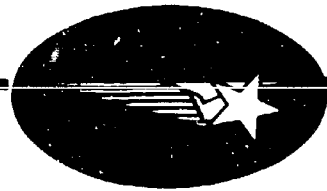


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THERMAL RADIATION PHENOMENA

VOL. 1

THE EQUILIBRIUM THERMODYNAMIC PROPERTIES OF HIGH TEMPERATURE AIR

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May 1967

THERMAL RADIATION PHENOMENA

**The Equilibrium Thermodynamic
Properties of High Temperature Air**

by

Forrest R. Gilmore

Edited by

John L. Magee and Henry Aroeste

Open Publication was approved by the Department of Defense on 3 April 1967

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FOREWORD

"Thermal radiation" is electromagnetic radiation emitted by matter in a state of thermal excitation. The energy density of such radiation in an enclosure at constant temperature is given by the well known Planck formula. The importance of thermal radiation in physical problems increases as the temperature is raised; at moderate temperatures (say, thousands of degrees Kelvin) its role is primarily one of transmitting energy, whereas at high temperatures (say, millions of degrees Kelvin) the energy density of the radiation field itself becomes important as well. If thermal radiation must be considered explicitly in a problem, the radiative properties of the matter must be known. In the simplest order of approximation, it can be assumed that the matter is in thermodynamic equilibrium "locally" (a condition called local thermodynamic equilibrium, or LTE), and all of the necessary radiative properties can be defined, at least in principle. Of course whenever thermal radiation must be considered, the medium which contains it inevitably has pressure and density gradients and the treatment requires the use of hydrodynamics. Hydrodynamics with explicit consideration of thermal radiation is called "radiation hydrodynamics".

In the past twenty years or so, many radiation hydrodynamic problems involving air have been studied. In this work a great deal of effort has gone into calculations of the equilibrium properties of air. Both thermodynamic and radiative properties have been calculated. It has been generally believed that the basic theory is well enough understood that such calculations yield valid results, and the limited experimental checks which are possible seem to support this hypothesis. The advantage of having sets of tables which are entirely calculated is evident: the calculated quantities are self-consistent on the basis of some set of assumptions, and they can later be improved if calculational techniques are improved, or if better assumptions can be made.

The origin of this set of books was in the desire of a number of persons interested in the radiation hydrodynamics of air to have a good source of reliable information on basic air properties. A series of books dealing with both theoretical and practical aspects was envisaged. As the series materialized, it was thought appropriate to devote the first three volumes to the equilibrium properties of air. They are:

The Equilibrium Thermodynamic Properties of Air,
by F. R. Gilmore

The Radiative Properties of Heated Air,
by B. H. Armstrong and R. W. Nicholls

Tables of Radiative Properties of Air,
by Lockheed Staff

The first volume contains a set of tables along with a detailed discussion of the basic models and techniques used for their computation. Because of the size of the related radiative tables and text, two volumes were considered necessary. The first contains the text, and the second the tables. It is hoped that these volumes will be widely useful, but because of the emphasis on very high temperatures it is clear that they will be most attractive to those concerned with nuclear weapons phenomenology, reentry vehicles, etc.

Our understanding of kinetic phenomena, long known to be important and at present in a state of rapid growth, is not as easy to assess as are equilibrium properties. Severe limitations had to be placed on choice of material. One volume is offered at this time:

Excitation and Non Equilibrium Phenomena in Air,
by Landshoff, et al.

It provides material on the more important processes involved in the excitation of air, criteria for the validity of LTE and special radiative effects.

A discussion of radiation hydrodynamics was felt to be necessary and another volume was planned to deal with this topic:

Radiation Hydrodynamics of High Temperature Air,
by Landshoff, Hillendahl, et al.

It is not ready for publication at this time. It will review the basic theory of radiation hydrodynamics and discuss the application to fireballs in the atmosphere.

The choice of material for these last two volumes was made with an eye to the needs of the principal users of the other three volumes.

Most of the work on which these volumes are based was supported by the United States Government through various agencies of the Defense Department and the Atomic Energy Commission. The actual preparation of the volumes was largely supported by the Defense Atomic Support Agency.

We are indebted to many authors and organizations for assistance and we gratefully acknowledge their cooperation. We are particularly grateful to the RAND Corporation for permission to use works of F. R. Gilmore and H. L. Brode and to the IBM Corporation for permission to use some of the work of B. H. Armstrong. Most of the other authors are employed by the Lockheed Missiles and Space Company, in some cases as consultants.

Finally we would like to acknowledge the key role of Dr. R. E. Meyerott of LMSC in all of this effort, from the initial conception to its realization. We are particularly grateful to him for his constant advice and encouragement.

Criticism and constructive suggestions are invited from all readers of these books. We understand that much remains to be done in this field, and we hope that the efforts represented by this work will be a stimulus to its development.

The Editors

J. L. Magee

H. Arceste

Preface

This volume is concerned with the thermodynamic properties of air as well as individual air constituents from 1000°K to 10^7°K for densities between 10 and 10^{-7} times sea level density. It consists of text and tables which were both prepared by Dr. Forrest R. Gilmore. He is also the author of a somewhat smaller work (Gilmore, 1955) on the same topic which has received wide circulation.

The text describes the techniques, models and approximations used in calculation of the tables. It is not intended to be a general treatment of the theory of such calculations which is too well known to need restatement. The reader is expected to have some familiarity with both thermodynamics and statistical mechanics. Discussion of the approximations is detailed enough so that the accuracy can be readily assessed and improvements can be readily considered.

The tables can be accepted as an accurate summary of the thermodynamic properties of air and its constituents. They have been compared with other calculations (which differ in various approximations) and, where possible, with experiment. Of all inputs for calculations of hydrodynamics and radiation hydrodynamics, the equilibrium thermodynamic properties are by far the most reliable. It is unlikely that there will be a significant improvement of our knowledge in this area in the near future, nor is it needed, except perhaps at the highest density considered.

Information provided in the tables is much more widely useful than for air problems alone. It should be noted that most of the tables are devoted to the individual air constituents.

The air of this volume is a mixture of about 78% N_2 , 21% O_2 , 1% Ar, with a trace of CO_2 . It is essentially the air (i.e., dry air) found in the

homosphere, or the atmosphere below 95 kilometers altitude. In the homosphere, mixing processes are rapid, and the composition remains essentially constant. The local thermodynamic equilibrium (LTE) approximation of radiation hydrodynamics is reasonable only in the homosphere. For convenience of the reader a discussion of properties of the atmosphere prepared by A. D. Anderson is included as Appendix A.

We would like to thank Dr. Forrest R. Gilmore for his splendid cooperation and the RAND Corporation for permission to include this work in our series on "Thermal Radiation." Thanks are also due Mr. A. D. Anderson for preparation of Appendix A.

J. L. Magee

H. Aroeste

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CHAPTER 1. THE EQUILIBRIUM THERMODYNAMIC PROPERTIES OF HIGH-TEMPERATURE AIR: DISCUSSION

1.1 Introduction

In order to calculate the behavior of nuclear fireballs and of hypersonic missiles and meteorites, one needs values for the thermodynamic properties of air over a wide range of temperatures and pressures or densities. At temperatures above about 2000°K there are great experimental difficulties in measuring these properties directly, while it is generally accepted that careful theoretical calculations can yield results of high accuracy. Consequently, in this chapter the methods and data available for the theoretical computation of such properties are outlined, and published results reviewed briefly. Some improvements over existing treatments are also indicated. Extensive tables based on these improved expressions are given in Chapter 2.

Throughout this chapter the assumption of local thermodynamic equilibrium (LTE) is made. In some situations of interest, such as fireballs or missile trails at very high altitudes, this assumption is not valid, and the results given in this chapter are not applicable. In such non-equilibrium situations the thermodynamic properties of air depend upon the energy deposition mechanisms and the subsequent atomic and molecular processes, as discussed in a companion volume of Thermal Radiation Phenomena, Excitation and Non-equilibrium Phenomena in Air.

1.2 Air as a mixture of ideal gases in chemical equilibrium

The thermodynamic properties of most gases at low and moderate densities can be approximated over a certain temperature range by a thermal equation of state of the form

$$pV = NRT \quad (1.2-1)$$

and a caloric equation of state of the form

$$E = NC_V T, \quad (1.2-2)$$

where p is the pressure, V the volume, N the number of moles, R the gas constant per mole, T the temperature, E the internal energy, and C_V the (constant) molal specific heat at constant volume. A gas which satisfies Eq. (1.2-1) and Eq. (1.2-2) is called a perfect gas. Many gases satisfy Eq. (1.2-1) over a fairly wide range of temperatures, but Eq. (1.2-2) only over a much narrower range. Consequently, the definition of a perfect gas is sometimes modified to include gases which obey Eq. (1.2-1) but not Eq. (1.2-2). However, to avoid ambiguity it seems preferable to follow thermochemical practice, and use the phrase ideal gas to denote a gas which is thermally perfect but has an internal energy varying arbitrarily with the temperature.

Ideal-gas thermodynamic properties for many pure elements and compounds have been calculated and tabulated by various workers. The most extensive and accurate set of such tables was recently issued by

a Joint Army-Navy-Air Force (JANAF) Thermochemical Panel in loose leaf form (JANAF Thermochemical Tables, 1960), with revisions issued periodically. These tables include values for most air molecules to 6000°K. Methods for making such calculations at still higher temperatures will be discussed in later sections of this chapter.

Air is a mixture of nitrogen and oxygen, with small amounts of argon, carbon dioxide, and rare gases, and a variable amount of water vapor. At low and moderate densities its thermodynamic properties may be obtained simply by adding the ideal-gas contributions from its components. This is straightforward at low temperatures, where the composition does not change. At high temperatures, however, dissociation and other chemical reactions cause the composition to vary with temperature and pressure. Because of this variation the product pV for the mixture is no longer proportional to T , even though each component is effectively ideal. Consequently, aerodynamicists often call air at high temperatures a "real gas," although thermochemists prefer to reserve this term for high densities where intermolecular forces cause deviations from ideal-gas behavior.

The first step in calculating the thermodynamic properties of high-temperature air is usually to calculate the equilibrium chemical composition. The basic condition for chemical equilibrium (Epstein, 1937) is that at a fixed temperature and pressure the amounts or concentrations of the various chemical species must be such as to minimize the Gibbs free energy of the mixture, subject to conservation of the chemical elements in the mixture. If the temperature is high enough to produce significant ionization, electrons and ions must be included among the species, and charge must also be conserved.

The Gibbs free energy of an ideal-gas mixture is given by

$$F_{\text{tot}} = \sum_1 N_1 (F_1^{\circ} + RT \ln p_1) , \quad (1.2-3)$$

where N_1 is the number of moles of the i -th species, F_1° is the ideal-gas molal free energy of this species (at the temperature T and one atmosphere pressure), and p_1 is its partial pressure (in atmospheres). White, Johnson, and Dantzig (1958) have developed numerical methods for minimizing Eq. (1.2-3) while keeping the temperature and the total pressure fixed and conserving mass. Their methods are convenient for calculating equilibrium compositions at specified temperatures and pressures. For fireball applications it is preferable to make computations at specified temperatures and volumes (or densities), because the air density within a fireball varies by two or three orders of magnitude at most, while the pressure variation can be several more orders of magnitude. A convenient procedure for such computations can be based on the thermodynamic principle of minimizing the Helmholtz free energy (or work function)

$$A_{\text{tot}} = F_{\text{tot}} - pV = \sum_1 N_1 [F_1^{\circ} - RT + RT \ln (N_1 RT/V)] , \quad (1.2-4)$$

at a fixed temperature and volume (Epstein, 1937). Since Eq. (1.2-4) has nearly the same form as Eq. (1.2-3), the procedures of White, Johnson and Dantzig (1958) can be used with only minor modification.

For systems involving a limited number of reactions, or for more complex systems if a high-speed computer is not available, a computation

method based on "equilibrium constants" may be more convenient. To derive the necessary equations from the free-energy minimization principle, consider the effect of small changes δN_i in the amounts of the chemical species, while the temperature and (total) pressure are held fixed. By the use of Eq. (1.2-3) and the relation $p_i = pN_i/\sum_1 N_i$, the variation in free energy at constant p may be expressed as

$$\delta F_{\text{tot}} = \sum (F_i^{\circ} + RT \ln p_i) \delta N_i + \sum_1 N_i RT \delta(\ln N_i) - \sum_1 N_i RT \delta(\ln \sum_1 N_i). \quad (1.2-5)$$

Since $\delta \ln x = \delta x/x$, the last two terms on the right hand side of Eq. (1.2-5) cancel and the final result becomes

$$\delta F_{\text{tot}} = \sum_1 (F_i^{\circ} + RT \ln p_i) \delta N_i. \quad (1.2-6)$$

In equilibrium the free energy has a minimum, so $\delta F_{\text{tot}} = 0$ and from Eq. (1.2-6)

$$\sum_1 \delta N_i \ln p_i = - \sum_1 \delta N_i (F_i^{\circ}/RT) \quad (1.2-7)$$

for all sets of δN_i which satisfy the mass-balance constraints. One way of satisfying these constraints is to consider possible chemical reactions, such as



A composition variation due only to this reaction has $\delta N_{XY} = -\delta N_X = -\delta N_Y$ with all other δN_i vanishing. Eq. (1.2-7) then gives

$$\ln p_{XY} - \ln p_X - \ln p_Y = - \frac{F_{XY}^{\circ} - F_X^{\circ} - F_Y^{\circ}}{RT} \quad (1.2-9)$$

Taking the exponential of this equation, one obtains

$$\frac{p_{XY}}{p_X p_Y} = \exp \left[- \frac{F_{XY}^{\circ} - F_X^{\circ} - F_Y^{\circ}}{RT} \right]. \quad (1.2-10)$$

The right hand side of Eq. (1.2-10) is independent of the composition and pressure of the mixture (although it does vary with temperature); it is conventionally called the equilibrium constant, K_p , of reaction Eq. (1.2-8). With the help of the ideal-gas relation, $p_i = N_i RT/V = \bar{N}_i RT$, where \bar{N}_i is the concentration (moles per unit volume) of the species i , Eq. (1.2-10) may be transformed to

$$\frac{\bar{N}_{XY}}{\bar{N}_X \bar{N}_Y} = RT \exp \left[- \frac{F_{XY}^{\circ} - F_X^{\circ} - F_Y^{\circ}}{RT} \right]. \quad (1.2-11)$$

(In Eq. (1.2-11) the F_i° are conventionally evaluated at 1 atmosphere pressure; hence, the units of RT must be atm-volume/mole.) The right hand side of Eq. (1.2-11) may be called the concentration equilibrium constant K_n , for reaction Eq. (1.2-8).

If there are I chemical species present in a reacting mixture and J mass-balance conditions to be satisfied (one for each element present, plus one for charge neutrality if ions are present), it turns out that $I - J$ independent equilibrium equations of the form Eq. (1.2-10) or Eq. (1.2-11)

can be found, and thus there are just enough equations to determine the partial pressures or concentrations uniquely. The set of equations used, however, is not unique, since, for example, the sum or difference of two reactions is also a permissible reaction; its equilibrium constant is just the product or quotient of the constants for the two reactions. Any convenient complete set of equations can be used to get the equilibrium composition.

Unless only two or three reactions are involved, a closed-form solution to the equilibrium equations is usually not obtainable, and numerical iteration schemes must be used. An important exception occurs however, when only atoms, atomic ions, and electrons are involved. The equilibrium ionization equations for each element X can be written

$$\bar{N}_{X^+} = K_{X^+} \bar{N}_X / \bar{N}_e, \quad \bar{N}_{X^{++}} = K_{X^{++}} \bar{N}_X / \bar{N}_e^2, \quad \bar{N}_{X^{+++}} = K_{X^{+++}} \bar{N}_X / \bar{N}_e^3, \quad \dots, \quad (1.2-12)$$

where \bar{N}_e is the electron concentration.* The sum of these concentrations, plus \bar{N}_X , is the total concentration of the element X , $\bar{N}_{\text{tot } X}$, which is usually specified. The summed equations can be readily solved for \bar{N}_X :

$$\bar{N}_X = \frac{\bar{N}_{\text{tot } X}}{1 + K_{X^+} / \bar{N}_e + K_{X^{++}} / \bar{N}_e^2 + \dots} \quad (1.2-13)$$

* If the negative ion X^- is stable, an additional equation for its concentration must be included in Eq. (1.2-12), and corresponding additional terms added to subsequent equations, but this does not complicate the analysis significantly.

If the elements X, Y, ... are present, the charge-balance relation is

$$\bar{N}_e = \bar{N}_{X^+} + 2\bar{N}_{X^{++}} + 3\bar{N}_{X^{+++}} + \dots + \bar{N}_{Y^+} + 2\bar{N}_{Y^{++}} + 3\bar{N}_{Y^{+++}} + \dots \quad (1.2-14)$$

With the help of Eqs. (1.2-12), (1.2-13), and similar relations for Y, etc., Eq. (1.2-14) can be written

$$\bar{N}_e = \frac{\bar{N}_{\text{tot. X}}(K_{X^+}\bar{N}_e + 2K_{X^{++}}\bar{N}_e^2 + \dots)}{1 + K_{X^+}\bar{N}_e + K_{X^{++}}\bar{N}_e^2 + \dots} + \frac{\bar{N}_{\text{tot. Y}}(K_{Y^+}\bar{N}_e + 2K_{Y^{++}}\bar{N}_e^2 + \dots)}{1 + K_{Y^+}\bar{N}_e + K_{Y^{++}}\bar{N}_e^2 + \dots} + \dots \quad (1.2-15)$$

In a specified-density problem the total concentration of each element is known, and Eq. (1.2-15) can in principle be solved for \bar{N}_e , although analytic solutions are possible only when the number of different ions present is small. However, if the elemental composition (hence, the ratios $\bar{N}_{\text{tot. Y}}/\bar{N}_{\text{tot. X}}$, etc.) and the electron concentration \bar{N}_e are taken as independent variables, Eq. (1.2-15) can be solved directly for $\bar{N}_{\text{tot. X}}$, and then the other concentrations can be obtained from Eq. (1.2-12), etc., all without iteration.*

Although a solution of Eq. (1.2-15) at a specified density (i.e., specified values of $\bar{N}_{\text{tot. X}}$, $\bar{N}_{\text{tot. Y}}$, etc.) usually requires an iteration process, it is a particularly simple one, involving only the variable \bar{N}_e . A numerical study by the writer shows that a scheme using the total atom concentration as the first approximation to \bar{N}_e , and obtaining successively better values

* This fact has been discovered, apparently independently, by a number of different workers. The earliest publication known to the writer is that of Hilsenrath, Green, and Beckett (1959).

by substituting the previous value in the right hand side of Eq. (1.2-15), converges quite rapidly when the second approximate N_{\bullet} is larger than about half the atom concentration. For smaller N_{\bullet} values, rapid convergence can be obtained by using for each new approximation the geometric mean between the previous approximation and the value obtained from Eq. (1.2-15).

Once the equilibrium composition of a reacting gas mixture such as high-temperature air is obtained by the free-energy-minimization or equilibrium-constant methods described above, the basic thermodynamic properties may be obtained simply by adding the ideal-gas contributions from the various constituents. The ideal-gas entropies and free energies are conventionally tabulated for 1 atmosphere pressure, and must be corrected to the actual partial pressure of each species, as earlier indicated for the free energy (see Eq. (1.2-3)).

Calculations for "differential" thermodynamic functions, such as the specific heat, are less straightforward. A specific heat computed by averaging the specific heats of the component species, weighted according to their equilibrium concentrations at a given temperature and density, is a "frozen composition" specific heat, useful only in situations where the temperature is varied so rapidly that chemical reactions do not have time to take place. In the usual true-equilibrium situation, however, the variation of composition with temperature gives an additional contribution to the specific heat. Hochstim (1962) has presented rather lengthy equations for the specific heat and related quantities in terms of the equilibrium constants and their temperature derivatives, and shown how

they can be solved for air using a high-speed computer. In most cases, however, it is probably simpler to calculate the energy at two or three closely-spaced points and obtain the specific heat by numerical differentiation. Moreover, in many fireball calculations the energy and pressure of air are approximated by analytic functions of temperature and density. Differentiation of these functions gives approximate values for the specific heat, velocity of sound, etc., rather simply.

The equilibrium compositions obtained in the course of calculating thermodynamic properties are also useful in determining radiation properties (see Volume 2) and transport properties (viscosity, electrical conductivity, etc.) of air. For these purposes it is often more convenient to express species concentrations in terms of molecules (atoms, ions) per unit volume. Since thermochemical tables are usually based on the gram mole, the equations in this chapter are given in molal form, but they are equally valid if concentrations are expressed in molecules (or particles) per unit volume, while volumes, energies, etc., are taken per molecule instead of per mole and the gas constant per mole, R , is replaced by the gas constant per molecule, k (Boltzmann's constant).

1.3 Ideal-gas properties for monatomic gases

As will be shown below, the thermodynamic properties of monatomic gases depend in part on the quantum-mechanical properties of their constituent atoms. It is beyond the scope of this chapter to explain the quantum mechanics of atomic structure (for a good introduction, see

Herzberg, 1944). However, in the next few paragraphs, enough of the terminology will be explained to permit the reader to use existing energy-level tables to calculate thermodynamic properties.

An atom or atomic ion may exist in many different states with different energies, corresponding to different arrangements of the orbital electrons. According to quantum-mechanical principles for light atoms (Russell-Saunders coupling, Herzberg, 1944), the states are grouped in terms, where for each term the total orbital angular momentum (in atomic units) of the electrons must be an integer. The terms are designated, for historical reasons, by the letters S, P, D, F, G, H, ..., corresponding to total orbital angular momenta, L, equal to 0, 1, 2, 3, 4, 5, ..., respectively. In addition, each electron possesses a spin (intrinsic angular momentum) of $1/2$, and these spins add algebraically to give a total spin S. The quantity $2S + 1$ is called the multiplicity of the term; it is conventionally written as a superscript. Thus a term with $L = 2$ and $S = 3/2$ is denoted by 4D . A given atom or ion may have many terms of the same type, with the same L and S values, but differing in the arrangement of the individual electrons, and thus in the energy.

A term having $S \leq L$ is composed of $2S + 1$ levels, having total angular momenta $J = L + S, L + S - 1, L + S - 2, \dots, L - S$, respectively, all with energies fairly close to each other. (If $L < S$, the quantities L and S should be interchanged in the preceding statement). Thus, a 4D state is composed of four levels designated by subscripting their J values: ${}^4D_{7/2}, {}^4D_{5/2}, {}^4D_{3/2}, {}^4D_{1/2}$. By placing the atom in a magnetic field, each of these levels can be split further, into $2J + 1$ individual

sublevels. Quantum theory shows that there are just this many distinct "quantum states" in such an electronic level; in the absence of a magnetic or electric field their energies are the same, so that they can be treated as a single level with a "degeneracy" or statistical weight of $2J + 1$. Often, the splitting of an L, S state into levels with different J values can also be ignored, and it can be treated as a single level with a statistical weight of $(2L + 1)(2S + 1)$. Thus, a 4D state has a statistical weight of 20; its four levels (${}^4D_{7/2}, {}^4D_{5/2}, {}^4D_{3/2}, {}^4D_{1/2}$) have statistical weights of 8, 6, 4, and 2, respectively.

Except for one-electron atoms and ions, accurate calculations of energy levels are difficult, while very accurate measurements by spectrography are usually relatively simple. Since spectroscopists measure wavelengths, which by Planck's law are inversely proportional to the energy level differences, they conventionally present energy levels in units of cm^{-1} . To convert to true energy units, these must be multiplied by hc , where h is Planck's constant and c is the velocity of light.

Moore (1949) has collected together the best experimental energy-level values for the light elements and ions; her tables are complete enough for many practical purposes. If necessary, Moore's values can be tested for completeness by comparison with the tables of predicted terms given in the front of the same volume, and missing values estimated by using various semiempirical methods (isoelectronic extrapolation, quantum defects, screening constants (Herzberg, 1944; Edlen, 1964)). For the highly ionized species, for which experimental data are incomplete, Edlen (1964) gives a number of useful extrapolation formulas and tables.

Fig. 1.1 depicts, as an example, the energy levels of the nitrogen atom. Since, there are many terms with the same L and S values, the terms are also marked with the quantum numbers of the individual electrons. Thus, $2s2p^4$ indicates one electron with principal quantum number $n = 2$ and orbital angular momentum $l = 0$, and four electrons with $n = 2$ and $l = 1$. Although not marked, all of the states shown have two inner, tightly bound electrons, $1s^2$; states without these electrons lie so high in energy that they can be completely ignored for present purposes.

According to statistical mechanics (Mayer and Mayer, 1940), in an ideal gas in equilibrium, the fraction of an atomic or ionic species which is in a particular electronic state or level j is

$$N_j/N = (g_j/Q) \exp(-hcE'_j/kT) , \quad (1.3-1)$$

where g_j is the statistical weight of the level, E'_j is its energy (in cm^{-1}), and Q is a proportionality constant called the partition function. The fraction N_j/N is also called the "fractional population" or "occupation number." When Eq. (1.3-1) is summed over all j values, the left hand side reduces to unity and the equation can be solved for the partition function:

$$Q = \sum_j g_j \exp(-c_2 E'_j/T) , \quad (1.3-2)$$

where c_2 is known as the second radiation constant,

$$c_2 = hc/k = 1.43879 \text{ cm}^\circ\text{K} \quad (1.3-3)$$

The values quoted in this chapter for the pertinent physical constants are those recently recommended by the National Academy of Sciences - National Research Council (1964); they differ slightly from those used in previous work.

The electronic-energy contribution of the atoms in state j to the internal energy of the gas is $N_j G hcE'_j$, where G is the number of atoms per mole (Avogadro's number). Since $G = R/k$, this contribution can also be written $N_j Rc_2 E'_j$. The ideal-gas internal energy per mole can then be obtained by using Eq. (1.3-1) to evaluate N_j , summing the contributions over j , and adding $(3/2)RT$ for the contribution from the translational motion of the atoms. The result may be written in dimensionless form:

$$\frac{E^\circ - E_0^\circ}{RT} = \frac{3}{2} + \frac{1}{QT} \sum_j c_2 E'_j \exp(-c_2 E'_j / T), \quad (1.3-4)$$

where the superscript \circ indicates the ideal-gas state, the subscript 0 indicates 0°K , and

$$R = 8.3143 \times 10^7 \text{ erg}/^\circ\text{K-mole} = 1.98717 \text{ cal}/^\circ\text{K-mole}. \quad (1.3-5)$$

E_0° in Eq. (1.3-4) represents the internal energy of the ideal gas at 0°K ; its numerical value is somewhat arbitrary, since in thermodynamics only energy differences can be measured. However, in reacting gases, consistent choices must be made, so that the differences in E_0° values between the reactants and the products gives the correct reaction energy (at absolute zero). For example, if E_0° is taken to be zero for atomic N, the corresponding quantity for N^+ must equal the ionization energy of N, while that for N_2 must be the negative of the dissociation energy. In thermochemistry it is conventional to choose $E_0^\circ = 0$ for the elements in the phases that are stable at room temperature and pressure. For air (including carbon dioxide) these are gaseous N_2 , O_2 , and Ar and crystalline graphite. The use of graphite as a reference material has the disadvantage that it makes the internal energy of gaseous CO_2 negative, and this causes the calculated energies for air near room temperature to deviate appreciably from direct proportionality to the temperature. To prevent this behavior, E_0° for gaseous CO_2 (as well as gaseous N_2 , O_2 , and Ar) has been set equal to zero in the present work.

The corresponding values of E_0° for the atomic species of present interest are given in the first table of the second chapter, together with the dissociation and ionization energies from which they were derived, and the corresponding references. An effort was made to obtain the best values presently available, since results of thermodynamic calculations are usually more sensitive to inaccuracies in these values than to any other inaccuracies.

The ideal-gas entropy (at one atmosphere pressure) can be obtained, except for a constant term, from the thermodynamic relation $S = \int dH/T$ (p constant), where $H = E + RT$ and E is given by Eq. (1.3-4). The result can be written

$$S^\circ/R = (E^\circ - E_0^\circ)/RT + \ln Q + \frac{5}{2} \ln T + C, \quad (1.3-6)$$

where statistical mechanics (Mayer and Mayer, 1940) shows that the integration constant is

$$C = 1 + \ln(k/p^\circ) + \frac{3}{2} \ln(2\pi M k/C^2 h^2) = \frac{3}{2} \ln M - 2.66496, \quad (1.3-7)$$

with $p^\circ = 1$ atmosphere and M the atomic weight. Other ideal-gas thermodynamic properties can be obtained from Eq. (1.3-4) and Eq. (1.3-6) using well-known thermodynamic identities. For example, the dimensionless Gibbs free energy is given by

$$-\frac{F^\circ - E_0^\circ}{RT} = \frac{S^\circ}{R} - \frac{E^\circ - E_0^\circ}{RT} - 1 = \ln Q + \frac{5}{2} \ln T + \frac{3}{2} \ln M - 3.66496. \quad (1.3-8)$$

Substitution of this expression in Eq. (1.2-11) gives an equation for the equilibrium constant in terms of the partition functions of the reactants:

$$\frac{N_{AB}}{N_A N_B} = Q \left(\frac{Q_{AB}^2 M_{AB}}{2\pi k T M_A M_B} \right)^{3/2} \frac{Q_{AB}}{Q_A Q_B} \exp \left[- \frac{E_0^\circ(AB) - E_0^\circ(A) - E_0^\circ(B)}{RT} \right]. \quad (1.3-9)$$

When A represents a positive ion, B an electron (with $Q_B = 2$), and AB a neutral atom, Eq. (1.3-9) yields the familiar Saha equation for equilibrium ionization.

In calculating ideal-gas functions by the above equations, however, there is a basic difficulty not mentioned in elementary texts. An isolated atom or positive ion (in an unlimited volume) actually has an infinite number of stable electronic states with energies E_j less than its ionization energy, and thus the sums in Eq. (1.3-2) and Eq. (1.3-4) diverge. However, at temperatures up to several thousand degrees the series are semi-convergent in the sense that essentially the same answer is obtained by taking the first ten or the first ten thousand terms. The omission of the infinite "tail" of the series, which contains terms corresponding to electrons in highly-excited levels, is justified because in actual situations no atom can occupy an unlimited volume, since it is limited at least to the volume of the system, and generally, in systems containing many atoms, to a much smaller volume, comparable to the mean volume per atom (see Section 1.7).

At somewhat higher temperatures the difficulty is less trivial, because there may be no point at which the terms in the sum become small, and thus the answer may depend significantly upon where the series is broken off. This is illustrated in Fig. 1.2, which shows the percentage increase in internal energy and free energy as the cutoff point is raised from an electron quantum number of $n = 4$ to $n = 8$. Various workers have suggested simple cutoffs which depend upon the atom density, the electron density, or the temperature. However, none of these simple

one-parameter relations can be completely correct, because the high electronic levels are affected both by close-in neutral particles and, to a greater extent, by close-in charged particles, while the temperature influences how often these particles come close-in. The true cutoff is thus a function of the composition, density, and temperature, so that if the sums in Eqs. (1.3-2) and (1.3-4) are sensitive to the cutoff the "ideal-gas" functions also depend upon the composition and density as well as temperature, which greatly complicates thermodynamic calculations. Moreover, the higher bound levels below the cutoff may be perturbed sufficiently to further affect the thermodynamic properties.

As shown by Fig. 1.2, at successively higher stages of ionization an atom's properties remain independent of the cutoff to successively higher temperatures. In air below standard (sea level) density, as the temperature is raised to the point where the cutoff for any particular ion becomes important the concentration of that ion becomes so small (due to further ionization) that the choice of cutoff has little effect on the thermodynamic properties of the equilibrium mixture. Unfortunately, this simplification does not hold for the highest air densities of present interest (up to 10 times the standard density, as produced by a strong shock wave at low altitudes). Even at such densities, however, electronic states with $n \leq 4$ should be little affected by neighboring atoms, since the electronic orbits of such states lie well within the mean interatomic or interionic distance. Thus, thermodynamic functions calculated by summing up to $n = 4$ represent lower limits to the true values. In addition, they usually represent useful approximations to the actual

values, since at high densities the correct cutoff is not much greater than 4 (see Section 1.7), while at low densities the equilibrium properties are relatively insensitive to the cutoff, as already pointed out.

If better, variable-cutoff thermodynamic properties are required they may be obtained by adding the contributions from states between $n = 5$ and the cutoff n_c . For light atoms and ions, the most important of such states are those having only one electron with $n > 4$, such states with one electron outside a "core" are quite hydrogen-like, with a statistical weight equal to $2n^2$ times that of the core (with the outer electron removed), and an energy just $Ry (Z + 1)^2/n^2$ less than the energy of the core, where Ry is the Rydberg ($109,737 \text{ cm}^{-1} = 13.605 \text{ eV}$), and Z is the charge of the atom or ion. The partition-function summation, Eq. (1.3-2), over these states can then be factored into a sum over the states of the outer electron and a sum over the states of the core. The final result is

$$Q(X) = Q_{n \leq 4}(X) + Q_{n \leq 4}(X^+) \exp\left(-\frac{I(X)}{kT}\right) \sum_{n=5}^{n_c} 2n^2 \exp\left(\frac{Ry (Z+1)^2}{n^2 kT}\right) \quad (1.3-10)$$

where $Q_{n \leq 4}(X^+)$ is the partition function for the next higher ion and $I(X)$ is the $X \rightarrow X^+$ ionization energy. Since the cutoff n_c depends upon temperature, density, and somewhat on composition (see Section 1.7), it is more convenient to calculate the correction term on the right hand side of Eq. (1.3-10) during the course of an equilibrium ionization calculation than to tabulate the "true" ideal-gas thermodynamic properties of each species as functions of two or three variables.

Accordingly, ideal gas functions for the atoms and ions of C, N, O, and Ar have been calculated for temperatures of present interest using a fixed cutoff just above $n = 4$. Extensive numerical results are presented in Chapter 2. Tables showing the energy-level data used, and the fractional population of each electronic state versus temperature are also included. The thermodynamic results have been compared with results of several previous workers (JANAF Thermochemical Tables, 1960; Gilmore, 1955; Woolley, 1957; Kilsch, Gilmer, and Gilles, 1957; Green, Poland, and Margrave, 1960; Yungman et al., 1961; Martinez, 1961; Gurvich et al., 1962; McBride et al., 1963; Hilsenrath, Messina, and Evans, 1964). Up to 10,000°K, almost all the results agree to within 0.03 per cent. Moreover, the small differences are due primarily to use of different values for the gas constant R ; if this is corrected for, the deviations are generally reduced to less than 0.01 per cent. An exception is the table for N by Hilsenrath, Messina, and Evans (1964), which gives values deviating from other work by up to 2 per cent (their values for the other air atoms and ions show no such deviation).

Only a few tables extending above 10,000°K have been published previously, and these show increasing variations in the results for the neutral atoms, depending upon the electronic cutoff used by the different investigators. (Variations for the ions appear only at considerably higher temperatures, as shown by Fig. 1.2.) The earlier work by the writer (Gilmore, 1955) up to 24,000°K used a cutoff around $n = 5$ but omitted some states. Up to 12,000°K those results agree very well with the present results, but differ by up to 6 per cent for the neutral atoms at 24,000°K. The values of Woolley (1957) to 4,000,000°K and the extensive Russian tables (Yungman et al., 1961; Gurvich et al., 1962) to 20,000°K also show deviations above 10,000°K. Woolley (1957) used a somewhat different type of cutoff that excludes many

states included in the present work (planning to include them in subsequent equilibrium calculations). Hence, his values for the enthalpy, entropy, and negative free energy are generally lower than the present values; for the neutral atoms the difference is a few per cent or less at $20,000^{\circ}\text{K}$. On the other hand, the Russian values are generally higher because they used cutoffs at $n = 11 - 13$, based on restricting the electrons to the mean volume per atom at densities corresponding to a pressure of one atmosphere. At $20,000^{\circ}\text{K}$ their enthalpy values for the neutral atoms are almost a factor of two higher than the present values, although their entropies and free energies are only a few per cent higher. Whether such differences are significant in equilibrium thermodynamic calculations depends upon the density under consideration and also upon whether separate allowance for the highly excited states is made in the equilibrium computation, as already discussed (see also Section 1.7).

1.4 Ideal-gas properties for diatomic gases

The relations Eqs. (1.3-4) and (1.3-6) for the energy and entropy of a monatomic gas apply equally well to a molecular gas, provided that the summations are extended over all the molecular energy levels, which can differ not only in electronic energy but also in rotational and vibrational energy. Because of these additional degrees of freedom, the individual levels of a molecule are so numerous that it is rather impractical to tabulate all of them. Fortunately, however, for each degree of electronic excitation the rotational and vibrational levels are usually quite regular and can be represented by simple formulas, only the coefficients of which

need to be tabulated. Moreover, using these formulas, the terms of the series in Eqs. (1.3-2), (1.3-4) and (1.3-6) can often be summed algebraically with reasonable accuracy, at least in some temperature ranges.

The energy levels of molecules can be grouped into electronic states, each of which is characterized (in part) by the total spin S of the electrons. Just as for atoms, the multiplicity $2S + 1$, is written as a superscript on the left of the state symbol. Unlike the atoms, however, diatomic molecules have an internuclear axis, and the second important quantum number is not the total orbital angular momentum, L , of the electrons, but the component, Λ , of this momentum in the axial direction. In analogy with the Roman-letter designations of atomic terms, diatomic states are designated by the Greek letters Σ , Π , Δ , Φ , ..., corresponding to $\Lambda = 0, 1, 2, 3, \dots$. Because in diatomic molecules terms of a given L are separated into states of different Λ , the statistical weights of these states are generally less than those of the corresponding atomic terms; specifically, the weights are $2S + 1$ for Σ states and $2(2S + 1)$ for Π , Δ , Φ , ..., states. States with $S > 0$ and $\Lambda > 0$ split into $2S + 1$ substates, designated by writing the vector sum of Λ and the axial component of S as a subscript. However, this splitting can often be ignored, since it is usually small and often associated only with higher excited states. Other subscripts and superscripts are sometimes added to the state symbol to indicate the electronic symmetry, but this does not affect the present considerations.

Since a diatomic molecule may have more than one state with the same S and Λ values, and also since there may be a considerable period between the experimental discovery of a state and the determination of its type, the states are also labelled somewhat arbitrarily by Roman letters, with X designating the ground state, and A, B, C, \dots the successively higher (or earlier discovered) states of the same multiplicity as the ground state, while a, b, c, \dots designate states of a different multiplicity. (Exceptions are the N_2 and C_2 molecules, where the capital and lower case letters are reversed, due to early misidentification of the ground state.)

The electronic energy of a diatomic molecule depends not only upon the electronic state but also upon the interatomic (or, more accurately, internuclear) distances. Curves showing this variation for N_2 and N_2^+ are presented in Fig. 1.3. At large internuclear distances the energy must be that of two individual atoms. At distances approaching zero the energy must approach infinity because of the strong Coulomb (electrostatic) repulsion between the two nuclei. At intermediate distances the curve must have a minimum if the molecular state is to be stable. The two nuclei will tend to approach this minimum-energy distance, but may vibrate about this point. Since the vibrational motion of the nuclei is much slower than the orbital motions of the lighter electrons, the electrons will keep adjusted to the instantaneous position of the nuclei. Thus, the electronic energy will follow the same curve regardless of the amplitude of vibration, and such a curve forms an effective potential for molecular vibration.

The lower portion of an attractive potential curve (see Fig. 1.3) can often be approximated by a parabola. Quantum theory (Herzberg, 1950) shows that the vibrational energy in a parabolic potential equals $\omega(v + 1/2)$, where ω is a constant which depends inversely upon the width of the parabola, v is the vibrational quantum number, which can take on the values 0, 1, 2, ..., and the zero of energy is measured from the bottom of the parabola. Actual potential curves, however, diverge more and more from a parabola at higher energies; therefore the vibrational energy levels, instead of being evenly spaced as in the above formula, fall closer and closer together as the dissociation limit is approached. It is conventional to fit these levels by the formula

$$G(v) = \omega_e(v + 1/2) - \omega_e x_e(v + 1/2)^2 + \omega_e y_e(v + 1/2)^2 + \dots, \quad (1.4-1)$$

where ω_e , $\omega_e x_e$, $\omega_e y_e$, etc., are constants determined spectroscopically, and the subscripted e indicates that this is an expansion about the equilibrium point (potential curve minimum). The short numbered lines on the potential curves of Fig. 1.3 indicate the observed vibrational energy levels of these molecules.

Besides vibrating, a molecule can also rotate. The simplest approximation is that of a "rigid rotator," whose quantum-mechanical energy levels (Herzberg, 1950) are given by $BJ(J+1)$, where B is a constant inversely proportional to the square of the internuclear distance, and the rotational quantum number J equals 0, 1, 2, ... Since actual molecules are not rigid, but stretch as they rotate so that the effective value of B

decreases with increasing J , a negative correction term proportional to $J^2(J+1)^2$ is conventionally added to the energy expression. Moreover, if the molecule is also vibrating, this affects the mean internuclear distance and gives a B value which depends somewhat on the vibrational quantum number.

By adding the contributions of electronic, vibrational, and rotational energy one obtains the following general formula for the molecular energy levels (term values):

$$\begin{aligned} \tilde{G}(v, J) = & \tilde{G}_e^* + \omega_e(v+1/2) - \omega_e x_e(v+1/2)^2 + \omega_e y_e(v+1/2)^3 \\ & + \dots + B_v J(J+1) - D_v J^2(J+1)^2 + H_v J^3(J+1)^3 + \dots, \end{aligned} \quad (1.4-2)$$

where

$$B_v = B_e - \alpha_e(v+1/2) + \gamma_e(v+1/2)^2 + \dots,$$

$$D_v = D_e + \beta_e(v+1/2) + \dots,$$

$$H_v = H_e + \delta_e(v+1/2) + \dots,$$

and \tilde{G}_e^* is the electronic energy at the equilibrium distance, taking the zero of energy to be the lowest level ($v = 0, J = 0$) of the ground state. (The asterisk is added to distinguish this quantity from the conventional \tilde{G}_e , the energy above the potential minimum of the ground state.) In Eq. (1.4-2) some generally-negligible terms due to the interaction of the electronic and

rotational angular momenta have been omitted.

The statistical weight of each level is just the electronic statistical weight already discussed, multiplied by $2J + 1$ for most molecules. However, if the molecule is homonuclear (like N_2 , N_2^+ , etc.) the $2J + 1$ is replaced by a rapidly-oscillating function of J , which for present purposes can be approximated by its mean value, $(2J + 1)/2$.

Since each electronic state has only a finite number of bound rotational-vibrational levels,* the summations required for thermodynamic calculations can be carried out without any further convergence difficulties. However, at temperatures of a few thousand degrees, many hundreds of terms make significant contributions to the sums, so that hand computations become lengthy. For this reason, Mayer and Mayer (1940) have worked out approximate algebraic formulas for these sums, based on replacing the summation over rotational levels by an integration, and neglecting or approximating the higher correction terms in the energy-level formulas. However, some of these approximations become poor at very high temperatures. Moreover, with modern high-speed computers it is virtually as easy to perform the summation directly.

At temperatures above $5000^\circ K$ or $6000^\circ K$, vibration-rotation energy levels of the lower electronic states near their dissociation limits can make significant contributions to the thermodynamic properties. Unfortunately, spectroscopic measurements on such levels have not been made for most electronic states of interest. For the few states for which they are available, it is found that a large number of terms must be included in Eq. (1.4-2) in order to fit the data. This indicates that the usual measurements on only the lower levels of an electronic state cannot be safely

* Neglecting a few highly-excited states which dissociate to positive plus negative atomic ions.

extrapolated to get the very high levels. However, these levels are determined by the high portions of the corresponding potential curve. It is often possible to determine this curve with some confidence, by use of Rydberg-Klein and valence-bond calculations (Vanderslice, Mason, and Lippincott, 1959; Gilmore, 1965). The energy levels corresponding to this curve can then be calculated quantum-mechanically.

For present purposes, however, it is possible to bypass this last step, and calculate the contributions of the high levels to the thermodynamic properties directly from the potential curve. At temperatures where these levels contribute significantly, their spacing is small compared to kT , so that the formulas of classical statistical mechanics can be used. These formulas show that the partition function for structureless particles of mass m with total energies between E_1 and E_2 , in a volume dV where the potential is U , is given by (Mayer and Mayer, 1940):

$$\frac{2\pi(2m)^{3/2}dV}{h^3} \int_{E_1}^{E_2} (E-U)^{1/2} \exp(-E/kT) dE \quad (1.4-3)$$

$$= \frac{2\pi(2mkT)^{3/2}dV}{h^3} e^{-U/kT} \left[\frac{\sqrt{\pi}}{2} \operatorname{erf} x^{1/2} - x^{1/2} e^{-x} \right]_{(E_1-U)/kT}^{(E_2-U)/kT}$$

where erf is the error function. The partition function contribution from diatomic energy levels between E_1 and the dissociation energy D can be obtained by multiplying the above expression by the electronic statistical weight g_e , letting m be the reduced mass, $M_1M_2/(M_1+M_2)Q$,

where M_1 and M_2 are the atomic weights of the two atoms, replacing dV by $4\pi r^2 dr$ where r is the internuclear distance, and integrating over r . The result is

$$Q(E_1 \text{ to } D) = \frac{8\pi^2 (2mkT)^{3/2} g}{h^3} \left[\int_{r_0}^{\infty} f_D(r) r^2 dr - \int_{r_1}^{r_2} f_1(r) r^2 dr \right], \quad (1.4-4)$$

where

$$f_D(r) = \frac{\sqrt{\pi}}{2} \operatorname{erf} \left(\frac{D-U(r)}{kT} \right)^{1/2} e^{-U(r)/kT} - \left(\frac{D-U(r)}{kT} \right)^{1/2} e^{-D/kT},$$

$f_1(r)$ is the same function except that D is replaced by E_1 , r_0 is the point on the inner branch of the potential curve where $U(r) = D$, and r_1 and r_2 are the two points where $U(r) = E_1$. A similar but slightly longer expression can be derived for the summation appearing in Eq. (1.3-4).

The above approach omits the quasistable rotational levels above the dissociation energy (Herzberg, 1950), which some investigators include. However, such levels are more conveniently treated as two separate atoms subject to an interatomic attraction (see Section 1.6). Moreover, there is little point in including bound levels near or above the dissociation energy unless the unbound or "repulsive" states or levels of similar energy and internuclear distance are also included, since the two types make comparable contributions to the equilibrium thermodynamic properties. Inclusion of the latter type, however, requires a departure from the ideal-gas approximation.

To check the accuracy of the above relations, partition function and energy calculations for several of the states of N_2 , NO , and O_2 were made using the direct summation method up to $1/3$, $1/2$, and $2/3$ of the dissociation energy, respectively, and the classical integrals beyond these energies. The results using the three different crossover points were virtually identical up to several thousand degrees, and agreed within 0.5 per cent for the entire range from 1000 to 40,000°K.

The total partition function and energy of diatomic molecules may be obtained by adding such contributions from all the electronic states. Of course, just as for atoms, isolated molecules have an infinite number of high-excited electronic states, while at finite densities these are "cut off" in some complicated fashion by electron-ion interactions. However, for most molecules such states lie considerably above the dissociation energy, so the molecules tend to dissociate before the choice of electronic cutoff makes much difference. In fact, unless the repulsive as well as attractive states near the dissociation energy are treated carefully, there is little point in including states above the dissociation energy (unless their fractional populations are desired for other purposes, such as radiation calculations).

In the present work, thermodynamic calculations were made for the diatomic molecules N_2 , N_2^+ , NO , NO^+ , O_2^- , O_2 , O_2^+ , and CO , which make a significant contribution either to the thermodynamic properties or to the charged-particle concentration of equilibrium air. These calculations included all the known and predicted bound states up to the

lowest dissociation limit, and in some cases one or two states above this limit. The method used was to sum over the energy level up to half the dissociation energy of each state, where the levels were calculated using the spectroscopic data given in Table 86 of the supplementary volume. (The higher rotational constants D_v and H_v , for which data are sparse, were calculated from the vibrational constants using formulas given in Herzberg (1950).) Levels above half the dissociation energy were included by means of the classical integral, Eq. (1.4-3), using the potential curves of Figs. 1-3 to 1-5, and of Krupenie and Weissman (1965) for CO.

The results are presented in Chapter 2. Up to 6000°K they generally agree very well with those of previous workers (Gilmore, 1955; Beckett and Haar (1957); JANAF Thermochemical Panel (1960); Yungman et al., 1961; Gurvich et al., 1962; Bristow and McChesney, 1965) except for small differences due to use of more recent values for the gas constant R and the second-radiation constant $c_2 = hc/k$. Above 6000°K, however, the present values for most molecules begin to diverge from the older values, usually in the positive direction due to inclusion of more electronic states in the present calculation than in any previous calculation, except that of Bristow and McChesney (1965). At still higher temperatures, around 15,000 or 20,000°K, the present values cross over and fall below the few previous values available, because previous investigators effectively included some levels above the dissociation limit of each state.

1.5 Ideal-gas properties for polyatomic gases

The only polyatomic molecules which contribute as much as 0.01 per cent to the equilibrium thermodynamic properties of dry air are CO_2 and NO_2^- . In addition, the negative ion NO_2^- can affect the electron concentration and hence the radio-wave absorption of high density air at a few thousand degrees, so it is desirable to include it in the equilibrium calculation.

The ideal-gas properties of polyatomic molecules can be computed by summing over their rotational, vibrational, and electronic energy levels in the same way as already described for diatomic molecules. Of course, the additional rotational and vibrational degree of freedom of the larger molecules produce a more complex set of energy levels. However, since the concentrations of polyatomic molecules generally become small above 5000 or 6000°K, the calculations can be restricted to lower temperatures, where excited electronic states and high rotational and vibrational levels can usually be neglected. This permits relatively simple approximations to the ideal-gas thermodynamic properties (Mayer and Mayer, 1940).

Results of such calculations are available in the JANAF Tables (1960) for the polyatomic molecules of present interest except NO_2^- . Thermodynamic values for the latter are tabulated in a recent report by Clifton (1966).

Since the existing ideal-gas tables for polyatomic molecules are fairly adequate for high-temperature air calculations, no further equations or tables will be presented here.

1.6 Effects of interparticle forces on the thermodynamic properties of air

In the ideal-gas approximation the interactions between the molecules, atoms, ions, and electrons in high-temperature air are neglected, except when two or more particles are bound together and can be treated as a single particle. This approximation is reasonable at low air densities, but at sufficiently high densities the mean distance between free particles becomes so small that such interactions can no longer be neglected. For neutral molecules and atoms, interaction forces are very small except at distances less than about twice the intermolecular distance in the liquid or solid phase. The highest air density associated with nuclear fireballs or missile flow-fields is that produced by a strong shock wave at sea level, which is roughly 0.01 g/cm^3 (about 10 times the ambient density). Since this density is about 1 per cent of that of liquid air, one may expect that neglect of intermolecular forces will produce errors of the order of one per cent in the thermodynamic properties.

At temperatures so high that the air is largely ionized, considerably greater errors can be made by neglecting the interactions between the ions and electrons. This large effect is due to the long range of the Coulomb forces between charged particles, which decrease with distance like $1/r^2$, in contrast to the forces between neutral molecules, which decrease like $1/r^7$ for large values of r . As an example, consider

air at 0.01 g/cm^3 and $70,000^\circ\text{K}$, where the major equilibrium species are N^+ , O^+ , and free electrons. The ideal-gas pressure under these conditions is about 10,000 atm, while the total Coulomb force between neighboring electrons and positive ions (at their mean distance on opposite sides of a unit surface) is about 1000 atm. Accordingly, one may expect errors of the order of ten per cent in the ideal-gas approximation under these conditions. This makes it quite desirable to include corrections for charged-particle interactions in the thermodynamic calculations for air, as well as somewhat desirable to include neutral-particle interactions.

The standard method for the thermodynamic treatment of moderately dense gases is to write a virial expansion, where the first term is the ideal-gas contribution and subsequent terms give the contributions from two-particle, three-particle, etc., interactions. The virial equation for the pressure of a gas mixture may be written (Mayer and Mayer, 1940; Hirschfelder, Curtis, and Bird, 1954)

$$p = \sum_i \bar{N}_i RT + \sum_i \sum_j \bar{N}_i \bar{N}_j B_{ij}(T) RT + \sum_i \sum_j \sum_k \bar{N}_i \bar{N}_j \bar{N}_k C_{ijk}(T) RT + \dots, \quad (1.6-1)$$

where $B_{ij}(T)$, $C_{ijk}(T)$, ... are called the second, third, etc., virial coefficients. These coefficients can be evaluated in terms of the interparticle forces. If we treat the air particles as spherical so that they have a two-particle interaction energy U_{ij} which depends only on their distance r , the second virial coefficient is given by (Mayer and

Meyer, 1940; Hirschfelder, Curtis, and Bird, 1954)

$$B_{ij}(T) = 2\pi Q \int_0^{\infty} [1 - \exp(-U_{ij}(r)/kT)] r^2 dr \quad , \quad (1.6-2)$$

where Q is Avogadro's number. The expressions for the higher virial coefficients are much more complicated, but fortunately the corresponding terms in the virial expansion can generally be neglected for air densities of present interest.

A virial expansion can also be written for the internal energy, similar to Eq. (2.6-1) for the pressure, except that temperature derivatives of the virial coefficients, $T dB_{ij}/dT$, etc., appear instead of the coefficients themselves. Tabulations of virial coefficients for various molecules (Hirschfelder, Curtis, and Bird, 1954; Woolley, 1962) show that, at the high temperatures of present interest, such derivatives are typically an order of magnitude smaller than the coefficients themselves. This is to be expected, since the longer-range intermolecular interactions (except for Coulomb interactions) are fairly small compared to thermal energies at such temperatures, so that molecules behave roughly like rigid spheres, with virial coefficients approximately independent of temperature. Accordingly, for air densities and temperatures of present interest, it is reasonable to neglect virial corrections to the internal energy (except for charged-particle interactions; see Section 1.7).

The Helmholtz free energy is given by

$$A = A_{\text{ideal}} + VRT \sum_{\text{mixture}} \sum_j \bar{N}_i \bar{N}_j B_{ij}(T) + \dots \quad , \quad (1.6-3)$$

where V is the volume of the system. The virial corrections to the entropy and the Gibbs free energy may be obtained readily from Eqs.

(1.6-1) and (1.6-3) with the help of the thermodynamic identities

$$S = (E-A)/T \quad \text{and} \quad F = A + pV.$$

In Section 1.2 the ideal-gas expression for the chemical-equilibrium constant, in terms of partial pressures, was derived by minimizing the Gibbs free energy. For nonideal gas mixtures, however, a similar derivation is not convenient because the total pressure is no longer the sum of the individual partial pressures. The equilibrium constant may be obtained instead, by minimizing the Helmholtz free energy at constant temperature and volume. Equation (1.6-3), after substitution for the ideal free energy from Eq. (1.2-4), can be written

$$A/VRT = \sum_I \bar{N}_I \left[F_I^{\circ}/RT - 1 + \ln(\bar{N}_I RT) \right] + \sum_I \sum_J \bar{N}_I \bar{N}_J B_{IJ}(T) . \quad (1.6-4)$$

The minimization condition that the differential vanish yields, after some cancellation,

$$0 = \sum_I \left[F_I^{\circ}/RT + \ln(\bar{N}_I RT) + 2 \sum_J \bar{N}_J B_{IJ} \right] \delta \bar{N}_I . \quad (1.6-5)$$

For variations due to a single chemical reaction, $XY \rightleftharpoons X + Y$, one has $\delta \bar{N}_{XY} = -\delta \bar{N}_X = -\delta \bar{N}_Y$, while all other $\delta \bar{N}_I$ vanish, so that Eq. (1.6-5) yields

$$\frac{\bar{N}_{XY}}{\bar{N}_X \bar{N}_Y} = RT \exp \left[-\frac{F_{XY}^{\circ} - F_X^{\circ} - F_Y^{\circ}}{RT} - 2 \sum_J \bar{N}_J (B_{XY,J} - B_{XJ} - B_{YJ}) \right] . \quad (1.6-6)$$

The ideal-gas part of this equation agrees with Eq. (1.2-11).

In order to apply the relations derived above to thermodynamic calculations, numerical values for the second virial coefficients, $B_{ij}(T)$, are needed. For most common molecules that are stable at room temperature, values of the virial coefficients for like molecules ($i = j$) and a few for unlike molecules ($i \neq j$) have been measured over the easily-accessible temperature range, and extrapolated to higher temperatures by fitting an intermolecular potential according to Eq. (1.6-2) (Hirschfelder, Curtis, and Bird, 1954). Woolley (1962) has calculated and tabulated such values for air molecules up to $15,000^{\circ}\text{K}$. However, at high temperatures such extrapolations often give too high values. Better virial coefficients for N_2 and the rare gases have been calculated by Amdur and Mason (1958), using potentials derived from molecular beam scattering. In the calculation range of 1000 to $15,000^{\circ}\text{K}$ their values for N_2 range from 0 to 19 per cent lower than those of Woolley, while their values for Ar are 10 to 23 per cent lower.

In high temperature air calculations, virial coefficients are also needed for species such as atomic N and O, for which no measurements are available. Woolley (1962) has also made estimates of these coefficients by deducing the interatomic potentials from the corresponding intermolecular potentials. For interactions not involving chemical bonding, such as N - N_2 or O - Ar, his results are not unreasonable. However, better values for the N - N_2 virial coefficient may be obtained by using the potential calculated by Meador (1960) using valence-bond theory. The results range from 25 to 40 per cent lower than Woolley's results, over the temperature range from 8000 to $15,000^{\circ}\text{K}$. It may be added that Meador's

potential, and the derived virial coefficient, are probably about 4 per cent too low, judging by a comparison of his $N_2 - N_2$ potential with the experimental results of Amdur, Mason, and Jordan (1957).

Nonbonding potentials, at temperatures of several thousand degrees or more where the small van der Waals attraction is negligible, can usually be fit by an exponential repulsion:

$$U(r) = a e^{-cr} \quad , \quad (1.6-7)$$

where a and c are constants which depend upon the two molecules or atoms. The integral in Eq. (1.6-2) can then be approximated by (Amdur and Mason, 1958)

$$B(T) = \frac{2\pi a_0}{3c^3} \left[\log \frac{1.781a}{kT} \right]^3 \quad , \quad kT \ll a \quad . \quad (1.6-8)$$

The recommended values for the constants, obtained by increasing Meador's (1960) values by 4 per cent, are

$$\begin{aligned} N_2 - N_2: \quad a &= 833 \text{ eV}, \quad c = 2.78 \times 10^8 \text{ cm}^{-1} \quad , \\ N - N_2: \quad a &= 363 \text{ eV}, \quad c = 2.85 \times 10^8 \text{ cm}^{-1} \quad . \end{aligned} \quad (1.6-9)$$

Much less is known about the high-temperature interactions of other air molecules and atoms, although some theoretical calculations involving O_2 , NO , and O are available (Meador, 1960). However, these molecules and atoms, and even many of the minor air species like CO and C , are approximately the same "size" as N_2 or N , and should have roughly the same high-temperature

virial coefficients. For air above 8000°K , it is reasonable, then, to use Eqs. (1.6-8) and (1.6-9a) for all neutral molecule-molecule interactions, and Eqs. (1.6-8) and (1.6-9b) for all neutral atom-molecule interactions.

Virial coefficients for interactions between neutral and charged particles, on the other hand, are generally much smaller (Woolley, 1960) because the polarization attraction counteracts the core repulsion. For present purposes it seems adequate to set them equal to zero. Coulomb interactions between charged particles will be considered later, in Section 1.7.

Interactions involving chemical bonding, such as the important N - N , N - O , and O - O interactions, cannot be adequately treated by considering only a single interaction potential. Instead, as shown in Figs. 1-3, 1-4, and 1-5, the two atoms may approach each other on any of several potential curves, depending on the relative orientation of their electrons. The correct virial coefficient to use is a weighted average of the values computed using the various curves, where the proper weights are the statistical weights of the molecular states (see Section 1.4), and contributions of those states or levels already included in the molecular partition function should be omitted here.

The present calculations of the partition function and thermodynamic properties of diatomic molecules, described in Section 1.4, include for all the lower electronic states every rotational-vibrational level below the corresponding dissociation energy. For attractive potentials, to be consistent, the virial integral of Eq. (1.6-2) must then

be replaced by one which omits contributions from bound states. The result, after taking the weighted average over the different electronic states n , is

$$B(T) = \frac{2\pi G}{\sum_n g_n} \sum_n g_n \int_0^\infty r^2 dr \left[1 - \left(e^{-U_n/kT} \right)_{U_n > 0} - \frac{2}{kT/\pi kT} \int_{U_n < 0}^\infty (E - U_n)^{1/2} e^{-E/kT} dE \right] \quad (1.6-10)$$

where for simplicity the subscripts ij designating the interacting atoms, and the variation of U_n with r , are not explicitly indicated. The last integral in Eq. (1.6-10) can also be expressed in terms of the error function, as in Eq. (1.4-3).

Sample calculations for nitrogen and oxygen atoms at high temperatures were carried out using Eq. (1.6-10). They gave second virial coefficients almost an order of magnitude smaller than those involving molecules, because negative contributions from nonbound levels in the attractive potentials largely cancelled the positive contributions from the repulsive cores. Accordingly, for present purposes the atom-atom virial corrections can be neglected.

It might be mentioned that when high-temperature diatomic partition functions are calculated by integrating over all portions of the potential curves and all energies, as done by Beckett and Haar (1957) and Bristow and McChesney (1965), instead of cutting them off at the dissociation energy as done in Section 1.4, the corresponding atom-atom virial correction is already included implicitly in the molecular thermodynamics. The only remaining contributions to the coefficient are those from any electronic

states not included in the diatomic integration. In principle, the diatomic partition functions could include all electronic states, thus making the atom-atom virial coefficients vanish identically, but in practice the purely-repulsive states are usually omitted from the molecular treatment. The corresponding second virial coefficients, obtained by summing Eq. (1.6-10) only over the repulsive states, are somewhat larger than those obtained by using the complete sum, but still only about half as large as the coefficients estimated by Woolley (1960) by scaling down the molecule-molecule potentials.

1.7 Effects of Coulomb forces on the thermodynamic properties of ionized air

The Coulomb forces between the ions and electrons present in high-temperature air are sufficiently different from the intermolecular forces already considered as to require a separate treatment. When $U_{ij}(r) = \text{constant}/r$, the integral in Eq. (1.6-2) is found to diverge at $r = 0$ when the constant is negative (i.e., for charged particles of opposite sign), while for large r it behaves like $\pm \int r dr$ and diverges for both positive and negative Coulomb potentials. The divergence at $r = 0$ is due to inclusion of bound states; it may be removed by including only the states with energies above that of the separated particles, by use of Eq. (1.6-10). The divergence at $r = \infty$, however, is more fundamental. A uniform gas of charged particles which is not electrically neutral (i.e., has more positive than negative charges, or vice versa) can be shown to have a Coulomb energy per unit mass which depends upon the size and shape of the gas volume considered, and becomes infinite as

the volume goes to infinity (at fixed gas density). It is not surprising, then, that the virial coefficients for a Coulomb potential diverge. In an ionized gas with no net charge, the infinite positive and negative virial terms from the repulsive and attractive Coulomb forces, respectively, must somehow cancel to first order, leaving only a finite remainder.

If the charged-particle density is not too high, this problem can be treated by the Debye-Hückel theory, which determines the mean distribution of electrons and ions around any given electron or ion, using a linearized self-consistent-field approximation. Since the derivation and results are available in several texts (Fowler, 1936; Fowler and Guggenheim, 1956; Cambel, Duclos, and Anderson, 1963) they will not be reproduced here. Qualitatively, the effect of Coulomb interactions is to decrease the effective ionization potential of each species, and thus increase the degree of ionization. The interactions also decrease the pressure and energy of the ionized gas mixture directly, in contrast to the indirect increase due to the increased ionization, so that the net thermodynamic corrections are positive at some temperatures and densities and negative at others.

For present purposes, however, the conventional Debye-Hückel treatment needs to be supplemented by two additional considerations. The first concerns the dielectric constant. The original analysis of Debye and Hückel was applied to ions in solution, and since the force between adjacent ions is affected by the polarizability of the intervening liquid, the dielectric constant of the latter enters into the basic equations. A similar effect may be expected in an ionized gas whenever molecules, atoms, or polarizable ions are situated between neighboring ions, but in

gases the continuum fluid approximation and the use of the static dielectric constant will be less accurate. Fortunately, at gas densities and temperatures of present interest, the dielectric constant will not deviate more than a couple per cent from that of empty space, so that it can be approximated by the latter value, with an error less than the other errors inherent in the Debye-Hückel approach.

The second consideration involves the electronic-state "cutoff" introduced in Section 1.3. Conventional Debye-Hückel theory does not consider electronically-excited states. It does, however, give for the mean potential about each ion of charge Z :

$$U(r) = (Ze/r) \exp(-r/d) \quad , \quad (1.7-1)$$

where d is the Debye length, given by

$$d^2 = kT / \left(4\pi e^2 \sum_I \bar{N}_I Z_I^2 \right) \quad . \quad (1.7-2)$$

and the summation is taken over all charged particles, including electrons. Some workers have assumed that the higher excited states of each atom or ion are precisely the bound states of an electron in the Debye-Hückel potential, Eq. (1.7-1). This potential has only a finite number of bound states, so that the partition function converges. However, these states include a number having classical electron orbits with radii approaching the Debye length. Since the Debye-Hückel treatment is valid only when the Debye length is longer than the mean distance between ions (Cambel, Duclos, and Anderson, 1963), such states have a bound electron which is generally closer to other ions than to the ion to which it is presumed to be

bound. This is not reasonable. Moreover, from the viewpoint of classical statistical mechanics, in which an electron is characterized by a position and a momentum or energy, it is clear that such a procedure will give a partition function which counts portions of phase space more than once.

A better procedure is suggested by the classical approach: The entire volume of the gas can be divided into approximately spherical volume elements surrounding each ion, and the bound states within each element calculated. The volume elements may be taken of equal size, but when ions of different charges are present it is preferable to make the size of each element proportional to the charge of the ion it contains. Since the radii of the volume elements are smaller than the Debye-Hückel length d , it is reasonable to omit the exponential factor in Eq. (1.7-1), leaving just the ordinary Coulomb field. The lower bound states of electrons in this field will be just the Rydberg states already described in Section 1.3, while the higher ones will deviate due to the finite volume. However, for gas densities of present interest the latter states are high enough to be approximated classically. Classically, the bound electron is unaffected by the finite volume until its energy is sufficient to permit it to reach the boundary, at which point it ceases to be bound. This principle gives a cutoff quantum number for substitution in Eq. (1.3-10):

$$n_c^2 = Ry (Z + 1) r_{Z+1} / e^2 \quad (1.7-3)$$

where r_{Z+1} is the radius of the volume element about an ion of charge $Z + 1$ ($Z + 1$ appears instead of Z because a highly-excited atom or ion of charge Z is treated like an ion of charge $Z + 1$ plus an outer electron.)

1.3 Equilibrium calculations and results for air

Based on the theoretical relations presented in the preceding sections, a FORTRAN code has been written and equilibrium calculations carried out for air between 10,000 and 10,000,000°K, including the Debye-Hückel, variable electronic cutoff, and second virial corrections. The iteration process selected, based on the assumption that the molecular concentrations are smaller than the atomic ones, failed to converge for temperatures below 10,000°K at high densities. No attempt was made to modify it, due to lack of time and the adequacy of the earlier results of Hilsenrath and Klein (1963, 1965) in this lower temperature region.

The basic composition of normal air, used as input, was about the same as that used previously (Gilmore, 1955, 1959; Hilsenrath and Klein, 1963, 1965), except that the CO₂ concentration was decreased slightly in accordance with recent measurements (Kelley and La Chapelle, 1966), and the small amount of neon was lumped in with the argon. This gives the initial composition shown below:

<u>Molecule</u>	<u>Mole per cent</u>
N ₂	78.084
O ₂	20.946
Ar	0.938
CO ₂	0.032

The density range covered was from 10^{-9} to 10 times standard density, where the standard density is $1.2923 \times 10^{-3} \text{ g/cm}^3$, corresponding to the ideal gas mixture at 273.15°K and 1 atm pressure. At the lowest density considered the assumption of thermodynamic equilibrium might seem unrealistic in most practical situations. However, for energy densities corresponding to temperatures above about $10,000^\circ\text{K}$ many free electrons are usually present, and characteristic times for these electrons to equilibrate with each other and with the ion excitation and ionization are only a few milliseconds. Of course, equilibration of ion velocities will take a longer time (though often still short compared to radiative or hydrodynamic cooling times of large masses of air), but the ion kinetic energies make only a relatively small contribution to the total energy and pressure at the higher temperatures. Radiation will also depopulate nonmetastable states below their equilibrium concentrations, but even in equilibrium their populations are small, since at low densities ions tend to ionize further rather than become excited.

The calculated equilibrium compositions are presented graphically in Figs. 2.1 to 2.8. The concentrations of most species agree within a percent with the values of Hilsenrath and Klein (1963, 1965) up to $15,000^\circ\text{K}$, after correcting for the 3 percent smaller initial CO_2 concentration used in the present work. There are, however, differences of several percent in the molecular concentrations, due to use of improved diatomic thermodynamic properties and virial coefficients. Moreover, the O^- concentration is up to a factor of 2 lower, and the O_2^- concentration a couple orders of magnitude higher due to use of revised electron affinities. However, at all temperatures and densities considered the negative ion densities are more than an order of magnitude below the electron densities.

The calculated equilibrium thermodynamic properties are presented in Tables 102 to 111. These values agree within 1 percent with those of Hilsenrath and Klein up to 15,000^oK. They also agree within 2 percent with the earlier values of the writer (Gilmcre, 1954, 1959) up to 24,000^oK, and of Hilsenrath, Green, and Beckett (1957) up to 5,000,000^oK, except for differences of several percent at the higher densities due to omission of virial and Debye-Hückel corrections from the earlier work.

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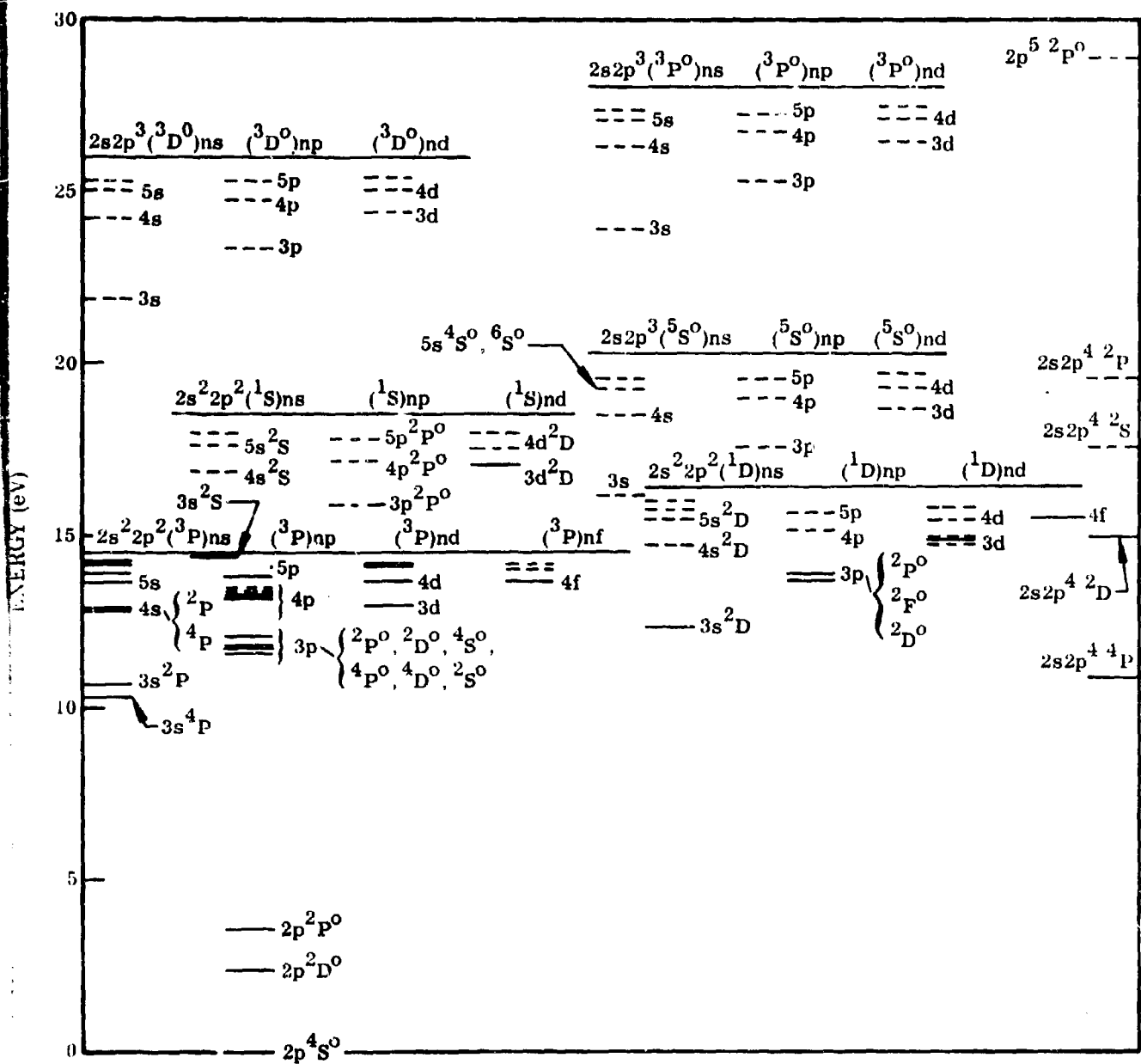


FIG. 1-1 ENERGY LEVELS OF THE NITROGEN ATOM BELOW 30 eV

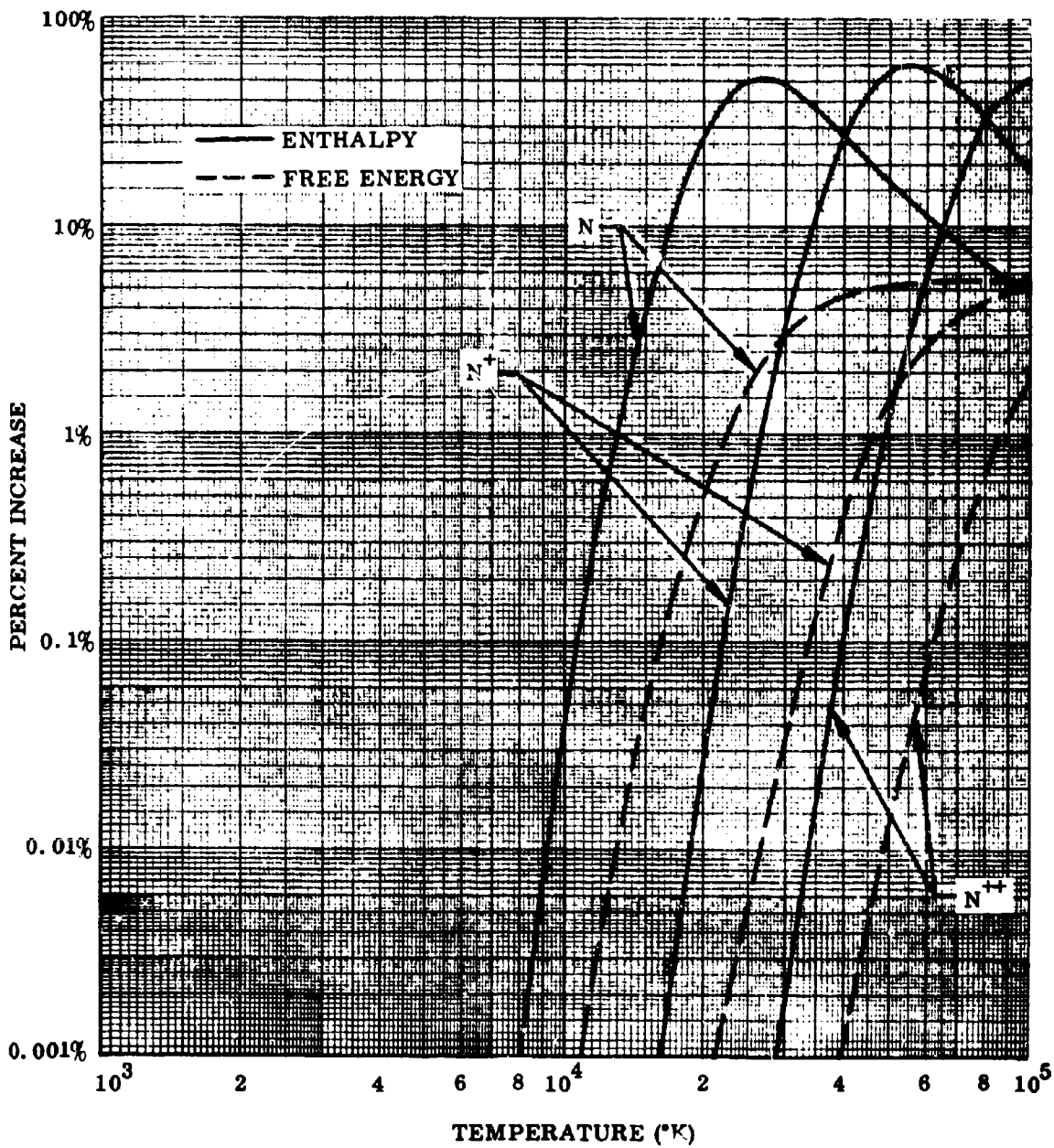
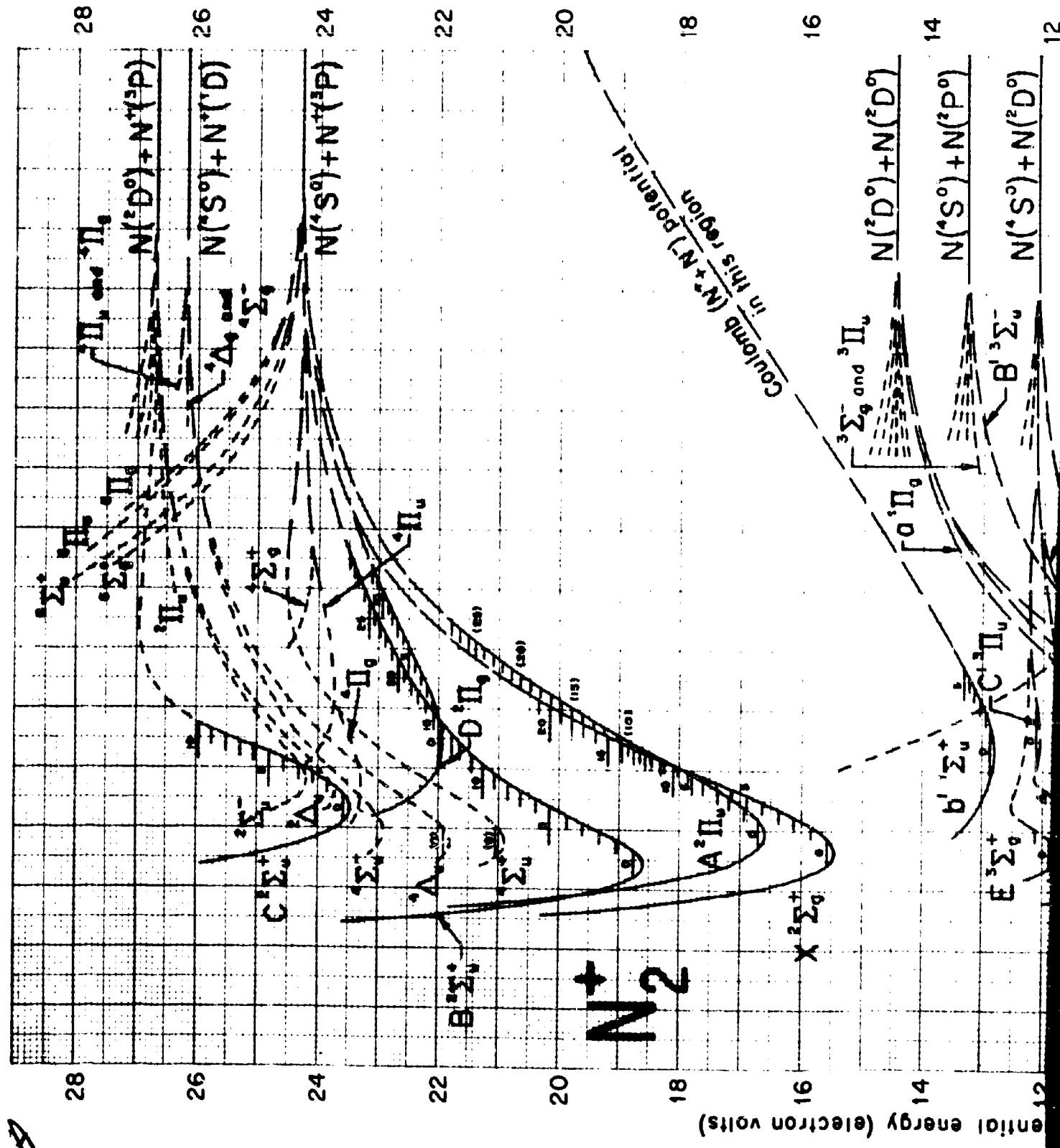


FIG. 1-2 PERCENT INCREASE IN THERMODYNAMIC FUNCTIONS FOR NITROGEN ATOMS AND IONS DUE TO SUMMING OVER ELECTRONIC LEVELS WITH $n \leq 8$ INSTEAD OF $n \leq 4$.



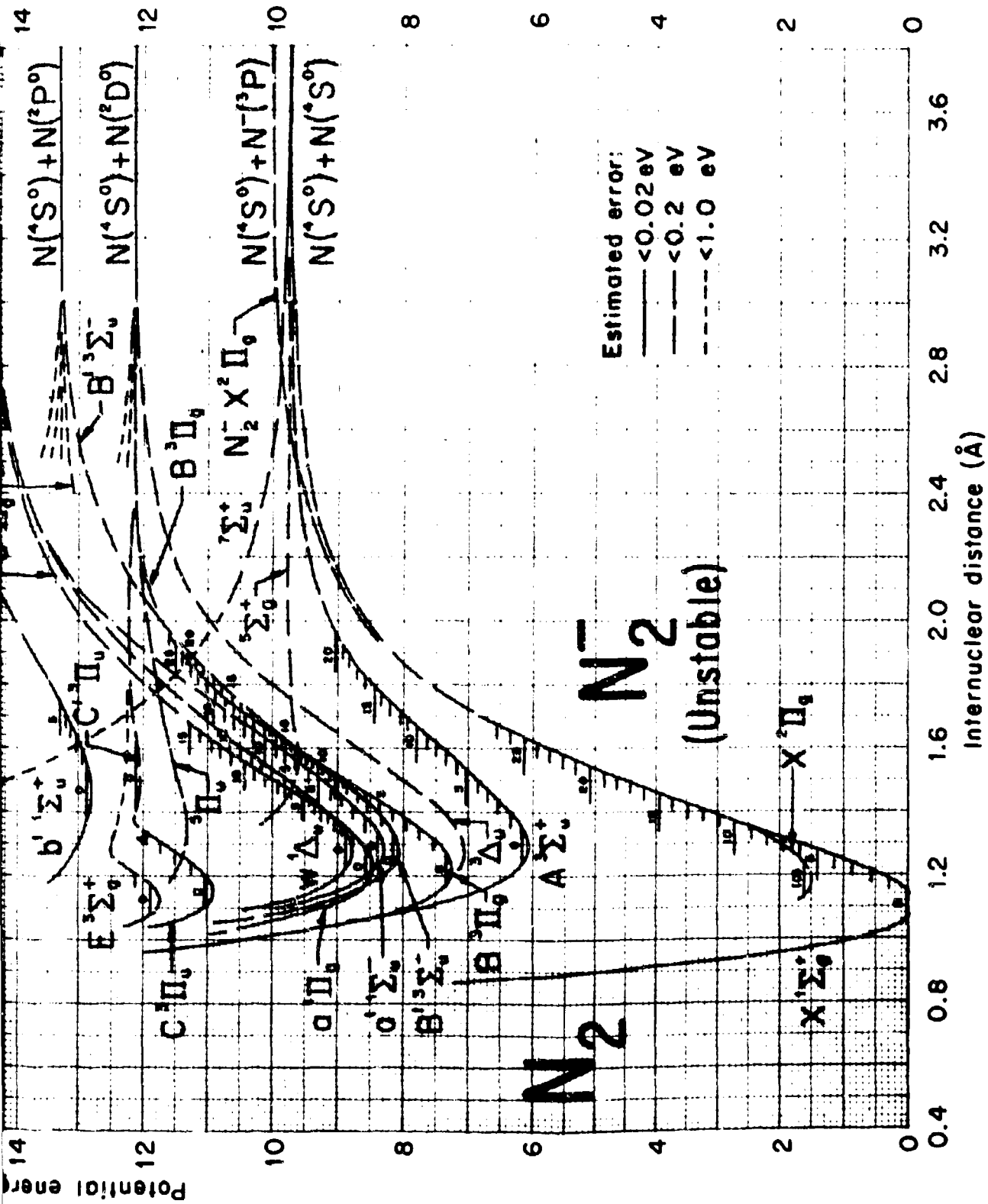
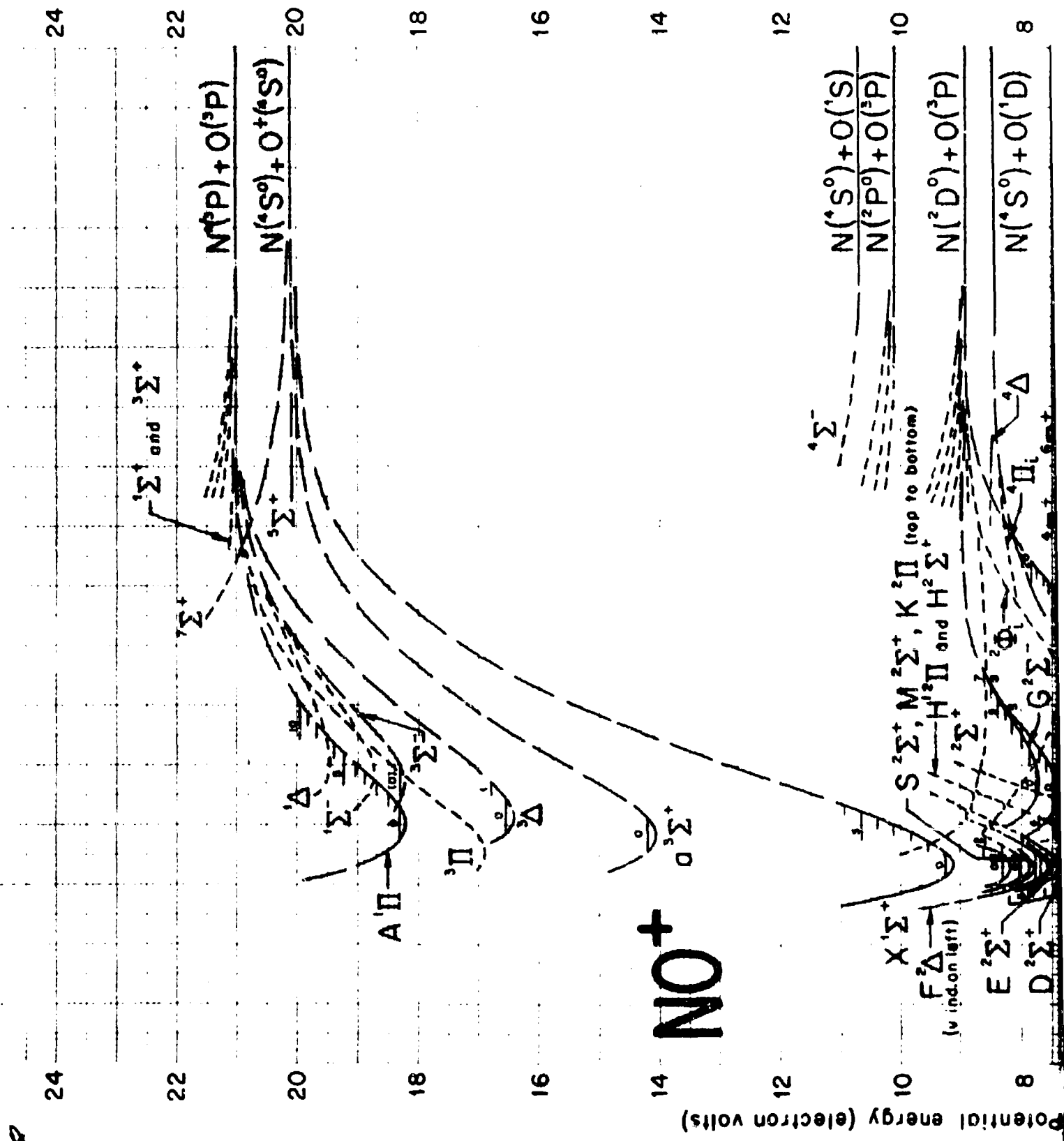


FIG. 1-3 POTENTIAL-ENERGY CURVES FOR N_2^- (UNSTABLE), N_2 and N_2^+ .

8



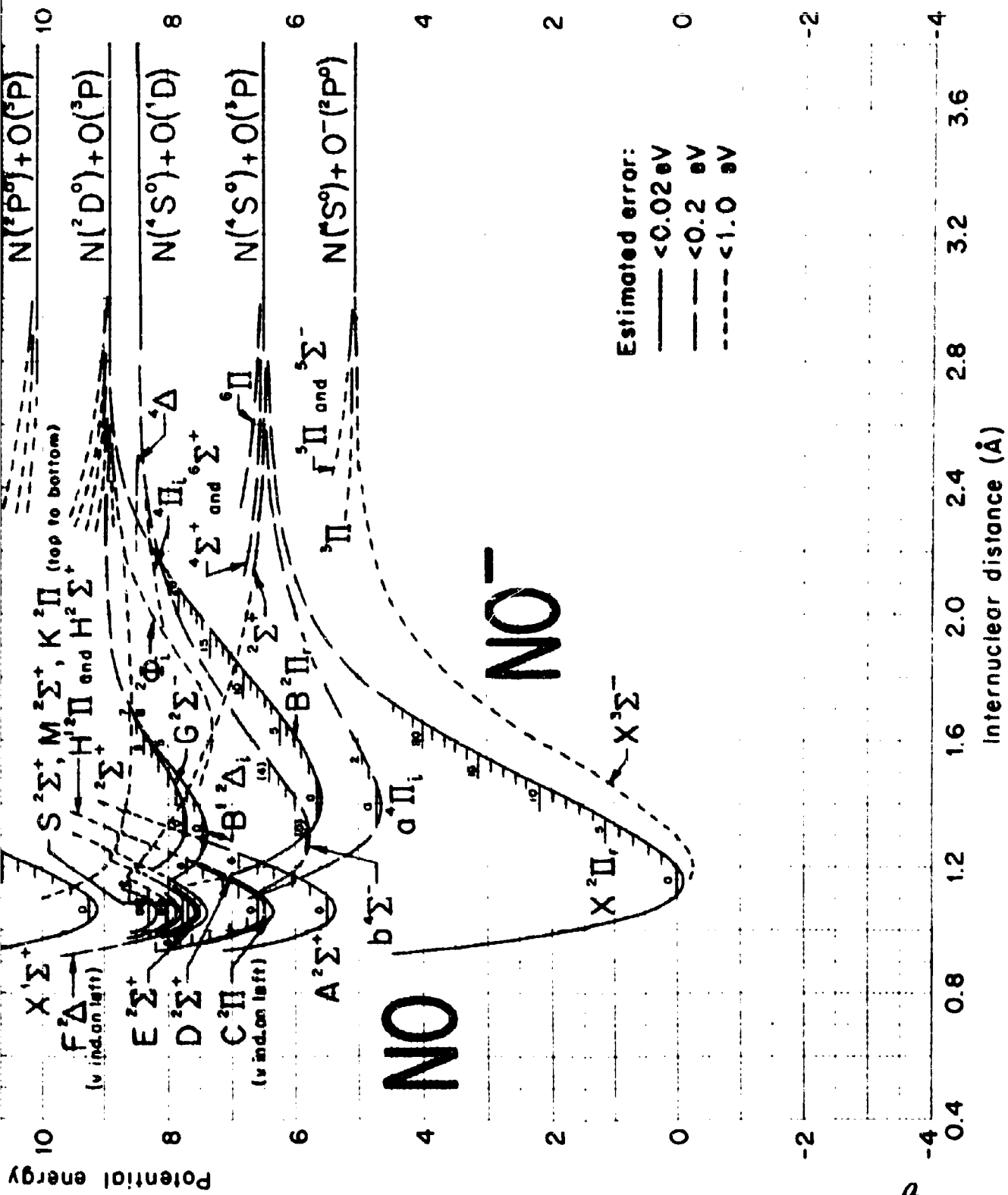
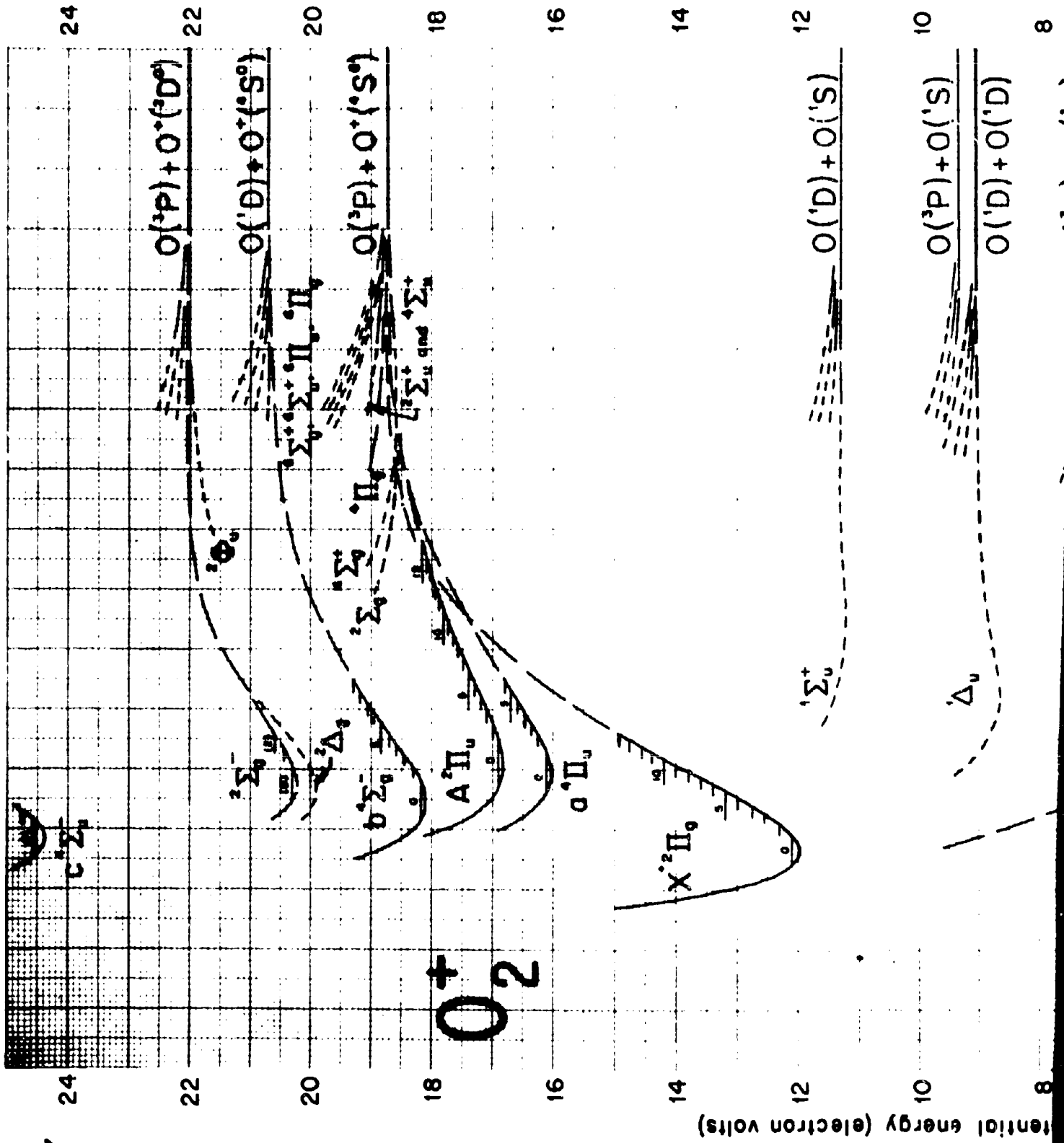


FIG. 1-4 POTENTIAL-ENERGY CURVES FOR NO⁻, NO and NO⁺.



Potential energy (electron volts)

O_2^+

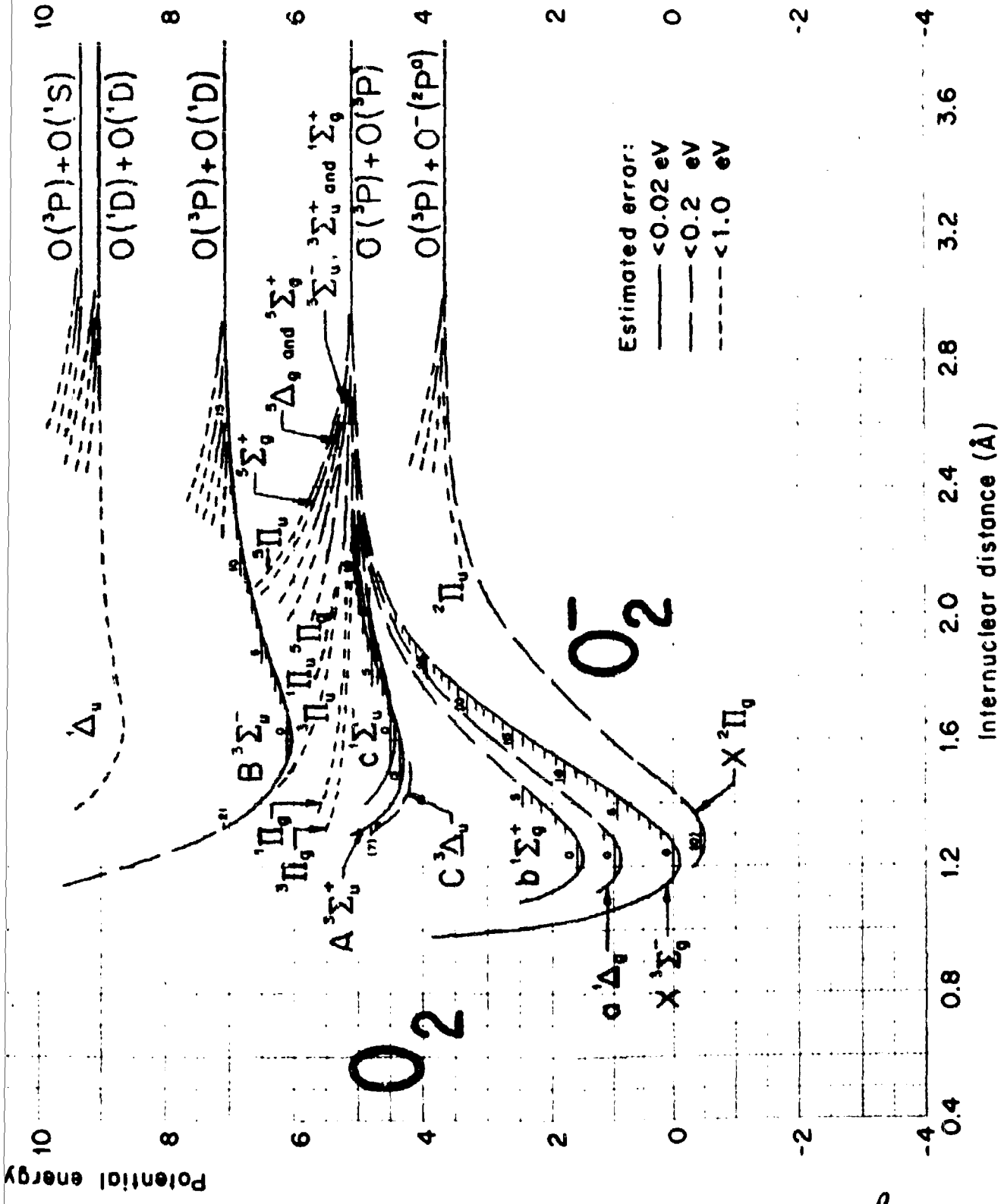


FIG. 1-5 POTENTIAL-ENERGY CURVES FOR O_2^- , O_2 and O_2^+ .

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Chapter 2. THE EQUILIBRIUM THERMODYNAMIC PROPERTIES
OF HIGH-TEMPERATURE AIR: TABLES AND GRAPHS

This Chapter contains the following material:

1. Energy Zero for Air Species: Table 1.
2. Ideal-Gas Properties for Monatomic Air Species: Tables 2-45.
3. Energy Levels and Fractional Electronic Populations for Monatomic Air Species: Tables 46-85.
4. Spectroscopic Constants for Diatomic Air Species: Table 86.
5. Ideal-Gas Properties for Diatomic Air Species: Tables 87-94.
6. Fractional Electronic Populations for Diatomic Air Species: Tables 95-101.
7. Dimensionless Pressure, Pressure and Log of Pressure of Equilibrium Air, 10^4 to 10^7 °K 10^{-9} to 10 Fold Sea Level Air Density: Tables 102-104.
8. Dimensionless Internal Energy, Internal Energy and Internal Energy Density of Equilibrium Air, Same Temperature and Density Range As Above: Tables 105-107.
9. Enthalpy of Equilibrium Air, Same Temperature and Density Range As Above: Table 108.
10. Effective Gamma of Equilibrium Air, Same Temperature and Density Range As Above: Table 109.
11. Dimensionless Entropy of Equilibrium Air, Same Temperature and Density Range as Above: Table 110.
12. Equilibrium Composition of Air, 10^4 to 10^7 °K, 10^{-6} fold to Normal Sea Level Air Density: Figs. 2-1 to 2-8.

Table 1. Energy of Air Particles at 0°K

Species	$E_0^{\circ}(\text{cm}^{-1})$	Species	$E_0^{\circ}(\text{cm}^{-1})$	Species	$E_0^{\circ}(\text{cm}^{-1})$
CO ₂	0	N	39,359	Ar	0
NO ₂	3,065	N ⁺	156,573	Ar ⁺	127,110
NO ₂ ⁻	-29,100	N ⁺⁺	395,324	Ar ⁺⁺	349,958
N ₂	0	N ³⁺	777,950	Ar ³⁺	679,924
N ₂ ⁺	125,667	N ⁴⁺	1,402,801	Ar ⁴⁺	1,162,300
NO	7,506	N ⁵⁺	2,192,317	Ar ⁵⁺	1,767,400
NO ⁺	82,253	N ⁶⁺	6,645,117	Ar ⁶⁺	2,504,000
O ₂ ⁻	-3,470	N ⁷⁺	12,025,206	Ar ⁷⁺	3,504,000
O ₂	0	O ⁻	8,705	Ar ⁸⁺	4,661,800
O ₂ ⁺	97,295	O	20,630	Ar ⁹⁺	8,069,100
CO	23,351	O ⁺	130,467	Ar ¹⁰⁺	11,930,000
C	92,315	O ⁺⁺	413,711	Ar ¹¹⁺	16,277,000
C ⁺	183,129	O ³⁺	856,518	Ar ¹²⁺	21,263,600
C ⁺⁺	379,788	O ⁴⁺	1,480,915	Ar ¹³⁺	26,797,400
C ³⁺	766,002	O ⁵⁺	2,399,617	Ar ¹⁴⁺	32,892,900
C ⁴⁺	128,179	O ⁶⁺	3,513,617	Ar ¹⁵⁺	39,787,100
C ⁵⁺	4,448,629	O ⁷⁺	9,476,617	Ar ¹⁶⁺	47,196,400
C ⁶⁺	8,400,690	O ⁸⁺	16,505,010	Ar ¹⁷⁺	80,386,400
				Ar ¹⁸⁺	116,086,300

TABLE 2. IDEAL GAS FUNCTIONS FOR O- (ATOMIC WEIGHT 15.9999, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 46 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{F^0 - E^0}{RT}$	$\frac{S^0}{R}$	$\ln \left(\frac{W^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} \right) - \frac{S^0}{R}$	$\frac{F^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$\frac{W^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R} - \frac{W^0 - E^0}{RT}$	TEMP. (°K)	
1000	5.3272	2.60216	19.4361	22.0393	39.4228	43.7937	3.1839E 03	5.1709E 03	3.8623E 04	1000
1200	5.4311	2.58958	19.6094	22.4990	41.5492	44.7092	3.7903E 03	6.1751E 03	4.7474E 04	1200
1400	5.4922	2.57988	20.3078	22.9875	43.1240	45.4810	4.3944E 03	7.1765E 03	5.4497E 04	1400
1600	5.5278	2.57190	20.8517	23.2232	44.1000	46.1434	4.9944E 03	8.1740E 03	6.2661E 04	1600
1800	5.5578	2.56487	20.9542	23.3191	44.6395	46.7363	5.5974E 03	9.1749E 03	7.4951E 04	1800
2000	5.5822	2.55934	21.2242	23.3835	45.0833	47.2617	6.1973E 03	1.0172E 04	8.4392E 04	2000
2200	5.6019	2.55466	21.4679	24.0225	45.0754	47.7347	6.7968E 03	1.1160E 04	9.3892E 04	2200
2400	5.6159	2.55066	21.6900	24.7406	45.1015	48.1767	7.3955E 03	1.2165E 04	1.0344E 05	2400
2600	5.7082	2.54720	21.8940	24.4412	45.0810	48.5845	7.9938E 03	1.3180E 04	1.1312E 05	2600
2800	5.7275	2.54417	22.0826	24.6248	45.0819	48.9375	8.5919E 03	1.4150E 04	1.2287E 05	2800
3000	5.7445	2.54151	22.2561	24.7995	45.0500	49.2899	9.1897E 03	1.5151E 04	1.3264E 05	3000
3200	5.7595	2.53915	22.4220	24.9612	45.04570	49.6870	9.7873E 03	1.6144E 04	1.4250E 05	3200
3400	5.7728	2.53704	22.5759	25.1129	45.04151	49.9336	1.0363E 04	1.7141E 04	1.5239E 05	3400
3600	5.7847	2.53514	22.7209	25.2540	45.1501	50.1878	1.0982E 04	1.8134E 04	1.6254E 05	3600
3800	5.7954	2.53343	22.8578	25.3913	45.2343	50.4567	1.1597E 04	1.9131E 04	1.7261E 05	3800
4000	5.8051	2.53188	22.9878	25.5197	45.3326	50.7118	1.2174E 04	2.0129E 04	1.8272E 05	4000
4200	5.8140	2.53046	23.1113	25.6417	45.4259	50.9544	1.2779E 04	2.1114E 04	1.9289E 05	4200
4400	5.8220	2.52917	23.2290	25.7581	45.5285	51.1857	1.3370E 04	2.2114E 04	2.0310E 05	4400
4600	5.8294	2.52798	23.3414	25.8693	45.6230	51.4047	1.3967E 04	2.3108E 04	2.1336E 05	4600
4800	5.8362	2.52688	23.4489	25.9758	45.7213	51.6182	1.4564E 04	2.4102E 04	2.2367E 05	4800
5000	5.8425	2.52586	23.5521	26.0779	45.8018	51.8212	1.5161E 04	2.5097E 04	2.3401E 05	5000
5200	5.8483	2.52492	23.6511	26.1760	45.8967	52.0181	1.5757E 04	2.6091E 04	2.4439E 05	5200
5400	5.8538	2.52405	23.7464	26.2704	45.9170	52.2037	1.6354E 04	2.7083E 04	2.5482E 05	5400
5600	5.8588	2.52323	23.8382	26.3614	45.01408	52.3843	1.6951E 04	2.8079E 04	2.6527E 05	5600
5800	5.8635	2.52247	23.9267	26.4492	45.01251	52.5589	1.7547E 04	2.9073E 04	2.7577E 05	5800
6000	5.8679	2.52175	24.0122	26.5340	45.01114	52.7274	1.8144E 04	3.0067E 04	2.8630E 05	6000
6200	5.8720	2.52108	24.0949	26.6160	45.00981	52.8903	1.8740E 04	3.1061E 04	2.9686E 05	6200
6400	5.8759	2.52045	24.1749	26.6954	45.00856	53.0481	1.9337E 04	3.2055E 04	3.0745E 05	6400
6600	5.8795	2.51986	24.2525	26.7723	45.00738	53.2018	1.9933E 04	3.3049E 04	3.1809E 05	6600
6800	5.8830	2.51930	24.3277	26.8470	45.00627	53.3494	2.0530E 04	3.4043E 04	3.2873E 05	6800
7000	5.8862	2.51877	24.4007	26.9195	45.00522	53.4934	2.1126E 04	3.5037E 04	3.3942E 05	7000
7200	5.8893	2.51827	24.4716	26.9899	45.00422	53.6334	2.1723E 04	3.6030E 04	3.5013E 05	7200
7400	5.8922	2.51779	24.5404	27.0584	45.00327	53.7694	2.2319E 04	3.7024E 04	3.6087E 05	7400
7600	5.8950	2.51734	24.6078	27.1251	45.00238	53.9021	2.2914E 04	3.8018E 04	3.7164E 05	7600
7800	5.8976	2.51692	24.6732	27.1901	45.00153	54.0312	2.3512E 04	3.9012E 04	3.8243E 05	7800
8000	5.9001	2.51651	24.7369	27.2534	45.00072	54.1570	2.4108E 04	4.0006E 04	3.9323E 05	8000
8200	5.9024	2.51612	24.7990	27.3151	45.00024	54.2797	2.4704E 04	4.1000E 04	4.0409E 05	8200
8400	5.9047	2.51575	24.8598	27.3754	45.00020	54.3994	2.5301E 04	4.1993E 04	4.1496E 05	8400
8600	5.9069	2.51539	24.9188	27.4342	45.00050	54.5163	2.5897E 04	4.2987E 04	4.2585E 05	8600
8800	5.9089	2.51505	24.9767	27.4917	45.00083	54.6308	2.6494E 04	4.3981E 04	4.3677E 05	8800
9000	5.9109	2.51473	25.0332	27.5479	45.00078	54.7422	2.7090E 04	4.4975E 04	4.4771E 05	9000
9200	5.9128	2.51442	25.0884	27.6029	45.00059	54.8514	2.7686E 04	4.5968E 04	4.5864E 05	9200
9400	5.9146	2.51412	25.1425	27.6566	45.00057	54.9583	2.8282E 04	4.6962E 04	4.6952E 05	9400
9600	5.9164	2.51384	25.1954	27.7093	45.00054	55.0629	2.8878E 04	4.7956E 04	4.8043E 05	9600
9800	5.9180	2.51356	25.2473	27.7608	45.00046	55.1654	2.9475E 04	4.8950E 04	4.9137E 05	9800

TABLE 2 (CONT.). IDEAL GAS FUNCTIONS FOR O-

TEMP. (°K)	PARTIC. FUNCT.	$\frac{h^2}{8\pi^2 m k T}$	$\frac{h^2}{8\pi^2 m k T}$	$\ln \left(\frac{h^2}{8\pi^2 m k T} \right)$	$\ln \left(\frac{h^2}{8\pi^2 m k T} \right)$	$\ln \left(\frac{h^2}{8\pi^2 m k T} \right)$	$\ln \left(\frac{h^2}{8\pi^2 m k T} \right)$	$\ln \left(\frac{h^2}{8\pi^2 m k T} \right)$	$\ln \left(\frac{h^2}{8\pi^2 m k T} \right)$	TEMP. (°K)	
10000	3.9194	2.5133	25.2966	27.8113	4.99434	50.2714	55.2627	3.0072E 04	4.9943E 04	5.271E 05	10000
10500	3.9268	2.51268	25.297	27.8333	4.99311	50.5150	55.5002	3.1562E 04	4.9931E 04	5.3001E 05	10500
11000	3.9342	2.5121	25.2975	28.0497	4.99200	50.7473	55.7393	3.3052E 04	4.9920E 04	5.3222E 05	11000
11500	3.9416	2.5115	25.2982	28.1608	4.99097	50.9792	55.9782	3.4544E 04	4.9909E 04	5.3443E 05	11500
12000	3.9490	2.5111	25.2986	28.2672	4.99004	51.1816	56.1716	3.6034E 04	4.9900E 04	5.3664E 05	12000
12500	3.9564	2.5107	25.2990	28.3693	4.98917	51.3833	56.3764	3.7524E 04	4.9891E 04	5.3885E 05	12500
13000	3.9638	2.5103	25.2993	28.4673	4.98837	51.5809	56.5803	3.9014E 04	4.9883E 04	5.4106E 05	13000
13500	3.9712	2.5099	25.2996	28.5617	4.98763	51.7762	56.7768	4.0504E 04	4.9876E 04	5.4327E 05	13500
14000	3.9786	2.5095	25.2998	28.6526	4.98694	51.9705	56.9735	4.1997E 04	4.9869E 04	5.4548E 05	14000
14500	3.9860	2.5092	25.2999	28.7403	4.98629	52.1625	57.1718	4.3487E 04	4.9862E 04	5.4769E 05	14500
4.979E 04	3.9934	2.5089	25.2999	15.000 061322	15.500 5.9478	2.50864	28.3964	28.9071	4.98933	52.4080	57.4432
BAD BLOCK	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED
16500	3.9837	2.5086	25.3000	29.0633	4.98561	52.7697	57.7538	4.9849E 04	4.9849E 04	5.4990E 05	16500
17000	3.9911	2.5083	25.3000	29.1380	4.98483	52.9105	57.9021	5.0540E 04	4.9848E 04	5.5211E 05	17000
17500	3.9985	2.5080	25.3000	29.2105	4.98409	53.0629	58.0461	5.2030E 04	4.9840E 04	5.5432E 05	17500
18000	4.0059	2.5077	25.3000	29.2809	4.98339	53.2033	58.1863	5.3521E 04	4.9833E 04	5.5653E 05	18000
18500	4.0133	2.5074	25.3000	29.3487	4.98274	53.3433	58.3222	5.5012E 04	4.9827E 04	5.5874E 05	18500
19000	4.0207	2.5071	25.3000	29.4144	4.98212	53.4828	58.4567	5.6503E 04	4.9821E 04	5.6095E 05	19000
19500	4.0281	2.5068	25.3000	29.4781	4.98153	53.6221	58.5917	5.7994E 04	4.9815E 04	5.6316E 05	19500
20000	4.0355	2.5066	25.3000	29.5403	4.98097	53.7611	58.7262	5.9485E 04	4.9809E 04	5.6537E 05	20000
20500	4.0429	2.5064	25.3000	29.6014	4.98044	53.9001	58.8603	6.0976E 04	4.9804E 04	5.6758E 05	20500
21000	4.0503	2.5062	25.3000	29.6614	4.97993	54.0391	59.0000	6.2467E 04	4.9799E 04	5.6979E 05	21000
21500	4.0577	2.5060	25.3000	29.7208	4.97943	54.1781	59.1391	6.3958E 04	4.9794E 04	5.7200E 05	21500
22000	4.0651	2.5058	25.3000	29.7797	4.97894	54.3171	59.2777	6.5449E 04	4.9789E 04	5.7421E 05	22000
22500	4.0725	2.5056	25.3000	29.8381	4.97847	54.4561	59.4167	6.6940E 04	4.9784E 04	5.7642E 05	22500
23000	4.0799	2.5054	25.3000	29.8958	4.97802	54.5951	59.5557	6.8431E 04	4.9780E 04	5.7863E 05	23000
23500	4.0873	2.5052	25.3000	29.9530	4.97759	54.7341	59.6952	6.9922E 04	4.9775E 04	5.8084E 05	23500
24000	4.0947	2.5050	25.3000	30.0097	4.97718	54.8731	59.8347	7.1413E 04	4.9771E 04	5.8305E 05	24000
24500	4.1021	2.5049	25.3000	30.0659	4.97679	55.0124	59.9742	7.2904E 04	4.9767E 04	5.8526E 05	24500
25000	4.1095	2.5048	25.3000	30.1216	4.97642	55.1514	60.1137	7.4395E 04	4.9764E 04	5.8747E 05	25000
30000	4.1238	2.5043	25.3000	30.3580	4.97548	55.7470	60.3881	8.1386E 04	4.9754E 04	6.1228E 05	30000
32000	4.1312	2.5042	25.3000	30.7194	4.97433	56.0482	61.0435	8.8377E 04	4.9743E 04	6.3709E 05	32000
34000	4.1386	2.5041	25.3000	30.8710	4.97386	56.3498	61.3487	9.1368E 04	4.9738E 04	6.5690E 05	34000
36000	4.1460	2.5040	25.3000	31.0130	4.97340	56.6514	61.6539	9.4359E 04	4.9734E 04	6.7671E 05	36000
38000	4.1534	2.5039	25.3000	31.1499	4.97295	56.9529	61.9591	9.7350E 04	4.9729E 04	6.9652E 05	38000
40000	4.1608	2.5038	25.3000	31.2773	4.97251	57.1704	62.1331	1.00341E 05	4.9725E 04	7.1633E 05	40000
42000	4.1682	2.5037	25.3000	31.3992	4.97208	57.4211	62.3995	1.03382E 05	4.9720E 04	7.3614E 05	42000
44000	4.1756	2.5036	25.3000	31.5155	4.97166	57.6525	62.6246	1.06423E 05	4.9716E 04	7.5595E 05	44000
46000	4.1830	2.5035	25.3000	31.6267	4.97125	57.8736	62.8497	1.09464E 05	4.9712E 04	7.7576E 05	46000
48000	4.1904	2.5034	25.3000	31.7331	4.97085	58.0883	63.0588	1.12505E 05	4.9708E 04	7.9557E 05	48000
50000	4.1978	2.5033	25.3000	31.8351	4.97046	58.2883	63.2616	1.15546E 05	4.9704E 04	8.1538E 05	50000

TABLE 3. IDEAL GAS FUNCTIONS FOR C (ATOMIC WEIGHT 12.0112, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 47 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNC'T.	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	$\frac{h^2}{8\pi^2 I} - \frac{E^2}{RT}$	TEMP. (°K)
1000	8.0287	2.84209	19.4880	22.0301	5.05156	38.7260	43.7775	3.0644E 03	5.0516E 03	3.8728E 04	3.8728E 04	1000	
1200	8.6875	2.53319	19.9509	22.4861	5.03783	39.6457	44.6835	3.6608E 03	4.0354E 03	4.7579E 04	4.7579E 04	1200	
1400	8.7314	2.53034	20.3413	22.8716	5.02821	40.4215	45.4497	4.2575E 03	7.0393E 03	5.6590E 04	5.6590E 04	1400	
1600	8.7648	2.52698	20.6789	23.2059	5.02192	41.0925	46.1140	4.8344E 03	6.5744E 04	6.5744E 04	6.5744E 04	1600	
1800	8.7915	2.52485	20.9764	23.5013	5.01730	41.6837	46.7010	5.4542E 03	9.0311E 03	7.5931E 04	7.5931E 04	1800	
2000	8.8140	2.52369	21.2424	23.7663	5.01339	42.2122	47.2276	6.0545E 03	1.0031E 04	8.4424E 04	8.4424E 04	2000	
2200	8.8341	2.52306	21.4830	24.0070	5.01020	42.6902	47.7059	6.6428E 03	1.1035E 04	9.3910E 04	9.3910E 04	2200	
2400	8.8530	2.52231	21.7026	24.2279	5.00760	43.1249	48.1449	7.2745E 03	1.2044E 04	1.0329E 05	1.0329E 05	2400	
2600	8.8717	2.52156	21.9048	24.4324	5.00543	43.5285	48.5512	7.9424E 03	1.3059E 04	1.1317E 05	1.1317E 05	2600	
2800	8.8899	2.52077	22.0923	24.6230	5.00364	43.9010	48.9300	8.5173E 03	1.4081E 04	1.2292E 05	1.2292E 05	2800	
3000	8.9109	2.52078	22.2670	24.8016	5.00203	44.2482	49.2852	9.1111E 03	1.5111E 04	1.3274E 05	1.3274E 05	3000	
3200	8.9328	2.52048	22.4307	24.9702	5.00047	44.5736	49.6199	9.7495E 03	1.6148E 04	1.4264E 05	1.4264E 05	3200	
3400	8.9551	2.52044	22.5848	25.1294	5.00043	44.8798	49.9364	1.0437E 04	1.7193E 04	1.5259E 05	1.5259E 05	3400	
3600	8.9784	2.52045	22.7305	25.2809	5.00016	45.1692	50.2373	1.1092E 04	1.8248E 04	1.6241E 05	1.6241E 05	3600	
3800	8.9954	2.52048	22.8685	25.4250	5.00015	45.4435	50.5237	1.1753E 04	1.9305E 04	1.7269E 05	1.7269E 05	3800	
4000	9.0136	2.52074	22.9998	25.5625	5.00240	45.7044	50.7970	1.2422E 04	2.0370E 04	1.8282E 05	1.8282E 05	4000	
4200	9.0321	2.52015	23.1250	25.6961	5.00532	45.9532	51.0585	1.3094E 04	2.1442E 04	1.9308E 05	1.9308E 05	4200	
4400	9.0524	2.51941	23.2454	25.8253	5.00817	46.1910	51.3091	1.3774E 04	2.2520E 04	2.0324E 05	2.0324E 05	4400	
4600	9.1248	2.51820	23.3593	25.9419	5.01102	46.4188	51.5498	1.4462E 04	2.3603E 04	2.1353E 05	2.1353E 05	4600	
4800	9.1577	2.51653	23.4693	26.0578	5.01377	46.6374	51.7812	1.5152E 04	2.4699E 04	2.2386E 05	2.2386E 05	4800	
5000	9.1920	2.51483	23.5751	26.1699	5.01635	46.8477	52.0040	1.5844E 04	2.5782E 04	2.3424E 05	2.3424E 05	5000	
5200	9.2274	2.51310	23.6770	26.2780	5.01886	47.0501	52.2188	1.6544E 04	2.6877E 04	2.4464E 05	2.4464E 05	5200	
5400	9.2637	2.51130	23.7753	26.3824	5.02133	47.2454	52.4262	1.7242E 04	2.7976E 04	2.5513E 05	2.5513E 05	5400	
5600	9.3009	2.50940	23.8702	26.4832	5.02376	47.4341	52.6285	1.7950E 04	2.9078E 04	2.6563E 05	2.6563E 05	5600	
5800	9.3387	2.50733	23.9620	26.5807	5.02614	47.6165	52.8263	1.8657E 04	3.0182E 04	2.7618E 05	2.7618E 05	5800	
6000	9.3773	2.50528	24.0509	26.6752	5.02847	47.7931	53.0209	1.9364E 04	3.1289E 04	2.8676E 05	2.8676E 05	6000	
6200	9.4164	2.50326	24.1370	26.7667	5.03075	47.9642	53.1800	2.0078E 04	3.2398E 04	2.9738E 05	2.9738E 05	6200	
6400	9.4560	2.50124	24.2206	26.8554	5.03298	48.1303	53.3442	2.0792E 04	3.3509E 04	3.0803E 05	3.0803E 05	6400	
6600	9.4961	2.49925	24.3017	26.9416	5.03516	48.2916	53.5374	2.1507E 04	3.4622E 04	3.1872E 05	3.1872E 05	6600	
6800	9.5365	2.49730	24.3806	27.0253	5.03729	48.4483	53.7038	2.2224E 04	3.5737E 04	3.2945E 05	3.2945E 05	6800	
7000	9.5772	2.49536	24.4574	27.1067	5.03935	48.6008	53.8455	2.2943E 04	3.6853E 04	3.4021E 05	3.4021E 05	7000	
7200	9.6182	2.49341	24.5320	27.1860	5.04137	48.7492	54.0230	2.3663E 04	3.7971E 04	3.5099E 05	3.5099E 05	7200	
7400	9.6595	2.49148	24.6048	27.2631	5.04334	48.8939	54.1743	2.4384E 04	3.9090E 04	3.6181E 05	3.6181E 05	7400	
7600	9.7009	2.48955	24.6758	27.3383	5.04526	49.0348	54.3268	2.5108E 04	4.0211E 04	3.7268E 05	3.7268E 05	7600	
7800	9.7424	2.48764	24.7450	27.4117	5.04714	49.1724	54.4715	2.5833E 04	4.1333E 04	3.8354E 05	3.8354E 05	7800	
8000	9.7841	2.48571	24.8126	27.4833	5.04900	49.3066	54.6138	2.6560E 04	4.2457E 04	3.9443E 05	3.9443E 05	8000	
8200	9.8260	2.48378	24.8785	27.5532	5.05083	49.4378	54.7528	2.7288E 04	4.3582E 04	4.0539E 05	4.0539E 05	8200	
8400	9.8679	2.48182	24.9430	27.6216	5.05265	49.5660	54.8884	2.8018E 04	4.4710E 04	4.1635E 05	4.1635E 05	8400	
8600	9.9098	2.47983	25.0061	27.6884	5.05446	49.6913	55.0215	2.8750E 04	4.5840E 04	4.2735E 05	4.2735E 05	8600	
8800	9.9519	2.47780	25.0678	27.7539	5.05626	49.8139	55.1516	2.9485E 04	4.6972E 04	4.3834E 05	4.3834E 05	8800	
9000	9.9940	2.47581	25.1282	27.8180	5.05804	49.9340	55.2790	3.0221E 04	4.8104E 04	4.4941E 05	4.4941E 05	9000	
9200	10.0362	2.47380	25.1874	27.8809	5.05981	50.0515	55.4040	3.0961E 04	4.9243E 04	4.6047E 05	4.6047E 05	9200	
9400	10.0785	2.47176	25.2454	27.9428	5.06157	50.1667	55.5264	3.1704E 04	5.0392E 04	4.7137E 05	4.7137E 05	9400	
9600	10.1208	2.46970	25.3022	28.0032	5.06332	50.2794	55.6470	3.2450E 04	5.1527E 04	4.8268E 05	4.8268E 05	9600	
9800	10.1632	2.46761	25.3579	28.0627	5.06506	50.3904	55.7653	3.3200E 04	5.2674E 04	4.9383E 05	4.9383E 05	9800	

TABLE 4. IDEAL GAS FUNCTIONS FOR N (ATOMIC WEIGHT 14.0067, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N, S, L. SEE TABLE 4B FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T}$	TEMP. (°K)
1000	4.0000	2.50000	10.9500	21.4500	4.96791	37.6548	42.6248	2.9070E 03	4.9679E 03	3.7657E 04	1000	
1200	4.0000	2.50000	19.4000	21.9058	4.96791	38.5424	43.5124	3.5749E 03	5.9615E 03	4.4275E 04	1200	
1400	4.0000	2.50000	19.7412	22.2312	4.96791	39.3204	44.2965	4.1750E 03	6.9531E 03	5.3040E 04	1400	
1600	4.0000	2.50000	20.1250	22.4922	4.96791	39.9918	44.9597	4.7462E 03	7.9407E 03	6.3907E 04	1600	
1800	4.0000	2.50001	20.4195	22.6919	4.96793	40.5448	45.5448	5.2854E 03	8.9423E 03	7.5030E 04	1800	
2000	4.0000	2.50003	20.6829	22.8229	4.96794	41.0003	46.0603	5.7944E 03	9.9340E 03	8.7201E 04	2000	
2200	4.0000	2.50011	20.9212	22.8913	4.96813	41.3738	46.5420	6.2681E 03	1.0930E 04	9.1462E 04	2200	
2400	4.0001	2.50028	21.1387	22.8996	4.96848	42.6681	46.9746	7.1522E 03	1.1924E 04	1.0081E 05	2400	
2600	4.0002	2.50064	21.3369	22.8395	4.96918	42.6039	47.3700	7.9522E 03	1.2920E 04	1.1025E 05	2600	
2800	4.0005	2.50127	21.5242	22.8255	4.97044	42.7722	47.7426	8.5532E 03	1.3911E 04	1.1970E 05	2800	
3000	4.0018	2.50238	21.6968	22.81991	4.97248	43.1151	48.0876	8.9548E 03	1.4917E 04	1.2935E 05	3000	
3200	4.0038	2.50383	21.8504	22.8422	4.97556	43.5362	48.4117	9.2622E 03	1.5922E 04	1.3900E 05	3200	
3400	4.0067	2.50604	22.0102	22.8162	4.97991	43.7379	48.7176	1.0175E 04	1.6932E 04	1.4871E 05	3400	
3600	4.0097	2.50899	22.1535	22.8425	4.98579	44.0227	49.0005	1.0795E 04	1.7945E 04	1.5844E 05	3600	
3800	4.0070	2.51201	22.2893	22.8621	4.99338	44.2925	49.2659	1.1424E 04	1.8975E 04	1.6831E 05	3800	
4000	4.0101	2.51799	22.4183	22.8959	5.00284	44.5468	49.5517	1.2063E 04	2.0011E 04	1.7820E 05	4000	
4200	4.0141	2.52337	22.5413	22.9444	5.01436	44.7932	49.8074	1.2714E 04	2.1066E 04	1.8813E 05	4200	
4400	4.0191	2.52922	22.6586	22.1000	5.02796	45.0288	50.0547	1.3386E 04	2.2123E 04	1.9812E 05	4400	
4600	4.0252	2.53614	22.7714	22.3096	5.04371	45.2506	50.2943	1.4080E 04	2.3201E 04	2.0814E 05	4600	
4800	4.0325	2.54414	22.8797	22.4268	5.06160	45.4607	50.5272	1.4795E 04	2.4296E 04	2.1824E 05	4800	
5000	4.0410	2.55721	22.9930	22.5410	5.08199	45.6727	50.7543	1.5472E 04	2.5400E 04	2.2836E 05	5000	
5200	4.0518	2.56829	23.0963	22.6526	5.10362	45.8726	50.9760	1.6204E 04	2.6539E 04	2.3854E 05	5200	
5400	4.0623	2.58035	23.1815	22.7618	5.12750	46.0655	51.1930	1.6995E 04	2.7690E 04	2.4875E 05	5400	
5600	4.0752	2.59332	23.2756	22.8699	5.15336	46.2524	51.4050	1.7731E 04	2.8859E 04	2.5901E 05	5600	
5800	4.0895	2.60713	23.3660	22.9739	5.18080	46.4337	51.6145	1.8523E 04	3.0049E 04	2.6932E 05	5800	
6000	4.1054	2.62171	23.4594	26.0771	5.20976	46.6098	51.8196	1.9334E 04	3.1259E 04	2.7964E 05	6000	
6200	4.1228	2.63696	23.5416	26.1784	5.24007	46.7811	52.0212	2.0168E 04	3.2488E 04	2.9004E 05	6200	
6400	4.1418	2.65290	23.6256	26.2784	5.27154	46.9480	52.2195	2.1020E 04	3.3730E 04	3.0047E 05	6400	
6600	4.1624	2.66914	23.7079	26.3764	5.30402	47.1107	52.4147	2.1891E 04	3.5007E 04	3.1093E 05	6600	
6800	4.1845	2.68589	23.7874	26.4733	5.33731	47.2695	52.6069	2.2791E 04	3.6294E 04	3.2143E 05	6800	
7000	4.2081	2.70397	23.8655	26.5685	5.37135	47.4269	52.7960	2.3699E 04	3.7599E 04	3.3197E 05	7000	
7200	4.2333	2.72330	23.9419	26.6622	5.40548	47.5745	52.9822	2.4613E 04	3.8921E 04	3.4259E 05	7200	
7400	4.2599	2.73778	24.0167	26.7545	5.44042	47.7211	53.1656	2.5534E 04	4.0259E 04	3.5311E 05	7400	
7600	4.2880	2.75295	24.0899	26.8453	5.47534	47.8707	53.3469	2.6480E 04	4.1613E 04	3.6362E 05	7600	
7800	4.3175	2.77293	24.1617	26.9347	5.51028	48.0134	53.5255	2.7460E 04	4.2980E 04	3.7450E 05	7800	
8000	4.3484	2.79046	24.2322	27.0226	5.54511	48.1533	53.6904	2.8464E 04	4.4361E 04	3.8523E 05	8000	
8200	4.3807	2.80708	24.3013	27.1092	5.57972	48.2907	53.8704	2.9494E 04	4.5754E 04	3.9590E 05	8200	
8400	4.4142	2.82512	24.3691	27.1943	5.61398	48.4259	54.0395	3.0545E 04	4.7157E 04	4.0677E 05	8400	
8600	4.4490	2.84215	24.4356	27.2780	5.64780	48.5586	54.2058	3.1622E 04	4.8571E 04	4.1768E 05	8600	
8800	4.4850	2.85891	24.5014	27.3603	5.68113	48.6892	54.3694	3.2730E 04	4.9994E 04	4.2844E 05	8800	
9000	4.5222	2.87537	24.5668	27.4412	5.71304	48.8163	54.5301	3.3864E 04	5.1438E 04	4.3935E 05	9000	
9200	4.5604	2.89150	24.6292	27.5207	5.74450	48.9402	54.6882	3.5020E 04	5.2892E 04	4.5022E 05	9200	
9400	4.5990	2.90724	24.6915	27.5988	5.77522	49.0611	54.8433	3.6194E 04	5.4364E 04	4.6122E 05	9400	
9600	4.6401	2.92265	24.7529	27.6755	5.80778	49.1801	54.9959	3.7396E 04	5.5854E 04	4.7212E 05	9600	
9800	4.6815	2.93763	24.8133	27.7509	5.83755	49.3001	55.1457	3.8614E 04	5.7368E 04	4.8322E 05	9800	

TABLE 5. IDEAL GAS FUNCTIONS FOR O (ATOMIC WEIGHT 15.9994, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 49 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIAL FUNCT.	$\frac{W^0 - E^0}{RT}$	$\ln \frac{W^0 - E^0}{RT}$	$\ln \frac{W^0 - E^0}{RT} - \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{W^0 - E^0}{RT}$	TEMP. (°K)			
1000	0.1105	2.59613	19.8544	22.4525	5.15693	39.4569	44.6169	3.1718E 03	5.1569E 03	1.0000E 04	1000
1200	0.2435	2.58227	20.3285	22.9107	5.13140	40.3960	45.5274	3.7731E 03	4.1577E 03	4.0475E 04	1200
1400	0.3416	2.57186	20.7257	23.2976	5.11071	41.1094	46.2961	4.3720E 03	7.1550E 03	5.7468E 04	1400
1600	0.4174	2.56377	21.0666	23.6323	5.09463	41.6663	46.9614	4.9720E 03	6.1514E 03	4.6907E 04	1600
1800	0.4774	2.55732	21.3702	23.9275	5.08182	42.0660	47.5479	5.5704E 03	9.1672E 03	7.0439E 04	1800
2000	0.5245	2.55209	21.6393	24.1914	5.07142	42.4099	48.0723	6.1685E 03	1.0163E 04	8.0002E 04	2000
2200	0.5673	2.54780	21.8823	24.4302	5.06240	42.6948	48.5448	6.7664E 03	1.1130E 04	9.0000E 04	2200
2400	0.6061	2.54431	22.1039	24.6482	5.05456	42.9241	48.9680	7.3645E 03	1.2134E 04	1.0000E 05	2400
2600	0.6412	2.54150	22.3074	24.8489	5.04769	43.1039	49.3479	7.9624E 03	1.3131E 04	1.1000E 05	2600
2800	0.6731	2.53932	22.4957	25.0350	5.04140	43.2406	49.6787	8.5602E 03	1.4129E 04	1.2000E 05	2800
3000	0.7021	2.53773	22.6708	25.2086	5.03540	43.3390	49.9567	9.1579E 03	1.5129E 04	1.3000E 05	3000
3200	0.7289	2.53671	22.8346	25.3713	5.02960	43.3948	50.1869	9.7556E 03	1.6131E 04	1.4000E 05	3200
3400	0.7528	2.53622	22.9885	25.5246	5.02400	43.4131	50.3648	1.0350E 04	1.7134E 04	1.5000E 05	3400
3600	0.7742	2.53626	23.1333	25.6696	5.01860	43.3914	50.4957	1.0970E 04	1.8136E 04	1.6000E 05	3600
3800	0.7935	2.53678	23.2704	25.8072	5.01340	43.3267	50.5752	1.1600E 04	1.9138E 04	1.7000E 05	3800
4000	0.8112	2.53778	23.4006	25.9384	5.00840	43.2240	50.6090	1.2220E 04	2.0140E 04	1.8000E 05	4000
4200	0.8277	2.53920	23.5244	26.0636	5.00360	43.0848	50.6923	1.2840E 04	2.1142E 04	1.9000E 05	4200
4400	0.8421	2.54103	23.6426	26.1836	5.00000	42.9048	50.7218	1.3460E 04	2.2144E 04	2.0000E 05	4400
4600	0.8546	2.54321	23.7556	26.2988	5.00000	42.6848	50.7032	1.4080E 04	2.3146E 04	2.1000E 05	4600
4800	0.8653	2.54572	23.8639	26.4096	5.00000	42.4248	50.6323	1.4700E 04	2.4148E 04	2.2000E 05	4800
5000	0.8743	2.54857	23.9679	26.5164	5.00000	42.1248	50.5152	1.5320E 04	2.5150E 04	2.3000E 05	5000
5200	0.8817	2.55184	24.0679	26.6195	5.00000	41.7848	50.3487	1.5940E 04	2.6152E 04	2.4000E 05	5200
5400	0.8875	2.55564	24.1642	26.7191	5.00000	41.4048	50.1280	1.6560E 04	2.7154E 04	2.5000E 05	5400
5600	0.8918	2.55989	24.2572	26.8154	5.00000	40.9848	49.8580	1.7180E 04	2.8156E 04	2.6000E 05	5600
5800	0.8946	2.56460	24.3471	26.9089	5.00000	40.5248	49.5352	1.7800E 04	2.9158E 04	2.7000E 05	5800
6000	0.8959	2.56961	24.4340	27.0000	5.00000	40.0248	49.1580	1.8420E 04	3.0160E 04	2.8000E 05	6000
6200	0.8957	2.57493	24.5182	27.0876	5.00000	39.4848	48.7218	1.9040E 04	3.1162E 04	2.9000E 05	6200
6400	0.8941	2.58057	24.5995	27.1731	5.00000	38.9048	48.2318	1.9660E 04	3.2164E 04	3.0000E 05	6400
6600	0.8909	2.58724	24.6790	27.2563	5.00000	38.2848	47.6923	2.0280E 04	3.3166E 04	3.1000E 05	6600
6800	0.8862	2.59482	24.7560	27.3372	5.00000	37.6248	47.1018	2.0900E 04	3.4168E 04	3.2000E 05	6800
7000	0.8800	2.59316	24.8309	27.4161	5.00000	36.9248	46.4580	2.1520E 04	3.5170E 04	3.3000E 05	7000
7200	0.8723	2.59111	24.9036	27.4929	5.00000	36.1848	45.7680	2.2140E 04	3.6172E 04	3.4000E 05	7200
7400	0.8631	2.58864	24.9748	27.5678	5.00000	35.4048	45.0280	2.2760E 04	3.7174E 04	3.5000E 05	7400
7600	0.8525	2.58584	25.0440	27.6400	5.00000	34.5848	44.2430	2.3380E 04	3.8176E 04	3.6000E 05	7600
7800	0.8405	2.58279	25.1115	27.7123	5.00000	33.7248	43.4080	2.4000E 04	3.9178E 04	3.7000E 05	7800
8000	0.8272	2.57948	25.1774	27.7820	5.00000	32.8248	42.5280	2.4620E 04	4.0180E 04	3.8000E 05	8000
8200	0.8128	2.57591	25.2418	27.8491	5.00000	31.8848	41.6080	2.5240E 04	4.1182E 04	3.9000E 05	8200
8400	0.7975	2.57208	25.3044	27.9144	5.00000	30.9048	40.6480	2.5860E 04	4.2184E 04	4.0000E 05	8400
8600	0.7813	2.56800	25.3646	27.9781	5.00000	29.8848	39.6480	2.6480E 04	4.3186E 04	4.1000E 05	8600
8800	0.7642	2.56367	25.4223	28.0404	5.00000	28.8248	38.6080	2.7100E 04	4.4188E 04	4.2000E 05	8800
9000	0.7462	2.55911	25.4780	28.1017	5.00000	27.7248	37.5280	2.7720E 04	4.5190E 04	4.3000E 05	9000
9200	0.7275	2.55431	25.5319	28.1618	5.00000	26.5848	36.4080	2.8340E 04	4.6192E 04	4.4000E 05	9200
9400	0.7081	2.54928	25.5840	28.2204	5.00000	25.4048	35.2480	2.8960E 04	4.7194E 04	4.5000E 05	9400
9600	0.6880	2.54403	25.6344	28.2776	5.00000	24.1848	34.0480	2.9580E 04	4.8196E 04	4.6000E 05	9600
9800	0.6672	2.53857	25.6831	28.3333	5.00000	22.9248	32.8080	3.0200E 04	4.9198E 04	4.7000E 05	9800
10000	0.6457	2.53291	25.7291	28.3886	5.00000	21.6248	31.5280	3.0820E 04	5.0200E 04	4.8000E 05	10000

TABLE 4. REDUCED GAS FUNCTIONS FOR AN IDEAL GASEOUS STATE WITH PRINCIPAL QUANTUM NUMBERS n, l, m . SEE TABLE 50 FOR LIST OF STATES USED.

TEMP. (%)	PARTIAL PRESS. (mm Hg)	$\frac{W}{RT} - \frac{W_0}{RT_0}$	$\frac{W}{RT} - \frac{W_0}{RT_0} - \frac{W_0}{RT_0} \ln \frac{T}{T_0}$	$\frac{W}{RT} - \frac{W_0}{RT_0} - \frac{W_0}{RT_0} \ln \frac{T}{T_0} - \frac{W_0}{RT_0} \ln \frac{P}{P_0}$	$\frac{W}{RT} - \frac{W_0}{RT_0} - \frac{W_0}{RT_0} \ln \frac{T}{T_0} - \frac{W_0}{RT_0} \ln \frac{P}{P_0} - \frac{W_0}{RT_0} \ln \frac{V}{V_0}$	$\frac{W}{RT} - \frac{W_0}{RT_0} - \frac{W_0}{RT_0} \ln \frac{T}{T_0} - \frac{W_0}{RT_0} \ln \frac{P}{P_0} - \frac{W_0}{RT_0} \ln \frac{V}{V_0} - \frac{W_0}{RT_0} \ln \frac{P_0}{P}$	$\frac{W}{RT} - \frac{W_0}{RT_0} - \frac{W_0}{RT_0} \ln \frac{T}{T_0} - \frac{W_0}{RT_0} \ln \frac{P}{P_0} - \frac{W_0}{RT_0} \ln \frac{V}{V_0} - \frac{W_0}{RT_0} \ln \frac{P_0}{P} - \frac{W_0}{RT_0} \ln \frac{V_0}{V}$	TEMP. (%)		
1000	1.0000	19.1350	21.6350	6.90791	30.0240	42.9939	2.90070	4.90790	3.80240	1000
1200	1.0000	19.5916	22.0916	6.90791	30.4806	43.4495	2.90070	4.90790	3.80240	1200
1400	1.0000	20.0482	22.5482	6.90791	30.9372	43.9061	2.90070	4.90790	3.80240	1400
1600	1.0000	20.5048	23.0048	6.90791	31.3938	44.3627	2.90070	4.90790	3.80240	1600
1800	1.0000	20.9614	23.4614	6.90791	31.8504	44.8193	2.90070	4.90790	3.80240	1800
2000	1.0000	21.4180	23.9180	6.90791	32.3070	45.2759	2.90070	4.90790	3.80240	2000
2200	1.0000	21.8746	24.3746	6.90791	32.7636	45.7325	2.90070	4.90790	3.80240	2200
2400	1.0000	22.3312	24.8312	6.90791	33.2202	46.1891	2.90070	4.90790	3.80240	2400
2600	1.0000	22.7878	25.2878	6.90791	33.6768	46.6457	2.90070	4.90790	3.80240	2600
2800	1.0000	23.2444	25.7444	6.90791	34.1334	47.1023	2.90070	4.90790	3.80240	2800
3000	1.0000	23.7010	26.2010	6.90791	34.5900	47.5589	2.90070	4.90790	3.80240	3000
3200	1.0000	24.1576	26.6576	6.90791	35.0466	48.0155	2.90070	4.90790	3.80240	3200
3400	1.0000	24.6142	27.1142	6.90791	35.5032	48.4721	2.90070	4.90790	3.80240	3400
3600	1.0000	25.0708	27.5708	6.90791	35.9598	48.9287	2.90070	4.90790	3.80240	3600
3800	1.0000	25.5274	28.0274	6.90791	36.4164	49.3853	2.90070	4.90790	3.80240	3800
4000	1.0000	25.9840	28.4840	6.90791	36.8730	49.8419	2.90070	4.90790	3.80240	4000
4200	1.0000	26.4406	28.9406	6.90791	37.3296	50.2985	2.90070	4.90790	3.80240	4200
4400	1.0000	26.8972	29.3972	6.90791	37.7862	50.7551	2.90070	4.90790	3.80240	4400
4600	1.0000	27.3538	29.8538	6.90791	38.2428	51.2117	2.90070	4.90790	3.80240	4600
4800	1.0000	27.8104	30.3104	6.90791	38.6994	51.6683	2.90070	4.90790	3.80240	4800
5000	1.0000	28.2670	30.7670	6.90791	39.1560	52.1249	2.90070	4.90790	3.80240	5000
5200	1.0000	28.7236	31.2236	6.90791	39.6126	52.5815	2.90070	4.90790	3.80240	5200
5400	1.0000	29.1802	31.6802	6.90791	40.0692	53.0381	2.90070	4.90790	3.80240	5400
5600	1.0000	29.6368	32.1368	6.90791	40.5258	53.4947	2.90070	4.90790	3.80240	5600
5800	1.0000	30.0934	32.5934	6.90791	40.9824	53.9513	2.90070	4.90790	3.80240	5800
6000	1.0000	30.5500	33.0500	6.90791	41.4390	54.4079	2.90070	4.90790	3.80240	6000
6200	1.0000	31.0066	33.5066	6.90791	41.8956	54.8645	2.90070	4.90790	3.80240	6200
6400	1.0000	31.4632	33.9632	6.90791	42.3522	55.3211	2.90070	4.90790	3.80240	6400
6600	1.0000	31.9198	34.4198	6.90791	42.8088	55.7777	2.90070	4.90790	3.80240	6600
6800	1.0000	32.3764	34.8764	6.90791	43.2654	56.2343	2.90070	4.90790	3.80240	6800
7000	1.0000	32.8330	35.3330	6.90791	43.7220	56.6909	2.90070	4.90790	3.80240	7000
7200	1.0000	33.2896	35.7896	6.90791	44.1786	57.1475	2.90070	4.90790	3.80240	7200
7400	1.0000	33.7462	36.2462	6.90791	44.6352	57.6041	2.90070	4.90790	3.80240	7400
7600	1.0000	34.2028	36.7028	6.90791	45.0918	58.0607	2.90070	4.90790	3.80240	7600
7800	1.0000	34.6594	37.1594	6.90791	45.5484	58.5173	2.90070	4.90790	3.80240	7800
8000	1.0000	35.1160	37.6160	6.90791	46.0050	58.9739	2.90070	4.90790	3.80240	8000
8200	1.0000	35.5726	38.0726	6.90791	46.4616	59.4305	2.90070	4.90790	3.80240	8200
8400	1.0000	36.0292	38.5292	6.90791	46.9182	59.8871	2.90070	4.90790	3.80240	8400
8600	1.0000	36.4858	38.9858	6.90791	47.3748	60.3437	2.90070	4.90790	3.80240	8600
8800	1.0000	36.9424	39.4424	6.90791	47.8314	60.8003	2.90070	4.90790	3.80240	8800
9000	1.0000	37.3990	39.8990	6.90791	48.2880	61.2569	2.90070	4.90790	3.80240	9000
9200	1.0000	37.8556	40.3556	6.90791	48.7446	61.7135	2.90070	4.90790	3.80240	9200
9400	1.0000	38.3122	40.8122	6.90791	49.2012	62.1701	2.90070	4.90790	3.80240	9400
9600	1.0000	38.7688	41.2688	6.90791	49.6578	62.6267	2.90070	4.90790	3.80240	9600
9800	1.0000	39.2254	41.7254	6.90791	50.1144	63.0833	2.90070	4.90790	3.80240	9800
10000	1.0000	39.6820	42.1820	6.90791	50.5710	63.5399	2.90070	4.90790	3.80240	10000

TABLE 6 (CONT.). IDEAL GAS FUNCTIONS FOR AIR

TEMP. (°F)	PARTIAL PRESS.	$\frac{W}{R}$	$\frac{W}{R} \ln \frac{W}{R}$	$\frac{W}{R} \ln \frac{W}{R} - \frac{W}{R}$	$\frac{W}{R} \ln \frac{W}{R} - \frac{W}{R} + \frac{W}{R}$	$\frac{W}{R} \ln \frac{W}{R} - \frac{W}{R} + \frac{W}{R} - \frac{W}{R}$	$\frac{W}{R} \ln \frac{W}{R} - \frac{W}{R} + \frac{W}{R} - \frac{W}{R} + \frac{W}{R}$	$\frac{W}{R} \ln \frac{W}{R} - \frac{W}{R} + \frac{W}{R} - \frac{W}{R} + \frac{W}{R} - \frac{W}{R}$	TEMP. (°F)
10000	1.0000	2.5000	24.0000	27.5000	4.0000	96.4000	2.0017E 04	4.9440E 04	10000
10000	1.0001	2.5000	24.0113	27.5133	4.0006	96.4076	3.1310E 04	5.2192E 04	10000
11000	1.0001	2.5010	24.1307	27.5325	4.0016	96.4208	3.2527E 04	5.4404E 04	11000
11000	1.0002	2.5013	24.2419	27.5450	4.0016	96.4298	3.4396E 04	5.7280E 04	11000
12000	1.0004	2.5052	24.3403	27.5537	4.0029	96.4376	3.5994E 04	6.0446E 04	12000
12000	1.0007	2.5037	24.4500	27.5592	4.0054	96.4454	3.7667E 04	6.3219E 04	12000
13000	1.0011	2.51293	24.5493	28.0622	4.0036	96.4506	3.9004E 04	6.6002E 04	13000
13000	1.0017	2.51035	24.6442	28.1636	4.0037	96.4563	4.0790E 04	6.8790E 04	13000
14000	1.0026	2.52014	24.7340	28.2641	4.0038	96.4615	4.2533E 04	7.1590E 04	14000
14000	1.0037	2.52966	24.8249	28.3644	4.0041	96.4671	4.4336E 04	7.4412E 04	14000
15000	1.0053	2.53913	24.9113	28.4644	4.0042	96.4721	4.6102E 04	7.7239E 04	15000
15000	1.0075	2.54443	24.9933	28.5700	4.0043	96.4773	4.7930E 04	8.0068E 04	15000
16000	1.0102	2.54903	24.0779	28.6765	4.0044	96.4826	4.9819E 04	8.2912E 04	16000
16000	1.0130	2.55364	24.1579	28.7869	4.0045	96.4880	5.1764E 04	8.5767E 04	16000
17000	1.0162	2.55832	24.2369	28.8922	4.0046	96.4933	5.3767E 04	8.8635E 04	17000
17000	1.0237	2.56050	24.3160	29.0023	4.0047	96.4986	5.5828E 04	9.1511E 04	17000
18000	1.0305	2.57013	24.3917	29.1089	4.0048	96.5039	5.7947E 04	9.4401E 04	18000
18000	1.0384	2.57767	24.4651	29.2195	4.0049	96.5092	6.0124E 04	9.7304E 04	18000
19000	1.0464	2.58444	24.5441	29.3266	4.0050	96.5145	6.2359E 04	1.0032E 04	19000
19000	1.0549	2.59061	24.6200	29.4396	4.0051	96.5198	6.4652E 04	1.0368E 04	19000
20000	1.0734	3.04317	26.0960	29.7391	4.0052	96.5251	6.7004E 04	1.0714E 04	20000
20000	1.1514	3.05446	27.0044	30.0491	4.0053	96.5304	6.9416E 04	1.1069E 04	20000
24000	1.2777	3.05253	27.3260	31.0705	4.0054	96.5357	7.1888E 04	1.1433E 04	24000
26000	1.4447	4.06500	27.6427	32.1277	4.0055	96.5410	7.4420E 04	1.1806E 04	26000
28000	1.7230	4.92270	28.0109	32.9336	4.0056	96.5463	7.7012E 04	1.2188E 04	28000
30000	2.0640	5.20419	28.3434	33.6476	4.0057	96.5516	7.9664E 04	1.2579E 04	30000
32000	2.4919	5.53067	28.7132	34.2829	4.0058	96.5569	8.2376E 04	1.2979E 04	32000
34000	3.0119	5.70012	29.0543	34.7844	4.0059	96.5622	8.5148E 04	1.3388E 04	34000
36000	3.6262	5.70409	29.3028	35.1677	4.0060	96.5675	8.7980E 04	1.3806E 04	36000
38000	4.3353	5.01372	29.6966	35.5103	4.0061	96.5728	9.0872E 04	1.4233E 04	38000
40000	5.1378	5.00323	29.9966	35.7979	4.0062	96.5781	9.3824E 04	1.4669E 04	40000
42000	6.0314	5.76619	30.2770	36.0432	4.0063	96.5834	9.6836E 04	1.5114E 04	42000
44000	7.0127	5.71189	30.5440	36.2599	4.0064	96.5887	9.9908E 04	1.5568E 04	44000
46000	8.0776	5.46491	30.7965	36.4434	4.0065	96.5940	1.0323E 04	1.6030E 04	46000
48000	9.2215	5.27579	31.0393	36.6111	4.0066	96.5993	1.0648E 04	1.6500E 04	48000
50000	10.4594	5.20105	31.2615	36.7631	4.0067	96.6046	1.0983E 04	1.6978E 04	50000

TABLE 7. IDEAL GAS FUNCTIONS FOR C+ (ATOMIC WEIGHT 12.0106, $\alpha = 1.99717$ CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS n, l, m. SEE TABLE 51 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\ln \frac{W}{kT}$	$\ln \frac{W}{kT} - \frac{E_0}{kT}$	$\ln \frac{W}{kT} - \frac{E_0}{kT} - \frac{E_1}{kT}$	$\ln \frac{W}{kT} - \frac{E_0}{kT} - \frac{E_1}{kT} - \frac{E_2}{kT}$	$\ln \frac{W}{kT} - \frac{E_0}{kT} - \frac{E_1}{kT} - \frac{E_2}{kT} - \frac{E_3}{kT}$	$\ln \frac{W}{kT} - \frac{E_0}{kT} - \frac{E_1}{kT} - \frac{E_2}{kT} - \frac{E_3}{kT} - \frac{E_4}{kT}$	TEMP. (°K)			
1000	5.6481	2.59048	19.0644	21.6239	5.06410	37.0642	42.9793	3.00096 03	5.06410 03	3.70046 04	1000
1200	5.7045	2.59603	19.5362	22.0800	5.06494	38.0092	43.8764	3.00076 03	4.00076 03	4.65726 04	1200
1400	5.7454	2.54288	19.8227	22.4656	5.05312	38.4997	44.6420	3.00076 03	7.07646 03	5.56264 04	1400
1600	5.7782	2.53762	20.2619	22.7995	5.04268	40.2637	45.3044	4.00068 03	8.06426 03	6.44226 04	1600
1800	5.8065	2.53352	20.5665	23.0900	5.03452	40.8572	45.9117	5.00052 03	9.06216 03	7.35436 04	1800
2000	5.8280	2.53022	20.8273	23.3375	5.02796	41.3073	46.4152	6.00166 03	1.00056 04	8.27736 04	2000
2200	5.8440	2.52751	21.0643	23.5958	5.02284	41.6662	46.8088	6.02776 03	1.10086 04	9.21066 04	2200
2400	5.8564	2.52525	21.2781	23.8134	5.01869	42.0030	47.1211	7.07426 03	1.20046 04	1.01536 05	2400
2600	5.8660	2.52333	21.4602	24.0135	5.01490	42.3045	47.3780	8.06706 03	1.30036 04	1.11086 05	2600
2800	5.8734	2.52166	21.6171	24.1968	5.01160	42.5740	47.6070	8.46676 03	1.40031 04	1.20616 05	2800
3000	5.8791	2.52025	21.8510	24.3713	5.00816	42.8215	47.8070	9.04306 03	1.50246 04	1.30246 05	3000
3200	5.8845	2.51900	22.0137	24.5127	5.00562	43.0448	47.9805	9.65926 03	1.60186 04	1.40006 05	3200
3400	5.8891	2.51789	22.1463	24.6262	5.00367	43.2442	48.1317	1.02556 04	1.70126 04	1.49766 05	3400
3600	5.8930	2.51691	22.25162	24.7162	5.00211	43.4241	48.2636	1.00026 04	1.80086 04	1.59486 05	3600
3800	5.8962	2.51603	22.3463	24.7823	4.99976	43.5895	48.3803	1.14406 04	1.89996 04	1.69206 05	3800
4000	5.8990	2.51523	22.5753	25.0906	4.99819	44.0609	48.6991	1.20046 04	1.99956 04	1.79046 05	4000
4200	5.9133	2.51452	22.6780	25.2125	4.99677	45.1097	50.1015	1.26406 04	2.09946 04	1.89046 05	4200
4400	5.9172	2.51380	22.8150	25.3289	4.99549	45.3372	50.3326	1.32376 04	2.19986 04	1.99406 05	4400
4600	5.9207	2.51329	22.9267	25.4400	4.99433	45.5592	50.5335	1.38336 04	2.29746 04	2.09406 05	4600
4800	5.9240	2.51277	23.0337	25.5464	4.99329	45.7717	50.7050	1.44296 04	2.39486 04	2.19706 05	4800
5000	5.9271	2.51231	23.1362	25.6485	4.99237	45.9755	50.9679	1.50246 04	2.49426 04	2.29906 05	5000
5200	5.9299	2.51189	23.2348	25.7467	4.99156	46.1713	51.1629	1.56246 04	2.59546 04	2.40006 05	5200
5400	5.9325	2.51155	23.3296	25.8411	4.99084	46.3597	51.3895	1.62206 04	2.69816 04	2.50346 05	5400
5600	5.9350	2.51125	23.4209	25.9321	4.99028	46.5412	51.5315	1.68176 04	2.79466 04	2.60806 05	5600
5800	5.9373	2.51103	23.5096	26.0200	4.98982	46.7163	51.7061	1.74156 04	2.89416 04	2.70956 05	5800
6000	5.9395	2.51087	23.5961	26.1050	4.98951	46.8895	51.8790	1.80146 04	2.99376 04	2.81316 05	6000
6200	5.9416	2.51078	23.6765	26.1872	4.98934	47.0691	52.0364	1.86136 04	3.09346 04	2.91706 05	6200
6400	5.9436	2.51077	23.7562	26.2670	4.98932	47.2075	52.1960	1.92126 04	3.19326 04	3.02136 05	6400
6600	5.9456	2.51085	23.8334	26.3443	4.98948	47.3610	52.3505	1.98136 04	3.29316 04	3.12546 05	6600
6800	5.9475	2.51103	23.9084	26.4194	4.98983	47.5099	52.4990	2.04106 04	3.39316 04	3.23076 05	6800
7000	5.9495	2.51130	23.9812	26.4923	4.99038	47.6546	52.6450	2.10226 04	3.49326 04	3.33506 05	7000
7200	5.9516	2.51169	24.0519	26.5634	4.99114	47.7952	52.7863	2.16286 04	3.59346 04	3.44136 05	7200
7400	5.9533	2.51219	24.1208	26.6330	4.99213	47.9320	52.9251	2.22376 04	3.69426 04	3.54786 05	7400
7600	5.9553	2.51281	24.1878	26.7006	4.99337	48.0651	53.0605	2.28476 04	3.79506 04	3.65286 05	7600
7800	5.9573	2.51356	24.2531	26.7666	4.99487	48.1948	53.1897	2.34606 04	3.89606 04	3.75926 05	7800
8000	5.9595	2.51445	24.3167	26.8312	4.99663	48.3213	53.3179	2.40766 04	3.99776 04	3.86576 05	8000
8200	5.9617	2.51548	24.3788	26.8943	4.99868	48.4447	53.4434	2.46946 04	4.09996 04	3.97296 05	8200
8400	5.9640	2.51666	24.4394	26.9561	5.00103	48.5652	53.5662	2.53146 04	4.20266 04	4.07996 05	8400
8600	5.9664	2.51799	24.4987	27.0167	4.99829	48.6829	53.6866	2.59346 04	4.30536 04	4.18676 05	8600
8800	5.9690	2.51948	24.5566	27.0761	5.00663	48.7980	53.8046	2.65716 04	4.40806 04	4.29426 05	8800
9000	5.9717	2.52113	24.6132	27.1343	5.00990	48.9105	53.9204	2.72096 04	4.51076 04	4.40196 05	9000
9200	5.9746	2.52294	24.6686	27.1916	5.01391	49.0202	54.0342	2.78496 04	4.61346 04	4.50996 05	9200
9400	5.9777	2.52482	24.7228	27.2478	5.01864	49.1280	54.1468	2.84926 04	4.71616 04	4.61816 05	9400
9600	5.9809	2.52677	24.7761	27.3032	5.02310	49.2342	54.2582	2.91386 04	4.81886 04	4.72646 05	9600
9800	5.9844	2.52879	24.8282	27.3576	5.02836	49.3376	54.3691	2.97866 04	4.92206 04	4.83516 05	9800

TABLE 7 (CONT.). IDEAL GAS FUNCTIONS FOR C*

TEMP. (°C)	PARTIT. FUNCT.	$\frac{10^4 \ln Z}{RT}$	$\ln Z$	$\ln Z - \ln Z_0$	$\ln Z - \ln Z_0 - \frac{10^4 \ln Z}{RT}$	$\frac{10^4 \ln Z}{RT}$	$\frac{10^4 \ln Z}{RT}$	$\frac{10^4 \ln Z}{RT} - \frac{10^4 \ln Z_0}{RT}$	$\frac{10^4 \ln Z}{RT} - \frac{10^4 \ln Z_0}{RT}$	TEMP. (°C)	
10000	5.9481	2.52107	29.6794	27.6112	5.06826	46.6386	34.4986	1.04116 04	5.03126 04	4.94396 05	10000
10500	5.9984	2.53883	25.0030	27.5419	5.04952	44.7393	32.5993	3.21086 04	5.29726 04	5.21696 05	10500
11000	6.0103	2.54483	25.1213	27.6682	5.04693	48.9202	54.9812	3.33126 04	5.54716 04	5.49126 05	11000
11500	6.0340	2.55336	25.3347	27.7906	5.07681	50.1454	55.2243	3.48556 04	5.84086 04	5.74646 05	11500
12000	6.0394	2.56586	25.3437	27.9096	5.09875	50.3622	55.4610	3.73596 04	5.11856 04	6.04396 05	12000
12500	6.0572	2.57678	25.4487	28.0235	5.12048	50.5708	55.6812	3.91646 04	6.45046 04	6.32136 05	12500
13000	6.0769	2.58655	25.5500	28.1385	5.14387	50.7720	55.9159	4.10376 04	6.80046 05	6.60046 05	13000
13500	6.0984	2.60110	25.6479	28.2490	5.16882	50.9666	56.1354	4.29526 04	6.97796 04	6.80096 05	13500
14000	6.1125	2.61436	25.7427	28.3571	5.19317	51.1551	56.3502	4.49126 04	7.27326 04	7.10176 05	14000
14500	6.1186	2.62826	25.8347	28.4630	5.22278	51.3379	56.5606	4.69146 04	7.57306 04	7.44406 05	14500
15000	6.1769	2.64271	25.9241	28.5668	5.25150	51.5154	56.7669	4.89636 04	7.87726 04	7.72726 05	15000
15500	6.2074	2.65764	26.0110	28.6686	5.28117	51.6881	56.9492	5.10576 04	8.18506 04	8.01176 05	15500
16000	6.2431	2.67298	26.0956	28.7686	5.31164	51.8562	57.1679	5.31926 04	8.49876 04	8.29706 05	16000
16500	6.2749	2.68867	26.1781	28.8667	5.34284	52.0202	57.3630	5.53466 04	8.81576 04	8.58336 05	16500
17000	6.3118	2.70464	26.2586	28.9632	5.37457	52.1691	57.5547	5.75866 04	9.13646 04	8.87046 05	17000
17500	6.3508	2.72090	26.3372	29.0580	5.40676	52.3064	57.7431	5.99436 04	9.46186 04	9.15896 05	17500
18000	6.3819	2.73721	26.4141	29.1513	5.43920	52.4392	57.9284	6.23186 04	9.79076 04	9.44906 05	18000
18500	6.4351	2.75370	26.4893	29.2430	5.47206	52.5686	58.1107	6.47116 04	1.01236 05	9.73816 05	18500
19000	6.4862	2.77028	26.5630	29.3332	5.50500	52.7050	58.2900	6.68396 04	1.08406 05	1.00276 06	19000
19500	6.5272	2.78691	26.6351	29.4220	5.53805	52.8284	58.4665	6.92426 04	1.07996 05	1.03216 06	19500
20000	6.5762	2.80356	26.7059	29.5095	5.57114	53.0490	58.6402	7.16796 04	1.11426 05	1.06146 06	20000
20500	6.7064	2.86996	26.9762	29.8062	5.70312	53.6042	59.3093	8.17516 04	1.25476 05	1.17936 06	20500
21000	7.0324	2.93572	27.2280	30.1645	5.83376	54.1081	59.9418	9.23186 04	1.40016 05	1.29866 06	21000
21500	7.3008	3.00110	27.6463	30.4874	5.96368	54.5802	60.5438	1.03396 05	1.55046 05	1.41916 06	21500
22000	7.5993	3.06712	27.6912	30.7583	6.09488	55.0269	61.1218	1.15026 05	1.70446 05	1.54086 06	22000
30000	7.9165	3.13513	27.9051	31.0402	6.23002	55.4320	61.6820	1.27296 05	1.84906 05	1.64346 06	30000
32000	8.2654	3.20450	28.1097	31.3142	6.37184	55.8393	62.2304	1.40316 05	2.01906 05	1.78756 06	32000
34000	8.6476	3.28241	28.3063	31.5887	6.52249	56.2593	62.7720	1.54216 05	2.21176 05	1.91236 06	34000
36000	9.0437	3.35348	28.4962	31.8599	6.68118	56.6267	63.3108	1.69086 05	2.40636 05	2.03046 06	36000
38000	9.5189	3.42685	28.6804	32.1310	6.83701	56.9926	63.8496	1.85096 05	2.60576 05	2.16576 06	38000
40000	10.0178	3.50318	28.8587	32.4025	7.00088	57.3490	64.3899	2.02186 05	2.81646 05	2.29496 06	40000
42000	10.5487	3.58284	29.0395	32.6735	7.23435	57.6711	64.9317	2.20396 05	3.03926 05	2.42336 06	42000
44000	11.1164	3.64200	29.2206	32.9486	7.43596	58.0383	65.4743	2.37926 05	3.27186 05	2.55376 06	44000
46000	11.8283	3.68452	29.3792	33.2211	7.66452	58.3734	66.0199	2.60146 05	3.51556 05	2.68926 06	46000
48000	12.5934	3.72088	29.5111	33.4920	7.85105	58.7031	66.5561	2.81476 05	3.76896 05	2.83176 06	48000
50000	13.3477	4.05530	29.7045	33.7598	8.05955	59.0276	67.0863	3.03376 05	4.02936 05	2.99146 06	50000

TABLE 8. IONIAL GAS FUNCTIONS FOR $n = 10$ (IONIC WAVELENGTH 14.0042, $R = 1.98717$ CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS $n \leq 6$. SEE TABLE 52 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{q^*}{RT}$	$\frac{q^*}{RT} - \frac{q}{RT}$	$\ln \frac{q^*}{RT}$	$\ln \frac{q}{RT}$	$\ln \frac{q^*}{RT} - \ln \frac{q}{RT}$	$\frac{q^*}{RT} - \frac{q}{RT}$	$\frac{q^*}{RT} - \frac{q}{RT}$	$\frac{q^*}{RT} - \frac{q}{RT}$	TEMP. (°K)			
1000	7.9993	2.62287	19.6395	9.21207	39.0190	44.2311	3.22496	03	5.21216	07	3.90196	04	1800
1200	8.1641	2.60310	20.1113	9.17280	40.9656	45.1384	3.82286	03	6.20746	03	4.79196	04	1200
1400	8.3244	2.58881	20.5120	9.14339	42.7607	46.5201	4.42016	03	7.20216	03	5.76256	04	1400
1600	8.3144	2.57600	20.8549	9.12291	41.4442	44.5491	5.01726	03	8.19646	03	6.63146	04	1600
1800	8.3891	2.56955	21.1401	9.10613	42.4006	47.1347	5.61416	03	9.19106	03	7.54076	04	1800
2000	8.4478	2.56281	21.4305	9.09273	42.9859	47.6786	6.21116	03	1.01896	04	8.51726	04	2000
2200	8.4963	2.55737	21.6795	9.08192	43.0707	48.1324	6.80856	03	1.11866	04	9.43946	04	2200
2400	8.5371	2.55298	21.8968	9.07319	43.5125	48.5857	7.40056	03	1.21726	04	1.04426	05	2400
2600	8.5721	2.54948	22.1010	9.06624	43.9185	48.9845	8.00046	03	1.31526	04	1.14186	05	2600
2800	8.6028	2.54678	22.2892	9.06088	44.2935	49.3544	8.60046	03	1.41276	04	1.24026	05	2800
3000	8.6299	2.54481	22.4655	9.05697	44.6426	49.6995	9.20046	03	1.50926	04	1.33926	05	3000
3200	8.6546	2.54353	22.6296	9.05441	44.9688	50.0233	9.81526	03	1.60426	04	1.43926	05	3200
3400	8.6772	2.54288	22.7838	9.05312	45.2752	50.3283	1.04246	04	1.69826	04	1.53926	05	3400
3600	8.6995	2.54283	22.9292	9.05303	45.5640	50.6171	1.80376	04	1.79126	04	1.64026	05	3600
3800	8.7188	2.54334	23.0667	9.05404	45.8373	50.8913	1.16546	04	1.88326	04	1.74126	05	3800
4000	8.7384	2.54437	23.1971	9.05608	46.0964	51.1526	1.22746	04	1.97626	04	1.84326	05	4000
4200	8.7576	2.54587	23.3213	9.05906	46.3433	51.4024	1.29026	04	2.06926	04	1.94626	05	4200
4400	8.7767	2.54780	23.4398	9.06276	46.5787	51.6416	1.35326	04	2.16226	04	2.04926	05	4400
4600	8.7958	2.55011	23.5531	9.06749	46.8039	51.8714	1.41626	04	2.25526	04	2.15226	05	4600
4800	8.8151	2.55276	23.6617	9.07276	47.0197	52.0924	1.47926	04	2.34826	04	2.25526	05	4800
5000	8.8346	2.55571	23.7660	9.07861	47.2269	52.3055	1.54226	04	2.44126	04	2.35826	05	5000
5200	8.8545	2.5591	23.8663	9.08497	47.4262	52.5112	1.60526	04	2.53426	04	2.46126	05	5200
5400	8.8747	2.56322	23.9639	9.09176	47.6183	52.7189	1.66826	04	2.62726	04	2.56426	05	5400
5600	8.8954	2.56801	24.0591	9.09909	47.8035	52.9284	1.73126	04	2.72026	04	2.66726	05	5600
5800	8.9166	2.57356	24.1522	9.10632	47.9826	53.1389	1.79426	04	2.81326	04	2.77026	05	5800
6000	8.9383	2.57981	24.2434	9.11398	48.1558	53.3509	1.85726	04	2.90626	04	2.87326	05	6000
6200	8.9606	2.58745	24.3319	9.12218	48.3236	53.5654	1.92026	04	2.99926	04	2.97626	05	6200
6400	8.9830	2.59615	24.4198	9.13097	48.4864	53.7821	2.01326	04	3.09226	04	3.07926	05	6400
6600	9.0061	2.59549	24.4793	9.13780	48.6443	53.7821	2.07626	04	3.18526	04	3.18226	05	6600
6800	9.0297	2.59556	24.5565	9.14588	48.7978	53.9437	2.14926	04	3.27826	04	3.28526	05	6800
7000	9.0537	2.59363	24.6316	9.15398	48.9471	54.1011	2.21626	04	3.37126	04	3.38826	05	7000
7200	9.0781	2.59170	24.7048	9.16242	49.0924	54.2545	2.28526	04	3.46426	04	3.49126	05	7200
7400	9.1030	2.58974	24.7760	9.17068	49.2346	54.4041	2.35526	04	3.55726	04	3.59426	05	7400
7600	9.1282	2.58775	24.8454	9.17868	49.3720	54.5500	2.42626	04	3.65026	04	3.69726	05	7600
7800	9.1538	2.58572	24.9132	9.18632	49.5046	54.6925	2.49726	04	3.74326	04	3.80026	05	7800
8000	9.1797	2.58364	24.9793	9.19374	49.6330	54.8317	2.56826	04	3.83626	04	3.90326	05	8000
8200	9.2059	2.58151	25.0439	9.20142	49.7663	54.9677	2.63926	04	3.92926	04	4.00626	05	8200
8400	9.2324	2.57932	25.1070	9.20906	49.8917	55.1007	2.71026	04	4.02226	04	4.10926	05	8400
8600	9.2592	2.57707	25.1687	9.21645	50.0144	55.2300	2.78126	04	4.11526	04	4.21226	05	8600
8800	9.2863	2.57476	25.2291	9.22377	50.1344	55.3562	2.85226	04	4.20826	04	4.31526	05	8800
9000	9.3136	2.57238	25.2882	9.23097	50.2519	55.4793	2.92326	04	4.30126	04	4.41826	05	9000
9200	9.3411	2.56993	25.3461	9.23803	50.3669	55.6004	2.99426	04	4.39426	04	4.52126	05	9200
9400	9.3688	2.56741	25.4028	9.24495	50.4796	55.7194	3.06526	04	4.48726	04	4.62426	05	9400
9600	9.3967	2.56483	25.4583	9.25176	50.5901	55.8369	3.13626	04	4.58026	04	4.72726	05	9600
9800	9.4247	2.56221	25.5130	9.25853	50.6985	55.9524	3.20726	04	4.67326	04	4.83026	05	9800

TABLE 8 (CONT.). IDEAL GAS FUNCTIONS FOR n^*

TEMP. (%)	PARTIAL FUNCT.	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	$\frac{W^2 - C^2}{RT}$	TEMP. (%)
10000	9.4529	2.64945	25.5445	28.2159	5.26490	56.0497	3.27776	04	5.26496	04	5.08056	05	10000
10500	9.5239	2.65734	25.6599	28.3533	5.28062	51.0640	3.25812	04	5.26476	04	5.06156	05	10500
11000	9.5954	2.66487	25.8197	28.4864	5.29854	51.3093	3.23826	04	5.26116	04	5.04396	05	11000
11500	9.6677	2.67201	25.9933	28.6103	5.31973	51.5438	3.21806	04	5.25622	04	5.02756	05	11500
12000	9.7401	2.67880	26.0522	28.7310	5.33222	51.7700	3.19752	04	5.25006	04	5.01246	05	12000
12500	9.8128	2.68528	26.1617	28.8470	5.34609	51.9876	3.17676	04	5.24262	04	4.99856	05	12500
13000	9.8855	2.69147	26.2671	28.9586	5.36039	52.1971	3.15576	04	5.23402	04	4.98506	05	13000
13500	9.9583	2.69740	26.3688	29.0662	5.36617	52.3992	3.13452	04	5.22426	04	4.97196	05	13500
14000	10.0311	2.70310	26.4670	29.1701	5.37131	52.5949	3.11302	04	5.21342	04	4.95926	05	14000
14500	10.1039	2.70860	26.5620	29.2704	5.37684	52.7830	3.09126	04	5.20152	04	4.94696	05	14500
15000	10.1765	2.71393	26.6539	29.3678	5.38269	52.9637	3.06932	04	5.18856	04	4.93506	05	15000
15500	10.2490	2.71911	26.7420	29.4621	5.40331	53.1427	3.04716	04	5.17446	04	4.92356	05	15500
16000	10.3214	2.72416	26.8294	29.5535	5.41335	53.3144	3.02476	04	5.15922	04	4.91246	05	16000
16500	10.3936	2.72911	26.9133	29.6424	5.42318	53.4811	3.00212	04	5.14382	04	4.90176	05	16500
17000	10.4657	2.73397	26.9946	29.7288	5.43285	53.6432	2.97926	04	5.12726	04	4.89146	05	17000
17500	10.5376	2.73878	27.0741	29.8129	5.44240	53.8008	2.95616	04	5.10956	04	4.88156	05	17500
18000	10.6095	2.74354	27.1514	29.8949	5.45187	53.9542	2.93282	04	5.09072	04	4.87206	05	18000
18500	10.6812	2.74828	27.2284	29.9749	5.46129	54.1037	2.90922	04	5.07072	04	4.86296	05	18500
19000	10.7528	2.75301	27.2999	30.0530	5.47065	54.2495	2.88536	04	5.04956	04	4.85426	05	19000
19500	10.8244	2.75776	27.3715	30.1293	5.48012	54.3917	2.86122	04	5.02722	04	4.84596	05	19500
20000	10.8959	2.76253	27.4414	30.2039	5.48960	54.5306	2.83682	04	5.00372	04	4.83806	05	20000
20500	11.1622	2.76728	27.5056	30.4878	5.52860	55.0556	2.81216	04	4.97812	04	4.83056	05	20500
21000	11.4705	2.80351	27.9486	30.7521	5.57104	55.5595	2.78722	04	4.95132	04	4.82346	05	21000
21500	11.7634	2.82743	28.1739	31.0014	5.61858	56.0442	2.76102	04	4.92342	04	4.81676	05	21500
22000	12.0442	2.85495	28.3844	31.2394	5.67326	56.5094	2.73456	04	4.89442	04	4.81046	05	22000
22500	12.3764	2.88709	28.5825	31.4696	5.73713	56.9581	2.70782	04	4.86432	04	4.80456	05	22500
23000	12.7044	2.92489	28.7700	31.6949	5.81224	57.3929	2.68082	04	4.83302	04	4.79906	05	23000
23500	13.0270	2.96833	28.9484	31.9179	5.90054	57.8254	2.65352	04	4.80052	04	4.79396	05	23500
24000	13.4270	3.02124	29.1197	32.1410	6.00373	58.2567	2.62592	04	4.76692	04	4.78926	05	24000
24500	13.8325	3.08131	29.2847	32.3640	6.12307	58.6865	2.59802	04	4.73222	04	4.78496	05	24500
25000	14.2755	3.14986	29.4444	32.5893	6.25928	59.1109	2.56982	04	4.69642	04	4.78106	05	25000
25500	14.7624	3.22893	29.5999	32.8269	6.41245	59.5260	2.54132	04	4.65792	04	4.77746	05	25500
26000	15.2997	3.31222	29.7570	33.0662	6.58192	59.9321	2.51252	04	4.61842	04	4.77416	05	26000
26500	15.8943	3.40992	29.9012	33.3063	6.76844	60.3295	2.48342	04	4.57792	04	4.77116	05	26500
27000	16.5528	3.52635	30.0482	33.5525	6.96371	59.7100	2.45402	04	4.53642	04	4.76836	05	27000
27500	17.2819	3.66891	30.1934	33.8023	7.17149	59.0993	2.42432	04	4.49392	04	4.76576	05	27500

TABLE 9. IDEAL GAS FUNCTIONS FOR O₂ (ATOMIC WEIGHT 15.9948, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS n ≤ 4. SEE TABLE 33 FOR LIST OF STATES USED.

TEMP. (%)	PARTIAL FUNCT.	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	$\frac{h^2 - \bar{h}^2}{RT}$	TEMP. (%)
1000	4.0000	2.50000	16.1499	4.90791	20.0921	43.0211	2.90076	4.46782	3.80202	04	1000
1200	4.0000	2.50000	19.6053	4.90791	30.6929	43.0211	3.57692	5.36152	4.67512	04	1200
1400	4.0000	2.50000	19.9907	4.90791	39.7248	44.6927	4.17302	6.36152	5.36152	04	1400
1600	4.0000	2.50000	20.3245	4.90791	48.3062	45.3531	4.70472	7.40472	6.04212	04	1600
1800	4.0000	2.50000	20.6190	4.90791	56.4733	45.9912	5.16422	8.49422	7.37322	04	1800
2000	4.0000	2.50000	20.8824	4.90791	64.1967	46.6044	5.56152	9.52902	8.52902	04	2000
2200	4.0000	2.50000	21.1204	4.90791	71.4702	47.1921	5.90422	1.07202	9.52902	04	2200
2400	4.0000	2.50000	21.3362	4.90791	78.2927	47.7541	6.19202	1.11202	1.07202	05	2400
2600	4.0000	2.50000	21.5303	4.90791	84.6642	48.2921	6.43202	1.11202	1.11202	05	2600
2800	4.0000	2.50000	21.7235	4.90791	90.5757	48.8042	6.63202	1.11202	1.11202	05	2800
3000	4.0000	2.50000	21.9040	4.90791	96.0272	49.2921	6.79202	1.11202	1.11202	05	3000
3200	4.0001	2.50010	22.0574	4.90791	101.0115	49.7541	6.92202	1.11202	1.11202	05	3200
3400	4.0001	2.50010	22.2000	4.90791	105.5257	50.1921	7.02202	1.11202	1.11202	05	3400
3600	4.0002	2.50040	22.3319	4.90791	109.5692	50.6042	7.09202	1.11202	1.11202	05	3600
3800	4.0004	2.50079	22.4471	4.90791	113.1427	50.9921	7.13202	1.11202	1.11202	05	3800
4000	4.0006	2.50157	22.5464	4.90791	116.2562	51.3541	7.14202	1.11202	1.11202	05	4000
4200	4.0010	2.50237	22.6319	4.90791	118.9097	51.6921	7.12202	1.11202	1.11202	05	4200
4400	4.0016	2.50344	22.6959	4.90791	121.1132	52.0042	7.07202	1.11202	1.11202	05	4400
4600	4.0023	2.50483	22.7424	4.90791	122.8667	52.2921	7.00202	1.11202	1.11202	05	4600
4800	4.0033	2.50656	22.7719	4.90791	124.1702	52.5541	6.91202	1.11202	1.11202	05	4800
5000	4.0045	2.50873	22.7842	4.90791	125.0237	52.7862	6.80202	1.11202	1.11202	05	5000
5200	4.0061	2.51132	22.7787	4.90791	125.4272	52.9862	6.67202	1.11202	1.11202	05	5200
5400	4.0080	2.51439	22.7567	4.90791	125.3807	53.1541	6.53202	1.11202	1.11202	05	5400
5600	4.0104	2.51796	22.7194	4.90791	124.9042	53.2921	6.38202	1.11202	1.11202	05	5600
5800	4.0132	2.52205	22.6674	4.90791	124.0077	53.4042	6.23202	1.11202	1.11202	05	5800
6000	4.0165	2.52667	22.6030	4.90791	122.6912	53.4921	6.08202	1.11202	1.11202	05	6000
6200	4.0203	2.53185	22.5279	4.90791	120.5547	53.5541	5.93202	1.11202	1.11202	05	6200
6400	4.0247	2.53759	22.4444	4.90791	117.6082	53.5921	5.78202	1.11202	1.11202	05	6400
6600	4.0298	2.54387	22.3544	4.90791	113.9617	53.6042	5.63202	1.11202	1.11202	05	6600
6800	4.0355	2.55070	22.2594	4.90791	109.7152	53.5921	5.48202	1.11202	1.11202	05	6800
7000	4.0418	2.55806	22.1627	4.90791	104.9687	53.5541	5.33202	1.11202	1.11202	05	7000
7200	4.0489	2.56595	22.0654	4.90791	99.8222	53.4921	5.18202	1.11202	1.11202	05	7200
7400	4.0567	2.57436	21.9677	4.90791	94.2757	53.4042	5.03202	1.11202	1.11202	05	7400
7600	4.0652	2.58329	21.8699	4.90791	88.3292	53.2921	4.88202	1.11202	1.11202	05	7600
7800	4.0745	2.59274	21.7722	4.90791	82.0827	53.1541	4.73202	1.11202	1.11202	05	7800
8000	4.0845	2.60272	21.6754	4.90791	75.5362	52.9862	4.58202	1.11202	1.11202	05	8000
8200	4.0954	2.61324	21.5799	4.90791	68.6897	52.7921	4.43202	1.11202	1.11202	05	8200
8400	4.1070	2.62439	21.4854	4.90791	61.5432	52.5741	4.28202	1.11202	1.11202	05	8400
8600	4.1194	2.63618	21.3922	4.90791	54.1967	52.3362	4.13202	1.11202	1.11202	05	8600
8800	4.1327	2.64851	21.3007	4.90791	46.6502	52.0782	3.98202	1.11202	1.11202	05	8800
9000	4.1467	2.66149	21.2114	4.90791	38.9037	51.7921	3.83202	1.11202	1.11202	05	9000
9200	4.1615	2.67512	21.1244	4.90791	30.9572	51.4862	3.68202	1.11202	1.11202	05	9200
9400	4.1772	2.68941	21.0399	4.90791	22.8107	51.1642	3.53202	1.11202	1.11202	05	9400
9600	4.1936	2.70437	20.9574	4.90791	14.4642	50.8262	3.38202	1.11202	1.11202	05	9600
9800	4.2100	2.72000	20.8764	4.90791	6.0177	50.4721	3.23202	1.11202	1.11202	05	9800

TABLE 9 (CONT.). IDEAL GAS VISCOSITIES PER B.

TEMP. (°K)	PARTIC. PURET.	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	$\frac{\eta}{T^2}$	TEMP. (°K)
10000	4.2287	2.71626	24.2616	27.6708	5.39904	69.6020	95.0018	3.6119E 04	5.2090E 04	3.2990E 04	2.2643E 05	10000
10500	4.2769	2.74522	25.0949	27.8231	5.46116	69.6027	95.3208	3.6417E 04	5.2734E 04	3.3490E 04	2.3241E 05	10500
11000	4.3246	2.77460	25.2235	28.0931	5.52353	69.6034	95.6407	3.6790E 04	5.3379E 04	3.4079E 04	2.3812E 05	11000
11500	4.3669	2.81073	25.3471	28.1364	5.58595	69.6041	95.9595	3.7180E 04	5.4012E 04	3.4668E 04	2.4384E 05	11500
12000	4.4042	2.84127	25.4660	28.3052	5.64807	69.6048	96.2791	3.7593E 04	5.4697E 04	3.5257E 04	2.4956E 05	12000
12500	4.4333	2.87095	25.5846	28.4595	5.70954	69.6055	96.5989	3.8017E 04	5.5432E 04	3.5846E 04	2.5528E 05	12500
13000	4.4621	2.89954	25.6977	28.5973	5.76107	69.6062	96.9187	3.8461E 04	5.6217E 04	3.6435E 04	2.6100E 05	13000
13500	4.4911	2.92699	25.8077	28.7346	5.81251	69.6069	97.2385	3.8925E 04	5.7052E 04	3.7024E 04	2.6672E 05	13500
14000	4.5201	2.95387	25.9146	28.8675	5.86395	69.6076	97.5583	3.9409E 04	5.7937E 04	3.7613E 04	2.7244E 05	14000
14500	4.5490	2.97979	26.0186	28.9960	5.91539	69.6083	97.8781	3.9913E 04	5.8872E 04	3.8202E 04	2.7866E 05	14500
15000	4.5779	3.00440	26.1200	29.1204	5.96683	69.6090	98.1979	4.0437E 04	5.9857E 04	3.8791E 04	2.8488E 05	15000
15500	4.6069	3.02780	26.2187	29.2406	6.01827	69.6097	98.5177	4.0981E 04	6.0892E 04	3.9380E 04	2.9110E 05	15500
16000	4.6358	3.05000	26.3154	29.3564	6.06971	69.6104	98.8375	4.1545E 04	6.1977E 04	4.0069E 04	2.9732E 05	16000
16500	4.6647	3.07100	26.4099	29.4682	6.12115	69.6111	99.1573	4.2129E 04	6.3112E 04	4.0758E 04	3.0354E 05	16500
17000	4.6936	3.09080	26.5025	29.5769	6.17259	69.6118	99.4771	4.2733E 04	6.4297E 04	4.1447E 04	3.0976E 05	17000
17500	4.7225	3.10940	26.5931	29.6821	6.22403	69.6125	99.7969	4.3367E 04	6.5532E 04	4.2136E 04	3.1598E 05	17500
18000	4.7514	3.12680	26.6818	29.7844	6.27547	69.6132	100.1167	4.3961E 04	6.6817E 04	4.2825E 04	3.2220E 05	18000
18500	4.7803	3.14310	26.7686	29.8836	6.32691	69.6139	100.4365	4.4575E 04	6.8152E 04	4.3514E 04	3.2844E 05	18500
19000	4.8092	3.15830	26.8535	29.9798	6.37835	69.6146	100.7563	4.5209E 04	6.9537E 04	4.4203E 04	3.3468E 05	19000
19500	4.8381	3.17250	26.9366	30.0730	6.42979	69.6153	101.0761	4.5863E 04	7.0972E 04	4.4892E 04	3.4092E 05	19500
20000	4.8670	3.18570	27.0179	30.1632	6.48123	69.6160	101.3959	4.6537E 04	7.2457E 04	4.5581E 04	3.4716E 05	20000
20500	4.8959	3.19790	27.1000	30.2504	6.53267	69.6167	101.7157	4.7231E 04	7.3992E 04	4.6270E 04	3.5340E 05	20500
21000	4.9248	3.20910	27.1811	30.3346	6.58411	69.6174	102.0355	4.7945E 04	7.5577E 04	4.6959E 04	3.5964E 05	21000
21500	4.9537	3.21930	27.2603	30.4158	6.63555	69.6181	102.3553	4.8679E 04	7.7212E 04	4.7668E 04	3.6588E 05	21500
22000	4.9826	3.22850	27.3376	30.4940	6.68700	69.6188	102.6751	4.9433E 04	7.8897E 04	4.8377E 04	3.7212E 05	22000
22500	5.0115	3.23670	27.4130	30.5694	6.73844	69.6195	102.9949	5.0207E 04	8.0632E 04	4.9086E 04	3.7756E 05	22500
23000	5.0404	3.24390	27.4866	30.6418	6.78989	69.6202	103.3147	5.0991E 04	8.2417E 04	4.9815E 04	3.8300E 05	23000
23500	5.0693	3.25010	27.5583	30.7112	6.84133	69.6209	103.6345	5.1795E 04	8.4252E 04	5.0564E 04	3.8844E 05	23500
24000	5.0982	3.25530	27.6281	30.7776	6.89278	69.6216	103.9543	5.2619E 04	8.6137E 04	5.1333E 04	3.9388E 05	24000
24500	5.1271	3.25950	27.6960	30.8410	6.94423	69.6223	104.2741	5.3463E 04	8.8072E 04	5.2132E 04	3.9932E 05	24500
25000	5.1560	3.26270	27.7620	30.9014	6.99568	69.6230	104.5939	5.4327E 04	8.9957E 04	5.2951E 04	4.0476E 05	25000
25500	5.1849	3.26490	27.8261	30.9588	7.04713	69.6237	104.9137	5.5211E 04	9.1892E 04	5.3790E 04	4.1020E 05	25500
26000	5.2138	3.26610	27.8883	31.0132	7.09858	69.6244	105.2335	5.6115E 04	9.3877E 04	5.4649E 04	4.1564E 05	26000
26500	5.2427	3.26630	27.9487	31.0646	7.14993	69.6251	105.5533	5.7039E 04	9.5912E 04	5.5528E 04	4.2108E 05	26500
27000	5.2716	3.26550	28.0072	31.1130	7.20128	69.6258	105.8731	5.7983E 04	9.8007E 04	5.6427E 04	4.2652E 05	27000
27500	5.3005	3.26370	28.0637	31.1584	7.25263	69.6265	106.1929	5.8953E 04	1.0055E 05	5.7346E 04	4.3196E 05	27500
28000	5.3294	3.26090	28.1182	31.2008	7.30398	69.6272	106.5127	5.9943E 04	1.0213E 05	5.8285E 04	4.3740E 05	28000
28500	5.3583	3.25710	28.1707	31.2402	7.35533	69.6279	106.8325	6.0953E 04	1.0381E 05	5.9244E 04	4.4284E 05	28500
29000	5.3872	3.25230	28.2211	31.2766	7.40668	69.6286	107.1523	6.1993E 04	1.0559E 05	6.0223E 04	4.4828E 05	29000
29500	5.4161	3.24650	28.2696	31.3100	7.45803	69.6293	107.4721	6.3063E 04	1.0747E 05	6.1232E 04	4.5372E 05	29500
30000	5.4450	3.23970	28.3161	31.3404	7.50938	69.6300	107.7919	6.4163E 04	1.0945E 05	6.2261E 04	4.5916E 05	30000

TABLE 10. IDEAL GAS FUNCTIONS FOR AR. (ATOMIC WEIGHT 39.9470, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N. 4. SEE TABLE 5A FOR LIST OF STATES USED.

TEMP. (°K)	PARTIAL FUNCT.	$\frac{W^2 - W_0^2}{RT^2}$	$\frac{W^2 - W_0^2}{RT}$	$\frac{W^2 - W_0^2}{RT^2}$	$\frac{W^2 - W_0^2}{RT}$	$\frac{W^2 - W_0^2}{RT^2}$	$\frac{W^2 - W_0^2}{RT}$	$\frac{W^2 - W_0^2}{RT^2}$	$\frac{W^2 - W_0^2}{RT}$	$\frac{W^2 - W_0^2}{RT^2}$	TEMP. (°K)		
1000	4.2548	2.62339	20.5838	25.2072	5.21312	40.9074	66.1144	3.22686	03	5.21312	03	4.89086	04
1200	4.3592	2.64149	21.0639	23.7853	5.24007	41.8074	67.1064	3.25143	03	5.24007	03	4.92798	04
1400	4.4591	2.65152	21.4719	24.1234	5.25690	42.6442	67.9732	3.27648	03	5.25690	03	4.96726	04
1600	4.5518	2.65611	21.8263	24.4824	5.27012	43.3755	68.5506	3.30202	03	5.27012	03	5.00842	04
1800	4.6367	2.65717	22.1392	24.7964	5.28024	43.9943	69.2746	3.32816	03	5.28024	03	5.05102	04
2000	4.7139	2.65681	22.4191	25.0752	5.27794	44.5585	69.8205	3.35482	03	5.27794	03	5.09504	04
2200	4.7840	2.65547	22.6522	25.3257	5.27289	45.0934	70.2883	3.38202	03	5.27289	03	5.14042	04
2400	4.8476	2.65311	22.9629	25.5530	5.26420	45.5119	70.7781	3.40978	03	5.26420	03	5.18726	04
2600	4.9055	2.64927	23.1149	25.7612	5.25258	45.8319	71.1917	3.43812	03	5.25258	03	5.23562	04
2800	4.9582	2.64421	23.3109	25.9531	5.23950	46.3225	71.5759	3.46702	03	5.23950	03	5.28548	04
3000	5.0064	2.63806	23.4950	26.1311	5.22526	46.6045	71.9267	3.49748	03	5.22526	03	5.33682	04
3200	5.0505	2.63192	23.6631	26.2971	5.21004	47.0226	72.2464	3.52952	03	5.21004	03	5.38962	04
3400	5.0911	2.62587	23.8227	26.4526	5.22299	47.3794	72.5464	3.56312	03	5.22299	03	5.44386	04
3600	5.1284	2.61993	23.9729	26.5980	5.21616	47.6301	72.8263	3.59828	03	5.21616	03	5.49954	04
3800	5.1629	2.61413	24.1146	26.7369	5.21066	47.8200	73.0863	3.63502	03	5.21066	03	5.55666	04
4000	5.1949	2.60848	24.2492	26.8677	5.20535	48.1071	73.3263	3.67332	03	5.20535	03	5.61512	04
4200	5.2246	2.60298	24.3768	26.9918	5.19944	48.4408	73.5463	3.71318	03	5.19944	03	5.67492	04
4400	5.2522	2.60146	24.4984	27.1101	5.19376	48.8024	73.7463	3.75452	03	5.19376	03	5.73606	04
4600	5.2779	2.60045	24.6164	27.2229	5.18842	49.1730	73.9263	3.79732	03	5.18842	03	5.79846	04
4800	5.3020	2.60041	24.7254	27.3308	5.18334	49.5434	74.0863	3.84158	03	5.18334	03	5.86312	04
5000	5.3246	2.60251	24.8317	27.4342	5.17861	49.9447	74.2263	3.88722	03	5.17861	03	5.92992	04
5200	5.3457	2.59974	24.9354	27.5334	5.17424	50.3774	74.3463	3.93422	03	5.17424	03	6.00002	04
5400	5.3654	2.59711	25.0316	27.6289	5.17024	50.8423	74.4463	3.98252	03	5.17024	03	6.07342	04
5600	5.3839	2.59459	25.1282	27.7208	5.16659	51.3398	74.5263	4.03212	03	5.16659	03	6.15002	04
5800	5.4020	2.59220	25.2172	27.8094	5.16312	51.8697	74.5863	4.08302	03	5.16312	03	6.22982	04
6000	5.4187	2.58991	25.3050	27.8949	5.16087	52.4323	74.6263	4.13522	03	5.16087	03	6.31192	04
6200	5.4345	2.58772	25.3899	27.9776	5.15882	53.0274	74.6463	4.18872	03	5.15882	03	6.39632	04
6400	5.4495	2.58563	25.4720	28.0577	5.15697	53.6547	74.6463	4.24352	03	5.15697	03	6.48292	04
6600	5.4637	2.58363	25.5516	28.1352	5.15530	54.3130	74.6263	4.29962	03	5.15530	03	6.57172	04
6800	5.4772	2.58172	25.6287	28.2104	5.15380	55.0023	74.5863	4.35702	03	5.15380	03	6.66272	04
7000	5.4901	2.57989	25.7035	28.2834	5.15246	55.7224	74.5263	4.41572	03	5.15246	03	6.75592	04
7200	5.5023	2.57813	25.7761	28.3543	5.15127	56.4734	74.4463	4.47582	03	5.15127	03	6.85132	04
7400	5.5139	2.57645	25.8467	28.4232	5.15023	57.2543	74.3463	4.53732	03	5.15023	03	6.94892	04
7600	5.5251	2.57488	25.9154	28.4903	5.14934	58.0647	74.2263	4.59922	03	5.14934	03	7.04872	04
7800	5.5357	2.57338	25.9823	28.5556	5.14853	58.9034	74.0863	4.66252	03	5.14853	03	7.15072	04
8000	5.5459	2.57179	26.0474	28.6192	5.14780	59.7697	73.9263	4.72722	03	5.14780	03	7.25492	04
8200	5.5556	2.57034	26.1109	28.6813	5.14713	60.6624	73.7463	4.79332	03	5.14713	03	7.36132	04
8400	5.5650	2.56898	26.1728	28.7418	5.14652	61.5807	73.5463	4.86082	03	5.14652	03	7.46992	04
8600	5.5739	2.56765	26.2333	28.8009	5.14597	62.5334	73.3263	4.92972	03	5.14597	03	7.58072	04
8800	5.5825	2.56637	26.2923	28.8587	5.14548	63.5207	73.0863	5.00002	03	5.14548	03	7.69372	04
9000	5.5908	2.56514	26.3499	28.9151	5.14504	64.5424	72.8263	5.07252	03	5.14504	03	7.80892	04
9200	5.5987	2.56395	26.4063	28.9703	5.14466	65.5987	72.5463	5.14722	03	5.14466	03	7.92632	04
9400	5.6063	2.56280	26.4614	29.0242	5.14434	66.6894	72.2463	5.22422	03	5.14434	03	8.04592	04
9600	5.6137	2.56169	26.5154	29.0771	5.14407	67.8134	71.9263	5.30352	03	5.14407	03	8.16772	04
9800	5.6208	2.56062	26.5682	29.1288	5.14385	68.9707	71.5759	5.38512	03	5.14385	03	8.29172	04

TABLE 10 (CONT.). IDEAL GAS FUNCTIONS FOR AIR

TEMP. (°F)	TEMP. (°C)	$\frac{U}{R}$	$\frac{H}{R}$	$\ln \frac{P}{P_0}$	$\frac{G}{R} - T \ln \frac{P}{P_0}$	$\frac{G}{R} - T \ln \frac{P}{P_0} - \frac{U}{R}$	$\frac{G}{R} - T \ln \frac{P}{P_0} - \frac{U}{R} - \frac{H}{R}$	$\frac{G}{R} - T \ln \frac{P}{P_0} - \frac{U}{R} - \frac{H}{R} - T \ln \frac{P}{P_0}$	TEMP. (°F)					
10000	5-6276	2-59959	26-6199	29-1795	5-06633	52-0902	57-0045	3-09026	04	5-06636	04	5-20906	05	10000
10500	5-6437	2-59713	26-7647	29-3019	5-09148	52-1642	58-2277	3-24908	04	5-33966	04	5-30046	05	10500
11000	5-6594	2-59490	26-9036	29-4105	5-07702	53-3825	58-6995	3-39086	04	5-50676	04	5-87216	05	11000
11500	5-6719	2-59283	26-9772	29-5100	5-07205	53-6001	59-6010	3-54882	04	5-63306	04	6-10496	05	11500
12000	5-6815	2-59091	27-0858	29-6067	5-06907	53-8239	59-8950	3-69036	04	6-80256	04	6-45096	05	12000
12500	5-6961	2-58913	27-1899	29-7000	5-06554	54-0308	59-6963	3-84006	04	6-33106	04	6-75306	05	12500
13000	5-7060	2-58740	27-2898	29-8173	5-06230	54-2704	59-2817	3-99736	04	6-54106	04	7-04906	05	13000
13500	5-7170	2-58590	27-3898	29-9319	5-05928	54-5204	59-4797	4-16746	04	6-83806	04	7-34476	05	13500
14000	5-7284	2-58460	27-4785	30-0231	5-05647	54-6843	59-6689	4-29716	04	7-07926	04	7-64406	05	14000
14500	5-7352	2-58335	27-5678	30-1111	5-05407	54-7817	59-8399	4-45906	04	7-33046	04	7-94336	05	14500
15000	5-7436	2-58225	27-6548	30-1962	5-05187	54-8930	60-0099	4-59716	04	7-57706	04	8-24306	05	15000
15500	5-7514	2-58129	27-7375	30-2786	5-04997	55-1186	60-3466	4-76736	04	7-82756	04	8-54346	05	15500
16000	5-7599	2-58041	27-8160	30-3585	5-04820	55-2789	60-3273	4-89806	04	8-07746	04	8-84446	05	16000
16500	5-7660	2-57991	27-8941	30-4361	5-04662	55-4343	60-4015	5-04916	04	8-32796	04	9-14476	05	16500
17000	5-7729	2-57955	27-9729	30-5115	5-04614	55-5069	60-6314	5-20086	04	8-57906	04	9-44446	05	17000
17500	5-7795	2-57940	28-0456	30-5850	5-04620	55-7312	60-7734	5-36336	04	8-83006	04	9-74306	05	17500
18000	5-7859	2-57953	28-1171	30-6567	5-04681	55-8734	60-9199	5-50646	04	9-08376	04	1-00276	06	18000
18500	5-7922	2-58004	28-1867	30-7267	5-04767	56-0116	61-0591	5-65146	04	9-33706	04	1-03436	06	18500
19000	5-7985	2-58090	28-2545	30-7954	5-04819	56-1463	61-1955	5-81176	04	9-59296	04	1-08606	06	19000
19500	5-8047	2-58220	28-3205	30-8627	5-05177	56-2775	61-3292	5-97606	04	9-85106	04	1-09746	06	19500
20000	5-8110	2-58399	28-3849	30-9280	5-05533	56-4054	61-4607	6-13636	04	1-01116	05	1-12006	06	20000
20500	5-8166	2-58571	28-4470	31-1953	5-06159	56-6083	61-9703	6-31006	04	1-11006	05	1-25156	06	20500
21000	5-8240	2-58845	28-5016	31-4599	5-13573	57-3326	62-4403	7-54646	04	1-23246	05	1-37606	06	21000
21500	5-8237	2-59026	28-5600	31-6902	5-22474	57-7409	62-9737	8-42306	04	1-35906	05	1-50146	06	21500
22000	5-8294	2-69049	28-5775	31-6970	5-36474	58-1390	63-5030	9-45726	04	1-50316	05	1-62796	06	22000
22500	5-8377	2-70645	29-6467	32-2631	5-55701	58-5154	64-0724	1-07106	05	1-66716	05	1-75956	06	22500
23000	5-8395	2-72225	29-6319	32-5233	5-80700	59-0817	64-6467	1-22236	05	1-80426	05	1-88426	06	23000
23500	5-8400	2-73629	29-6126	32-8889	6-11311	59-2827	65-2958	1-48206	05	1-88426	05	2-01436	06	23500
24000	5-8484	2-75093	29-9934	33-2485	6-66820	59-6019	66-0702	1-61326	05	2-32066	05	2-19376	06	24000
24500	5-8531	3-65851	30-1746	33-6272	6-86071	59-9630	66-8227	1-81196	05	2-60716	05	2-27066	06	24500
25000	5-8621	3-66115	30-3570	34-0182	7-27531	60-3244	67-5997	2-11536	05	2-91016	05	2-41306	06	25000
25500	5-8525	3-67272	30-5400	34-4135	8-08996	60-6896	68-3053	2-39746	05	3-23226	05	2-54906	06	25500
26000	5-8404	4-67937	30-7257	34-8095	8-18639	61-0571	69-1035	2-69246	05	3-56606	05	2-68096	06	26000
26500	5-8217	4-27520	30-9114	35-1859	61-6261	61-6261	69-9202	2-99326	05	3-90736	05	2-82546	06	26500
27000	5-8101	4-68315	31-0972	35-5503	8-04914	61-7952	70-6444	3-29376	05	4-24766	05	2-96626	06	27000
27500	10-6594	4-61210	31-2823	35-8944	9-16516	62-1630	71-3202	3-58906	05	4-58246	05	3-10026	06	27500

TABLE 11. IDEAL GAS FUNCTIONS FOR C ++ (ATOMIC WEIGHT 12.0101, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 55 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T} - \frac{F_0}{RT}$	$\ln \frac{h^2}{8\pi^2 I k T}$	$\ln \frac{h^2}{8\pi^2 I k T} - \frac{F_0}{RT}$	$\ln \frac{h^2}{8\pi^2 I k T} - \frac{F_0}{RT} - \frac{F_0}{RT}$	$e^{-\frac{F_0}{RT}}$	$\frac{h^2}{8\pi^2 I k T} - \frac{F_0}{RT} - \frac{F_0}{RT}$	$\frac{h^2}{8\pi^2 I k T} - \frac{F_0}{RT} - \frac{F_0}{RT}$	TEMP. (°K)
3000	1.0000	2.50000	20.0704	4.94791	39.9014	44.8494	0.9422	1.4904	1.1970	3000
3200	1.0000	2.50000	20.2409	4.94791	40.2221	45.1900	0.9364	1.5091	1.2071	3200
3400	1.0000	2.50000	20.3923	4.94791	40.5732	45.5192	0.9319	1.5378	1.2278	3400
3600	1.0000	2.50000	20.5254	4.94791	40.8972	45.8374	0.9278	1.5711	1.2541	3600
4000	1.0000	2.50000	20.7900	4.94792	41.3304	46.2005	0.9192	1.6372	1.3032	4000
4200	1.0000	2.50000	20.9270	4.94792	41.5730	46.3499	0.9150	1.6656	1.3260	4200
4400	1.0000	2.50001	21.0371	4.94792	41.7841	46.4770	0.9112	1.6950	1.3504	4400
4600	1.0000	2.50001	21.1242	4.94794	41.9642	46.5829	0.9079	1.7253	1.3761	4600
5000	1.0000	2.50002	21.2344	4.94794	42.2364	47.0063	0.9006	1.7946	1.4376	5000
5200	1.0000	2.50004	21.3044	4.94794	42.4392	47.4072	0.8944	1.8546	1.4946	5200
5400	1.0000	2.50011	21.3541	4.94804	42.6140	47.7807	0.8891	1.9046	1.5476	5400
5600	1.0000	2.50017	21.3942	4.94813	42.7615	48.1297	0.8847	1.9496	1.5966	5600
6000	1.0000	2.50026	21.4777	4.94822	43.0822	48.7905	0.8782	2.0222	1.6812	6000
6200	1.0000	2.50039	21.5125	4.94830	43.1766	48.9490	0.8746	2.0511	1.7125	6200
6400	1.0000	2.50057	21.5395	4.94837	43.2459	49.0867	0.8715	2.0759	1.7380	6400
6600	1.0001	2.50081	21.5739	4.94842	43.2952	49.2052	0.8687	2.1000	1.7644	6600
6800	1.0001	2.50112	21.6060	4.94846	43.3316	49.3086	0.8662	2.1204	1.7916	6800
7000	1.0001	2.50152	21.6355	4.94849	43.3570	49.3979	0.8639	2.1376	1.8146	7000
7200	1.0002	2.50203	21.6624	4.94851	43.3711	49.4734	0.8618	2.1512	1.8334	7200
7400	1.0003	2.50264	21.6865	4.94852	43.3737	49.5362	0.8600	2.1616	1.8486	7400
7600	1.0004	2.50337	21.7085	4.94852	43.3642	49.5886	0.8584	2.1692	1.8612	7600
8000	1.0007	2.50422	21.7324	4.94851	43.3454	49.6570	0.8570	2.1736	1.8716	8000
8200	1.0009	2.50498	21.7493	4.94849	43.3187	49.7124	0.8558	2.1752	1.8792	8200
8400	1.0011	2.50584	21.7594	4.94845	43.2842	49.7564	0.8548	2.1742	1.8836	8400
8600	1.0014	2.50672	21.7619	4.94839	43.2422	49.7890	0.8540	2.1710	1.8852	8600
9000	1.0017	2.51140	21.7716	4.94831	43.1766	49.8227	0.8534	2.1662	1.8842	9000
9200	1.0021	2.51727	21.7822	4.94822	43.0822	49.8464	0.8529	2.1604	1.8812	9200
9400	1.0025	2.52424	21.7835	4.94810	42.9614	49.8601	0.8525	2.1536	1.8772	9400
9600	1.0029	2.53240	21.7770	4.94794	42.8044	49.8640	0.8522	2.1458	1.8722	9600
10000	1.0041	2.54136	21.7643	4.94764	42.5744	49.8587	0.8520	2.1366	1.8656	10000
10000	1.0046	2.53365	21.6943	4.94750	42.4021	49.8313	0.8520	2.1254	1.8576	10000
10500	1.0068	2.54806	21.2103	4.94699	41.9306	49.7671	0.8516	2.1116	1.8446	10500
11000	1.0095	2.56442	21.3372	4.94622	41.4422	49.6744	0.8514	2.0954	1.8272	11000
11500	1.0128	2.58277	21.4516	4.94524	40.9344	49.5544	0.8514	2.0766	1.8056	11500
12000	1.0168	2.60308	21.5430	4.94404	40.4015	49.4099	0.8514	2.0546	1.7806	12000
12500	1.0216	2.62749	21.6147	4.94264	39.8447	49.2424	0.8514	2.0296	1.7536	12500
13000	1.0272	2.65499	21.7223	4.94104	39.2595	49.0524	0.8514	2.0016	1.7186	13000
13500	1.0338	2.68291	21.8730	4.93924	38.6466	48.8404	0.8514	1.9706	1.6756	13500
14000	1.0413	2.71194	21.9711	4.93724	37.9996	48.6074	0.8514	1.9366	1.6246	14000
14500	1.0497	2.74248	21.0649	4.93504	37.3207	48.3524	0.8514	1.8996	1.5676	14500

TABLE II (CONT.). IDEAL GAS FUNCTIONS FOR C₂

TEMP. (°K)	PARTIAL FUNCT.	$\frac{W}{RT}$	$\frac{W}{RT} - \frac{W}{RT}$	$\ln \frac{W}{RT}$	$\ln \frac{W}{RT} - \ln \frac{W}{RT}$	$\ln \frac{W}{RT} - \ln \frac{W}{RT}$	$\ln \frac{W}{RT} - \ln \frac{W}{RT}$	$\ln \frac{W}{RT} - \ln \frac{W}{RT}$	TEMP. (°K)
15000	1.0792	2.78171	24.1600	5.52771	46.0112	51.5309	5.31006	0.2910E 04	7.2017E 05
15500	1.0696	2.61767	24.2524	5.59957	46.1956	51.7952	5.3992E 04	0.2793E 04	7.0790E 04
16000	1.0611	2.48517	24.3425	5.67345	46.3724	54.0462	5.4904E 04	0.2779E 04	7.0779E 04
16500	1.0536	2.38332	24.4309	5.74931	46.5403	54.2970	5.4667E 04	0.2808E 04	6.8108E 05
17000	1.1072	2.93205	24.5179	5.82646	46.7211	54.5475	6.5264E 04	0.2826E 04	6.2026E 05
17500	1.1217	2.97107	24.6024	5.90400	46.9011	54.7951	6.5945E 04	1.0332E 05	6.5259E 05
18000	1.1374	3.04014	24.6877	5.98164	49.0809	55.0401	7.1901E 04	1.0767E 05	6.8308E 05
18500	1.1540	3.09703	24.7767	6.05992	49.2234	55.2824	7.5327E 04	1.1209E 05	7.1063E 05
19000	1.1716	3.16752	24.8625	6.13940	49.3668	55.5215	7.8817E 04	1.1657E 05	7.3633E 05
19500	1.1902	3.24542	24.9432	6.21976	49.5064	55.7571	8.2368E 04	1.2111E 05	7.6043E 05
20000	1.2099	3.32979	25.0128	6.29959	49.7064	55.9892	8.5980E 04	1.2564E 05	7.8406E 05
20500	1.2372	3.41136	25.0289	6.36835	50.3166	56.8771	1.0061E 05	1.4532E 05	1.1070E 06
21000	1.2682	3.48893	25.0913	6.43796	50.8901	57.6868	1.1506E 05	1.6317E 05	1.2216E 06
21500	1.3113	3.57406	25.1513	6.50954	51.4962	58.4452	1.3028E 05	1.8187E 05	1.3377E 06
22000	1.3590	3.66007	25.1952	6.58393	51.9767	59.1206	1.4647E 05	2.0031E 05	1.4553E 06
23000	1.4770	3.66349	26.0058	7.27996	52.6727	59.7527	1.5070E 05	2.1040E 05	1.5742E 06
24000	1.6009	3.71371	26.6439	7.37675	52.9450	60.3296	1.7253E 05	2.3452E 05	1.6993E 06
25000	2.0770	3.75196	26.8762	7.45560	53.3956	60.8514	1.8593E 05	2.5350E 05	1.8194E 06
26000	2.2116	3.78226	27.0056	7.51590	53.8229	61.3395	1.9904E 05	2.7050E 05	1.9174E 06
27000	2.3720	3.80618	27.2007	7.56351	54.2312	61.7967	2.1190E 05	2.8741E 05	2.0600E 06
28000	2.5376	3.82251	27.4065	7.60193	54.6202	62.2221	2.2490E 05	3.0400E 05	2.1840E 06
29000	2.7082	3.84174	27.6125	7.63416	54.9919	62.6260	2.3713E 05	3.2063E 05	2.3097E 06
30000	2.8836	3.85660	27.8226	7.66264	55.3477	63.0103	2.4972E 05	3.3714E 05	2.4328E 06
40000	3.4037	3.86026	28.0263	7.68993	55.6009	63.3793	2.6234E 05	3.5371E 05	2.5617E 06
50000	3.2485	3.88297	28.1892	7.71610	56.0167	63.7320	2.7499E 05	3.7037E 05	2.6886E 06
60000	3.4382	3.89699	28.3466	7.74346	56.3322	64.0762	2.8764E 05	3.8720E 05	2.8166E 06
70000	4.4696	3.90972	29.4161	7.76824	57.7591	65.6073	3.5644E 05	4.7569E 05	3.4465E 06
80000	5.6783	4.12771	29.6909	8.20243	59.0000	67.2032	4.3508E 05	5.7417E 05	4.1301E 06
90000	7.1315	4.29029	30.3520	8.52532	60.1170	68.6425	5.2307E 05	6.8204E 05	4.8094E 06
100000	8.8065	4.44505	30.7171	8.83306	61.1393	69.9724	6.1613E 05	7.9490E 05	5.5025E 06
100000	10.9013	4.56647	31.7422	9.07831	62.0034	71.1417	7.0911E 05	9.0763E 05	6.2083E 06
150000	26.4499	4.66250	33.1364	9.24523	65.0475	75.1127	1.0937E 06	1.3090E 06	9.0771E 06
200000	47.7229	4.68250	34.4448	9.34050	66.4444	77.1949	1.3523E 06	1.7697E 06	1.3669E 07
300000	99.5730	3.91791	36.1312	7.70544	71.7908	79.5443	1.7394E 06	2.3357E 06	2.1540E 07
400000	134.3071	3.46763	37.2125	6.60281	73.9674	81.1164	2.0727E 06	2.8674E 06	2.9579E 07
500000	140.1174	3.40447	37.9942	6.13907	75.5000	82.2661	2.3090E 06	3.3424E 06	3.7750E 07
600000	199.4645	3.26302	38.6017	6.18647	76.7000	83.1922	2.4902E 06	3.6990E 06	4.4625E 07
800000	237.8949	2.98827	39.5130	6.21200	78.0189	84.4399	3.3071E 06	4.8904E 06	6.2813E 07
1000000	266.3902	2.90177	40.1074	6.19552	79.0590	85.7564	3.9103E 06	5.6974E 06	7.9039E 07

TABLE 12. IDEAL GAS FUNCTIONS FOR H_2 (ATOMIC WEIGHT 1.00794, $R = 1.98717$ CAL/MOLE)

TEMP. (%)	PARTIC. FUNCT.	$\frac{W}{RT}$	$\frac{U}{RT}$	$\frac{H}{RT}$	$\frac{S}{R}$	$\ln \frac{W}{RT} - \frac{U}{RT} - \frac{H}{RT} - \frac{S}{R}$	$\frac{U}{RT} - \frac{H}{RT}$	$\frac{S}{R}$	$\frac{U}{RT} - \frac{H}{RT} - \frac{S}{R}$	$\frac{U}{RT} - \frac{H}{RT}$	TEMP. (%)
3000	5.6789	2.55422	22.04669	24.6811	5.07565	43.0168	44.0062	9.24546	1.52376	1.31426	3000
3200	5.6982	2.55092	22.2116	24.7424	5.08116	43.0116	44.0028	9.24526	1.52376	1.31426	3200
3400	5.7151	2.54800	22.3462	24.7912	5.08533	43.0062	44.0000	9.24512	1.52376	1.31426	3400
3600	5.7305	2.54540	22.4518	24.8372	5.08913	43.0016	43.9976	9.24500	1.52376	1.31426	3600
3800	5.7443	2.54307	22.5343	24.8812	5.09259	42.9976	43.9952	9.24490	1.52376	1.31426	3800
4000	5.7566	2.54096	22.5997	24.9237	5.09573	42.9942	43.9928	9.24482	1.52376	1.31426	4000
4200	5.7679	2.53906	22.6506	24.9647	5.09857	42.9912	43.9904	9.24476	1.52376	1.31426	4200
4400	5.7781	2.53731	22.6877	24.9999	5.10113	42.9884	43.9880	9.24472	1.52376	1.31426	4400
4600	5.7875	2.53572	22.7214	25.0292	5.10343	42.9858	43.9856	9.24469	1.52376	1.31426	4600
4800	5.7962	2.53426	22.7518	25.0528	5.10548	42.9834	43.9832	9.24467	1.52376	1.31426	4800
5000	5.8041	2.53291	22.7789	25.0717	5.10729	42.9812	43.9810	9.24466	1.52376	1.31426	5000
5200	5.8115	2.53167	22.8026	25.0861	5.10886	42.9792	43.9788	9.24466	1.52376	1.31426	5200
5400	5.8183	2.53052	22.8226	25.0972	5.11021	42.9774	43.9768	9.24466	1.52376	1.31426	5400
5600	5.8246	2.52945	22.8396	25.1059	5.11135	42.9758	43.9750	9.24466	1.52376	1.31426	5600
5800	5.8303	2.52846	22.8536	25.1124	5.11228	42.9744	43.9734	9.24466	1.52376	1.31426	5800
6000	5.8354	2.52754	22.8646	25.1169	5.11299	42.9732	43.9720	9.24466	1.52376	1.31426	6000
6200	5.8400	2.52668	22.8728	25.1196	5.11348	42.9722	43.9708	9.24466	1.52376	1.31426	6200
6400	5.8441	2.52588	22.8783	25.1206	5.11376	42.9714	43.9700	9.24466	1.52376	1.31426	6400
6600	5.8477	2.52513	22.8814	25.1209	5.11384	42.9708	43.9694	9.24466	1.52376	1.31426	6600
6800	5.8509	2.52444	22.8824	25.1207	5.11373	42.9704	43.9689	9.24466	1.52376	1.31426	6800
7000	5.8536	2.52381	22.8814	25.1196	5.11353	42.9702	43.9685	9.24466	1.52376	1.31426	7000
7200	5.8559	2.52323	22.8783	25.1177	5.11325	42.9702	43.9681	9.24466	1.52376	1.31426	7200
7400	5.8578	2.52270	22.8736	25.1154	5.11289	42.9704	43.9678	9.24466	1.52376	1.31426	7400
7600	5.8593	2.52221	22.8674	25.1128	5.11245	42.9708	43.9676	9.24466	1.52376	1.31426	7600
7800	5.8605	2.52176	22.8600	25.1099	5.11193	42.9714	43.9675	9.24466	1.52376	1.31426	7800
8000	5.8614	2.52134	22.8514	25.1066	5.11135	42.9722	43.9675	9.24466	1.52376	1.31426	8000
8200	5.8619	2.52095	22.8418	25.1029	5.11071	42.9732	43.9676	9.24466	1.52376	1.31426	8200
8400	5.8621	2.52060	22.8314	25.0988	5.11002	42.9744	43.9678	9.24466	1.52376	1.31426	8400
8600	5.8620	2.52028	22.8202	25.0943	5.10929	42.9758	43.9681	9.24466	1.52376	1.31426	8600
8800	5.8616	2.52000	22.8084	25.0895	5.10852	42.9774	43.9685	9.24466	1.52376	1.31426	8800
9000	5.8609	2.51975	22.7961	25.0844	5.10771	42.9792	43.9690	9.24466	1.52376	1.31426	9000
9200	5.8600	2.51952	22.7834	25.0790	5.10686	42.9812	43.9696	9.24466	1.52376	1.31426	9200
9400	5.8589	2.51931	22.7702	25.0733	5.10597	42.9834	43.9703	9.24466	1.52376	1.31426	9400
9600	5.8576	2.51912	22.7566	25.0673	5.10505	42.9858	43.9710	9.24466	1.52376	1.31426	9600
9800	5.8561	2.51895	22.7426	25.0611	5.10410	42.9884	43.9718	9.24466	1.52376	1.31426	9800
10000	5.8544	2.51880	22.7282	25.0547	5.10313	42.9912	43.9726	9.24466	1.52376	1.31426	10000
10200	5.8526	2.51866	22.7134	25.0481	5.10214	42.9942	43.9734	9.24466	1.52376	1.31426	10200
10400	5.8507	2.51853	22.6982	25.0412	5.10113	42.9974	43.9742	9.24466	1.52376	1.31426	10400
10600	5.8487	2.51841	22.6826	25.0341	5.10009	42.9999	43.9750	9.24466	1.52376	1.31426	10600
10800	5.8466	2.51830	22.6666	25.0268	5.09902	42.9999	43.9758	9.24466	1.52376	1.31426	10800
11000	5.8444	2.51820	22.6502	25.0193	5.09793	42.9999	43.9766	9.24466	1.52376	1.31426	11000
11200	5.8421	2.51811	22.6334	25.0116	5.09681	42.9999	43.9774	9.24466	1.52376	1.31426	11200
11400	5.8397	2.51803	22.6162	25.0037	5.09567	42.9999	43.9782	9.24466	1.52376	1.31426	11400
11600	5.8372	2.51796	22.5986	24.9956	5.09451	42.9999	43.9790	9.24466	1.52376	1.31426	11600
11800	5.8347	2.51790	22.5806	24.9872	5.09333	42.9999	43.9798	9.24466	1.52376	1.31426	11800
12000	5.8321	2.51784	22.5622	24.9786	5.09214	42.9999	43.9806	9.24466	1.52376	1.31426	12000
12500	5.8277	2.51780	22.5239	24.9603	5.08957	42.9999	43.9814	9.24466	1.52376	1.31426	12500
13000	5.8234	2.51777	22.4856	24.9420	5.08700	42.9999	43.9822	9.24466	1.52376	1.31426	13000
13500	5.8191	2.51775	22.4473	24.9237	5.08443	42.9999	43.9830	9.24466	1.52376	1.31426	13500
14000	5.8148	2.51773	22.4090	24.9054	5.08186	42.9999	43.9838	9.24466	1.52376	1.31426	14000
14500	5.8105	2.51771	22.3707	24.8871	5.07929	42.9999	43.9846	9.24466	1.52376	1.31426	14500
15000	5.8062	2.51769	22.3324	24.8688	5.07672	42.9999	43.9854	9.24466	1.52376	1.31426	15000

TABLE 12 (CONT.) 1. IDEAL GAS FUNCTIONS FOR H₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	$\frac{h^2}{8\pi^2 I}$	TEMP. (°K)
15000	9.8079	2.57731	26.1220	26.4001	5.00100	51.9182	54.9020	6.44200	7.62270	9.03110	1.78420	15000
15000	9.8085	2.56431	26.1267	26.3709	5.00231	52.0771	57.1726	6.01700	7.09000	8.47100	1.07100	15000
16000	6.0084	2.57165	26.1262	26.0399	5.11030	52.2391	57.3494	6.99700	8.17600	9.35000	1.20000	16000
16000	6.0224	2.57961	26.1375	26.0675	5.12812	52.3966	57.5227	5.17930	6.45010	8.49350	1.00000	16000
17000	6.0375	2.59007	26.1446	26.0927	5.14302	52.5499	57.6928	5.36400	6.74300	8.93350	1.00000	17000
17000	6.0537	2.59670	26.1590	26.1168	5.16004	52.6992	57.8590	5.55300	7.03110	9.22240	1.00000	17000
18000	6.0710	2.60633	26.1693	26.1396	5.17920	52.8440	58.0200	5.74700	7.32000	9.51210	1.00000	18000
18000	6.0895	2.61407	26.1664	26.1607	5.19055	52.9870	58.1056	5.94100	7.61100	9.80260	1.00000	18000
19000	6.1092	2.62416	26.1745	26.1807	5.20462	53.1279	58.1445	6.13900	7.90200	1.00000	1.00000	19000
19000	6.1301	2.63659	26.1807	26.2007	5.22034	53.2617	58.1371	6.34100	8.19300	1.00000	1.00000	19000
20000	6.1523	2.65131	26.1840	26.2171	5.23664	53.3884	58.0853	6.54700	8.48400	1.00000	1.00000	20000
20000	6.1722	2.66248	27.1242	26.2316	5.25401	53.5082	58.2566	7.30910	1.17710	1.00000	1.00000	20000
24000	6.3707	2.73990	27.3605	26.3104	5.44406	54.3640	59.6194	8.29700	1.36070	1.00000	1.00000	24000
24000	6.5666	2.78795	27.5817	26.3496	5.54013	54.8093	60.3495	9.23700	1.44040	1.00000	1.00000	24000
28000	6.6585	2.83941	27.7900	26.4076	5.63462	55.2234	60.6576	1.02120	1.57760	1.00000	1.00000	28000
30000	6.8251	2.88130	27.9872	26.4606	5.72570	55.6152	61.3410	1.12160	1.71770	1.00000	1.00000	30000
32000	7.0051	2.92333	28.1746	26.5099	5.81311	55.9876	61.8007	1.22430	1.86020	1.00000	1.00000	32000
34000	7.1972	2.96479	28.3532	26.5532	5.89501	56.3425	62.2303	1.32900	2.00440	1.00000	1.00000	34000
36000	7.4001	3.00616	28.5239	26.5916	5.97375	56.6817	62.6359	1.43500	2.15020	1.00000	1.00000	36000
38000	7.6130	3.04760	28.6876	26.6256	6.04707	57.0067	63.0190	1.54200	2.29700	1.00000	1.00000	38000
40000	7.8351	3.07706	28.8444	26.6544	6.11621	57.3187	63.3749	1.65100	2.44400	1.00000	1.00000	40000
42000	8.0656	3.11004	28.9954	26.6784	6.18176	57.6187	63.7084	1.76100	2.59100	1.00000	1.00000	42000
44000	8.3042	3.14230	29.1409	26.7000	6.24462	57.9077	64.0210	1.87300	2.73700	1.00000	1.00000	44000
46000	8.5505	3.17287	29.2812	26.7191	6.30501	58.1866	64.3116	1.98600	2.88200	1.00000	1.00000	46000
48000	8.8045	3.20272	29.4169	26.7356	6.36334	58.4562	64.5805	2.10100	3.02600	1.00000	1.00000	48000
50000	9.0661	3.23236	29.5482	26.7496	6.42024	58.7172	64.8364	2.21800	3.16900	1.00000	1.00000	50000
60000	16.5629	3.39049	30.1511	26.8116	6.73766	59.9553	66.6227	2.89000	3.94200	1.00000	1.00000	60000
70000	12.3203	3.50706	30.6000	26.8760	7.1907	60.9821	68.1120	3.99900	5.00000	1.00000	1.00000	70000
80000	14.3503	3.62943	31.1025	26.9319	7.67972	61.9447	69.3744	5.49000	6.00000	1.00000	1.00000	80000
90000	17.0303	3.69175	31.6466	26.9794	8.1999	62.8910	71.0220	7.32900	7.31700	1.00000	1.00000	90000
100000	20.4165	3.74152	32.2029	26.9994	8.7571	63.7739	72.4012	9.64010	9.00000	1.00000	1.00000	100000
150000	49.8466	4.96505	35.9992	26.9602	9.74715	67.3691	77.3091	1.66400	1.66400	1.00000	1.00000	150000
200000	98.2075	4.75210	35.3965	26.9106	9.44321	70.3307	79.7019	1.49120	1.49120	1.00000	1.00000	200000
300000	221.1414	4.23274	37.2219	26.8419	8.41115	73.9640	82.3772	1.92720	1.92720	1.00000	1.00000	300000
400000	344.9302	3.66556	38.3356	26.7592	7.60151	76.2786	83.9601	2.27700	2.27700	1.00000	1.00000	400000
500000	454.0216	3.41952	39.2200	26.6630	7.19259	77.3367	85.1293	2.62700	2.62700	1.00000	1.00000	500000
600000	548.3764	3.46457	39.0630	26.5644	6.84901	79.3160	86.0449	2.91700	2.91700	1.00000	1.00000	600000
800000	698.6315	3.22165	40.8216	26.4033	6.40196	81.1194	87.5213	3.53100	3.53100	1.00000	1.00000	800000
1000000	803.5193	3.08253	41.5245	26.2670	6.12549	82.5168	88.6415	4.13000	4.13000	1.00000	1.00000	1000000

TABLE 13. IDEAL GAS FUNCTIONS PER MOLE (ATOMIC WEIGHT 15.9993, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS n, l, m. SEE TABLE 57 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	$\frac{h^2}{8\pi^2 I k T}$	TEMP. (°K)
3000	0.1268	2.99726	22.6009	29.2090	9.16110	44.9248	94.0000	9.52216	1.54042	1.34776	05	3000	
3200	0.2043	2.59164	22.7759	29.3676	9.14891	45.2576	96.4896	1.01211	1.44006	1.44006	05	3200	
3400	0.2580	2.50679	22.9129	29.5197	9.14039	45.5713	98.7119	1.07218	1.54942	1.54942	05	3400	
3600	0.2990	2.56245	23.0066	29.6433	9.13215	45.8651	100.9712	1.13226	1.66111	1.66111	05	3600	
3800	0.3372	2.57914	23.2262	29.7499	9.12517	46.1423	103.2675	1.19246	1.77534	1.77534	05	3800	
4000	0.3694	2.57420	23.3324	29.8306	9.11934	46.4051	105.5244	1.25296	1.89372	1.89372	05	4000	
4200	0.3918	2.57360	23.4700	29.8910	9.11456	46.6547	107.7443	1.31346	2.01810	2.01810	05	4200	
4400	0.4195	2.57109	23.5977	29.9406	9.11078	46.8926	109.9233	1.37406	2.14872	2.14872	05	4400	
4600	0.4442	2.57045	23.7126	29.9825	9.10791	47.1197	112.0792	1.43486	2.28482	2.28482	05	4600	
4800	0.4713	2.56944	23.8214	29.9990	9.10591	47.3376	114.2159	1.49596	2.42692	2.42692	05	4800	
5000	0.4953	2.56804	23.9263	29.9951	9.10471	47.5454	116.3361	1.55746	2.57492	2.57492	05	5000	
5200	0.5182	2.56641	24.0276	29.9804	9.10425	47.7436	118.4429	1.61936	2.72892	2.72892	05	5200	
5400	0.5403	2.56473	24.1259	29.9642	9.10449	47.9323	120.5378	1.68166	2.88892	2.88892	05	5400	
5600	0.5617	2.56317	24.2214	29.9465	9.10536	48.1127	122.6229	1.74436	3.05392	3.05392	05	5600	
5800	0.5826	2.56170	24.3153	29.9274	9.10682	48.2851	124.6999	1.80746	3.22492	3.22492	05	5800	
6000	0.6031	2.56031	24.4077	29.9068	9.10882	48.4503	126.7691	1.87096	3.40192	3.40192	05	6000	
6200	0.6233	2.55916	24.4996	29.8848	9.11131	48.6083	128.8329	1.93486	3.58492	3.58492	05	6200	
6400	0.6433	2.55824	24.5912	29.8615	9.11424	48.7601	130.8939	2.00016	3.77392	3.77392	05	6400	
6600	0.6631	2.55753	24.6829	29.8371	9.11757	48.9063	132.9539	2.06686	3.96892	3.96892	05	6600	
6800	0.6829	2.55717	24.7746	29.8118	9.12126	49.0474	135.0139	2.13396	4.17092	4.17092	05	6800	
7000	0.7026	2.55710	24.8663	29.7857	9.12527	49.1840	137.0749	2.20146	4.37992	4.37992	05	7000	
7200	0.7223	2.55734	24.9580	29.7594	9.12955	49.3166	139.1379	2.26936	4.59492	4.59492	05	7200	
7400	0.7420	2.55802	24.9500	29.7331	9.13409	49.4459	141.2039	2.33766	4.81592	4.81592	05	7400	
7600	0.7618	2.55901	24.9429	29.7068	9.13882	49.5723	143.2729	2.40636	5.04292	5.04292	05	7600	
7800	0.7817	2.56049	24.9367	29.6806	9.14375	49.6959	145.3439	2.47566	5.27592	5.27592	05	7800	
8000	0.8016	2.56246	24.9307	29.6544	9.14893	49.8169	147.4169	2.54546	5.51492	5.51492	05	8000	
8200	0.8217	2.56493	24.9250	29.6282	9.15433	49.9349	149.4929	2.61586	5.75992	5.75992	05	8200	
8400	0.8419	2.56790	24.9200	29.6020	9.15993	50.0503	151.5719	2.68686	6.01192	6.01192	05	8400	
8600	0.8623	2.57146	24.9156	29.5764	9.16583	50.1633	153.6539	2.75846	6.27092	6.27092	05	8600	
8800	0.8828	2.57562	24.9118	29.5514	9.17204	50.2743	155.7389	2.83066	6.53692	6.53692	05	8800	
9000	0.9034	2.58039	24.9087	29.5270	9.17856	50.3833	157.8269	2.90346	6.80992	6.80992	05	9000	
9200	0.9242	2.58576	24.9062	29.5032	9.18539	50.4903	159.9179	2.97686	7.08992	7.08992	05	9200	
9400	0.9451	2.59173	24.9043	29.4800	9.19253	50.5953	162.0119	3.05086	7.37592	7.37592	05	9400	
9600	0.9661	2.59830	24.9030	29.4574	9.20000	50.7003	164.1089	3.12546	7.66792	7.66792	05	9600	
9800	0.9873	2.60547	24.9022	29.4354	9.20780	50.8053	166.2089	3.20066	7.96592	7.96592	05	9800	
10000	0.0084	2.61324	24.9019	29.4140	9.21593	50.9103	168.3119	3.27646	8.26992	8.26992	05	10000	
10500	0.0424	2.62554	24.9026	29.3932	9.22440	51.0153	170.4179	3.35286	8.57992	8.57992	05	10500	
11000	0.1129	2.63239	24.9040	29.3730	9.23322	51.1203	172.5259	3.42986	8.89592	8.89592	05	11000	
11500	0.1721	2.63900	24.9062	29.3534	9.24237	51.2253	174.6359	3.50746	9.21792	9.21792	05	11500	
12000	0.2277	2.64547	24.9094	29.3344	9.25174	51.3303	176.7479	3.58566	9.54592	9.54592	05	12000	
12500	0.2839	2.65174	24.9136	29.3160	9.26134	51.4353	178.8619	3.66446	9.87992	9.87992	05	12500	
13000	0.3404	2.65780	24.9187	29.2982	9.27116	51.5403	180.9779	3.74386	10.21992	10.21992	05	13000	
13500	0.3973	2.66366	24.9246	29.2810	9.28120	51.6453	183.0959	3.82386	10.56592	10.56592	05	13500	
14000	0.4543	2.66931	24.9312	29.2644	9.29146	51.7503	185.2159	3.90446	10.91792	10.91792	05	14000	
14500	0.5116	2.67476	24.9384	29.2484	9.30193	51.8553	187.3379	3.98566	11.27592	11.27592	05	14500	

TABLE 13. IDEAL GAS FUNCTIONS FOR AR++ (ATOMIC WEIGHT 39.9470, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S,L. SEE TABLE 9B FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^0 - E^0}{RT}$	$\ln \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^1}{RT}$	$\ln \frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^1}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^1 - E^2}{RT}$	$\ln \frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^1}{RT} - \ln \frac{W^0 - E^2}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^1 - E^2}{RT} - \frac{E^2 - E^3}{RT}$	$\ln \frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^1}{RT} - \ln \frac{W^0 - E^2}{RT} - \ln \frac{W^0 - E^3}{RT}$	TEMP. (°K)				
3000	7.2309	2.6631	23.0019	24.8488	9.79918	97.9107	98.7989	1.00918	0	1.80098	04	1.42288	05	3000
3200	7.3224	2.6775	24.0346	26.7153	53.0856	51.0481	51.0481	1.04818	04	1.70406	04	1.52838	05	3200
3400	7.4017	2.67690	24.1949	26.4729	51.3176	48.0833	51.3176	1.13248	04	1.80008	04	1.63408	05	3400
3600	7.4759	2.67304	24.3498	27.0228	51.1176	48.3498	51.1176	1.24178	04	1.91228	04	1.74198	05	3600
3800	7.5457	2.67083	24.4962	27.1651	51.30737	48.6741	51.30737	1.24178	04	2.01608	04	1.84998	05	3800
4000	7.6118	2.66931	24.6312	27.3085	51.30463	48.9463	51.30463	1.32698	04	2.12178	04	1.95798	05	4000
4200	7.6748	2.66843	24.7614	27.4298	51.30282	49.2098	51.30282	1.39288	04	2.22718	04	2.06448	05	4200
4400	7.7351	2.66812	24.8855	27.5337	51.30200	49.4517	51.30200	1.44988	04	2.33298	04	2.17198	05	4400
4600	7.7931	2.66831	25.0041	27.6285	51.30238	49.6874	51.30238	1.50788	04	2.43918	04	2.27998	05	4600
4800	7.8492	2.66894	25.1177	27.7067	51.30362	49.9131	51.30362	1.55918	04	2.54578	04	2.38898	05	4800
5000	7.9037	2.66994	25.2287	27.7696	51.30526	50.1296	51.30526	1.60528	04	2.65298	04	2.50098	05	5000
5200	7.9567	2.67125	25.3314	27.8207	51.30822	50.3377	51.30822	1.64668	04	2.76038	04	2.61748	05	5200
5400	8.0086	2.67283	25.4283	27.8611	51.31135	50.5381	51.31135	1.68338	04	2.86808	04	2.72918	05	5400
5600	8.0593	2.67462	25.5205	27.8924	51.31491	50.7314	51.31491	1.71568	04	2.97608	04	2.84108	05	5600
5800	8.1091	2.67658	25.6084	27.9156	51.31880	50.9179	51.31880	1.74368	04	3.08448	04	2.95528	05	5800
6000	8.1581	2.67867	25.7142	27.9328	51.32294	51.0993	51.32294	1.76748	04	3.19328	04	3.07068	05	6000
6200	8.2063	2.68086	25.8020	27.9429	51.32732	51.2729	51.32732	1.78698	04	3.30248	04	3.18728	05	6200
6400	8.2539	2.68312	25.8812	27.9453	51.33181	51.4421	51.33181	1.80228	04	3.41188	04	3.30408	05	6400
6600	8.3008	2.68542	25.9528	27.9398	51.33643	51.6033	51.33643	1.81368	04	3.52168	04	3.42208	05	6600
6800	8.3472	2.68774	26.0160	27.9267	51.34099	51.7556	51.34099	1.82088	04	3.63128	04	3.54018	05	6800
7000	8.3930	2.69006	26.1279	27.9060	51.34560	51.9085	51.34560	1.82488	04	3.74168	04	3.65948	05	7000
7200	8.4383	2.69237	26.2037	27.8781	51.35018	52.0618	51.35018	1.82468	04	3.85288	04	3.77998	05	7200
7400	8.4832	2.69464	26.2775	27.8429	51.35470	52.2178	51.35470	1.82028	04	3.96528	04	3.90048	05	7400
7600	8.5276	2.69688	26.3494	27.7998	51.35914	52.3667	51.35914	1.81168	04	4.07788	04	4.02198	05	7600
7800	8.5715	2.69906	26.4195	27.7487	51.36348	52.5080	51.36348	1.80008	04	4.19068	04	4.14448	05	7800
8000	8.6151	2.70119	26.4879	27.6891	51.36771	52.6428	51.36771	1.78548	04	4.30468	04	4.26798	05	8000
8200	8.6582	2.70325	26.5546	27.6219	51.37180	52.7694	51.37180	1.76688	04	4.41988	04	4.39248	05	8200
8400	8.7009	2.70524	26.6198	27.5470	51.37576	52.8879	51.37576	1.74428	04	4.53628	04	4.51998	05	8400
8600	8.7433	2.70716	26.6835	27.4646	51.37957	53.0244	51.37957	1.71768	04	4.65388	04	4.64948	05	8600
8800	8.7852	2.70900	26.7457	27.3757	51.38323	53.1481	51.38323	1.68708	04	4.77268	04	4.78098	05	8800
9000	8.8267	2.71077	26.8065	27.2804	51.38674	53.2692	51.38674	1.65148	04	4.89268	04	4.91348	05	9000
9200	8.8679	2.71245	26.8662	27.1787	51.39000	53.3786	51.39000	1.61088	04	5.01428	04	5.04698	05	9200
9400	8.9086	2.71406	26.9244	27.0714	51.39309	53.4763	51.39309	1.56528	04	5.13768	04	5.18148	05	9400
9600	8.9490	2.71559	26.9817	26.9587	51.39602	53.5624	51.39602	1.51468	04	5.26168	04	5.31698	05	9600
9800	8.9890	2.71704	27.0377	26.8414	51.39880	53.6368	51.39880	1.45908	04	5.38728	04	5.45348	05	9800
10000	9.0286	2.71841	27.0926	26.7180	51.40143	53.7094	51.40143	1.39848	04	5.51448	04	5.59098	05	10000
10500	9.1261	2.72150	27.2253	26.5948	51.40897	54.0112	51.40897	1.33288	04	5.64768	04	5.72948	05	10500
11000	9.2212	2.72414	27.3520	26.4714	51.41331	54.3530	51.41331	1.26228	04	5.78668	04	5.86898	05	11000
11500	9.3140	2.72635	27.4731	26.3481	51.41771	54.7337	51.41771	1.18668	04	5.93118	04	6.00948	05	11500
12000	9.4045	2.72816	27.5892	26.2254	51.42131	55.1543	51.42131	1.10608	04	6.08068	04	6.15098	05	12000
12500	9.4928	2.72962	27.7006	26.1030	51.42420	55.6157	51.42420	1.02148	04	6.22768	04	6.29348	05	12500
13000	9.5789	2.73074	27.8077	25.9814	51.42644	56.1189	51.42644	0.93188	04	6.38018	04	6.43698	05	13000
13500	9.6628	2.73157	27.9108	25.8612	51.42809	56.6643	51.42809	0.83728	04	6.53768	04	6.58148	05	13500
14000	9.7447	2.73214	28.0101	25.7423	51.42914	57.2427	51.42914	0.73768	04	6.69918	04	6.72698	05	14000
14500	9.8244	2.73247	28.1060	25.6244	51.42967	57.8513	51.42967	0.63308	04	6.87068	04	6.87348	05	14500

TABLE 14 (CONT.). IDEAL GAS FUNCTIONS FOR AIR

TEMP. (°F)	PARTIAL PRESS.	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT} - \frac{h^*_f - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$	$\frac{h^* - h^*_f}{RT}$
15000	9.9022	2.73260	28.1964	30.9312	5.43013	56.0724	01.4665	01.4665	5.4444	04	8.1452E	04	8.4033E	05	15000		
15000	9.9786	2.73255	28.2082	31.0208	5.43003	56.2124	01.4634	01.4634	5.3364E	04	8.1452E	04	8.4033E	05	15000		
14000	10.0519	2.73235	28.3750	31.1073	5.42963	56.3858	01.4584	01.4584	5.2074E	04	8.1452E	04	8.4033E	05	14000		
14000	10.1240	2.73202	28.4591	31.1911	5.42897	56.5529	01.4519	01.4519	5.0786E	04	8.1452E	04	8.4033E	05	14000		
17000	10.1943	2.73159	28.5406	31.2722	5.42811	56.7149	01.4431	01.4431	4.9496E	04	8.1452E	04	8.4033E	05	17000		
17500	10.2629	2.73107	28.6198	31.3509	5.42710	56.8723	01.4329	01.4329	4.8204E	04	8.1452E	04	8.4033E	05	17500		
18000	10.3298	2.73050	28.6967	31.4272	5.42594	57.0251	01.4211	01.4211	4.6910E	04	8.1452E	04	8.4033E	05	18000		
18000	10.3952	2.72989	28.7715	31.5014	5.42463	57.1738	01.4080	01.4080	4.5614E	04	8.1452E	04	8.4033E	05	18000		
18000	10.4590	2.72927	28.8443	31.5736	5.42319	57.3184	01.3938	01.3938	4.4316E	04	8.1452E	04	8.4033E	05	18000		
19500	10.5216	2.72865	28.9152	31.6439	5.42162	57.4593	01.3786	01.3786	4.3016E	04	8.1452E	04	8.4033E	05	19500		
20000	10.5824	2.72805	28.9843	31.7123	5.42003	57.5964	01.3625	01.3625	4.1714E	04	8.1452E	04	8.4033E	05	20000		
22000	10.6419	2.72742	29.0514	31.7789	5.41842	57.7297	01.3456	01.3456	4.0410E	04	8.1452E	04	8.4033E	05	22000		
24000	11.0288	2.72664	29.4914	32.2078	5.41708	58.2844	01.3023	01.3023	3.8112E	04	8.1452E	04	8.4033E	05	24000		
24000	11.2317	2.72977	29.6997	32.4295	5.42450	59.0183	01.4428	01.4428	4.4316E	04	8.1452E	04	8.4033E	05	24000		
24000	11.4275	2.73749	29.9223	32.6398	5.43985	59.4208	01.4607	01.4607	4.6675E	04	8.1452E	04	8.4033E	05	24000		
30000	11.6212	2.72082	30.0916	32.8424	5.44633	59.7970	01.4833	01.4833	4.9037E	05	8.1452E	05	8.4033E	06	30000		
32000	11.6179	2.77806	30.2697	33.0406	5.50615	60.1509	01.5371	01.5371	5.2837E	05	8.1452E	05	8.4033E	06	32000		
34000	12.0231	2.79859	30.4385	33.2371	5.56126	60.4863	01.6076	01.6076	5.7125E	05	8.1452E	05	8.4033E	06	34000		
34000	12.4420	2.83479	30.8994	33.6342	5.63320	60.9041	01.6391	01.6391	6.1248E	05	8.1452E	05	8.4033E	06	34000		
36000	12.4802	2.87908	30.7539	33.6339	5.72299	61.1130	01.6360	01.6360	6.4196E	05	8.1452E	05	8.4033E	06	36000		
40000	12.7430	2.93435	30.9029	33.8373	5.83104	61.4093	01.7403	01.7403	7.0374E	05	8.1452E	05	8.4033E	06	40000		
42000	13.0354	2.99778	31.0474	34.0454	5.95708	61.6847	01.8528	01.8528	7.6745E	05	8.1452E	05	8.4033E	06	42000		
44000	13.3620	3.06979	31.1887	34.2585	6.10017	61.9771	01.9771	01.9771	8.3307E	05	8.1452E	05	8.4033E	06	44000		
44000	13.7291	3.14955	31.3285	34.4784	6.25868	62.2917	02.1044	02.1044	9.0062E	05	8.1452E	05	8.4033E	06	44000		
48000	14.1594	3.23596	31.4627	34.6987	6.43042	62.5317	02.2511	02.2511	9.7032E	05	8.1452E	05	8.4033E	06	48000		
50000	14.5976	3.32773	31.5947	34.9244	6.61274	62.7870	02.4000	02.4000	1.0428E	05	8.1452E	05	8.4033E	06	50000		
60000	17.7194	3.81303	32.2463	36.0593	7.37713	67.0787	03.1858	03.1858	1.7858E	05	8.1452E	05	8.4033E	06	60000		
70000	22.4135	4.22461	33.0667	37.0913	8.39501	69.3115	03.7065	03.7065	2.6055E	05	8.1452E	05	8.4033E	06	70000		
80000	28.7563	4.66840	33.4497	37.9261	9.61919	66.4701	04.3893	04.3893	3.5546E	05	8.1452E	05	8.4033E	06	80000		
90000	36.6588	4.61720	33.9889	38.6042	9.17531	67.5376	04.7129	04.7129	4.6693E	05	8.1452E	05	8.4033E	06	90000		
100000	45.9324	4.63240	34.6759	39.1283	9.64908	68.5092	04.9922	04.9922	5.9592E	05	8.1452E	05	8.4033E	06	100000		
150000	105.1130	4.39320	36.3174	40.6707	6.95071	72.1687	06.8194	06.8194	9.9933E	05	8.1452E	05	8.4033E	06	150000		
200000	178.4394	4.06935	37.5199	41.5253	7.95950	74.5593	08.2176	08.2176	1.4944E	06	8.1452E	06	1.4944E	07	200000		
300000	283.9313	3.54379	39.0510	42.6148	7.08104	77.6009	09.6827	09.6827	2.1244E	06	8.1452E	06	2.1244E	07	300000		
400000	374.4401	3.31655	40.3394	43.3359	6.59054	79.5649	08.1954	08.1954	1.8413E	06	8.1452E	06	1.8413E	07	400000		
500000	441.1088	3.16139	40.7618	43.9230	6.28220	81.0000	07.2822	07.2822	1.6475E	06	8.1452E	06	1.6475E	07	500000		
600000	492.2237	2.99542	41.3286	44.3635	6.07162	82.1256	06.1973	06.1973	1.5077E	06	8.1452E	06	1.5077E	07	600000		
800000	666.4824	2.92036	42.1887	45.1071	5.80324	83.1320	05.6324	05.6324	1.3652E	06	8.1452E	06	1.3652E	07	800000		
1000000	816.3017	2.83803	42.8289	45.6869	5.61943	83.1061	05.1061	05.1061	1.2579E	06	8.1452E	06	1.2579E	07	1000000		

TABLE 15. IDEAL GAS FUNCTIONS FOR C 3+ (ATOMIC WEIGHT 12.0095, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N S L. SEE TABLE 59 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIAL FUNCT.	$\frac{W^0 - E^0}{RT}$	$-\frac{F^0 - E^0}{RT}$	$\frac{S^0}{R}$	$\ln \frac{W^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$\frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$\frac{W^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$-\frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	TEMP. (°K)			
3000	2.0000	2.50000	20.7727	23.2727	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	3000
3200	2.0000	2.49300	20.9340	23.4340	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	3200
3400	2.0000	2.48600	21.0954	23.5954	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	3400
3600	2.0000	2.47900	21.2568	23.7568	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	3600
3800	2.0000	2.47200	21.4182	23.9182	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	3800
4000	2.0000	2.46500	21.5796	24.0796	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	4000
4200	2.0000	2.45800	21.7410	24.2410	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	4200
4400	2.0000	2.45100	21.9024	24.4024	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	4400
4600	2.0000	2.44400	22.0638	24.5638	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	4600
4800	2.0000	2.43700	22.2252	24.7252	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	4800
5000	2.0000	2.43000	22.3866	24.8866	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	5000
5200	2.0000	2.42300	22.5480	25.0480	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	5200
5400	2.0000	2.41600	22.7094	25.2094	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	5400
5600	2.0000	2.40900	22.8708	25.3708	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	5600
5800	2.0000	2.40200	23.0322	25.5322	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	5800
6000	2.0000	2.39500	23.1936	25.6936	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	6000
6200	2.0000	2.38800	23.3550	25.8550	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	6200
6400	2.0000	2.38100	23.5164	26.0164	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	6400
6600	2.0000	2.37400	23.6778	26.1778	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	6600
6800	2.0000	2.36700	23.8392	26.3392	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	6800
7000	2.0000	2.36000	23.9999	26.5000	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	7000
7200	2.0000	2.35300	24.1613	26.6613	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	7200
7400	2.0000	2.34600	24.3227	26.8227	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	7400
7600	2.0000	2.33900	24.4841	26.9841	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	7600
7800	2.0000	2.33200	24.6455	27.1455	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	7800
8000	2.0000	2.32500	24.8069	27.3069	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	8000
8200	2.0000	2.31800	24.9683	27.4683	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	8200
8400	2.0000	2.31100	25.1297	27.6297	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	8400
8600	2.0000	2.30400	25.2911	27.7911	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	8600
8800	2.0000	2.29700	25.4525	27.9525	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	8800
9000	2.0000	2.29000	25.6139	28.1139	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	9000
9200	2.0000	2.28300	25.7753	28.2753	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	9200
9400	2.0000	2.27600	25.9367	28.4367	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	9400
9600	2.0000	2.26900	26.0981	28.5981	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	9600
9800	2.0000	2.26200	26.2595	28.7595	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	9800
10000	2.0000	2.25500	26.4209	28.9209	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	10000
10500	2.0000	2.24800	26.5823	29.0823	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	10500
11000	2.0000	2.24100	26.7437	29.2437	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	11000
11500	2.0000	2.23400	26.9051	29.4051	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	11500
12000	2.0000	2.22700	27.0665	29.5665	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	12000
12500	2.0000	2.22000	27.2279	29.7279	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	12500
13000	2.0000	2.21300	27.3893	29.8893	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	13000
13500	2.0000	2.20600	27.5507	30.0507	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	13500
14000	2.0000	2.19900	27.7121	30.2121	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	14000
14500	2.0000	2.19200	27.8735	30.3735	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	14500
15000	2.0000	2.18500	28.0349	30.5349	4.96791	41.2797	46.2466	8.94232	03	1.4904E 04	1.2304E 05	15000

TABLE 15 (CONT.). IDEAL GAS FUNCTIONS FOR C₃H₈

TEMP. (°K)	PARTIT. FUNC.	$\frac{h^2}{RT}$	$\ln \frac{h^2}{RT}$	$-\frac{h^2}{RT} \ln \frac{h^2}{RT}$	$\ln \frac{h^2}{RT}$	h^2	$\ln \frac{h^2}{RT}$	h^2	$\ln \frac{h^2}{RT}$	h^2	$\ln \frac{h^2}{RT}$	TEMP. (°K)
19000	2.0123	2.53776	24.8024	5.02796	27.3401	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	19000
15000	2.0150	2.54457	24.8857	5.05467	27.4303	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	15000
16000	2.0181	2.55199	24.9666	5.07127	27.5186	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	16000
17000	2.0215	2.56000	25.0452	5.08715	27.6052	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	17000
18000	2.0254	2.56859	25.1218	5.10222	27.6904	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	18000
19000	2.0297	2.57773	25.1964	5.11694	27.7741	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	19000
20000	2.0344	2.58737	25.2691	5.13133	27.8565	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	20000
21000	2.0396	2.59748	25.3402	5.14542	27.9376	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	21000
22000	2.0452	2.60803	25.4096	5.15928	28.0174	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	22000
23000	2.0512	2.61906	25.4775	5.17291	28.0964	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	23000
24000	2.0577	2.63024	25.5439	5.22673	28.1741	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	24000
25000	2.0648	2.64149	25.6088	5.24028	28.2508	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	25000
26000	2.0724	2.65281	25.6723	5.25361	28.3265	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	26000
27000	2.0805	2.66420	25.7345	5.26673	28.4012	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	27000
28000	2.0891	2.67566	25.7955	5.27964	28.4749	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	28000
29000	2.0982	2.68719	25.8553	5.29234	28.5476	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	29000
30000	2.1078	2.69879	25.9140	5.30483	28.6193	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	30000
32000	2.1214	2.71023	26.0564	5.31706	28.6901	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	32000
34000	2.1344	2.72151	26.1978	5.32903	28.7600	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	34000
36000	2.1478	2.73274	26.3382	5.34074	28.8290	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	36000
38000	2.1616	2.74392	26.4777	5.35228	28.8971	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	38000
40000	2.1758	2.75505	26.6162	5.36365	28.9643	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	40000
42000	2.1904	2.76613	26.7537	5.37486	29.0306	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	42000
44000	2.2054	2.77716	26.8902	5.38591	29.0960	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	44000
46000	2.2208	2.78814	27.0257	5.39680	29.1605	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	46000
48000	2.2366	2.79907	27.1602	5.40753	29.2241	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	48000
50000	2.2528	2.81005	27.2937	5.41811	29.2868	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	50000
52000	2.2694	2.82107	27.4262	5.42854	29.3486	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	52000
54000	2.2864	2.83214	27.5577	5.43882	29.4095	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	54000
56000	2.3038	2.84326	27.6882	5.44895	29.4695	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	56000
58000	2.3216	2.85442	27.8177	5.45893	29.5286	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	58000
60000	2.3398	2.86563	27.9462	5.46876	29.5868	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	60000
62000	2.3584	2.87689	28.0737	5.47844	29.6441	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	62000
64000	2.3774	2.88820	28.2002	5.48797	29.7005	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	64000
66000	2.3968	2.89956	28.3257	5.49735	29.7560	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	66000
68000	2.4166	2.91097	28.4502	5.50658	29.8106	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	68000
70000	2.4368	2.92243	28.5737	5.51566	29.8643	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	70000
72000	2.4574	2.93394	28.6962	5.52459	29.9171	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	72000
74000	2.4784	2.94550	28.8177	5.53337	29.9690	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	74000
76000	2.4998	2.95711	28.9382	5.54200	30.0200	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	76000
78000	2.5216	2.96877	29.0577	5.55058	30.0701	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	78000
80000	2.5438	2.98048	29.1762	5.55901	30.1193	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	80000
82000	2.5664	2.99224	29.2937	5.56729	30.1676	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	82000
84000	2.5894	3.00405	29.4102	5.57552	30.2150	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	84000
86000	2.6128	3.01591	29.5257	5.58360	30.2615	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	86000
88000	2.6366	3.02782	29.6402	5.59153	30.3071	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	88000
90000	2.6608	3.03978	29.7537	5.59931	30.3518	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	90000
92000	2.6854	3.05179	29.8662	5.60694	30.3956	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	92000
94000	2.7104	3.06385	29.9777	5.61442	30.4385	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	94000
96000	2.7358	3.07596	30.0882	5.62175	30.4805	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	96000
98000	2.7616	3.08812	30.1977	5.62893	30.5216	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	98000
100000	2.7878	3.10033	30.3062	5.63596	30.5618	4.58376	4.58376	7.54446	7.54446	7.54446	7.54446	100000

TABLE 16. IDEAL GAS FUNCTIONS FOR N₂ (ATOMIC WEIGHT 14.0030, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 60 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIAL FUNCT.	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i}{h}$	$\ln \sum \frac{g_i e^{-\epsilon_i/kT}}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^2}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^3}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^4}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^5}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^6}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^7}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^8}{h}$	$\frac{h^2}{8\pi^2 I} \sum \frac{g_i \epsilon_i^9}{h}$	TEMP. (°K)
3000	1.0000	2.50000	20.3101	4.96791	40.3395	45.3274	2.9422E 03	1.6904E 04	1.2100E 05	3000			
3200	1.0000	2.50000	20.4714	4.96791	40.6801	45.8400	9.5304E 03	1.5877E 04	1.2410E 05	3200			
3400	1.0000	2.50000	20.6230	4.96791	41.0813	46.4492	1.8133E 04	1.4891E 04	1.2934E 05	3400			
3600	1.0000	2.50000	20.7659	4.96791	41.5359	47.1683	1.0731E 04	1.3984E 04	1.4029E 05	3600			
3800	1.0000	2.50000	20.9011	4.96791	42.1339	48.0018	1.1327E 04	1.3178E 04	1.4782E 05	3800			
4000	1.0000	2.50000	21.0293	4.96791	42.8679	49.0546	1.1923E 04	1.2472E 04	1.5715E 05	4000			
4200	1.0000	2.50000	21.1513	4.96791	43.7311	50.3440	1.2519E 04	1.1866E 04	1.7039E 05	4200			
4400	1.0000	2.50000	21.2676	4.96791	44.7282	51.8823	1.3116E 04	1.1359E 04	1.8764E 05	4400			
4600	1.0000	2.50000	21.3787	4.96791	45.8653	53.6943	1.3713E 04	1.0952E 04	2.0943E 05	4600			
4800	1.0000	2.50000	21.4851	4.96791	47.1564	56.8045	1.4310E 04	1.0635E 04	2.3629E 05	4800			
5000	1.0000	2.50000	21.5871	4.96791	48.6072	60.2451	1.4907E 04	1.0408E 04	2.6860E 05	5000			
5200	1.0000	2.50000	21.6852	4.96791	50.2342	64.0500	1.5504E 04	1.0271E 04	3.0660E 05	5200			
5400	1.0000	2.50000	21.7794	4.96791	52.0528	68.2549	1.6101E 04	1.0224E 04	3.5060E 05	5400			
5600	1.0000	2.50000	21.8705	4.96791	54.0792	72.9048	1.6701E 04	1.0277E 04	4.0120E 05	5600			
5800	1.0000	2.50001	21.9582	4.96791	56.3293	78.0547	1.7301E 04	1.0430E 04	4.5900E 05	5800			
6000	1.0000	2.50001	22.0430	4.96791	58.8200	83.7506	1.7901E 04	1.0683E 04	5.2460E 05	6000			
6200	1.0000	2.50002	22.1249	4.96791	61.5672	90.0465	1.8501E 04	1.1036E 04	5.9840E 05	6200			
6400	1.0000	2.50004	22.2043	4.96791	64.5879	97.0014	1.9101E 04	1.1489E 04	6.8100E 05	6400			
6600	1.0000	2.50006	22.2812	4.96791	67.9082	104.6843	1.9701E 04	1.2042E 04	7.8300E 05	6600			
6800	1.0000	2.50008	22.3559	4.96791	71.4648	113.1642	2.0301E 04	1.2705E 04	9.1600E 05	6800			
7000	1.0000	2.50012	22.4283	4.96791	75.2928	122.5101	2.0901E 04	1.3488E 04	1.0840E 06	7000			
7200	1.0000	2.50016	22.4984	4.96791	79.4482	132.6940	2.1501E 04	1.4391E 04	1.2920E 06	7200			
7400	1.0000	2.50025	22.5673	4.96791	83.9840	143.7849	2.2101E 04	1.5424E 04	1.5440E 06	7400			
7600	1.0000	2.50034	22.6340	4.96791	88.8648	155.8548	2.2701E 04	1.6597E 04	1.8540E 06	7600			
7800	1.0000	2.50044	22.6989	4.96791	94.0647	168.9747	2.3301E 04	1.7920E 04	2.2320E 06	7800			
8000	1.0001	2.50061	22.7622	4.96791	99.6482	183.2146	2.3901E 04	1.9403E 04	2.6840E 06	8000			
8200	1.0001	2.50079	22.8240	4.96791	105.6799	198.6545	2.4501E 04	2.1046E 04	3.2240E 06	8200			
8400	1.0001	2.50103	22.8842	4.96791	112.2249	215.3744	2.5101E 04	2.2859E 04	3.8640E 06	8400			
8600	1.0001	2.50131	22.9431	4.96791	119.3482	233.4643	2.5701E 04	2.4842E 04	4.6240E 06	8600			
8800	1.0002	2.50165	23.0004	4.96791	127.1240	252.9142	2.6301E 04	2.7005E 04	5.5240E 06	8800			
9000	1.0002	2.50207	23.0568	4.96791	135.6112	273.7241	2.6901E 04	2.9348E 04	6.5840E 06	9000			
9200	1.0002	2.50255	23.1118	4.96791	144.8749	295.9040	2.7501E 04	3.1871E 04	7.8340E 06	9200			
9400	1.0003	2.50312	23.1656	4.96791	154.9848	319.5539	2.8101E 04	3.4574E 04	9.2940E 06	9400			
9600	1.0004	2.50378	23.2183	4.96791	165.9147	344.7838	2.8701E 04	3.7447E 04	1.0984E 07	9600			
9800	1.0005	2.50456	23.2700	4.96791	177.7446	371.6937	2.9301E 04	4.0490E 04	1.2964E 07	9800			
10000	1.0006	2.50545	23.3206	4.96791	190.5545	400.3836	2.9901E 04	4.3723E 04	1.5344E 07	10000			
10500	1.0009	2.50622	23.4429	4.96791	205.2944	440.9735	3.0501E 04	4.7146E 04	1.8224E 07	10500			
11000	1.0014	2.51193	23.5596	4.96791	221.1243	484.6634	3.1101E 04	5.0769E 04	2.1844E 07	11000			
11500	1.0020	2.51672	23.6716	4.96791	238.1342	531.5533	3.1701E 04	5.4592E 04	2.6364E 07	11500			
12000	1.0028	2.52274	23.7786	4.96791	256.4241	581.8432	3.2301E 04	5.8625E 04	3.1884E 07	12000			
12500	1.0039	2.53012	23.8818	4.96791	276.0940	635.7331	3.2901E 04	6.2868E 04	3.8504E 07	12500			
13000	1.0053	2.53896	23.9812	4.96791	297.2439	693.4230	3.3501E 04	6.7321E 04	4.6424E 07	13000			
13500	1.0069	2.54935	24.0772	4.96791	319.8738	755.1129	3.4101E 04	7.1984E 04	5.5744E 07	13500			
14000	1.0089	2.56170	24.1701	4.96791	344.0837	821.0028	3.4701E 04	7.6857E 04	6.6664E 07	14000			
14500	1.0114	2.57504	24.2602	4.96791	369.9736	891.3927	3.5301E 04	8.1940E 04	7.9304E 07	14500			

TABLE 16 (CONT.) IDEAL GAS FUNCTIONS FOR N₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	TEMP. (°K)
15000	1.0152	2.39039	24.3478	24.9282	5.14754	48.3831	53.9304	4.74048	7.72138	0.4	7.25748	05	15000
15000	1.0175	2.60781	24.5330	27.0404	5.18136	48.5324	53.7337	4.92108	8.05118	04	7.52548	05	15000
16000	1.0213	2.82608	24.5161	27.1421	5.21842	48.7175	53.9399	5.17808	8.34998	04	7.79488	05	16000
16000	1.0255	2.84689	24.5972	27.2435	5.27462	48.8787	54.1373	5.39798	8.67878	04	8.06588	05	16000
17000	1.0304	2.86803	24.6765	27.3445	5.30771	49.0363	54.3361	5.63498	9.01318	04	8.33628	05	17000
17500	1.0357	2.89118	24.7542	27.4453	5.34177	49.1966	54.5384	5.91118	9.35878	04	8.60048	05	17500
18000	1.0417	2.91564	24.8303	27.5460	5.37681	49.3419	54.7384	6.20788	9.71348	04	8.86918	05	18000
18500	1.0482	2.94130	24.9041	27.6464	5.41274	49.4805	54.9379	6.51518	1.00708	05	9.15578	05	18500
19000	1.0554	2.96803	24.9785	27.7466	5.44953	49.6165	55.1370	6.87548	1.04518	05	9.43098	05	19000
19500	1.0631	2.99569	25.0508	27.8466	5.48711	49.7501	55.3356	7.28338	1.08338	05	9.70718	05	19500
20000	1.0715	2.92416	25.1219	27.9461	5.52546	49.8814	55.5335	7.74908	1.12248	05	9.98438	05	20000
20000	1.1112	2.94332	25.1946	28.0450	5.56462	50.0106	55.7312	8.27278	1.16248	05	1.26408	05	20000
24000	1.1610	3.06483	25.6580	28.1438	5.60450	50.1384	57.0769	9.86748	1.44178	05	1.22378	04	24000
24000	1.2204	3.18193	25.9079	28.2424	5.64510	51.2320	57.8044	1.12738	1.64408	05	1.33048	04	24000
28000	1.2888	3.29000	26.1478	28.3408	5.68736	51.9599	58.4977	1.27428	1.83008	05	1.43498	04	28000
30000	1.3656	3.38648	26.3781	28.4381	5.72950	52.4177	59.1672	1.42278	2.01808	05	1.52738	04	30000
32000	1.4500	3.47046	26.5994	28.5342	5.77150	52.8037	59.7938	1.57098	2.20608	05	1.61148	04	32000
34000	1.5412	3.54214	26.8120	28.6292	5.81324	53.1182	60.3168	1.71768	2.39328	05	1.69138	04	34000
34000	1.6387	3.60240	27.0163	28.7233	5.85464	53.3658	60.8443	1.86178	2.57718	05	1.76778	04	34000
36000	1.7417	3.65245	27.2124	28.8164	5.89564	53.6356	61.3336	2.00298	2.75818	05	1.84138	04	36000
40000	1.8496	3.69359	27.4008	28.9088	5.93630	53.9277	61.7890	2.14108	2.93598	05	1.91238	04	40000
42000	1.9624	3.72707	27.5819	28.9994	5.97660	54.2420	62.2161	2.27408	3.11048	05	1.97938	04	42000
44000	2.0790	3.75406	27.7559	29.0882	6.01654	54.5784	62.6156	2.40008	3.28248	05	2.04248	04	44000
44000	2.1993	3.77560	27.9233	29.1757	6.05614	54.9364	62.9909	2.51928	3.45138	05	2.10248	04	44000
48000	2.3228	3.79257	28.0843	29.2614	6.09544	55.3164	63.3447	2.63248	3.61738	05	2.15948	04	48000
50000	2.4494	3.80575	28.2394	29.3452	6.13444	55.7184	63.6791	2.74078	3.78038	05	2.21248	04	50000
60000	3.1180	3.83499	28.5364	29.4274	6.17314	56.1424	64.0944	2.84428	3.94038	05	2.26148	04	60000
70000	3.8318	3.83825	29.5281	29.5084	6.21154	56.5884	64.4944	2.94338	4.09738	05	2.30648	04	70000
80000	4.5828	3.84471	30.0409	29.5884	6.24964	57.0544	64.8844	3.03848	4.25138	05	2.34848	04	80000
90000	5.3758	3.85332	30.4950	29.6674	6.28744	57.5404	65.2644	3.12948	4.40238	05	2.38748	04	90000
100000	6.2242	3.86376	30.9049	29.7442	6.32494	58.0464	65.6344	3.21648	4.55038	05	2.42348	04	100000
150000	11.9275	4.33239	32.5690	30.8014	6.40914	59.5724	67.3291	3.39038	4.79438	05	2.50648	04	150000
200000	20.9740	4.84600	33.9526	31.9526	6.49364	61.1264	70.0704	3.56038	5.03438	05	2.58448	04	200000
300000	47.0548	6.30082	35.6744	33.6082	6.57844	63.8464	73.8464	3.72638	5.27038	05	2.65748	04	300000
400000	76.9378	8.05161	36.8955	35.0082	6.66344	67.5724	78.5724	3.88838	5.51238	05	2.72648	04	400000
500000	105.8050	9.80402	37.7617	36.1617	6.74864	72.2464	83.2464	4.04638	5.76038	05	2.79148	04	500000
600000	131.9011	11.56170	38.4379	37.1617	6.83404	76.8704	88.8704	4.20038	6.01438	05	2.85248	04	600000
800000	175.1500	15.36322	39.4408	42.8040	6.91964	82.4464	94.4464	4.35038	6.26838	05	2.90948	04	800000
1000000	208.4488	19.20130	40.1726	43.3739	6.99544	87.9724	99.9724	4.49638	6.52238	05	2.96248	04	1000000

TABLE 1/. IDEAL GAS FUNCTIONS FOR \bar{U}^0 (ATOMIC WEIGHT 15.9977, $F = 1.98717$ CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS n.s.g. SEE TABLE 61 FOR LIST OF STATES USED.

TEMP. (°K)	PARTI. FUNCT.	$\frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT} - \frac{E^0 - E^0}{RT}$	TEMP. (°K)			
3000	5.3232	2.61872	22.1817	26.7974	5.19787	44.0787	69.2766	9.6321E 03	1.5594E 04	1.3224E 05	3000
3200	5.3619	2.60896	22.3503	26.9593	5.18443	44.4137	69.5982	1.0231E 04	1.8594E 04	1.4212E 05	3200
3400	5.3965	2.60294	22.5003	27.1112	5.17247	44.7277	69.9002	1.0050E 04	1.7506E 04	1.5207E 05	3400
3600	5.4275	2.59759	22.6369	27.2545	5.16176	45.0220	70.1848	1.1429E 04	1.8582E 04	1.6208E 05	3600
3800	5.4555	2.59269	22.7672	27.3899	5.15211	45.3018	70.4539	1.2027E 04	1.9570E 04	1.7215E 05	3800
4000	5.4808	2.58829	22.8931	27.5184	5.14337	45.5659	70.7093	1.2625E 04	2.0572E 04	1.8224E 05	4000
4200	5.5040	2.58429	23.0163	27.6406	5.13541	45.8166	70.9520	1.3223E 04	2.1596E 04	1.9246E 05	4200
4400	5.5251	2.58064	23.1364	27.7570	5.12815	46.0554	71.1835	1.3820E 04	2.2641E 04	2.0284E 05	4400
4600	5.5445	2.57728	23.2531	27.8683	5.12149	46.2832	71.4047	1.4418E 04	2.3705E 04	2.1338E 05	4600
4800	5.5624	2.57420	23.3667	27.9749	5.11536	46.5010	71.6164	1.5015E 04	2.4789E 04	2.2420E 05	4800
5000	5.5790	2.57135	23.4767	28.0770	5.10969	46.7097	71.8194	1.5613E 04	2.5894E 04	2.3555E 05	5000
5200	5.5943	2.56871	23.5835	28.1752	5.10445	46.9100	72.0145	1.6210E 04	2.6993E 04	2.4739E 05	5200
5400	5.6086	2.56626	23.6873	28.2697	5.09958	47.1026	72.2021	1.6807E 04	2.7990E 04	2.5935E 05	5400
5600	5.6219	2.56398	23.7887	28.3607	5.09504	47.2879	72.3830	1.7404E 04	2.8932E 04	2.7181E 05	5600
5800	5.6343	2.56185	23.8866	28.4485	5.09081	47.4667	72.5575	1.8001E 04	2.9827E 04	2.7531E 05	5800
6000	5.6459	2.55985	23.9734	28.5333	5.08685	47.6392	72.7260	1.8598E 04	3.0671E 04	2.8384E 05	6000
6200	5.6569	2.55798	24.0573	28.6151	5.08315	47.8059	72.8891	1.9194E 04	3.1515E 04	2.9240E 05	6200
6400	5.6671	2.55623	24.1385	28.6948	5.07964	47.9672	73.0469	1.9782E 04	3.2310E 04	3.0098E 05	6400
6600	5.6768	2.55458	24.2172	28.7717	5.07637	48.1235	73.1999	2.0369E 04	3.3064E 04	3.1162E 05	6600
6800	5.6859	2.55302	24.2934	28.8464	5.07328	48.2750	73.3483	2.0956E 04	3.3769E 04	3.2027E 05	6800
7000	5.6945	2.55155	24.3674	28.9189	5.07036	48.4220	73.4924	2.1542E 04	3.4493E 04	3.2899E 05	7000
7200	5.7027	2.55017	24.4392	28.9894	5.06760	48.5640	73.6324	2.2127E 04	3.5241E 04	3.3697E 05	7200
7400	5.7104	2.54886	24.5091	29.0580	5.06500	48.7036	73.7686	2.2714E 04	3.5941E 04	3.4441E 05	7400
7600	5.7178	2.54761	24.5771	29.1247	5.06253	48.8407	73.9012	2.3303E 04	3.6615E 04	3.5117E 05	7600
7800	5.7248	2.54644	24.6432	29.1897	5.06020	48.9761	74.0303	2.3897E 04	3.7267E 04	3.5819E 05	7800
8000	5.7314	2.54533	24.7077	29.2530	5.05798	49.1092	74.1562	2.4487E 04	3.7894E 04	3.6527E 05	8000
8200	5.7378	2.54427	24.7705	29.3148	5.05589	49.2423	74.2790	2.5074E 04	3.8498E 04	3.7240E 05	8200
8400	5.7438	2.54327	24.8318	29.3751	5.05391	49.3749	74.4000	2.5658E 04	3.9080E 04	3.7958E 05	8400
8600	5.7496	2.54233	24.8916	29.4340	5.05203	49.5068	74.5198	2.6239E 04	3.9644E 04	3.8681E 05	8600
8800	5.7552	2.54144	24.9501	29.4915	5.05026	49.6379	74.6382	2.6818E 04	4.0192E 04	3.9408E 05	8800
9000	5.7609	2.54060	25.0072	29.5478	5.04859	49.7684	74.7548	2.7395E 04	4.0726E 04	4.0124E 05	9000
9200	5.7656	2.53981	25.0630	29.6028	5.04701	49.8983	74.8694	2.7970E 04	4.1246E 04	4.0834E 05	9200
9400	5.7704	2.53906	25.1176	29.6567	5.04553	49.9279	74.9824	2.8543E 04	4.1752E 04	4.1538E 05	9400
9600	5.7751	2.53837	25.1711	29.7094	5.04415	50.0562	75.0940	2.9114E 04	4.2245E 04	4.2238E 05	9600
9800	5.7797	2.53772	25.2234	29.7611	5.04286	50.1831	75.2045	2.9680E 04	4.2726E 04	4.2934E 05	9800
10000	5.7841	2.53712	25.2747	29.8119	5.04167	50.3089	75.3136	3.0242E 04	4.3196E 04	4.3625E 05	10000
10500	5.7943	2.53582	25.3464	29.9342	5.03959	50.4709	75.4700	3.0799E 04	4.3658E 04	4.4312E 05	10500
11000	5.8039	2.53463	25.4164	29.9512	5.03712	50.7052	75.6242	3.1350E 04	4.4111E 04	4.4994E 05	11000
11500	5.8128	2.53355	25.4845	29.9632	5.03577	50.9291	75.7764	3.1895E 04	4.4556E 04	4.5671E 05	11500
12000	5.8212	2.53259	25.5509	29.9707	5.03450	51.1434	75.9275	3.2435E 04	4.5002E 04	4.6344E 05	12000
12500	5.8292	2.53176	25.6163	29.9738	5.03330	51.3480	76.0768	3.2969E 04	4.5449E 04	4.7012E 05	12500
13000	5.8370	2.53094	25.6807	29.9723	5.03215	51.5444	76.2244	3.3498E 04	4.5897E 04	4.7678E 05	13000
13500	5.8446	2.53024	25.7441	29.9663	5.03104	51.7337	76.3704	3.4022E 04	4.6346E 04	4.8341E 05	13500
14000	5.8521	2.52955	25.8065	29.9558	5.03000	51.9167	76.5148	3.4542E 04	4.6796E 04	4.8994E 05	14000
14500	5.8596	2.52887	25.8680	29.9408	5.02902	52.0944	76.6576	3.5058E 04	4.7247E 04	4.9647E 05	14500

TABLE 17 (CONT.) IDEAL GAS FUNCTIONS FOR O₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W}{RT}$	$\ln \frac{W}{RT}$	$\frac{W}{RT} - \ln \frac{W}{RT}$	$\ln \frac{W}{RT} - \ln \frac{W}{RT}$	$\frac{W}{RT} - \ln \frac{W}{RT}$	$\frac{W}{RT} - \ln \frac{W}{RT}$	$\frac{W}{RT} - \ln \frac{W}{RT}$	$\frac{W}{RT} - \ln \frac{W}{RT}$	TEMP. (°K)
15000	5.822	2.51935	26.3026	5.06411	28.8420	57.3137	4.58046	7.34928	7.84818	15000
15500	5.8750	2.54186	26.3359	5.08071	28.9276	57.4039	4.74886	7.40804	7.91716	15500
16000	5.8830	2.54439	26.4666	5.09513	29.0110	57.4697	4.91036	7.46992	8.41808	16000
16500	5.8916	2.54754	26.5450	5.06236	29.0923	57.5117	5.07418	7.53276	8.78962	16500
17000	5.9000	2.55109	26.6211	5.06944	29.1722	57.5700	5.23991	7.61812	8.99318	17000
17500	5.9091	2.55506	26.6951	5.07732	29.2502	57.6279	5.40706	7.69596	9.20338	17500
18000	5.9186	2.55943	26.7671	5.08600	29.3266	57.6857	5.57796	7.77048	9.57438	18000
18500	5.9287	2.56419	26.8373	5.09546	29.4015	57.7427	5.75262	7.84268	9.86618	18500
19000	5.9392	2.56933	26.9058	5.10568	29.4751	57.7993	5.92228	7.91268	1.01578	19000
19500	5.9503	2.57484	26.9726	5.11663	29.5474	57.8559	6.10286	7.98148	1.04522	19500
20000	5.9621	2.58070	27.0378	5.12829	29.6186	57.9127	6.28226	8.05006	1.07466	20000
20500	6.0196	2.60742	27.2850	5.16137	29.6824	57.9693	6.46226	8.11846	1.10410	20500
21000	6.0798	2.63851	27.5132	5.20166	29.7486	58.0259	6.64226	8.18686	1.13354	21000
21500	6.1358	2.67284	27.7237	5.24936	29.8171	58.0825	6.82226	8.25526	1.16298	21500
22000	6.1943	2.70932	27.9251	5.30388	29.8885	58.1391	7.00226	8.32366	1.19242	22000
23000	6.3424	2.74701	28.1133	5.45076	30.0604	58.2000	7.18226	8.39206	1.22186	23000
24000	6.4521	2.78507	28.2819	5.53439	31.0769	58.2609	7.36226	8.46046	1.25130	24000
25000	6.5721	2.82285	28.4418	5.60947	31.2847	58.3218	7.54226	8.52886	1.28074	25000
26000	6.7015	2.85984	28.6242	5.68297	31.5641	58.3827	7.72226	8.59726	1.31018	26000
27000	6.8398	2.89565	28.7790	5.75413	31.6755	58.4436	7.90226	8.66566	1.33962	27000
28000	6.9862	2.93002	28.9292	5.82293	31.9592	58.5045	8.08226	8.73406	1.36906	28000
29000	7.1400	2.96276	29.0730	5.88750	32.0357	58.5654	8.26226	8.80246	1.39850	29000
30000	7.3006	2.99379	29.2115	5.94915	32.0953	58.6263	8.44226	8.87086	1.42794	30000
31000	7.4675	3.02306	29.3453	6.00731	32.1549	58.6872	8.62226	8.93926	1.45738	31000
32000	7.6401	3.05057	29.4745	6.06199	32.2145	58.7481	8.80226	9.00766	1.48682	32000
33000	7.8179	3.07638	29.5996	6.11320	32.2740	58.8090	8.98226	9.07606	1.51626	33000
34000	8.0010	3.10249	30.1704	6.16126	32.3336	58.8700	9.16226	9.14446	1.54570	34000
35000	8.1896	3.12891	30.6473	6.20652	32.3932	58.9309	9.34826	9.21286	1.57514	35000
36000	8.3837	3.15564	31.1078	6.24929	32.4528	58.9918	9.53426	9.28126	1.60458	36000
37000	8.5834	3.18268	31.5500	6.28917	32.5124	59.0527	9.72026	9.34966	1.63402	37000
38000	8.7887	3.20992	31.9845	6.32654	32.5720	59.1136	9.90626	9.41806	1.66346	38000
39000	8.9996	3.23736	32.4211	6.36181	32.6316	59.1745	10.09226	9.48646	1.69290	39000
40000	9.2161	3.26500	32.8511	6.39548	32.6912	59.2354	10.27826	9.55486	1.72234	40000
41000	9.4382	3.29284	33.2836	6.42705	32.7508	59.2963	10.46426	9.62326	1.75178	41000
42000	9.6659	3.32088	33.7186	6.45701	32.8104	59.3572	10.64926	9.69166	1.78122	42000
43000	9.8992	3.34912	34.1561	6.48587	32.8700	59.4181	10.83526	9.76006	1.81066	43000
44000	10.1381	3.37756	34.5961	6.51413	32.9296	59.4790	11.02126	9.82846	1.84010	44000
45000	10.3826	3.40619	35.0386	6.54139	32.9892	59.5400	11.20726	9.89686	1.86954	45000
46000	10.6327	3.43501	35.4836	6.56815	33.0488	59.6009	11.39326	9.96526	1.89898	46000
47000	10.8884	3.46402	35.9311	6.59491	33.1084	59.6618	11.57926	10.03366	1.92842	47000
48000	11.1497	3.49323	36.3811	6.62117	33.1680	59.7227	11.76526	10.10206	1.95786	48000
49000	11.4166	3.52264	36.8336	6.64743	33.2276	59.7836	11.95126	10.17046	1.98730	49000
50000	11.6891	3.55225	37.2886	6.67319	33.2872	59.8445	12.13726	10.23886	2.01674	50000

TABLE 18. IDEAL GAS FUNCTIONS FOR AR 3+ (ATOMIC WEIGHT 39.9440, R = 1.90717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 62 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{U^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT} - \ln \frac{U^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT} - \ln \frac{U^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT} - \ln \frac{U^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT} - \ln \frac{U^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT} - \ln \frac{U^0 - U^0}{RT}$	TEMP. (°K)	
3000	4.0004	2.50099	23.2406	4.96908	46.2307	91.2009	6.9402E 03	1.4910E 04	1.1372E 05	3000
3200	4.0007	2.50175	23.4301	4.97140	46.5394	91.5308	9.5499E 03	1.4910E 04	1.4099E 05	3200
3400	4.0013	2.50289	23.5818	4.97346	46.8409	91.8546	1.0134E 04	1.4910E 04	1.5933E 05	3400
3600	4.0021	2.50450	23.7259	4.97545	47.1453	92.1721	1.0763E 04	1.4910E 04	1.6977E 05	3600
4000	4.0033	2.50645	23.8666	4.98114	47.4145	92.3956	1.1377E 04	1.4910E 04	1.8001E 05	4000
4200	4.0050	2.50945	23.9990	4.98649	47.6701	92.6549	1.1998E 04	1.4910E 04	1.9044E 05	4200
4400	4.0071	2.51295	24.1115	4.99364	47.9136	92.9072	1.2627E 04	1.4910E 04	2.0104E 05	4400
4600	4.0099	2.51721	24.2285	5.00211	48.1461	93.1482	1.3266E 04	2.0694E 04	2.1184E 05	4600
4800	4.0134	2.52227	24.3405	5.01217	48.3686	93.3806	1.3919E 04	2.3094E 04	2.2282E 05	4800
5000	4.0177	2.52817	24.4480	5.02389	48.5822	93.6061	1.4576E 04	2.4119E 04	2.3319E 05	5000
5200	4.0229	2.53491	24.5513	5.03728	48.7875	93.8248	1.5231E 04	2.5184E 04	2.4394E 05	5200
5400	4.0290	2.54249	24.6509	5.05234	48.9854	94.0377	1.5939E 04	2.6272E 04	2.5472E 05	5400
5600	4.0361	2.55090	24.7470	5.06964	49.1764	94.2454	1.6642E 04	2.7372E 04	2.6552E 05	5600
5800	4.0442	2.56012	24.8399	5.08738	49.3610	94.4484	1.7361E 04	2.8489E 04	2.7642E 05	5800
6000	4.0535	2.57011	24.9299	5.10723	49.5399	94.6471	1.8096E 04	2.9622E 04	2.8733E 05	6000
6200	4.0638	2.58084	25.0172	5.12895	49.7134	94.8420	1.8848E 04	3.0771E 04	2.9828E 05	6200
6400	4.0754	2.59225	25.1021	5.15122	49.8819	95.0332	1.9617E 04	3.1930E 04	3.0927E 05	6400
6600	4.0881	2.60429	25.1845	5.17515	50.0459	95.2210	2.0403E 04	3.3121E 04	3.2034E 05	6600
6800	4.1020	2.61691	25.2649	5.20022	50.2055	95.4057	2.1204E 04	3.4321E 04	3.3146E 05	6800
7000	4.1172	2.63004	25.3432	5.22633	50.3611	95.5876	2.2026E 04	3.5533E 04	3.4264E 05	7000
7200	4.1335	2.64363	25.4196	5.25334	50.5130	95.7663	2.2863E 04	3.6772E 04	3.5395E 05	7200
7400	4.1511	2.65762	25.4943	5.28113	50.6614	95.9425	2.3717E 04	3.8042E 04	3.6527E 05	7400
7600	4.1699	2.67194	25.5673	5.30959	50.8065	96.1161	2.4586E 04	3.9311E 04	3.7677E 05	7600
7800	4.1898	2.68654	25.6388	5.33860	50.9484	96.2870	2.5471E 04	4.0572E 04	3.8821E 05	7800
8000	4.2110	2.70136	25.7087	5.36804	51.0875	96.4555	2.6371E 04	4.1817E 04	3.9940E 05	8000
8200	4.2333	2.71633	25.7773	5.39780	51.2238	96.6216	2.7285E 04	4.3102E 04	4.0979E 05	8200
8400	4.2568	2.73141	25.8446	5.42776	51.3574	96.7852	2.8213E 04	4.4408E 04	4.2113E 05	8400
8600	4.2813	2.74655	25.9106	5.45784	51.4886	96.9464	2.9154E 04	4.5744E 04	4.3254E 05	8600
8800	4.3070	2.76169	25.9754	5.48794	51.6174	97.1053	3.0107E 04	4.7119E 04	4.4391E 05	8800
9000	4.3338	2.77680	26.0390	5.51796	51.7439	97.2618	3.1071E 04	4.8554E 04	4.5535E 05	9000
9200	4.3615	2.79183	26.1016	5.54782	51.8682	97.4160	3.2044E 04	4.9930E 04	4.6681E 05	9200
9400	4.3903	2.80674	26.1631	5.57745	51.9905	97.5679	3.3031E 04	5.1313E 04	4.7831E 05	9400
9600	4.4201	2.82149	26.2237	5.60677	52.1107	97.7175	3.4024E 04	5.2704E 04	4.8984E 05	9600
9800	4.4509	2.83606	26.2832	5.63573	52.2291	97.8648	3.5024E 04	5.4103E 04	5.0140E 05	9800
10000	4.4824	2.85042	26.3418	5.66426	52.3456	98.0096	3.6035E 04	5.5510E 04	5.1299E 05	10000
10500	4.5149	2.86454	26.3996	5.69231	52.4603	98.1526	3.7051E 04	5.6923E 04	5.2466E 05	10500
11000	4.5487	2.87844	26.4562	5.72007	52.5737	98.2938	3.8081E 04	5.8341E 04	5.3640E 05	11000
11500	4.5833	2.89222	26.5118	5.74753	52.6858	98.4332	3.9124E 04	5.9764E 04	5.4821E 05	11500
12000	4.6187	2.90587	26.5664	5.77469	52.7966	98.5709	4.0180E 04	6.1193E 04	5.6008E 05	12000
12500	4.6549	2.91939	26.6199	5.80156	52.9061	98.7069	4.1248E 04	6.2616E 04	5.7201E 05	12500
13000	4.6919	2.93277	26.6723	5.82813	53.0143	98.8413	4.2328E 04	6.4074E 04	5.8400E 05	13000
13500	4.7296	2.94602	26.7236	5.85440	53.1212	98.9742	4.3419E 04	6.5569E 04	5.9604E 05	13500
14000	4.7679	2.95915	26.7738	5.88037	53.2268	99.1057	4.4521E 04	6.7094E 04	6.0814E 05	14000
14500	4.8066	2.97216	26.8229	5.90604	53.3311	99.2357	4.5634E 04	6.8644E 04	6.2028E 05	14500
15000	4.8457	2.98504	26.8709	5.93141	53.4341	99.3642	4.6758E 04	7.0216E 04	6.3248E 05	15000

TABLE 19. IDEAL GAS FUNCTIONS FOR C 4+ (ATOMIC WEIGHT 12.0099, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS n, l, s. SEE TABLE 63 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^0 - C}{RT}$	$\frac{W^0 - C}{RT} - \frac{W^0 - C}{RT}$	$\ln \frac{W^0 - C}{RT} - \ln \frac{W^0 - C}{RT}$	$\ln \frac{W^0 - C}{RT} - \ln \frac{W^0 - C}{RT}$	$\ln \frac{W^0 - C}{RT} - \ln \frac{W^0 - C}{RT}$	$\ln \frac{W^0 - C}{RT} - \ln \frac{W^0 - C}{RT}$	$\ln \frac{W^0 - C}{RT} - \ln \frac{W^0 - C}{RT}$	TEMP. (°K)		
5000	1.0000	2.50000	21.3565	23.8565	4.96791	42.4389	47.4668	1.4904E 04	2.4040E 04	2.1219E 05	5000
5200	1.0000	2.50000	21.4546	23.9546	4.96791	42.6336	47.6017	1.5500E 04	2.4640E 04	2.2170E 05	5200
5400	1.0000	2.50000	21.5489	24.0489	4.96791	42.8212	47.7892	1.6094E 04	2.5232E 04	2.3123E 05	5400
5600	1.0000	2.50000	21.6398	24.1398	4.96791	43.0019	47.9768	1.6672E 04	2.5824E 04	2.4081E 05	5600
5800	1.0000	2.50000	21.7276	24.2276	4.96791	43.1762	48.1644	1.7246E 04	2.6416E 04	2.5042E 05	5800
6000	1.0000	2.50000	21.8123	24.3123	4.96791	43.3447	48.3520	1.7816E 04	2.7008E 04	2.6007E 05	6000
6200	1.0000	2.50000	21.8943	24.3943	4.96791	43.5076	48.5395	1.8382E 04	2.7600E 04	2.6973E 05	6200
6400	1.0000	2.50000	21.9737	24.4737	4.96791	43.6653	48.7270	1.8944E 04	2.8192E 04	2.7940E 05	6400
6600	1.0000	2.50000	22.0504	24.5504	4.96791	43.8182	48.9145	1.9502E 04	2.8784E 04	2.8907E 05	6600
6800	1.0000	2.50000	22.1252	24.6252	4.96791	43.9665	49.1020	2.0056E 04	2.9376E 04	2.9874E 05	6800
7000	1.0000	2.50000	22.1977	24.6977	4.96791	44.1105	49.2895	2.0606E 04	3.0000E 04	3.0841E 05	7000
7200	1.0000	2.50000	22.2681	24.7681	4.96791	44.2504	49.4770	2.1152E 04	3.0624E 04	3.1808E 05	7200
7400	1.0000	2.50000	22.3364	24.8364	4.96791	44.3859	49.6645	2.1694E 04	3.1248E 04	3.2776E 05	7400
7600	1.0000	2.50000	22.4033	24.9033	4.96791	44.5170	49.8520	2.2232E 04	3.1872E 04	3.3744E 05	7600
7800	1.0000	2.50000	22.4682	24.9682	4.96791	44.6441	50.0395	2.2766E 04	3.2496E 04	3.4712E 05	7800
8000	1.0000	2.50000	22.5315	25.0315	4.96791	44.7678	50.2270	2.3296E 04	3.3120E 04	3.5680E 05	8000
8200	1.0000	2.50000	22.5932	25.0932	4.96791	44.8884	50.4145	2.3822E 04	3.3744E 04	3.6648E 05	8200
8400	1.0000	2.50000	22.6535	25.1535	4.96791	45.0062	50.6020	2.4344E 04	3.4368E 04	3.7616E 05	8400
8600	1.0000	2.50000	22.7123	25.2123	4.96791	45.1213	50.7895	2.4862E 04	3.4992E 04	3.8584E 05	8600
8800	1.0000	2.50000	22.7698	25.2698	4.96791	45.2343	50.9770	2.5376E 04	3.5616E 04	3.9552E 05	8800
9000	1.0000	2.50000	22.8260	25.3260	4.96791	45.3450	51.1645	2.5886E 04	3.6240E 04	4.0520E 05	9000
9200	1.0000	2.50000	22.8809	25.3809	4.96791	45.4528	51.3520	2.6392E 04	3.6864E 04	4.1488E 05	9200
9400	1.0000	2.50000	22.9347	25.4347	4.96791	45.5579	51.5395	2.6894E 04	3.7488E 04	4.2456E 05	9400
9600	1.0000	2.50000	22.9873	25.4873	4.96791	45.6606	51.7270	2.7392E 04	3.8112E 04	4.3424E 05	9600
9800	1.0000	2.50000	23.0389	25.5389	4.96791	45.7613	51.9145	2.7886E 04	3.8736E 04	4.4392E 05	9800
10000	1.0000	2.50000	23.0894	25.5894	4.96791	45.8595	52.1020	2.8376E 04	3.9360E 04	4.5360E 05	10000
10500	1.0000	2.50000	23.2113	25.7113	4.96791	46.1264	52.4895	3.1296E 04	4.2280E 04	4.8320E 05	10500
11000	1.0000	2.50000	23.3276	25.8276	4.96791	46.3529	52.8770	3.3706E 04	4.5200E 04	5.1280E 05	11000
11500	1.0000	2.50000	23.4388	25.9388	4.96791	46.5384	53.2645	3.5716E 04	4.7616E 04	5.4240E 05	11500
12000	1.0000	2.50000	23.5452	26.0452	4.96791	46.7082	53.6520	3.7326E 04	5.0032E 04	5.7200E 05	12000
12500	1.0000	2.50000	23.6472	26.1472	4.96791	46.8710	53.9995	3.8736E 04	5.2048E 04	6.0160E 05	12500
13000	1.0000	2.50000	23.7453	26.2453	4.96791	47.0258	54.3070	4.0046E 04	5.4064E 04	6.3120E 05	13000
13500	1.0000	2.50000	23.8396	26.3396	4.96791	47.1733	54.5745	4.1256E 04	5.5680E 04	6.6080E 05	13500
14000	1.0000	2.50000	23.9306	26.4306	4.96791	47.3140	54.8020	4.2366E 04	5.7296E 04	6.9040E 05	14000
14500	1.0000	2.50000	24.0183	26.5183	4.96791	47.4483	55.0095	4.3376E 04	5.8912E 04	7.2000E 05	14500
15000	1.0000	2.50000	24.1030	26.6030	4.96791	47.5767	55.1970	4.4286E 04	6.0528E 04	7.4960E 05	15000
15500	1.0000	2.50000	24.1850	26.6850	4.96791	47.7000	55.3645	4.5196E 04	6.2144E 04	7.7920E 05	15500
16000	1.0000	2.50000	24.2644	26.7644	4.96791	47.8193	55.5120	4.6106E 04	6.3760E 04	8.0880E 05	16000
16500	1.0000	2.50000	24.3413	26.8413	4.96791	47.9346	55.6395	4.6916E 04	6.5376E 04	8.3840E 05	16500
17000	1.0000	2.50000	24.4159	26.9159	4.96791	48.0459	55.7470	4.7726E 04	6.7000E 04	8.6800E 05	17000
17500	1.0000	2.50000	24.4884	26.9884	4.96791	48.1534	55.8345	4.8536E 04	6.8624E 04	8.9760E 05	17500
18000	1.0000	2.50000	24.5588	27.0588	4.96791	48.2570	55.9120	4.9346E 04	7.0248E 04	9.2720E 05	18000
18500	1.0000	2.50000	24.6273	27.1273	4.96791	48.3567	55.9800	5.0156E 04	7.1872E 04	9.5680E 05	18500
19000	1.0000	2.50000	24.6940	27.1940	4.96791	48.4524	56.0385	5.0966E 04	7.3496E 04	9.8640E 05	19000
19500	1.0000	2.50000	24.7589	27.2589	4.96791	48.5441	56.0870	5.1776E 04	7.5120E 04	10.1600E 05	19500

TABLE 19 (CONT.). IDEAL GAS FUNCTIONS FOR C 4+

TEMP. (°K)	PARTI. FUNCT.	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	$\frac{h^2 - \epsilon}{RT}$	TEMP. (°K)
20000	1.0000	2.50000	27.3222	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	20000		
22000	1.0000	2.50000	25.0622	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	22000		
24000	1.0000	2.50000	25.2780	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	24000		
26000	1.0000	2.50000	25.4782	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	26000		
28000	1.0000	2.50000	25.6634	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	28000		
30000	1.0000	2.50000	25.8359	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	30000		
32000	1.0000	2.50000	25.9973	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	32000		
34000	1.0000	2.50000	26.1488	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	34000		
36000	1.0000	2.50000	26.2917	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	36000		
38000	1.0000	2.50000	26.4269	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	38000		
40000	1.0000	2.50000	26.5551	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	40000		
42000	1.0000	2.50000	26.6771	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	42000		
44000	1.0000	2.50000	26.7934	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	44000		
46000	1.0000	2.50000	26.9045	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	46000		
48000	1.0000	2.50000	27.0109	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	48000		
50000	1.0000	2.50000	27.1130	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	50000		
52000	1.0000	2.50000	27.2110	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	52000		
54000	1.0000	2.50000	27.3058	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	54000		
56000	1.0000	2.50000	27.3977	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	56000		
58000	1.0000	2.50000	27.4868	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	58000		
60000	1.0000	2.50000	27.5734	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	60000		
62000	1.0000	2.50000	27.6578	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	62000		
64000	1.0000	2.50000	27.7401	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	64000		
66000	1.0000	2.50000	27.8205	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	66000		
68000	1.0000	2.50000	27.8991	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	68000		
70000	1.0000	2.50000	27.9760	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	70000		
72000	1.0000	2.50000	28.0514	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	72000		
74000	1.0000	2.50000	28.1254	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	74000		
76000	1.0000	2.50000	28.1982	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	76000		
78000	1.0000	2.50000	28.2700	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	78000		
80000	1.0000	2.50000	28.3408	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	80000		
82000	1.0000	2.50000	28.4107	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	82000		
84000	1.0000	2.50000	28.4798	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	84000		
86000	1.0000	2.50000	28.5481	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	86000		
88000	1.0000	2.50000	28.6157	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	88000		
90000	1.0000	2.50000	28.6826	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	90000		
92000	1.0000	2.50000	28.7489	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	92000		
94000	1.0000	2.50000	28.8147	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	94000		
96000	1.0000	2.50000	28.8800	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	96000		
98000	1.0000	2.50000	28.9449	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	98000		
100000	1.0000	2.50000	29.0094	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	100000		
102000	1.0000	2.50000	29.0736	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	102000		
104000	1.0000	2.50000	29.1375	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	104000		
106000	1.0000	2.50000	29.2012	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	106000		
108000	1.0000	2.50000	29.2647	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	108000		
110000	1.0000	2.50000	29.3281	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	110000		
112000	1.0000	2.50000	29.3914	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	112000		
114000	1.0000	2.50000	29.4546	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	114000		
116000	1.0000	2.50000	29.5178	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	116000		
118000	1.0000	2.50000	29.5809	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	118000		
120000	1.0000	2.50000	29.6440	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	120000		
122000	1.0000	2.50000	29.7071	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	122000		
124000	1.0000	2.50000	29.7702	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	124000		
126000	1.0000	2.50000	29.8333	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	126000		
128000	1.0000	2.50000	29.8964	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	128000		
130000	1.0000	2.50000	29.9595	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	130000		
132000	1.0000	2.50000	30.0226	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	132000		
134000	1.0000	2.50000	30.0857	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	134000		
136000	1.0000	2.50000	30.1488	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	136000		
138000	1.0000	2.50000	30.2119	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	138000		
140000	1.0000	2.50000	30.2750	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	140000		
142000	1.0000	2.50000	30.3381	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	142000		
144000	1.0000	2.50000	30.4012	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	144000		
146000	1.0000	2.50000	30.4643	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	146000		
148000	1.0000	2.50000	30.5274	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	148000		
150000	1.0000	2.50000	30.5905	4.96791	49.2939	56.7673	5.9615E 04	9.9358E 04	9.8652E 05	9.8652E 05	150000		

TABLE 20. IDEAL GAS FUNCTIONS FOR N₂ (ATOMIC WEIGHT 14.0045, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N=4. SEE TABLE 64 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	TEMP. (°K)
8000	2.0000	22.7600	24.7402	4.96791	4.96791	49.2424	1.4904E 04	2.4840E 04	2.2137E 05	5000
8200	2.0000	22.7600	24.7402	4.96791	4.96791	49.2424	1.4904E 04	2.4840E 04	2.2137E 05	5200
8400	2.0000	22.7600	24.7402	4.96791	4.96791	49.2424	1.4904E 04	2.4840E 04	2.2137E 05	5400
8600	2.0000	22.7600	24.7402	4.96791	4.96791	49.2424	1.4904E 04	2.4840E 04	2.2137E 05	5600
8800	2.0000	22.7600	24.7402	4.96791	4.96791	49.2424	1.4904E 04	2.4840E 04	2.2137E 05	5800
6000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	6000
6200	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	6200
6400	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	6400
6600	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	6600
6800	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	6800
7000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	7000
7200	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	7200
7400	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	7400
7600	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	7600
7800	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	7800
8000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	8000
8200	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	8200
8400	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	8400
8600	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	8600
8800	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	8800
9000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	9000
9200	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	9200
9400	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	9400
9600	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	9600
9800	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	9800
10000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	10000
10500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	10500
11000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	11000
11500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	11500
12000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	12000
12500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	12500
13000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	13000
13500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	13500
14000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	14000
14500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	14500
15000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	15000
15500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	15500
16000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	16000
16500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	16500
17000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	17000
17500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	17500
18000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	18000
18500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	18500
19000	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	19000
19500	2.0000	22.7600	25.2360	4.96791	4.96791	45.1482	1.7884E 04	2.9807E 04	2.7108E 05	19500

TABLE 20 (C.C.I.). IDEAL GAS FUNCTIONS FOR H₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	TEMP. (°K)
20000	2.0181	2.5521c	28.3072	5.07157	51.1795	56.2510	6.1680c	04	1.0143c	05	1.0236c	04	20000
22000	2.0308	2.57985	28.5794	5.12660	51.6453	56.7919	6.9067c	04	1.1279c	05	1.1364c	04	22000
24000	2.0477	2.61266	28.8360	5.19178	52.1141	57.3059	7.6911c	04	1.2400c	05	1.2507c	04	24000
26000	2.0692	2.65926	29.0852	5.26852	52.5825	57.7971	8.5211c	04	1.3480c	05	1.3608c	04	26000
28000	2.0952	2.68827	29.3219	5.34203	52.9255	58.2675	9.3934c	04	1.4520c	05	1.4674c	04	28000
30000	2.1255	2.72832	29.5488	5.42163	53.2968	58.7104	1.0303c	05	1.4269c	05	1.4969c	04	30000
32000	2.1598	2.76825	29.7661	5.50097	53.6492	59.1502	1.1244c	05	1.7403c	05	1.7164c	04	32000
34000	2.1978	2.80708	29.9739	5.57814	53.9850	59.5632	1.2209c	05	1.8548c	05	1.8355c	04	34000
36000	2.2391	2.84510	30.1725	5.65169	54.3060	59.9577	1.3192c	05	2.0344c	05	1.9550c	04	36000
38000	2.2833	2.87877	30.3618	5.72060	54.6134	60.3340	1.4187c	05	2.1730c	05	2.0753c	04	38000
40000	2.3300	2.91078	30.5423	5.78520	54.9085	60.6927	1.5186c	05	2.3137c	05	2.1943c	04	40000
42000	2.3789	2.93924	30.7142	5.84614	55.1921	61.0343	1.6191c	05	2.4537c	05	2.3181c	04	42000
44000	2.4298	2.96420	30.8776	5.90333	55.4651	61.3584	1.7192c	05	2.5924c	05	2.4402c	04	44000
46000	2.4817	2.98660	31.0337	5.95802	55.7282	61.6650	1.8187c	05	2.7292c	05	2.5632c	04	46000
48000	2.5351	3.01024	31.1820	5.99185	55.9819	61.9537	1.9174c	05	2.8613c	05	2.6811c	04	48000
50000	2.5894	3.02828	31.3233	6.01769	56.2268	62.2445	2.0153c	05	3.0008c	05	2.8113c	04	50000
60000	2.8678	3.08586	31.9388	6.13211	57.3556	63.4677	2.4870c	05	3.6193c	05	3.4401c	04	60000
70000	3.1448	3.10623	32.4367	6.17259	58.2846	64.4572	2.9290c	05	4.3202c	05	4.0799c	04	70000
80000	3.4109	3.10817	32.8537	6.17645	59.1093	65.2897	3.3344c	05	4.9412c	05	4.7287c	04	80000
90000	3.6634	3.10411	33.2155	6.16038	59.8363	66.0047	3.7631c	05	5.5815c	05	5.3853c	04	90000
100000	3.9035	3.10159	33.5199	6.16336	60.4989	66.6493	4.1762c	05	6.1634c	05	6.0065c	04	100000
150000	5.0373	3.19264	34.8996	6.34431	63.0070	69.3517	6.5357c	05	9.3169c	05	9.4910c	04	150000
200000	6.3124	3.30824	36.3401	6.73300	64.8046	71.6176	9.4917c	05	1.3466c	04	1.2977c	07	200000
300000	9.5481	3.61523	37.6945	7.18407	67.7212	74.9053	1.5591c	04	2.1552c	04	2.0314c	07	300000
400000	13.1851	3.60432	38.1212	7.16239	69.7917	76.9541	2.0701c	04	2.8650c	04	2.7917c	07	400000
500000	16.7101	3.51576	38.5165	6.98640	71.3722	78.3565	2.4934c	04	3.4932c	04	3.5486c	07	500000
600000	19.9450	3.41728	38.8488	6.79070	72.6295	79.4182	2.8821c	04	4.0744c	04	4.3377c	07	600000
800000	25.3502	3.24982	37.5078	6.45813	76.5362	80.9924	3.5782c	04	5.1468c	04	5.9627c	07	800000
1000000	29.5542	3.17235	36.2191	6.21437	78.9477	82.1421	4.2372c	04	6.2144c	04	7.5948c	07	1000000
1500000	36.6311	2.94031	39.6475	5.84289	80.3887	84.2316	5.7936c	04	8.7463c	04	1.1179c	08	1500000
2000000	40.9462	2.83782	40.2781	5.63922	80.0392	85.6704	7.3041c	07	1.1372c	07	1.4609c	08	2000000
3000000	45.8839	2.72596	41.0055	5.49287	82.2796	87.7045	1.0315c	07	1.6273c	07	2.4654c	08	3000000
4000000	48.6128	2.67415	42.1825	5.31399	84.81378	89.1378	1.1307c	07	2.1254c	07	3.3279c	08	4000000
5000000	50.3408	2.64011	42.7753	5.24634	85.0018	90.2419	1.6422c	07	2.8232c	07	4.2591c	08	5000000
6000000	51.5324	2.61119	43.2545	5.20079	85.9538	91.1546	1.9282c	07	3.1209c	07	5.1572c	08	6000000
8000000	53.0680	2.58829	44.0031	49.5914	87.4414	92.5847	2.5590c	07	4.1147c	07	6.9953c	08	8000000
10000000	54.0147	2.57082	44.5786	5.10864	88.5851	93.6937	3.1215c	07	5.1086c	07	8.8985c	08	10000000

TABLE 71. IDEAL GAS FUNCTIONS FOR O ⁴⁺ (ATOMIC WEIGHT 15.9972, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S. SEE TABLE 65 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNC.	$\ln \frac{Z}{RT}$	$\ln \frac{Z}{RT} - \frac{E_0}{RT}$	$\frac{E_0}{RT}$	$\frac{E_0}{RT} - \frac{E_1}{RT}$	$\frac{E_1}{RT}$	$\frac{E_1}{RT} - \frac{E_2}{RT}$	$\frac{E_2}{RT}$	$\frac{E_2}{RT} - \frac{E_3}{RT}$	$\frac{E_3}{RT}$	$\frac{E_3}{RT} - \frac{E_4}{RT}$	$\frac{E_4}{RT}$	$\frac{E_4}{RT} - \frac{E_5}{RT}$	$\frac{E_5}{RT}$	TEMP. (°K)
5000	1.0000	2.50000	21.7866	24.2666	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	5000		
5200	1.0000	2.50000	21.8667	24.3467	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	5200		
5400	1.0000	2.50000	21.9468	24.4268	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	5400		
5600	1.0000	2.50000	22.0269	24.5069	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	5600		
5800	1.0000	2.50000	22.1070	24.5870	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	5800		
6000	1.0000	2.50000	22.1871	24.6671	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	6000		
6200	1.0000	2.50000	22.2672	24.7472	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	6200		
6400	1.0000	2.50000	22.3473	24.8273	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	6400		
6600	1.0000	2.50000	22.4274	24.9074	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	6600		
6800	1.0000	2.50000	22.5075	24.9875	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	6800		
7000	1.0000	2.50001	22.5876	25.0676	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	7000		
7200	1.0000	2.50001	22.6677	25.1477	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	7200		
7400	1.0000	2.50002	22.7478	25.2278	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	7400		
7600	1.0000	2.50002	22.8279	25.3079	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	7600		
7800	1.0000	2.50003	22.9080	25.3880	4.96791	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	7800		
8000	1.0000	2.50005	22.9881	25.4681	4.96801	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	8000		
8200	1.0000	2.50007	23.0682	25.5482	4.96801	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	8200		
8400	1.0000	2.50009	23.1483	25.6283	4.96810	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	8400		
8600	1.0000	2.50011	23.2284	25.7084	4.96810	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	8600		
8800	1.0000	2.50017	23.3085	25.7885	4.96825	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	8800		
9000	1.0000	2.50022	23.3886	25.8686	4.96836	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	9000		
9200	1.0000	2.50029	23.4687	25.9487	4.96850	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	9200		
9400	1.0000	2.50036	23.5488	26.0288	4.96866	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	9400		
9600	1.0000	2.50048	23.6289	26.1089	4.96887	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	9600		
9800	1.0001	2.50061	23.7090	26.1890	4.96912	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	9800		
10000	1.0001	2.50076	23.7891	26.2691	4.96942	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	10000		
10500	1.0001	2.50127	23.9492	26.4292	4.97043	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	10500		
11000	1.0002	2.50202	24.0693	26.5893	4.97193	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	11000		
11500	1.0003	2.50309	24.2094	26.7494	4.97405	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	11500		
12000	1.0005	2.50454	24.3695	26.9095	4.97694	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	12000		
12500	1.0007	2.50648	24.5496	27.0896	4.98078	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	12500		
13000	1.0010	2.50897	24.7497	27.2897	4.98573	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	13000		
13500	1.0014	2.51210	24.9698	27.5098	4.99196	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	13500		
14000	1.0019	2.51596	25.2099	27.7499	4.99965	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	14000		
14500	1.0025	2.52063	25.4699	28.0099	5.00890	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	14500		
15000	1.0033	2.52617	25.7499	28.2899	5.01992	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	15000		
15500	1.0043	2.53265	26.0499	28.5899	5.03280	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	15500		
16000	1.0054	2.54014	26.3699	28.9099	5.04767	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	16000		
16500	1.0068	2.54864	26.7099	29.2499	5.06461	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	16500		
17000	1.0084	2.55826	27.0699	29.6099	5.08369	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	17000		
17500	1.0103	2.56897	27.4499	29.9899	5.10496	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	17500		
18000	1.0124	2.58079	27.8499	30.3899	5.12845	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	18000		
18500	1.0148	2.59373	28.2699	30.8099	5.15416	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	18500		
19000	1.0176	2.60777	28.7099	31.2499	5.18207	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	19000		
19500	1.0206	2.62291	29.1699	31.7099	5.21215	43.2937	48.2616	1.4906	4.4840	2.4840	2.1647	05	19500		

TABLE 21 (CONT.) IDEAL GAS FUNCTIONS FOR D

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - h^0}{RT}$	$\frac{h^2 - h^0}{RT} - \frac{h^2 - h^0}{RT}$	$\ln \frac{h^2 - h^0}{RT}$	$\ln \frac{h^2 - h^0}{RT} - \ln \frac{h^2 - h^0}{RT}$	$\ln \frac{h^2 - h^0}{RT} - \ln \frac{h^2 - h^0}{RT}$	$\ln \frac{h^2 - h^0}{RT} - \ln \frac{h^2 - h^0}{RT}$	$\ln \frac{h^2 - h^0}{RT} - \ln \frac{h^2 - h^0}{RT}$	$\ln \frac{h^2 - h^0}{RT} - \ln \frac{h^2 - h^0}{RT}$	TEMP. (°K)				
2000	1.0240	2.63910	25.2761	27.9152	5.24433	50.2278	55.4721	6.51436	04	1.04496	05	1.00446	04	20000
2200	1.0412	2.71364	25.5310	28.2446	5.39244	50.7343	56.1268	7.49166	04	1.16636	05	1.11422	04	22000
2400	1.0646	2.80096	25.7708	28.5718	5.56598	51.2108	56.7768	8.58926	04	1.33596	05	1.27916	04	24000
2600	1.0946	2.89660	25.9987	28.8953	5.79903	51.6638	57.4198	9.79906	04	1.56046	05	1.46396	04	26000
2800	1.1314	2.99589	26.2170	29.2129	5.99333	52.0975	58.0509	1.11036	05	1.84696	05	1.73596	04	28000
3000	1.1747	3.09465	26.4271	29.5217	6.14959	52.5150	58.6646	1.24876	05	1.84496	05	1.57546	04	30000
3200	1.2244	3.18956	26.6299	29.8194	6.33822	52.9179	59.2562	1.39236	05	2.02826	05	1.69346	04	32000
3400	1.2801	3.27832	26.8259	30.1043	6.51657	53.3076	59.8221	1.53936	05	2.21506	05	1.81296	04	34000
3600	1.3415	3.35947	27.0157	30.3751	6.67562	53.6844	60.3684	1.68396	05	2.40336	05	1.93246	04	36000
3800	1.4081	3.43235	27.1993	30.6316	6.82066	54.0495	60.8701	1.83676	05	2.59186	05	2.05346	04	38000
4000	1.4794	3.49688	27.3770	30.8739	6.94888	54.4026	61.3515	1.99476	05	2.77946	05	2.17416	04	40000
4200	1.5555	3.55334	27.5490	31.1024	7.06108	54.7445	61.8085	2.13106	05	2.96576	05	2.29976	04	42000
4400	1.6355	3.60237	27.7155	31.3177	7.15830	55.0752	62.2335	2.27536	05	3.14976	05	2.42316	04	44000
4600	1.7193	3.64432	27.8764	31.5209	7.24186	55.3953	62.6372	2.41726	05	3.33136	05	2.54436	04	46000
4800	1.8083	3.68019	28.0324	31.7126	7.31314	55.7051	63.0182	2.55836	05	3.51036	05	2.67386	04	48000
5000	1.8968	3.71037	28.1833	31.8939	7.37352	56.0049	63.3784	2.69326	05	3.68606	05	2.80026	04	50000
6000	2.3875	3.80114	28.8691	32.6703	7.59349	57.3678	64.9213	3.33986	05	4.53216	05	3.44216	04	60000
7000	2.9254	3.82868	29.4577	33.2664	7.60822	58.5374	66.1496	3.93476	05	5.33386	05	4.09786	04	70000
8000	3.4934	3.82554	29.6690	33.7945	7.60198	59.5333	67.1593	4.49196	05	6.08166	05	4.76436	04	80000
9000	4.0801	3.80922	30.4187	34.2779	7.56955	60.4470	68.0165	5.02416	05	6.81266	05	5.44026	04	90000
10000	4.6790	3.79041	30.8191	34.6095	7.53217	61.2426	68.7747	5.54506	05	7.53226	05	6.12436	04	100000
15000	7.8764	3.82921	32.3535	36.1827	7.60927	64.2918	71.9011	6.43326	05	1.15146	06	9.64316	04	150000
20000	11.9444	4.09588	33.4891	37.5850	8.13919	66.5484	74.6876	1.23046	06	1.42786	06	1.33106	07	200000
30000	24.7781	4.63381	35.2325	39.6643	8.81072	70.0127	78.8235	2.04716	06	2.44326	06	2.10046	07	300000
40000	42.9708	4.35054	36.5022	40.8528	8.64924	72.5360	81.1812	2.66326	06	3.45816	06	2.90146	07	400000
50000	63.6204	4.15519	37.4523	41.6077	8.25705	74.4243	82.6814	3.13496	06	4.12896	06	3.72126	07	500000
60000	84.5443	3.86432	38.1958	42.1876	7.87854	75.8854	83.7741	3.53486	06	4.72716	06	4.55376	07	600000
80000	123.4091	3.66729	39.2981	43.8576	7.28732	78.0789	85.3434	4.24036	06	5.83006	06	6.24416	07	800000
100000	156.4224	3.46202	40.0850	44.3470	6.87960	79.6375	86.5751	4.89246	06	6.87986	06	7.98386	07	1000000
150000	218.7576	3.16290	41.4249	44.5878	6.28520	82.3181	88.6083	6.44706	06	9.42786	06	1.23486	08	1500000
200000	256.1329	3.00422	42.3110	45.3152	5.96988	84.0790	90.0488	7.96546	06	1.19406	07	1.68186	08	2000000
300000	303.3408	2.84043	43.4938	46.3343	5.64440	86.4294	92.0738	1.09726	07	1.69336	07	2.59296	08	3000000
400000	330.3706	2.75682	44.2984	47.0552	5.47825	88.0282	93.5045	1.39646	07	2.19136	07	3.52116	08	4000000
500000	347.8131	2.70614	44.9077	47.6136	5.37756	89.2390	94.6166	1.69526	07	2.68006	07	4.44206	08	5000000
600000	359.9843	2.67216	45.3979	48.0701	5.31003	90.2131	95.5232	1.99376	07	3.16886	07	5.41286	08	6000000
800000	375.8382	2.62947	46.1602	48.7897	5.22518	91.7280	96.9531	2.59046	07	4.18016	07	7.33826	08	8000000
1000000	385.7048	2.60373	46.7440	49.3477	5.17405	92.6880	98.0621	3.16696	07	5.17416	07	9.28886	08	10000000

TABLE 22. IDEAL GAS FUNCTIONS FOR AR 4+ (ATOMIC WEIGHT 39.9460, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 6A FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T} - \frac{h^2}{2\pi m k T}$	$57N$	$\ln \frac{h^2}{2\pi m k T} - \ln \frac{h^2}{2\pi m k T}$	$\ln \frac{h^2}{2\pi m k T} - \ln \frac{h^2}{2\pi m k T}$	$\ln \frac{h^2}{2\pi m k T} - \ln \frac{h^2}{2\pi m k T}$	$\ln \frac{h^2}{2\pi m k T} - \ln \frac{h^2}{2\pi m k T}$	$\ln \frac{h^2}{2\pi m k T} - \ln \frac{h^2}{2\pi m k T}$	TEMP. (°K)	
5000	6-2394	2-88058	24-9902	27-8708	49-6597	58-3899	1-06836	04	2-8421E 04	2-4430E 05	5000
5200	6-3324	2-87337	25-1030	27-9764	5-70985	49-8839	1-9398E 04	04	2-9691E 04	2-5940E 05	5200
5400	6-4214	2-86699	25-2114	28-0764	5-67919	50-0992	2-0034E 04	04	3-0769E 04	2-7054E 05	5400
5600	6-5071	2-86137	25-3155	28-1769	5-65602	50-3061	2-0714E 04	04	3-1842E 04	2-8171E 05	5600
5800	6-5895	2-85642	25-4158	28-2723	5-63617	50-5065	2-1394E 04	04	3-2922E 04	2-9293E 05	5800
6000	6-6691	2-85205	25-5126	28-3647	5-61975	50-7043	2-2082E 04	04	3-4009E 04	3-0419E 05	6000
6200	6-7441	2-84821	25-6061	28-4543	5-60633	50-8935	2-2771E 04	04	3-5091E 04	3-1544E 05	6200
6400	6-8207	2-84482	25-6964	28-5413	5-59531	51-0831	2-3462E 04	04	3-6180E 04	3-2680E 05	6400
6600	6-8932	2-84184	25-7839	28-6258	5-58620	51-2699	2-4154E 04	04	3-7272E 04	3-3814E 05	6600
6800	6-9636	2-83921	25-8687	28-7079	5-57918	51-4544	2-4853E 04	04	3-8365E 04	3-4954E 05	6800
7000	7-0322	2-83689	25-9510	28-7879	5-57373	51-6399	2-5551E 04	04	3-9462E 04	3-6098E 05	7000
7200	7-0990	2-83484	26-0309	28-8657	5-56887	51-8257	2-6252E 04	04	4-0568E 04	3-7244E 05	7200
7400	7-1643	2-83303	26-1085	28-9416	5-56469	52-0117	2-6953E 04	04	4-1680E 04	3-8398E 05	7400
7600	7-2280	2-83142	26-1841	29-0155	5-56115	52-1982	2-7659E 04	04	4-2781E 04	3-9544E 05	7600
7800	7-2904	2-82998	26-2576	29-0876	5-55824	52-3855	2-8363E 04	04	4-3884E 04	4-0699E 05	7800
8000	7-3514	2-82870	26-3292	29-1579	5-55610	52-5725	2-9072E 04	04	4-4996E 04	4-1854E 05	8000
8200	7-4112	2-82755	26-3991	29-2266	5-55453	52-7597	2-9780E 04	04	4-6074E 04	4-3017E 05	8200
8400	7-4699	2-82652	26-4672	29-2937	5-55347	52-9471	3-0489E 04	04	4-7191E 04	4-4180E 05	8400
8600	7-5274	2-82558	26-5337	29-3593	5-55288	53-1347	3-1198E 04	04	4-8280E 04	4-5346E 05	8600
8800	7-5839	2-82471	26-5986	29-4233	5-55265	53-3225	3-1909E 04	04	4-9394E 04	4-6513E 05	8800
9000	7-6393	2-82392	26-6621	29-4860	5-55266	53-5104	3-2620E 04	04	5-0504E 04	4-7686E 05	9000
9200	7-6938	2-82319	26-7242	29-5473	5-55281	53-7003	3-3331E 04	04	5-1613E 04	4-8857E 05	9200
9400	7-7475	2-82250	26-7849	29-6074	5-55307	53-8924	3-4043E 04	04	5-2722E 04	5-0030E 05	9400
9600	7-8002	2-82184	26-8443	29-6661	5-55344	54-0867	3-4755E 04	04	5-3832E 04	5-1210E 05	9600
9800	7-8521	2-82122	26-9025	29-7231	5-55390	54-2831	3-5467E 04	04	5-4941E 04	5-2390E 05	9800
10000	7-9031	2-82063	26-9594	29-7801	5-55445	54-4815	3-6179E 04	04	5-6051E 04	5-3572E 05	10000
10500	8-0275	2-81921	27-0970	29-9162	5-55523	54-6819	3-7592E 04	04	5-8232E 04	5-6239E 05	10500
11000	8-1473	2-81784	27-2282	30-0450	5-55620	54-8843	3-9738E 04	04	6-1592E 04	5-9312E 05	11000
11500	8-2630	2-81647	27-3534	30-1698	5-55739	55-0887	4-1511E 04	04	6-4349E 04	6-2509E 05	11500
12000	8-3748	2-81508	27-4732	30-2883	5-55879	55-2951	4-3282E 04	04	6-7120E 04	6-5913E 05	12000
12500	8-4830	2-81364	27-5861	30-4017	5-56031	55-5034	4-5050E 04	04	6-9890E 04	6-9520E 05	12500
13000	8-5877	2-81215	27-6984	30-5106	5-56194	55-7136	4-6814E 04	04	7-2647E 04	7-1554E 05	13000
13500	8-6892	2-81061	27-8045	30-6151	5-56368	55-9257	4-8579E 04	04	7-5400E 04	7-4590E 05	13500
14000	8-7877	2-80902	27-9067	30-7157	5-56553	56-1398	5-0329E 04	04	7-8140E 04	7-7637E 05	14000
14500	8-8832	2-80739	28-0053	30-8127	5-56747	56-3561	5-2079E 04	04	8-0892E 04	8-0694E 05	14500
15000	8-9760	2-80572	28-1004	30-9061	5-56949	56-5744	5-3824E 04	04	8-3632E 04	8-3760E 05	15000
15500	9-0662	2-80403	28-1924	30-9964	5-57158	56-7946	5-5544E 04	04	8-6367E 04	8-6836E 05	15500
16000	9-1539	2-80233	28-2814	31-0837	5-57374	57-0168	5-7204E 04	04	8-9099E 04	8-9920E 05	16000
16500	9-2392	2-80062	28-3676	31-1682	5-57596	57-2409	5-8939E 04	04	9-1827E 04	9-3012E 05	16500
17000	9-3223	2-79893	28-4512	31-2501	5-57824	57-4669	6-0711E 04	04	9-4553E 04	9-6113E 05	17000
17500	9-4032	2-79726	28-5323	31-3295	5-58056	57-6944	6-2500E 04	04	9-7276E 04	9-9232E 05	17500
18000	9-4820	2-79562	28-6111	31-4067	5-58292	57-9234	6-4310E 04	04	1-0034E 05	1-0234E 06	18000
18500	9-5590	2-79404	28-6876	31-4817	5-58532	58-1538	6-6159E 04	04	1-0272E 05	1-0494E 06	18500
19000	9-6340	2-79252	28-7621	31-5546	5-58785	58-3856	6-8049E 04	04	1-0549E 05	1-0809E 06	19000
19500	9-7073	2-79106	28-8346	31-6257	5-59043	58-6189	6-9980E 04	04	1-0819E 05	1-1173E 06	19500

TABLE 22 (CONT.). IDEAL GAS FUNCTIONS FOR AR

TEMP. (°K)	PARTIT. FUNC.	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	$\frac{h^2}{2\pi m k T}$	TEMP. (°K)
2000	9.7789	2.78970	28.9053	31.6990	57.4305	62.9832	7.1120E 04	1.1807E 05	1.1807E 05	1.1400E 06	20000	
2200	10.0505	2.78524	29.1709	31.9542	57.9674	63.5822	7.0847E 04	1.2176E 05	1.2176E 05	1.2751E 06	22000	
2400	10.3018	2.78282	29.4132	32.1960	58.4480	63.9748	8.5024E 04	1.3272E 05	1.4827E 06	24000		
2600	10.5375	2.78284	29.6359	32.4187	58.8914	64.4216	9.9350E 04	1.4372E 05	1.5312E 06	26000		
2800	10.7616	2.78554	29.8422	32.6278	59.3634	64.8368	9.9350E 04	1.5499E 05	1.6604E 06	28000		
3000	10.9776	2.79116	30.0346	32.8237	59.8637	65.2822	1.0637E 05	1.6639E 05	1.7995E 06	30000		
3200	11.1887	2.79971	30.2150	33.0167	60.3801	65.7664	1.1444E 05	1.7893E 05	1.9213E 06	32000		
3400	11.3978	2.81128	30.3850	33.1965	60.9011	66.2822	1.2238E 05	1.8996E 05	2.0529E 06	34000		
3600	11.6059	2.82589	30.5461	33.3720	61.4282	66.8353	1.3042E 05	2.0216E 05	2.1852E 06	36000		
3800	11.8106	2.84354	30.6994	33.5429	61.9607	67.4216	1.3821E 05	2.1472E 05	2.3182E 06	38000		
4000	12.0349	2.86427	30.8457	33.7100	62.4956	68.0368	1.4612E 05	2.2707E 05	2.4519E 06	40000		
4200	12.2576	2.88808	30.9840	33.8741	63.1244	68.6832	1.5426E 05	2.4104E 05	2.5861E 06	42000		
4400	12.4805	2.91497	31.1210	34.0360	63.7552	69.3516	1.6264E 05	2.5487E 05	2.7211E 06	44000		
4600	12.7232	2.94484	31.2512	34.1962	64.3809	70.0432	1.7135E 05	2.6820E 05	2.8567E 06	46000		
4800	12.9816	2.97748	31.3773	34.3552	64.9975	70.7526	1.8047E 05	2.8109E 05	2.9929E 06	48000		
5000	13.2469	3.01405	31.4995	34.5136	65.6992	71.4892	1.9011E 05	2.9347E 05	3.1297E 06	50000		
6000	14.8223	3.23631	32.0677	35.3040	66.3109	73.239	2.6444E 05	3.8587E 05	3.8234E 06	60000		
7000	16.9413	3.51031	32.5867	36.0970	66.97556	74.97308	3.4919E 05	4.8827E 05	4.5329E 06	70000		
8000	19.7594	3.80020	33.0744	36.8748	67.55163	76.7260	4.4516E 05	6.0413E 05	5.2379E 06	80000		
9000	23.3984	4.06969	33.5379	37.6076	68.08715	78.4926	5.4900E 05	7.2704E 05	5.9981E 06	90000		
10000	27.9424	4.29458	33.9788	38.2734	68.5948	80.2555	6.5449E 05	8.5340E 05	6.7522E 06	100000		
15000	44.7184	4.71032	35.8324	40.5427	71.2049	80.5650	1.1040E 06	1.5040E 06	1.0881E 07	150000		
20000	120.5037	4.56827	37.1732	41.7415	73.4893	82.9472	1.4181E 06	1.8158E 06	1.4374E 07	200000		
30000	255.7587	4.12508	38.9394	43.0845	77.3791	85.5765	1.8430E 06	2.4592E 06	1.8214E 07	300000		
40000	389.2408	3.79959	40.0786	43.8782	79.6428	87.1932	2.2233E 06	3.0202E 06	2.2414E 07	400000		
50000	507.0526	3.57526	40.9089	44.4761	81.2788	88.3816	2.5597E 06	3.5523E 06	2.6031E 07	500000		
60000	607.7148	3.41471	41.5378	44.9525	82.5424	89.3280	2.8791E 06	4.0714E 06	2.9524E 07	600000		
80000	765.9948	3.20262	42.4184	45.6910	84.3413	90.7957	3.5014E 06	5.0913E 06	3.7544E 07	800000		
100000	882.4050	3.06967	43.1878	46.2574	85.8212	91.9212	4.1178E 06	5.9999E 06	4.5821E 07	1000000		
15000001000.6634		2.88622	44.3929	47.2792	88.2161	93.9515	5.6223E 06	8.6031E 06	1.3232E 08	15000000		
20000001177.4513		2.79199	45.2091	48.0011	89.8379	95.3861	7.1219E 06	1.1094E 07	1.7940E 08	20000000		
30000001298.3037		2.69617	46.3205	49.0186	92.0464	97.4041	1.0112E 07	1.5073E 07	2.7614E 08	30000000		
40000001363.6903		2.64768	47.0888	49.7465	93.5732	98.4346	1.3097E 07	2.1044E 07	3.7429E 08	40000000		
50000001404.6153		2.61841	47.6762	50.2946	94.7405	99.9438	1.6090E 07	2.6016E 07	4.7370E 08	50000000		
60000001432.6309		2.59882	48.1518	50.7506	95.6855	100.8498	1.9093E 07	3.0984E 07	5.7411E 08	60000000		
80000001466.4973		2.57425	48.6957	51.4700	97.1639	102.2793	2.5024E 07	4.0924E 07	7.7731E 08	80000000		
100000001490.4790		2.55946	49.4684	52.0279	98.3019	103.3680	3.0969E 07	5.0846E 07	9.8302E 08	100000000		

TABLE 23. IDEAL GAS FUNCTIONS FOR C₅ (ATOMIC HEIGHT 12.0084, R = 1.9871) CAL/MOLE. BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S,K. SEE TABLE 67 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W-E}{RT}$	$-\frac{F-E}{RT}$	S/R	$(W-E)RT$ CAL/MOLE	$-(F-E)RT$ CAL/MOLE	$\ln \frac{W-E}{RT}$	$\ln \frac{-(F-E)}{RT}$	$\ln \frac{W-E}{RT} - \ln \frac{-(F-E)}{RT}$	$\ln \frac{W-E}{RT} - \ln \frac{-(F-E)}{RT} - \ln \frac{W-E}{RT}$	TEMP. (°K)
5000	2.0000	2.50000	22.0496	24.5496	4.96791	48.7841	1.5904E 04	2.4840E 04	2.4840E 04	2.1909E 05	5000
5200	2.0000	2.50000	22.1476	24.6476	4.96791	48.9789	1.5500E 04	2.4833E 04	2.4833E 04	2.2804E 05	5200
5400	2.0000	2.50000	22.2420	24.7420	4.96791	49.1765	1.6096E 04	2.4827E 04	2.4827E 04	2.3681E 05	5400
5600	2.0000	2.50000	22.3329	24.8329	4.96791	49.3471	1.6692E 04	2.4820E 04	2.4820E 04	2.4522E 05	5600
5800	2.0000	2.50000	22.4206	24.9206	4.96791	49.5335	1.7288E 04	2.4814E 04	2.4814E 04	2.5361E 05	5800
6000	2.0000	2.50000	22.5054	25.0054	4.96791	49.6998	1.7884E 04	2.4807E 04	2.4807E 04	2.6193E 05	6000
6200	2.0000	2.50000	22.5874	25.0874	4.96791	49.8527	1.8481E 04	2.4801E 04	2.4801E 04	2.7025E 05	6200
6400	2.0000	2.50000	22.6667	25.1667	4.96791	50.0105	1.9077E 04	2.4795E 04	2.4795E 04	2.7857E 05	6400
6600	2.0000	2.50000	22.7437	25.2437	4.96791	50.1633	1.9673E 04	2.4789E 04	2.4789E 04	2.8689E 05	6600
6800	2.0000	2.50000	22.8183	25.3183	4.96791	50.3163	2.0269E 04	2.4783E 04	2.4783E 04	2.9521E 05	6800
7000	2.0000	2.50000	22.8908	25.3908	4.96791	50.4677	2.0865E 04	2.4777E 04	2.4777E 04	3.0353E 05	7000
7200	2.0000	2.50000	22.9612	25.4612	4.96791	50.6277	2.1461E 04	2.4771E 04	2.4771E 04	3.1185E 05	7200
7400	2.0000	2.50000	23.0297	25.5297	4.96791	50.7838	2.2057E 04	2.4765E 04	2.4765E 04	3.2017E 05	7400
7600	2.0000	2.50000	23.0964	25.5964	4.96791	50.9363	2.2654E 04	2.4759E 04	2.4759E 04	3.2849E 05	7600
7800	2.0000	2.50000	23.1613	25.6613	4.96791	51.0853	2.3250E 04	2.4753E 04	2.4753E 04	3.3681E 05	7800
8000	2.0000	2.50000	23.2246	25.7246	4.96791	51.2311	2.3846E 04	2.4747E 04	2.4747E 04	3.4513E 05	8000
8200	2.0000	2.50000	23.2863	25.7863	4.96791	51.3738	2.4442E 04	2.4741E 04	2.4741E 04	3.5345E 05	8200
8400	2.0000	2.50000	23.3466	25.8466	4.96791	51.5141	2.5038E 04	2.4735E 04	2.4735E 04	3.6177E 05	8400
8600	2.0000	2.50000	23.4054	25.9054	4.96791	51.6524	2.5634E 04	2.4729E 04	2.4729E 04	3.7009E 05	8600
8800	2.0000	2.50000	23.4629	25.9629	4.96791	51.7893	2.6231E 04	2.4723E 04	2.4723E 04	3.7841E 05	8800
9000	2.0000	2.50000	23.5191	26.0191	4.96791	51.9242	2.6827E 04	2.4717E 04	2.4717E 04	3.8673E 05	9000
9200	2.0000	2.50000	23.5740	26.0740	4.96791	52.0573	2.7423E 04	2.4711E 04	2.4711E 04	3.9505E 05	9200
9400	2.0000	2.50000	23.6278	26.1278	4.96791	52.1893	2.8019E 04	2.4705E 04	2.4705E 04	4.0337E 05	9400
9600	2.0000	2.50000	23.6804	26.1804	4.96791	52.3208	2.8615E 04	2.4699E 04	2.4699E 04	4.1169E 05	9600
9800	2.0000	2.50000	23.7319	26.2319	4.96791	52.4513	2.9211E 04	2.4693E 04	2.4693E 04	4.2001E 05	9800
10000	2.0000	2.50000	23.7825	26.2825	4.96791	52.5813	2.9807E 04	2.4687E 04	2.4687E 04	4.2833E 05	10000
10500	2.0000	2.50000	24.0044	26.4044	4.96791	52.8700	3.1298E 04	2.4681E 04	2.4681E 04	4.4365E 05	10500
11000	2.0000	2.50000	24.2207	26.5207	4.96791	53.1582	3.2789E 04	2.4675E 04	2.4675E 04	4.5897E 05	11000
11500	2.0000	2.50000	24.4319	26.6319	4.96791	53.4461	3.4279E 04	2.4669E 04	2.4669E 04	4.7429E 05	11500
12000	2.0000	2.50000	24.6383	26.7383	4.96791	53.7333	3.5769E 04	2.4663E 04	2.4663E 04	4.8961E 05	12000
12500	2.0000	2.50000	24.8403	26.8403	4.96791	54.0208	3.7259E 04	2.4657E 04	2.4657E 04	5.0493E 05	12500
13000	2.0000	2.50000	24.9384	26.9384	4.96791	54.3077	3.8749E 04	2.4651E 04	2.4651E 04	5.2025E 05	13000
13500	2.0000	2.50000	25.0327	27.0327	4.96791	54.5946	4.0239E 04	2.4645E 04	2.4645E 04	5.3557E 05	13500
14000	2.0000	2.50000	25.1236	27.1236	4.96791	54.8811	4.1729E 04	2.4639E 04	2.4639E 04	5.5089E 05	14000
14500	2.0000	2.50000	25.2114	27.2114	4.96791	55.1675	4.3219E 04	2.4633E 04	2.4633E 04	5.6621E 05	14500
15000	2.0000	2.50000	25.2961	27.2961	4.96791	55.4540	4.4709E 04	2.4627E 04	2.4627E 04	5.8153E 05	15000
15500	2.0000	2.50000	25.3781	27.3781	4.96791	55.7404	4.6199E 04	2.4621E 04	2.4621E 04	5.9685E 05	15500
16000	2.0000	2.50000	25.4575	27.4575	4.96791	56.0268	4.7689E 04	2.4615E 04	2.4615E 04	6.1217E 05	16000
16500	2.0000	2.50000	25.5344	27.5344	4.96791	56.3133	4.9179E 04	2.4609E 04	2.4609E 04	6.2749E 05	16500
17000	2.0000	2.50000	25.6090	27.6090	4.96791	56.6007	5.0669E 04	2.4603E 04	2.4603E 04	6.4281E 05	17000
17500	2.0000	2.50000	25.6815	27.6815	4.96791	56.8877	5.2159E 04	2.4597E 04	2.4597E 04	6.5813E 05	17500
18000	2.0000	2.50000	25.7519	27.7519	4.96791	57.1751	5.3649E 04	2.4591E 04	2.4591E 04	6.7345E 05	18000
18500	2.0000	2.50000	25.8204	27.8204	4.96791	57.4625	5.5139E 04	2.4585E 04	2.4585E 04	6.8877E 05	18500
19000	2.0000	2.50000	25.8871	27.8871	4.96791	57.7500	5.6629E 04	2.4579E 04	2.4579E 04	7.0409E 05	19000
19500	2.0000	2.50000	25.9520	27.9520	4.96791	58.0374	5.8119E 04	2.4573E 04	2.4573E 04	7.1941E 05	19500

TABLE 23 (CONT.). IDEAL GAS FUNCTIONS FOR C 5*

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{RT}$	$-\frac{h^2}{RT}$	$\frac{5R}{2}$	$(h^2 - \frac{5R}{2})T$ -- CAL/MOLE --	$\frac{5}{2}$	$h^2 - \frac{5R}{2}$	$h^2 - \frac{5R}{2}$ -- CAL/MOLE --	$-\ln \frac{h^2 - \frac{5R}{2}}{h^2 - \frac{5R}{2}}$	TEMP. (°K)	
20000	2.0000	2.50000	25.5153	28.0153	4.96791	50.7032	55.6711	5.96156 04	9.93586 04	1.01416 04	20000
22000	2.0000	2.50000	25.7536	28.2536	4.96791	51.1767	56.1446	6.02296 05	1.09296 05	1.12596 04	22000
24000	2.0000	2.50000	25.9711	28.4711	4.96791	51.6089	56.5768	7.15366 04	1.19236 05	1.23606 04	24000
26000	2.0000	2.50000	26.1712	28.6712	4.96791	52.0066	56.9745	7.74996 04	1.29176 05	1.34226 04	26000
28000	2.0000	2.50000	26.3565	28.8565	4.96791	52.3747	57.3426	8.34616 04	1.39106 05	1.44686 04	28000
30000	2.0000	2.50000	26.5290	29.0290	4.96791	52.7175	57.6954	8.94236 04	1.49046 05	1.54916 04	30000
32000	2.0000	2.50000	26.6903	29.1903	4.96791	53.0381	58.0680	9.53856 04	1.58976 05	1.64926 04	32000
34000	2.0000	2.50000	26.8419	29.3419	4.96791	53.3393	58.3672	1.01336 05	1.68916 05	1.74736 04	34000
36000	2.0000	2.50000	26.9848	29.4848	4.96791	53.6232	58.5911	1.07316 05	1.78846 05	1.84386 04	36000
38000	2.0000	2.50000	27.1200	29.6200	4.96791	53.8916	58.8597	1.13276 05	1.88786 05	1.94496 04	38000
40000	2.0000	2.50000	27.2482	29.7482	4.96791	54.1467	59.1146	1.19236 05	1.98726 05	2.04596 04	40000
42000	2.0000	2.50000	27.3702	29.8702	4.96791	54.3890	59.3570	1.25196 05	2.08656 05	2.14636 04	42000
44000	2.0000	2.50000	27.4865	29.9865	4.96791	54.6201	59.5881	1.31156 05	2.18596 05	2.24636 04	44000
46000	2.0000	2.50000	27.5976	30.0976	4.96791	54.8410	59.8089	1.37116 05	2.28526 05	2.34576 04	46000
48000	2.0000	2.50000	27.7040	30.2040	4.96791	55.0524	60.0203	1.43086 05	2.38456 05	2.44476 04	48000
50000	2.0000	2.50000	27.8060	30.3060	4.96791	55.2552	60.2231	1.49046 05	2.48386 05	2.54336 04	50000
60000	2.0000	2.50000	28.2619	30.7619	4.96791	56.1289	61.1289	1.78846 05	2.96776 05	3.30976 04	60000
70000	2.0000	2.50000	28.6472	31.1472	4.96791	56.9266	61.8947	2.08656 05	3.47756 05	3.98496 04	70000
80000	2.0000	2.50000	28.9811	31.4811	4.96791	57.5902	62.5581	2.38456 05	3.97436 05	4.60726 04	80000
90000	2.0000	2.50000	29.2755	31.7755	4.96791	58.1437	63.1437	2.68276 05	4.47116 05	5.23586 04	90000
100000	2.0000	2.50000	29.5389	32.0389	4.96791	58.6967	63.6466	2.98076 05	4.96796 05	5.86996 04	100000
200000	2.0000	2.50000	30.5526	33.0526	4.96791	60.7130	65.4809	4.71156 05	7.45176 05	9.10706 04	200000
300000	2.0000	2.50000	31.2718	33.7718	4.96791	62.1422	67.1101	5.91586 05	9.91586 05	1.24206 07	300000
400000	2.0000	2.50000	32.2854	34.7854	4.96801	64.1565	69.1245	8.94236 05	1.49046 06	1.82476 07	400000
500000	2.0000	2.50172	33.0048	35.5048	4.97132	65.5860	70.5573	1.19376 06	1.98876 06	2.62346 07	500000
600000	2.0031	2.51442	33.5640	36.0785	4.99656	66.6973	71.6939	1.50476 06	2.49836 06	3.33496 07	600000
800000	2.0149	2.55916	34.0258	36.5649	5.08546	67.6148	72.7803	1.85986 06	3.05136 06	4.05096 07	800000
1000000	2.1120	2.62370	34.7920	37.6157	5.61116	69.1375	74.7487	2.89976 06	4.48096 06	5.53106 07	1000000
1500000	2.3822	3.29156	35.4702	38.7618	6.54088	70.4852	77.0261	4.55376 06	6.54096 06	7.04856 07	1500000
2000000	4.0007	4.16599	37.0024	41.1684	8.278.1	73.5298	81.8083	9.43706 06	1.24106 07	1.10296 08	2000000
3000000	6.6124	4.25275	38.2240	42.4768	8.45091	75.9575	84.4084	1.29276 07	1.49026 07	1.51916 08	3000000
4000000	12.8820	3.91838	39.8889	43.8073	7.78447	79.2469	87.0524	2.33586 07	2.33586 07	2.37806 08	4000000
5000000	18.2820	3.62155	40.9759	44.8016	7.20853	81.6219	88.4304	2.88856 07	2.88856 07	3.25406 08	5000000
6000000	22.9775	3.42599	41.7403	45.1863	6.82860	82.9817	89.7927	3.44046 07	3.44046 07	4.14926 08	6000000
8000000	26.8423	3.28297	42.3718	45.6596	6.52800	84.1994	90.7232	2.72206 07	3.91496 07	5.05206 08	8000000
10000000	32.4979	3.09836	43.2881	46.3845	6.15298	86.0207	92.1737	3.33276 07	4.92246 07	6.08176 08	10000000
15000000	36.0579	2.98092	43.9658	46.9467	5.92357	87.3672	93.2908	3.93646 07	5.92346 07	6.73676 08	15000000

TABLE 24. IDEAL GAS FUNCTIONS FOR N 5+ (ATOMIC WEIGHT 14.0039, R = 1.90717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N S 4. SEE TABLE 68 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W_0 E_0}{RT}$	$\frac{W_0 E_0}{RT} - \frac{F_0 E_0}{RT}$	$\frac{S_0}{R}$	$\ln \frac{W_0 E_0 - W_0 E_0}{RT} - \ln \frac{W_0 E_0}{RT}$	$F_0 - E_0$	$\frac{W_0 E_0}{RT} - \frac{F_0 E_0}{RT}$	$\frac{W_0 E_0}{RT} - \frac{F_0 E_0}{RT} - \frac{W_0 E_0}{RT}$	$\frac{W_0 E_0}{RT} - \frac{F_0 E_0}{RT} - \frac{W_0 E_0}{RT}$	TEMP. (°K)
5000	1.0000	2.50000	21.5876	24.0870	47.0649	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	5000
5200	1.0000	2.50000	21.6851	24.1851	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	5200
5400	1.0000	2.50000	21.7794	24.2794	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	5400
5600	1.0000	2.50000	21.8704	24.3704	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	5600
5800	1.0000	2.50000	21.9581	24.4581	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	5800
6000	1.0000	2.50000	22.0428	24.5428	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	6000
6200	1.0000	2.50000	22.1248	24.6248	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	6200
6400	1.0000	2.50000	22.2042	24.7042	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	6400
6600	1.0000	2.50000	22.2811	24.7811	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	6600
6800	1.0000	2.50000	22.3557	24.8557	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	6800
7000	1.0000	2.50000	22.4282	24.9282	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	7000
7200	1.0000	2.50000	22.4986	24.9986	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	7200
7400	1.0000	2.50000	22.5671	25.0671	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	7400
7600	1.0000	2.50000	22.6338	25.1338	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	7600
7800	1.0000	2.50000	22.6987	25.1987	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	7800
8000	1.0000	2.50000	22.7620	25.2620	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	8000
8200	1.0000	2.50000	22.8238	25.3238	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	8200
8400	1.0000	2.50000	22.8840	25.3840	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	8400
8600	1.0000	2.50000	22.9428	25.4428	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	8600
8800	1.0000	2.50000	23.0003	25.5003	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	8800
9000	1.0000	2.50000	23.0565	25.5565	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	9000
9200	1.0000	2.50000	23.1114	25.6114	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	9200
9400	1.0000	2.50000	23.1652	25.6652	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	9400
9600	1.0000	2.50000	23.2178	25.7178	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	9600
9800	1.0000	2.50000	23.2694	25.7694	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	9800
10000	1.0000	2.50000	23.3199	25.8199	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	10000
10500	1.0000	2.50000	23.4319	25.9319	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	10500
11000	1.0000	2.50000	23.5382	26.0382	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	11000
11500	1.0000	2.50000	23.6403	26.1403	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	11500
12000	1.0000	2.50000	23.7377	26.2377	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	12000
12500	1.0000	2.50000	23.8319	26.3319	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	12500
13000	1.0000	2.50000	23.9228	26.4228	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	13000
13500	1.0000	2.50000	24.0114	26.5114	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	13500
14000	1.0000	2.50000	24.0987	26.5987	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	14000
14500	1.0000	2.50000	24.1848	26.6848	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	14500
15000	1.0000	2.50000	24.2698	26.7698	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	15000
15500	1.0000	2.50000	24.3536	26.8536	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	15500
16000	1.0000	2.50000	24.4362	26.9362	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	16000
16500	1.0000	2.50000	24.5178	27.0178	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	16500
17000	1.0000	2.50000	24.5985	27.0985	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	17000
17500	1.0000	2.50000	24.6784	27.1784	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	17500
18000	1.0000	2.50000	24.7576	27.2576	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	18000
18500	1.0000	2.50000	24.8361	27.3361	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	18500
19000	1.0000	2.50000	24.9140	27.4140	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	19000
19500	1.0000	2.50000	24.9914	27.4914	47.0679	1.4904E 04	2.4840E 04	2.1640E 05	2.1640E 05	19500

TABLE 24 (CONT.). IDEAL GAS FUNCTIONS FOR $n = 5/2$

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - kT}{RT}$	$\ln \frac{h^2 - kT}{RT}$	$\ln \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT}$	$\ln \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT}$	$\ln \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT}$	$\ln \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT} - \frac{h^2 - kT}{RT}$	TEMP. (°K)		
20000	1.0000	2.50000	27.5528	4.96791	49.7840	54.7519	5.9619E 04	9.9338E 04	9.9546E 05	20000
22000	1.0000	2.50000	25.2910	4.96791	50.2575	55.2234	6.5570E 04	1.0929E 05	1.1097E 06	22000
24000	1.0000	2.50000	25.5086	4.96791	50.6497	55.6577	7.1530E 04	1.1923E 05	1.2164E 06	24000
26000	1.0000	2.50000	25.7087	4.96791	51.0791	56.0553	7.7499E 04	1.2917E 05	1.3283E 06	26000
28000	1.0000	2.50000	25.8939	4.96791	51.5456	56.4325	8.3461E 04	1.3910E 05	1.4408E 06	28000
30000	1.0000	2.50000	26.0644	4.96791	51.9983	56.7842	8.9422E 04	1.4904E 05	1.5539E 06	30000
32000	1.0000	2.50000	26.2278	4.96791	52.4189	57.0848	9.5384E 04	1.5897E 05	1.6678E 06	32000
34000	1.0000	2.50000	26.3793	4.96791	52.8010	57.3380	1.0135E 05	1.6891E 05	1.7823E 06	34000
36000	1.0000	2.50000	26.5222	4.96791	53.1541	57.5527	1.0731E 05	1.7884E 05	1.8973E 06	36000
38000	1.0000	2.50000	26.6574	4.96791	53.4927	57.7406	1.1327E 05	1.8878E 05	2.0136E 06	38000
40000	1.0000	2.50000	26.7856	4.96791	53.8275	58.1954	1.1923E 05	1.9872E 05	2.1291E 06	40000
42000	1.0000	2.50000	26.9076	4.96791	54.1490	58.4378	1.2518E 05	2.0866E 05	2.2457E 06	42000
44000	1.0000	2.50000	27.0239	4.96791	54.4578	58.6489	1.3113E 05	2.1860E 05	2.3624E 06	44000
46000	1.0000	2.50000	27.1350	4.96791	54.7535	58.8397	1.3711E 05	2.2852E 05	2.4800E 06	46000
48000	1.0000	2.50000	27.2414	4.96791	55.0372	59.1012	1.4308E 05	2.3844E 05	2.5986E 06	48000
50000	1.0000	2.50000	27.3435	4.96791	55.3360	59.3040	1.4904E 05	2.4836E 05	2.7184E 06	50000
60000	1.0000	2.50000	27.7993	4.96791	55.2418	60.2097	1.7888E 05	2.9607E 05	3.3145E 06	60000
70000	1.0000	2.50000	28.1847	4.96791	56.0076	60.9755	2.0869E 05	3.4775E 05	3.9289E 06	70000
80000	1.0000	2.50000	28.5185	4.96791	56.6710	61.6389	2.3844E 05	3.9743E 05	4.5337E 06	80000
90000	1.0000	2.50000	28.8130	4.96791	57.2561	62.2240	2.6827E 05	4.4711E 05	5.1531E 06	90000
100000	1.0000	2.50000	29.0764	4.96791	57.7795	62.7475	2.9807E 05	4.9679E 05	5.7780E 06	100000
150000	1.0000	2.50000	30.0900	4.96791	59.7939	64.7618	4.6711E 05	7.4531E 05	8.9491E 06	150000
200000	1.0000	2.50000	30.8092	4.96791	61.2230	66.1909	5.9619E 05	9.9350E 05	1.2244E 07	200000
300000	1.0000	2.50002	31.8229	4.96796	63.2374	68.2053	8.9424E 05	1.4904E 06	1.8971E 07	300000
400000	1.0001	2.50140	32.5422	4.97070	64.6467	69.6374	1.1934E 06	1.9883E 06	2.5667E 07	400000
500000	1.0015	2.51443	33.1015	5.00057	65.7791	70.7787	1.5067E 06	2.5003E 06	3.2809E 07	500000
600000	1.0093	2.53434	33.5651	5.13551	66.6993	71.8348	1.8098E 06	3.0813E 06	4.0820E 07	600000
800000	1.0932	3.09464	34.3461	6.14837	68.4265	74.4265	4.3290E 06	6.5876E 06	5.4430E 07	800000
1000000	1.3782	4.04482	35.1574	8.03792	69.8560	77.8319	6.0508E 06	8.9370E 06	6.9854E 07	1000000
1500000	3.4492	5.21336	37.0990	10.35980	73.7219	84.0817	1.2559E 07	1.5340E 07	1.1058E 08	1500000
2000000	7.6776	4.98164	38.5776	9.89935	76.4401	86.5594	1.5824E 07	1.8799E 07	1.5332E 08	2000000
3000000	17.8723	4.31195	40.4626	8.56856	80.4059	88.9745	1.9744E 07	2.3760E 07	2.1222E 08	3000000
4000000	28.2778	3.89182	41.6408	7.73370	82.7438	90.4805	2.2986E 07	3.0933E 07	3.3099E 08	4000000
5000000	37.4097	3.62493	42.4783	7.20333	84.6115	91.6148	2.6081E 07	3.6617E 07	4.2204E 08	5000000
6000000	45.1484	3.44267	43.1222	6.84116	85.6909	92.5321	2.8124E 07	4.1047E 07	5.1431E 08	6000000
8000000	57.1874	3.21113	44.0778	6.38105	87.5878	93.9708	3.5151E 07	5.1044E 07	7.0072E 08	8000000
10000000	65.9420	3.07060	44.7781	6.10180	88.9814	95.0832	4.1144E 07	6.1018E 07	8.8981E 08	10000000

TABLE 25. IDEAL GAS FUNCTIONS FOR O⁺ (ATOMIC WEIGHT 15.9946, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 69 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h\nu}{RT}$	$\frac{h^2\nu^2}{RT^2}$	$\frac{h^3\nu^3}{RT^3}$	$\frac{h^4\nu^4}{RT^4}$	$\frac{h^5\nu^5}{RT^5}$	$\frac{h^6\nu^6}{RT^6}$	$\frac{h^7\nu^7}{RT^7}$	$\frac{h^8\nu^8}{RT^8}$	$\frac{h^9\nu^9}{RT^9}$	$\frac{h^{10}\nu^{10}}{RT^{10}}$	$\frac{h^{11}\nu^{11}}{RT^{11}}$	$\frac{h^{12}\nu^{12}}{RT^{12}}$	TEMP. (°K)
5000	2.0000	2.50000	22.4797	24.9797	4.96791	44.0710	49.6309	1.49046	2.44402	2.44402	2.21385	05	5000	
5200	2.0000	2.50000	22.5778	25.0778	4.96791	44.8658	49.8337	1.55006	2.50376	2.50376	2.33306	05	5200	
5400	2.0000	2.50000	22.6721	25.1721	4.96791	45.0333	50.0212	1.60946	2.48276	2.48276	2.43296	05	5400	
5600	2.0000	2.50000	22.7631	25.2631	4.96791	45.2340	50.2019	1.66826	2.46206	2.46206	2.51316	05	5600	
5800	2.0000	2.50000	22.8508	25.3508	4.96791	45.4603	50.3767	1.72686	2.44146	2.44146	2.63376	05	5800	
6000	2.0000	2.50000	22.9355	25.4355	4.96791	45.7137	50.5466	1.78546	2.42086	2.42086	2.73446	05	6000	
5200	2.0000	2.50000	23.0175	25.5175	4.96791	45.9966	50.7075	1.84416	2.40026	2.40026	2.83516	05	6200	
6400	2.0000	2.50000	23.0969	25.5969	4.96791	46.3093	50.8613	1.90286	2.37966	2.37966	2.93586	05	6400	
6600	2.0000	2.50000	23.1738	25.6738	4.96791	46.6520	51.0181	1.96156	2.35906	2.35906	3.03656	05	6600	
6800	2.0000	2.50000	23.2485	25.7485	4.96791	47.0257	51.1684	2.02026	2.33846	2.33846	3.14156	05	6800	
7000	2.0000	2.50000	23.3209	25.8209	4.96791	47.5209	51.3104	2.07896	2.31786	2.31786	3.24446	05	7000	
7200	2.0000	2.50000	23.3913	25.8913	4.96791	48.1483	51.4540	2.13766	2.29726	2.29726	3.34476	05	7200	
7400	2.0000	2.50000	23.4598	25.9598	4.96791	48.8186	51.6005	2.19636	2.27666	2.27666	3.44176	05	7400	
7600	2.0000	2.50000	23.5265	26.0265	4.96791	49.5311	51.7490	2.25506	2.25606	2.25606	3.53516	05	7600	
7800	2.0000	2.50000	23.5915	26.0915	4.96792	49.8801	51.8940	2.31376	2.23546	2.23546	3.62446	05	7800	
8000	2.0000	2.50000	23.6547	26.1547	4.96792	47.0059	51.9738	2.37246	2.21486	2.21486	3.70976	05	8000	
8200	2.0000	2.50000	23.7165	26.2165	4.96792	47.1286	52.0065	2.43116	2.19426	2.19426	3.79106	05	8200	
8400	2.0000	2.50000	23.7767	26.2767	4.96792	47.2483	52.0160	2.48986	2.17366	2.17366	3.86836	05	8400	
8600	2.0000	2.50000	23.8356	26.3356	4.96792	47.3652	52.0331	2.54856	2.15306	2.15306	3.94266	05	8600	
8800	2.0000	2.50001	23.8930	26.3930	4.96793	47.4794	52.0473	2.60726	2.13246	2.13246	4.01396	05	8800	
9000	2.0000	2.50001	23.9492	26.4492	4.96793	47.5910	52.0590	2.66596	2.11186	2.11186	4.08226	05	9000	
9200	2.0000	2.50001	24.0042	26.5042	4.96794	47.7002	52.0682	2.72466	2.09126	2.09126	4.14856	05	9200	
9400	2.0000	2.50002	24.0579	26.5579	4.96795	47.8071	52.0750	2.78336	2.07066	2.07066	4.21286	05	9400	
9600	2.0000	2.50002	24.1106	26.6106	4.96796	47.9117	52.0794	2.84206	2.05006	2.05006	4.27516	05	9600	
9800	2.0000	2.50003	24.1621	26.6621	4.96797	48.0141	52.0821	2.90076	2.02946	2.02946	4.33546	05	9800	
10000	2.0000	2.50004	24.2126	26.7126	4.96799	48.1145	53.0824	2.95946	2.00886	2.00886	4.39376	05	10000	
10500	2.0000	2.50007	24.3346	26.8347	4.96805	48.3580	53.3249	3.11996	1.98826	1.98826	4.50756	05	10500	
11000	2.0000	2.50012	24.4509	26.9510	4.96815	48.5880	53.5541	3.27916	1.96766	1.96766	4.61776	05	11000	
11500	2.0000	2.50020	24.5620	27.0622	4.96831	48.8008	53.7771	3.43836	1.94706	1.94706	4.72426	05	11500	
12000	2.0001	2.50032	24.6684	27.1688	4.96855	49.0000	53.9908	3.59756	1.92646	1.92646	4.82776	05	12000	
12500	2.0001	2.50049	24.7705	27.2710	4.96888	49.2731	54.1920	3.75676	1.90586	1.90586	4.92826	05	12500	
13000	2.0001	2.50072	24.8686	27.3693	4.96934	49.6180	54.3873	3.91596	1.88526	1.88526	5.02576	05	13000	
13500	2.0002	2.50103	24.9630	27.4640	4.96986	49.8055	54.5735	4.07516	1.86466	1.86466	5.12026	05	13500	
14000	2.0003	2.50144	25.0539	27.5556	4.97077	49.7863	54.7571	4.23436	1.84406	1.84406	5.21176	05	14000	
14500	2.0004	2.50195	25.1417	27.6437	4.97179	49.9608	54.9325	4.39356	1.82346	1.82346	5.30026	05	14500	
15000	2.0006	2.50260	25.2265	27.7291	4.97308	50.1293	55.1024	4.55276	1.80286	1.80286	5.38576	05	15000	
15500	2.0008	2.50339	25.3086	27.8120	4.97466	50.2924	55.2671	4.71196	1.78226	1.78226	5.46826	05	15500	
16000	2.0010	2.50435	25.3881	27.8925	4.97656	50.4504	55.4249	4.87106	1.76166	1.76166	5.54776	05	16000	
16500	2.0013	2.50549	25.4652	27.9707	4.97883	50.6036	55.5724	5.03016	1.74106	1.74106	5.62426	05	16500	
17000	2.0017	2.50683	25.5400	28.0468	4.98149	50.7522	55.7337	5.18926	1.72046	1.72046	5.69776	05	17000	
17500	2.0021	2.50838	25.6127	28.1211	4.98457	50.8967	55.8912	5.34836	1.70006	1.70006	5.76826	05	17500	
18000	2.0026	2.51014	25.6834	28.1935	4.98810	51.0371	56.0452	5.50746	1.67966	1.67966	5.83576	05	18000	
18500	2.0032	2.51218	25.7522	28.2644	4.99212	51.1739	56.1960	5.66656	1.65926	1.65926	5.90026	05	18500	
19000	2.0040	2.51445	25.8192	28.3337	4.99663	51.3071	56.3433	5.82566	1.63886	1.63886	5.96176	05	19000	
19500	2.0048	2.51698	25.8846	28.4015	5.00166	51.4369	56.4886	5.98476	1.61846	1.61846	6.02026	05	19500	

TABLE 25 (CONT.). IDEAL GAS FUNCTIONS FOR O₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^3}{RT^3}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}} \frac{1}{h}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}} \frac{1}{h^2}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}} \frac{1}{h^3}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}} \frac{1}{h^4}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}} \frac{1}{h^5}$	$\frac{h^3}{RT^3} e^{-\frac{h^2}{4RT}} \frac{1}{h^6}$	TEMP. (°K)	
2000	2.0057	2.51978	25.9483	26.4681	5.00722	51.5636	56.5708	6.0401E 04	1.0014E 05	1.0313E 06	20000
2200	2.0107	2.53377	26.1891	28.7229	5.07502	52.0421	57.0771	6.7053E 04	1.1077E 05	1.1449E 06	22000
2400	2.0182	2.55225	26.4103	28.9626	5.07175	52.46817	57.5534	7.4030E 04	1.2172E 05	1.2596E 06	24000
2600	2.0284	2.57497	26.6155	25.1905	5.11688	52.8884	58.0063	8.1373E 04	1.3304E 05	1.3751E 06	26000
2800	2.0416	2.60137	26.8073	26.4086	5.16935	53.2705	58.4398	8.9101E 04	1.4474E 05	1.4916E 06	28000
3000	2.0560	2.63073	26.9877	29.6185	5.22771	53.6291	58.8568	9.7216E 04	1.5683E 05	1.6089E 06	30000
3200	2.0775	2.66225	27.1505	29.8208	5.29033	53.9684	59.2588	1.0570E 05	1.6929E 05	1.7270E 06	32000
3400	2.1001	2.69511	27.3209	30.0160	5.3562	54.2911	59.6467	1.1453E 05	1.8209E 05	1.8459E 06	34000
3600	2.1257	2.72854	27.4759	30.2044	5.42205	54.5991	60.0212	1.2366E 05	1.9519E 05	1.9656E 06	36000
3800	2.1540	2.76187	27.6243	30.3862	5.48829	54.8940	60.3823	1.3304E 05	2.0856E 05	2.0860E 06	38000
4000	2.1850	2.79558	27.7658	30.5613	5.55321	55.1772	60.7304	1.4264E 05	2.2213E 05	2.2071E 06	40000
4200	2.2183	2.82609	27.8939	30.7300	5.61520	55.4497	61.0656	1.5241E 05	2.3587E 05	2.3289E 06	42000
4400	2.2538	2.85616	28.0361	30.8922	5.67567	55.7123	61.3880	1.6229E 05	2.4973E 05	2.4513E 06	44000
4600	2.2912	2.88452	28.1637	31.0482	5.73402	55.9659	61.6979	1.7226E 05	2.6367E 05	2.5744E 06	46000
4800	2.3303	2.91099	28.2870	31.1980	5.78962	56.2110	61.9956	1.8228E 05	2.7766E 05	2.6981E 06	48000
5000	2.3709	2.93548	28.4063	31.3418	5.84329	56.4481	62.2814	1.9231E 05	2.9166E 05	2.8224E 06	50000
6000	2.5899	3.02834	28.9505	31.9788	6.01781	57.5294	63.4472	2.6184E 05	3.6107E 05	3.6518E 06	60000
7000	2.8217	3.07905	29.4216	32.5006	6.11858	58.5653	64.5941	2.8920E 05	4.2830E 05	4.0926E 06	70000
8000	3.0536	3.10064	29.8344	32.9350	6.16149	59.2858	65.6473	3.3395E 05	4.9292E 05	4.7429E 06	80000
9000	3.2786	3.10434	30.1999	33.3043	6.16883	60.0122	66.1811	3.7635E 05	5.5519E 05	5.4011E 06	90000
10000	3.4932	3.09817	30.5267	33.6249	6.15658	60.6617	66.8183	4.1694E 05	6.1566E 05	6.0642E 06	100000
15000	4.6103	3.05737	31.7735	34.8309	6.07550	63.1392	69.2147	6.1325E 05	9.1132E 05	9.6709E 06	150000
20000	5.2024	3.11220	32.6580	35.7102	6.18445	64.8949	71.0813	8.3946E 05	1.2348E 06	1.2879E 07	200000
30000	7.0081	3.18258	33.9647	37.3573	6.22173	67.5034	74.2241	1.6204E 06	2.0165E 06	2.6231E 07	300000
40000	9.2897	3.25680	34.9708	38.5274	7.06793	69.4923	76.5602	2.0323E 06	2.8272E 06	2.7797E 07	400000
50000	11.8289	3.29913	35.7701	39.3632	7.14015	71.0810	78.2212	2.5765E 06	3.5701E 06	3.5541E 07	500000
60000	14.4033	3.35875	36.4228	39.9815	7.07172	72.3701	79.4499	3.0508E 06	4.2431E 06	4.3421E 07	600000
80000	19.2053	3.43120	37.8297	40.8609	6.81835	74.3790	81.1974	3.8669E 06	5.4547E 06	5.9503E 07	800000
100000	23.3184	3.46081	38.1816	41.4884	6.57118	75.6732	82.4444	4.5840E 06	6.5712E 06	7.5873E 07	1000000
150000	30.9052	3.48777	39.8770	42.5647	6.13592	78.4473	84.9832	6.2231E 06	9.2039E 06	1.1767E 08	1500000
200000	35.8988	2.95762	40.3460	43.3036	5.87728	80.1741	86.0514	7.7802E 06	1.1753E 07	1.6035E 08	2000000
300000	41.9238	2.81537	41.5148	44.3301	5.59460	82.4967	88.0913	1.0822E 07	1.6784E 07	2.4749E 08	3000000
400000	45.3903	2.74012	42.3134	45.0535	5.44508	84.0838	89.5288	1.3832E 07	2.1760E 07	3.3834E 08	4000000
500000	47.6333	2.69376	42.9195	45.6133	5.35295	85.2882	90.6411	1.6829E 07	2.6745E 07	4.2644E 08	5000000
600000	49.2011	2.66237	43.4077	46.0701	5.29057	86.2583	91.5488	1.9820E 07	3.1743E 07	5.1755E 08	6000000
800000	51.2445	2.62260	44.1676	46.7902	5.21155	87.7684	92.8799	2.5795E 07	4.1692E 07	7.0215E 08	8000000
1000000	52.5212	2.59867	44.7501	47.3485	5.16359	88.9258	94.0894	3.1764E 07	5.1636E 07	8.8726E 08	10000000

TABLE 26. IDEAL GAS FUNCTIONS FOR AR 3+ (ATOMIC WEIGHT 39.9480, $R = 1.98717$ CAL/MOLE) SEE TABLE 70 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\ln \frac{q}{RT}$	$\ln \frac{q}{RT} - \frac{E_0}{RT}$	$\frac{E_0}{RT}$	$\frac{E_0}{RT} - \frac{E_1}{RT}$	$\frac{E_1}{RT}$	$\frac{E_1}{RT} - \frac{E_2}{RT}$	$\frac{E_2}{RT}$	$\frac{E_2}{RT} - \frac{E_3}{RT}$	$\frac{E_3}{RT}$	$\frac{E_3}{RT} - \frac{E_4}{RT}$	$\frac{E_4}{RT}$	$\frac{E_4}{RT} - \frac{E_5}{RT}$	$\frac{E_5}{RT}$	TEMP. (°K)
5000	3.9305	2.92300	24.5280	27.4510	5.80849	49.7413	54.5498	1.91076	04	2.99426	04	2.43716	05	9000	
5200	3.9949	2.90673	24.6424	27.5491	5.77616	49.8089	54.7446	1.97036	04	3.00346	04	2.54446	05	9200	
5400	4.0556	2.89167	24.7518	27.6434	5.74623	49.8859	54.9321	2.02996	04	3.10306	04	2.65606	05	9400	
5600	4.1127	2.87748	24.8567	27.7344	5.71843	49.9743	55.1128	2.08956	04	3.20236	04	2.76616	05	9600	
5800	4.1666	2.86466	24.9574	27.8221	5.69255	49.9545	55.2871	2.14916	04	3.30136	04	2.87686	05	9800	
6000	4.2176	2.85250	25.0543	27.9068	5.66840	49.7871	55.4555	2.20876	04	3.40106	04	2.98726	05	6000	
6200	4.2659	2.84113	25.1477	27.9888	5.64580	49.9726	55.6184	2.26846	04	3.50046	04	3.09806	05	6200	
6400	4.3115	2.83047	25.2377	28.0682	5.62462	50.1515	55.7761	2.32806	04	3.59986	04	3.20976	05	6400	
6600	4.3549	2.82046	25.3247	28.1451	5.60472	50.3243	55.9290	2.38746	04	3.69916	04	3.32146	05	6600	
6800	4.3961	2.81103	25.4087	28.2198	5.58599	50.4913	56.0773	2.44726	04	3.79856	04	3.43346	05	6800	
7000	4.4354	2.80215	25.4890	28.2922	5.56833	50.6530	56.2213	2.50686	04	3.89796	04	3.54576	05	7000	
7200	4.4728	2.79375	25.5669	28.3622	5.55165	50.8096	56.3613	2.56646	04	3.99726	04	3.65826	05	7200	
7400	4.5084	2.78581	25.6433	28.4311	5.53597	50.9615	56.4974	2.62606	04	4.09646	04	3.77126	05	7400	
7600	4.5425	2.77829	25.7195	28.4978	5.52093	51.1090	56.6299	2.68576	04	4.19546	04	3.88446	05	7600	
7800	4.5750	2.77116	25.7916	28.5628	5.50675	51.2522	56.7589	2.74536	04	4.29436	04	3.99376	05	7800	
8000	4.6061	2.76438	25.8617	28.6261	5.49328	51.3914	56.8847	2.80496	04	4.39346	04	4.11136	05	8000	
8200	4.6359	2.75793	25.9299	28.6878	5.48046	51.5269	57.0074	2.86446	04	4.49206	04	4.22826	05	8200	
8400	4.6645	2.75179	25.9962	28.7480	5.46826	51.6588	57.1271	2.92346	04	4.59036	04	4.33996	05	8400	
8600	4.6918	2.74593	26.0609	28.8069	5.45663	51.7874	57.2440	2.98276	04	4.68826	04	4.45376	05	8600	
8800	4.7181	2.74035	26.1240	28.8643	5.44552	51.9127	57.3582	3.04146	04	4.78576	04	4.56776	05	8800	
9000	4.7434	2.73501	26.1855	28.9205	5.43491	52.0349	57.4698	3.10006	04	4.88346	04	4.68216	05	9000	
9200	4.7677	2.72990	26.2456	28.9755	5.42476	52.1543	57.5790	3.15846	04	4.97986	04	4.79826	05	9200	
9400	4.7911	2.72501	26.3042	29.0292	5.41504	52.2708	57.6859	3.21666	04	5.07616	04	4.91536	05	9400	
9600	4.8136	2.72032	26.3615	29.0819	5.40573	52.3847	57.7905	3.27466	04	5.17146	04	5.03286	05	9600	
9800	4.8353	2.71583	26.4176	29.1334	5.39681	52.4961	57.8929	3.33246	04	5.26746	04	5.15146	05	9800	
10000	4.8562	2.71152	26.4724	29.1839	5.38824	52.6051	57.9933	3.40116	04	5.36246	04	5.28066	05	10000	
10500	4.9054	2.70146	26.6045	29.3059	5.36825	52.8675	58.2357	3.55016	04	5.63676	04	5.53116	05	10500	
11000	4.9505	2.69233	26.7299	29.4272	5.35011	53.1168	58.4669	3.69926	04	5.89516	04	5.84286	05	11000	
11500	4.9921	2.68401	26.8494	29.5434	5.33357	53.3542	58.6878	3.84846	04	6.13346	04	6.13576	05	11500	
12000	5.0305	2.67641	26.9635	29.6539	5.31846	53.5809	58.9093	3.99746	04	6.36226	04	6.42976	05	12000	
12500	5.0661	2.66944	27.0726	29.7420	5.30463	53.7977	59.1023	4.14686	04	6.63086	04	6.72476	05	12500	
13000	5.0993	2.66306	27.1772	29.8402	5.29194	54.0055	59.2874	4.29626	04	6.87996	04	7.02076	05	13000	
13500	5.1302	2.65720	27.2776	29.9348	5.28029	54.2050	59.4593	4.44576	04	7.12846	04	7.31776	05	13500	
14000	5.1591	2.65182	27.3741	30.0259	5.26961	54.3968	59.6265	4.59546	04	7.37756	04	7.61546	05	14000	
14500	5.1862	2.64690	27.4671	30.1140	5.25983	54.5816	59.8014	4.74546	04	7.62686	04	7.91436	05	14500	
15000	5.2117	2.64241	27.5567	30.1991	5.25090	54.7598	60.0104	4.89546	04	7.87736	04	8.21406	05	15000	
15500	5.2357	2.63831	27.6433	30.2816	5.24277	54.9318	60.1744	5.04546	04	8.12636	04	8.51446	05	15500	
16000	5.2585	2.63461	27.7270	30.3618	5.23544	55.0980	60.3335	5.19546	04	8.37676	04	8.81576	05	16000	
16500	5.2800	2.63126	27.8080	30.4393	5.22879	55.2591	60.4879	5.34546	04	8.62746	04	9.11786	05	16500	
17000	5.3005	2.62832	27.8865	30.5148	5.22291	55.4151	60.6380	5.49546	04	8.87846	04	9.42086	05	17000	
17500	5.3200	2.62572	27.9627	30.5884	5.21774	55.5665	60.7842	5.64546	04	9.13106	04	9.72416	05	17500	
18000	5.3388	2.62347	28.0366	30.6601	5.21328	55.7134	60.9267	5.79546	04	9.38396	04	1.00286	06	18000	
18500	5.3567	2.62158	28.1085	30.7300	5.20951	55.8562	61.0657	5.94546	04	9.63786	04	1.03336	06	18500	
19000	5.3740	2.62003	28.1784	30.7984	5.20644	55.9951	61.2015	6.09546	04	9.89226	04	1.06396	06	19000	
19500	5.3907	2.61883	28.2464	30.8652	5.20405	56.1303	61.3343	6.24546	04	1.01486	05	1.09456	06	19500	

TABLE 26 (CONT.) IDEAL GAS FUNCTIONS FOR NA 9.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W}{RT}$	$-\frac{F^0 - F}{RT}$	$\ln \frac{W}{RT}$	$\ln \frac{W}{RT} - \frac{F^0 - F}{RT}$	$\ln \frac{W}{RT} - \frac{F^0 - F}{RT} - \frac{S^0}{R}$	$\ln \frac{W}{RT} - \frac{F^0 - F}{RT} - \frac{S^0}{R} - \frac{S^0}{R}$	$\ln \frac{W}{RT} - \frac{F^0 - F}{RT} - \frac{S^0}{R} - \frac{S^0}{R} - \frac{S^0}{R}$	TEMP. (°K)		
20000	5.4099	2.61799	28.3127	30.9107	5.20236	56.2629	61.6666	6.2804E 04	1.0409E 05	1.1235E 04	20000
24000	5.4578	2.61802	28.7422	31.4932	5.20245	56.7517	61.9602	7.9730E 04	1.1443E 05	1.2487E 04	24000
28000	5.5253	2.62336	28.7792	31.8131	5.21391	57.2191	62.4742	1.7430E 04	1.2312E 05	1.3731E 04	28000
32000	5.5824	2.63838	29.0085	31.6749	5.23694	57.6289	63.0680	3.4462E 04	1.3611E 05	1.4984E 04	32000
36000	5.6414	2.65026	29.1763	31.6566	5.26650	58.0199	63.7844	5.1821E 04	1.5474E 05	1.6245E 04	36000
40000	5.7050	2.67074	29.3799	32.0506	5.30731	58.3628	64.6099	6.9604E 04	1.7922E 05	1.7516E 04	40000
44000	5.7717	2.69550	29.5530	32.2485	5.35640	58.7427	65.5481	8.7870E 04	2.1040E 05	1.8798E 04	44000
48000	5.8453	2.72385	29.7172	32.4411	5.41273	59.1531	66.5856	1.0643E 05	2.4803E 05	2.0078E 04	48000
52000	5.9258	2.75329	29.8773	32.6291	5.47521	59.5842	67.7194	1.2577E 05	2.9111E 05	2.1371E 04	52000
56000	6.0136	2.78330	30.0237	32.8130	5.54280	59.6420	68.9440	1.4591E 05	3.4033E 05	2.2672E 04	56000
60000	6.1090	2.82539	30.1677	32.9930	5.61452	59.9481	70.2626	1.6696E 05	3.9580E 05	2.3979E 04	60000
64000	6.2125	2.86913	30.3064	33.1695	5.68952	60.2239	71.6714	1.8892E 05	4.5760E 05	2.5294E 04	64000
68000	6.3239	2.92115	30.4405	33.3427	5.76705	60.4403	73.1653	2.1179E 05	5.2579E 05	2.6614E 04	68000
72000	6.4437	2.98214	30.5704	33.5125	5.84651	60.7484	74.7401	2.3564E 05	5.9944E 05	2.7944E 04	72000
76000	6.5717	2.98284	30.6945	33.6793	5.92740	60.9969	76.3923	2.6046E 05	6.7851E 05	2.9279E 04	76000
80000	6.7081	3.02407	30.8191	33.8431	6.00932	61.2426	78.1194	2.8626E 05	7.6297E 05	3.0621E 04	80000
84000	7.5184	3.23397	31.3889	34.6729	6.42443	62.3750	80.9014	3.3336E 05	8.5252E 05	3.2025E 04	84000
88000	8.4538	3.46317	31.9293	35.6485	6.84112	63.3971	83.7321	3.8013E 05	9.4721E 05	3.3476E 04	88000
92000	9.5278	3.65327	32.3770	36.0303	7.25966	64.3384	86.6176	4.2180E 05	1.0467E 06	3.4971E 04	92000
96000	11.4008	3.85240	32.8189	36.8713	7.65936	65.2106	89.5476	4.5101E 05	1.1510E 06	3.6519E 04	96000
100000	13.2743	4.03375	33.2344	37.2702	8.01969	66.0423	92.5160	4.8325E 05	1.2607E 06	3.8121E 04	100000
104000	28.0898	4.59807	34.5977	39.5958	9.13712	68.0462	105.6176	1.0724E 06	1.3704E 06	4.0432E 04	104000
108000	52.3633	4.68248	36.3397	41.0222	9.30487	73.2130	118.9176	1.4635E 06	1.8610E 06	4.4443E 04	108000
112000	121.3059	4.40730	38.1935	42.6008	8.75803	75.6967	132.4547	2.0314E 06	2.6274E 06	4.9444E 04	112000
116000	200.9259	4.09377	39.4173	43.3131	8.13897	78.3287	146.2276	2.4607E 06	3.2554E 06	5.4444E 04	116000
120000	279.0959	3.85169	40.3038	44.1554	7.65394	80.0902	160.2442	2.8334E 06	3.8210E 06	6.0444E 04	120000
124000	351.0188	4.09889	40.9889	44.6550	7.28526	81.9516	174.4976	3.1789E 06	4.3712E 06	6.6711E 04	124000
128000	472.6429	3.41002	42.0056	45.4156	6.77628	83.4720	188.9840	3.5313E 06	4.9210E 06	7.3211E 04	128000
132000	568.1451	3.24417	42.7475	45.9916	6.44669	84.9463	203.7000	3.8945E 06	5.4711E 06	7.9711E 04	132000
136000	730.6115	3.00978	44.0126	47.0224	5.98093	87.4604	218.7443	4.2644E 06	6.0211E 06	8.6211E 04	136000
140000	830.5990	2.68723	44.8601	47.7473	5.73741	89.1344	234.1144	4.6444E 06	6.5711E 06	9.2711E 04	140000
144000	945.7005	2.76132	46.0016	48.7650	5.48211	91.0000	250.0000	5.0311E 06	7.1211E 06	9.9211E 04	144000
148000	1078.8383	2.69315	46.7884	49.4855	5.35969	92.9762	266.4444	5.4211E 06	7.6711E 06	1.0571E 05	148000
152000	1230.3243	2.65827	47.3857	50.0440	5.28242	95.0642	283.4444	5.8111E 06	8.2211E 06	1.1221E 05	152000
156000	1398.6389	2.63219	47.8679	50.5001	5.24081	97.2613	301.0000	6.2011E 06	8.7711E 06	1.1871E 05	156000
160000	1584.1114	2.59943	48.6202	51.2197	5.16549	99.5664	319.1114	6.5911E 06	9.3211E 06	1.2521E 05	160000
164000	1787.1374	2.57968	49.1960	51.7777	5.12624	101.9819	337.7777	7.0811E 06	9.8711E 06	1.3171E 05	164000

TABLE 27. IDEAL GAS FUNCTIONS FOR C₆ (ATOMIC WEIGHT 12.0079, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 E}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^2 - E^3}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^2 - E^3}{RT} - \frac{E^4 - E^5}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^2 - E^3}{RT} - \frac{E^4 - E^5}{RT} - \frac{E^6 - E^7}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^2 - E^3}{RT} - \frac{E^4 - E^5}{RT} - \frac{E^6 - E^7}{RT} - \frac{E^8 - E^9}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^2 - E^3}{RT} - \frac{E^4 - E^5}{RT} - \frac{E^6 - E^7}{RT} - \frac{E^8 - E^9}{RT} - \frac{E^{10} - E^{11}}{RT}$	$\frac{h^2 E}{RT} - \frac{E^0 - E^1}{RT} - \frac{E^2 - E^3}{RT} - \frac{E^4 - E^5}{RT} - \frac{E^6 - E^7}{RT} - \frac{E^8 - E^9}{RT} - \frac{E^{10} - E^{11}}{RT} - \frac{E^{12} - E^{13}}{RT}$	TEMP. (°K)		
5000	1.0000	2.50000	21.3564	23.8564	4.96791	42.4368	47.6865	1.43046	2.48406	2.48406	2.12196	05
5200	1.0000	2.50000	21.4544	23.9544	4.96791	42.6335	47.9016	1.55006	2.58336	2.58336	2.21696	05
5400	1.0000	2.50000	21.5488	24.0488	4.96791	42.8210	48.1289	1.66946	2.68276	2.68276	2.31236	05
5600	1.0000	2.50000	21.6397	24.1397	4.96791	43.0016	48.3699	1.78826	2.78226	2.78226	2.40816	05
5800	1.0000	2.50000	21.7274	24.2274	4.96791	43.1760	48.6149	1.90686	2.88186	2.88186	2.50426	05
6000	1.0000	2.50000	21.8122	24.3122	4.96791	43.3444	48.8639	2.02526	2.98166	2.98166	2.60076	05
6200	1.0000	2.50000	21.8941	24.3941	4.96791	43.5073	49.1169	2.14346	3.08166	3.08166	2.69756	05
6400	1.0000	2.50000	21.9735	24.4735	4.96791	43.6650	49.3739	2.26146	3.18186	3.18186	2.79466	05
6600	1.0000	2.50000	22.0504	24.5504	4.96791	43.8179	49.6349	2.37926	3.28226	3.28226	2.89206	05
6800	1.0000	2.50000	22.1251	24.6251	4.96791	43.9662	49.8999	2.49686	3.38286	3.38286	2.98976	05
7000	1.0000	2.50000	22.1975	24.6975	4.96791	44.1102	50.1689	2.61426	3.48366	3.48366	3.08776	05
7200	1.0000	2.50000	22.2680	24.7680	4.96791	44.2502	50.4419	2.73146	3.58466	3.58466	3.18606	05
7400	1.0000	2.50000	22.3365	24.8365	4.96791	44.3869	50.7189	2.84846	3.68586	3.68586	3.28466	05
7600	1.0000	2.50000	22.4031	24.9031	4.96791	44.5208	51.0009	2.96506	3.78726	3.78726	3.38346	05
7800	1.0000	2.50000	22.4681	24.9681	4.96791	44.6514	51.2869	3.08146	3.88886	3.88886	3.48246	05
8000	1.0000	2.50000	22.5314	25.0314	4.96791	44.7791	51.5769	3.19766	3.99066	3.99066	3.58166	05
8200	1.0000	2.50000	22.5931	25.0931	4.96791	44.9042	51.8709	3.31366	4.09266	4.09266	3.68106	05
8400	1.0000	2.50000	22.6534	25.1534	4.96791	45.0271	52.1689	3.42946	4.19486	4.19486	3.78066	05
8600	1.0000	2.50000	22.7122	25.2122	4.96791	45.1475	52.4709	3.54506	4.29726	4.29726	3.88046	05
8800	1.0000	2.50000	22.7697	25.2697	4.96791	45.2657	52.7769	3.66046	4.39986	4.39986	3.98046	05
9000	1.0000	2.50000	22.8258	25.3258	4.96791	45.3821	53.0869	3.77566	4.50266	4.50266	4.08066	05
9200	1.0000	2.50000	22.8808	25.3808	4.96791	45.4969	53.4009	3.89166	4.60566	4.60566	4.18106	05
9400	1.0000	2.50000	22.9345	25.4345	4.96791	45.6105	53.7189	4.01046	4.70886	4.70886	4.28166	05
9600	1.0000	2.50000	22.9872	25.4872	4.96791	45.7233	54.0409	4.12906	4.81226	4.81226	4.38246	05
9800	1.0000	2.50000	23.0387	25.5387	4.96791	45.8357	54.3669	4.24746	4.91586	4.91586	4.48346	05
10000	1.0000	2.50000	23.0892	25.5892	4.96791	45.9471	54.6969	4.36566	5.01966	5.01966	4.58466	05
10500	1.0000	2.50000	23.2112	25.7112	4.96791	46.1245	55.0829	4.58366	5.24566	5.24566	4.83616	05
11000	1.0000	2.50000	23.3275	25.8275	4.96791	46.3005	55.4729	4.80146	5.47166	5.47166	5.08786	05
11500	1.0000	2.50000	23.4386	25.9386	4.96791	46.4745	55.8669	5.01906	5.69766	5.69766	5.33966	05
12000	1.0000	2.50000	23.5450	26.0450	4.96791	46.6471	56.2649	5.23626	5.92366	5.92366	5.59166	05
12500	1.0000	2.50000	23.6471	26.1471	4.96791	46.8187	56.6669	5.45326	6.14966	6.14966	5.84386	05
13000	1.0000	2.50000	23.7451	26.2451	4.96791	47.1855	57.0729	5.67006	6.37566	6.37566	6.09626	05
13500	1.0000	2.50000	23.8395	26.3395	4.96791	47.5479	57.4829	5.88666	6.60166	6.60166	6.34886	05
14000	1.0000	2.50000	23.9304	26.4304	4.96791	47.9059	57.8969	6.10306	6.82766	6.82766	6.60166	05
14500	1.0000	2.50000	24.0181	26.5181	4.96791	48.2599	58.3149	6.31926	7.05366	7.05366	6.85466	05
15000	1.0000	2.50000	24.1029	26.6029	4.96791	48.6089	58.7369	6.53526	7.27966	7.27966	7.10766	05
15500	1.0000	2.50000	24.1849	26.6849	4.96791	48.9539	59.1629	6.75106	7.50566	7.50566	7.36066	05
16000	1.0000	2.50000	24.2642	26.7642	4.96791	49.2949	59.5929	6.96666	7.73166	7.73166	7.61366	05
16500	1.0000	2.50000	24.3412	26.8412	4.96791	49.6219	60.0269	7.18206	7.95766	7.95766	7.86666	05
17000	1.0000	2.50000	24.4158	26.9158	4.96791	49.9459	60.4649	7.39726	8.18366	8.18366	8.11966	05
17500	1.0000	2.50000	24.4883	26.9883	4.96791	50.2669	60.9069	7.61226	8.40966	8.40966	8.37266	05
18000	1.0000	2.50000	24.5587	27.0587	4.96791	50.5849	61.3529	7.82706	8.63566	8.63566	8.62566	05
18500	1.0000	2.50000	24.6272	27.1272	4.96791	50.8999	61.8029	8.04166	8.86166	8.86166	8.87866	05
19000	1.0000	2.50000	24.6939	27.1939	4.96791	51.2119	62.2569	8.25606	9.08766	9.08766	9.13166	05
19500	1.0000	2.50000	24.7588	27.2588	4.96791	51.5219	62.7149	8.47026	9.31366	9.31366	9.38466	05

TABLE 27 (CONT.). IDEAL GAS FUNCTIONS FOR C 6

TEMP. (°K)	PARTIT. FUNCT.	$\frac{U^0 - U}{RT}$	$-\frac{U^0 - U}{RT}$	$\frac{S^0 - S}{R}$	$\ln \left(\frac{U^0 - U}{RT} \right) - \frac{S^0 - S}{R}$	$\frac{U^0 - U}{RT} - \frac{S^0 - S}{R}$	$\frac{U^0 - U}{RT} - \frac{S^0 - S}{R}$	$\frac{U^0 - U}{RT} - \frac{S^0 - S}{R}$	TEMP. (°K)	
20000	1.0000	2.50000	26.6771	27.3221	4.96791	56.2039	5.9619E 04	9.9359E 04	9.8651E 05	20000
22000	1.0000	2.50000	23.0604	27.5604	4.96791	56.7670	6.5576E 04	1.0925E 05	1.0925E 05	22000
24000	1.0000	2.50000	25.2779	27.7779	4.96791	50.2315	7.1538E 04	1.1923E 05	1.2054E 06	24000
26000	1.0000	2.50000	25.4780	27.9780	4.96791	55.5969	7.7498E 04	1.2917E 05	1.3164E 06	26000
28000	1.0000	2.50000	25.6633	28.1633	4.96791	50.9972	8.3461E 04	1.3910E 05	1.4279E 06	28000
30000	1.0000	2.50000	25.8358	28.3358	4.96791	51.3399	8.9422E 04	1.4904E 05	1.5402E 06	30000
32000	1.0000	2.50000	25.9971	28.4971	4.96791	51.6404	9.5384E 04	1.5897E 05	1.6531E 06	32000
34000	1.0000	2.50000	26.1487	28.6487	4.96791	51.9017	1.0139E 05	1.6891E 05	1.7667E 06	34000
36000	1.0000	2.50000	26.2916	28.7916	4.96791	52.2457	1.0731E 05	1.7884E 05	1.8808E 06	36000
38000	1.0000	2.50000	26.4267	28.9267	4.96791	52.5143	1.1327E 05	1.8878E 05	1.9955E 06	38000
40000	1.0000	2.50000	26.5550	29.0550	4.96791	52.7691	1.1923E 05	1.9872E 05	2.1108E 06	40000
42000	1.0000	2.50000	26.6769	29.1769	4.96791	53.0115	1.2519E 05	2.0869E 05	2.2265E 06	42000
44000	1.0000	2.50000	26.7932	29.2932	4.96791	53.2428	1.3115E 05	2.1859E 05	2.3427E 06	44000
46000	1.0000	2.50000	26.9044	29.4044	4.96791	53.4634	1.3711E 05	2.2852E 05	2.4593E 06	46000
48000	1.0000	2.50000	27.0108	29.5108	4.96791	53.6749	1.4308E 05	2.3844E 05	2.5764E 06	48000
50000	1.0000	2.50000	27.1128	29.6128	4.96791	53.8777	1.4904E 05	2.4840E 05	2.6939E 06	50000
60000	1.0000	2.50000	27.5686	30.0686	4.96791	54.7834	1.7884E 05	2.9807E 05	3.2870E 06	60000
70000	1.0000	2.50000	27.9540	30.4540	4.96791	55.5492	2.0865E 05	3.4775E 05	3.8884E 06	70000
80000	1.0000	2.50000	28.2878	30.7878	4.96791	56.2125	2.3846E 05	3.9743E 05	4.4970E 06	80000
90000	1.0000	2.50000	28.5823	31.0823	4.96791	56.7918	2.6827E 05	4.4711E 05	5.1118E 06	90000
100000	1.0000	2.50000	28.8457	31.3457	4.96791	57.3212	2.9807E 05	4.9679E 05	5.7321E 06	100000
150000	1.0000	2.50000	29.8594	32.3594	4.96791	59.3355	4.4711E 05	7.4519E 05	8.9003E 06	150000
200000	1.0000	2.50000	30.5784	33.0784	4.96791	60.7447	5.9619E 05	9.9359E 05	1.2153E 07	200000
300000	1.0000	2.50000	31.5922	34.0922	4.96791	62.7790	8.9422E 05	1.4904E 06	1.8834E 07	300000
400000	1.0000	2.50000	32.3114	34.8114	4.96791	64.2082	1.1923E 06	1.9872E 06	2.5868E 07	400000
500000	1.0000	2.50000	32.8493	35.3493	4.96791	65.3167	1.4904E 06	2.4840E 06	3.2658E 07	500000
600000	1.0000	2.50000	33.2251	35.7251	4.96791	66.2229	1.7884E 06	2.9807E 06	3.9733E 07	600000
800000	1.0000	2.50000	34.0443	36.5443	4.96791	67.6517	2.3846E 06	3.9743E 06	5.4121E 07	800000
1000000	1.0000	2.50000	34.6022	37.1022	4.96791	68.7602	2.9807E 06	4.9679E 06	6.8740E 07	1000000
1500000	1.0000	2.50000	35.6158	38.1158	4.96791	70.7745	4.4711E 06	7.4519E 06	1.0616E 08	1500000
2000000	1.0000	2.50000	36.3350	38.8350	4.96791	72.2037	5.9619E 06	9.9359E 06	1.4441E 08	2000000
3000000	1.0000	2.50000	37.3487	39.8487	4.96791	74.2180	8.9422E 06	1.4904E 07	2.2265E 08	3000000
4000000	1.0000	2.50000	38.0679	40.5679	4.96791	75.6472	1.1923E 07	1.9872E 07	3.0259E 08	4000000
5000000	1.0000	2.50000	38.6258	41.1258	4.96791	76.7558	1.4904E 07	2.4840E 07	3.8376E 08	5000000
6000000	1.0000	2.50000	39.0816	41.5816	4.96791	77.6613	1.7884E 07	2.9807E 07	4.6597E 08	6000000
8000000	1.0000	2.50000	39.8006	42.3006	4.96791	79.0907	2.3846E 07	3.9743E 07	6.3273E 08	8000000
10000000	1.0000	2.50000	40.3486	42.8486	4.96791	80.1993	2.9807E 07	4.9679E 07	8.0199E 08	10000000

TABLE 20. IDEAL GAS FUNCTIONS FOR N₂ (ATOMIC WEIGHT 14.0034, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N, S, L. SEE TABLE 71 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	$\frac{h^2-E}{RT}$	$\ln \frac{h^2-E}{RT}$	TEMP. (°K)
5000	2.0000	2.5000	22.2801	24.7801	4.96791	49.2743	49.2743	1.4904E 04	2.4840E 04	2.2137E 05	5000											
5200	2.0000	2.5000	22.3762	24.8791	4.96791	49.46791	49.46791	1.5509E 04	2.5833E 04	2.3124E 05	5200											
5400	2.0000	2.5000	22.4725	24.9725	4.96791	49.6625	49.6625	1.6096E 04	2.6827E 04	2.4115E 05	5400											
5600	2.0000	2.5000	22.5634	25.0634	4.96791	49.8573	49.8573	1.6692E 04	2.7820E 04	2.5109E 05	5600											
5800	2.0000	2.5000	22.6512	25.1512	4.96791	50.0518	49.9795	1.7288E 04	2.8814E 04	2.6107E 05	5800											
6000	2.0000	2.5000	22.7359	25.2359	4.96791	50.2460	50.1480	1.7884E 04	2.9807E 04	2.7108E 05	6000											
6200	2.0000	2.5000	22.8179	25.3179	4.96791	50.4429	50.3109	1.8481E 04	3.0801E 04	2.8113E 05	6200											
6400	2.0000	2.5000	22.8973	25.3973	4.96791	50.6407	50.4688	1.9077E 04	3.1795E 04	2.9120E 05	6400											
6600	2.0000	2.5000	22.9742	25.4742	4.96791	50.8395	50.6213	1.9673E 04	3.2788E 04	3.0131E 05	6600											
6800	2.0000	2.5000	23.0478	25.5488	4.96791	51.0391	50.7698	2.0269E 04	3.3782E 04	3.1145E 05	6800											
7000	2.0000	2.5000	23.1213	25.6213	4.96791	51.2405	50.9138	2.0855E 04	3.4775E 04	3.2162E 05	7000											
7200	2.0000	2.5000	23.1917	25.6917	4.96791	51.4437	51.0537	2.1441E 04	3.5768E 04	3.3182E 05	7200											
7400	2.0000	2.5000	23.2602	25.7602	4.96791	51.6488	51.1898	2.2028E 04	3.6763E 04	3.4204E 05	7400											
7600	2.0000	2.5000	23.3269	25.8269	4.96791	51.8554	51.3223	2.2615E 04	3.7754E 04	3.5229E 05	7600											
7800	2.0000	2.5000	23.3918	25.8918	4.96791	52.0635	51.4514	2.3202E 04	3.8750E 04	3.6257E 05	7800											
8000	2.0000	2.5000	23.4551	25.9551	4.96791	52.2731	51.5771	2.3789E 04	3.9743E 04	3.7287E 05	8000											
8200	2.0000	2.5000	23.5169	26.0169	4.96791	52.4842	51.6998	2.4376E 04	4.0737E 04	3.8320E 05	8200											
8400	2.0000	2.5000	23.5771	26.0771	4.96791	52.6968	51.8195	2.4963E 04	4.1732E 04	3.9356E 05	8400											
8600	2.0000	2.5000	23.6359	26.1359	4.96791	52.9118	51.9364	2.5550E 04	4.2724E 04	4.0393E 05	8600											
8800	2.0000	2.5000	23.6933	26.1933	4.96791	53.1291	52.0506	2.6137E 04	4.3718E 04	4.1433E 05	8800											
9000	2.0000	2.5000	23.7496	26.2496	4.96791	53.3487	52.1623	2.6724E 04	4.4711E 04	4.2476E 05	9000											
9200	2.0000	2.5000	23.8045	26.3045	4.96791	53.5705	52.2715	2.7311E 04	4.5705E 04	4.3519E 05	9200											
9400	2.0000	2.5000	23.8583	26.3583	4.96791	53.7945	52.3783	2.7898E 04	4.6698E 04	4.4564E 05	9400											
9600	2.0000	2.5000	23.9109	26.4109	4.96791	54.0207	52.4829	2.8485E 04	4.7692E 04	4.5614E 05	9600											
9800	2.0000	2.5000	23.9625	26.4625	4.96791	54.2491	52.5853	2.9072E 04	4.8686E 04	4.6665E 05	9800											
10000	2.0000	2.5000	24.0130	26.5130	4.96791	54.4797	52.6857	2.9659E 04	4.9678E 04	4.7718E 05	10000											
10500	2.0000	2.5000	24.1350	26.6350	4.96791	54.9202	52.9281	3.1298E 04	5.2163E 04	5.0358E 05	10500											
11000	2.0000	2.5000	24.2512	26.7512	4.96791	55.3592	53.1592	3.2788E 04	5.4647E 04	5.3010E 05	11000											
11500	2.0000	2.5000	24.3624	26.8624	4.96791	55.7968	53.3800	3.4279E 04	5.7131E 04	5.5674E 05	11500											
12000	2.0000	2.5000	24.4688	26.9688	4.96791	56.2335	53.5915	3.5770E 04	5.9615E 04	5.8348E 05	12000											
12500	2.0000	2.5000	24.5709	27.0709	4.96791	56.6693	53.7943	3.7259E 04	6.2098E 04	6.1033E 05	12500											
13000	2.0000	2.5000	24.6689	27.1689	4.96791	57.1042	53.9891	3.8748E 04	6.4583E 04	6.3728E 05	13000											
13500	2.0000	2.5000	24.7633	27.2633	4.96791	57.5081	54.1766	4.0237E 04	6.7067E 04	6.6432E 05	13500											
14000	2.0000	2.5000	24.8542	27.3542	4.96791	57.9119	54.3573	4.1726E 04	6.9551E 04	6.9185E 05	14000											
14500	2.0000	2.5000	24.9419	27.4419	4.96791	58.3157	54.5316	4.3215E 04	7.2035E 04	7.1967E 05	14500											
15000	2.0000	2.5000	25.0267	27.5267	4.96791	58.7195	54.7000	4.4704E 04	7.4519E 04	7.4798E 05	15000											
15500	2.0000	2.5000	25.1086	27.6086	4.96791	59.1233	54.8629	4.6193E 04	7.7002E 04	7.7337E 05	15500											
16000	2.0000	2.5000	25.1880	27.6880	4.96791	59.5271	55.0206	4.7682E 04	7.9487E 04	8.0004E 05	16000											
16500	2.0000	2.5000	25.2649	27.7649	4.96791	59.9309	55.1755	4.9171E 04	8.1971E 04	8.2839E 05	16500											
17000	2.0000	2.5000	25.3396	27.8396	4.96791	60.3347	55.3218	5.0660E 04	8.4459E 04	8.5602E 05	17000											
17500	2.0000	2.5000	25.4120	27.9120	4.96791	60.7385	55.4658	5.2149E 04	8.6948E 04	8.8371E 05	17500											
18000	2.0000	2.5000	25.4825	27.9825	4.96791	61.1423	55.6058	5.3638E 04	8.9437E 04	9.1148E 05	18000											
18500	2.0000	2.5000	25.5510	28.0510	4.96791	61.5461	55.7419	5.5127E 04	9.1926E 04	9.3922E 05	18500											
19000	2.0000	2.5000	25.6176	28.1176	4.96791	61.9499	55.8744	5.6616E 04	9.4415E 04	9.6722E 05	19000											
19500	2.0000	2.5000	25.6826	28.1826	4.96791	62.3537	56.0034	5.8105E 04	9.6904E 04	9.9519E 05	19500											

TABLE 28 (CONT.). IDEAL GAS FUNCTIONS FOR N₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^0 - E^0}{RT}$	$\ln \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \ln \frac{W^0 - E^0}{RT}$	TEMP. (°K)	
2000	2.0000	25.7455	28.2459	4.96791	51.1613	56.1292	5.9613E 04	9.9358E 04	1.0232E 06	20000
2000	2.0000	25.9841	28.4861	4.96791	51.6348	56.6027	6.5378E 04	1.1340E 04	1.1340E 06	22000
24000	2.0000	26.2017	28.7017	4.96791	52.0670	57.0350	7.1539E 04	1.2912E 05	1.2912E 06	24000
26000	2.0000	26.4018	28.9018	4.96791	52.4647	57.4326	7.7499E 04	1.4911E 05	1.4911E 06	26000
28000	2.0000	26.5870	29.0870	4.96791	52.8328	57.8008	8.3461E 04	1.7391E 05	1.7391E 06	28000
30000	2.0000	26.7595	29.2595	4.96791	53.1756	58.1435	8.9422E 04	1.9904E 05	1.9904E 06	30000
32000	2.0000	26.9209	29.4209	4.96791	53.5062	58.4641	9.5364E 04	1.5897E 05	1.5897E 06	32000
34000	2.0000	27.0724	29.5724	4.96791	53.7974	58.7653	1.0135E 05	1.6891E 05	1.6891E 06	34000
36000	2.0000	27.2153	29.7153	4.96791	54.0614	59.0493	1.0731E 05	1.7804E 05	1.7804E 06	36000
38000	2.0000	27.3505	29.8505	4.96791	54.3500	59.3179	1.1327E 05	1.8878E 05	1.8878E 06	38000
40000	2.0000	27.4787	29.9787	4.96791	54.6048	59.5727	1.1923E 05	1.9872E 05	1.9872E 06	40000
42000	2.0000	27.6007	30.1007	4.96791	54.8472	59.8151	1.2519E 05	2.0856E 05	2.0856E 06	42000
44000	2.0000	27.7170	30.2170	4.96791	55.0783	60.0452	1.3115E 05	2.1839E 05	2.1839E 06	44000
46000	2.0000	27.8281	30.3281	4.96791	55.2991	60.2570	1.3711E 05	2.2822E 05	2.2822E 06	46000
48000	2.0000	27.9345	30.4345	4.96791	55.5105	60.4704	1.4308E 05	2.3804E 05	2.3804E 06	48000
50000	2.0000	28.0366	30.5366	4.96791	55.7133	60.6812	1.4904E 05	2.4800E 05	2.4800E 06	50000
60000	2.0000	28.4924	30.9924	4.96791	56.6191	61.5870	1.7883E 05	2.9807E 05	2.9807E 06	60000
70000	2.0000	28.8778	31.3778	4.96791	57.3849	62.3528	2.0858E 05	3.4735E 05	3.4735E 06	70000
80000	2.0000	29.2116	31.7116	4.96791	58.0483	63.0162	2.3866E 05	3.9743E 05	3.9743E 06	80000
90000	2.0000	29.5061	32.0061	4.96791	58.6334	63.6013	2.6827E 05	4.4711E 05	4.4711E 06	90000
100000	2.0000	29.7695	32.2695	4.96791	59.1568	64.1247	2.9807E 05	4.9679E 05	4.9679E 06	100000
150000	2.0000	30.7831	33.2831	4.96791	61.1711	66.1391	4.4711E 05	7.4519E 05	7.4519E 06	150000
200000	2.0000	31.5023	34.0023	4.96791	62.6003	67.5682	5.9613E 05	9.9358E 05	9.9358E 06	200000
300000	2.0000	32.5160	35.0160	4.96791	64.6146	69.5826	8.9422E 05	1.4904E 06	1.4904E 07	300000
400000	2.0000	33.2352	35.7352	4.96799	66.0438	71.0118	1.1923E 06	1.9904E 06	1.9904E 07	400000
500000	2.0001	33.7931	36.2931	4.96792	67.1525	72.1217	1.4910E 06	2.4800E 06	2.4800E 07	500000
600000	2.0009	34.2493	36.7493	4.97703	68.0590	73.0360	1.7939E 06	2.9807E 06	2.9807E 07	600000
800000	2.0126	34.9744	37.5254	5.06937	69.4998	74.5692	2.4658E 06	4.0535E 06	4.0535E 07	800000
1000000	2.0251	35.5580	38.2565	5.38261	70.6596	76.0420	3.3952E 06	5.3824E 06	5.3824E 07	1000000
1500000	2.0635	36.8033	40.3452	7.03829	73.1362	80.1725	7.5767E 06	1.0537E 07	1.0537E 07	1500000
2000000	3.8655	37.9177	42.0584	8.22824	75.3458	83.5770	1.2482E 07	1.6456E 07	1.6456E 07	2000000
3000000	7.8193	39.6359	43.8356	9.56557	78.1097	87.1087	1.9073E 07	2.5037E 07	2.5037E 07	3000000
4000000	12.3106	40.8090	44.7687	7.62884	81.0920	90.9230	2.3376E 07	3.1315E 07	3.1315E 07	4000000
5000000	16.5460	41.6625	45.3739	7.97513	82.7903	92.7903	2.6806E 07	3.6744E 07	3.6744E 07	5000000
8000000	20.5041	42.5230	45.8959	7.62763	84.1028	91.1304	3.0243E 07	4.2166E 07	4.2166E 07	8000000
8000000	26.4952	43.3049	46.6032	6.55422	86.0541	92.6083	3.6536E 07	5.2434E 07	5.2434E 07	8000000
10000000	31.0093	44.0235	47.1705	6.25359	87.8820	93.7356	4.2664E 07	6.2536E 07	6.2536E 07	10000000

TABLE 29. IDEAL GAS FUNCTIONS FOR O⁺ (ATOMIC WEIGHT 15.9946, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 72 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{M^* - E_0}{RT}$	$\frac{S^*}{R}$	$(M^* - E_0)VT - \frac{3}{2} \ln \frac{M^* - E_0}{RT}$	$\frac{S^*}{R}$	$(M^* - E_0)VT - \frac{3}{2} \ln \frac{M^* - E_0}{RT}$	$\frac{S^*}{R}$	$(M^* - E_0)VT - \frac{3}{2} \ln \frac{M^* - E_0}{RT}$	$\frac{S^*}{R}$	$(M^* - E_0)VT - \frac{3}{2} \ln \frac{M^* - E_0}{RT}$	TEMP. (°K)
5000	1.0000	2.50000	21.7865	4.96791	24.2865	48.2614	1.4904E 04	2.5800E 04	2.1647E 05	5000	
5200	1.0000	2.50000	21.8846	4.96791	24.3846	48.5362	1.5500E 04	2.5833E 04	2.2614E 05	5200	
5400	1.0000	2.50000	21.9789	4.96791	24.4789	48.8110	1.6098E 04	2.5862E 04	2.3580E 05	5400	
5600	1.0000	2.50000	22.0699	4.96791	24.5699	49.0858	1.6692E 04	2.5892E 04	2.4548E 05	5600	
5800	1.0000	2.50000	22.1576	4.96791	24.6576	49.3607	1.7280E 04	2.5923E 04	2.5516E 05	5800	
6000	1.0000	2.50000	22.2423	4.96791	24.7423	49.6356	1.7864E 04	2.5955E 04	2.6484E 05	6000	
6200	1.0000	2.50000	22.3243	4.96791	24.8243	49.9105	1.8444E 04	2.5988E 04	2.7452E 05	6200	
6400	1.0000	2.50000	22.4037	4.96791	24.9037	50.1854	1.9019E 04	2.6022E 04	2.8420E 05	6400	
6600	1.0000	2.50000	22.4806	4.96791	24.9806	50.4603	1.9589E 04	2.6057E 04	2.9388E 05	6600	
6800	1.0000	2.50000	22.5553	4.96791	25.0553	50.7352	2.0154E 04	2.6093E 04	3.0356E 05	6800	
7000	1.0000	2.50000	22.6277	4.96791	25.1277	51.0101	2.0714E 04	2.6130E 04	3.1324E 05	7000	
7200	1.0000	2.50000	22.6982	4.96791	25.1982	51.2850	2.1269E 04	2.6168E 04	3.2292E 05	7200	
7400	1.0000	2.50000	22.7667	4.96791	25.2667	51.5599	2.1819E 04	2.6207E 04	3.3260E 05	7400	
7600	1.0000	2.50000	22.8333	4.96791	25.3333	51.8348	2.2364E 04	2.6247E 04	3.4228E 05	7600	
7800	1.0000	2.50000	22.8983	4.96791	25.3983	52.1097	2.2904E 04	2.6288E 04	3.5196E 05	7800	
8000	1.0000	2.50000	22.9616	4.96791	25.4616	52.3846	2.3439E 04	2.6330E 04	3.6164E 05	8000	
8200	1.0000	2.50000	23.0233	4.96791	25.5233	52.6595	2.3969E 04	2.6373E 04	3.7132E 05	8200	
8400	1.0000	2.50000	23.0833	4.96791	25.5833	52.9344	2.4494E 04	2.6417E 04	3.8100E 05	8400	
8600	1.0000	2.50000	23.1424	4.96791	25.6424	53.2093	2.5014E 04	2.6462E 04	3.9068E 05	8600	
8800	1.0000	2.50000	23.1998	4.96791	25.6998	53.4842	2.5529E 04	2.6508E 04	4.0036E 05	8800	
9000	1.0000	2.50000	23.2560	4.96791	25.7560	53.7591	2.6039E 04	2.6555E 04	4.1004E 05	9000	
9200	1.0000	2.50000	23.3110	4.96791	25.8110	54.0340	2.6545E 04	2.6603E 04	4.1972E 05	9200	
9400	1.0000	2.50000	23.3647	4.96791	25.8647	54.3089	2.7046E 04	2.6652E 04	4.2940E 05	9400	
9600	1.0000	2.50000	23.4174	4.96791	25.9174	54.5838	2.7542E 04	2.6702E 04	4.3908E 05	9600	
9800	1.0000	2.50000	23.4689	4.96791	25.9689	54.8587	2.8034E 04	2.6753E 04	4.4876E 05	9800	
10000	1.0000	2.50000	23.5194	4.96791	26.0194	55.1336	2.8521E 04	2.6805E 04	4.5844E 05	10000	
10500	1.0000	2.50000	23.6416	4.96791	26.1416	55.4085	2.9004E 04	2.6858E 04	4.6812E 05	10500	
11000	1.0000	2.50000	23.7577	4.96791	26.2577	55.6834	2.9482E 04	2.6912E 04	4.7780E 05	11000	
11500	1.0000	2.50000	23.8688	4.96791	26.3688	55.9583	2.9956E 04	2.6967E 04	4.8748E 05	11500	
12000	1.0000	2.50000	23.9752	4.96791	26.4752	56.2332	3.0425E 04	2.7023E 04	4.9716E 05	12000	
12500	1.0000	2.50000	24.0773	4.96791	26.5773	56.5081	3.0890E 04	2.7080E 04	5.0684E 05	12500	
13000	1.0000	2.50000	24.1753	4.96791	26.6753	56.7830	3.1351E 04	2.7138E 04	5.1652E 05	13000	
13500	1.0000	2.50000	24.2697	4.96791	26.7697	57.0579	3.1808E 04	2.7197E 04	5.2620E 05	13500	
14000	1.0000	2.50000	24.3606	4.96791	26.8606	57.3328	3.2261E 04	2.7257E 04	5.3588E 05	14000	
14500	1.0000	2.50000	24.4483	4.96791	26.9483	57.6077	3.2711E 04	2.7318E 04	5.4556E 05	14500	
15000	1.0000	2.50000	24.5331	4.96791	27.0331	57.8826	3.3158E 04	2.7380E 04	5.5524E 05	15000	
15500	1.0000	2.50000	24.6151	4.96791	27.1151	58.1575	3.3602E 04	2.7443E 04	5.6492E 05	15500	
16000	1.0000	2.50000	24.6944	4.96791	27.1944	58.4324	3.4043E 04	2.7507E 04	5.7460E 05	16000	
16500	1.0000	2.50000	24.7714	4.96791	27.2714	58.7073	3.4481E 04	2.7572E 04	5.8428E 05	16500	
17000	1.0000	2.50000	24.8460	4.96791	27.3460	58.9822	3.4916E 04	2.7638E 04	5.9396E 05	17000	
17500	1.0000	2.50000	24.9185	4.96791	27.4185	59.2571	3.5348E 04	2.7705E 04	6.0364E 05	17500	
18000	1.0000	2.50000	24.9889	4.96791	27.4889	59.5320	3.5777E 04	2.7773E 04	6.1332E 05	18000	
18500	1.0000	2.50000	25.0574	4.96791	27.5574	59.8069	3.6203E 04	2.7842E 04	6.2300E 05	18500	
19000	1.0000	2.50000	25.1240	4.96791	27.6240	60.0818	3.6626E 04	2.7912E 04	6.3268E 05	19000	
19500	1.0000	2.50000	25.1890	4.96791	27.6890	60.3567	3.7046E 04	2.7983E 04	6.4236E 05	19500	

TABLE 29 (CONT.). IDEAL GAS FUNCTIONS FOR O₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^* - E^*}{RT}$	$\frac{E^* - E_0^*}{RT}$	$\frac{S^* - S_0^*}{R}$	$\ln \frac{W^* - E^*}{RT} - \frac{E^* - E_0^*}{RT} - \frac{S^* - S_0^*}{R}$	$\frac{E^* - E_0^*}{RT}$	$\frac{S^* - S_0^*}{R}$	$\frac{E^* - E_0^*}{RT} - \frac{S^* - S_0^*}{R}$	$\frac{E^* - E_0^*}{RT}$	$\frac{S^* - S_0^*}{R}$	$\frac{E^* - E_0^*}{RT} - \frac{S^* - S_0^*}{R}$	TEMP. (°K)
20000	1.0000	2.50000	25.2523	27.7523	4.96791	50.1805	55.1486	5.96102	9.3358E 04	1.9034E 04	1.9034E 04	20000
22000	1.0000	2.50000	25.4906	27.9906	4.96791	50.5840	55.6319	6.0427E 04	1.0929E 05	1.1144E 04	1.1144E 04	22000
24000	1.0000	2.50000	25.7081	28.2081	4.96791	51.0862	56.0941	7.1538E 04	1.1929E 05	1.2281E 04	1.2281E 04	24000
26000	1.0000	2.50000	25.9082	28.4082	4.96791	51.6839	56.4518	7.7499E 04	1.2917E 05	1.3388E 04	1.3388E 04	26000
28000	1.0000	2.50000	26.0935	28.5935	4.96791	52.3819	56.7199	8.3461E 04	1.3910E 05	1.4519E 04	1.4519E 04	28000
30000	1.0000	2.50000	26.2659	28.7659	4.96791	52.1948	57.1627	8.9422E 04	1.4904E 05	1.5658E 04	1.5658E 04	30000
32000	1.0000	2.50000	26.4273	28.9273	4.96791	52.2154	57.4833	9.5384E 04	1.5897E 05	1.6809E 04	1.6809E 04	32000
34000	1.0000	2.50000	26.5789	29.0789	4.96791	52.8166	57.7845	1.0135E 05	1.6891E 05	1.7959E 04	1.7959E 04	34000
36000	1.0000	2.50000	26.7217	29.2217	4.96791	53.1005	58.0684	1.0731E 05	1.7884E 05	1.9114E 04	1.9114E 04	36000
38000	1.0000	2.50000	26.8569	29.3569	4.96791	53.3691	58.3370	1.1327E 05	1.8878E 05	2.0280E 04	2.0280E 04	38000
40000	1.0000	2.50000	26.9851	29.4851	4.96791	53.6240	58.5919	1.1923E 05	1.9872E 05	2.1459E 04	2.1459E 04	40000
42000	1.0000	2.50000	27.1071	29.6071	4.96791	53.8663	58.8343	1.2519E 05	2.0865E 05	2.2624E 04	2.2624E 04	42000
44000	1.0000	2.50000	27.2234	29.7234	4.96791	54.0974	59.0654	1.3115E 05	2.1859E 05	2.3803E 04	2.3803E 04	44000
46000	1.0000	2.50000	27.3346	29.8346	4.96791	54.3183	59.2862	1.3711E 05	2.2852E 05	2.4984E 04	2.4984E 04	46000
48000	1.0000	2.50000	27.4410	29.9410	4.96791	54.5297	59.4976	1.4308E 05	2.3846E 05	2.6174E 04	2.6174E 04	48000
50000	1.0000	2.50000	27.5430	30.0430	4.96791	54.7325	59.7004	1.4904E 05	2.4840E 05	2.7364E 04	2.7364E 04	50000
60000	1.0000	2.50000	27.9988	30.4988	4.96791	55.6383	60.4862	1.7884E 05	2.9872E 05	3.3383E 04	3.3383E 04	60000
70000	1.0000	2.50000	28.3842	30.8842	4.96791	56.4041	61.3720	2.0865E 05	3.4773E 05	3.9483E 04	3.9483E 04	70000
80000	1.0000	2.50000	28.7180	31.2180	4.96791	57.0674	62.0354	2.3846E 05	3.9743E 05	4.5654E 04	4.5654E 04	80000
90000	1.0000	2.50000	29.0125	31.5125	4.96791	57.6526	62.6205	2.6827E 05	4.4711E 05	5.1887E 04	5.1887E 04	90000
100000	1.0000	2.50000	29.2759	31.7759	4.96791	58.1760	63.1439	2.9807E 05	4.9679E 05	5.8174E 04	5.8174E 04	100000
150000	1.0000	2.50000	30.2895	32.7895	4.96791	60.1903	65.1582	4.4711E 05	7.4519E 05	9.0289E 04	9.0289E 04	150000
200000	1.0000	2.50000	31.0087	33.5087	4.96791	61.6195	66.5874	5.9415E 05	9.9358E 05	1.2324E 05	1.2324E 05	200000
300000	1.0000	2.50000	32.0224	34.5224	4.96791	63.6338	68.6017	8.9422E 05	1.4904E 06	1.9099E 05	1.9099E 05	300000
400000	1.0000	2.50005	32.7416	35.2417	4.96802	65.0630	70.0310	1.1923E 06	1.9872E 06	2.4025E 05	2.4025E 05	400000
500000	1.0001	2.50110	33.2994	35.8007	4.97011	66.1717	71.1418	1.4915E 06	2.4851E 06	3.3084E 05	3.3084E 05	500000
600000	1.0008	2.50859	33.7560	36.2644	4.98458	67.0788	72.0436	1.7907E 06	2.9830E 06	4.0247E 05	4.0247E 05	600000
800000	1.0131	2.61156	34.4875	37.0990	5.10980	68.2323	73.7219	2.6424E 06	4.1517E 06	5.4824E 05	5.4824E 05	800000
1000000	1.0749	2.99107	35.1046	38.0926	5.45375	69.7586	75.7023	3.5348E 06	5.9439E 06	8.9175E 05	8.9175E 05	1000000
1500000	1.8110	4.66567	36.6402	41.3059	6.27145	72.8102	82.0816	1.0929E 07	1.3907E 07	1.0922E 06	1.0922E 06	1500000
2000000	3.7407	5.19317	38.0845	43.2776	10.31969	75.6802	85.9998	1.6465E 07	2.0439E 07	1.5134E 06	1.5134E 06	2000000
3000000	10.4083	4.74413	40.1215	45.8656	8.23737	79.2780	90.1554	2.3271E 07	2.8782E 07	2.3918E 06	2.3918E 06	3000000
4000000	18.5346	4.27234	41.4177	45.6901	8.48985	82.3038	96.7937	2.6011E 07	3.3959E 07	3.2922E 06	3.2922E 06	4000000
5000000	26.5216	3.94732	42.3339	46.2812	7.94369	84.1244	91.9488	2.9284E 07	3.9220E 07	4.2064E 06	4.2064E 06	5000000
6000000	33.8019	3.71907	43.0323	46.7513	7.39041	85.1222	92.9026	3.2419E 07	4.4342E 07	5.1307E 06	5.1307E 06	6000000
8000000	55.9246	3.42424	44.0379	47.4822	6.80453	87.5504	94.3549	3.8539E 07	5.4434E 07	7.0040E 06	7.0040E 06	8000000
10000000	55.2771	3.24339	44.8012	48.0446	6.44515	89.0273	95.4725	4.4580E 07	6.4452E 07	8.9027E 06	8.9027E 06	10000000

TABLE 10. IDEAL GAS FUNCTIONS FOR AN α (BROMINE WEIGHT 39.9450, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS n, s. SEE TABLE 73 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	TEMP. (°K)
5000	1.0000	2.50000	23.1593	29.6193	4.96791	66.0213	59.9992	1.4904E 04	2.4846E 04	2.4846E 04	2.3011E 05	5000
5200	1.0000	2.50000	23.2573	29.7373	4.96791	66.2162	51.1841	1.5500E 04	2.4833E 04	2.4833E 04	2.4032E 05	5200
5400	1.0000	2.50000	23.3517	29.8517	4.96791	66.4031	51.3716	1.6096E 04	2.4827E 04	2.4827E 04	2.5050E 05	5400
5600	1.0000	2.50000	23.4426	29.9626	4.96791	66.5845	51.5522	1.6692E 04	2.4820E 04	2.4820E 04	2.6080E 05	5600
5800	1.0000	2.50000	23.5303	30.0703	4.96791	66.7701	51.7286	1.7288E 04	2.4814E 04	2.4814E 04	2.7120E 05	5800
6000	1.0000	2.50000	23.6151	30.1751	4.96791	66.9590	51.9000	1.7884E 04	2.4807E 04	2.4807E 04	2.8150E 05	6000
6200	1.0000	2.50000	23.6971	30.2771	4.96791	67.1500	52.0679	1.8481E 04	2.4801E 04	2.4801E 04	2.9190E 05	6200
6400	1.0000	2.50000	23.7774	30.3774	4.96791	67.3426	52.2334	1.9077E 04	2.4795E 04	2.4795E 04	3.0230E 05	6400
6600	1.0000	2.50000	23.8534	30.4734	4.96791	67.5369	52.3965	1.9673E 04	2.4789E 04	2.4789E 04	3.1280E 05	6600
6800	1.0000	2.50000	23.9280	30.5680	4.96791	67.7329	52.5568	2.0269E 04	2.4783E 04	2.4783E 04	3.2330E 05	6800
7000	1.0000	2.50000	24.0005	30.6605	4.96791	67.9309	52.7148	2.0865E 04	2.4777E 04	2.4777E 04	3.3380E 05	7000
7200	1.0000	2.50000	24.0709	30.7509	4.96791	68.1309	52.8708	2.1461E 04	2.4771E 04	2.4771E 04	3.4430E 05	7200
7400	1.0000	2.50000	24.1394	30.8394	4.96791	68.3329	53.0249	2.2057E 04	2.4765E 04	2.4765E 04	3.5480E 05	7400
7600	1.0000	2.50000	24.2061	30.9261	4.96791	68.5369	53.1774	2.2654E 04	2.4759E 04	2.4759E 04	3.6530E 05	7600
7800	1.0000	2.50000	24.2710	31.0110	4.96791	68.7429	53.3294	2.3250E 04	2.4753E 04	2.4753E 04	3.7580E 05	7800
8000	1.0000	2.50000	24.3343	31.0943	4.96791	68.9509	53.4819	2.3846E 04	2.4747E 04	2.4747E 04	3.8630E 05	8000
8200	1.0000	2.50000	24.3960	31.1760	4.96791	69.1609	53.6349	2.4442E 04	2.4741E 04	2.4741E 04	3.9680E 05	8200
8400	1.0000	2.50000	24.4563	31.2563	4.96791	69.3729	53.7884	2.5038E 04	2.4735E 04	2.4735E 04	4.0730E 05	8400
8600	1.0000	2.50000	24.5151	31.3351	4.96791	69.5869	53.9424	2.5634E 04	2.4729E 04	2.4729E 04	4.1780E 05	8600
8800	1.0000	2.50000	24.5726	31.4126	4.96792	69.8029	54.0969	2.6230E 04	2.4723E 04	2.4723E 04	4.2830E 05	8800
9000	1.0000	2.50000	24.6287	31.4887	4.96792	69.9209	54.2519	2.6826E 04	2.4717E 04	2.4717E 04	4.3880E 05	9000
9200	1.0000	2.50000	24.6837	31.5637	4.96792	70.0409	54.4074	2.7422E 04	2.4711E 04	2.4711E 04	4.4930E 05	9200
9400	1.0000	2.50000	24.7375	31.6375	4.96792	70.1629	54.5634	2.8018E 04	2.4705E 04	2.4705E 04	4.5980E 05	9400
9600	1.0000	2.50000	24.7901	31.7101	4.96792	70.2869	54.7204	2.8614E 04	2.4699E 04	2.4699E 04	4.7030E 05	9600
9800	1.0000	2.50001	24.8415	31.7815	4.96793	70.4129	54.8784	2.9210E 04	2.4693E 04	2.4693E 04	4.8080E 05	9800
10000	1.0000	2.50001	24.8922	31.8522	4.96793	70.5409	55.0374	2.9806E 04	2.4687E 04	2.4687E 04	4.9130E 05	10000
10500	1.0000	2.50002	25.0181	32.0181	4.96796	70.7072	55.1959	3.1298E 04	2.4681E 04	2.4681E 04	5.217E 05	10500
11000	1.0000	2.50004	25.1304	32.1704	4.96799	70.8735	55.3544	3.2790E 04	2.4675E 04	2.4675E 04	5.521E 05	11000
11500	1.0000	2.50008	25.2416	32.3216	4.96806	71.0398	55.5129	3.4282E 04	2.4669E 04	2.4669E 04	5.825E 05	11500
12000	1.0000	2.50013	25.3480	32.4780	4.96817	71.2061	55.6714	3.5774E 04	2.4663E 04	2.4663E 04	6.129E 05	12000
12500	1.0000	2.50022	25.4500	32.6300	4.96835	71.3724	55.8309	3.7266E 04	2.4657E 04	2.4657E 04	6.433E 05	12500
13000	1.0000	2.50035	25.5481	32.7781	4.96861	71.5387	55.9904	3.8758E 04	2.4651E 04	2.4651E 04	6.737E 05	13000
13500	1.0000	2.50054	25.6425	32.9225	4.96898	71.7050	56.1500	4.0250E 04	2.4645E 04	2.4645E 04	7.041E 05	13500
14000	1.0001	2.50080	25.7334	33.0634	4.96951	71.8713	56.3100	4.1742E 04	2.4639E 04	2.4639E 04	7.345E 05	14000
14500	1.0001	2.50117	25.8212	33.2012	4.97023	72.0376	56.4701	4.3234E 04	2.4633E 04	2.4633E 04	7.649E 05	14500
15000	1.0001	2.50165	25.9060	33.3360	4.97119	72.2039	56.6302	4.4726E 04	2.4627E 04	2.4627E 04	7.953E 05	15000
15500	1.0002	2.50228	25.9880	33.4780	4.97233	72.3702	56.7903	4.6218E 04	2.4621E 04	2.4621E 04	8.257E 05	15500
16000	1.0003	2.50308	26.0675	33.6175	4.97365	72.5365	56.9504	4.7710E 04	2.4615E 04	2.4615E 04	8.561E 05	16000
16500	1.0004	2.50408	26.1445	33.7545	4.97511	72.7028	57.1105	4.9202E 04	2.4609E 04	2.4609E 04	8.865E 05	16500
17000	1.0005	2.50532	26.2193	33.8893	4.97674	72.8691	57.2706	5.0694E 04	2.4603E 04	2.4603E 04	9.169E 05	17000
17500	1.0006	2.50682	26.2919	34.0219	4.97854	73.0354	57.4307	5.2186E 04	2.4597E 04	2.4597E 04	9.473E 05	17500
18000	1.0009	2.50862	26.3626	34.1526	4.98054	73.2017	57.5908	5.3678E 04	2.4591E 04	2.4591E 04	9.777E 05	18000
18500	1.0012	2.51075	26.4313	34.2813	4.98274	73.3680	57.7509	5.5170E 04	2.4585E 04	2.4585E 04	1.0081E 06	18500
19000	1.0015	2.51325	26.4983	34.4083	4.98514	73.5343	57.9110	5.6662E 04	2.4579E 04	2.4579E 04	1.0385E 06	19000
19500	1.0019	2.51613	26.5636	34.5336	4.98774	73.7006	58.0711	5.8154E 04	2.4573E 04	2.4573E 04	1.0689E 06	19500

TABLE 30 (CONT.). IDEAL GAS FUNCTIONS FOR AR 6*

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^3}{RT^3}$	$\frac{h^3}{RT^3} - \frac{h^3}{RT^3}$	$\ln \frac{h^3}{RT^3} - \ln \frac{h^3}{RT^3}$	$\ln \frac{h^3}{RT^3} - \ln \frac{h^3}{RT^3}$	$\ln \frac{h^3}{RT^3} - \ln \frac{h^3}{RT^3}$	$\ln \frac{h^3}{RT^3} - \ln \frac{h^3}{RT^3}$	$\ln \frac{h^3}{RT^3} - \ln \frac{h^3}{RT^3}$	TEMP. (°K)	
20000	1.0024	2.51945	26.6274	29.1468	5.00854	57.9195	6.0380E 04	1.0013E 05	1.0583E 06	20000
22000	1.0050	2.53749	26.8683	29.4058	5.04241	58.4341	6.7216E 04	1.1093E 05	1.1746E 06	22000
24000	1.0094	2.56427	27.0902	29.6544	5.09462	58.9282	7.4403E 04	1.2229E 05	1.2920E 06	24000
26000	1.0160	2.60062	27.2988	29.8974	5.15787	59.4111	8.2098E 04	1.3434E 05	1.4103E 06	26000
28000	1.0252	2.64671	27.4911	30.1378	5.22945	59.8889	9.0244E 04	1.4726E 05	1.5294E 06	28000
30000	1.0376	2.70204	27.6704	30.3776	5.30960	60.3653	1.0147E 05	1.6108E 05	1.6479E 06	30000
32000	1.0533	2.76562	27.8319	30.6176	5.39374	60.8422	1.1227E 05	1.7584E 05	1.7711E 06	32000
34000	1.0726	2.83814	28.0217	30.8578	5.48368	61.3196	1.2406E 05	1.9182E 05	1.8932E 06	34000
36000	1.0958	2.91216	28.1859	31.0981	5.57895	61.7971	1.3697E 05	2.0833E 05	2.0164E 06	36000
38000	1.1228	2.99226	28.3455	31.3378	5.68111	62.2733	1.5044E 05	2.2595E 05	2.1404E 06	38000
40000	1.1540	3.07513	28.5011	31.5762	5.79364	62.7472	1.6493E 05	2.4443E 05	2.2655E 06	40000
42000	1.1892	3.15968	28.6532	31.8129	5.91681	63.2174	1.8025E 05	2.6371E 05	2.3914E 06	42000
44000	1.2287	3.24502	28.8021	32.0471	6.04838	63.6830	1.9629E 05	2.8373E 05	2.5183E 06	44000
46000	1.2725	3.33045	28.9483	32.2787	6.18816	64.1431	2.1303E 05	3.0444E 05	2.6461E 06	46000
48000	1.3206	3.41549	29.0918	32.5073	6.33615	64.5974	2.3040E 05	3.2578E 05	2.7749E 06	48000
50000	1.3733	3.49976	29.2329	32.7327	6.49261	65.0453	2.4837E 05	3.4773E 05	2.9045E 06	50000
60000	1.7084	3.90172	29.9071	33.8088	7.75336	67.1838	3.4597E 05	4.6520E 05	3.5458E 06	60000
70000	2.1792	4.25493	30.5359	34.7908	8.45525	69.1351	4.5277E 05	5.9187E 05	4.2474E 06	70000
80000	2.8084	4.57900	31.1234	35.6513	9.01755	70.8649	5.6243E 05	7.2140E 05	4.9478E 06	80000
90000	3.6151	4.73960	31.6703	36.4099	9.41836	72.3525	6.8681E 05	8.6785E 05	5.6641E 06	90000
100000	4.6097	4.84475	32.1768	37.0415	9.66705	73.6076	7.6790E 05	9.6671E 05	6.3941E 06	100000
150000	12.2644	4.84697	34.1693	39.0163	9.63172	67.9001	1.1467E 06	1.4448E 06	1.0185E 07	150000
200000	23.1530	4.56943	35.5236	40.0730	8.04947	70.5913	1.4107E 06	1.80081E 06	1.4110E 07	200000
300000	46.1000	4.05924	37.2684	41.3277	8.06639	76.0565	1.8230E 06	2.4199E 06	2.2218E 07	300000
400000	71.9194	3.74465	38.3899	42.1345	7.66124	76.2871	2.1816E 06	2.9745E 06	3.0515E 07	400000
500000	92.6762	3.53318	39.2013	42.7445	7.02100	77.8995	2.5160E 06	3.5105E 06	3.8920E 07	500000
600000	110.3281	3.38235	39.5315	43.2138	6.72129	79.1517	2.8405E 06	4.0328E 06	4.7491E 07	600000
800000	138.0279	3.28232	40.7747	43.9570	6.32379	81.0260	3.4693E 06	5.0590E 06	6.4821E 07	800000
1000000	158.4085	3.05594	41.6703	44.5262	6.07267	82.4083	4.0855E 06	5.8727E 06	8.2506E 07	1000000
1500000	191.0945	2.87977	42.6715	45.5513	5.72259	84.7953	5.6031E 06	8.5839E 06	1.2719E 08	1500000
2000000	210.2490	2.78831	43.4862	46.2745	5.54084	86.1143	7.1073E 06	1.1082E 07	1.7283E 08	2000000
3000000	231.5931	2.69455	44.5966	47.2911	5.35452	88.6208	1.0102E 07	1.6044E 07	2.4586E 08	3000000
4000000	243.1718	2.64680	45.3466	48.0114	5.29943	90.1466	1.3090E 07	2.1039E 07	3.4059E 08	4000000
5000000	250.4106	2.61787	45.9519	48.5697	5.20214	91.3139	1.6075E 07	2.6011E 07	4.5657E 08	5000000
6000000	255.4049	2.59846	46.4273	49.0258	5.16357	92.2588	1.9058E 07	3.0981E 07	5.5355E 08	6000000
8000000	261.7795	2.57407	47.1712	49.7453	5.11510	93.7369	2.5023E 07	4.0921E 07	7.6990E 08	8000000
10000000	265.6839	2.55936	47.7439	50.3032	5.08588	94.8750	3.0987E 07	5.0859E 07	9.4875E 08	10000000

TABLE 31. IDEAL GAS FUNCTIONS FOR N₂ (ATOMIC WEIGHT 14.0028, R = 1.98717 CAL/MOLE)

BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS M.S.A.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2-E_0}{RT}$	$\frac{h^2-E_0}{RT} - \frac{E_0-E_1}{RT}$	$\frac{h^2-E_0}{RT}$	$\frac{h^2-E_0}{RT} - \frac{E_0-E_1}{RT}$	$\frac{h^2-E_0}{RT}$	$\frac{h^2-E_0}{RT} - \frac{E_0-E_1}{RT}$	$\frac{h^2-E_0}{RT}$	$\frac{h^2-E_0}{RT} - \frac{E_0-E_1}{RT}$	TEMP. (°K)
5000	1.0000	2.50000	21.5849	4.96791	42.8647	1.4904E 04	1.4904E 04	2.5840E 04	2.5840E 04	5000
5200	1.0000	2.50000	21.6850	4.96791	43.0816	1.5500E 04	1.5500E 04	2.5833E 04	2.5833E 04	5200
5400	1.0000	2.50000	21.7793	4.96791	43.2791	1.6095E 04	1.6095E 04	2.5827E 04	2.5827E 04	5400
5600	1.0000	2.50000	21.8702	4.96791	43.4598	1.6692E 04	1.6692E 04	2.5821E 04	2.5821E 04	5600
5800	1.0000	2.50000	21.9580	4.96791	43.6341	1.7288E 04	1.7288E 04	2.5814E 04	2.5814E 04	5800
6000	1.0000	2.50000	22.0427	4.96791	43.8025	1.7884E 04	1.7884E 04	2.5807E 04	2.5807E 04	6000
6200	1.0000	2.50000	22.1247	4.96791	43.9654	1.8481E 04	1.8481E 04	2.5800E 04	2.5800E 04	6200
6400	1.0000	2.50000	22.2041	4.96791	44.1231	1.9077E 04	1.9077E 04	2.5793E 04	2.5793E 04	6400
6600	1.0000	2.50000	22.2810	4.96791	44.2760	1.9673E 04	1.9673E 04	2.5786E 04	2.5786E 04	6600
6800	1.0000	2.50000	22.3556	4.96791	44.4243	2.0269E 04	2.0269E 04	2.5779E 04	2.5779E 04	6800
7000	1.0000	2.50000	22.4281	4.96791	44.5683	2.0865E 04	2.0865E 04	2.5772E 04	2.5772E 04	7000
7200	1.0000	2.50000	22.4985	4.96791	44.7083	2.1461E 04	2.1461E 04	2.5765E 04	2.5765E 04	7200
7400	1.0000	2.50000	22.5670	4.96791	44.8444	2.2058E 04	2.2058E 04	2.5758E 04	2.5758E 04	7400
7600	1.0000	2.50000	22.6337	4.96791	44.9769	2.2654E 04	2.2654E 04	2.5751E 04	2.5751E 04	7600
7800	1.0000	2.50000	22.6986	4.96791	45.1059	2.3250E 04	2.3250E 04	2.5744E 04	2.5744E 04	7800
8000	1.0000	2.50000	22.7619	4.96791	45.2317	2.3846E 04	2.3846E 04	2.5737E 04	2.5737E 04	8000
8200	1.0000	2.50000	22.8237	4.96791	45.3544	2.4443E 04	2.4443E 04	2.5730E 04	2.5730E 04	8200
8400	1.0000	2.50000	22.8839	4.96791	45.4741	2.5040E 04	2.5040E 04	2.5723E 04	2.5723E 04	8400
8600	1.0000	2.50000	22.9427	4.96791	45.5910	2.5637E 04	2.5637E 04	2.5716E 04	2.5716E 04	8600
8800	1.0000	2.50000	23.0002	4.96791	45.7052	2.6233E 04	2.6233E 04	2.5709E 04	2.5709E 04	8800
9000	1.0000	2.50000	23.0564	4.96791	45.8168	2.6829E 04	2.6829E 04	2.5702E 04	2.5702E 04	9000
9200	1.0000	2.50000	23.1113	4.96791	45.9260	2.7425E 04	2.7425E 04	2.5695E 04	2.5695E 04	9200
9400	1.0000	2.50000	23.1651	4.96791	46.0329	2.8021E 04	2.8021E 04	2.5688E 04	2.5688E 04	9400
9600	1.0000	2.50000	23.2177	4.96791	46.1375	2.8617E 04	2.8617E 04	2.5681E 04	2.5681E 04	9600
9800	1.0000	2.50000	23.2693	4.96791	46.2399	2.9213E 04	2.9213E 04	2.5674E 04	2.5674E 04	9800
10000	1.0000	2.50000	23.3198	4.96791	46.3403	2.9809E 04	2.9809E 04	2.5667E 04	2.5667E 04	10000
10500	1.0000	2.50000	23.4418	4.96791	46.5826	3.1298E 04	3.1298E 04	2.5660E 04	2.5660E 04	10500
11000	1.0000	2.50000	23.5581	4.96791	46.8138	3.2788E 04	3.2788E 04	2.5653E 04	2.5653E 04	11000
11500	1.0000	2.50000	23.6692	4.96791	47.0346	3.4279E 04	3.4279E 04	2.5646E 04	2.5646E 04	11500
12000	1.0000	2.50000	23.7756	4.96791	47.2460	3.5770E 04	3.5770E 04	2.5639E 04	2.5639E 04	12000
12500	1.0000	2.50000	23.8776	4.96791	47.4488	3.7261E 04	3.7261E 04	2.5632E 04	2.5632E 04	12500
13000	1.0000	2.50000	23.9757	4.96791	47.6437	3.8752E 04	3.8752E 04	2.5625E 04	2.5625E 04	13000
13500	1.0000	2.50000	24.0700	4.96791	47.8312	4.0243E 04	4.0243E 04	2.5618E 04	2.5618E 04	13500
14000	1.0000	2.50000	24.1610	4.96791	48.0118	4.1734E 04	4.1734E 04	2.5611E 04	2.5611E 04	14000
14500	1.0000	2.50000	24.2487	4.96791	48.1862	4.3225E 04	4.3225E 04	2.5604E 04	2.5604E 04	14500
15000	1.0000	2.50000	24.3334	4.96791	48.3546	4.4716E 04	4.4716E 04	2.5597E 04	2.5597E 04	15000
15500	1.0000	2.50000	24.4154	4.96791	48.5175	4.6207E 04	4.6207E 04	2.5590E 04	2.5590E 04	15500
16000	1.0000	2.50000	24.4948	4.96791	48.6752	4.7698E 04	4.7698E 04	2.5583E 04	2.5583E 04	16000
16500	1.0000	2.50000	24.5717	4.96791	48.8281	4.9189E 04	4.9189E 04	2.5576E 04	2.5576E 04	16500
17000	1.0000	2.50000	24.6464	4.96791	48.9764	5.0680E 04	5.0680E 04	2.5569E 04	2.5569E 04	17000
17500	1.0000	2.50000	24.7188	4.96791	49.1204	5.2171E 04	5.2171E 04	2.5562E 04	2.5562E 04	17500
18000	1.0000	2.50000	24.7892	4.96791	49.2603	5.3662E 04	5.3662E 04	2.5555E 04	2.5555E 04	18000
18500	1.0000	2.50000	24.8577	4.96791	49.3965	5.5153E 04	5.5153E 04	2.5548E 04	2.5548E 04	18500
19000	1.0000	2.50000	24.9244	4.96791	49.5289	5.6644E 04	5.6644E 04	2.5541E 04	2.5541E 04	19000
19500	1.0000	2.50000	24.9894	4.96791	49.6590	5.8135E 04	5.8135E 04	2.5534E 04	2.5534E 04	19500

TABLE 21 (CONT'D). IDEAL GAS FUNCTIONS FOR N₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$57.76 \ln \frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\ln \frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT} - \frac{h^2 - E_0}{RT}$	TEMP. (°K)
20000	1.0000	25.0526	4.96791	49.7838	54.7517	5.9615E 04	9.9558E 04	9.9548E 05	20000	
22000	1.0000	25.2969	4.96791	50.2522	55.2252	6.5571E 04	1.0929E 05	1.1057E 06	22000	
24000	1.0000	25.5085	4.96791	50.8895	55.8554	7.1538E 04	1.1923E 05	1.2185E 06	24000	
26000	1.0000	25.7085	4.96791	51.0812	56.0551	7.7899E 04	1.2917E 05	1.3283E 06	26000	
28000	1.0000	25.8938	4.96791	51.4553	56.8232	8.5361E 04	1.3910E 05	1.4407E 06	28000	
30000	1.0000	26.0663	4.96791	51.7991	56.7660	8.9622E 04	1.4904E 05	1.5530E 06	30000	
32000	1.0000	26.2277	4.96791	52.1187	57.0866	9.5364E 04	1.5897E 05	1.6678E 06	32000	
34000	1.0000	26.3792	4.96791	52.4199	57.3878	1.0135E 05	1.5891E 05	1.7823E 06	34000	
36000	1.0000	26.5221	4.96791	52.7036	57.6717	1.0731E 05	1.7884E 05	1.8973E 06	36000	
38000	1.0000	26.6573	4.96791	52.9724	57.9403	1.1327E 05	1.8878E 05	2.0130E 06	38000	
40000	1.0000	26.7855	4.96791	53.2273	58.1952	1.1923E 05	1.9872E 05	2.1291E 06	40000	
42000	1.0000	26.9075	4.96791	53.4656	58.4376	1.2519E 05	2.0865E 05	2.2457E 06	42000	
44000	1.0000	27.0238	4.96791	53.7007	58.6687	1.3115E 05	2.1859E 05	2.3628E 06	44000	
46000	1.0000	27.1349	4.96791	53.9216	58.8895	1.3711E 05	2.2852E 05	2.4804E 06	46000	
48000	1.0000	27.2413	4.96791	54.1330	59.1009	1.4308E 05	2.3846E 05	2.5984E 06	48000	
50000	1.0000	27.3434	4.96791	54.3358	59.3037	1.4904E 05	2.4840E 05	2.7168E 06	50000	
60000	1.0000	27.7992	4.96791	55.2416	60.2095	1.7884E 05	2.9807E 05	3.3165E 06	60000	
70000	1.0000	28.1864	4.96791	56.0074	60.9753	2.0865E 05	3.4775E 05	3.9205E 06	70000	
80000	1.0000	28.5184	4.96791	56.6707	61.6387	2.3846E 05	3.9743E 05	4.5337E 06	80000	
90000	1.0000	28.8128	4.96791	57.2359	62.2238	2.6827E 05	4.4711E 05	5.1530E 06	90000	
100000	1.0000	29.0762	4.96791	57.7793	62.7472	2.9807E 05	4.9679E 05	5.7779E 06	100000	
150000	1.0000	30.0899	4.96791	59.7936	64.7615	4.4711E 05	7.4519E 05	8.9690E 06	150000	
200000	1.0000	30.8091	4.96791	61.2228	65.1907	5.9615E 05	9.9358E 05	1.2245E 07	200000	
300000	1.0000	31.8228	4.96791	63.2371	68.2050	8.9622E 05	1.4904E 06	1.8971E 07	300000	
400000	1.0000	32.5420	4.96791	64.6663	69.6342	1.1923E 06	1.9872E 06	2.5867E 07	400000	
500000	1.0000	33.0998	4.96791	65.7749	70.7428	1.4904E 06	2.4840E 06	3.2887E 07	500000	
600000	1.0000	33.5556	4.96791	66.6806	71.6485	1.7884E 06	2.9807E 06	4.0009E 07	600000	
800000	1.0000	34.2748	4.96791	68.1098	73.0777	2.3846E 06	3.9743E 06	5.4480E 07	800000	
1000000	1.0000	34.8327	4.96791	69.2183	74.1863	2.9807E 06	4.9679E 06	6.9218E 07	1000000	
1500000	1.0000	35.8444	4.96791	71.2327	76.2006	4.4711E 06	7.4519E 06	1.0685E 08	1500000	
2000000	1.0000	36.5654	4.96791	72.6618	77.6298	5.9615E 06	9.9358E 06	1.4532E 08	2000000	
3000000	1.0000	37.5792	4.96791	74.6762	79.6441	8.9622E 06	1.4904E 07	2.2403E 08	3000000	
4000000	1.0000	38.2984	4.96791	76.1053	81.0733	1.1923E 07	1.9872E 07	3.0442E 08	4000000	
5000000	1.0000	38.8563	4.96791	77.2139	82.1818	1.4904E 07	2.4840E 07	3.8607E 08	5000000	
6000000	1.0000	39.3121	4.96791	78.1197	83.0876	1.7884E 07	2.9807E 07	4.6872E 08	6000000	
8000000	1.0000	40.0313	4.96791	79.5488	84.5183	2.3846E 07	3.9743E 07	6.3639E 08	8000000	
10000000	1.0000	40.5892	4.96791	80.6574	85.6253	2.9807E 07	4.9679E 07	8.0557E 08	10000000	

TABLE 32. IDEAL GAS FUNCTIONS FOR O₂ (ATOMIC WEIGHT 15.9955, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 4. SEE TABLE 74 FOR LIST OF STATES USED.

TEMP. (%)	PARTIT. FUNCT.	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	$\frac{h^2 - E}{RT}$	TEMP. (%)
5000	2.0000	2.50000	22.4796	4.96791	24.9796	44.6708	49.8387	1.4904E 04	2.4840E 04	2.4840E 04	2.4840E 04	2.4840E 04	5000
5200	2.0000	2.50000	22.5777	4.96791	25.0777	44.8656	49.8335	1.5500E 04	2.5833E 04	2.5833E 04	2.5833E 04	2.5833E 04	5200
5400	2.0000	2.50000	22.6720	4.96791	25.1720	45.0531	50.0210	1.6096E 04	2.6827E 04	2.6827E 04	2.6827E 04	2.6827E 04	5400
5600	2.0000	2.50000	22.7630	4.96791	25.2630	45.2438	50.2017	1.6692E 04	2.7820E 04	2.7820E 04	2.7820E 04	2.7820E 04	5600
5800	2.0000	2.50000	22.8507	4.96791	25.3507	45.4361	50.3760	1.7288E 04	2.8814E 04	2.8814E 04	2.8814E 04	2.8814E 04	5800
6000	2.0000	2.50000	22.9354	4.96791	25.4354	45.6304	50.5444	1.7884E 04	2.9807E 04	2.9807E 04	2.9807E 04	2.9807E 04	6000
6200	2.0000	2.50000	23.0174	4.96791	25.5174	45.8268	50.7073	1.8481E 04	3.0801E 04	3.0801E 04	3.0801E 04	3.0801E 04	6200
6400	2.0000	2.50000	23.0968	4.96791	25.5968	46.0251	50.8650	1.9077E 04	3.1795E 04	3.1795E 04	3.1795E 04	3.1795E 04	6400
6600	2.0000	2.50000	23.1737	4.96791	25.6737	46.2254	51.0179	1.9673E 04	3.2788E 04	3.2788E 04	3.2788E 04	3.2788E 04	6600
6800	2.0000	2.50000	23.2483	4.96791	25.7483	46.4276	51.1662	2.0269E 04	3.3782E 04	3.3782E 04	3.3782E 04	3.3782E 04	6800
7000	2.0000	2.50000	23.3208	4.96791	25.8208	46.6317	51.3102	2.0855E 04	3.4775E 04	3.4775E 04	3.4775E 04	3.4775E 04	7000
7200	2.0000	2.50000	23.3912	4.96791	25.8912	46.8374	51.4502	2.1442E 04	3.5768E 04	3.5768E 04	3.5768E 04	3.5768E 04	7200
7400	2.0000	2.50000	23.4597	4.96791	25.9597	47.0446	51.5863	2.2028E 04	3.6761E 04	3.6761E 04	3.6761E 04	3.6761E 04	7400
7600	2.0000	2.50000	23.5264	4.96791	26.0264	47.2546	51.7186	2.2614E 04	3.7754E 04	3.7754E 04	3.7754E 04	3.7754E 04	7600
7800	2.0000	2.50000	23.5914	4.96791	26.0914	47.4671	51.8478	2.3200E 04	3.8747E 04	3.8747E 04	3.8747E 04	3.8747E 04	7800
8000	2.0000	2.50000	23.6546	4.96791	26.1546	47.6817	51.9736	2.3786E 04	3.9740E 04	3.9740E 04	3.9740E 04	3.9740E 04	8000
8200	2.0000	2.50000	23.7164	4.96791	26.2164	47.8984	52.0963	2.4372E 04	4.0733E 04	4.0733E 04	4.0733E 04	4.0733E 04	8200
8400	2.0000	2.50000	23.7766	4.96791	26.2766	48.1171	52.2160	2.4958E 04	4.1726E 04	4.1726E 04	4.1726E 04	4.1726E 04	8400
8600	2.0000	2.50000	23.8354	4.96791	26.3354	48.3378	52.3329	2.5544E 04	4.2719E 04	4.2719E 04	4.2719E 04	4.2719E 04	8600
8800	2.0000	2.50000	23.8929	4.96791	26.3929	48.5604	52.4471	2.6130E 04	4.3712E 04	4.3712E 04	4.3712E 04	4.3712E 04	8800
9000	2.0000	2.50000	23.9491	4.96791	26.4491	48.7849	52.5587	2.6716E 04	4.4705E 04	4.4705E 04	4.4705E 04	4.4705E 04	9000
9200	2.0000	2.50000	24.0040	4.96791	26.5040	49.0114	52.6679	2.7302E 04	4.5698E 04	4.5698E 04	4.5698E 04	4.5698E 04	9200
9400	2.0000	2.50000	24.0578	4.96791	26.5578	49.2404	52.7748	2.7888E 04	4.6691E 04	4.6691E 04	4.6691E 04	4.6691E 04	9400
9600	2.0000	2.50000	24.1104	4.96791	26.6104	49.4717	52.8794	2.8474E 04	4.7684E 04	4.7684E 04	4.7684E 04	4.7684E 04	9600
9800	2.0000	2.50000	24.1620	4.96791	26.6620	49.7054	52.9818	2.9060E 04	4.8677E 04	4.8677E 04	4.8677E 04	4.8677E 04	9800
10000	2.0000	2.50000	24.2125	4.96791	26.7125	49.9417	53.0822	2.9646E 04	4.9670E 04	4.9670E 04	4.9670E 04	4.9670E 04	10000
10500	2.0000	2.50000	24.3345	4.96791	26.8345	50.3866	53.3245	3.1298E 04	5.1716E 04	5.1716E 04	5.1716E 04	5.1716E 04	10500
11000	2.0000	2.50000	24.4508	4.96791	26.9508	50.8377	53.5557	3.2788E 04	5.3447E 04	5.3447E 04	5.3447E 04	5.3447E 04	11000
11500	2.0000	2.50000	24.5619	4.96791	27.0619	51.2850	53.7765	3.4279E 04	5.5178E 04	5.5178E 04	5.5178E 04	5.5178E 04	11500
12000	2.0000	2.50000	24.6683	4.96791	27.1683	51.7284	53.9879	3.5769E 04	5.6909E 04	5.6909E 04	5.6909E 04	5.6909E 04	12000
12500	2.0000	2.50000	24.7704	4.96791	27.2704	52.1784	54.1907	3.7259E 04	5.8640E 04	5.8640E 04	5.8640E 04	5.8640E 04	12500
13000	2.0000	2.50000	24.8684	4.96791	27.3684	52.4344	54.3856	3.8750E 04	6.0371E 04	6.0371E 04	6.0371E 04	6.0371E 04	13000
13500	2.0000	2.50000	24.9628	4.96791	27.4628	52.6924	54.5731	4.0240E 04	6.2102E 04	6.2102E 04	6.2102E 04	6.2102E 04	13500
14000	2.0000	2.50000	25.0537	4.96791	27.5537	52.9524	54.7537	4.1730E 04	6.3833E 04	6.3833E 04	6.3833E 04	6.3833E 04	14000
14500	2.0000	2.50000	25.1414	4.96791	27.6414	53.2144	54.9281	4.3221E 04	6.5564E 04	6.5564E 04	6.5564E 04	6.5564E 04	14500
15000	2.0000	2.50000	25.2262	4.96791	27.7262	53.4784	55.0965	4.4711E 04	6.7295E 04	6.7295E 04	6.7295E 04	6.7295E 04	15000
15500	2.0000	2.50000	25.3081	4.96791	27.8081	53.7444	55.2594	4.6202E 04	6.9026E 04	6.9026E 04	6.9026E 04	6.9026E 04	15500
16000	2.0000	2.50000	25.3875	4.96791	27.8875	54.0114	55.4171	4.7693E 04	7.0757E 04	7.0757E 04	7.0757E 04	7.0757E 04	16000
16500	2.0000	2.50000	25.4644	4.96791	27.9644	54.2704	55.5700	4.9184E 04	7.2488E 04	7.2488E 04	7.2488E 04	7.2488E 04	16500
17000	2.0000	2.50000	25.5391	4.96791	28.0391	54.5264	55.7183	5.0675E 04	7.4219E 04	7.4219E 04	7.4219E 04	7.4219E 04	17000
17500	2.0000	2.50000	25.6115	4.96791	28.1115	54.7804	55.8623	5.2166E 04	7.5950E 04	7.5950E 04	7.5950E 04	7.5950E 04	17500
18000	2.0000	2.50000	25.6820	4.96791	28.1820	55.0314	56.0022	5.3657E 04	7.7681E 04	7.7681E 04	7.7681E 04	7.7681E 04	18000
18500	2.0000	2.50000	25.7505	4.96791	28.2505	55.2804	56.1384	5.5148E 04	7.9412E 04	7.9412E 04	7.9412E 04	7.9412E 04	18500
19000	2.0000	2.50000	25.8171	4.96791	28.3171	55.5264	56.2700	5.6639E 04	8.1143E 04	8.1143E 04	8.1143E 04	8.1143E 04	19000
19500	2.0000	2.50000	25.8821	4.96791	28.3821	55.7694	56.3999	5.8130E 04	8.2874E 04	8.2874E 04	8.2874E 04	8.2874E 04	19500

TABLE 32 (CONT.). IDEAL GAS FUNCTIONS FOR U₁

TEMP. (°C)	PARTIT. FUNCT.	$\frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	$\frac{U_1^0 - U_1}{RT} - \frac{U_1^0 - U_1}{RT}$	TEMP. (°C)
20000	2.0000	25.9454	28.4654	4.96791	51.5377	56.5237	5.9619E 04	9.9330E 04	1.0312E 06	1.0312E 06	20000	
22000	2.0000	26.1836	28.6836	4.96791	52.0312	56.9992	1.1447E 06	1.1447E 06	1.1447E 06	1.1447E 06	22000	
24000	2.0000	26.4218	28.9012	4.96791	52.4635	57.4314	7.1530E 05	1.1923E 05	1.2591E 06	1.2591E 06	24000	
26000	2.0000	26.6601	29.1193	4.96791	52.8291	57.8291	7.4699E 04	1.2917E 05	1.3744E 06	1.3744E 06	26000	
28000	2.0000	26.8986	29.3386	4.96791	53.2293	58.1972	8.3461E 04	1.3910E 05	1.4904E 06	1.4904E 06	28000	
30000	2.0000	27.1372	29.5582	4.96791	53.6521	58.5400	8.9422E 04	1.4904E 05	1.6072E 06	1.6072E 06	30000	
32000	2.0000	27.3759	29.7779	4.96791	54.0979	58.8606	9.5384E 04	1.5897E 05	1.7246E 06	1.7246E 06	32000	
34000	2.0000	27.6146	29.9976	4.96791	54.5693	59.1618	1.0135E 05	1.6891E 05	1.8426E 06	1.8426E 06	34000	
36000	2.0000	27.8532	30.2172	4.96791	55.0713	59.4457	1.0731E 05	1.7884E 05	1.9612E 06	1.9612E 06	36000	
38000	2.0000	28.0918	30.4368	4.96791	55.6044	59.7143	1.1327E 05	1.8877E 05	2.0804E 06	2.0804E 06	38000	
40000	2.0000	28.3304	30.6564	4.96791	56.1682	59.9682	1.1923E 05	1.9870E 05	2.2000E 06	2.2000E 06	40000	
42000	2.0000	28.5689	30.8760	4.96791	56.7626	60.2115	1.2519E 05	2.0863E 05	2.3202E 06	2.3202E 06	42000	
44000	2.0000	28.8075	31.0956	4.96791	57.3879	60.4426	1.3115E 05	2.1856E 05	2.4409E 06	2.4409E 06	44000	
46000	2.0000	29.0460	31.3152	4.96791	58.0437	60.6635	1.3711E 05	2.2849E 05	2.5620E 06	2.5620E 06	46000	
48000	2.0000	29.2846	31.5348	4.96791	58.7299	60.8749	1.4308E 05	2.3842E 05	2.6835E 06	2.6835E 06	48000	
50000	2.0000	29.5231	31.7544	4.96791	59.4477	61.0777	1.4904E 05	2.4835E 05	2.8055E 06	2.8055E 06	50000	
60000	2.0000	29.9619	32.1931	4.96791	57.0156	61.9835	1.7884E 05	2.9807E 05	3.4209E 06	3.4209E 06	60000	
70000	2.0000	30.4007	32.6318	4.96791	57.7814	62.7493	2.0863E 05	3.4773E 05	4.0447E 06	4.0447E 06	70000	
80000	2.0000	30.8394	33.0705	4.96791	58.5447	63.4126	2.3842E 05	3.9743E 05	4.6756E 06	4.6756E 06	80000	
90000	2.0000	31.2781	33.5092	4.96791	59.3079	63.9978	2.6821E 05	4.4711E 05	5.3127E 06	5.3127E 06	90000	
100000	2.0000	31.7168	33.9479	4.96791	59.5533	64.5212	2.9807E 05	4.9679E 05	5.9553E 06	5.9553E 06	100000	
150000	2.0000	32.8526	34.5826	4.96791	61.5676	66.5365	4.4711E 05	7.4519E 05	9.2351E 06	9.2351E 06	150000	
200000	2.0000	33.7018	34.9718	4.96791	62.9968	67.9647	5.9615E 05	9.9358E 05	1.2599E 07	1.2599E 07	200000	
300000	2.0000	34.7155	35.2155	4.96791	65.0111	69.9790	8.9422E 05	1.4904E 06	1.9503E 07	1.9503E 07	300000	
400000	2.0000	35.4347	35.3347	4.96791	66.6403	71.4082	1.1923E 06	1.9872E 06	2.6576E 07	2.6576E 07	400000	
500000	2.0000	35.9926	35.4926	4.96791	67.5688	72.5168	1.4904E 06	2.4835E 06	3.3774E 07	3.3774E 07	500000	
600000	2.0000	36.4484	35.6484	4.96791	68.4966	73.4230	1.7884E 06	2.9807E 06	4.1073E 07	4.1073E 07	600000	
800000	2.0011	35.1681	37.6737	4.97899	69.8848	74.8638	2.3932E 06	3.9832E 06	5.5908E 07	5.5908E 07	800000	
1000000	2.0088	35.7298	38.2667	5.04129	71.0010	76.0423	3.0541E 06	5.0413E 06	7.1001E 07	7.1001E 07	1000000	
1500000	2.1535	36.8130	39.7267	5.78991	73.1535	78.9435	5.7041E 06	8.6849E 06	1.0973E 08	1.0973E 08	1500000	
2000000	2.6609	37.7438	41.5484	7.14305	75.0032	82.1443	1.0312E 07	1.4286E 07	1.5001E 08	1.5001E 08	2000000	
3000000	4.8951	4.25653	43.6236	8.45862	78.2288	86.6872	1.9416E 07	2.5374E 07	2.3469E 08	2.3469E 08	3000000	
4000000	8.0943	4.18532	44.7765	8.31692	80.4574	88.9743	2.5319E 07	3.3266E 07	3.2263E 08	3.2263E 08	4000000	
5000000	11.5415	3.98451	45.5018	65.9663	7.91787	90.3889	2.9654E 07	3.9589E 07	4.1235E 08	4.1235E 08	5000000	
6000000	14.8739	3.79748	42.2113	46.0088	83.6806	91.4270	3.3354E 07	4.5277E 07	5.0328E 08	5.0328E 08	6000000	
8000000	20.7345	3.51801	43.2627	46.7907	6.99086	85.9701	4.0030E 07	5.5927E 07	6.8776E 08	6.8776E 08	8000000	
10000000	25.4728	3.33161	44.0264	47.3580	6.62046	87.4876	4.6333E 07	6.6205E 07	8.7488E 08	8.7488E 08	10000000	

TABLE 33. IDEAL GAS FUNCTIONS FOR AR 7s (ATOMIC WEIGHT 39.9440, R = 1.98717 CAL./MOLE).
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS R ≤ 4. SEE TABLE 75 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIAL FUNCT.	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	TEMP. (°K)
5000	2.0000	23.8524	4.96791	46.3524	47.3944	1.49044	04	2.48404	04	2.36994	05	5000
5200	2.0000	23.9504	4.96791	26.5404	47.5935	1.55004	04	2.58334	04	2.47494	05	5200
5400	2.0000	24.0448	4.96791	26.5448	47.7810	1.60944	04	2.68274	04	2.58024	05	5400
5600	2.0000	24.1357	4.96791	26.6357	47.9617	1.66924	04	2.78204	04	2.68594	05	5600
5800	2.0000	24.2234	4.96791	26.7234	48.1360	1.72804	04	2.88144	04	2.79194	05	5800
6000	2.0000	24.3082	4.96791	26.8082	48.3044	1.78684	04	2.98074	04	2.89834	05	6000
6200	2.0000	24.3902	4.96791	26.8902	48.4673	1.84564	04	3.08014	04	3.00504	05	6200
6400	2.0000	24.4695	4.96791	26.9695	48.6250	1.90444	04	3.17954	04	3.11104	05	6400
6600	2.0000	24.5465	4.96791	27.0465	48.7779	1.96324	04	3.27894	04	3.21924	05	6600
6800	2.0000	24.6211	4.96791	27.1211	48.9262	2.02204	04	3.37834	04	3.32704	05	6800
7000	2.0000	24.6936	4.96791	27.1936	49.0702	2.08084	04	3.47774	04	3.43494	05	7000
7200	2.0000	24.7644	4.96791	27.2644	49.2112	2.13964	04	3.57714	04	3.54314	05	7200
7400	2.0000	24.8325	4.96791	27.3325	49.3483	2.19844	04	3.67654	04	3.65164	05	7400
7600	2.0000	24.8992	4.96791	27.3992	49.4788	2.25724	04	3.77594	04	3.76044	05	7600
7800	2.0000	24.9641	4.96791	27.4641	49.6078	2.31604	04	3.87534	04	3.86944	05	7800
8000	2.0000	25.0274	4.96791	27.5274	49.7336	2.37484	04	3.97474	04	3.97874	05	8000
8200	2.0000	25.0891	4.96791	27.5891	49.8563	2.43364	04	4.07414	04	4.08824	05	8200
8400	2.0000	25.1494	4.96791	27.6494	49.9760	2.49244	04	4.17354	04	4.19804	05	8400
8600	2.0000	25.2082	4.96791	27.7082	50.0929	2.55124	04	4.27294	04	4.30804	05	8600
8800	2.0000	25.2657	4.96791	27.7657	50.2071	2.61004	04	4.37234	04	4.41824	05	8800
9000	2.0000	25.3219	4.96791	27.8219	50.3187	2.66884	04	4.47174	04	4.52874	05	9000
9200	2.0000	25.3768	4.96791	27.8768	50.4279	2.72764	04	4.57114	04	4.63944	05	9200
9400	2.0000	25.4308	4.96791	27.9308	50.5348	2.78644	04	4.67054	04	4.75034	05	9400
9600	2.0000	25.4832	4.96791	27.9832	50.6393	2.84524	04	4.76994	04	4.86144	05	9600
9800	2.0000	25.5348	4.96791	28.0348	50.7418	2.90404	04	4.86934	04	4.97274	05	9800
10000	2.0000	25.5853	4.96791	28.0853	50.8421	2.96284	04	4.96874	04	5.08424	05	10000
10500	2.0000	25.7072	4.96791	28.2072	51.0845	3.12964	04	5.21634	04	5.36994	05	10500
11000	2.0000	25.8235	4.96791	28.3235	51.3156	3.29644	04	5.46794	04	5.66474	05	11000
11500	2.0000	25.9347	4.96791	28.4347	51.5345	3.46324	04	5.71954	04	5.95954	05	11500
12000	2.0000	26.0411	4.96791	28.5411	51.7479	3.63004	04	5.97114	04	6.25434	05	12000
12500	2.0000	26.1431	4.96791	28.6431	51.9560	3.79684	04	6.22274	04	6.54914	05	12500
13000	2.0000	26.2412	4.96791	28.7412	52.1595	3.96364	04	6.47434	04	6.84394	05	13000
13500	2.0000	26.3355	4.96791	28.8355	52.3590	4.13044	04	6.72594	04	7.13874	05	13500
14000	2.0000	26.4264	4.96791	28.9264	52.5537	4.29724	04	6.97754	04	7.43354	05	14000
14500	2.0000	26.5142	4.96791	29.0142	52.7440	4.46404	04	7.22914	04	7.72834	05	14500
15000	2.0000	26.5989	4.96804	29.1089	52.9304	4.63084	04	7.48074	04	8.02314	05	15000
15500	2.0000	26.6809	4.96804	29.1810	53.1131	4.79764	04	7.73234	04	8.31794	05	15500
16000	2.0000	26.7603	4.96813	29.2506	53.2924	4.96444	04	7.98394	04	8.61274	05	16000
16500	2.0000	26.8372	4.96823	29.3174	53.4687	5.13124	04	8.23554	04	8.90754	05	16500
17000	2.0000	26.9118	4.96835	29.3812	53.6423	5.29804	04	8.48714	04	9.20234	05	17000
17500	2.0000	26.9843	4.96851	29.4446	53.8133	5.46484	04	8.73874	04	9.49714	05	17500
18000	2.0000	27.0548	4.96869	29.5052	53.9820	5.63164	04	8.99034	04	9.79194	05	18000
18500	2.0000	27.1233	4.96888	29.5638	54.1487	5.79844	04	9.24194	04	10.08674	05	18500
19000	2.0000	27.1900	4.96907	29.6207	54.3130	5.96524	04	9.49354	04	10.38154	05	19000
19500	2.0000	27.2549	4.96926	29.6758	54.4754	6.13204	04	9.74514	04	10.67634	05	19500

TABLE 33 (CONT.). IDEAL GAS FUNCTIONS FOR AIR 76

TEMP. (°F)	PARTIT. FUNCT.	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	$\frac{h^* - h_f}{RT}$	TEMP. (°F)
20000	2.0002	2.50113	27.3182	29.8196	4.97016	54.2859	59.2560	5.96606	9.94036	04	1.04576	06	20000
22000	2.0006	2.50257	27.5567	30.0593	4.97308	54.7597	59.7328	6.06906	1.09616	05	1.20476	06	22000
24000	2.0012	2.50516	27.7765	30.2797	4.97817	55.1926	60.1708	7.17846	1.19446	05	1.32466	07	24000
26000	2.0023	2.50916	28.0612	30.6864	4.98612	55.5913	60.5775	7.97336	1.29646	05	1.44546	06	26000
28000	2.0041	2.51489	28.4164	30.4762	4.99751	55.9513	60.9588	8.42906	1.39936	05	1.56696	06	28000
30000	2.0067	2.52256	28.8351	30.8577	5.01278	56.3064	61.3193	9.07686	1.50386	05	1.68926	06	30000
32000	2.0102	2.53234	29.4962	31.0306	5.03217	56.6307	61.6628	9.74406	1.61036	05	1.81226	06	32000
34000	2.0148	2.54421	29.8521	31.1963	5.05571	56.9364	61.9922	1.04336	1.71906	05	1.93506	06	34000
36000	2.0207	2.55816	29.8789	31.3560	5.08348	57.2262	62.3097	1.11476	1.83016	05	2.04016	06	36000
38000	2.0279	2.57406	29.9366	31.5107	5.11508	57.5019	62.6169	1.18846	1.94376	05	2.14816	06	38000
40000	2.0363	2.59176	29.9691	31.6609	5.15025	57.7681	62.9184	1.26526	2.04916	05	2.25846	06	40000
42000	2.0466	2.61105	29.9780	31.8071	5.18899	58.0173	63.2099	1.34406	2.14926	05	2.36376	06	42000
44000	2.0582	2.63172	29.9719	31.9497	5.23167	58.2596	63.4993	1.42476	2.24316	05	2.46346	06	44000
46000	2.0713	2.65396	29.9536	32.0890	5.27803	58.4930	63.7861	1.50756	2.34046	05	2.55746	06	46000
48000	2.0858	2.67628	29.9268	32.2251	5.32822	58.7164	64.0706	1.59286	2.44176	05	2.64576	06	48000
50000	2.1019	2.69973	29.8955	32.3583	5.38190	58.9364	64.3512	1.68086	2.54646	05	2.72946	06	50000
52000	2.2233	2.82102	30.1615	32.4825	5.43953	59.1516	64.6288	1.77126	2.65446	05	2.80816	06	52000
54000	2.3357	2.93725	30.6092	33.6024	5.50180	60.1676	64.9044	1.86476	2.76546	05	2.88176	06	54000
56000	2.4492	3.04818	31.5043	34.0445	5.56813	61.1016	65.1780	1.96126	2.87046	05	2.94946	06	56000
58000	2.5709	3.12792	31.3376	34.4955	5.63859	62.1326	65.4493	2.06076	2.97346	05	3.01176	06	58000
60000	2.6648	3.20150	31.7011	34.9026	5.71290	62.9953	65.7126	2.16326	3.07476	05	3.06846	06	60000
62000	2.7493	3.26814	33.0484	34.6785	5.79126	63.6726	66.0688	2.26846	3.17446	05	3.11946	06	62000
64000	2.8257	3.32848	34.6528	37.5993	5.87364	64.2744	66.5159	2.37546	3.27346	05	3.16446	06	64000
66000	2.8942	3.38265	35.5101	39.1277	5.96004	64.8044	66.9544	2.48346	3.37146	05	3.20346	06	66000
68000	2.9569	3.43075	36.5459	40.1156	6.05059	65.2627	67.3844	2.59246	3.46846	05	3.23746	06	68000
70000	3.0150	3.47344	37.3335	40.8171	6.14526	65.6576	67.8044	2.70246	3.56346	05	3.26646	06	70000
72000	3.0693	3.51044	37.9687	41.3550	6.24416	65.9944	68.2144	2.81346	3.65646	05	3.29046	06	72000
74000	3.1203	3.54185	38.4153	41.7321	6.34716	66.2744	68.6144	2.92546	3.74746	05	3.30946	06	74000
76000	3.1682	3.56768	38.6928	42.0536	6.45416	66.5044	68.9944	3.03846	3.83746	05	3.32446	06	76000
78000	3.2132	3.58762	38.9059	42.3231	6.56516	66.6844	69.3544	3.15246	3.92546	05	3.33646	06	78000
80000	3.2557	3.60214	39.0587	42.5456	6.68016	66.8144	69.6944	3.26746	4.01146	05	3.34446	06	80000
82000	3.2957	3.61185	39.1526	42.7226	6.80016	66.8944	69.9244	3.38346	4.09546	05	3.34846	06	82000
84000	3.3332	3.61644	39.1987	42.8546	6.92516	66.9244	70.1544	3.50446	4.17746	05	3.34846	06	84000
86000	3.3682	3.61614	39.1987	42.9426	7.05516	66.9044	70.2844	3.63046	4.25746	05	3.34446	06	86000
88000	3.4007	3.61105	39.1426	42.9866	7.19016	66.8344	70.3144	3.76146	4.33546	05	3.33646	06	88000
90000	3.4307	3.60175	39.0366	42.9866	7.33016	66.7144	70.2444	3.89746	4.41146	05	3.32446	06	90000
92000	3.4582	3.58814	38.8816	42.9326	7.47516	66.5444	70.0744	4.03846	4.48546	05	3.30846	06	92000
94000	3.4832	3.57014	38.6866	42.8266	7.62516	66.3244	69.8044	4.18446	4.55746	05	3.28846	06	94000
96000	3.5057	3.54814	38.4416	42.6716	7.78016	66.0544	69.5344	4.34546	4.62746	05	3.26446	06	96000
98000	3.5257	3.52214	38.1566	42.4766	7.94016	65.7344	69.1644	4.52146	4.69546	05	3.23646	06	98000
100000	3.5432	3.49214	37.8316	42.2416	8.10516	65.3644	68.6944	4.71346	4.76146	05	3.20446	06	100000

TABLE 34. IDEAL GAS FUNCTIONS FOR O₂. ATOMIC WEIGHTS 15.9950, R = 1.98717 CAL/MOLE |
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N S₂.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^0 - E^0}{RT}$	$\ln \frac{W^0 - E^0}{RT}$	$\frac{S^0 - E^0}{RT}$	$\ln \frac{S^0 - E^0}{RT}$	$\ln \frac{W^0 - E^0}{RT} - \frac{S^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{S^0 - E^0}{RT}$	$\frac{W^0 - E^0}{RT} - \frac{S^0 - E^0}{RT}$	TEMP. (°K)	
5000	1.0000	2.50000	21.7844	24.2464	4.96791	43.2933	1.4904E 04	2.4840E 04	2.1847E 05	5000
5200	1.0000	2.50000	21.8865	24.1945	4.96771	43.4881	1.5500E 04	2.5933E 04	2.2614E 05	5200
5400	1.0000	2.50000	21.9783	24.1428	4.96751	43.6783	1.6095E 04	2.6827E 04	2.3385E 05	5400
5600	1.0000	2.50000	22.0698	24.0918	4.96731	43.8534	1.6692E 04	2.7620E 04	2.4560E 05	5600
5800	1.0000	2.50000	22.1575	24.0415	4.96711	44.0306	1.7288E 04	2.8814E 04	2.5538E 05	5800
6000	1.0000	2.50000	22.2422	24.0012	4.96791	44.1990	1.7884E 04	2.9807E 04	2.6519E 05	6000
6200	1.0000	2.50000	22.3242	23.9742	4.96791	44.3298	1.8481E 04	3.0801E 04	2.7504E 05	6200
6400	1.0000	2.50000	22.4038	23.9508	4.96791	44.5104	1.9077E 04	3.1795E 04	2.8493E 05	6400
6600	1.0000	2.50000	22.4805	23.9295	4.96791	44.6723	1.9673E 04	3.2788E 04	2.9484E 05	6600
6800	1.0000	2.50000	22.5552	23.9092	4.96791	44.8268	2.0269E 04	3.3782E 04	3.0478E 05	6800
7000	1.0000	2.50000	22.6276	23.8902	4.96791	44.9648	2.0865E 04	3.4775E 04	3.1475E 05	7000
7200	1.0000	2.50000	22.6980	23.8726	4.96791	45.1048	2.1461E 04	3.5768E 04	3.2475E 05	7200
7400	1.0000	2.50000	22.7665	23.8565	4.96791	45.2469	2.2058E 04	3.6763E 04	3.3478E 05	7400
7600	1.0000	2.50000	22.8332	23.8417	4.96791	45.3734	2.2654E 04	3.7758E 04	3.4484E 05	7600
7800	1.0000	2.50000	22.8982	23.8282	4.96791	45.5024	2.3250E 04	3.8750E 04	3.5492E 05	7800
8000	1.0000	2.50000	22.9615	23.8159	4.96791	45.6282	2.3846E 04	3.9743E 04	3.6503E 05	8000
8200	1.0000	2.50000	23.0232	23.8048	4.96791	45.7509	2.4442E 04	4.0737E 04	3.7516E 05	8200
8400	1.0000	2.50000	23.0834	23.7948	4.96791	45.8704	2.5038E 04	4.1730E 04	3.8531E 05	8400
8600	1.0000	2.50000	23.1423	23.7858	4.96791	45.9875	2.5634E 04	4.2724E 04	3.9549E 05	8600
8800	1.0000	2.50000	23.1997	23.7777	4.96791	46.1017	2.6231E 04	4.3718E 04	4.0569E 05	8800
9000	1.0000	2.50000	23.2559	23.7705	4.96791	46.2133	2.6837E 04	4.4711E 04	4.1592E 05	9000
9200	1.0000	2.50000	23.3109	23.7642	4.96791	46.3225	2.7442E 04	4.5704E 04	4.2617E 05	9200
9400	1.0000	2.50000	23.3646	23.7588	4.96791	46.4294	2.8047E 04	4.6698E 04	4.3644E 05	9400
9600	1.0000	2.50000	23.4173	23.7543	4.96791	46.5340	2.8649E 04	4.7692E 04	4.4673E 05	9600
9800	1.0000	2.50000	23.4688	23.7506	4.96791	46.6364	2.9251E 04	4.8686E 04	4.5704E 05	9800
10000	1.0000	2.50000	23.5193	23.7477	4.96791	46.7368	2.9853E 04	4.9699E 04	4.6737E 05	10000
10500	1.0000	2.50000	23.6413	23.7413	4.96791	46.9791	3.1298E 04	5.2163E 04	4.9328E 05	10500
11000	1.0000	2.50000	23.7576	23.7356	4.96791	47.2103	3.2788E 04	5.4647E 04	5.1931E 05	11000
11500	1.0000	2.50000	23.8687	23.7307	4.96791	47.4311	3.4279E 04	5.7131E 04	5.4544E 05	11500
12000	1.0000	2.50000	23.9751	23.7265	4.96791	47.6425	3.5769E 04	5.9615E 04	5.7171E 05	12000
12500	1.0000	2.50000	24.0772	23.7229	4.96791	47.8453	3.7259E 04	6.2099E 04	5.9807E 05	12500
13000	1.0000	2.50000	24.1752	23.7200	4.96791	48.0402	3.8750E 04	6.4583E 04	6.2452E 05	13000
13500	1.0000	2.50000	24.2694	23.7178	4.96791	48.2277	4.0240E 04	6.7067E 04	6.5107E 05	13500
14000	1.0000	2.50000	24.3605	23.7162	4.96791	48.4083	4.1730E 04	6.9551E 04	6.7772E 05	14000
14500	1.0000	2.50000	24.4482	23.7151	4.96791	48.5827	4.3221E 04	7.2035E 04	7.0443E 05	14500
15000	1.0000	2.50000	24.5330	23.7145	4.96791	48.7511	4.4711E 04	7.4519E 04	7.3127E 05	15000
15500	1.0000	2.50000	24.6149	23.7144	4.96791	48.9140	4.6202E 04	7.7003E 04	7.5817E 05	15500
16000	1.0000	2.50000	24.6933	23.7148	4.96791	49.0717	4.7692E 04	7.9487E 04	7.8515E 05	16000
16500	1.0000	2.50000	24.7712	23.7155	4.96791	49.2246	4.9182E 04	8.1971E 04	8.1221E 05	16500
17000	1.0000	2.50000	24.8459	23.7169	4.96791	49.3729	5.0673E 04	8.4455E 04	8.3934E 05	17000
17500	1.0000	2.50000	24.9183	23.7189	4.96791	49.5169	5.2163E 04	8.6938E 04	8.6655E 05	17500
18000	1.0000	2.50000	24.9888	23.7215	4.96791	49.6568	5.3652E 04	8.9422E 04	8.9382E 05	18000
18500	1.0000	2.50000	25.0573	23.7247	4.96791	49.7929	5.5144E 04	9.1906E 04	9.2117E 05	18500
19000	1.0000	2.50000	25.1239	23.7285	4.96791	49.9254	5.6634E 04	9.4390E 04	9.4858E 05	19000
19500	1.0000	2.50000	25.1889	23.7329	4.96791	50.0545	5.8125E 04	9.6874E 04	9.7604E 05	19500

TABLE 34 (CONT.) IDEAL GAS FUNCTIONS FOR 0.8

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^3}{RT^3}$	$\frac{5R}{2T}$	$\frac{5R}{2T} - \ln \frac{h^3}{RT^3}$	$\frac{5R}{2T} - \ln \frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{5R}{2T} - \ln \frac{h^3}{RT^3} - \frac{5}{2} - \frac{5}{2}$	$\frac{5R}{2T} - \ln \frac{h^3}{RT^3} - \frac{5}{2} - \frac{5}{2} - \frac{5}{2}$	$\frac{5R}{2T} - \ln \frac{h^3}{RT^3} - \frac{5}{2} - \frac{5}{2} - \frac{5}{2} - \frac{5}{2}$	TEMP. (°K)	
20000	1.0000	2.50000	25.2522	4.96791	50.1803	55.1402	5.9615E 04	9.9358E 04	1.0034E 06	20000
22000	1.0000	2.50000	25.4905	4.96791	50.6231	55.6217	6.5576E 04	1.0927E 05	1.1164E 06	22000
24000	1.0000	2.50000	25.7080	4.96791	51.0860	56.0959	7.1530E 04	1.1923E 05	1.2261E 06	24000
26000	1.0000	2.50000	25.9081	4.96791	51.4887	56.5516	7.7499E 04	1.2917E 05	1.3386E 06	26000
28000	1.0000	2.50000	26.0934	4.96791	51.8518	56.9197	8.3461E 04	1.3910E 05	1.4519E 06	28000
30000	1.0000	2.50000	26.2658	4.96791	52.1946	57.1625	8.9422E 04	1.4904E 05	1.5658E 06	30000
32000	1.0000	2.50000	26.4272	4.96791	52.5192	57.4031	9.5384E 04	1.5897E 05	1.6805E 06	32000
34000	1.0000	2.50000	26.5787	4.96791	52.8164	57.6433	1.0135E 05	1.6891E 05	1.7958E 06	34000
36000	1.0000	2.50000	26.7216	4.96791	53.1003	57.8842	1.0731E 05	1.7884E 05	1.9116E 06	36000
38000	1.0000	2.50000	26.8568	4.96791	53.3689	58.1348	1.1327E 05	1.8878E 05	2.0280E 06	38000
40000	1.0000	2.50000	26.9850	4.96791	53.6237	58.3917	1.1923E 05	1.9872E 05	2.1449E 06	40000
42000	1.0000	2.50000	27.1070	4.96791	53.8661	58.6540	1.2519E 05	2.0865E 05	2.2623E 06	42000
44000	1.0000	2.50000	27.2233	4.96791	54.0972	58.9222	1.3115E 05	2.1859E 05	2.3803E 06	44000
46000	1.0000	2.50000	27.3345	4.96791	54.3181	59.1960	1.3711E 05	2.2852E 05	2.4988E 06	46000
48000	1.0000	2.50000	27.4408	4.96791	54.5295	59.4774	1.4308E 05	2.3846E 05	2.6179E 06	48000
50000	1.0000	2.50000	27.5429	4.96791	54.7323	59.7602	1.4904E 05	2.4840E 05	2.7366E 06	50000
60000	1.0000	2.50000	27.9987	4.96791	55.6381	60.4060	1.7884E 05	2.9872E 05	3.3381E 06	60000
70000	1.0000	2.50000	28.3841	4.96791	56.4033	61.3718	2.0865E 05	3.4907E 05	3.9432E 06	70000
80000	1.0000	2.50000	28.7179	4.96791	57.0832	62.0352	2.3846E 05	3.9942E 05	4.5529E 06	80000
90000	1.0000	2.50000	29.0124	4.96791	57.6524	62.6203	2.6827E 05	4.4971E 05	5.1687E 06	90000
100000	1.0000	2.50000	29.2758	4.96791	58.1758	63.1437	2.9807E 05	4.9997E 05	5.8178E 06	100000
150000	1.0000	2.50000	30.2494	4.96791	60.1580	65.1580	4.4711E 05	7.4519E 05	9.0287E 07	150000
200000	1.0000	2.50000	31.0086	4.96791	61.6191	66.5872	5.9615E 05	9.9358E 05	1.2324E 07	200000
300000	1.0000	2.50000	32.0223	4.96791	63.6336	68.6015	8.9422E 05	1.4904E 06	1.9095E 07	300000
400000	1.0000	2.50000	32.7415	4.96791	65.0628	70.0307	1.1923E 06	1.9872E 06	2.6025E 07	400000
500000	1.0000	2.50000	33.2994	4.96791	66.1713	71.1393	1.4904E 06	2.4840E 06	3.3064E 07	500000
600000	1.0000	2.50000	33.7552	4.96791	67.0771	72.0450	1.7884E 06	2.9872E 06	4.0244E 07	600000
800000	1.0000	2.50000	34.6744	4.96791	68.5063	73.9742	2.3846E 06	3.9743E 06	5.4005E 07	800000
1000000	1.0000	2.50000	35.3322	4.96791	69.6148	74.5828	2.9807E 06	4.9679E 06	6.9615E 07	1000000
1500000	1.0000	2.50000	36.0459	4.96791	71.6292	76.5971	4.4711E 06	7.4519E 06	1.0744E 08	1500000
2000000	1.0000	2.50000	36.7451	4.96791	73.0583	78.0263	5.9615E 06	9.9358E 06	1.4612E 08	2000000
3000000	1.0000	2.50000	37.3788	4.96791	75.0727	80.0406	8.9422E 06	1.4904E 07	2.2522E 08	3000000
4000000	1.0000	2.50000	38.0486	4.96791	76.5018	81.6697	1.1923E 07	1.9872E 07	3.0401E 08	4000000
5000000	1.0000	2.50000	38.7358	4.96791	77.6104	82.8783	1.4904E 07	2.4840E 07	3.9095E 08	5000000
6000000	1.0000	2.50000	39.4116	4.96791	78.5161	83.6841	1.7884E 07	2.9872E 07	4.7110E 08	6000000
8000000	1.0000	2.50000	40.2308	4.96791	79.9453	84.9132	2.3846E 07	3.9743E 07	6.3954E 08	8000000
10000000	1.0000	2.50000	40.7587	4.96791	81.0539	86.0218	2.9807E 07	4.9679E 07	8.1054E 08	10000000

TABLE 39. IDEAL GAS FUNCTIONS FOR AR 0+ (ATOMIC WEIGHT 39.9480, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N 5+. SEE TABLE 76 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{K^2 C^2}{RT^2}$	$-\frac{F^0}{RT}$	$\ln \frac{Q}{N}$	$\ln \frac{Q^0}{N^0}$	$\ln \frac{Q^0}{N^0} - \frac{F^0}{RT}$	$\ln \frac{Q^0}{N^0} - \frac{F^0}{RT} - \frac{F^0}{RT}$	$\ln \frac{Q^0}{N^0} - \frac{F^0}{RT} - \frac{F^0}{RT} - \frac{F^0}{RT}$	TEMP. (°K)		
5000	1.0000	2.50000	23.1502	26.5592	4.96791	46.0212	50.0000	1.5904E 04	2.5902E 04	2.3011E 05	5000
5200	1.0000	2.50000	23.2573	25.7573	4.96791	46.2161	51.1840	1.5500E 04	2.7833E 04	2.4032E 05	5200
5400	1.0000	2.50000	23.3516	25.5516	4.96791	46.4036	51.3715	1.4096E 04	2.6827E 04	2.5087E 05	5400
5600	1.0000	2.50000	23.4428	25.3428	4.96791	46.5853	51.5522	1.4692E 04	2.7820E 04	2.6087E 05	5600
5800	1.0000	2.50000	23.5303	25.1303	4.96791	46.7706	51.7285	1.7288E 04	2.8814E 04	2.7120E 05	5800
6000	1.0000	2.50000	23.6150	24.9150	4.96791	46.9270	51.8949	1.7884E 04	2.9807E 04	2.8156E 05	6000
6200	1.0000	2.50000	23.6970	24.6970	4.96791	47.0899	52.0578	1.8481E 04	3.0801E 04	2.9196E 05	6200
6400	1.0000	2.50000	23.7764	24.4764	4.96791	47.2476	52.2155	1.9077E 04	3.1795E 04	3.0238E 05	6400
6600	1.0000	2.50000	23.8533	24.2533	4.96791	47.4005	52.3484	1.9673E 04	3.2788E 04	3.1284E 05	6600
6800	1.0000	2.50000	23.9280	24.0280	4.96791	47.5488	52.5167	2.0269E 04	3.3782E 04	3.2333E 05	6800
7000	1.0000	2.50000	24.0006	23.8006	4.96791	47.6928	52.6607	2.0865E 04	3.4775E 04	3.3385E 05	7000
7200	1.0000	2.50000	24.0709	23.5709	4.96791	47.8328	52.8007	2.1461E 04	3.5768E 04	3.4440E 05	7200
7400	1.0000	2.50000	24.1394	23.3394	4.96791	47.9689	52.9368	2.2058E 04	3.6762E 04	3.5497E 05	7400
7600	1.0000	2.50000	24.2060	23.1060	4.96791	48.1014	53.0693	2.2654E 04	3.7756E 04	3.6557E 05	7600
7800	1.0000	2.50000	24.2710	22.8710	4.96791	48.2304	53.1993	2.3250E 04	3.8750E 04	3.7620E 05	7800
8000	1.0000	2.50000	24.3343	22.6343	4.96791	48.3562	53.3261	2.3846E 04	3.9744E 04	3.8685E 05	8000
8200	1.0000	2.50000	24.3960	22.3960	4.96791	48.4789	53.4468	2.4442E 04	4.0737E 04	3.9753E 05	8200
8400	1.0000	2.50000	24.4562	22.1562	4.96791	48.5986	53.5645	2.5038E 04	4.1730E 04	4.0823E 05	8400
8600	1.0000	2.50000	24.5151	21.9151	4.96791	48.7155	53.6834	2.5634E 04	4.2724E 04	4.1895E 05	8600
8800	1.0000	2.50000	24.5725	21.6725	4.96791	48.8297	53.7976	2.6231E 04	4.3718E 04	4.2970E 05	8800
9000	1.0000	2.50000	24.6287	21.4287	4.96791	48.9413	53.9072	2.6827E 04	4.4711E 04	4.4057E 05	9000
9200	1.0000	2.50000	24.6837	21.1837	4.96791	49.0505	54.0184	2.7423E 04	4.5705E 04	4.5126E 05	9200
9400	1.0000	2.50000	24.7374	20.9374	4.96791	49.1574	54.1253	2.8019E 04	4.6698E 04	4.6208E 05	9400
9600	1.0000	2.50000	24.7901	20.6901	4.96791	49.2619	54.2299	2.8615E 04	4.7692E 04	4.7291E 05	9600
9800	1.0000	2.50000	24.8416	20.4416	4.96791	49.3644	54.3323	2.9211E 04	4.8686E 04	4.8377E 05	9800
10000	1.0000	2.50000	24.8921	20.1921	4.96791	49.4647	54.4327	2.9807E 04	4.9679E 04	4.9465E 05	10000
10500	1.0000	2.50000	25.0161	19.7161	4.96791	49.7071	54.6750	3.1298E 04	5.2163E 04	5.2192E 05	10500
11000	1.0000	2.50000	25.1304	19.2304	4.96791	49.9382	54.9082	3.2788E 04	5.4847E 04	5.4932E 05	11000
11500	1.0000	2.50000	25.2415	18.7415	4.96791	50.1591	55.1270	3.4279E 04	5.7531E 04	5.7683E 05	11500
12000	1.0000	2.50000	25.3479	18.2479	4.96791	50.3705	55.3384	3.5769E 04	6.0215E 04	6.0445E 05	12000
12500	1.0000	2.50000	25.4500	17.7500	4.96791	50.5733	55.5412	3.7259E 04	6.2909E 04	6.3217E 05	12500
13000	1.0000	2.50000	25.5480	17.2480	4.96791	50.7681	55.7361	3.8750E 04	6.5603E 04	6.5999E 05	13000
13500	1.0000	2.50000	25.6424	16.7424	4.96791	50.9556	55.9234	4.0240E 04	6.8297E 04	6.8790E 05	13500
14000	1.0000	2.50000	25.7333	16.2333	4.96791	51.1363	56.1042	4.1730E 04	7.0991E 04	7.1591E 05	14000
14500	1.0000	2.50000	25.8210	15.7210	4.96791	51.3106	56.2786	4.3221E 04	7.3685E 04	7.4400E 05	14500
15000	1.0000	2.50000	25.9058	15.2058	4.96791	51.4791	56.4470	4.4711E 04	7.6379E 04	7.7219E 05	15000
15500	1.0000	2.50000	25.9878	14.6878	4.96791	51.6420	56.6099	4.6202E 04	7.9073E 04	8.0045E 05	15500
16000	1.0000	2.50000	26.0671	14.1671	4.96791	51.7997	56.7676	4.7692E 04	8.1767E 04	8.2879E 05	16000
16500	1.0000	2.50000	26.1441	13.6441	4.96791	51.9526	56.9205	4.9182E 04	8.4461E 04	8.5722E 05	16500
17000	1.0000	2.50000	26.2187	13.1187	4.96791	52.1009	57.0688	5.0673E 04	8.7155E 04	8.8571E 05	17000
17500	1.0000	2.50000	26.2912	12.5912	4.96791	52.2449	57.2128	5.2163E 04	8.9849E 04	9.1429E 05	17500
18000	1.0000	2.50000	26.3616	12.0616	4.96791	52.3848	57.3527	5.3653E 04	9.2542E 04	9.4293E 05	18000
18500	1.0000	2.50000	26.4301	11.5301	4.96791	52.5209	57.4888	5.5144E 04	9.5144E 04	9.7164E 05	18500
19000	1.0000	2.50000	26.4967	10.9967	4.96791	52.6534	57.6213	5.6634E 04	9.7990E 04	1.0004E 06	19000
19500	1.0000	2.50000	26.5617	10.4617	4.96791	52.7825	57.7504	5.8125E 04	1.0074E 05	1.0273E 06	19500

TABLE 35 (CONT.): IDEAL GAS FUNCTIONS FOR AIR 8*

TEMP. (°F)	PARTIT. FUNCT.	$\frac{M^* - E^*}{RT}$	$-\frac{P^* - E^*}{RT}$	$\ln \frac{M^* - E^*}{RT} - \ln \frac{P^* - E^*}{RT}$	$\ln \frac{M^* - E^*}{RT} - \ln \frac{P^* - E^*}{RT} - \ln \frac{P^* - E^*}{RT}$	$\ln \frac{M^* - E^*}{RT} - \ln \frac{P^* - E^*}{RT} - \ln \frac{P^* - E^*}{RT} - \ln \frac{P^* - E^*}{RT}$	TEMP. (°F)				
20000	1.0000	2.50000	26.6250	29.1750	4.96791	52.9082	57.8762	5.9358E 04	9.5358E 04	1.0582E 04	20000
22000	1.0000	2.50000	26.6233	29.1633	4.96791	53.3817	58.3496	6.5576E 04	1.0929E 05	1.1764E 04	22000
24000	1.0000	2.50000	27.0808	29.5808	4.96791	53.8160	58.7819	7.1530E 04	1.1923E 05	1.2913E 04	24000
26000	1.0000	2.50000	27.2809	29.7809	4.96791	54.2116	59.1796	7.7499E 04	1.2917E 05	1.4095E 04	26000
28000	1.0000	2.50000	27.4662	29.9662	4.96791	54.5798	59.5477	8.3461E 04	1.3910E 05	1.5282E 04	28000
30000	1.0000	2.50000	27.6366	30.1366	4.96791	54.9228	59.8905	8.9422E 04	1.4904E 05	1.6477E 04	30000
32000	1.0000	2.50000	27.8000	30.3000	4.96791	55.2432	60.2111	9.5384E 04	1.5897E 05	1.7678E 04	32000
34000	1.0000	2.50000	27.9516	30.4516	4.96791	55.5444	60.5129	1.0133E 05	1.6891E 05	1.8885E 04	34000
36000	1.0000	2.50000	28.0944	30.5944	4.96791	55.8283	60.7962	1.0713E 05	1.7884E 05	2.0090E 04	36000
38000	1.0000	2.50000	28.2296	30.7296	4.96791	56.0969	61.0648	1.1327E 05	1.8878E 05	2.1317E 04	38000
40000	1.0000	2.50000	28.3578	30.8578	4.96791	56.3517	61.3196	1.1973E 05	1.9872E 05	2.2561E 04	40000
42000	1.0000	2.50000	28.4788	30.9788	4.96791	56.5941	61.5620	1.2650E 05	2.0865E 05	2.3770E 04	42000
44000	1.0000	2.50000	28.5941	31.0941	4.96791	56.8252	61.7931	1.3351E 05	2.1859E 05	2.5003E 04	44000
46000	1.0000	2.50000	28.7073	31.2073	4.96791	57.0451	62.0140	1.4071E 05	2.2852E 05	2.6241E 04	46000
48000	1.0000	2.50000	28.8137	31.3137	4.96791	57.2575	62.2254	1.4808E 05	2.3846E 05	2.7484E 04	48000
50000	1.0000	2.50000	28.9157	31.4157	4.96791	57.4603	62.4282	1.5564E 05	2.4840E 05	2.8730E 04	50000
60000	1.0000	2.50000	29.3715	31.8715	4.96791	58.3641	63.3340	1.7884E 05	2.9607E 05	3.5020E 04	60000
70000	1.0000	2.50000	29.7549	32.2549	4.96791	59.1319	64.0998	2.0845E 05	3.4775E 05	4.1392E 04	70000
80000	1.0000	2.50000	30.0907	32.5907	4.96791	59.7952	64.7831	2.3946E 05	3.9743E 05	4.7836E 04	80000
90000	1.0000	2.50000	30.3892	32.8852	4.96791	60.3804	65.3883	2.6827E 05	4.4711E 05	5.4342E 04	90000
100000	1.0000	2.50000	30.6468	33.1486	4.96791	60.9030	65.8717	2.9607E 05	4.9679E 05	6.0904E 04	100000
150000	1.0000	2.50000	31.6422	34.1622	4.96792	62.9191	67.8860	4.4711E 05	7.4518E 05	9.4377E 04	150000
200000	1.0000	2.50019	32.3815	34.8816	4.96828	64.3473	69.3154	5.9622E 05	9.9366E 05	1.2869E 05	200000
300000	1.0025	2.52734	33.1976	35.6975	5.02229	66.3664	71.3889	9.1054E 05	1.5067E 06	1.9910E 05	300000
400000	1.0406	2.83274	34.1542	36.6649	5.62913	67.8699	73.4991	1.4548E 06	2.2517E 06	2.7148E 05	400000
500000	1.2284	3.80126	34.8779	36.8791	7.55374	69.3081	76.8618	2.7833E 06	3.7769E 06	3.4654E 05	500000
600000	1.7417	5.03345	35.6829	40.7163	10.00229	70.9077	80.9100	4.8091E 06	6.0014E 06	4.2594E 05	600000
800000	4.3476	6.02827	37.3168	43.3451	11.97916	74.1547	86.1330	7.9936E 06	9.5833E 06	5.9324E 05	800000
1000000	9.4348	5.83258	38.6494	44.4820	11.59031	76.8028	88.3931	9.6093E 06	1.1590E 07	7.6803E 05	1000000
1500000	30.6421	4.95962	40.8611	45.8007	9.85558	81.1500	91.0134	1.1803E 07	1.4783E 07	1.2174E 06	1500000
2000000	57.1782	4.39533	42.1841	46.5794	8.73633	83.6287	92.5611	1.3494E 07	1.7469E 07	1.6765E 06	2000000
3000000	108.2648	3.78902	43.8361	47.6252	7.52942	87.1097	94.5391	1.6427E 07	2.2580E 07	2.6133E 06	3000000
4000000	149.6363	3.47488	44.8790	48.3539	6.90315	89.1021	96.0872	1.9672E 07	2.7621E 07	3.5673E 06	4000000
5000000	181.9316	3.28354	45.6323	48.9158	6.52494	90.6789	97.2030	2.2489E 07	3.2642E 07	4.5339E 06	5000000
6000000	207.3540	3.15490	46.2189	49.3738	6.26931	91.8445	98.1130	2.5493E 07	3.7616E 07	5.5107E 06	6000000
8000000	244.3131	2.99295	47.1021	50.0950	5.94749	93.5598	99.5471	3.1083E 07	4.7580E 07	7.4880E 06	8000000
10000000	269.6555	2.89520	47.7586	50.6538	5.75323	94.9043	100.6576	3.7661E 07	5.7532E 07	9.4904E 06	10000000

TABLE 36. IDEAL GAS FUNCTIONS FOR AR 9+ (ATOMIC WEIGHT 39.9430, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS $n \leq 4$. SEE TABLE 77 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNC.	$\frac{U^0 - U^0}{RT}$	$\frac{F^0 - U^0}{RT}$	S^0/R	$\ln \frac{U^0 - U^0}{RT} - \frac{F^0 - U^0}{RT}$	$\ln \frac{U^0 - U^0}{RT} - \frac{F^0 - U^0}{RT}$	$e^{-\frac{U^0 - U^0}{RT}}$	$e^{-\frac{F^0 - U^0}{RT}}$	$\frac{U^0 - U^0}{CAL/MOLE}$	$\frac{F^0 - U^0}{CAL/MOLE}$	$-(U^0 - U^0)$	TEMP. (°K)
20000	4.5458	2.6592	28.1391	30.7951	5.2776	59.9171	61.1949	6.5812E 04	1.0554E 05	1.1183E 05	1.1183E 06	20000
22000	4.6142	2.6571	28.3233	31.0495	5.2801	56.4203	61.4705	7.2647E 04	1.1616E 05	1.2412E 05	1.2412E 06	22000
24000	4.6777	2.6567	28.6235	31.2803	5.2794	52.8797	62.1192	7.9715E 04	1.2671E 05	1.3551E 05	1.3551E 06	24000
26000	4.7365	2.6553	28.8361	31.4915	5.2760	49.3022	62.5788	8.5925E 04	1.3719E 05	1.4699E 05	1.4699E 06	26000
28000	4.7910	2.6531	27.0329	31.6860	5.2725	57.6925	62.9653	9.1982E 04	1.4762E 05	1.6154E 05	1.6154E 06	28000
30000	4.8414	2.6507	29.2158	31.8663	5.2693	59.0567	63.3236	9.7939E 04	1.5801E 05	1.7417E 05	1.7417E 06	30000
32000	4.8882	2.6474	29.3868	32.0363	5.2610	58.3964	63.6574	1.0476E 05	1.6833E 05	1.8687E 05	1.8687E 06	32000
34000	4.9316	2.6443	25.5472	32.1915	5.2547	58.7151	63.9498	1.1110E 05	1.7844E 05	1.9943E 05	1.9943E 06	34000
36000	4.9720	2.6410	29.6982	32.3393	5.2481	59.0153	64.2635	1.1740E 05	1.8894E 05	2.1246E 05	2.1246E 06	36000
38000	5.0097	2.6377	29.8409	32.4787	5.2417	59.2989	64.5404	1.2367E 05	1.9918E 05	2.2594E 05	2.2594E 06	38000
40000	5.0448	2.6348	29.9762	32.6104	5.2351	59.5676	64.8027	1.2992E 05	2.0941E 05	2.3827E 05	2.3827E 06	40000
42000	5.0776	2.6312	30.1046	32.7359	5.2282	59.8229	65.0516	1.3615E 05	2.1961E 05	2.5126E 05	2.5126E 06	42000
44000	5.1085	2.6280	30.2270	32.8550	5.2212	60.0680	65.2684	1.4234E 05	2.2979E 05	2.6438E 05	2.6438E 06	44000
46000	5.1371	2.6249	30.3437	32.9687	5.2162	60.2980	65.5162	1.4854E 05	2.3992E 05	2.7737E 05	2.7737E 06	46000
48000	5.1642	2.6219	30.4554	33.0774	5.2103	60.5198	65.7302	1.5471E 05	2.5010E 05	2.9050E 05	2.9050E 06	48000
50000	5.1896	2.6190	30.5623	33.1814	5.2046	60.7324	65.9370	1.6087E 05	2.6023E 05	3.0366E 05	3.0366E 06	50000
52000	5.2172	2.6160	31.0387	33.2847	5.1985	61.0790	66.1575	1.6704E 05	2.7037E 05	3.1687E 05	3.1687E 06	52000
54000	5.2460	2.6130	31.4395	33.3874	5.1929	62.4756	67.4327	1.7321E 05	2.8050E 05	3.3010E 05	3.3010E 06	54000
56000	5.2755	2.6106	31.7855	33.4717	5.1873	63.1630	68.3023	1.7937E 05	2.9063E 05	3.4333E 05	3.4333E 06	56000
58000	5.3057	2.6088	32.0897	33.5485	5.1816	63.7675	68.8921	1.8554E 05	3.0076E 05	3.5656E 05	3.5656E 06	58000
60000	5.3368	2.6070	32.3610	33.6184	5.1760	64.3067	69.4193	1.9171E 05	3.1089E 05	3.6979E 05	3.6979E 06	60000
62000	5.3681	2.6052	33.4006	33.6824	5.1704	64.7725	71.4544	1.9788E 05	3.2102E 05	3.8302E 05	3.8302E 06	62000
64000	5.3993	2.6034	34.1362	33.7417	5.1648	67.8343	72.9193	2.0397E 05	3.3115E 05	3.9625E 05	3.9625E 06	64000
66000	5.4305	2.6016	35.1779	33.7962	5.1592	69.9043	75.0409	2.1082E 05	3.4128E 05	4.0948E 05	4.0948E 06	66000
68000	5.4617	2.6000	35.9310	33.8469	5.1536	71.4008	76.7224	2.1767E 05	3.5141E 05	4.2271E 05	4.2271E 06	68000
70000	5.4928	2.5984	36.5590	33.8939	5.1480	72.6487	78.6559	2.2452E 05	3.6154E 05	4.3594E 05	4.3594E 06	70000
72000	5.5239	2.5968	37.1682	33.9374	5.1424	73.8594	81.2798	2.3143E 05	3.7167E 05	4.4917E 05	4.4917E 06	72000
74000	5.5549	2.5952	38.4830	33.9774	5.1368	76.4323	86.7497	2.3832E 05	3.8180E 05	4.6240E 05	4.6240E 06	74000
76000	5.5858	2.5936	39.4854	34.0141	5.1312	78.8614	90.0247	2.4521E 05	3.9193E 05	4.7563E 05	4.7563E 06	76000
78000	5.6166	2.5920	41.8835	34.0476	5.1256	83.2295	93.3450	2.5210E 05	4.0206E 05	4.8886E 05	4.8886E 06	78000
80000	5.6473	2.5904	43.2675	34.0787	5.1200	85.9797	94.9719	2.5900E 05	4.1219E 05	5.0209E 05	5.0209E 06	80000
82000	5.6779	2.5888	44.9712	34.1074	5.1144	89.3453	97.1121	2.6589E 05	4.2232E 05	5.1532E 05	5.1532E 06	82000
84000	5.7084	2.5872	46.0419	34.1341	5.1088	91.9228	99.5861	2.7278E 05	4.3245E 05	5.2855E 05	5.2855E 06	84000
86000	5.7388	2.5856	46.8122	34.1584	5.1032	94.8066	99.8236	2.7973E 05	4.4258E 05	5.4178E 05	5.4178E 06	86000
88000	5.7691	2.5840	47.4102	34.1801	5.0976	98.2119	100.5950	2.8668E 05	4.5271E 05	5.5501E 05	5.5501E 06	88000
90000	5.7993	2.5824	48.3078	34.2000	5.0920	99.9955	102.0287	2.9363E 05	4.6284E 05	5.6824E 05	5.6824E 06	90000
1000000	908.2249	2.92971	48.9730	51.9027	5.82181	37.3174	103.1392	3.8346E 07	5.8218E 07	9.7317E 08	9.7317E 08	1000000

TABLE 37. IDEAL GAS FUNCTIONS FOR AN 10+ ATOMIC WEIGHT 39.9430, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S. SEE TABLE 78 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIC. FUNCT.	$\frac{h\nu}{RT}$	$-\frac{E^0}{RT}$	$-\frac{E^0 - E^1}{RT}$	$\frac{S^0}{R}$	$\ln \frac{h\nu}{RT} - \frac{E^0 - E^1}{RT}$	$\ln \frac{h\nu}{RT} - \frac{E^0 - E^1}{RT} - \frac{S^0}{R}$	$e^{\frac{E^0 - E^1}{RT}}$	$e^{\frac{E^0 - E^1}{RT} - \frac{S^0}{R}}$	$\frac{h\nu}{RT} - \frac{E^0 - E^1}{RT} - \frac{S^0}{R}$	$\frac{h\nu}{RT} - \frac{E^0 - E^1}{RT} - \frac{S^0}{R} - \frac{E^0 - E^1}{RT}$	TEMP. (°K)
20000	6.3668	2.7667	28.4760	31.2307	5.47398	56.8666	62.0606	6.9734E 04	1.0940E 03	1.1317E 04	1.1317E 04	20000
22000	6.5251	2.7680	28.7389	31.4995	5.48577	57.1089	62.5947	7.6969E 04	1.2049E 03	1.2564E 04	1.2564E 04	22000
24000	6.6763	2.76610	29.0093	31.7454	5.49670	57.3867	63.0834	8.4229E 04	1.3192E 03	1.3421E 04	1.3421E 04	24000
26000	6.8214	2.77133	29.2009	31.9723	5.50709	58.0271	63.5342	9.1510E 04	1.4310E 03	1.4310E 04	1.4310E 04	26000
28000	6.9613	2.77630	29.4065	32.1828	5.51697	58.4355	63.9525	9.8835E 04	1.5440E 03	1.5440E 04	1.5440E 04	28000
30000	7.0964	2.78099	29.5982	32.3792	5.52629	58.8165	64.3428	1.0617E 05	1.6579E 03	1.6579E 04	1.6579E 04	30000
32000	7.2273	2.78536	29.7778	32.5632	5.53497	59.1734	64.7084	1.1353E 05	1.7712E 03	1.7712E 04	1.7712E 04	32000
34000	7.3543	2.78935	29.9468	32.7362	5.54291	59.5092	65.0521	1.2090E 05	1.8844E 03	1.8844E 04	1.8844E 04	34000
36000	7.4777	2.79295	30.1063	32.8993	5.55006	59.8263	65.3763	1.2826E 05	1.9980E 03	1.9980E 04	1.9980E 04	36000
38000	7.5978	2.79613	30.2574	33.0536	5.55638	60.1265	65.6829	1.3563E 05	2.1114E 03	2.1114E 04	2.1114E 04	38000
40000	7.7146	2.79890	30.4009	33.1998	5.56188	60.4117	65.9735	1.4299E 05	2.2240E 03	2.2240E 04	2.2240E 04	40000
42000	7.8284	2.80125	30.5375	33.3388	5.56658	60.6831	66.2497	1.5033E 05	2.3360E 03	2.3360E 04	2.3360E 04	42000
44000	7.9392	2.80320	30.6678	33.4711	5.57053	60.9422	66.5126	1.5764E 05	2.4479E 03	2.4479E 04	2.4479E 04	44000
46000	8.0473	2.80477	30.7925	33.5973	5.57375	61.1899	66.7634	1.6497E 05	2.5598E 03	2.5598E 04	2.5598E 04	46000
48000	8.1525	2.80599	30.9119	33.7179	5.57636	61.4271	67.0031	1.7226E 05	2.6716E 03	2.6716E 04	2.6716E 04	48000
50000	8.2552	2.80686	31.0265	33.8354	5.57770	61.6548	67.2325	1.7953E 05	2.7830E 03	2.7830E 04	2.7830E 04	50000
60000	8.7312	2.80706	31.5386	34.3654	5.57810	62.6720	68.2501	2.1546E 05	3.3469E 03	3.3469E 04	3.3469E 04	60000
70000	9.1316	2.80740	31.9708	34.7732	5.56883	63.5317	69.1001	2.5072E 05	3.8902E 03	4.4472E 04	4.4472E 04	70000
80000	9.5244	2.79514	32.3445	35.1397	5.5544C	64.2739	69.8283	2.8530E 05	4.4435E 03	5.1619E 04	5.1619E 04	80000
90000	9.8565	2.78687	32.6733	35.4602	5.53798	64.9272	70.4652	3.1957E 05	4.9842E 03	5.8434E 04	5.8434E 04	90000
100000	10.1547	2.77866	32.9665	35.7451	5.52166	65.5098	71.0315	3.5345E 05	5.5217E 03	6.5519E 04	6.5519E 04	100000
150000	11.3039	2.75389	34.0874	36.8412	5.47243	67.7372	73.2096	5.2279E 05	8.2084E 03	1.0141E 05	1.0141E 05	150000
200000	12.1608	2.75784	34.9796	37.6375	5.48029	69.3116	74.7919	6.9862E 05	1.0941E 04	1.3643E 05	1.3643E 05	200000
300000	13.5871	2.79219	36.0042	38.7964	5.54854	71.5463	77.0948	1.0684E 04	1.6644E 04	2.1644E 05	2.1644E 05	300000
400000	14.8300	2.81400	36.8109	39.6249	5.59188	73.1494	78.7413	1.4419E 04	2.2368E 04	2.9268E 05	2.9268E 05	400000
500000	15.9175	2.81805	37.4396	40.2576	5.59994	74.3986	79.9985	1.8044E 04	2.8000E 04	3.7199E 05	3.7199E 05	500000
600000	16.8594	2.81139	37.9529	40.7643	5.58663	75.4186	81.0053	2.1597E 04	3.3520E 04	4.5251E 05	4.5251E 05	600000
700000	17.7784	2.78557	38.7583	41.5439	5.53538	77.0152	82.5546	2.8386E 04	4.5478E 04	6.1815E 05	6.1815E 05	700000
800000	18.6871	2.75718	39.3768	42.1340	5.47897	78.2443	83.7272	3.5910E 04	5.4790E 04	7.8240E 05	7.8240E 05	800000
900000	19.5239	2.69979	40.4632	43.1830	5.36493	80.4467	85.1117	4.5046E 04	6.0474E 04	1.00000E 06	1.00000E 06	900000
1000000	20.2638	2.66129	41.2542	43.9155	5.28843	81.9789	87.2674	5.6052E 04	1.0577E 04	1.2390E 06	1.2390E 06	1000000
1500000	23.5872	2.61548	42.1236	44.9391	5.19740	84.1040	89.3014	6.3070E 04	1.5592E 04	2.5231E 06	2.5231E 06	1500000
2000000	26.5486	2.58067	43.0722	45.6619	5.14611	85.5916	90.7377	1.2634E 05	2.0504E 04	3.4237E 06	3.4237E 06	2000000
3000000	28.0170	2.57323	43.6482	46.2216	5.11343	86.7362	91.9496	1.5431E 05	2.5547E 04	4.3348E 06	4.3348E 06	3000000
4000000	28.5271	2.56186	44.1163	46.6781	5.09083	87.6463	92.7572	1.8622E 05	3.0545E 04	5.2600E 06	5.2600E 06	4000000
5000000	28.7252	2.54718	44.48511	47.3983	5.06166	89.1265	94.1882	2.4596E 04	4.0493E 04	7.1301E 06	7.1301E 06	5000000
6000000	28.9703	2.53812	45.4184	47.9565	5.04367	90.2519	95.4976	3.0545E 04	5.0437E 04	9.0294E 06	9.0294E 06	6000000

TABLE 30. IDEAL GAS FUNCTIONS FOR AN 11+ IONIC WEIGHT 39.9420, R = 1.98717 CAL/MOLE
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S. SEE TABLE 79 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIAL FUNCT.	$\frac{M^2 - E^2}{RT^2}$	$\frac{M^2 - E^2}{RT}$	$\frac{M^2 - E^2}{RT^2}$	$\frac{M^2 - E^2}{RT}$	$\frac{M^2 - E^2}{RT^2}$	$\frac{M^2 - E^2}{RT}$	$\frac{M^2 - E^2}{RT^2}$	$\frac{M^2 - E^2}{RT}$	$\frac{M^2 - E^2}{RT^2}$	TEMP. (°K)
20000	4.0044	2.50882	26.0123	30.5212	4.98543	59.4452	60.4506	5.9965E 04	9.9709E 04	1.1133E 04	20000
22000	4.0092	2.51620	28.2318	30.7480	5.00010	56.1410	61.1411	6.0285E 04	1.0000E 05	1.2351E 04	22000
24000	4.0140	2.52472	28.6711	30.9979	5.02101	56.3769	61.5779	7.2812E 04	1.2050E 05	1.3578E 04	24000
26000	4.0273	2.54056	28.6739	31.2165	5.04856	56.8798	62.0284	1.3124E 05	1.4815E 04	1.4815E 04	26000
28000	4.0419	2.55378	28.8628	31.4206	5.08272	57.3552	62.4379	8.6679E 04	1.6232E 05	1.6232E 05	28000
30000	4.0608	2.57811	29.0399	31.6181	5.12913	57.7072	62.8303	9.6079E 04	1.5365E 05	1.7312E 04	30000
32000	4.0823	2.60126	29.2071	31.8083	5.16914	58.0393	63.2084	1.0182E 05	1.6541E 05	1.8372E 04	32000
34000	4.1125	2.62682	29.3455	31.9923	5.21993	58.3541	63.5741	1.0991E 05	1.7748E 05	1.9648E 04	34000
36000	4.1456	2.65432	29.5184	32.1708	5.27458	58.6540	63.9284	1.1839E 05	1.8988E 05	2.1113E 04	36000
38000	4.1834	2.68328	29.6607	32.3440	5.33211	58.9407	64.2729	1.2711E 05	2.0262E 05	2.2397E 04	38000
40000	4.2263	2.71321	29.7991	32.5123	5.39180	59.2157	64.6073	1.3618E 05	2.1564E 05	2.3686E 04	40000
42000	4.2737	2.74367	29.9322	32.6759	5.45213	59.4803	64.9324	1.4553E 05	2.2899E 05	2.4982E 04	42000
44000	4.3254	2.77425	30.0606	32.8348	5.51290	59.7353	65.2482	1.5513E 05	2.4257E 05	2.6284E 04	44000
46000	4.3814	2.80459	30.1844	32.9881	5.57318	59.9817	65.5549	1.6594E 05	2.5637E 05	2.7592E 04	46000
48000	4.4414	2.83437	30.3045	33.1369	5.63236	60.2201	65.8525	1.7497E 05	2.7035E 05	2.8904E 04	48000
50000	4.5051	2.86333	30.4208	33.2842	5.68971	60.4512	66.1412	1.8514E 05	2.8450E 05	3.0224E 04	50000
60000	4.8703	2.99010	30.9546	33.9467	5.94181	61.5119	67.4537	2.3728E 05	3.5651E 05	3.6907E 04	60000
70000	5.2911	3.08124	31.4228	34.5041	6.12294	62.4424	68.5653	2.9950E 05	4.2861E 05	4.3710E 04	70000
80000	5.7417	3.13941	31.8384	34.9778	6.23852	63.2482	69.5047	3.4011E 05	4.9908E 05	5.2613E 04	80000
90000	6.2038	3.17196	32.2103	35.3822	6.30321	64.0071	70.3103	3.8844E 05	5.6729E 05	5.7606E 04	90000
100000	6.6647	3.18624	32.5453	35.7316	6.33158	64.7300	71.0045	4.3444E 05	6.3314E 05	6.4473E 04	100000
150000	8.7580	3.13085	33.8321	36.9708	6.23701	67.2500	73.4870	6.3748E 05	9.3554E 05	1.0902E 07	150000
200000	10.3974	3.05060	34.7229	37.7735	6.06206	69.0002	75.0822	8.1498E 05	1.2124E 06	1.3688E 07	200000
300000	12.6410	2.91625	35.9320	38.8462	5.79109	71.4028	77.1939	1.1412E 06	1.7373E 06	2.1421E 07	300000
400000	14.0606	2.82785	36.7376	39.5855	5.61940	73.0435	78.6629	1.4529E 06	2.2478E 06	2.9217E 07	400000
500000	15.0286	2.77033	37.3821	40.1524	5.50510	74.2843	79.7894	1.7590E 06	2.7529E 06	3.7142E 07	500000
600000	15.7281	2.72967	37.8834	40.6130	5.42430	75.2805	80.7048	2.0623E 06	3.2544E 06	4.5164E 07	600000
800000	16.6689	2.67630	38.6407	41.3369	5.31825	76.8251	82.1434	2.6649E 06	4.2544E 06	6.1440E 07	800000
1000000	17.2713	2.64295	39.2540	41.8970	5.25198	78.0042	83.2562	3.2644E 06	5.2520E 06	7.8004E 07	1000000
1500000	18.1218	2.59696	40.3157	42.9127	5.16062	80.1140	85.2747	4.7602E 06	7.7409E 06	1.2017E 08	1500000
2000000	18.5684	2.57335	41.0593	43.6326	5.11368	81.5916	86.7053	6.2530E 06	1.0227E 07	1.6310E 08	2000000
3000000	19.0300	2.54931	42.0975	44.6448	5.06590	83.5447	88.7204	9.2362E 06	1.5198E 07	2.5094E 08	3000000
4000000	19.2645	2.53714	42.8291	45.3642	5.04171	85.1084	90.1501	1.2218E 07	2.0167E 07	3.4004E 08	4000000
5000000	19.5103	2.52978	43.3944	45.9241	5.02709	86.2318	91.2589	1.5200E 07	2.5135E 07	4.3116E 08	5000000
6000000	19.5078	2.52446	43.8531	46.3800	5.01731	87.1474	92.1447	1.8181E 07	3.0104E 07	5.2388E 08	6000000
8000000	18.6287	2.51846	44.5304	47.0992	5.00504	88.5889	93.5940	2.6143E 07	4.0040E 07	7.0871E 08	8000000
10000000	19.7023	2.51446	45.1422	47.6571	4.99765	89.7949	94.7026	3.0105E 07	4.9976E 07	8.9379E 08	10000000

TABLE 19. IDEAL GAS FUNCTIONS FOR AM 12. (ATOMIC WEIGHT 39.9420, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS M S. SEE TABLE 80 FOR LIST OF STATES USED.

TEMP. (%)	PARTIT. FUNCT.	$\frac{W_0 - E_0}{RT}$	$\ln \frac{W_0 - E_0}{RT}$	$\frac{W_0 - E_0}{RT}$	$\ln \frac{W_0 - E_0}{RT}$	$\frac{W_0 - E_0}{RT}$	$\ln \frac{W_0 - E_0}{RT}$	$\frac{W_0 - E_0}{RT}$	$\ln \frac{W_0 - E_0}{RT}$	$\frac{W_0 - E_0}{RT}$	$\ln \frac{W_0 - E_0}{RT}$	TEMP. (%)		
20000	3.5673	3.28473	27.9005	31.1852	6.52729	61.9701	9.08036	04	1.30594	05	1.10994	04	20000	
22000	3.6529	3.25233	28.2120	31.4645	56.0619	62.5252	9.44736	04	1.23344	05	1.07016	04	22000	
24000	4.1085	3.22368	28.4948	31.7176	6.40639	56.6218	1.04046	05	1.53736	05	1.35096	04	24000	
26000	4.3491	3.19266	28.7508	31.9499	6.31627	57.1326	1.13408	05	1.45246	05	1.44846	04	26000	
28000	4.5764	3.17653	28.9870	32.1635	6.31228	57.6020	1.21108	05	1.74746	05	1.61296	04	28000	
30000	4.7919	3.15704	29.2055	32.3625	6.27356	58.0341	1.28596	05	1.88216	05	1.74116	04	30000	
32000	4.9946	3.13979	29.4037	32.5445	6.23029	58.4389	1.34076	05	1.98446	05	1.81016	04	32000	
34000	5.1918	3.12461	29.5986	32.7230	6.20072	58.8172	1.43536	05	2.11046	05	1.99986	04	34000	
36000	5.3783	3.11057	29.7787	32.8873	6.18122	59.1713	1.50996	05	2.23246	05	2.13626	04	36000	
38000	5.5569	3.09801	29.9446	33.0426	6.15625	59.5048	1.56461	05	2.33946	05	2.26126	04	38000	
40000	5.7283	3.08650	30.1032	33.1897	6.13338	59.8200	1.65896	05	2.45346	05	2.39206	04	40000	
42000	5.8930	3.07586	30.2535	33.3294	6.11224	60.1187	1.73296	05	2.56716	05	2.52906	04	42000	
44000	6.0516	3.06595	30.3944	33.4623	6.09255	60.4026	1.80646	05	2.68076	05	2.65776	04	44000	
46000	6.2045	3.05665	30.5325	33.5891	6.07407	60.6730	1.88006	05	2.79416	05	2.79106	04	46000	
48000	6.3521	3.04787	30.6624	33.7102	6.05662	60.9312	1.95336	05	2.90726	05	2.92476	04	48000	
50000	6.4945	3.03953	30.7866	33.8261	6.04005	61.1781	2.02646	05	3.02006	05	3.05696	04	50000	
60000	7.1419	3.00264	31.3374	34.3401	5.94674	62.2726	2.34776	05	3.58006	05	3.73646	04	60000	
70000	7.6986	2.97113	31.7979	34.7690	5.90414	63.1876	2.74196	05	4.13296	05	4.23116	04	70000	
80000	8.1523	2.94325	32.1927	35.1340	5.84873	63.9723	3.08926	05	4.67906	05	4.71786	04	80000	
90000	8.6092	2.91820	32.5379	35.4561	5.79896	64.6583	3.43046	05	5.21916	05	5.21926	04	90000	
100000	8.9863	2.89535	32.8442	35.7390	5.75394	65.2649	3.76686	05	5.75396	05	5.75396	04	100000	
150000	10.3651	2.80914	34.0066	36.8097	5.58223	67.5648	5.39236	05	8.37336	05	8.37336	04	150000	
200000	11.2354	2.75231	34.8004	37.5527	5.46930	69.1342	6.96436	05	1.09396	06	1.30316	07	200000	
300000	12.2873	2.68356	35.9020	38.5855	5.33269	71.3431	76.6758	1.00376	06	1.59596	06	2.14836	07	300000
400000	12.8557	2.64395	36.6481	39.3121	5.25397	72.8656	78.1195	1.30676	06	2.10146	06	2.91446	07	400000
500000	13.2374	2.61831	37.2551	39.8735	5.20302	74.0321	79.2351	1.60796	06	2.60136	06	3.70146	07	500000
600000	13.5034	2.60039	37.7308	40.3312	5.18741	74.9774	80.1448	1.90816	06	3.10046	06	4.49646	07	600000
800000	13.8506	2.57702	38.4754	41.0525	5.12097	76.4570	81.5780	2.50706	06	4.09686	06	6.11446	07	800000
1000000	14.0871	2.56247	39.0488	41.6113	5.09204	77.5964	82.6885	3.10426	06	5.09206	06	7.75946	07	1000000
1500000	14.3658	2.54241	40.0835	42.6259	5.05219	79.6325	84.7047	4.59726	06	7.57836	06	1.19446	08	1500000
2000000	14.6766	2.52210	40.8133	43.3454	5.01170	81.1028	86.1345	6.08916	06	1.00436	07	1.42216	08	2000000
3000000	14.9766	2.51250	41.3377	44.3593	5.01063	82.1028	87.1471	9.07106	06	1.50326	07	2.49426	08	3000000
4000000	14.7000	2.51627	42.5624	45.0726	5.00025	85.5787	89.5787	1.20536	07	2.08216	07	3.38316	08	4000000
5000000	14.8044	2.51305	43.1233	45.8365	4.99385	86.4835	90.6073	1.50336	07	2.49446	07	4.28446	08	5000000
6000000	14.8367	2.51090	43.5813	46.0724	4.98951	86.6036	91.5931	1.80146	07	2.99376	07	5.19626	08	6000000
8000000	14.8772	2.50819	44.3034	46.8116	4.98419	88.0382	93.0224	2.39786	07	3.98746	07	7.04316	08	8000000
10000000	14.9016	2.50656	44.8629	47.3695	4.98096	88.1500	94.1309	2.89386	07	4.98106	07	8.91306	08	10000000

TABLE 40. IDEAL GAS FUNCTIONS FOR AR 13 (ATOMIC WEIGHT 39.9410, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S.4. SEE TABLE 81 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{V_0 - V}{RT}$	$\ln \frac{V_0 - V}{RT}$	$\ln \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT}$	$\ln \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT}$	$\ln \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT}$	$\ln \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT}$	$\ln \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT} - \frac{V_0 - V}{RT}$	TEMP. (°K)		
2000	2.7834	2.95889	27.4446	30.6074	5.87980	54.9422	60.8220	7.7853E 04	1.1740E 05	1.0768E 04	20000
2000	2.9036	2.96301	27.9708	30.8938	5.88799	55.5031	61.9311	8.5810E 04	1.2954E 05	1.2211E 04	22000
2000	3.0238	2.96730	28.1826	31.1499	5.89599	56.0154	61.9000	1.0510E 04	1.4123E 05	1.3444E 04	24000
2000	3.1441	2.97174	28.4254	31.3812	5.90394	56.4860	62.3594	1.2271E 05	1.5271E 05	1.4686E 04	26000
2000	3.2643	2.97572	28.6442	31.5919	5.91199	56.9207	62.7783	1.4033E 05	1.6401E 05	1.5938E 04	28000
3000	3.3492	2.93824	28.8472	31.7855	5.93876	57.2342	63.1630	1.5553E 05	1.7516E 05	1.7197E 04	30000
3000	3.4441	2.92799	29.0265	31.9645	5.91839	57.7004	63.5188	1.2240E 05	1.8619E 05	1.8464E 04	32000
3000	3.5400	2.91748	29.2137	32.1312	5.97951	58.0525	63.8500	1.2953E 05	1.9712E 05	1.9730E 04	34000
3000	3.6378	2.90708	29.3802	32.2873	5.97684	58.3833	64.1602	1.3643E 05	2.0797E 05	2.1018E 04	36000
3000	3.7373	2.89705	29.5375	32.4362	5.97562	58.6951	64.4520	1.4323E 05	2.1876E 05	2.2304E 04	38000
4000	3.7725	2.88759	29.6855	32.5751	5.93813	58.9899	64.7280	1.5004E 05	2.2953E 05	2.3594E 04	40000
4000	3.8436	2.87806	29.8261	32.7058	5.92077	59.2695	64.9902	1.5681E 05	2.4027E 05	2.4893E 04	42000
4000	3.9113	2.87004	29.9599	32.8308	5.90504	59.5352	65.2403	1.6359E 05	2.5102E 05	2.6195E 04	44000
4000	3.9757	2.86393	30.0873	32.9513	5.89109	59.7885	65.4796	1.7038E 05	2.6179E 05	2.7503E 04	46000
4000	4.0372	2.85785	30.2091	33.0669	5.87903	60.0305	65.7095	1.7721E 05	2.7259E 05	2.8815E 04	48000
5000	4.0942	2.85276	30.3254	33.1784	5.86800	60.2621	65.9310	1.8409E 05	2.8344E 05	3.0131E 04	50000
6000	4.1425	2.84817	30.4444	33.2843	5.85827	61.2930	66.9403	2.1961E 05	3.1804E 05	3.4174E 04	60000
7000	4.1913	2.84397	31.2131	34.1361	5.84932	62.1647	67.8340	2.3775E 05	3.3904E 05	4.3515E 04	70000
8000	4.2413	2.84040	31.6457	34.5445	5.84242	62.9250	68.6496	2.9605E 05	4.3797E 05	5.0346E 04	80000
9000	4.2939	2.83711	32.0072	34.9269	5.83695	63.6036	69.4055	3.6333E 05	5.2218E 05	5.7273E 04	90000
10000	4.3450	2.83403	32.3171	35.2819	5.83160	64.2194	70.1110	3.9064E 05	5.8916E 05	6.4219E 04	100000
13000	4.4911	2.83570	33.5629	36.1986	6.35051	66.6940	73.0276	6.3150E 05	9.4958E 05	1.0004E 07	150000
20000	4.3222	3.32283	34.5003	37.8223	6.40261	68.5577	75.1003	7.2309E 05	1.2520E 06	1.3712E 07	200000
30000	11.6707	3.40469	35.8691	39.2738	6.76586	71.2778	78.0434	1.4336E 06	2.6297E 06	2.1393E 07	300000
40000	15.3623	3.37716	36.8461	40.2233	6.71102	73.2193	79.9303	1.8899E 06	2.6844E 06	2.9288E 07	400000
50000	18.5499	3.31795	37.5934	40.9115	6.59331	74.7047	81.2900	2.3031E 06	3.2947E 06	3.7352E 07	500000
60000	21.4330	3.25346	38.1928	41.4465	6.48557	75.8957	82.5610	2.6870E 06	3.8792E 06	4.5337E 07	600000
80000	26.1921	3.13873	39.1125	42.2913	6.23717	77.7231	83.9402	3.4000E 06	4.9697E 06	6.2178E 07	800000
100000	29.9000	3.04847	39.8028	42.8513	6.05782	79.0947	85.1525	4.0707E 06	6.0578E 06	7.9695E 07	1000000
150000	34.2064	2.90032	41.0079	43.9982	5.76342	81.4894	87.2529	5.6644E 06	8.8451E 06	1.2223E 08	1500000
200000	40.1064	2.81354	41.8294	44.6429	5.59100	83.1219	88.7129	7.2077E 06	1.1102E 07	1.6424E 08	2000000
300000	44.4274	2.71800	42.9498	45.4478	5.40112	85.3484	90.7495	1.0242E 07	1.6203E 07	2.5469E 08	3000000
400000	47.1536	2.64687	43.7261	46.3900	5.29952	86.8870	92.1864	1.3249E 07	2.1198E 07	3.4759E 08	4000000
500000	48.7638	2.63512	44.3155	46.9506	5.23642	88.0422	93.2687	1.6244E 07	2.8103E 07	4.4931E 08	5000000
600000	49.8790	2.61350	44.7939	47.4074	5.19344	89.0129	94.2064	1.9238E 07	3.1161E 07	5.3408E 08	6000000
800000	51.3218	2.59597	45.5416	48.1276	5.13075	90.4968	95.6375	2.5213E 07	4.1102E 07	7.2399E 08	8000000
1000000	52.2145	2.56918	46.1147	48.6859	5.10559	91.4616	96.7470	3.1182E 07	5.1054E 07	9.1642E 08	10000000

TABLE 41. IDEAL GAS FUNCTIONS FOR AR 16+ (ATOMIC WEIGHT 39.9410, $k = 1.380658 \times 10^{-16}$ CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS $n \leq 4$. SEE TABLE 42 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\ln \frac{q}{RT}$	$\ln \frac{q}{RT} - \frac{U_0}{RT}$	$\ln \frac{q}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT}$	$\ln \frac{q}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT}$	$\ln \frac{q}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT}$	$\ln \frac{q}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT}$	$\ln \frac{q}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT} - \frac{U_0}{RT}$	TEMP (°K)			
20000	1.0000	2.50001	26.6249	29.1249	4.94793	52.9080	57.0759	59.6156	04	1.05426	06	20000
22000	1.0003	2.50003	26.8631	29.3632	4.96797	53.3015	58.3495	6.59706	04	1.07308	05	22000
24000	1.0000	2.50009	27.0807	29.5807	4.96809	53.8138	59.7819	7.15428	04	1.09128	05	24000
26000	1.0000	2.50025	27.2808	29.7810	4.96841	54.2115	59.1799	7.75128	04	1.20108	05	26000
28000	1.0000	2.50059	27.4661	29.9667	4.96909	54.5797	59.5488	8.34942	04	1.30136	05	28000
30000	1.0001	2.50124	27.6386	30.1399	4.97037	54.9225	59.8929	8.94942	04	1.40116	05	30000
32000	1.0002	2.50235	27.8001	30.3024	4.97259	55.2434	60.2160	9.55342	04	1.50128	05	32000
34000	1.0004	2.50413	27.9519	30.4560	4.97613	55.5450	60.5211	1.01428	05	1.60108	05	34000
36000	1.0007	2.50648	28.0951	30.6019	4.98142	55.8295	60.8109	1.07708	05	1.70136	05	36000
38000	1.0012	2.51047	28.2307	30.7413	4.98893	56.0990	61.0880	1.14078	05	1.80108	05	38000
40000	1.0019	2.51569	28.3596	30.8753	4.99910	56.3552	61.3543	1.20408	05	1.90096	05	40000
42000	1.0028	2.52238	28.4825	31.0049	5.01238	56.5996	61.6118	1.27048	05	2.00128	05	42000
44000	1.0040	2.53081	28.6000	31.1308	5.02914	56.8330	61.8621	1.33898	05	2.10208	05	44000
46000	1.0056	2.54116	28.7127	31.2539	5.04971	57.0569	62.1067	1.40988	05	2.20328	05	46000
48000	1.0076	2.55356	28.8211	31.3747	5.07435	57.2724	62.3467	1.48108	05	2.30478	05	48000
50000	1.0101	2.56809	28.9257	31.4938	5.10322	57.4801	62.5833	1.55308	05	2.40648	05	50000
60000	1.0314	2.67280	29.4023	32.0751	5.31130	58.4273	63.7306	1.99458	05	3.18608	05	60000
70000	1.0707	2.82182	29.8251	32.6469	5.60761	59.2674	64.8748	2.53428	05	3.92528	05	70000
80000	1.1302	2.99298	30.2130	33.2060	5.94755	60.0382	65.9957	3.16838	05	4.75008	05	80000
90000	1.2097	3.18329	30.5754	33.7387	6.28599	60.7384	67.0444	3.86098	05	5.63748	05	90000
100000	1.3079	3.31686	30.9169	34.2337	6.59114	61.3369	68.0290	4.60408	05	6.59116	05	100000
150000	2.0077	3.73805	32.3591	36.0972	7.42812	64.3029	71.7310	8.16148	05	1.11428	06	150000
200000	2.9125	3.82279	33.4504	37.2731	7.59651	64.4714	74.0679	1.12196	06	1.51938	06	200000
300000	4.9284	3.74204	34.9900	38.7321	7.43605	65.5309	76.5470	1.63478	06	2.23092	07	300000
400000	6.9128	3.60264	36.0476	39.6502	7.15908	71.6325	78.7916	2.04808	06	2.86348	07	400000
500000	8.7159	3.47308	36.8372	40.3103	6.90159	73.2016	80.1032	2.45772	06	3.45008	07	500000
600000	10.3046	3.34380	37.4405	40.8243	6.68442	74.4401	81.1245	2.81848	06	4.01078	07	600000
800000	12.8973	3.19572	38.4041	41.6028	6.35639	76.3152	82.6716	3.49548	06	5.08518	07	800000
1000000	14.8770	3.08364	39.1047	42.1884	6.12770	77.7076	83.8353	4.16048	06	6.12778	07	1000000
1500000	18.1712	2.91094	40.3184	43.2296	5.78455	80.1194	85.9039	5.69618	06	8.67608	07	1500000
2000000	20.1647	2.81633	41.1617	43.9581	5.59651	81.7554	87.3187	7.21878	06	1.11938	07	2000000
3000000	22.4371	2.71624	42.2622	44.9786	5.39761	83.9819	89.3795	1.02318	07	1.61938	07	3000000
4000000	23.6913	2.64416	43.0356	45.6999	5.29413	85.5192	90.8133	1.12178	07	2.11778	07	4000000
5000000	24.9847	2.58227	43.6266	46.2589	5.23076	86.5260	91.9240	1.62188	07	2.61348	07	5000000
6000000	25.0320	2.51075	44.1045	46.7132	5.19800	87.6429	92.8309	1.92038	07	3.11208	07	6000000
8000000	25.7369	2.58355	44.8515	47.4450	5.13395	89.1273	94.2412	2.51748	07	4.10728	07	8000000
10000000	26.1713	2.56708	45.4261	47.9931	5.10120	90.2691	95.3703	3.11408	07	5.10128	07	10000000

TABLE 42. IDEAL GAS FUNCTIONS FOR AR 15+ IONIC WEIGHT 39.9400, R = 1.98717 CAL/MOLE) BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N ≤ 6. SEE TABLE 83 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT} - \frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	$\frac{h^2 - \epsilon_0}{RT}$	TEMP. (°K)
20000	2.0000	2.5000	27.3180	29.8180	4.96791	54.2953	59.2533	5.96156	9.93586	1.08576	20000	
22000	2.0000	2.5000	27.5563	30.0563	4.96792	54.7588	60.2130	6.95776	1.09276	1.20476	22000	
24000	2.0000	2.5000	27.7738	30.2738	4.96792	55.1738	64.1590	7.15236	1.09276	1.32466	24000	
26000	2.0000	2.5000	27.9739	30.4739	4.96794	55.5887	66.9249	7.50086	1.29176	1.44536	26000	
28000	2.0000	2.5000	28.1592	30.6592	4.96799	55.9569	68.5629	8.34636	1.39106	1.56626	28000	
30000	2.0000	2.5000	28.3316	30.8316	4.96809	56.2997	61.2678	8.94206	1.49046	1.68906	30000	
32000	2.0000	2.5000	28.4930	30.9930	4.96828	56.6203	61.5086	9.53946	1.58986	1.81186	32000	
34000	2.0001	2.5004	28.6446	31.1446	4.96846	56.9215	61.8001	1.01376	1.68926	1.93536	34000	
36000	2.0002	2.5008	28.7875	31.2881	4.96863	57.2055	62.1747	1.07356	1.78866	2.05946	36000	
38000	2.0004	2.5018	28.9227	31.4238	4.96879	57.4742	62.4443	1.13356	1.88806	2.18406	38000	
40000	2.0006	2.5025	29.0510	31.5527	4.96893	57.7292	62.7005	1.19376	1.98746	2.30926	40000	
42000	2.0008	2.5029	29.1731	31.6757	4.96906	57.9718	62.9448	1.25416	2.08686	2.43486	42000	
44000	2.0012	2.5032	29.2899	31.7925	4.96918	58.2032	63.1784	1.31466	2.18626	2.56046	44000	
46000	2.0018	2.5037	29.4008	31.9042	4.96928	58.4244	63.4028	1.37466	2.28566	2.68746	46000	
48000	2.0025	2.5042	29.5072	32.0118	4.96936	58.6364	63.6186	1.43466	2.38506	2.81446	48000	
50000	2.0032	2.5049	29.6099	32.1195	4.96942	58.8398	63.8248	1.49466	2.48446	2.94206	50000	
60000	2.0050	2.5062	30.0890	32.5962	5.02596	59.7521	64.7781	1.72336	3.21346	3.58616	60000	
70000	2.0129	2.5246	30.4413	33.0242	5.07299	60.5315	65.6245	2.17416	3.94316	4.23726	70000	
80000	2.0259	2.60926	30.8044	33.4196	5.18502	61.2174	66.4024	2.35836	4.14806	4.49746	80000	
90000	2.0788	2.66426	31.1168	33.7811	5.29433	61.8343	67.1286	2.97646	4.76496	5.16516	90000	
100000	2.1216	2.72341	31.4006	34.1240	5.41186	62.3981	67.8100	3.42476	5.41196	5.82396	100000	
150000	2.4594	2.97389	32.5565	35.5104	5.90961	64.6952	70.6048	5.88376	8.86446	9.76436	150000	
200000	2.8540	3.08337	33.4300	36.5134	6.12718	66.4310	72.5582	8.28086	1.22546	1.32866	200000	
300000	3.6357	3.06473	34.6858	37.7705	6.12987	68.9263	75.0562	1.24286	1.83906	2.06786	300000	
400000	4.2637	3.01754	35.5643	38.5818	5.99636	70.6721	76.6485	1.40376	2.39896	2.82696	400000	
500000	4.7510	2.95175	36.2304	39.1821	5.84543	71.9957	77.8414	1.93926	2.93286	3.59986	500000	
600000	5.1334	2.87995	36.7636	39.6615	5.75871	73.0553	78.8140	2.26296	3.45526	4.34836	600000	
800000	5.6947	2.82840	37.5886	40.4150	5.62050	74.6907	80.3112	2.90676	4.49646	5.97536	800000	
1000000	6.1091	2.80263	38.2147	41.0233	5.58122	75.9388	81.5201	3.59416	5.58126	7.59396	1000000	
1500000	7.0494	2.84172	39.3715	42.3132	5.84548	78.2377	84.0833	5.78786	8.76956	1.17346	1500000	
2000000	8.2654	3.17562	40.2498	43.4255	6.31048	79.9831	86.2936	8.44462	1.26216	1.59976	2000000	
3000000	11.5743	3.44646	41.6002	45.0467	6.84849	82.6445	89.5152	1.45056	2.05446	2.44806	3000000	
4000000	15.2921	3.44591	42.5980	46.0439	6.88734	84.4492	91.5365	1.96016	2.75496	3.36606	4000000	
5000000	18.8487	3.40027	43.3450	46.7353	6.75690	86.1734	92.9303	2.38496	3.37856	4.34876	5000000	
6000000	22.0534	3.31859	44.1978	47.2967	6.59838	87.1911	93.9864	2.76496	3.95726	5.24396	6000000	
8000000	27.3430	3.17487	44.9120	48.0048	6.30889	89.2475	95.5545	3.45756	5.04726	7.13906	8000000	
10000000	31.9009	3.08682	45.6082	48.6750	6.09428	90.6310	96.7253	4.18716	6.09426	9.06316	10000000	

TABLE 43. IDEAL GAS FUNCTIONS FOR AN 10^6 (ATOMIC WEIGHT 39.9480, $R = 1.98717$ CAL/MOLE)

BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS $n \leq 5$. SEE TABLE 34 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\ln \frac{q}{T}$	$\ln \frac{q}{T^2}$	$\ln \frac{q}{T^3}$	$\ln \frac{q}{T^4}$	$\ln \frac{q}{T^5}$	$\ln \frac{q}{T^6}$	$\ln \frac{q}{T^7}$	$\ln \frac{q}{T^8}$	$\ln \frac{q}{T^9}$	$\ln \frac{q}{T^{10}}$	TEMP. (°K)
20000	1.0000	2.50000	28.6298	29.1748	4.96791	52.9079	59.8799	5.96156	9.93586	04	1.07622	20000
22000	1.0000	2.50000	28.6631	29.3631	4.96791	53.3493	58.3493	1.17442	1.17442	04	2.00000	22000
24000	1.0000	2.50000	27.0806	29.5806	4.96791	53.8116	58.7816	1.29176	1.29176	04	2.00000	24000
26000	1.0000	2.50000	27.2807	29.7807	4.96791	54.2113	59.1793	1.44894	1.44894	04	2.00000	26000
28000	1.0000	2.50000	27.4660	29.9660	4.96791	54.5795	59.5474	1.63106	1.63106	04	2.00000	28000
30000	1.0000	2.50000	27.6385	30.1385	4.96791	54.9223	59.8902	1.84476	1.84476	04	2.00000	30000
32000	1.0000	2.50000	27.7998	30.2998	4.96791	55.2429	60.2106	2.08642	2.08642	04	2.00000	32000
34000	1.0000	2.50000	27.9514	30.4514	4.96791	55.5441	60.5120	2.35491	2.35491	04	2.00000	34000
36000	1.0000	2.50000	28.0943	30.5943	4.96791	55.8280	60.7959	2.64842	2.64842	04	2.00000	36000
38000	1.0000	2.50000	28.2295	30.7295	4.96791	56.0956	61.0645	2.96762	2.96762	04	2.00000	38000
40000	1.0000	2.50000	28.3577	30.8577	4.96791	56.3414	61.3193	3.31193	3.31193	04	2.00000	40000
42000	1.0000	2.50000	28.4797	30.9797	4.96791	56.5933	61.5617	3.68242	3.68242	04	2.00000	42000
44000	1.0000	2.50000	28.5960	31.0960	4.96791	56.8249	61.7928	4.08042	4.08042	04	2.00000	44000
46000	1.0000	2.50000	28.7071	31.2071	4.96791	57.0458	62.0137	4.50642	4.50642	04	2.00000	46000
48000	1.0000	2.50000	28.8135	31.3135	4.96791	57.2572	62.2251	4.96142	4.96142	04	2.00000	48000
50000	1.0000	2.50000	28.9156	31.4156	4.96791	57.4600	62.4279	5.44642	5.44642	04	2.00000	50000
60000	1.0070	2.50000	29.3714	31.8714	4.96791	58.3658	63.3337	7.08642	7.08642	04	2.00000	60000
70000	1.0000	2.50000	29.7567	32.2567	4.96791	59.1316	64.0995	9.17642	9.17642	04	2.00000	70000
80000	1.0000	2.50000	30.0906	32.5906	4.96791	59.7949	64.7628	1.17642	1.17642	04	2.00000	80000
90000	1.0000	2.50000	30.3850	32.8850	4.96791	60.3801	65.3480	1.62762	1.62762	04	2.00000	90000
100000	1.0000	2.50000	30.6484	33.1484	4.96791	60.9035	65.8714	2.12076	2.12076	04	2.00000	100000
150000	1.0000	2.50000	31.6421	34.1421	4.96791	62.9178	67.8857	4.47116	4.47116	04	2.00000	150000
200000	1.0000	2.50000	32.3813	34.8813	4.96791	64.3470	69.3149	6.93502	6.93502	04	2.00000	200000
300000	1.0000	2.50000	33.3950	35.8950	4.96791	66.3413	71.3292	9.96222	9.96222	04	2.00000	300000
400000	1.0000	2.50000	34.1142	36.6142	4.96791	67.7905	72.7564	1.19232	1.19232	04	2.00000	400000
500000	1.0000	2.50000	34.6720	37.1720	4.96791	68.8990	73.8670	1.49042	1.49042	04	2.00000	500000
600000	1.0000	2.50000	35.1278	37.6278	4.96791	69.8048	74.7727	1.78842	1.78842	04	2.00000	600000
800000	1.0000	2.50000	35.8470	38.3470	4.96791	71.2340	76.2019	2.38442	2.38442	04	2.00000	800000
1000000	1.0000	2.50000	36.4049	38.9049	4.96791	72.3425	77.3104	2.98076	2.98076	04	2.00000	1000000
1500000	1.0000	2.50000	37.4186	39.9186	4.96791	74.3548	79.3248	4.57116	4.57116	04	2.00000	1500000
2000000	1.0000	2.50001	38.1378	40.6378	4.96793	75.7660	80.7340	5.96156	5.96156	04	2.00000	2000000
3000000	1.0002	2.50255	39.1516	41.6516	4.97208	77.8007	82.7737	8.95792	8.95792	04	2.00000	3000000
4000000	1.0018	2.50444	39.8795	42.3795	5.04202	79.2391	84.2993	1.22922	1.22922	07	2.04616	4000000
5000000	1.0319	2.73802	40.4618	43.2199	5.48065	80.4044	85.8850	1.74672	1.74672	07	2.74672	5000000
6000000	1.1269	3.24730	41.0037	44.2510	6.45293	81.4812	87.9241	2.67952	2.67952	07	3.67952	6000000
8000000	1.6753	4.53645	42.1195	46.6519	9.01467	83.6983	92.7130	5.62202	5.62202	07	7.21172	8000000
10000000	2.8626	5.15134	43.2131	48.3444	10.23656	85.8715	96.1081	8.24942	8.24942	07	1.02372	10000000

TABLE 44. IDEAL GAS FUNCTIONS FOR AR 17. (ATOMIC WEIGHT 39.9390, R = 1.98717 CAL/MOLE)
 BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS N,S. SEE TABLE B5 FOR LIST OF STATES USED.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{8\pi^2}$	$\frac{5R}{T}$	$\ln \frac{h^2}{8\pi^2} - \frac{5R}{T}$	$\ln \frac{h^2}{8\pi^2} - \frac{5R}{T} - \frac{S}{R}$	$e^{-\frac{S}{R}}$	$\frac{h^2}{8\pi^2} - \frac{5R}{T} - \frac{S}{R}$	$\ln \frac{h^2}{8\pi^2} - \frac{5R}{T} - \frac{S}{R}$	TEMP. (°K)
20000	2.0000	27.3179	29.6179	4.96791	54.2833	5.9615E 04	9.9358E 04	1.0897E 04	20000
22000	2.0000	27.5562	30.0562	4.96791	54.7568	6.5376E 04	1.0729E 04	1.2867E 04	22000
24000	2.0000	27.7737	30.4737	4.96791	55.1910	7.1338E 04	1.1923E 05	1.3446E 04	24000
26000	2.0000	27.9739	30.8739	4.96791	55.5887	7.7499E 04	1.2917E 05	1.4453E 04	26000
28000	2.0000	28.1591	30.6591	4.96791	55.9568	8.3941E 04	1.3910E 05	1.5660E 04	28000
30000	2.0000	28.3316	30.8316	4.96791	56.2996	8.9222E 04	1.4904E 05	1.6890E 04	30000
32000	2.0000	28.4930	30.9930	4.96791	56.6202	9.4361E 04	1.5897E 05	1.8110E 04	32000
34000	2.0000	28.6445	31.1445	4.96791	56.9214	9.9358E 04	1.6891E 05	1.9313E 04	34000
36000	2.0000	28.7874	31.2874	4.96791	57.2033	1.0731E 05	1.7884E 05	2.0594E 04	36000
38000	2.0000	28.9226	31.4226	4.96791	57.4739	1.1327E 05	1.8878E 05	2.1844E 04	38000
40000	2.0000	29.0508	31.5508	4.96791	57.7288	1.1923E 05	1.9872E 05	2.3092E 04	40000
42000	2.0000	29.1728	31.6728	4.96791	57.9711	1.2518E 05	2.0865E 05	2.4341E 04	42000
44000	2.0000	29.2891	31.7891	4.96791	58.2023	1.3113E 05	2.1855E 05	2.5489E 04	44000
46000	2.0000	29.4002	31.9002	4.96791	58.4231	1.3711E 05	2.2842E 05	2.6673E 04	46000
48000	2.0000	29.5066	32.0066	4.96791	58.6345	1.4308E 05	2.3846E 05	2.8149E 04	48000
50000	2.0000	29.6087	32.1087	4.96791	58.8373	1.4904E 05	2.4846E 05	2.9419E 04	50000
60000	2.0000	30.0645	32.5645	4.96791	59.7431	1.7694E 05	3.0807E 05	3.5844E 04	60000
70000	2.0000	30.4498	32.9498	4.96791	60.5059	2.0865E 05	3.4779E 05	4.2354E 04	70000
80000	2.0000	30.7837	33.2837	4.96791	61.1723	2.3846E 05	3.9743E 05	4.8936E 04	80000
90000	2.0000	31.0781	33.5781	4.96791	61.7514	2.6827E 05	4.4711E 05	5.5582E 04	90000
100000	2.0000	31.3415	33.8415	4.96791	62.2808	2.9807E 05	4.9679E 05	6.2281E 04	100000
150000	2.0000	32.3552	34.8552	4.96791	64.2951	6.92630	4.4711E 05	7.4519E 05	150000
200000	2.0000	33.6744	35.5744	4.96791	65.7253	70.4922	5.9615E 05	9.9358E 05	200000
300000	2.0000	34.8681	36.5681	4.96791	67.7364	72.7085	8.9422E 05	1.4904E 06	300000
400000	2.0000	34.8673	36.5673	4.96791	69.1678	74.1397	1.1923E 04	1.9872E 06	400000
500000	2.0000	35.3451	37.0451	4.96791	70.2764	75.2443	1.4904E 04	2.4846E 06	500000
600000	2.0000	35.8209	37.5209	4.96791	71.1821	76.1500	1.7884E 04	2.9807E 06	600000
800000	2.0000	36.5481	38.0481	4.96791	72.6113	77.3792	2.3846E 04	3.9743E 06	800000
1000000	2.0000	37.0980	38.5980	4.96791	73.7199	78.6878	2.9807E 04	4.9679E 06	1000000
1500000	2.0000	38.1117	40.6117	4.96791	75.7342	80.7821	4.4711E 04	7.4519E 06	1500000
2000000	2.0000	38.8389	41.3309	4.96791	77.1634	82.1313	5.9615E 04	9.9358E 06	2000000
3000000	2.0000	39.6445	42.3445	4.96791	79.1777	84.1460	8.9422E 04	1.4904E 07	3000000
4000000	2.0000	40.5442	43.0442	4.96791	80.6078	85.5892	1.1923E 04	1.9872E 07	4000000
5000000	2.0076	41.1254	43.6254	5.07292	81.7230	86.7959	1.3279E 07	2.5145E 07	5000000
6000000	2.0323	41.5934	44.2091	5.19777	82.6530	87.8500	1.9244E 07	3.1187E 07	6000000
8000000	2.2021	42.3929	45.0017	5.97902	84.2417	90.2207	3.1935E 07	4.7633E 07	8000000
10000000	2.6157	43.1228	46.0763	7.06128	85.6562	92.7535	5.0741E 07	7.0613E 07	10000000

TABLE 49. IDEAL GAS FUNCTIONS FOR AR 10+ (ATOMIC WEIGHT 39.9505, $h = 1.05717$ CAL/MOLE)

BASED ON ELECTRONIC STATES WITH PRINCIPAL QUANTUM NUMBERS 1-5.

TEMP. (°K)	PARTIT. FUNCT.	$\frac{U^0}{RT}$	$\frac{U^0}{RT} - \frac{U^0}{RT} - \frac{U^0}{RT}$	$\ln \frac{U^0}{RT} - \ln \frac{U^0}{RT} - \ln \frac{U^0}{RT}$	$\ln \frac{U^0}{RT} - \ln \frac{U^0}{RT} - \ln \frac{U^0}{RT}$	$\ln \frac{U^0}{RT} - \ln \frac{U^0}{RT} - \ln \frac{U^0}{RT}$	$\ln \frac{U^0}{RT} - \ln \frac{U^0}{RT} - \ln \frac{U^0}{RT}$	$\ln \frac{U^0}{RT} - \ln \frac{U^0}{RT} - \ln \frac{U^0}{RT}$	TEMP. (°K)				
2000	1.0000	2.50000	26.6248	29.1248	4.96791	52.9079	57.0750	59.9613	9.93508	04	1.07000	06	20000
2200	1.0000	2.50000	26.8631	29.3631	4.96791	53.3814	58.2403	60.5746	1.00292	05	1.17645	06	22000
2400	1.0000	2.50000	27.0886	29.5886	4.96791	53.8136	58.7815	61.1878	1.10278	05	1.29185	06	24000
2600	1.0000	2.50000	27.2807	29.7807	4.96791	54.2113	59.1792	61.7908	1.20178	05	1.40926	06	26000
2800	1.0000	2.50000	27.4460	29.9460	4.96791	54.5794	59.5473	62.3841	1.29168	05	1.52872	06	28000
3000	1.0000	2.50000	27.6385	30.1385	4.96791	54.9222	59.8901	62.9678	1.37404	05	1.65021	06	30000
3200	1.0000	2.50000	27.7998	30.2998	4.96791	55.2528	60.2107	63.5420	1.44978	05	1.77370	06	32000
3400	1.0000	2.50000	27.9314	30.4514	4.96791	55.5660	60.5119	64.1073	1.52802	05	1.90008	06	34000
3600	1.0000	2.50000	28.0443	30.5543	4.96791	55.8279	60.7999	64.6548	1.60448	05	2.02926	06	36000
3800	1.0000	2.50000	28.2294	30.7294	4.96791	56.0965	61.0665	65.1845	1.67832	05	2.16126	06	38000
4000	1.0000	2.50000	28.3577	30.8577	4.96791	56.3514	61.3193	65.6972	1.75000	05	2.29600	06	40000
4200	1.0000	2.50000	28.4796	30.9796	4.96791	56.5937	61.5617	66.1937	1.81992	05	2.43340	06	42000
4400	1.0000	2.50000	28.5959	31.0959	4.96791	56.8249	61.7928	66.6750	1.88748	05	2.57346	06	44000
4600	1.0000	2.50000	28.7071	31.2071	4.96791	57.0457	62.0136	67.1412	1.95308	05	2.71618	06	46000
4800	1.0000	2.50000	28.8135	31.3135	4.96791	57.2571	62.2250	67.5925	2.01702	05	2.86162	06	48000
5000	1.0000	2.50000	28.9155	31.4155	4.96791	57.4599	62.4278	67.9298	2.07958	05	2.99982	06	50000
6000	1.0000	2.50000	29.3713	31.8713	4.96791	58.3657	63.3336	68.8496	2.20878	05	3.29198	06	60000
7000	1.0000	2.50000	29.7567	32.2567	4.96791	59.1315	64.0994	69.6842	2.31792	05	3.58792	06	70000
8000	1.0000	2.50000	30.0805	32.5805	4.96791	59.7949	64.7628	70.4338	2.41102	05	3.88782	06	80000
9000	1.0000	2.50000	30.3490	32.8490	4.96791	60.3800	65.3479	71.1082	2.49002	05	4.19072	06	90000
10000	1.0000	2.50000	30.6484	33.1484	4.96791	60.9034	65.8713	71.7172	2.55502	05	4.49662	06	100000
15000	1.0000	2.50000	31.6821	34.1821	4.96791	62.9177	67.8056	73.6512	2.70802	05	5.14452	06	150000
20000	1.0000	2.50000	32.3813	34.8813	4.96791	64.3469	69.3291	75.1753	2.82802	05	5.54442	06	200000
30000	1.0000	2.50000	33.3949	35.8949	4.96791	67.3625	72.3291	77.3104	3.00802	05	6.14432	06	300000
40000	1.0000	2.50000	34.1141	36.6141	4.96791	70.7904	74.7904	79.3257	3.14802	05	6.54422	06	400000
50000	1.0000	2.50000	34.6720	37.1720	4.96791	74.6990	77.6699	81.2307	3.24802	05	6.84412	06	500000
60000	1.0000	2.50000	35.1278	37.6278	4.96791	79.0047	80.9726	83.0257	3.31802	05	7.04402	06	600000
80000	1.0000	2.50000	35.8570	38.3570	4.96791	83.7339	86.2018	86.6104	3.41802	05	7.34392	06	800000
100000	1.0000	2.50000	36.4049	38.9049	4.96791	89.0425	92.3612	91.7104	3.48802	05	7.54382	06	1000000
150000	1.0000	2.50000	37.4185	39.9185	4.96791	95.3568	99.3257	98.2104	3.58802	05	7.84372	06	1500000
200000	1.0000	2.50000	38.1377	40.6377	4.96791	102.7860	107.1399	105.7104	3.66802	05	8.04362	06	2000000
300000	1.0000	2.50000	39.1514	41.6514	4.96791	112.8003	118.442	116.2104	3.74802	05	8.24352	06	3000000
400000	1.0000	2.50000	39.8706	42.3706	4.96791	124.2994	131.974	128.7104	3.80802	05	8.44342	06	4000000
500000	1.0000	2.50000	40.4284	42.9284	4.96791	137.3300	147.309	141.2104	3.85802	05	8.54332	06	5000000
600000	1.0000	2.50000	40.8862	43.3862	4.96791	151.9338	164.538	156.7104	3.89802	05	8.64322	06	6000000
800000	1.0000	2.50000	41.6035	44.1035	4.96791	170.2499	184.609	176.2104	3.93802	05	8.74312	06	8000000
1000000	1.0000	2.50000	42.1613	44.6613	4.96791	190.7815	207.781	198.7104	3.96802	05	8.84302	06	10000000

TABLE No. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O-

STATE	LEVEL	STAT.	TEMPERATURE (DEG K)																	
			1200	1600	2000	2400	2800	3200	3600	4000	4400									
2s 2p ³ P ₂ ^o	(CM-1)	WT.																		
	0	4	7.30E-01	7.21E-01	7.11E-01	7.02E-01	6.93E-01	6.84E-01	6.75E-01	6.66E-01	6.57E-01	6.48E-01	6.39E-01	6.30E-01	6.21E-01	6.12E-01	6.03E-01	5.94E-01	5.85E-01	5.76E-01
100	215	2	2.82E-01	2.79E-01	2.69E-01	2.97E-01	3.02E-01	3.05E-01	3.09E-01	3.11E-01	3.09E-01	3.07E-01	3.05E-01	3.03E-01	3.01E-01	2.99E-01	2.97E-01	2.95E-01	2.93E-01	2.91E-01
			TEMPERATURE (DEG K)																	
LEVEL	(CM-1)	WT.																		
	0	5000	6000	6400	6800	7200	7600	8000	8400	8800	9200									
205	6.05E-01	6.04E-01	6.03E-01	6.02E-01	6.01E-01	6.00E-01	6.79E-01	6.78E-01	6.77E-01	6.76E-01	6.75E-01	6.74E-01	6.73E-01	6.72E-01	6.71E-01	6.70E-01	6.69E-01	6.68E-01	6.67E-01	6.66E-01
205	3.15E-01	3.14E-01	3.17E-01	3.18E-01	3.19E-01	3.20E-01	3.21E-01	3.22E-01	3.23E-01	3.24E-01	3.25E-01	3.26E-01	3.27E-01	3.28E-01	3.29E-01	3.30E-01	3.31E-01	3.32E-01	3.33E-01	3.34E-01
			TEMPERATURE (DEG K)																	
LEVEL	(CM-1)	WT.																		
	0	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000									
205	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01	6.74E-01
205	3.24E-01	3.24E-01	3.25E-01	3.26E-01	3.27E-01	3.27E-01	3.27E-01	3.28E-01	3.28E-01	3.28E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01
			TEMPERATURE (DEG K)																	
LEVEL	(CM-1)	WT.																		
	0	24000	26000	30000	34000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000
205	6.70E-01	6.70E-01	6.70E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01	6.69E-01
205	3.30E-01	3.30E-01	3.30E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01	3.31E-01

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 UNSTABLE ENERGY LEVELS FROM BERRY ET AL. (1965)

TABLE 47. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C

STATE	LEVEL	STAT.	TEMPERATURE (DEG K)									
			1200	1600	2000	2400	2800	3200	3600	4000	4400	
2 ¹ 2p ²	0	0	1.15E-01	1.14E-01	1.13E-01	1.12E-01	1.12E-01	1.11E-01	1.10E-01	1.09E-01	1.08E-01	
	10	0	3.79E-01	3.77E-01	3.76E-01	3.75E-01	3.74E-01	3.73E-01	3.72E-01	3.71E-01	3.70E-01	
	41	0	5.46E-01	5.44E-01	5.42E-01	5.41E-01	5.40E-01	5.39E-01	5.38E-01	5.37E-01	5.36E-01	
	101 94	5	2.82E-06	2.81E-06	2.80E-06	2.79E-06	2.78E-06	2.77E-06	2.76E-06	2.75E-06	2.74E-06	
	216 66	5	6.15E-13	6.14E-13	6.13E-13	6.12E-13	6.11E-13	6.10E-13	6.09E-13	6.08E-13	6.07E-13	
2 ³ 2p	337 75	5	1.56E-15	1.55E-15	1.54E-15	1.53E-15	1.52E-15	1.51E-15	1.50E-15	1.49E-15	1.48E-15	
	64 91	15	7.31E-34	7.30E-34	7.29E-34	7.28E-34	7.27E-34	7.26E-34	7.25E-34	7.24E-34	7.23E-34	
	79 254	9	0	0	0	0	0	0	0	0	0	
	109 601	3	0	0	0	0	0	0	0	0	0	
	12 13 50	5	0	0	0	0	0	0	0	0	0	
2 ¹ p	11 907 70	3	0	0	0	0	0	0	0	0	0	
	10 5 72	0	0	0	0	0	0	0	0	0	0	
	10 5 90 8	5	0	0	0	0	0	0	0	0	0	
	10 1 0 0 0 0	1	0	0	0	0	0	0	0	0	0	
	10 1 0 0 0 0	12	3.11E-32	3.10E-32	3.09E-32	3.08E-32	3.07E-32	3.06E-32	3.05E-32	3.04E-32	3.03E-32	
2 ³ 2p (P)	6 6 2 2 2	35	2.62E-27	2.61E-27	2.60E-27	2.59E-27	2.58E-27	2.57E-27	2.56E-27	2.55E-27	2.54E-27	
	7 6 1 1 1	60	1.61E-20	1.60E-20	1.59E-20	1.58E-20	1.57E-20	1.56E-20	1.55E-20	1.54E-20	1.53E-20	
	7 6 1 1 1	12	0	0	0	0	0	0	0	0	0	
	6 6 2 2 2	34	1.60E-31	1.59E-31	1.58E-31	1.57E-31	1.56E-31	1.55E-31	1.54E-31	1.53E-31	1.52E-31	
	6 6 2 2 2	60	1.23E-32	1.22E-32	1.21E-32	1.20E-32	1.19E-32	1.18E-32	1.17E-32	1.16E-32	1.15E-32	
2 ³ 2p (D)	6 6 2 2 2	84	1.50E-32	1.49E-32	1.48E-32	1.47E-32	1.46E-32	1.45E-32	1.44E-32	1.43E-32	1.42E-32	
	6 6 2 2 2	24	0	0	0	0	0	0	0	0	0	
	6 6 2 2 2	72	0	0	0	0	0	0	0	0	0	
	6 6 2 2 2	120	0	0	0	0	0	0	0	0	0	
	6 6 2 2 2	24	0	0	0	0	0	0	0	0	0	
2 ³ 2p (F)	13 0 0 0 0	20	0	0	0	0	0	0	0	0	0	
	14 0 0 0 0	60	0	0	0	0	0	0	0	0	0	
	15 0 0 0 0	100	0	0	0	0	0	0	0	0	0	
	16 0 0 0 0	320	0	0	0	0	0	0	0	0	0	
	18 0 0 0 0	100	0	0	0	0	0	0	0	0	0	
(D)	21 0 0 2 3	192	0	0	0	0	0	0	0	0	0	
	21 0 0 2 3	36	0	0	0	0	0	0	0	0	0	
	21 0 0 2 3	64	0	0	0	0	0	0	0	0	0	
	21 0 0 2 3	72	0	0	0	0	0	0	0	0	0	
	21 0 0 2 3	120	0	0	0	0	0	0	0	0	0	
(F)	27 0 0 0 0	100	0	0	0	0	0	0	0	0	0	
	27 0 0 0 0	120	0	0	0	0	0	0	0	0	0	
	27 0 0 0 0	160	0	0	0	0	0	0	0	0	0	
	27 0 0 0 0	240	0	0	0	0	0	0	0	0	0	
	27 0 0 0 0	320	0	0	0	0	0	0	0	0	0	

*ESTIMATED **INCLUDES ESTIMATED SURLEVELS
 NONSTABILIZED ENERGY LEVELS FROM MOORE (1949) AND HILMAGREN (1954, 1955)

TABLE 47 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C

LEVEL (CM-1)	TEMPERATURE (DEG K)										
	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000	
0	1.07E-01	1.00E-01	1.04E-01	1.07E-01	1.05E-01	1.04E-01	1.03E-01	1.02E-01	1.01E-01	1.00E-01	9.94E-02
16	3.24E-01	3.24E-01	3.10E-01	3.11E-01	3.13E-01	3.11E-01	3.08E-01	3.06E-01	3.04E-01	3.01E-01	2.98E-01
43	5.32E-01	5.32E-01	5.24E-01	5.28E-01	5.19E-01	5.15E-01	5.07E-01	5.01E-01	4.95E-01	4.90E-01	4.85E-01
10194	2.57E-02	2.57E-02	2.53E-02	2.53E-02	2.43E-02	2.40E-02	2.34E-02	2.29E-02	2.24E-02	2.20E-02	2.17E-02
21640	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04	1.64E-04
33735	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05
64081	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09	7.43E-09
73256	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10	1.37E-10
102091	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15	5.32E-15
97878	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16	9.90E-16
119478	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17	8.12E-17
150000	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20	2.92E-20
153000	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21	1.42E-21
181000	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25	2.99E-25
60776	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06	1.61E-06
69722	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09	3.30E-09
70426	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10	4.07E-10
78104	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11	8.70E-11
60864	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10	1.17E-10
81550	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11	7.94E-11
94000	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10	1.07E-10
110000	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15	2.08E-15
125000	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16	4.20E-16
132000	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17	6.98E-17
136169	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18	4.92E-18
150000	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18	2.37E-18
165000	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20	9.79E-20
154000	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20	6.44E-20
164000	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23	1.31E-23
170000	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22	2.91E-22
179000	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23	3.49E-23
216000	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28	5.90E-28
223000	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29	7.16E-29
234000	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28	1.34E-28
235000	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29	1.63E-29
243000	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31	2.74E-31
252000	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32	3.20E-32

TABLE 47 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C

LEVEL (CM-1)	TEMPERATURE (006 K)											
	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
0	9.89E-02	9.60E-02	9.40E-02	9.40E-02	9.20E-02	9.94E-02	8.77E-02	8.54E-02	8.30E-02	8.04E-02	7.77E-02	7.48E-02
16	2.94E-01	2.93E-01	2.87E-01	2.81E-01	2.78E-01	2.64E-01	2.63E-01	2.54E-01	2.49E-01	2.41E-01	2.30E-01	2.24E-01
43	6.91E-01	6.87E-01	6.77E-01	6.67E-01	6.58E-01	6.47E-01	6.37E-01	6.26E-01	6.14E-01	6.01E-01	5.87E-01	5.73E-01
10194	1.07E-01	1.13E-01	1.24E-01	1.38E-01	1.49E-01	1.58E-01	1.65E-01	1.71E-01	1.75E-01	1.78E-01	1.80E-01	1.82E-01
21648	3.69E-03	4.35E-03	5.63E-03	7.01E-03	8.38E-03	9.72E-03	1.10E-02	1.22E-02	1.33E-02	1.43E-02	1.51E-02	1.58E-02
33735	3.19E-03	3.02E-03	3.82E-03	4.23E-03	4.10E-03	4.65E-03	4.73E-03	4.86E-03	4.99E-03	5.12E-03	5.25E-03	5.38E-03
64091	9.98E-05	1.03E-04	1.07E-04	1.11E-04	1.15E-04	1.20E-04	1.24E-04	1.28E-04	1.32E-04	1.36E-04	1.40E-04	1.44E-04
75234	1.12E-05	1.75E-05	4.59E-05	1.02E-04	2.00E-04	3.54E-04	5.79E-04	8.69E-04	1.28E-03	1.77E-03	2.34E-03	3.00E-03
105401	3.85E-08	7.05E-07	2.81E-07	8.73E-07	2.27E-06	5.11E-06	1.03E-05	1.89E-05	3.22E-05	5.13E-05	7.73E-05	1.11E-04
97078	2.10E-07	3.75E-07	1.32E-06	3.74E-06	9.08E-06	1.92E-05	3.47E-05	6.43E-05	1.05E-04	1.61E-04	2.39E-04	3.27E-04
119478	4.57E-09	5.50E-09	4.44E-08	1.61E-07	4.77E-07	1.20E-06	2.57E-06	5.34E-06	9.77E-06	1.64E-05	2.64E-05	4.04E-05
150000	1.53E-10	3.74E-10	2.60E-09	1.31E-08	5.10E-08	1.63E-07	4.52E-07	1.07E-06	2.39E-06	4.62E-06	8.16E-06	1.40E-05
158000	2.57E-11	6.37E-11	5.00E-10	2.78E-09	1.17E-08	3.99E-08	1.15E-07	2.80E-07	6.47E-07	1.32E-06	2.47E-06	4.33E-06
181000	1.64E-13	4.80E-13	5.02E-12	3.53E-11	1.83E-10	7.50E-10	2.53E-09	7.29E-09	1.85E-08	4.67E-08	9.37E-08	1.84E-07
40774	1.31E-04	1.87E-04	4.06E-04	1.12E-04	1.12E-03	2.64E-03	3.94E-03	5.61E-03	8.16E-03	1.10E-02	1.52E-02	2.00E-02
69722	1.03E-04	1.55E-04	3.78E-04	7.92E-04	1.47E-03	2.50E-03	3.94E-03	5.82E-03	8.10E-03	1.08E-02	1.42E-02	1.79E-02
78424	4.64E-05	7.59E-05	2.02E-04	4.85E-04	9.30E-04	1.70E-03	2.89E-03	4.44E-03	6.33E-03	8.54E-03	1.12E-02	1.49E-02
78184	9.64E-04	1.53E-03	4.17E-03	9.57E-03	1.91E-02	3.49E-02	5.83E-02	9.07E-02	1.33E-01	1.86E-01	2.50E-01	3.24E-01
80844	1.94E-05	3.12E-05	8.81E-05	2.08E-04	4.30E-04	7.94E-04	1.25E-03	2.14E-03	3.19E-03	4.51E-03	6.13E-03	8.02E-03
83850	2.07E-05	3.39E-05	9.93E-05	2.43E-04	5.19E-04	9.74E-04	1.69E-03	2.72E-03	4.12E-03	5.92E-03	8.19E-03	1.08E-02
84000	2.83E-05	4.64E-05	1.34E-04	3.34E-04	7.08E-04	1.35E-03	2.31E-03	3.74E-03	5.70E-03	8.20E-03	1.13E-02	1.49E-02
116000	6.88E-06	1.33E-05	5.93E-05	2.08E-04	5.84E-04	1.43E-03	3.10E-03	6.02E-03	1.09E-02	1.81E-02	2.85E-02	4.23E-02
125000	5.20E-08	1.04E-07	5.40E-07	2.10E-06	5.50E-06	1.47E-05	3.92E-05	8.04E-05	1.52E-04	2.62E-04	4.32E-04	6.70E-04
132000	3.04E-08	6.44E-08	3.44E-07	1.51E-06	4.99E-06	1.30E-05	3.34E-05	7.17E-05	1.40E-04	2.53E-04	4.28E-04	6.74E-04
136149	3.25E-09	7.29E-09	4.24E-08	1.83E-07	6.29E-07	1.80E-06	4.84E-06	9.84E-06	1.97E-05	3.62E-05	6.20E-05	1.00E-04
138000	2.04E-09	4.47E-09	2.78E-08	1.22E-07	4.28E-07	1.25E-06	3.13E-06	6.91E-06	1.51E-05	2.61E-05	4.30E-05	7.31E-05
145000	2.14E-09	5.12E-09	3.34E-08	1.59E-07	5.92E-07	1.82E-06	4.60E-06	1.11E-05	2.33E-05	4.17E-05	7.04E-05	1.12E-04
154000	9.35E-10	2.34E-09	1.71E-08	9.99E-08	3.44E-07	1.20E-06	3.37E-06	8.27E-06	1.81E-05	3.63E-05	6.70E-05	1.16E-04
158000	1.64E-09	4.20E-09	3.25E-08	1.78E-07	7.49E-07	2.35E-06	7.35E-06	1.82E-05	4.14E-05	8.43E-05	1.54E-04	2.72E-04
184000	1.13E-11	3.37E-11	3.66E-10	2.64E-09	1.42E-08	9.95E-08	2.05E-07	4.02E-07	1.55E-06	3.54E-06	7.64E-06	1.44E-05
194000	4.47E-12	1.42E-11	1.76E-10	1.12E-09	6.34E-09	3.79E-08	1.68E-07	4.35E-07	1.05E-06	2.34E-06	4.22E-06	7.12E-06
170000	3.04E-11	6.41E-11	7.61E-10	4.75E-09	2.38E-08	8.34E-08	2.62E-07	7.86E-07	1.69E-06	3.63E-06	7.18E-06	1.22E-05
179000	1.41E-11	1.08E-11	4.17E-10	2.87E-09	1.47E-08	5.90E-08	1.62E-07	5.92E-07	1.40E-06	3.13E-06	6.47E-06	1.22E-05
216000	6.21E-14	2.23E-13	3.71E-12	3.83E-11	2.75E-10	1.48E-09	6.35E-09	2.24E-08	6.41E-08	1.84E-07	4.41E-07	9.42E-07
225000	2.84E-14	1.04E-13	2.03E-12	2.31E-11	1.80E-10	1.04E-09	4.76E-09	1.79E-08	5.70E-08	1.59E-07	3.94E-07	8.92E-07
234000	4.69E-14	1.78E-13	3.26E-12	3.67E-11	2.83E-10	1.63E-09	7.37E-09	2.75E-08	8.73E-08	2.43E-07	6.01E-07	1.37E-06
233000	2.14E-14	8.52E-14	1.70E-12	2.22E-11	1.15E-10	5.52E-09	2.17E-08	7.53E-08	2.10E-07	5.41E-07	1.24E-06	2.64E-06
243000	1.63E-15	6.32E-15	1.63E-13	2.25E-12	2.07E-11	1.30E-10	7.16E-10	2.96E-09	1.02E-08	3.19E-08	9.54E-08	2.97E-07
252000	7.51E-16	3.37E-15	8.92E-14	1.34E-12	1.34E-11	9.76E-11	5.34E-10	2.34E-09	8.71E-09	2.74E-08	7.69E-08	1.92E-07

TABLE 47 (CONT.)-1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C

LEVEL (CN-1)	TEMPERATURE (DEG K)									
	24000	26000	32000	36200	40000	44000	48000	0	0	0
0	4.25E-02	5.04E-02	4.00E-02	3.17E-02	2.53E-02	2.09E-02	1.66E-02	0.	0.	0.
16	1.87E-01	1.51E-01	1.29E-01	9.51E-02	7.68E-02	6.15E-02	5.07E-02	0.	0.	0.
43	3.12E-01	2.52E-01	2.00E-01	1.50E-01	1.24E-01	1.02E-01	8.41E-02	0.	0.	0.
19194	1.70E-01	1.46E-01	1.27E-01	1.04E-01	8.78E-02	7.35E-02	6.20E-02	0.	0.	0.
21648	1.71E-02	1.66E-02	1.51E-02	1.33E-02	1.16E-02	1.01E-02	8.80E-03	0.	0.	0.
33735	4.14E-02	4.14E-02	4.39E-02	4.12E-02	3.74E-02	3.40E-02	3.04E-02	0.	0.	0.
44921	2.91E-02	2.81E-02	2.34E-02	2.67E-02	2.79E-02	2.70E-02	2.70E-02	0.	0.	0.
75254	6.18E-03	9.58E-03	1.23E-02	1.41E-02	1.52E-02	1.56E-02	1.56E-02	0.	0.	0.
105891	3.30E-04	1.92E-04	1.03E-03	1.39E-03	1.69E-03	1.93E-03	2.12E-03	0.	0.	0.
197878	8.95E-04	1.69E-03	2.49E-03	3.17E-03	3.75E-03	4.18E-03	4.48E-03	0.	0.	0.
198076	1.42E-04	3.20E-04	5.48E-04	7.90E-04	1.02E-03	1.23E-03	1.39E-03	0.	0.	0.
198080	7.09E-05	2.64E-04	4.24E-04	7.11E-04	1.03E-03	1.37E-03	1.69E-03	0.	0.	0.
198088	2.51E-05	7.51E-05	1.64E-04	2.87E-04	4.31E-04	5.82E-04	7.59E-04	0.	0.	0.
181000	1.21E-04	4.61E-04	1.17E-03	2.29E-03	3.77E-03	5.51E-03	7.42E-03	0.	0.	0.
60776	1.94E-02	2.64E-02	3.12E-02	3.35E-02	3.42E-02	3.37E-02	3.27E-02	0.	0.	0.
69722	3.45E-02	5.07E-02	6.27E-02	7.04E-02	7.43E-02	7.59E-02	7.50E-02	0.	0.	0.
70424	3.41E-02	5.36E-02	7.04E-02	8.26E-02	9.05E-02	9.47E-02	9.63E-02	0.	0.	0.
78184	4.91E-03	1.07E-02	1.63E-02	1.67E-02	1.83E-02	1.91E-02	1.94E-02	0.	0.	0.
80644	1.77E-02	2.85E-02	3.80E-02	4.51E-02	4.98E-02	5.25E-02	5.37E-02	0.	0.	0.
83830	2.44E-02	4.07E-02	5.53E-02	6.67E-02	7.45E-02	7.93E-02	8.18E-02	0.	0.	0.
84000	3.42E-02	5.64E-02	7.70E-02	9.26E-02	1.04E-01	1.10E-01	1.14E-01	0.	0.	0.
116000	1.43E-03	3.12E-03	5.22E-03	7.38E-03	9.37E-03	1.11E-02	1.25E-02	0.	0.	0.
125000	2.51E-03	5.98E-03	1.04E-02	1.54E-02	2.03E-02	2.48E-02	2.84E-02	0.	0.	0.
132000	2.75E-03	6.84E-03	1.27E-02	1.95E-02	2.64E-02	3.28E-02	3.87E-02	0.	0.	0.
136169	4.28E-04	1.11E-03	2.11E-03	3.30E-03	4.54E-03	5.73E-03	6.82E-03	0.	0.	0.
136669	3.19E-04	8.40E-04	1.62E-03	2.55E-03	3.54E-03	4.59E-03	5.34E-03	0.	0.	0.
145000	5.36E-04	1.76E-03	3.54E-03	5.79E-03	8.28E-03	1.07E-02	1.31E-02	0.	0.	0.
154000	4.12E-04	1.82E-03	3.94E-03	6.73E-03	9.94E-03	1.33E-02	1.73E-02	0.	0.	0.
159000	1.54E-03	4.81E-03	1.09E-02	1.84E-02	2.76E-02	3.74E-02	4.73E-02	0.	0.	0.
184000	1.09E-04	4.27E-04	1.10E-03	2.19E-03	3.65E-03	5.40E-03	7.32E-03	0.	0.	0.
194000	1.07E-04	4.54E-04	1.25E-03	2.61E-03	4.33E-03	6.92E-03	9.64E-03	0.	0.	0.
170000	8.44E-05	2.92E-04	6.90E-04	1.26E-03	2.02E-03	2.84E-03	3.71E-03	0.	0.	0.
179000	8.75E-05	3.27E-04	8.19E-04	1.59E-03	2.59E-03	3.77E-03	5.04E-03	0.	0.	0.
216000	1.07E-05	5.19E-05	1.79E-04	4.07E-04	7.71E-04	1.26E-03	1.87E-03	0.	0.	0.
225000	1.11E-05	6.15E-05	2.07E-04	5.09E-04	9.91E-04	1.67E-03	2.54E-03	0.	0.	0.
234000	1.64E-05	9.18E-05	3.04E-04	7.39E-04	1.44E-03	2.43E-03	3.68E-03	0.	0.	0.
239000	1.72E-05	1.02E-04	3.61E-04	9.17E-04	1.66E-03	2.72E-03	4.09E-03	0.	0.	0.
243000	3.10E-04	2.04E-03	7.77E-03	2.07E-04	4.38E-04	7.84E-04	1.25E-03	0.	0.	0.
252000	3.36E-04	2.30E-03	9.22E-03	2.57E-04	5.63E-04	1.04E-03	1.70E-03	0.	0.	0.

TABLE 40. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF H

STATE	LEVEL (CM-1)	STAT. WT.	TEMPERATURE (DEG K)													
			1200	1400	2000	2400	2800	3200	3600	4000	4400					
2s ² 2p ⁵	0	4	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	
	19226	10	2.43E-10	7.74E-08	2.44E-06	2.44E-05	1.21E-04	4.00E-04	1.19E-03	2.07E-03	3.67E-03	5.82E-03	8.53E-03	1.21E-02	1.70E-02	2.40E-02
	28639	6	1.44E-15	8.19E-12	1.07E-09	5.60E-07	3.50E-06	1.44E-05	4.60E-05	1.31E-04	3.60E-04	9.51E-04	2.31E-03	5.82E-03	1.40E-02	3.40E-02
	88132	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s ² 2p ⁴ D	121000	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	142110	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	158230	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	232900	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s ² 2p ³ P	64288	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	95780	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	104501	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	118769	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3d	104661	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	103661	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	107420**	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	110313	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(D)	110441	126	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	99444	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	110973	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	121000**	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(S)	124000**	180	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	116279	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	120400*	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	137500*	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s ² 2p ² S	142000*	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	153000*	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	193410	140	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	230000*	270	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(D)	232000*	480	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	250442	630	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	268559	450	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	321111	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(S)	331000*	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	418377	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	418377	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	418377	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 NONSTARRED ENERGY LEVELS FROM MOORE (1949), ERIKSSON (1950), AND ERIKSSON AND JOHANSSON (1961)

TABLE 48 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N

LEVEL (CM-1)	TEMPERATURE (CEG N)											
	4000	5200	5600	6000	6400	6800	7200	7600	8000	8400	8800	9200
0	9.92E-01	9.87E-01	9.82E-01	9.74E-01	9.66E-01	9.54E-01	9.45E-01	9.33E-01	9.20E-01	9.06E-01	8.92E-01	8.77E-01
19228	7.79E-03	1.21E-02	1.76E-02	2.42E-02	3.20E-02	4.09E-02	5.07E-02	6.12E-02	7.24E-02	8.41E-02	9.61E-02	1.08E-01
28039	2.62E-04	5.07E-04	9.31E-04	1.45E-03	2.21E-03	3.29E-03	4.55E-03	5.95E-03	7.51E-03	9.23E-03	1.10E-02	1.29E-02
80132	1.00E-11	7.61E-11	4.32E-10	1.94E-09	7.20E-09	2.29E-08	6.37E-08	1.59E-07	3.71E-07	7.56E-07	1.48E-06	2.72E-06
121000	4.39E-16	7.12E-15	6.10E-13	6.10E-13	3.71E-12	1.82E-11	7.45E-11	2.83E-10	8.14E-10	2.26E-09	5.71E-09	1.33E-08
142110	1.57E-19	4.14E-18	6.02E-17	7.73E-16	6.44E-15	4.18E-14	2.19E-13	9.65E-13	3.63E-12	1.22E-11	3.62E-11	9.77E-11
150200	3.79E-21	1.45E-19	3.26E-18	4.69E-17	5.19E-16	4.16E-15	2.64E-14	1.38E-13	6.07E-13	2.32E-12	7.82E-12	2.37E-11
232900	7.14E-31	1.53E-29	6.13E-26	6.13E-25	2.64E-23	6.69E-22	6.69E-21	9.94E-20	8.08E-19	6.43E-18	3.88E-17	2.00E-16
84288	4.74E-11	3.31E-10	1.74E-09	7.31E-09	2.54E-08	7.73E-08	2.06E-07	4.93E-07	1.01E-06	2.19E-06	4.15E-06	7.44E-06
95780	4.55E-12	4.12E-11	2.78E-10	1.39E-09	5.81E-09	2.04E-08	6.21E-08	1.68E-07	4.10E-07	9.12E-07	1.90E-06	3.70E-06
104041	4.99E-13	5.57E-12	4.40E-11	2.63E-10	1.24E-09	4.90E-09	1.69E-08	5.02E-08	1.34E-07	3.23E-07	7.19E-07	1.49E-06
103841	1.35E-13	1.57E-12	1.14E-11	6.49E-11	3.53E-10	1.23E-09	4.12E-09	1.15E-08	3.20E-08	7.54E-08	1.68E-07	3.48E-07
107420	1.30E-13	1.65E-12	1.37E-11	8.55E-11	4.24E-10	1.74E-09	6.07E-09	1.85E-08	5.04E-08	1.22E-07	2.84E-07	5.94E-07
110315	9.73E-14	1.23E-12	1.08E-11	7.12E-11	3.89E-10	1.57E-09	5.67E-09	1.79E-08	5.01E-08	1.27E-07	2.92E-07	6.35E-07
110941	1.51E-13	1.67E-12	1.47E-11	9.67E-11	5.02E-10	2.14E-09	7.74E-09	2.44E-08	6.89E-08	1.74E-07	4.04E-07	8.72E-07
99464	2.63E-13	2.61E-12	1.80E-11	1.02E-10	4.49E-10	1.64E-09	5.30E-09	1.49E-08	3.78E-08	8.74E-08	1.87E-07	3.73E-07
110973	2.64E-14	3.42E-13	3.05E-12	2.03E-11	1.06E-10	4.59E-10	1.64E-09	5.26E-09	1.48E-08	3.78E-08	8.82E-08	1.91E-07
121000C	2.20E-15	3.54E-14	3.07E-13	3.05E-12	1.95E-11	9.09E-11	3.73E-10	1.31E-09	4.07E-09	1.13E-08	2.60E-08	6.63E-08
124400	2.39E-15	4.41E-14	4.01E-13	4.12E-12	2.64E-11	1.34E-10	5.81E-10	2.13E-09	6.82E-09	1.53E-08	3.07E-08	6.21E-07
116279	3.62E-16	5.24E-15	5.26E-14	3.70E-13	2.14E-12	9.07E-12	3.83E-11	1.26E-10	3.81E-10	1.01E-09	2.47E-09	5.55E-09
120400	2.07E-17	5.51E-16	6.93E-15	6.21E-14	4.21E-13	2.30E-12	1.02E-11	3.88E-11	1.29E-10	3.82E-10	1.02E-09	2.50E-09
137900	3.12E-18	7.41E-17	1.12E-15	1.17E-14	9.08E-14	5.54E-13	2.74E-12	1.16E-11	1.34E-10	3.04E-10	1.00E-09	1.80E-09
162000	2.60E-18	6.03E-17	1.12E-15	1.27E-14	1.04E-13	6.04E-13	3.59E-12	1.50E-11	5.94E-11	1.90E-10	1.80E-09	1.80E-09
152000	2.70E-19	9.15E-18	1.07E-16	2.56E-15	2.81E-14	1.80E-13	1.12E-12	5.37E-12	2.33E-11	8.47E-11	2.74E-10	8.91E-10
150000	1.95E-19	7.09E-18	1.54E-16	2.21E-15	2.27E-14	1.77E-13	1.09E-12	5.37E-12	2.40E-11	9.01E-11	2.99E-10	8.91E-10
192000	6.70E-24	3.63E-22	2.50E-20	4.65E-19	1.17E-17	1.47E-16	1.39E-15	1.03E-14	6.25E-14	3.19E-13	1.48E-12	5.39E-12
202000	6.02E-23	4.51E-23	3.40E-21	1.07E-19	2.20E-18	3.15E-17	3.94E-16	2.76E-15	1.84E-14	1.02E-13	4.89E-13	2.01E-12
219000	1.15E-26	1.62E-24	1.13E-22	4.44E-21	1.11E-19	1.80E-18	2.33E-17	2.21E-16	1.69E-15	1.04E-14	5.43E-14	2.46E-13
259000	2.62E-32	1.02E-29	1.70E-27	1.43E-25	6.95E-24	2.80E-22	4.31E-21	6.51E-20	7.45E-19	4.99E-18	4.99E-17	3.69E-16
331000	0.	0.	2.14E-35	6.17E-33	8.73E-31	6.00E-29	3.33E-27	1.07E-25	2.42E-24	4.03E-23	5.25E-22	5.43E-21

TABLE 48 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF H

LEVEL (cm ⁻¹)	TEMPERATURE (1000 K)										
	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	20000
0	0.425-01	0.475-01	0.505-01	7.715-01	7.395-01	7.005-01	6.605-01	6.375-01	6.005-01	5.805-01	5.575-01
19220	1.215-01	1.375-01	1.635-01	2.105-01	2.445-01	2.845-01	3.245-01	3.645-01	3.995-01	4.295-01	4.545-01
20030	1.725-02	2.005-02	2.395-02	2.895-02	3.495-02	4.195-02	4.995-02	5.895-02	6.895-02	7.995-02	9.295-02
20132	0.745-04	0.905-04	1.065-04	1.225-04	1.385-04	1.545-04	1.705-04	1.865-04	2.025-04	2.185-04	2.345-04
121000	2.875-00	2.705-00	2.535-00	2.365-00	2.195-00	2.025-00	1.855-00	1.685-00	1.515-00	1.345-00	1.175-00
142110	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10	2.425-10
150200	0.825-11	1.025-11	1.225-11	1.425-11	1.625-11	1.825-11	2.025-11	2.225-11	2.425-11	2.625-11	2.825-11
237000	0.945-15	1.145-15	1.345-15	1.545-15	1.745-15	1.945-15	2.145-15	2.345-15	2.545-15	2.745-15	2.945-15
043204	1.275-05	1.475-05	1.675-05	1.875-05	2.075-05	2.275-05	2.475-05	2.675-05	2.875-05	3.075-05	3.275-05
97700	0.755-06	1.105-06	1.455-06	1.805-06	2.155-06	2.505-06	2.855-06	3.205-06	3.555-06	3.905-06	4.255-06
100401	2.905-06	3.305-06	3.705-06	4.105-06	4.505-06	4.905-06	5.305-06	5.705-06	6.105-06	6.505-06	6.905-06
107001	0.745-07	1.145-07	1.545-07	1.945-07	2.345-07	2.745-07	3.145-07	3.545-07	3.945-07	4.345-07	4.745-07
107430	1.195-06	1.595-06	1.995-06	2.395-06	2.795-06	3.195-06	3.595-06	3.995-06	4.395-06	4.795-06	5.195-06
110710	1.295-04	1.695-04	2.095-04	2.495-04	2.895-04	3.295-04	3.695-04	4.095-04	4.495-04	4.895-04	5.295-04
110041	1.745-05	2.145-05	2.545-05	2.945-05	3.345-05	3.745-05	4.145-05	4.545-05	4.945-05	5.345-05	5.745-05
90044	7.025-07	1.255-06	1.655-06	2.055-06	2.455-06	2.855-06	3.255-06	3.655-06	4.055-06	4.455-06	4.855-06
110773	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07	3.075-07
121000	1.435-07	1.835-07	2.235-07	2.635-07	3.035-07	3.435-07	3.835-07	4.235-07	4.635-07	5.035-07	5.435-07
124000	2.605-07	3.005-07	3.405-07	3.805-07	4.205-07	4.605-07	5.005-07	5.405-07	5.805-07	6.205-07	6.605-07
116279	1.105-08	1.505-08	1.905-08	2.305-08	2.705-08	3.105-08	3.505-08	3.905-08	4.305-08	4.705-08	5.105-08
120000	3.605-09	4.005-09	4.405-09	4.805-09	5.205-09	5.605-09	6.005-09	6.405-09	6.805-09	7.205-09	7.605-09
137000	2.425-09	2.825-09	3.225-09	3.625-09	4.025-09	4.425-09	4.825-09	5.225-09	5.625-09	6.025-09	6.425-09
143000	3.045-09	3.445-09	3.845-09	4.245-09	4.645-09	5.045-09	5.445-09	5.845-09	6.245-09	6.645-09	7.045-09
150000	2.135-09	2.535-09	2.935-09	3.335-09	3.735-09	4.135-09	4.535-09	4.935-09	5.335-09	5.735-09	6.135-09
156000	2.525-09	2.925-09	3.325-09	3.725-09	4.125-09	4.525-09	4.925-09	5.325-09	5.725-09	6.125-09	6.525-09
150000	1.045-11	1.445-11	1.845-11	2.245-11	2.645-11	3.045-11	3.445-11	3.845-11	4.245-11	4.645-11	5.045-11
203000	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12	7.345-12
215000	0.815-13	1.215-13	1.615-13	2.015-13	2.415-13	2.815-13	3.215-13	3.615-13	4.015-13	4.415-13	4.815-13
250000	1.045-13	1.445-13	1.845-13	2.245-13	2.645-13	3.045-13	3.445-13	3.845-13	4.245-13	4.645-13	5.045-13
331000	0.615-20	1.015-20	1.415-20	1.815-20	2.215-20	2.615-20	3.015-20	3.415-20	3.815-20	4.215-20	4.615-20

TABLE 48 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N

LEVEL (CM-1)	TEMPERATURE (DEG K)									
	24000	28000	32000	36000	40000	44000	48000	0	0	0
0	4.24E-01	3.33E-01	2.53E-01	1.91E-01	1.45E-01	1.12E-01	8.79E-02	0.	0.	0.
19228	3.36E-01	2.67E-01	2.22E-01	1.82E-01	1.52E-01	1.29E-01	1.10E-01	0.	0.	0.
28839	1.13E-01	1.04E-01	9.04E-02	7.72E-02	6.54E-02	5.54E-02	4.72E-02	0.	0.	0.
88132	6.48E-03	1.08E-02	1.69E-02	2.69E-02	4.07E-02	5.89E-02	8.36E-02	0.	0.	0.
121000	7.53E-04	1.44E-03	2.75E-03	5.30E-03	9.67E-03	1.70E-02	2.95E-02	0.	0.	0.
142110	4.25E-05	1.12E-04	2.13E-04	3.27E-04	4.59E-04	6.21E-04	8.26E-04	0.	0.	0.
158200	4.84E-05	1.47E-04	3.10E-04	5.15E-04	7.54E-04	1.03E-03	1.39E-03	0.	0.	0.
232800	5.52E-07	3.17E-04	1.08E-03	2.60E-03	5.01E-03	8.27E-03	1.23E-02	0.	0.	0.
84288	1.22E-02	1.37E-02	2.58E-02	4.94E-02	9.15E-02	1.70E-01	3.14E-01	0.	0.	0.
95780	1.64E-02	3.27E-02	6.81E-02	1.42E-01	2.85E-01	5.57E-01	1.07E-01	0.	0.	0.
104661	1.70E-02	3.62E-02	7.11E-02	1.41E-01	2.81E-01	5.52E-01	1.07E-01	0.	0.	0.
109861	3.79E-03	7.28E-03	1.47E-02	3.06E-02	6.12E-02	1.22E-01	2.44E-01	0.	0.	0.
107420	9.18E-03	1.88E-02	3.73E-02	7.46E-02	1.49E-01	2.98E-01	5.96E-01	0.	0.	0.
110315	1.29E-02	2.59E-02	5.09E-02	1.02E-01	2.04E-01	4.08E-01	8.16E-01	0.	0.	0.
110441	1.79E-02	3.68E-02	7.37E-02	1.47E-01	2.94E-01	5.88E-01	1.18E-01	0.	0.	0.
99664	2.71E-03	5.42E-03	1.08E-02	2.16E-02	4.32E-02	8.64E-02	1.73E-01	0.	0.	0.
110973	4.12E-03	8.24E-03	1.65E-02	3.30E-02	6.60E-02	1.32E-01	2.64E-01	0.	0.	0.
121000	3.71E-03	7.42E-03	1.48E-02	2.96E-02	5.92E-02	1.18E-01	2.36E-01	0.	0.	0.
124400	9.71E-03	1.94E-02	3.88E-02	7.76E-02	1.55E-01	3.10E-01	6.20E-01	0.	0.	0.
116279	2.00E-04	4.00E-04	8.00E-04	1.60E-03	3.20E-03	6.40E-03	1.28E-02	0.	0.	0.
128400	2.90E-04	5.80E-04	1.16E-03	2.32E-03	4.64E-03	9.28E-03	1.86E-02	0.	0.	0.
137500	2.80E-04	5.60E-04	1.12E-03	2.24E-03	4.48E-03	8.96E-03	1.79E-02	0.	0.	0.
142800	6.84E-04	1.37E-03	2.74E-03	5.48E-03	1.09E-02	2.18E-02	4.36E-02	0.	0.	0.
133800	9.94E-04	1.99E-03	3.98E-03	7.96E-03	1.59E-02	3.18E-02	6.36E-02	0.	0.	0.
156800	1.40E-03	2.80E-03	5.60E-03	1.12E-02	2.24E-02	4.48E-02	8.96E-02	0.	0.	0.
192000	2.80E-04	5.60E-04	1.12E-03	2.24E-03	4.48E-03	8.96E-03	1.79E-02	0.	0.	0.
202000	2.81E-04	5.62E-04	1.124E-03	2.248E-03	4.496E-03	8.992E-03	1.798E-02	0.	0.	0.
215000	1.21E-04	2.42E-04	4.84E-04	9.68E-04	1.936E-03	3.872E-03	7.744E-03	0.	0.	0.
230000	1.04E-05	2.08E-05	4.16E-05	8.32E-05	1.664E-04	3.328E-04	6.656E-04	0.	0.	0.
331000	1.93E-07	3.86E-07	7.72E-07	1.544E-06	3.088E-06	6.176E-06	1.235E-05	0.	0.	0.

TABLE 4A. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O

STATE	LEVEL (CM-1)	LEVEL (eV)	STAT.	TEMPERATURE (800 K)							
				1200	1600	2000	2400	2800	3200	3600	4000
2p ²	0	0.	5	6.07E-01	5.94E-01	5.81E-01	5.70E-01	5.73E-01	5.72E-01	5.70E-01	5.68E-01
	126	0.0194	3	3.01E-01	3.14E-01	3.17E-01	3.10E-01	3.22E-01	3.23E-01	3.24E-01	3.24E-01
	226	0.0281	1	0.25E-02	0.49E-02	0.81E-02	1.03E-01	1.05E-01	1.05E-01	1.05E-01	1.05E-01
	15064	1.9873	5	3.31E-09	3.77E-07	4.44E-05	4.30E-04	4.50E-04	1.04E-03	1.05E-03	3.17E-03
	53792	4.1896	1	3.00E-19	7.53E-15	3.25E-12	1.05E-10	3.32E-09	2.90E-08	1.50E-07	1.00E-06
2p ²	126304	15.0593	9	0.	0.	0.	1.7E-33	6.77E-29	2.29E-25	1.23E-22	1.20E-18
	189037	23.5362	3	0.	0.	0.	0.	0.	2.94E-36	3.09E-34	3.70E-28
	277080*	34.3427	1	0.	0.	0.	0.	0.	0.	0.	0.
	74003	9.2845	8	0.	5.32E-20	3.72E-24	2.03E-20	1.70E-17	2.17E-15	5.13E-14	2.09E-11
	87379	10.8333	24	0.	2.14E-20	1.41E-24	4.00E-23	0.77E-20	2.39E-17	1.07E-15	1.00E-12
2p ²	97443	12.0811	40	0.	6.19E-20	1.67E-24	1.00E-25	0.34E-22	4.31E-19	5.99E-17	6.59E-14
	95257	11.0720	8	0.	3.01E-20	1.14E-20	1.00E-25	3.92E-22	1.04E-19	2.19E-17	1.00E-14
	99314	12.3120	24	0.	0.	0.	0.	1.00E-25	1.26E-19	3.50E-17	2.10E-14
	102900**	12.7576	116	0.	0.	0.	0.	1.00E-25	1.00E-19	1.03E-17	1.11E-15
	101323	12.5869	28	0.	0.	0.	4.40E-22	5.10E-23	3.05E-20	5.47E-18	8.00E-15
2p ²	113400**	14.0042	60	0.	0.	0.	2.27E-25	3.05E-25	4.53E-22	1.32E-19	1.72E-17
	123940**	15.3642	100	0.	0.	0.	6.20E-22	2.53E-21	7.23E-24	3.32E-21	4.00E-19
	128780**	15.2544	320	0.	0.	0.	1.12E-22	7.02E-20	2.72E-24	1.40E-21	2.07E-19
	115414	14.1894	12	0.	0.	0.	2.17E-20	5.94E-24	6.20E-23	1.00E-20	1.03E-17
	127900**	15.0572	54	0.	0.	0.	2.10E-23	1.10E-20	4.30E-25	2.40E-22	4.30E-20
2p ²	138000*	17.1094	60	0.	0.	0.	0.21E-24	1.11E-20	7.79E-27	1.00E-24	1.00E-21
	142100*	17.0177	192	0.	0.	0.	2.25E-26	6.31E-31	3.97E-27	4.34E-24	1.04E-21
	212000*	26.2840	216	0.	0.	0.	0.	0.	0.	3.04E-24	1.00E-21
	222000*	27.3238	304	0.	0.	0.	0.	0.	0.	0.	0.
	250000*	31.9871	180	0.	0.	0.	0.	0.	0.	0.	0.
2p ²	260000*	33.2249	320	0.	0.	0.	0.	0.	0.	0.	0.
	287000*	35.5825	34	0.	0.	0.	0.	0.	0.	0.	0.
	290000*	36.9443	64	0.	0.	0.	0.	0.	0.	0.	0.
	304000*	37.4902	100	0.	0.	0.	0.	0.	0.	0.	0.
	314000*	38.9700	192	0.	0.	0.	0.	0.	0.	0.	0.
2p ²	409000*	50.7902	108	0.	0.	0.	0.	0.	0.	0.	0.
	419000*	51.9400	192	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUMLEVELS
NONSTARRED ENERGY LEVELS FROM MOORE (1949) AND BOWEN (1975)

TABLE 49 (CONT. 1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O

LEVEL (CR-1)	TEMPERATURE (DEG K)											
	4000	5200	5600	6000	6400	6800	7200	7600	8000	8400	8800	9200
0	5.64E-01	5.64E-01	5.61E-01	5.59E-01	5.56E-01	5.54E-01	5.51E-01	5.49E-01	5.47E-01	5.43E-01	5.40E-01	5.37E-01
150	3.24E-01	3.24E-01	3.23E-01	3.23E-01	3.22E-01	3.21E-01	3.20E-01	3.19E-01	3.18E-01	3.17E-01	3.16E-01	3.14E-01
226	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01	2.04E-01
15444	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03	6.04E-03
33742	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04	6.51E-04
126304	3.42E-17	6.74E-16	6.19E-15	7.04E-14	4.67E-13	2.47E-12	1.09E-11	4.07E-11	1.34E-10	3.93E-10	1.04E-09	2.55E-09
189877	6.04E-24	5.22E-24	2.21E-22	5.49E-21	9.75E-20	1.95E-18	1.11E-17	6.11E-16	2.44E-15	6.07E-14	1.41E-13	4.11E-13
277000	6.04E-34	6.04E-35	1.39E-32	1.59E-30	1.80E-28	3.94E-27	1.01E-25	1.84E-24	2.53E-23	2.69E-22	2.31E-21	1.65E-20
74993	1.61E-10	9.90E-10	3.94E-09	1.42E-08	4.33E-08	1.16E-07	2.78E-07	6.99E-07	1.23E-06	2.33E-06	4.15E-06	7.82E-06
87379	1.19E-11	8.54E-11	6.79E-10	2.13E-09	7.04E-09	2.40E-08	6.91E-08	1.72E-07	3.94E-07	8.24E-07	1.62E-06	2.99E-06
97443	9.39E-13	8.01E-12	6.02E-11	3.10E-10	1.34E-09	4.92E-09	1.54E-08	4.27E-08	1.07E-07	2.45E-07	5.20E-07	1.03E-06
97573	3.10E-13	2.01E-12	1.04E-11	5.33E-11	3.90E-10	1.41E-09	4.31E-09	1.10E-08	2.89E-08	6.94E-08	1.37E-07	2.64E-07
97514	3.20E-13	3.15E-12	2.23E-11	1.22E-10	5.37E-10	1.99E-09	6.36E-09	1.04E-08	1.56E-08	1.87E-07	2.30E-07	4.63E-07
102500	5.20E-13	5.64E-12	4.29E-11	2.49E-10	1.14E-09	4.50E-09	1.50E-08	4.11E-08	1.14E-07	2.79E-07	6.10E-07	1.20E-06
101223	1.30E-13	1.42E-11	1.09E-11	5.90E-11	2.72E-10	1.04E-09	3.41E-09	9.04E-09	2.57E-08	6.09E-08	1.33E-07	2.73E-07
113400	1.11E-14	1.51E-13	1.42E-12	9.90E-12	5.61E-11	2.62E-10	9.15E-09	3.01E-08	9.73E-08	2.31E-07	5.54E-06	1.24E-07
123944	6.30E-16	1.44E-14	1.44E-13	1.34E-12	8.02E-12	4.52E-11	1.92E-10	7.00E-10	2.30E-09	6.54E-09	1.71E-08	4.10E-08
128700	6.30E-16	1.44E-14	1.57E-13	1.41E-12	5.60E-12	3.29E-11	1.29E-10	4.20E-10	1.39E-09	3.27E-09	7.51E-09	1.62E-08
114416	1.73E-15	2.51E-14	2.30E-13	1.63E-12	9.61E-12	4.07E-11	1.59E-10	5.01E-10	1.51E-09	4.81E-09	9.73E-09	2.10E-08
127900	9.12E-17	1.73E-15	2.16E-14	1.93E-13	1.30E-12	7.04E-12	3.19E-11	1.20E-10	4.02E-09	1.20E-09	3.22E-09	7.95E-09
130000	7.34E-18	1.77E-16	2.69E-15	2.69E-14	2.64E-13	1.39E-12	6.90E-12	2.97E-11	1.09E-10	3.53E-10	1.03E-09	2.73E-09
142100	6.09E-18	1.02E-16	3.04E-15	3.41E-14	1.04E-13	3.09E-12	9.09E-12	4.37E-11	1.67E-10	5.40E-10	1.40E-09	4.00E-09
212800	6.17E-27	8.15E-25	5.34E-23	2.03E-21	4.81E-20	7.91E-19	9.51E-18	6.00E-17	4.51E-16	3.90E-15	2.04E-14	9.25E-14
222800	5.47E-28	9.11E-26	7.30E-24	3.24E-22	9.04E-21	1.64E-19	2.39E-18	1.92E-17	1.02E-16	1.23E-15	7.13E-15	3.44E-14
230000	3.20E-33	2.02E-30	3.29E-28	2.72E-26	1.29E-24	3.91E-23	6.07E-22	1.21E-20	1.30E-19	1.20E-18	9.31E-18	5.79E-17
240000	4.60E-34	2.29E-31	4.40E-29	4.40E-27	2.43E-25	8.37E-24	1.94E-22	3.24E-21	4.00E-20	4.00E-19	3.23E-18	2.14E-17
281900	1.77E-37	1.32E-34	3.02E-32	5.19E-30	3.62E-28	1.69E-26	4.91E-25	9.95E-24	1.50E-23	1.79E-21	1.62E-20	1.24E-19
294000	0.	1.12E-35	6.03E-33	6.04E-31	5.72E-29	2.93E-27	9.69E-26	2.21E-24	3.70E-23	4.72E-22	4.70E-21	3.95E-20
304000	0.	3.59E-36	1.95E-33	2.64E-31	2.31E-29	1.39E-27	4.95E-26	1.20E-24	2.07E-23	2.07E-22	3.00E-21	2.61E-20
314000	0.	4.01E-37	1.90E-34	4.37E-32	4.71E-30	2.60E-28	1.19E-26	3.21E-25	6.24E-24	9.14E-23	1.00E-21	9.71E-21
409000	0.	0.	0.	0.	0.	3.12E-37	3.00E-35	2.79E-33	1.33E-31	4.41E-30	1.04E-28	1.93E-27
419000	0.	0.	0.	0.	0.	9.17E-36	7.40E-34	3.97E-32	1.41E-30	1.41E-28	3.67E-26	7.10E-25

TABLE 49 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTROMIC POPULATIONS OF 0

LEVEL	TEMPERATURE (225 K)											
	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
0	5.34E-01	5.31E-01	5.24E-01	5.14E-01	5.02E-01	4.89E-01	4.75E-01	4.60E-01	4.45E-01	4.30E-01	4.15E-01	4.00E-01
152	3.13E-01	3.11E-01	3.06E-01	3.00E-01	2.97E-01	2.92E-01	2.87E-01	2.82E-01	2.77E-01	2.72E-01	2.67E-01	2.62E-01
226	1.03E-01	1.02E-01	1.01E-01	1.00E-01	9.97E-02	9.94E-02	9.91E-02	9.88E-02	9.85E-02	9.82E-02	9.79E-02	9.76E-02
15040	4.92E-02	4.91E-02	4.90E-02	4.89E-02	4.88E-02	4.87E-02	4.86E-02	4.85E-02	4.84E-02	4.83E-02	4.82E-02	4.81E-02
3172	6.74E-04	6.72E-04	6.70E-04	6.68E-04	6.66E-04	6.64E-04	6.62E-04	6.60E-04	6.58E-04	6.56E-04	6.54E-04	6.52E-04
126304	5.76E-09	5.74E-09	5.72E-09	5.70E-09	5.68E-09	5.66E-09	5.64E-09	5.62E-09	5.60E-09	5.58E-09	5.56E-09	5.54E-09
189037	1.31E-13	1.30E-13	1.29E-13	1.28E-13	1.27E-13	1.26E-13	1.25E-13	1.24E-13	1.23E-13	1.22E-13	1.21E-13	1.20E-13
279000	9.97E-20	9.95E-20	9.93E-20	9.91E-20	9.89E-20	9.87E-20	9.85E-20	9.83E-20	9.81E-20	9.79E-20	9.77E-20	9.75E-20
74903	1.54E-05	1.53E-05	1.52E-05	1.51E-05	1.50E-05	1.49E-05	1.48E-05	1.47E-05	1.46E-05	1.45E-05	1.44E-05	1.43E-05
87370	5.26E-06	5.24E-06	5.22E-06	5.20E-06	5.18E-06	5.16E-06	5.14E-06	5.12E-06	5.10E-06	5.08E-06	5.06E-06	5.04E-06
97453	1.94E-06	1.92E-06	1.90E-06	1.88E-06	1.86E-06	1.84E-06	1.82E-06	1.80E-06	1.78E-06	1.76E-06	1.74E-06	1.72E-06
97517	5.00E-07	4.98E-07	4.96E-07	4.94E-07	4.92E-07	4.90E-07	4.88E-07	4.86E-07	4.84E-07	4.82E-07	4.80E-07	4.78E-07
99314	8.00E-07	7.98E-07	7.96E-07	7.94E-07	7.92E-07	7.90E-07	7.88E-07	7.86E-07	7.84E-07	7.82E-07	7.80E-07	7.78E-07
102900	2.80E-06	2.78E-06	2.76E-06	2.74E-06	2.72E-06	2.70E-06	2.68E-06	2.66E-06	2.64E-06	2.62E-06	2.60E-06	2.58E-06
103700	5.20E-07	5.18E-07	5.16E-07	5.14E-07	5.12E-07	5.10E-07	5.08E-07	5.06E-07	5.04E-07	5.02E-07	5.00E-07	4.98E-07
113000	2.50E-07	2.48E-07	2.46E-07	2.44E-07	2.42E-07	2.40E-07	2.38E-07	2.36E-07	2.34E-07	2.32E-07	2.30E-07	2.28E-07
123940	9.15E-08	9.13E-08	9.11E-08	9.09E-08	9.07E-08	9.05E-08	9.03E-08	9.01E-08	8.99E-08	8.97E-08	8.95E-08	8.93E-08
128700	1.52E-07	1.51E-07	1.50E-07	1.49E-07	1.48E-07	1.47E-07	1.46E-07	1.45E-07	1.44E-07	1.43E-07	1.42E-07	1.41E-07
110410	4.57E-08	4.55E-08	4.53E-08	4.51E-08	4.49E-08	4.47E-08	4.45E-08	4.43E-08	4.41E-08	4.39E-08	4.37E-08	4.35E-08
127900	1.02E-08	1.01E-08	1.00E-08	9.98E-09	9.96E-09	9.94E-09	9.92E-09	9.90E-09	9.88E-09	9.86E-09	9.84E-09	9.82E-09
130000	6.07E-09	6.05E-09	6.03E-09	6.01E-09	5.99E-09	5.97E-09	5.95E-09	5.93E-09	5.91E-09	5.89E-09	5.87E-09	5.85E-09
142100	1.19E-09	1.18E-09	1.17E-09	1.16E-09	1.15E-09	1.14E-09	1.13E-09	1.12E-09	1.11E-09	1.10E-09	1.09E-09	1.08E-09
212000	3.64E-13	3.62E-13	3.60E-13	3.58E-13	3.56E-13	3.54E-13	3.52E-13	3.50E-13	3.48E-13	3.46E-13	3.44E-13	3.42E-13
222000	1.46E-13	1.45E-13	1.44E-13	1.43E-13	1.42E-13	1.41E-13	1.40E-13	1.39E-13	1.38E-13	1.37E-13	1.36E-13	1.35E-13
230000	3.09E-16	3.07E-16	3.05E-16	3.03E-16	3.01E-16	2.99E-16	2.97E-16	2.95E-16	2.93E-16	2.91E-16	2.89E-16	2.87E-16
260000	1.23E-16	1.22E-16	1.21E-16	1.20E-16	1.19E-16	1.18E-16	1.17E-16	1.16E-16	1.15E-16	1.14E-16	1.13E-16	1.12E-16
267000	6.02E-19	6.00E-19	5.98E-19	5.96E-19	5.94E-19	5.92E-19	5.90E-19	5.88E-19	5.86E-19	5.84E-19	5.82E-19	5.80E-19
290000	2.74E-19	2.72E-19	2.70E-19	2.68E-19	2.66E-19	2.64E-19	2.62E-19	2.60E-19	2.58E-19	2.56E-19	2.54E-19	2.52E-19
304000	1.06E-19	1.05E-19	1.04E-19	1.03E-19	1.02E-19	1.01E-19	1.00E-19	9.98E-20	9.96E-20	9.94E-20	9.92E-20	9.90E-20
314000	7.48E-20	7.46E-20	7.44E-20	7.42E-20	7.40E-20	7.38E-20	7.36E-20	7.34E-20	7.32E-20	7.30E-20	7.28E-20	7.26E-20
407000	2.74E-26	2.72E-26	2.70E-26	2.68E-26	2.66E-26	2.64E-26	2.62E-26	2.60E-26	2.58E-26	2.56E-26	2.54E-26	2.52E-26
419000	1.09E-26	1.08E-26	1.07E-26	1.06E-26	1.05E-26	1.04E-26	1.03E-26	1.02E-26	1.01E-26	1.00E-26	9.98E-27	9.96E-27

TABLE 49 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O

LEVEL	TEMPERATURE (DEG K)									
	24000	26000	32000	36000	40000	44000	48000	52000	56000	60000
0	4.14E-01	3.57E-01	2.94E-01	2.34E-01	1.65E-01	1.47E-01	1.18E-01	0.	0.	0.
150	2.44E-01	1.12E-01	1.75E-01	1.44E-01	1.07E-01	0.74E-01	0.53E-01	0.	0.	0.
226	6.14E-02	7.02E-02	5.01E-02	4.65E-02	3.07E-02	2.91E-02	2.34E-02	0.	0.	0.
15000	1.64E-01	1.54E-01	1.44E-01	1.24E-01	1.05E-01	0.74E-01	0.32E-01	0.	0.	0.
33792	1.89E-02	1.26E-02	1.20E-02	1.21E-02	1.10E-02	9.73E-03	8.55E-03	0.	0.	0.
126304	3.83E-04	9.73E-04	1.01E-03	2.71E-03	3.55E-03	4.25E-03	4.01E-03	0.	0.	0.
189337	2.83E-06	1.24E-06	3.44E-06	7.13E-06	1.76E-06	1.77E-06	2.30E-06	0.	0.	0.
277000	5.86E-09	4.90E-08	2.29E-07	7.30E-07	1.74E-06	3.42E-06	5.03E-06	0.	0.	0.
74903	7.42E-03	1.22E-02	1.62E-02	1.84E-02	2.00E-02	2.03E-02	1.94E-02	0.	0.	0.
87379	1.09E-02	1.92E-02	2.77E-02	3.42E-02	3.84E-02	4.05E-02	4.12E-02	0.	0.	0.
97443	9.61E-03	1.91E-02	2.94E-02	3.82E-02	4.55E-02	4.89E-02	5.00E-02	0.	0.	0.
95757	2.13E-03	4.16E-03	6.34E-03	8.17E-03	9.64E-03	1.03E-02	1.07E-02	0.	0.	0.
99314	5.19E-03	1.04E-02	1.62E-02	2.13E-02	2.50E-02	2.74E-02	2.80E-02	0.	0.	0.
102900	2.01E-02	4.10E-02	6.67E-02	8.96E-02	1.04E-01	1.10E-01	1.23E-01	0.	0.	0.
101323	3.74E-03	7.74E-03	1.22E-02	1.42E-02	1.62E-02	1.73E-02	2.25E-02	0.	0.	0.
113409	5.47E-03	1.23E-02	2.13E-02	3.00E-02	3.74E-02	4.29E-02	4.69E-02	0.	0.	0.
123040	4.91E-03	1.22E-02	2.23E-02	3.31E-02	4.24E-02	4.10E-02	5.73E-02	0.	0.	0.
120700	1.16E-02	3.62E-02	5.76E-02	8.74E-02	1.14E-01	1.44E-01	1.69E-01	0.	0.	0.
114416	1.64E-03	2.39E-03	4.11E-03	5.81E-03	7.25E-03	8.34E-03	9.15E-03	0.	0.	0.
127900	1.39E-03	3.59E-03	6.72E-03	1.02E-02	1.34E-02	1.61E-02	1.83E-02	0.	0.	0.
130000	1.27E-03	3.54E-03	7.11E-03	1.13E-02	1.55E-02	1.92E-02	2.24E-02	0.	0.	0.
142100	3.17E-03	9.23E-03	1.89E-02	3.00E-02	4.29E-02	5.41E-02	6.39E-02	0.	0.	0.
212000	5.40E-03	2.84E-04	9.19E-04	2.12E-03	3.90E-03	5.19E-03	6.84E-03	0.	0.	0.
222000	5.27E-03	3.04E-04	1.04E-03	2.52E-03	4.04E-03	7.93E-03	1.14E-02	0.	0.	0.
250000	2.04E-06	2.24E-05	9.68E-05	2.81E-04	6.22E-04	1.19E-03	1.84E-03	0.	0.	0.
260000	2.79E-06	2.39E-05	1.10E-04	3.39E-04	7.72E-04	1.47E-03	2.44E-03	0.	0.	0.
297000	1.00E-07	1.01E-06	5.24E-06	1.74E-05	4.50E-05	8.00E-05	1.54E-04	0.	0.	0.
290000	9.23E-08	1.02E-06	5.70E-06	2.82E-05	5.25E-05	1.10E-04	1.90E-04	0.	0.	0.
304000	1.09E-07	1.27E-06	7.34E-06	2.60E-05	7.13E-05	1.53E-04	2.80E-04	0.	0.	0.
314000	1.04E-07	1.39E-06	8.33E-06	3.19E-05	8.92E-05	1.94E-04	3.60E-04	0.	0.	0.
409000	2.01E-10	5.74E-09	4.94E-08	4.83E-07	1.63E-06	4.92E-06	1.20E-05	0.	0.	0.
419000	1.94E-10	6.11E-09	7.42E-08	4.81E-07	2.03E-06	6.32E-06	1.59E-05	0.	0.	0.

TABLE 50. ENERGY LEVELS AND FRACTIONAL ELECTROMIC POPULATIONS OF AR

STATE	LEVEL	STAT.	TEMPERATURE (DEG K)											
			(CP-1)	(EV)	WT.	1200	1400	2000	2400	2800	3200	3600	4000	4400
3s 3p ¹ S	0		0	0	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	11499A	3d	16.2397	0.	20	2.01E-35	2.50E-29	4.07E-25	7.40E-22	1.40E-19	2.32E-19	3.60E-19	5.10E-19	
	99188	4	11.0815	0.	4	7.29E-36	6.90E-30	2.29E-25	1.09E-21	1.09E-18	1.20E-18	1.40E-18	1.70E-18	
	107421	4p	13.3182	0.	12	3.04E-33	1.29E-27	1.20E-23	1.27E-20	2.77E-18	1.99E-16	6.67E-15	2.20E-14	
3s 3p ¹ P ^o	120721	4d	16.9071	0.	20	3.04E-33	7.42E-31	2.29E-26	5.39E-23	2.22E-20	2.77E-18	1.04E-16	3.60E-15	
	121634	4f	15.0426	0.	20	2.75E-37	5.94E-31	1.57E-26	4.92E-23	2.19E-20	2.77E-18	1.44E-16	5.10E-15	
	112949	3d	16.0034	0.	40	2.04E-34	1.97E-28	2.44E-24	3.52E-21	9.94E-19	9.00E-17	3.40E-15	1.20E-14	
	99371	4	11.5762	0.	0	5.30E-29	3.92E-24	1.14E-20	4.05E-18	4.97E-16	2.00E-14	6.40E-13	2.00E-12	
3s 3p ¹ D ^o	109631	4p	13.0942	0.	24	2.74E-34	7.54E-27	6.42E-23	5.07E-20	1.11E-17	7.37E-16	2.30E-14	6.60E-13	
	119211	4d	16.7799	0.	40	2.20E-36	3.67E-30	9.97E-26	2.11E-22	8.14E-20	9.34E-18	6.70E-16	2.40E-15	
	120222	4f	16.9022	0.	56	1.54E-36	2.09E-30	8.30E-26	1.87E-22	7.60E-20	9.20E-18	4.70E-16	1.70E-15	
	222000	3d	21.3236	0.	20	0.	0.	0.	0.	0.	0.	0.	0.	
3s 3p ¹ F ^o	203000	4	25.1641	0.	4	0.	0.	0.	0.	0.	0.	0.	0.	
	215000	4p	26.6379	0.	12	0.	0.	0.	0.	0.	0.	0.	0.	
	227900	4d	28.2353	0.	20	0.	0.	0.	0.	0.	0.	0.	0.	
	229900	4f	28.3793	0.	20	0.	0.	0.	0.	0.	0.	0.	0.	

LEVEL	TEMPERATURE (DEG K)										
	(CP-1)	4000	5200	5600	6000	6400	7200	7600	8000	8400	9200
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
11495A	2.24E-14	3.14E-13	3.86E-12	2.19E-11	1.22E-10	5.50E-10	2.15E-09	7.21E-09	2.14E-08	5.72E-08	1.40E-07
99188	1.62E-12	1.44E-11	9.97E-11	6.09E-10	2.01E-09	7.14E-09	2.19E-08	5.97E-08	1.67E-07	3.32E-07	1.37E-06
107421	1.23E-13	1.40E-12	1.24E-11	7.00E-11	3.90E-10	1.61E-09	5.71E-09	1.77E-08	4.00E-08	1.23E-07	6.07E-07
120721	3.95E-15	6.23E-14	6.77E-13	5.94E-12	3.27E-11	1.61E-10	6.97E-10	2.37E-09	7.44E-09	2.09E-08	1.26E-07
121634	4.00E-15	6.74E-14	7.40E-13	5.99E-12	3.71E-11	1.95E-10	7.75E-10	2.70E-09	8.01E-09	2.50E-08	1.53E-07
112949	7.97E-14	1.07E-12	9.90E-12	6.91E-11	3.75E-10	1.97E-09	6.31E-09	2.07E-08	6.03E-08	1.90E-07	6.55E-07
99371	5.60E-12	4.02E-11	3.09E-10	1.91E-09	6.12E-09	2.10E-08	6.06E-08	1.60E-07	4.00E-07	1.07E-06	3.44E-06
109631	4.24E-13	4.84E-12	3.92E-11	2.40E-10	1.17E-09	4.72E-09	1.63E-08	4.94E-08	1.20E-07	3.32E-07	1.01E-06
119211	1.21E-14	1.89E-13	2.00E-12	1.54E-11	9.10E-11	4.44E-10	1.80E-09	6.32E-09	1.95E-08	5.42E-08	1.37E-07
120222	1.25E-14	2.00E-13	2.14E-12	1.49E-11	1.02E-10	5.00E-10	2.04E-09	7.31E-09	2.20E-08	6.30E-08	1.63E-07
222000	2.52E-20	6.21E-24	3.30E-24	1.52E-22	6.23E-21	7.97E-20	1.00E-18	1.22E-17	9.12E-16	3.42E-14	1.07E-14
203000	1.90E-20	1.02E-24	6.04E-24	2.80E-23	8.00E-18	6.16E-17	1.00E-16	1.60E-15	1.90E-14	3.17E-13	1.50E-14
215000	1.23E-27	1.75E-25	1.23E-23	4.00E-22	1.22E-20	2.10E-19	2.63E-18	2.53E-17	1.93E-16	1.22E-15	6.50E-14
227900	4.30E-29	6.23E-27	7.44E-25	3.09E-23	1.12E-21	2.29E-20	3.33E-19	3.64E-18	3.14E-17	2.23E-16	1.31E-15
229900	4.44E-29	8.74E-27	8.09E-25	4.06E-23	1.24E-21	2.59E-20	3.82E-19	4.24E-18	3.70E-17	2.63E-16	1.54E-15

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS ***UNSTARRED ENERGY LEVELS FROM MOORE (1949), GURMS AND MOARS (1953), AND HUMPHREYS AND PAUL (1959)

TABLE 50 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar

LEVEL (CI-1)	TEMPERATURE (DEG K)											
	9400	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
0	1.00E-00	1.00E-00	1.00E-00	1.00E-00	9.99E-01	9.97E-01	9.95E-01	9.90E-01	9.82E-01	9.70E-01	9.54E-01	9.32E-01
114854	6.69E-07	1.33E-06	5.96E-06	2.89E-05	6.33E-05	1.44E-04	3.27E-04	6.47E-04	1.18E-03	2.08E-03	3.19E-03	4.81E-03
93188	2.55E-06	4.51E-06	1.57E-05	4.42E-05	1.08E-04	2.25E-04	4.31E-04	7.59E-04	1.23E-03	1.77E-03	2.63E-03	3.94E-03
107421	1.22E-06	2.33E-06	9.49E-06	3.06E-05	8.23E-05	1.92E-04	4.00E-04	7.30E-04	1.23E-03	1.77E-03	2.63E-03	4.02E-03
120721	2.78E-07	5.72E-07	2.78E-06	1.06E-05	3.15E-05	8.16E-05	1.80E-04	3.02E-04	5.18E-04	8.24E-04	1.26E-03	1.92E-03
121654	3.36E-07	7.01E-07	3.44E-06	1.29E-05	3.97E-05	1.04E-04	2.38E-04	4.92E-04	9.20E-04	1.63E-03	2.67E-03	4.12E-03
112948	1.78E-06	3.50E-06	1.53E-05	5.25E-05	1.59E-04	3.63E-04	7.95E-04	1.54E-03	2.77E-03	4.64E-03	7.30E-03	1.10E-02
93371	6.69E-06	1.17E-05	3.97E-05	1.10E-04	2.60E-04	5.93E-04	1.03E-03	1.79E-03	2.91E-03	4.52E-03	6.80E-03	9.82E-03
105431	3.20E-06	6.02E-06	2.48E-05	7.50E-05	2.01E-04	4.62E-04	7.90E-04	1.38E-03	2.21E-03	3.49E-03	5.01E-03	7.12E-03
119211	6.46E-07	1.42E-06	6.76E-06	2.40E-05	7.44E-05	1.91E-04	4.30E-04	8.75E-04	1.63E-03	2.82E-03	4.56E-03	7.03E-03
120222	3.36E-07	1.72E-06	8.30E-06	2.90E-05	9.31E-05	2.41E-04	5.47E-04	1.12E-03	2.10E-03	3.62E-03	5.94E-03	9.15E-03
220200	7.10E-14	2.69E-13	4.90E-12	5.51E-11	4.24E-10	2.44E-09	1.12E-08	4.25E-08	1.34E-07	3.81E-07	9.54E-07	2.16E-06
203000	2.45E-13	8.27E-13	1.18E-11	1.07E-10	6.99E-10	3.47E-09	1.39E-08	4.47E-08	1.34E-07	3.49E-07	8.09E-07	1.49E-06
215000	1.22E-13	4.41E-13	7.34E-12	7.65E-11	5.95E-10	3.63E-09	1.32E-08	4.77E-08	1.47E-07	4.09E-07	9.73E-07	2.14E-06
227900	2.93E-14	1.15E-13	2.26E-12	2.71E-11	2.22E-10	1.54E-09	6.36E-09	2.49E-08	8.25E-08	2.38E-07	6.10E-07	1.41E-06
228900	3.53E-14	1.39E-13	2.76E-12	3.37E-11	2.78E-10	1.79E-09	8.12E-09	3.19E-08	1.04E-07	3.00E-07	7.92E-07	1.84E-06

LEVEL (CI-1)	TEMPERATURE (DEG K)											
	24000	28000	32000	36000	40000	44000	48000	0	0	0	0	
0	7.03E-01	5.80E-01	4.91E-01	4.01E-01	3.16E-01	2.34E-01	1.56E-01	8.95E-02	5.25E-02	3.04E-02	1.70E-02	0.
114854	1.69E-02	3.17E-02	4.99E-02	6.60E-02	8.25E-02	9.67E-02	1.09E-01	1.20E-01	1.25E-01	1.26E-01	1.26E-01	0.
93188	1.04E-02	1.74E-02	2.22E-02	2.64E-02	3.02E-02	3.36E-02	3.60E-02	3.75E-02	3.82E-02	3.86E-02	3.88E-02	0.
107421	1.58E-02	2.79E-02	3.89E-02	4.82E-02	5.60E-02	6.25E-02	6.80E-02	7.25E-02	7.55E-02	7.75E-02	7.88E-02	0.
120721	1.13E-02	2.35E-02	3.53E-02	4.63E-02	5.64E-02	6.56E-02	7.35E-02	8.02E-02	8.55E-02	8.95E-02	9.25E-02	0.
121654	1.49E-02	3.13E-02	4.73E-02	6.19E-02	7.50E-02	8.65E-02	9.55E-02	1.02E-01	1.07E-01	1.11E-01	1.14E-01	0.
112948	3.98E-02	7.00E-02	1.00E-01	1.21E-01	1.34E-01	1.42E-01	1.47E-01	1.50E-01	1.51E-01	1.51E-01	1.51E-01	0.
93371	2.32E-02	3.93E-02	5.42E-02	6.70E-02	7.80E-02	8.65E-02	9.28E-02	9.70E-02	9.95E-02	1.00E-01	1.00E-01	0.
105431	3.34E-02	6.12E-02	8.34E-02	1.01E-01	1.15E-01	1.26E-01	1.33E-01	1.38E-01	1.41E-01	1.43E-01	1.44E-01	0.
119211	2.67E-02	5.07E-02	7.59E-02	9.61E-02	1.11E-01	1.21E-01	1.27E-01	1.31E-01	1.34E-01	1.36E-01	1.37E-01	0.
120222	3.23E-02	6.74E-02	1.01E-01	1.24E-01	1.44E-01	1.57E-01	1.65E-01	1.70E-01	1.73E-01	1.75E-01	1.76E-01	0.
222000	2.60E-05	1.29E-04	3.71E-04	7.73E-04	1.33E-03	2.01E-03	2.79E-03	3.60E-03	4.42E-03	5.24E-03	6.06E-03	0.
203000	1.62E-05	6.84E-05	1.74E-04	3.36E-04	5.25E-04	7.47E-04	9.86E-04	1.23E-03	1.48E-03	1.73E-03	2.00E-03	0.
215000	2.37E-05	1.11E-04	3.02E-04	6.14E-04	1.02E-03	1.51E-03	2.07E-03	2.67E-03	3.29E-03	3.92E-03	4.56E-03	0.
227900	1.82E-05	9.52E-05	2.65E-04	5.11E-04	8.07E-04	1.16E-03	1.65E-03	2.14E-03	2.63E-03	3.12E-03	3.61E-03	0.
228900	2.41E-05	1.27E-04	3.81E-04	8.22E-04	1.45E-03	2.24E-03	3.18E-03	4.17E-03	5.16E-03	6.15E-03	7.14E-03	0.

TABLE 51. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C*

STATE	LEVEL (CM-1)	WT.	STAT.	TEMPERATURE (DEG K)								
				1200	1600	2000	2400	2800	3200	3600	4000	4400
2s ² 2p ²	0	0.	0.	3.51E-01	3.44E-01	3.44E-01	3.42E-01	3.41E-01	3.40E-01	3.39E-01	3.38E-01	3.38E-01
	4	0.0079	4	6.49E-01	6.54E-01	6.54E-01	6.52E-01	6.50E-01	6.49E-01	6.48E-01	6.47E-01	6.47E-01
	43033	5.3353	12	8.22E-23	3.25E-17	7.44E-14	1.23E-11	5.09E-10	8.04E-09	6.89E-08	3.89E-07	1.57E-06
	74932	9.2201	10	0.	9.13E-30	6.47E-24	5.22E-20	3.23E-17	3.37E-15	1.47E-13	3.31E-12	3.84E-11
	94494	11.7434	2	0.	7.16E-39	2.43E-31	2.58E-26	5.96E-23	4.89E-20	6.03E-18	2.66E-16	6.69E-15
2p ³	110653	12.7189	6	0.	0.	2.77E-35	1.59E-29	2.07E-25	2.52E-22	6.31E-20	5.24E-18	1.94E-16
	142024	17.6083	4	0.	0.	0.	7.21E-38	1.30E-32	1.25E-28	1.31E-25	4.41E-23	4.58E-21
	150465	18.6548	10	0.	0.	0.	0.	4.50E-34	7.04E-30	1.30E-26	5.29E-24	7.24E-22
	164744	20.9210	6	0.	0.	0.	0.	2.25E-36	1.14E-33	5.23E-30	4.43E-27	1.10E-24
	116538	14.4485	2	0.	0.	1.34E-37	1.54E-31	3.35E-27	5.94E-24	2.01E-21	2.11E-19	9.53E-18
2s ¹ (5)	131725	16.3314	6	0.	0.	0.	5.17E-35	4.10E-30	1.93E-26	1.39E-23	2.69E-21	1.89E-19
	145550	18.0454	10	0.	0.	0.	2.10E-38	5.62E-33	6.44E-29	9.44E-26	3.10E-23	3.61E-21
	157235	19.4942	2	0.	0.	0.	0.	2.77E-34	6.73E-32	1.73E-28	9.27E-26	1.54E-23
	162523	20.1498	6	0.	0.	0.	0.	5.50E-37	1.47E-32	6.28E-29	4.15E-26	8.43E-24
	168125	20.8443	10	0.	0.	0.	0.	5.15E-36	2.52E-33	1.12E-29	9.22E-27	2.23E-24
2s ¹ 2p	148979	20.9502	14	0.	0.	0.	0.	4.45E-38	2.60E-33	1.11E-29	9.50E-27	2.30E-24
	170443	21.1545	12	0.	0.	0.	0.	2.54E-38	1.64E-33	7.34E-30	6.71E-27	1.72E-24
	184746	24.1100	24	0.	0.	0.	0.	0.	7.38E-36	7.72E-32	1.24E-28	5.23E-24
	197742	26.5183	90	0.	0.	0.	0.	0.	7.28E-34	7.46E-30	1.96E-26	1.24E-27
	210000**	28.0360	18	0.	0.	0.	0.	0.	0.	1.08E-36	4.77E-33	4.57E-30
2p ³ (7)	215730**	26.7464	54	0.	0.	0.	0.	0.	0.	3.29E-37	1.82E-33	2.11E-30
	220445	27.3335	90	0.	0.	0.	0.	0.	0.	0.	5.53E-34	7.47E-31
	221438	27.4564	126	0.	0.	0.	0.	0.	0.	0.	5.42E-34	7.54E-31
	219000*	27.1518	6	0.	0.	0.	0.	0.	0.	0.	9.89E-39	6.25E-35
	234000*	29.0116	18	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ³ (D)	244000*	30.4993	30	0.	0.	0.	0.	0.	0.	0.	0.	0.
	260600*	32.2351	6	0.	0.	0.	0.	0.	0.	0.	0.	0.
	265000*	32.8550	18	0.	0.	0.	0.	0.	0.	0.	0.	0.
	270900*	33.5369	30	0.	0.	0.	0.	0.	0.	0.	0.	0.
	271400*	33.6484	42	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ³ (S)	257000*	31.8631	18	0.	0.	0.	0.	0.	0.	0.	0.	0.
	271000*	33.5989	54	0.	0.	0.	0.	0.	0.	0.	0.	0.
	283000*	35.0844	90	0.	0.	0.	0.	0.	0.	0.	0.	0.
	304500*	37.7822	288	0.	0.	0.	0.	0.	0.	0.	0.	0.
	267000*	35.1029	10	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ³ (5)	281000*	34.8387	30	0.	0.	0.	0.	0.	0.	0.	0.	0.
	292000*	36.2025	50	0.	0.	0.	0.	0.	0.	0.	0.	0.
	313000*	38.8081	180	0.	0.	0.	0.	0.	0.	0.	0.	0.
	319000*	39.5499	14	0.	0.	0.	0.	0.	0.	0.	0.	0.
	349000*	43.2694	32	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
MONSTARRED ENERGY LEVELS FROM MOORE (1949) AND GLAD (1954)

TABLE 51 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C*

LEVEL (C _{II} -1)	TEMPERATURE (DEG K)											
	4000	5200	5600	6000	6400	6800	7200	7600	8000	8400	8800	9200
C	3.38E-01	3.37E-01	3.37E-01	3.36E-01	3.36E-01	3.36E-01	3.35E-01	3.34E-01	3.34E-01	3.33E-01	3.33E-01	3.33E-01
64	6.82E-01	6.83E-01	6.83E-01	6.82E-01	6.82E-01	6.82E-01	6.81E-01	6.80E-01	6.80E-01	6.79E-01	6.79E-01	6.79E-01
43033	2.97E-10	2.97E-09	2.97E-08	2.96E-07	2.96E-06	2.96E-05	2.95E-04	2.95E-03	2.95E-02	2.94E-01	2.94E-01	2.94E-01
74932	2.97E-10	2.97E-09	2.97E-08	2.96E-07	2.96E-06	2.96E-05	2.95E-04	2.95E-03	2.95E-02	2.94E-01	2.94E-01	2.94E-01
94494	9.27E-14	5.74E-13	5.74E-12	3.01E-11	1.28E-10	4.57E-10	1.42E-09	3.11E-08	9.75E-07	2.23E-06	4.71E-06	9.35E-06
110653	3.99E-15	5.11E-14	4.59E-13	3.02E-12	1.59E-11	6.09E-11	2.51E-10	8.05E-10	2.29E-09	5.91E-09	1.40E-08	3.06E-08
142024	2.19E-19	5.70E-18	9.50E-17	1.09E-15	9.15E-14	3.90E-14	3.10E-13	1.41E-12	5.27E-12	1.83E-11	5.91E-11	1.51E-10
150465	4.37E-20	2.74E-17	3.60E-16	3.43E-15	2.51E-14	1.47E-13	7.15E-13	3.47E-12	1.60E-11	6.09E-11	3.47E-11	1.01E-10
168744	1.06E-21	1.50E-19	2.70E-18	2.70E-17	2.70E-16	2.70E-15	2.70E-14	2.70E-13	2.70E-12	2.70E-11	2.70E-10	2.70E-09
114530	2.28E-16	3.34E-15	3.34E-14	2.44E-13	1.41E-12	6.50E-12	2.50E-11	8.00E-11	2.65E-10	7.19E-10	1.70E-09	4.07E-09
131725	7.21E-18	1.50E-16	2.03E-15	1.93E-14	1.93E-13	7.93E-13	3.73E-12	1.49E-11	5.10E-11	1.60E-10	4.44E-10	1.14E-09
145550	1.95E-19	9.46E-17	1.17E-15	1.17E-14	1.02E-13	3.92E-13	1.01E-12	7.10E-12	2.50E-11	7.93E-11	2.18E-10	5.62E-10
157335	1.95E-20	9.46E-19	1.42E-17	1.42E-16	1.42E-15	7.40E-15	3.97E-14	1.74E-13	6.79E-13	2.29E-12	7.01E-12	2.18E-11
162523	7.95E-22	2.99E-20	7.42E-19	1.20E-17	1.37E-16	1.17E-15	7.92E-15	4.37E-14	2.04E-13	8.15E-13	2.90E-12	9.19E-12
168125	2.19E-22	1.06E-20	2.93E-19	5.21E-18	6.47E-17	5.90E-16	4.31E-15	2.52E-14	1.24E-13	5.22E-13	1.93E-12	6.20E-12
168979	2.30E-22	1.17E-20	3.29E-19	5.95E-18	7.40E-17	6.90E-16	5.09E-15	3.01E-14	1.49E-13	6.32E-13	2.35E-12	7.01E-12
170643	1.04E-22	2.74E-21	2.74E-19	5.13E-18	6.42E-17	6.32E-16	4.60E-15	2.62E-14	1.42E-13	5.20E-12	1.74E-12	5.62E-12
184786	6.04E-24	5.48E-22	2.19E-20	5.18E-19	6.24E-18	9.50E-17	8.34E-16	5.82E-15	3.34E-14	1.63E-13	6.80E-13	2.54E-12
197742	2.75E-25	2.95E-23	1.11E-21	3.04E-20	7.40E-19	1.02E-17	1.04E-16	6.34E-16	3.42E-15	2.95E-14	1.37E-13	5.59E-13
210000	1.40E-27	1.77E-25	1.12E-23	4.09E-22	9.31E-21	1.53E-19	1.60E-18	1.44E-17	1.20E-16	7.22E-16	3.70E-15	1.64E-14
219730	7.52E-28	1.09E-25	7.72E-24	3.10E-22	7.87E-21	1.36E-19	1.72E-18	1.64E-17	1.28E-16	8.11E-16	4.35E-15	2.01E-14
220465	3.92E-28	4.89E-26	3.81E-24	1.64E-22	4.32E-21	6.34E-20	1.11E-18	1.13E-17	9.10E-17	6.01E-16	3.34E-15	1.60E-14
221958	3.15E-28	5.20E-26	4.13E-24	1.64E-22	5.06E-21	4.46E-20	1.31E-18	1.31E-17	1.07E-16	7.10E-16	3.90E-15	1.92E-14
219000	3.14E-29	4.89E-27	3.70E-25	1.57E-23	4.19E-22	7.50E-21	9.94E-20	5.94E-19	7.90E-18	5.15E-17	2.83E-16	1.34E-15
234000	1.05E-30	2.31E-28	2.35E-26	1.29E-24	4.31E-23	9.52E-22	1.49E-20	1.74E-19	1.40E-18	1.10E-17	7.31E-17	3.05E-16
244000	4.79E-32	1.30E-29	1.00E-27	1.21E-25	4.84E-24	1.25E-22	2.24E-21	3.00E-20	3.07E-19	2.52E-18	1.71E-17	9.53E-17
260000	3.02E-34	5.79E-32	9.89E-30	8.46E-28	4.16E-26	1.29E-24	4.23E-22	4.73E-21	4.95E-20	3.47E-19	2.47E-18	1.70E-17
265000	9.47E-35	6.39E-32	8.18E-30	3.65E-28	3.04E-26	1.35E-24	3.04E-23	4.93E-22	6.05E-21	5.89E-20	4.60E-19	3.02E-18
270500	3.10E-35	1.58E-32	3.32E-30	3.41E-28	1.94E-26	7.02E-25	1.69E-23	2.90E-22	3.75E-21	3.00E-20	3.12E-19	2.19E-18
271400	3.31E-35	1.73E-32	3.69E-30	3.89E-28	2.25E-26	8.12E-25	1.97E-23	3.42E-22	4.46E-21	4.54E-20	3.77E-19	2.59E-18
257000	1.04E-33	3.90E-31	6.39E-29	5.21E-27	2.45E-25	7.33E-24	1.50E-22	2.24E-21	2.55E-20	2.30E-19	1.70E-18	1.06E-17
271000	4.80E-33	2.49E-32	5.25E-30	5.44E-28	1.45E-26	4.15E-24	3.75E-23	4.75E-22	6.17E-21	6.20E-20	5.17E-19	3.59E-18
283000	2.19E-34	1.49E-33	4.01E-31	5.11E-29	1.90E-27	5.95E-25	4.14E-24	8.14E-23	1.14E-22	1.14E-21	1.14E-20	9.09E-19
304500	0.	1.25E-35	5.12E-33	9.42E-31	9.03E-29	5.04E-27	1.01E-25	4.44E-24	7.95E-23	1.60E-22	1.14E-21	1.06E-20
267000	2.95E-35	1.39E-32	2.72E-30	2.63E-28	1.44E-26	4.91E-25	1.13E-23	1.07E-22	2.34E-21	2.31E-20	1.84E-19	1.23E-18
281000	1.33E-36	6.64E-34	2.73E-31	2.75E-29	1.05E-27	7.41E-26	3.07E-24	3.07E-23	5.67E-22	6.29E-21	5.60E-20	4.13E-19
293000	6.21E-36	6.80E-35	2.21E-32	3.20E-30	2.40E-28	1.24E-26	3.25E-24	3.25E-23	1.31E-22	1.90E-21	1.52E-20	1.23E-19
313000	0.	6.80E-37	3.20E-34	4.62E-32	7.42E-30	4.45E-28	4.95E-26	4.95E-25	9.50E-24	1.40E-23	1.40E-22	1.40E-21
319000	0.	0.	7.71E-36	1.82E-33	2.17E-31	1.47E-29	6.24E-28	1.70E-26	3.44E-24	5.65E-23	6.71E-23	4.50E-22
349000	0.	0.	0.	0.	1.53E-36	4.50E-34	4.50E-32	2.77E-30	1.09E-28	2.95E-27	5.80E-26	1.06E-25

TABLE 51 (CONT'D.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C⁺

LEVEL (CM ⁻¹)	TEMPERATURE (DEG K)											
	9400	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
0	3.34E-01	3.34E-01	3.33E-01	3.31E-01	3.29E-01	3.27E-01	3.24E-01	3.21E-01	3.17E-01	3.13E-01	3.09E-01	3.04E-01
64	6.62E-01	6.62E-01	6.60E-01	6.57E-01	6.54E-01	6.51E-01	6.47E-01	6.43E-01	6.39E-01	6.35E-01	6.31E-01	6.27E-01
43033	3.17E-03	3.17E-03	3.17E-03	3.16E-03	3.15E-03	3.14E-03	3.13E-03	3.12E-03	3.11E-03	3.10E-03	3.09E-03	3.08E-03
74932	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05	2.22E-05
96494	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07
110453	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08	4.30E-08
142024	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10	3.81E-10
150445	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10	2.69E-10
168744	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11	1.04E-11
116330	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09	8.69E-09
131125	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09
145550	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10	5.62E-10
157235	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11	1.95E-11
162323	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11	2.65E-11
168123	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11	1.91E-11
168979	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13	2.35E-13
170443	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11	3.35E-11
184784	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12	8.47E-12
197742	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12	2.03E-12
210000	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16	6.95E-16
215730	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16	8.20E-16
220465	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14	6.72E-14
221450	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14	8.11E-14
219000	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13	5.50E-13
234000	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15	1.77E-15
246000	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16	4.88E-16
260000	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17	1.20E-17
265000	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17	1.70E-17
270500	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17	1.24E-17
271490	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17	1.52E-17
257000	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17	5.43E-17
271000	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17	2.07E-17
283000	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18	5.72E-18
304500	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19	7.29E-19
267000	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18	6.94E-18
282000	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18	2.57E-18
292000	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19	6.24E-19
313000	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19	1.13E-19
319000	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21	5.19E-21
349000	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22	1.03E-22

TABLE 51 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C+

LEVEL	TEMPERATURE (DEG K)									
	24000	28000	32000	36000	40000	44000	48000	0	0	0
0	2.84E-01	2.63E-01	2.42E-01	2.21E-01	2.00E-01	1.79E-01	1.58E-01	0.	0.	0.
64	5.47E-01	5.26E-01	5.05E-01	4.84E-01	4.63E-01	4.42E-01	4.21E-01	0.	0.	0.
43033	1.73E-01	1.73E-01	2.10E-01	2.47E-01	2.84E-01	3.21E-01	3.58E-01	0.	0.	0.
74322	1.59E-02	2.80E-02	4.16E-02	5.52E-02	6.74E-02	7.95E-02	9.16E-02	0.	0.	0.
90494	8.74E-04	1.89E-03	3.16E-03	4.67E-03	6.21E-03	7.63E-03	8.93E-03	0.	0.	0.
110453	1.12E-03	2.69E-03	5.01E-03	7.95E-03	1.12E-02	1.44E-02	1.73E-02	0.	0.	0.
120224	1.16E-04	3.76E-04	8.18E-04	1.51E-03	2.41E-03	3.44E-03	4.51E-03	0.	0.	0.
150465	1.72E-04	5.76E-04	1.40E-03	2.70E-03	4.29E-03	6.13E-03	8.14E-03	0.	0.	0.
168744	3.48E-04	1.19E-04	3.68E-04	7.80E-04	1.30E-03	2.18E-03	3.44E-03	0.	0.	0.
116538	2.63E-04	6.60E-04	1.28E-03	2.09E-03	3.02E-03	4.04E-03	5.16E-03	0.	0.	0.
131725	3.17E-04	9.08E-04	1.99E-03	3.47E-03	5.24E-03	7.24E-03	9.22E-03	0.	0.	0.
145550	2.31E-04	7.44E-04	1.74E-03	3.21E-03	4.82E-03	6.57E-03	8.32E-03	0.	0.	0.
157235	2.76E-05	8.14E-05	2.04E-04	4.12E-04	6.98E-04	1.05E-03	1.43E-03	0.	0.	0.
162323	5.01E-05	1.87E-04	4.87E-04	1.04E-03	1.73E-03	2.64E-03	3.64E-03	0.	0.	0.
163125	5.97E-05	2.33E-04	6.31E-04	1.31E-03	2.34E-03	3.67E-03	5.16E-03	0.	0.	0.
168979	7.93E-05	3.12E-04	8.50E-04	1.84E-03	3.20E-03	4.99E-03	7.04E-03	0.	0.	0.
170443	9.23E-05	3.69E-04	1.01E-03	2.17E-03	3.88E-03	6.06E-03	8.61E-03	0.	0.	0.
184784	1.19E-04	5.39E-04	1.61E-03	3.70E-03	7.00E-03	1.15E-02	1.69E-02	0.	0.	0.
197742	9.89E-05	4.58E-04	1.50E-03	3.47E-03	7.32E-03	1.25E-02	1.91E-02	0.	0.	0.
210000	8.72E-06	4.88E-05	1.73E-04	4.56E-04	9.42E-04	1.66E-03	2.65E-03	0.	0.	0.
215730	1.86E-05	1.09E-04	4.00E-04	1.07E-03	2.30E-03	4.18E-03	6.49E-03	0.	0.	0.
220445	2.33E-05	1.42E-04	5.39E-04	1.44E-03	3.23E-03	5.96E-03	9.07E-03	0.	0.	0.
221458	3.07E-05	1.90E-04	7.22E-04	1.99E-03	4.37E-03	8.08E-03	1.31E-02	0.	0.	0.
219000	1.70E-04	1.02E-03	3.84E-03	1.05E-02	2.27E-02	4.17E-02	6.74E-02	0.	0.	0.
234000	2.07E-04	1.42E-03	5.87E-03	1.72E-02	3.97E-02	7.64E-02	1.29E-01	0.	0.	0.
244000	1.64E-04	1.29E-03	5.70E-03	1.78E-02	4.30E-02	8.42E-02	1.40E-01	0.	0.	0.
260000	1.44E-07	1.42E-06	5.08E-06	2.03E-05	5.20E-05	1.09E-04	1.97E-04	0.	0.	0.
265000	3.87E-07	2.89E-06	1.44E-05	6.99E-05	1.30E-04	2.78E-04	5.89E-04	0.	0.	0.
270500	3.87E-07	3.63E-06	1.90E-05	6.68E-05	1.70E-04	3.87E-04	7.19E-04	0.	0.	0.
271400	5.13E-07	4.83E-06	2.55E-05	9.02E-05	2.41E-04	5.24E-04	9.80E-04	0.	0.	0.
287000	5.21E-07	4.34E-06	2.09E-05	6.87E-05	1.74E-04	3.91E-04	6.47E-04	0.	0.	0.
271000	6.75E-07	6.37E-06	3.34E-05	1.10E-04	3.15E-04	6.65E-04	1.28E-03	0.	0.	0.
293000	3.46E-07	5.73E-06	3.24E-05	1.23E-04	3.61E-04	7.71E-04	1.46E-03	0.	0.	0.
304500	4.84E-07	6.07E-06	3.95E-05	1.48E-04	5.03E-04	1.22E-03	2.49E-03	0.	0.	0.
270000	1.59E-07	1.45E-06	7.40E-06	2.58E-05	6.73E-05	1.65E-04	2.64E-04	0.	0.	0.
281000	2.04E-07	2.12E-06	1.10E-05	4.39E-05	1.22E-04	2.75E-04	5.25E-04	0.	0.	0.
292000	1.74E-07	2.00E-06	1.25E-05	4.71E-05	1.37E-04	3.19E-04	6.29E-04	0.	0.	0.
313000	1.61E-07	2.18E-06	1.50E-05	6.52E-05	2.04E-04	5.14E-04	1.07E-03	0.	0.	0.
319000	1.27E-08	1.60E-07	1.20E-06	5.77E-06	1.87E-05	4.75E-05	1.01E-04	0.	0.	0.
349000	3.73E-09	4.64E-08	5.95E-07	3.89E-06	1.13E-05	3.17E-05	7.90E-05	0.	0.	0.

TABLE 52. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF P+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K)									
				1200	1600	2000	2400	2800	3200	3600	4000	4400	
2s 2p 3s	0	0.	1	1.23E-01	1.20E-01	1.18E-01	1.17E-01	1.16E-01	1.16E-01	1.15E-01	1.14E-01	1.14E-01	
	48	0.0040	3	3.49E-01	3.55E-01	3.43E-01	3.41E-01	3.40E-01	3.39E-01	3.37E-01	3.36E-01	3.36E-01	
	130	0.0142	7	5.27E-01	5.34E-01	5.39E-01	5.42E-01	5.43E-01	5.44E-01	5.44E-01	5.44E-01	5.44E-01	
	15314	1.8999	5	4.53E-09	6.27E-07	9.71E-06	6.03E-05	2.22E-04	5.96E-04	1.24E-03	2.32E-03	3.81E-03	
	32689	4.0526	1	1.17E-18	2.06E-14	7.23E-12	3.61E-10	5.09E-09	4.78E-08	2.44E-07	8.96E-07	2.66E-06	
2s 2p 3s	44785	5.8005	5	2.68E-25	3.22E-19	1.43E-15	3.86E-13	2.11E-11	4.23E-10	4.25E-09	2.81E-08	1.29E-07	
	92245	11.4366	15	0.	1.76E-36	2.67E-29	1.69E-24	4.33E-21	1.68E-18	1.64E-16	6.68E-15	1.24E-13	
	109218	13.5410	9	0.	0.	0.03E-35	3.67E-29	4.93E-25	4.58E-22	1.14E-19	9.6E-18	3.17E-16	
	159127	19.2328	3	0.	0.	0.	0.	8.39E-34	1.77E-31	4.09E-28	2.01E-25	3.19E-23	
	144188	17.0766	5	0.	0.	0.	1.69E-30	3.86E-33	4.64E-29	5.40E-26	1.71E-23	1.96E-21	
2p	146766	20.6758	3	0.	0.	0.	0.	2.12E-30	9.44E-34	3.91E-30	3.05E-27	7.09E-25	
	210000	27.0279	9	0.	0.	0.	0.	0.	1.50E-30	9.08E-35	1.13E-31	1.13E-31	
	229000	28.3916	5	0.	0.	0.	0.	0.	0.	9.48E-37	1.72E-33	3.67E-30	
	264000	32.7310	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	144056	18.4601	12	0.	0.	0.	0.	7.66E-34	1.69E-29	7.13E-26	9.29E-22	9.29E-22	
2s 2p 3p	169622	20.9555	36	0.	0.	0.	0.	7.98E-38	4.12E-33	1.98E-29	1.63E-26	4.07E-24	
	187693	23.2704	60	0.	0.	0.	0.	0.	1.53E-36	1.82E-32	3.28E-29	1.51E-26	
	194955	24.4187	12	0.	0.	0.	0.	0.	0.	6.99E-35	2.39E-31	1.44E-28	
	203304	25.2158	36	0.	0.	0.	0.	0.	0.	2.87E-35	6.97E-32	5.37E-29	
	210284	26.0712	50	0.	0.	0.	0.	0.	0.	2.10E-36	9.71E-33	9.37E-30	
2s 2p 3p	211271	26.1936	84	0.	0.	0.	0.	0.	0.	2.04E-36	9.33E-33	9.50E-30	
	207974	25.7848	24	0.	0.	0.	0.	0.	0.	2.20E-36	8.62E-33	7.98E-30	
	224495	28.0761	72	0.	0.	0.	0.	0.	0.	3.47E-35	5.66E-32	5.66E-32	
	244960	30.3154	120	0.	0.	0.	0.	0.	0.	0.	8.78E-36	2.50E-34	
	266180	32.9913	204	0.	0.	0.	0.	0.	0.	0.	0.	7.10E-37	
2s 2p 3d	252000	31.2432	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	270000	33.5769	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	280000	35.7045	100	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	300000	38.4093	320	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	323100	40.0583	100	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p 3s 3d	354000	43.9805	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	369100	46.1905	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	390000	48.1287	64	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	454291	54.2791	72	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	396000	44.0965	128	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p 3s 3d	380000	47.1128	100	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	412000	51.0002	320	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	440000	56.5642	100	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	544277	54.4277	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	439000	43.9000	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
MONITORED ENERGY LEVELS FROM MOORE (1949) AND ERIKSSON (1950)

TABLE 52 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF H⁺

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	4000	5200	5400	6000	6400	6800	7200	7600	8000	8400	8800	9200
0	1.12E-01	1.13E-01	1.12E-01	1.12E-01	1.11E-01	1.11E-01	1.10E-01	1.10E-01	1.09E-01	1.08E-01	1.08E-01	1.07E-01
48	3.35E-01	3.34E-01	3.33E-01	3.32E-01	3.30E-01	3.29E-01	3.28E-01	3.26E-01	3.24E-01	3.22E-01	3.20E-01	3.19E-01
130	5.43E-01	5.42E-01	5.41E-01	5.40E-01	5.38E-01	5.37E-01	5.35E-01	5.33E-01	5.30E-01	5.28E-01	5.26E-01	5.24E-01
13316	5.75E-03	5.74E-03	5.73E-03	5.72E-03	5.70E-03	5.69E-03	5.67E-03	5.65E-03	5.62E-03	5.60E-03	5.58E-03	5.56E-03
32389	5.30E-06	5.29E-06	5.28E-06	5.27E-06	5.25E-06	5.24E-06	5.22E-06	5.20E-06	5.17E-06	5.15E-06	5.13E-06	5.11E-06
44785	4.61E-07	4.60E-07	4.59E-07	4.58E-07	4.56E-07	4.55E-07	4.53E-07	4.51E-07	4.48E-07	4.46E-07	4.44E-07	4.42E-07
92245	4.27E-12	4.26E-12	4.25E-12	4.24E-12	4.22E-12	4.21E-12	4.19E-12	4.17E-12	4.14E-12	4.12E-12	4.10E-12	4.08E-12
109219	6.18E-15	6.17E-15	6.16E-15	6.15E-15	6.13E-15	6.12E-15	6.10E-15	6.08E-15	6.05E-15	6.03E-15	6.01E-15	5.99E-15
155127	7.75E-20	7.74E-20	7.73E-20	7.72E-20	7.70E-20	7.69E-20	7.67E-20	7.65E-20	7.62E-20	7.60E-20	7.58E-20	7.56E-20
144189	9.63E-20	9.62E-20	9.61E-20	9.60E-20	9.58E-20	9.57E-20	9.55E-20	9.53E-20	9.50E-20	9.48E-20	9.46E-20	9.44E-20
166766	6.64E-23	6.63E-23	6.62E-23	6.61E-23	6.59E-23	6.58E-23	6.56E-23	6.54E-23	6.51E-23	6.49E-23	6.47E-23	6.45E-23
218000	4.27E-29	4.26E-29	4.25E-29	4.24E-29	4.22E-29	4.21E-29	4.19E-29	4.17E-29	4.14E-29	4.12E-29	4.10E-29	4.08E-29
229000	8.77E-31	8.76E-31	8.75E-31	8.74E-31	8.72E-31	8.71E-31	8.69E-31	8.67E-31	8.64E-31	8.62E-31	8.60E-31	8.58E-31
244000	6.67E-34	6.66E-34	6.65E-34	6.64E-34	6.62E-34	6.61E-34	6.59E-34	6.57E-34	6.54E-34	6.52E-34	6.50E-34	6.48E-34
149056	5.37E-20	5.36E-20	5.35E-20	5.34E-20	5.32E-20	5.31E-20	5.29E-20	5.27E-20	5.24E-20	5.22E-20	5.20E-20	5.18E-20
169022	4.05E-23	4.04E-23	4.03E-23	4.02E-23	4.00E-23	3.99E-23	3.97E-23	3.95E-23	3.92E-23	3.90E-23	3.88E-23	3.86E-23
187693	2.51E-24	2.50E-24	2.49E-24	2.48E-24	2.46E-24	2.45E-24	2.43E-24	2.41E-24	2.38E-24	2.36E-24	2.34E-24	2.32E-24
198753	5.12E-26	5.11E-26	5.10E-26	5.09E-26	5.07E-26	5.06E-26	5.04E-26	5.02E-26	4.99E-26	4.97E-26	4.95E-26	4.93E-26
203384	1.36E-28	1.35E-28	1.34E-28	1.33E-28	1.31E-28	1.30E-28	1.28E-28	1.26E-28	1.23E-28	1.21E-28	1.19E-28	1.17E-28
210284	2.87E-27	2.86E-27	2.85E-27	2.84E-27	2.82E-27	2.81E-27	2.79E-27	2.77E-27	2.74E-27	2.72E-27	2.70E-27	2.68E-27
211271	2.99E-27	2.98E-27	2.97E-27	2.96E-27	2.94E-27	2.93E-27	2.91E-27	2.89E-27	2.86E-27	2.84E-27	2.82E-27	2.80E-27
207974	3.95E-27	3.94E-27	3.93E-27	3.92E-27	3.90E-27	3.89E-27	3.87E-27	3.85E-27	3.82E-27	3.80E-27	3.78E-27	3.76E-27
224455	2.71E-29	2.70E-29	2.69E-29	2.68E-29	2.66E-29	2.65E-29	2.63E-29	2.61E-29	2.58E-29	2.56E-29	2.54E-29	2.52E-29
244500	2.02E-31	2.01E-31	2.00E-31	1.99E-31	1.97E-31	1.96E-31	1.94E-31	1.92E-31	1.89E-31	1.87E-31	1.85E-31	1.83E-31
264100	9.97E-34	9.96E-34	9.95E-34	9.94E-34	9.92E-34	9.91E-34	9.89E-34	9.87E-34	9.84E-34	9.82E-34	9.80E-34	9.78E-34
292000	3.59E-33	3.58E-33	3.57E-33	3.56E-33	3.54E-33	3.53E-33	3.51E-33	3.49E-33	3.46E-33	3.44E-33	3.42E-33	3.40E-33
270000	6.84E-35	6.83E-35	6.82E-35	6.81E-35	6.79E-35	6.78E-35	6.76E-35	6.74E-35	6.71E-35	6.69E-35	6.67E-35	6.65E-35
288000	3.64E-37	3.63E-37	3.62E-37	3.61E-37	3.59E-37	3.58E-37	3.56E-37	3.54E-37	3.51E-37	3.49E-37	3.47E-37	3.45E-37
309600	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
323100	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
354900	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
369100	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
339600	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3.000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
394000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
390000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
412000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
406000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
439000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TABLE 52 (CONT.) ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS BY NO

LEVEL (CN-1)	TEMPERATURE (SECS K)											
	9400	10000	11000	12000	13000	1400	15000	16000	17000	18000	19000	20000
0	1.06E-01	1.04E-01	1.04E-01	1.03E-01	1.02E-01	9.97E-02	9.93E-02	9.89E-02	9.85E-02	9.81E-02	9.77E-02	9.73E-02
40	3.17E-01	3.15E-01	3.13E-01	3.11E-01	3.09E-01	3.07E-01	3.05E-01	3.03E-01	3.01E-01	2.99E-01	2.97E-01	2.95E-01
130	5.22E-01	5.19E-01	5.17E-01	5.15E-01	5.13E-01	5.11E-01	5.09E-01	5.07E-01	5.05E-01	5.03E-01	5.01E-01	4.99E-01
19316	5.34E-02	5.32E-02	5.30E-02	5.28E-02	5.26E-02	5.24E-02	5.22E-02	5.20E-02	5.18E-02	5.16E-02	5.14E-02	5.12E-02
32409	7.93E-04	7.91E-04	7.89E-04	7.87E-04	7.85E-04	7.83E-04	7.81E-04	7.79E-04	7.77E-04	7.75E-04	7.73E-04	7.71E-04
44705	4.79E-04	4.77E-04	4.75E-04	4.73E-04	4.71E-04	4.69E-04	4.67E-04	4.65E-04	4.63E-04	4.61E-04	4.59E-04	4.57E-04
92245	1.98E-06	1.96E-06	1.94E-06	1.92E-06	1.90E-06	1.88E-06	1.86E-06	1.84E-06	1.82E-06	1.80E-06	1.78E-06	1.76E-06
109310	7.53E-08	7.51E-08	7.49E-08	7.47E-08	7.45E-08	7.43E-08	7.41E-08	7.39E-08	7.37E-08	7.35E-08	7.33E-08	7.31E-08
159127	2.59E-11	2.57E-11	2.55E-11	2.53E-11	2.51E-11	2.49E-11	2.47E-11	2.45E-11	2.43E-11	2.41E-11	2.39E-11	2.37E-11
164106	2.19E-10	2.17E-10	2.15E-10	2.13E-10	2.11E-10	2.09E-10	2.07E-10	2.05E-10	2.03E-10	2.01E-10	1.99E-10	1.97E-10
164704	4.64E-12	4.62E-12	4.60E-12	4.58E-12	4.56E-12	4.54E-12	4.52E-12	4.50E-12	4.48E-12	4.46E-12	4.44E-12	4.42E-12
210000	6.19E-15	6.17E-15	6.15E-15	6.13E-15	6.11E-15	6.09E-15	6.07E-15	6.05E-15	6.03E-15	6.01E-15	5.99E-15	5.97E-15
237000	6.31E-14	6.29E-14	6.27E-14	6.25E-14	6.23E-14	6.21E-14	6.19E-14	6.17E-14	6.15E-14	6.13E-14	6.11E-14	6.09E-14
264000	6.37E-19	6.35E-19	6.33E-19	6.31E-19	6.29E-19	6.27E-19	6.25E-19	6.23E-19	6.21E-19	6.19E-19	6.17E-19	6.15E-19
149056	2.54E-10	2.52E-10	2.50E-10	2.48E-10	2.46E-10	2.44E-10	2.42E-10	2.40E-10	2.38E-10	2.36E-10	2.34E-10	2.32E-10
169022	3.02E-11	3.00E-11	2.98E-11	2.96E-11	2.94E-11	2.92E-11	2.90E-11	2.88E-11	2.86E-11	2.84E-11	2.82E-11	2.80E-11
187693	3.08E-12	3.06E-12	3.04E-12	3.02E-12	3.00E-12	2.98E-12	2.96E-12	2.94E-12	2.92E-12	2.90E-12	2.88E-12	2.86E-12
194955	1.93E-13	1.91E-13	1.89E-13	1.87E-13	1.85E-13	1.83E-13	1.81E-13	1.79E-13	1.77E-13	1.75E-13	1.73E-13	1.71E-13
203304	2.21E-13	2.19E-13	2.17E-13	2.15E-13	2.13E-13	2.11E-13	2.09E-13	2.07E-13	2.05E-13	2.03E-13	2.01E-13	1.99E-13
210204	1.31E-13	1.29E-13	1.27E-13	1.25E-13	1.23E-13	1.21E-13	1.19E-13	1.17E-13	1.15E-13	1.13E-13	1.11E-13	1.09E-13
211271	1.59E-13	1.57E-13	1.55E-13	1.53E-13	1.51E-13	1.49E-13	1.47E-13	1.45E-13	1.43E-13	1.41E-13	1.39E-13	1.37E-13
220774	7.42E-14	7.40E-14	7.38E-14	7.36E-14	7.34E-14	7.32E-14	7.30E-14	7.28E-14	7.26E-14	7.24E-14	7.22E-14	7.20E-14
224455	1.39E-14	1.37E-14	1.35E-14	1.33E-14	1.31E-14	1.29E-14	1.27E-14	1.25E-14	1.23E-14	1.21E-14	1.19E-14	1.17E-14
244500	1.64E-15	1.62E-15	1.60E-15	1.58E-15	1.56E-15	1.54E-15	1.52E-15	1.50E-15	1.48E-15	1.46E-15	1.44E-15	1.42E-15
260100	1.95E-16	1.93E-16	1.91E-16	1.89E-16	1.87E-16	1.85E-16	1.83E-16	1.81E-16	1.79E-16	1.77E-16	1.75E-16	1.73E-16
257000	8.42E-17	8.40E-17	8.38E-17	8.36E-17	8.34E-17	8.32E-17	8.30E-17	8.28E-17	8.26E-17	8.24E-17	8.22E-17	8.20E-17
270000	1.70E-17	1.68E-17	1.66E-17	1.64E-17	1.62E-17	1.60E-17	1.58E-17	1.56E-17	1.54E-17	1.52E-17	1.50E-17	1.48E-17
280000	1.91E-18	1.89E-18	1.87E-18	1.85E-18	1.83E-18	1.81E-18	1.79E-18	1.77E-18	1.75E-18	1.73E-18	1.71E-18	1.69E-18
309000	2.33E-19	2.31E-19	2.29E-19	2.27E-19	2.25E-19	2.23E-19	2.21E-19	2.19E-19	2.17E-19	2.15E-19	2.13E-19	2.11E-19
323100	1.07E-20	1.05E-20	1.03E-20	1.01E-20	9.98E-21	9.96E-21	9.94E-21	9.92E-21	9.90E-21	9.88E-21	9.86E-21	9.84E-21
354900	1.45E-22	1.43E-22	1.41E-22	1.39E-22	1.37E-22	1.35E-22	1.33E-22	1.31E-22	1.29E-22	1.27E-22	1.25E-22	1.23E-22
360100	3.30E-20	3.28E-20	3.26E-20	3.24E-20	3.22E-20	3.20E-20	3.18E-20	3.16E-20	3.14E-20	3.12E-20	3.10E-20	3.08E-20
339000	3.20E-22	3.18E-22	3.16E-22	3.14E-22	3.12E-22	3.10E-22	3.08E-22	3.06E-22	3.04E-22	3.02E-22	3.00E-22	2.98E-22
344000	1.84E-23	1.82E-23	1.80E-23	1.78E-23	1.76E-23	1.74E-23	1.72E-23	1.70E-23	1.68E-23	1.66E-23	1.64E-23	1.62E-23
364000	2.26E-25	2.24E-25	2.22E-25	2.20E-25	2.18E-25	2.16E-25	2.14E-25	2.12E-25	2.10E-25	2.08E-25	2.06E-25	2.04E-25
300000	3.53E-24	3.51E-24	3.49E-24	3.47E-24	3.45E-24	3.43E-24	3.41E-24	3.39E-24	3.37E-24	3.35E-24	3.33E-24	3.31E-24
412000	5.10E-26	5.08E-26	5.06E-26	5.04E-26	5.02E-26	5.00E-26	4.98E-26	4.96E-26	4.94E-26	4.92E-26	4.90E-26	4.88E-26
400000	3.19E-24	3.17E-24	3.15E-24	3.13E-24	3.11E-24	3.09E-24	3.07E-24	3.05E-24	3.03E-24	3.01E-24	2.99E-24	2.97E-24
430000	5.45E-28	5.43E-28	5.41E-28	5.39E-28	5.37E-28	5.35E-28	5.33E-28	5.31E-28	5.29E-28	5.27E-28	5.25E-28	5.23E-28

TABLE 52 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF H α

LEVEL	TEMPERATURE (DEG K)									
	14000	18000	24000	32000	36000	40000	44000	48000	0	0
0	8.72E-02	8.29E-02	7.87E-02	7.45E-02	7.03E-02	6.61E-02	6.19E-02	5.77E-02	0.	0.
48	2.61E-01	2.48E-01	2.36E-01	2.23E-01	2.10E-01	1.94E-01	1.81E-01	1.68E-01	0.	0.
130	4.32E-01	4.12E-01	3.91E-01	3.70E-01	3.49E-01	3.25E-01	3.01E-01	2.77E-01	0.	0.
15316	1.74E-01	1.69E-01	1.64E-01	1.59E-01	1.54E-01	1.49E-01	1.44E-01	1.39E-01	0.	0.
32489	1.23E-02	1.55E-02	1.81E-02	2.02E-02	2.16E-02	2.24E-02	2.27E-02	2.27E-02	0.	0.
46705	2.44E-02	3.74E-02	4.80E-02	5.74E-02	6.51E-02	7.08E-02	7.43E-02	7.59E-02	0.	0.
92245	1.09E-03	1.09E-02	1.07E-02	1.07E-02	1.07E-02	1.07E-02	1.07E-02	1.07E-02	0.	0.
108218	1.12E-03	2.78E-03	5.22E-03	8.52E-03	1.24E-02	1.65E-02	2.04E-02	2.41E-02	0.	0.
155127	2.59E-03	5.59E-03	2.21E-04	4.53E-04	7.82E-04	1.23E-03	1.72E-03	2.24E-03	0.	0.
144188	7.68E-05	2.51E-04	6.02E-04	1.17E-03	1.96E-03	2.92E-03	4.01E-03	5.16E-03	0.	0.
166766	1.19E-05	4.72E-05	1.31E-04	2.85E-04	5.22E-04	8.40E-04	1.22E-03	1.64E-03	0.	0.
210000	4.64E-06	1.02E-05	3.97E-05	1.10E-04	2.48E-04	4.72E-04	7.90E-04	1.16E-03	0.	0.
229000	4.74E-07	3.21E-06	1.73E-05	3.95E-05	9.27E-05	1.83E-04	3.16E-04	4.84E-04	0.	0.
264000	1.17E-06	1.04E-07	5.91E-07	1.95E-06	5.26E-06	1.14E-05	2.21E-05	3.84E-05	0.	0.
149056	1.38E-04	4.69E-04	1.14E-03	2.31E-03	3.95E-03	5.99E-03	8.32E-03	1.09E-02	0.	0.
169022	1.25E-04	5.04E-04	1.42E-03	3.12E-03	5.77E-03	9.34E-03	1.37E-02	1.87E-02	0.	0.
18783	4.70E-05	3.22E-04	1.02E-03	2.47E-03	4.91E-03	8.47E-03	1.31E-02	1.87E-02	0.	0.
196955	7.74E-06	4.00E-05	1.26E-04	3.41E-04	7.64E-04	1.24E-03	1.88E-03	2.64E-03	0.	0.
203384	1.59E-05	8.02E-05	3.02E-04	7.91E-04	1.60E-03	2.64E-03	4.09E-03	5.84E-03	0.	0.
210284	1.75E-05	1.01E-04	3.70E-04	1.00E-03	2.18E-03	4.09E-03	6.63E-03	9.54E-03	0.	0.
211271	2.31E-05	1.34E-04	4.92E-04	1.35E-03	2.95E-03	5.49E-03	9.02E-03	1.28E-02	0.	0.
207974	8.05E-06	4.54E-05	1.64E-04	4.59E-04	9.40E-04	1.75E-03	2.64E-03	3.53E-03	0.	0.
226425	7.90E-06	5.27E-05	1.95E-04	6.29E-04	1.46E-03	2.64E-03	4.90E-03	7.16E-03	0.	0.
244500	4.51E-06	3.48E-05	1.59E-04	5.10E-04	1.27E-03	2.44E-03	4.70E-03	6.96E-03	0.	0.
264100	3.95E-06	3.07E-05	1.92E-04	6.80E-04	1.87E-03	4.10E-03	7.97E-03	1.24E-02	0.	0.
252000	4.70E-07	3.94E-06	1.89E-05	6.30E-05	1.42E-04	3.42E-04	6.31E-04	1.09E-03	0.	0.
270000	4.08E-07	4.02E-06	2.52E-05	9.20E-05	2.52E-04	5.74E-04	1.11E-03	1.87E-03	0.	0.
280000	2.77E-07	3.10E-06	1.87E-05	7.97E-05	2.22E-04	5.31E-04	1.09E-03	1.68E-03	0.	0.
300000	2.44E-07	3.24E-06	2.22E-05	1.00E-04	3.24E-04	6.38E-04	1.19E-03	1.79E-03	0.	0.
323100	3.64E-08	5.31E-07	4.17E-06	1.90E-05	6.78E-05	1.82E-04	4.66E-04	8.04E-04	0.	0.
354000	9.69E-09	1.92E-07	1.78E-06	9.93E-06	3.04E-05	1.12E-04	2.79E-04	4.64E-04	0.	0.
368100	2.99E-08	3.97E-07	2.97E-06	1.20E-05	3.88E-05	9.91E-05	2.12E-04	3.53E-04	0.	0.
339000	7.94E-09	1.39E-07	1.17E-06	4.69E-06	2.21E-05	6.25E-05	1.44E-04	2.34E-04	0.	0.
344000	2.69E-09	4.49E-08	6.42E-07	2.50E-06	1.04E-05	3.19E-05	7.94E-05	1.24E-04	0.	0.
364000	5.44E-10	1.94E-08	1.86E-07	1.28E-06	5.04E-06	1.99E-05	5.41E-05	1.14E-04	0.	0.
340000	2.60E-09	4.94E-08	5.30E-07	3.40E-06	1.44E-05	4.72E-05	1.23E-04	1.94E-04	0.	0.
412000	5.23E-10	1.70E-08	2.27E-07	1.40E-06	6.21E-06	2.95E-05	9.37E-05	1.54E-04	0.	0.
460000	2.25E-10	7.02E-09	6.17E-08	6.64E-07	3.28E-06	1.12E-05	3.19E-05	5.14E-05	0.	0.
439000	6.22E-11	2.34E-09	4.02E-08	3.43E-07	1.87E-06	7.32E-06	2.24E-05	3.44E-05	0.	0.

TABLE 53. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O.

STATE	LEVEL (CM-1)	STAT. WT.	TEMPERATURE (DEG K)												
			1200	1500	2000	2400	2800	3200	3600	4000	4400				
2p ² 3P	0	4	1.00E 20	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	26019	10	2.71E-14	0.40E-11	1.04E-08	2.60E-07	1.59E-06	1.42E-05	5.25E-05	1.42E-04	3.15E-04	7.15E-04	1.62E-03	3.61E-03	7.92E-03
	40667	6	1.27E-21	2.36E-16	3.41E-13	4.37E-11	1.40E-09	1.80E-08	1.52E-07	7.15E-07	2.32E-06	7.78E-06	2.69E-05	9.15E-05	3.25E-04
	119933	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ² 1D	169991	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	195710	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ² 1P	212650	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	317400	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	186604	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	209280	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ² 3P	232343	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	239248	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	246000	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	31.0159	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(D) 3	259532	126	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	206972	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	229090	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	232571	50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(S) 3	272/280	160	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	226051	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	250251	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	279251	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ² 3P	34.2127	32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	296000	32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	281000	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	313000	160	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(D) 3	340000	270	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	373000	480	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	303000	420	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	437000	540	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ² 1D, 3P	534000	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	64.2059	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	64.2059	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	64.2059	750	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 INDENTED ENERGY LEVELS FROM MOORE (1949) AND ERIKSSON (1961)

TABLE 53 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O⁺

LEVEL (CR-1)	TEMPERATURE (DEG K)											
	4000	5200	5600	6000	6400	6800	7200	7600	8000	8400	8800	9200
0	9.99E-01	9.90E-01	9.87E-01	9.84E-01	9.81E-01	9.78E-01	9.75E-01	9.72E-01	9.69E-01	9.66E-01	9.63E-01	9.60E-01
24619	0.04E-04	1.49E-03	2.54E-03	4.01E-03	5.90E-03	8.11E-03	1.06E-02	1.34E-02	1.65E-02	2.00E-02	2.38E-02	2.78E-02
40467	0.09E-06	2.05E-06	4.57E-06	9.12E-06	1.54E-05	2.34E-05	3.31E-05	4.46E-05	5.79E-05	7.31E-05	9.04E-05	1.09E-04
119933	7.31E-16	1.14E-14	1.84E-13	2.83E-12	4.24E-11	6.14E-10	8.64E-09	1.21E-08	1.71E-07	2.41E-06	3.31E-05	4.41E-04
162991	6.15E-22	2.82E-20	7.56E-19	1.79E-17	3.86E-16	8.10E-15	1.69E-14	3.54E-13	7.41E-12	1.51E-11	3.04E-10	6.04E-09
195710	1.64E-24	1.52E-24	7.25E-23	2.07E-21	3.00E-20	5.14E-19	8.39E-17	1.35E-15	2.15E-14	3.35E-13	5.04E-12	7.24E-11
212690	3.11E-28	4.19E-26	2.00E-24	1.07E-22	4.20E-20	5.20E-19	4.05E-18	3.11E-17	2.22E-16	1.52E-15	1.01E-14	6.70E-13
317400	1.01E-30	1.00E-30	5.74E-28	1.32E-26	1.51E-24	1.81E-22	1.80E-20	1.75E-18	1.65E-16	1.51E-14	1.31E-12	1.09E-10
184404	2.30E-24	1.70E-22	6.77E-21	1.64E-19	2.70E-18	3.10E-17	2.01E-15	1.17E-14	5.74E-14	2.65E-13	9.16E-13	3.04E-12
209200	7.04E-27	9.70E-25	6.10E-23	2.19E-21	5.03E-20	7.90E-19	9.31E-18	9.37E-17	8.85E-16	3.60E-15	1.82E-14	6.01E-14
232343	1.19E-29	2.54E-27	2.52E-25	1.33E-23	4.40E-22	9.50E-21	1.64E-19	1.60E-18	1.51E-17	1.10E-16	6.60E-16	3.44E-15
239346	3.12E-31	7.79E-29	6.01E-27	3.51E-25	1.91E-23	4.52E-22	7.51E-21	9.20E-20	9.90E-19	6.87E-18	4.40E-17	2.44E-16
244660	9.04E-32	2.92E-29	3.04E-27	2.63E-25	1.66E-23	2.77E-22	5.02E-21	6.71E-20	6.91E-19	5.69E-18	3.87E-17	2.22E-16
252006	1.43E-32	5.11E-30	7.89E-28	6.21E-26	2.83E-24	1.64E-22	2.39E-20	2.64E-19	2.35E-18	1.70E-17	1.04E-16	5.44E-16
259432	1.52E-32	5.54E-30	8.71E-28	6.97E-26	3.22E-24	9.40E-23	1.91E-21	2.01E-20	3.16E-19	2.81E-18	2.05E-17	1.25E-16
266972	2.09E-32	3.34E-29	2.01E-27	6.94E-25	1.54E-23	2.37E-21	2.69E-19	2.37E-17	1.67E-16	9.70E-16	4.87E-15	2.11E-14
229090	8.95E-30	1.77E-27	1.67E-25	6.51E-24	2.67E-22	5.57E-21	9.20E-20	9.23E-19	6.11E-18	5.70E-17	3.94E-16	1.75E-15
252371	1.65E-32	5.57E-30	8.19E-28	6.19E-26	2.72E-24	1.49E-22	2.11E-20	2.29E-19	1.90E-18	1.51E-17	6.42E-17	6.42E-17
272930	1.08E-34	6.30E-32	1.40E-29	1.50E-27	6.94E-26	3.30E-24	1.43E-22	1.63E-21	1.60E-20	1.94E-19	1.61E-18	1.12E-17
224051	1.47E-30	2.75E-28	2.43E-26	1.10E-24	3.53E-23	7.07E-22	1.01E-20	1.10E-19	9.36E-18	6.49E-18	3.77E-17	1.68E-16
262231	3.07E-33	1.27E-30	1.70E-28	1.30E-26	5.50E-25	1.50E-23	2.06E-22	3.92E-21	4.17E-20	3.54E-19	2.47E-18	1.45E-17
279791	2.90E-36	1.73E-33	4.02E-31	4.35E-29	2.64E-27	1.69E-25	2.70E-24	5.04E-23	6.04E-22	7.23E-21	6.16E-20	4.32E-19
296000	0.	2.16E-35	7.48E-33	1.19E-30	1.60E-28	5.01E-27	1.62E-25	3.93E-24	5.99E-23	7.44E-22	7.43E-21	6.07E-20
313000	0.	9.77E-37	4.74E-34	1.22E-28	8.21E-27	3.37E-25	1.12E-24	1.75E-22	2.40E-21	2.74E-20	2.43E-19	1.70E-18
				1.01E-31	1.10E-29	6.06E-28	2.71E-26	7.24E-25	1.40E-23	2.03E-22	2.31E-21	2.12E-20
340000	0.	0.	7.77E-37	2.62E-34	4.20E-32	3.62E-30	2.07E-28	7.30E-27	1.64E-25	3.34E-24	4.71E-23	3.24E-22
373000	0.	0.	0.	0.	4.54E-35	6.31E-33	5.04E-31	2.54E-29	6.43E-28	2.90E-26	3.00E-25	3.39E-24
383000	0.	0.	0.	0.	4.51E-36	7.15E-34	6.41E-32	3.59E-30	1.34E-28	3.54E-27	6.94E-26	1.05E-24
437000	0.	0.	0.	0.	0.	1.61E-36	1.50E-34	1.50E-34	9.92E-33	4.16E-31	1.54E-29	2.74E-28
534000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.19E-36	9.70E-35

TABLE 53 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O^+

LEVEL (Cm-1)	TEMPERATURE (DEG K.)											
	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
0	9.54E-01	9.44E-01	9.24E-01	8.99E-01	8.73E-01	8.44E-01	8.10E-01	7.71E-01	7.28E-01	6.82E-01	6.33E-01	5.81E-01
26019	4.28E-02	4.96E-02	6.02E-02	7.07E-02	8.12E-02	9.18E-02	1.02E-01	1.12E-01	1.22E-01	1.32E-01	1.42E-01	1.52E-01
44047	3.32E-03	4.20E-03	5.07E-03	5.95E-03	6.82E-03	7.70E-03	8.58E-03	9.46E-03	1.03E-02	1.12E-02	1.21E-02	1.30E-02
119033	4.57E-00	9.10E-00	4.24E-07	1.53E-06	4.50E-06	1.33E-05	2.44E-05	4.92E-05	8.06E-05	1.25E-04	1.84E-04	2.54E-04
169991	3.74E-11	1.02E-10	8.60E-10	5.11E-09	2.79E-09	1.51E-08	8.25E-08	4.44E-07	2.31E-06	1.20E-05	6.21E-05	3.13E-04
19710	6.71E-14	2.79E-13	3.93E-12	2.90E-11	1.71E-10	7.70E-10	2.80E-09	9.00E-09	2.42E-08	5.94E-08	1.51E-07	3.44E-07
212650	2.04E-14	7.32E-14	1.15E-12	1.16E-11	7.87E-11	4.09E-10	1.70E-09	5.60E-09	1.75E-08	4.60E-08	1.09E-07	2.34E-07
317400	3.13E-21	2.02E-20	1.29E-18	6.00E-17	7.24E-16	8.65E-15	7.34E-14	4.73E-13	2.47E-12	1.04E-11	3.91E-11	1.24E-10
184604	3.07E-12	9.31E-12	1.04E-10	7.77E-10	4.22E-09	1.79E-08	6.21E-08	1.94E-07	6.74E-07	1.11E-06	2.39E-06	4.68E-06
204200	3.11E-13	1.08E-12	1.63E-11	1.95E-10	1.04E-09	2.13E-08	2.13E-08	2.22E-08	2.11E-07	5.92E-07	1.27E-06	2.71E-06
237563	1.50E-14	6.23E-14	1.20E-12	1.57E-11	1.30E-10	7.93E-10	3.70E-09	1.47E-08	4.07E-08	1.41E-07	3.62E-07	8.44E-07
279348	1.13E-15	4.71E-15	1.05E-13	1.39E-12	1.23E-11	7.90E-11	3.94E-10	1.60E-09	5.49E-09	1.62E-08	4.33E-08	1.04E-07
244848	1.10E-16	4.80E-15	1.10E-13	1.70E-12	1.61E-11	1.10E-10	5.79E-10	2.44E-09	8.72E-09	2.69E-08	7.39E-08	1.81E-07
258004	5.41E-16	2.40E-15	6.79E-14	1.07E-12	1.09E-11	7.90E-11	4.39E-10	1.94E-09	7.29E-09	2.34E-08	6.61E-08	1.60E-07
259032	6.60E-16	3.03E-15	8.43E-14	1.33E-12	1.37E-11	1.01E-10	5.62E-10	2.32E-09	9.44E-09	3.04E-08	8.62E-08	2.20E-07
284972	8.05E-14	2.76E-13	4.04E-12	3.75E-11	2.44E-10	1.22E-09	4.09E-09	1.63E-08	4.72E-08	1.21E-07	2.79E-07	5.91E-07
220096	7.17E-15	3.04E-14	6.04E-13	7.21E-12	5.83E-11	3.40E-10	1.63E-09	6.24E-09	2.03E-08	5.00E-08	1.47E-07	3.41E-07
253571	4.32E-14	1.95E-13	5.19E-12	7.93E-11	7.90E-10	5.64E-09	3.00E-08	1.32E-07	4.90E-07	1.50E-06	4.41E-06	1.11E-05
773930	6.84E-17	3.34E-16	1.14E-14	2.21E-13	2.64E-12	2.23E-11	1.48E-10	4.94E-10	2.44E-09	3.02E-09	3.02E-09	2.22E-08
226051	8.10E-16	3.10E-15	6.00E-14	6.92E-13	5.45E-12	3.17E-11	1.45E-10	5.76E-10	1.74E-09	4.99E-09	1.24E-08	2.63E-08
290291	7.30E-17	3.27E-16	8.44E-15	1.26E-13	1.23E-12	8.59E-12	4.62E-11	2.00E-10	7.27E-10	2.20E-09	6.32E-09	1.50E-08
279991	2.61E-18	1.35E-17	4.00E-16	9.61E-15	1.19E-13	1.02E-12	6.54E-12	3.31E-11	1.30E-10	4.07E-10	1.20E-09	3.13E-09
284000	4.13E-19	2.42E-18	1.13E-16	2.70E-15	4.14E-14	4.36E-13	3.04E-12	1.74E-11	8.07E-11	3.34E-10	1.20E-09	3.13E-09
281000	1.10E-17	5.00E-17	2.77E-15	4.72E-14	6.12E-13	5.97E-12	3.63E-11	1.89E-10	8.04E-10	3.23E-09	9.23E-09	2.59E-08
313000	1.62E-19	1.05E-18	6.13E-17	1.01E-15	3.15E-14	3.42E-13	2.99E-12	1.89E-11	9.57E-11	4.02E-10	1.45E-09	4.60E-09
340000	4.77E-21	3.63E-20	3.03E-18	1.20E-16	2.64E-15	3.01E-14	3.79E-13	2.01E-12	1.44E-11	7.04E-11	3.10E-10	1.11E-09
373000	6.03E-23	5.60E-22	7.10E-20	4.00E-18	1.23E-16	2.20E-15	2.04E-14	2.57E-13	1.79E-12	9.94E-12	4.64E-11	1.84E-10
343000	1.26E-23	1.24E-22	1.62E-20	1.15E-18	3.83E-17	7.64E-16	1.02E-14	9.80E-14	7.20E-13	4.21E-12	2.04E-11	8.42E-11
437000	4.12E-27	6.42E-26	1.91E-23	2.17E-21	1.19E-19	3.64E-18	7.03E-17	9.34E-16	9.11E-15	4.87E-14	4.10E-13	2.31E-12
594000	3.12E-33	7.61E-32	8.95E-29	2.85E-26	3.52E-24	2.82E-22	8.73E-21	2.07E-19	3.30E-18	4.62E-17	3.60E-16	2.69E-15

TABLE 53 (CONT.) 1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O⁺

LEVEL	TEMPERATURE (DEG K)										
	24000	26000	28000	30000	34000	40000	44000	48000	0	0	
6	6.11E-01	5.48E-01	4.97E-01	4.55E-01	4.19E-01	3.84E-01	3.55E-01	3.32E-01	0.	0.	0.
24817	3.04E-01	3.45E-01	3.72E-01	3.96E-01	4.02E-01	4.02E-01	3.97E-01	3.97E-01	0.	0.	0.
40447	6.10E-02	1.03E-01	1.21E-01	1.34E-01	1.47E-01	1.54E-01	1.56E-01	1.56E-01	0.	0.	0.
119933	1.38E-03	3.44E-03	6.19E-03	1.13E-02	1.88E-02	2.78E-02	3.82E-02	5.02E-02	0.	0.	0.
169991	7.29E-05	2.71E-04	1.13E-03	4.50E-03	1.62E-02	5.24E-02	1.63E-01	4.63E-01	0.	0.	0.
199710	2.45E-06	1.17E-05	3.75E-05	9.13E-05	1.64E-04	3.21E-04	5.02E-04	7.42E-04	0.	0.	0.
212650	2.67E-06	1.40E-05	5.25E-05	1.59E-04	3.80E-04	5.33E-04	6.80E-04	8.28E-04	0.	0.	0.
317400	5.00E-09	6.78E-08	4.73E-07	2.11E-06	6.92E-06	1.80E-05	3.93E-05	6.93E-05	0.	0.	0.
184404	3.81E-05	1.67E-04	5.09E-04	1.10E-03	2.29E-03	3.89E-03	5.95E-03	8.74E-03	0.	0.	0.
209208	2.92E-05	1.59E-04	5.52E-04	1.44E-03	3.05E-03	5.57E-03	9.04E-03	1.36E-02	0.	0.	0.
232543	1.21E-05	7.94E-05	3.22E-04	9.41E-04	2.26E-03	4.33E-03	7.50E-03	1.12E-02	0.	0.	0.
239248	1.61E-04	1.12E-05	4.74E-05	1.44E-04	3.44E-04	6.92E-04	1.22E-03	1.93E-03	0.	0.	0.
244540	3.09E-06	2.20E-05	1.01E-04	3.19E-04	7.83E-04	1.63E-03	2.93E-03	4.63E-03	0.	0.	0.
285006	3.14E-06	2.51E-05	1.17E-04	3.84E-04	9.79E-04	2.04E-03	3.63E-03	5.43E-03	0.	0.	0.
253932	4.18E-06	3.35E-05	1.57E-04	4.10E-04	1.33E-03	2.82E-03	5.21E-03	8.11E-03	0.	0.	0.
206972	6.24E-06	3.29E-05	1.13E-04	2.91E-04	6.12E-04	1.11E-03	1.79E-03	2.71E-03	0.	0.	0.
239098	6.74E-06	3.04E-05	1.21E-04	3.49E-04	8.05E-04	1.57E-03	2.71E-03	4.13E-03	0.	0.	0.
252571	2.03E-06	1.58E-05	7.27E-05	2.35E-04	5.94E-04	1.25E-03	2.29E-03	3.63E-03	0.	0.	0.
272930	1.92E-06	1.78E-05	9.31E-05	3.31E-04	9.14E-04	2.04E-03	3.90E-03	5.63E-03	0.	0.	0.
224451	3.79E-07	2.37E-06	9.24E-06	2.63E-05	5.99E-05	1.34E-04	2.63E-04	4.43E-04	0.	0.	0.
250251	2.80E-07	2.14E-06	9.50E-06	3.10E-05	7.75E-05	1.62E-04	2.94E-04	4.43E-04	0.	0.	0.
275951	9.99E-08	9.51E-07	5.60E-06	1.85E-05	5.12E-05	1.14E-04	2.27E-04	3.63E-04	0.	0.	0.
294000	6.11E-08	1.09E-06	4.40E-06	2.46E-05	7.07E-05	1.57E-04	2.90E-04	4.13E-04	0.	0.	0.
281000	6.64E-07	4.90E-06	3.44E-05	1.24E-04	3.84E-04	8.64E-04	1.74E-03	2.63E-03	0.	0.	0.
313000	1.73E-07	2.27E-06	1.54E-05	6.72E-05	2.16E-04	5.54E-04	1.25E-03	2.04E-03	0.	0.	0.
340000	5.80E-08	9.54E-07	7.70E-06	3.80E-05	1.30E-04	3.87E-04	8.90E-04	1.56E-03	0.	0.	0.
373000	1.43E-08	3.12E-07	3.11E-06	1.83E-05	7.45E-05	2.34E-04	5.94E-04	1.13E-03	0.	0.	0.
383000	7.34E-09	1.75E-07	1.04E-06	1.15E-05	4.90E-05	1.50E-04	4.13E-04	7.42E-04	0.	0.	0.
437000	3.52E-10	1.33E-08	2.00E-07	1.63E-06	8.59E-06	3.30E-05	9.99E-05	1.74E-04	0.	0.	0.
534000	1.43E-12	1.24E-10	3.44E-09	4.60E-08	3.58E-07	1.84E-06	7.44E-06	2.63E-05	0.	0.	0.

TABLE 54. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar*

STATE	LEVEL (CM-1)	STAT. WT.	TEMPERATURE (DEG K)									
			1200	1600	2000	2400	2800	3200	3600	4000	4400	
3s 3p ² 1P ₁	0	4	9.18E-01	8.79E-01	8.49E-01	8.23E-01	8.07E-01	7.92E-01	7.80E-01	7.70E-01	7.62E-01	
	1432	2	8.24E-02	1.21E-01	1.51E-01	1.75E-01	1.93E-01	2.08E-01	2.20E-01	2.30E-01	2.38E-01	
	108723	2	0.	0.	4.94E-35	2.04E-29	2.20E-25	2.35E-22	2.52E-20	2.70E-18	1.30E-16	
	3s 3p ² 1D	20	0.	0.	0.	1.33E-34	1.10E-29	5.36E-24	3.92E-23	7.70E-21	5.85E-19	
3s 3p ² 3d other	144319	70	0.	0.	0.	1.10E-37	3.14E-32	3.72E-28	5.47E-25	1.67E-22	2.22E-20	
	136028	18	0.	0.	0.	1.42E-35	1.60E-30	9.77E-27	8.00E-24	1.99E-21	1.65E-19	
	158023	54	0.	0.	0.	5.92E-35	3.93E-30	3.93E-27	3.14E-24	3.72E-22	3.72E-22	
	186693	90	0.	0.	0.	0.	6.25E-34	6.81E-32	6.81E-30	1.90E-28	5.24E-26	
(D) 3d	195547	126	0.	0.	0.	0.	1.42E-37	2.79E-33	4.83E-30	4.04E-27	4.04E-27	
	184082	50	0.	0.	0.	2.43E-34	9.03E-32	3.23E-28	2.25E-25	4.75E-23	4.75E-23	
	148754	10	0.	0.	0.	0.	1.20E-33	1.78E-29	2.95E-24	1.11E-23	1.43E-21	
	171831	30	0.	0.	0.	0.	1.64E-33	6.75E-30	8.30E-27	2.74E-24	2.74E-24	
(S) 3d	148657	50	0.	0.	0.	0.	0.	0.	7.14E-24	4.25E-21	4.21E-20	
	209029	70	0.	0.	0.	0.	0.	0.	7.14E-24	2.79E-22	2.75E-20	
	179728	10	0.	0.	0.	0.	0.	0.	1.24E-31	1.62E-28	5.70E-26	
	187309	2	0.	0.	0.	0.	1.86E-38	8.44E-34	3.54E-30	2.81E-27	6.82E-25	
3s 3p ² 3d	192095	6	0.	0.	0.	0.	0.	0.	5.32E-34	1.13E-30	5.99E-28	
	220000*	10	0.	0.	0.	0.	0.	0.	1.27E-34	8.26E-35	1.59E-31	
	229000*	14	0.	0.	0.	0.	0.	0.	0.	0.	1.11E-37	
	249000*	90	0.	0.	0.	0.	0.	0.	0.	0.	1.00E-37	
4f	249000*	18	0.	0.	0.	0.	0.	0.	0.	0.	1.49E-35	
	273000*	34	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	301000*	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	309000*	126	0.	0.	0.	0.	0.	0.	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 UNRESTARTED ENERGY LEVELS FROM MOORE (1949) AND HINNENACH (1958,1960)

TABLE 54 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar⁹⁺

LEVEL (CM ⁻¹)	TEMPERATURE (DEG K)											
	4800	5200	5600	6000	6400	6800	7200	7600	8000	8400	8800	9200
0												
1532	7.54E-01	7.49E-01	7.43E-01	7.38E-01	7.34E-01	7.30E-01	7.27E-01	7.24E-01	7.21E-01	7.19E-01	7.17E-01	7.14E-01
1532	2.48E-01	2.52E-01	2.57E-01	2.62E-01	2.66E-01	2.70E-01	2.74E-01	2.78E-01	2.82E-01	2.85E-01	2.87E-01	2.89E-01
106723	3.22E-14	2.78E-14	2.42E-14	2.12E-14	1.86E-14	1.62E-14	1.41E-14	1.22E-14	1.06E-14	9.28E-15	8.08E-15	7.04E-15
132776	2.14E-17	4.51E-15	8.14E-15	5.90E-14	4.27E-13	2.82E-12	1.80E-11	1.04E-10	6.46E-10	3.82E-09	2.24E-08	1.47E-08
146319	1.10E-18	3.42E-17	6.13E-16	7.47E-15	6.65E-14	4.58E-13	2.95E-12	1.88E-11	1.10E-10	6.47E-10	3.81E-09	2.24E-08
134028	6.62E-18	1.52E-16	2.82E-15	2.86E-14	1.73E-13	1.04E-12	5.12E-12	2.13E-11	7.70E-11	2.44E-10	7.07E-10	1.85E-09
159023	2.73E-20	1.04E-18	2.34E-17	3.48E-16	3.69E-15	2.97E-14	1.90E-13	9.95E-13	4.42E-12	1.71E-11	5.82E-11	1.78E-10
186693	8.44E-24	6.20E-22	2.46E-20	5.99E-19	7.70E-18	1.15E-16	1.03E-15	7.28E-15	4.25E-14	2.09E-13	8.93E-13	3.36E-12
195567	8.26E-23	7.49E-23	3.53E-21	9.99E-20	1.86E-18	2.66E-17	2.44E-16	1.90E-15	1.21E-14	6.61E-14	2.93E-13	1.17E-12
164482	4.12E-21	1.79E-19	4.54E-18	7.53E-17	8.76E-16	7.63E-15	5.23E-14	2.92E-13	1.34E-12	5.99E-12	2.00E-11	6.41E-11
140754	9.15E-20	2.49E-18	4.48E-17	5.95E-16	5.50E-15	3.91E-14	2.24E-13	1.07E-12	4.34E-12	1.55E-11	4.91E-11	1.41E-10
171031	4.25E-22	1.24E-20	3.74E-19	7.05E-18	9.21E-17	8.99E-16	6.67E-15	4.05E-14	2.05E-13	8.90E-13	3.33E-12	1.14E-11
196657	9.63E-26	9.53E-24	4.89E-22	1.49E-20	2.95E-19	4.11E-18	4.28E-17	3.44E-16	2.29E-15	1.26E-14	5.94E-14	2.44E-13
209029	8.12E-27	9.90E-25	6.17E-23	2.20E-21	5.02E-20	7.92E-19	8.26E-18	6.24E-17	5.95E-16	3.55E-15	1.80E-14	7.94E-14
179728	7.54E-24	4.73E-22	1.64E-20	3.54E-19	5.20E-18	5.57E-17	4.59E-16	3.03E-15	1.65E-14	7.67E-14	3.10E-13	1.11E-12
167369	6.24E-23	2.94E-21	7.97E-20	1.39E-18	1.70E-17	1.54E-16	1.10E-15	4.35E-15	3.08E-14	1.29E-13	4.72E-13	1.55E-12
192095	1.11E-23	9.27E-24	4.10E-22	1.09E-20	1.94E-19	2.54E-18	2.32E-17	1.74E-16	1.07E-15	5.54E-15	2.44E-14	9.62E-14
220006	6.33E-29	6.63E-27	5.28E-25	2.28E-23	8.06E-22	1.11E-20	1.44E-19	1.44E-18	1.18E-17	7.75E-17	4.24E-16	2.04E-15
228000	5.51E-30	1.03E-27	9.43E-26	4.85E-24	1.61E-22	2.84E-21	4.15E-20	4.82E-19	3.32E-18	2.14E-17	1.46E-16	8.17E-16
269000	1.63E-34	7.99E-32	1.61E-29	1.81E-27	9.00E-26	3.14E-24	7.30E-23	1.25E-21	1.59E-20	1.58E-19	1.58E-18	8.63E-18
249000	1.31E-32	4.04E-30	5.50E-28	3.89E-26	1.61E-24	4.32E-23	8.94E-22	1.19E-20	1.15E-19	9.71E-19	6.73E-18	3.94E-17
273000	2.92E-35	1.59E-32	3.64E-30	3.69E-28	2.20E-26	8.08E-25	1.99E-23	3.50E-22	4.63E-21	4.78E-20	3.96E-19	2.77E-18
301000	0.	1.14E-35	4.33E-33	7.47E-31	6.74E-29	3.60E-27	2.91E-25	2.91E-24	5.01E-23	6.58E-22	8.03E-21	5.79E-20
309000	0.	1.74E-36	7.77E-34	1.54E-31	1.57E-29	9.28E-28	3.49E-26	8.97E-25	1.66E-23	2.54E-22	2.59E-21	2.32E-20

TABLE 54 (CONT. 1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar*

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	9400	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
0	7.11E-01	7.11E-01	7.07E-01	7.04E-01	7.01E-01	6.99E-01	6.96E-01	6.95E-01	6.93E-01	6.91E-01	6.90E-01	6.88E-01
1432	2.87E-01	2.89E-01	2.93E-01	2.94E-01	2.94E-01	2.94E-01	2.94E-01	2.94E-01	2.94E-01	2.94E-01	2.94E-01	2.94E-01
108723	2.99E-08	5.72E-08	2.36E-07	7.67E-07	2.04E-06	4.90E-06	1.03E-05	1.77E-05	3.49E-05	5.81E-05	9.14E-05	1.30E-04
132474	6.49E-09	1.87E-08	1.05E-07	4.43E-07	1.50E-06	4.27E-06	1.04E-05	2.33E-05	4.64E-05	8.71E-05	1.53E-04	2.59E-04
146319	3.73E-09	8.95E-09	6.04E-08	2.94E-07	1.14E-06	3.60E-06	9.79E-06	2.35E-05	5.08E-05	1.01E-04	1.86E-04	3.23E-04
134028	4.49E-09	1.01E-08	5.94E-08	2.61E-07	9.13E-07	2.67E-06	6.75E-06	1.52E-05	3.12E-05	5.90E-05	1.04E-04	1.74E-04
184023	4.98E-10	1.20E-09	1.01E-08	5.61E-08	2.61E-07	8.25E-07	2.64E-06	6.32E-06	1.45E-05	3.05E-05	5.92E-05	1.07E-04
184453	1.13E-11	3.45E-11	3.95E-10	3.01E-09	1.48E-08	7.31E-08	2.62E-07	8.60E-07	2.14E-06	5.14E-06	1.12E-05	2.52E-05
195567	4.19E-12	1.35E-11	1.73E-10	1.43E-09	6.70E-09	1.41E-08	1.36E-07	5.04E-07	1.41E-06	3.54E-06	8.04E-06	1.80E-05
164082	1.86E-10	4.94E-10	4.22E-09	2.51E-08	1.14E-07	4.15E-07	1.27E-06	3.39E-06	8.60E-06	1.74E-05	3.46E-05	6.43E-05
148754	3.70E-10	9.01E-10	4.27E-09	3.16E-08	1.24E-07	4.01E-07	1.11E-06	2.69E-06	5.90E-06	1.19E-05	2.21E-05	3.87E-05
171831	3.50E-11	9.77E-11	4.19E-10	5.94E-09	2.89E-08	1.12E-07	3.63E-07	1.01E-06	2.51E-06	5.62E-06	1.16E-05	2.21E-05
194657	9.00E-13	2.97E-12	4.02E-11	3.53E-10	2.22E-09	1.07E-08	4.19E-08	1.30E-07	3.97E-07	1.01E-06	2.74E-06	4.99E-06
209079	3.04E-13	1.04E-12	1.65E-11	1.61E-10	1.10E-09	5.72E-09	2.39E-08	8.34E-08	2.52E-07	6.71E-07	1.61E-06	3.55E-06
179728	3.57E-12	1.03E-11	1.09E-10	7.70E-10	4.03E-09	1.64E-08	5.67E-08	1.64E-07	4.29E-07	9.97E-07	2.12E-06	4.17E-06
167309	4.59E-12	1.25E-11	1.11E-10	6.83E-10	3.10E-09	1.19E-08	3.73E-08	1.02E-07	2.49E-07	5.30E-07	1.00E-06	2.04E-06
192095	3.33E-13	1.04E-12	1.30E-11	1.05E-10	6.14E-10	2.80E-09	1.04E-08	3.28E-08	9.04E-08	2.22E-07	4.90E-07	1.03E-06
220000	6.53E-15	3.10E-14	5.63E-13	6.16E-12	4.67E-11	2.65E-10	1.19E-09	4.44E-09	1.42E-08	3.94E-08	1.00E-07	2.30E-07
228000	3.60E-15	1.61E-14	2.77E-13	3.30E-12	2.70E-11	1.63E-10	7.15E-10	3.03E-09	1.01E-08	2.94E-08	7.67E-08	1.91E-07
269000	4.97E-17	2.48E-16	8.34E-15	1.54E-13	1.03E-12	1.55E-11	9.74E-11	4.80E-10	2.02E-09	7.14E-09	2.21E-08	6.10E-08
249500	1.99E-16	8.83E-16	2.28E-14	3.43E-13	3.39E-12	2.42E-11	1.33E-10	5.90E-10	2.20E-09	7.04E-09	2.01E-08	5.13E-08
272000	1.64E-17	8.38E-17	2.94E-15	5.78E-14	7.14E-13	6.14E-12	3.99E-11	2.04E-10	6.44E-10	3.11E-09	9.73E-09	2.75E-08
301000	4.10E-19	2.79E-18	1.27E-16	3.34E-15	5.37E-14	5.70E-13	4.53E-12	2.75E-11	1.39E-10	5.51E-10	1.94E-09	6.11E-09
309000	1.73E-19	1.10E-18	6.23E-17	1.60E-15	3.10E-14	3.56E-13	2.95E-12	1.87E-11	9.30E-11	4.69E-10	1.50E-09	4.81E-09

TABLE 54 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR*

LEVEL	TEMPERATURE (DEG K)									
(CM-1)	24000	28000	32000	36000	40000	44000	48000	0	0	0
0										
1432	6.61E-01	4.47E-01	6.41E-01	5.92E-01	5.42E-01	4.74E-01	4.08E-01	0.	0.	0.
10923	3.12E-01	3.10E-01	3.01E-01	2.83E-01	2.57E-01	2.27E-01	1.92E-01	0.	0.	0.
132474	5.03E-04	1.23E-03	2.41E-03	3.88E-03	5.43E-03	6.60E-03	7.69E-03	0.	0.	0.
146319	1.21E-03	3.69E-03	6.30E-03	1.58E-02	2.31E-02	3.13E-02	3.84E-02	0.	0.	0.
146319	1.89E-03	6.34E-03	1.56E-02	3.03E-02	4.91E-02	6.96E-02	8.89E-02	0.	0.	0.
134028	8.81E-04	2.77E-03	6.37E-03	1.17E-02	1.93E-02	2.50E-02	3.11E-02	0.	0.	0.
134023	7.07E-04	2.60E-03	7.10E-03	1.44E-02	2.49E-02	3.66E-02	4.83E-02	0.	0.	0.
186893	2.11E-04	1.02E-03	3.28E-03	7.75E-03	1.48E-02	2.39E-02	3.51E-02	0.	0.	0.
193567	1.74E-04	9.09E-04	3.04E-03	7.61E-03	1.50E-02	2.50E-02	3.62E-02	0.	0.	0.
163082	4.58E-04	1.82E-03	5.01E-03	1.04E-02	1.85E-02	2.78E-02	3.73E-02	0.	0.	0.
148754	2.28E-04	7.99E-04	2.00E-03	3.92E-03	6.43E-03	9.18E-03	1.18E-02	0.	0.	0.
171831	1.72E-04	7.32E-04	2.12E-03	4.64E-03	8.41E-03	1.29E-02	1.77E-02	0.	0.	0.
199657	5.39E-05	2.92E-04	1.01E-03	2.56E-03	5.15E-03	8.68E-03	1.28E-02	0.	0.	0.
209029	4.30E-05	2.53E-04	9.30E-04	2.47E-03	5.15E-03	8.95E-03	1.34E-02	0.	0.	0.
179728	3.54E-05	1.63E-04	4.94E-04	1.14E-03	2.11E-03	3.33E-03	4.64E-03	0.	0.	0.
167309	1.50E-05	6.14E-05	1.75E-04	3.74E-04	6.60E-04	1.00E-03	1.35E-03	0.	0.	0.
192095	1.02E-05	5.17E-05	1.71E-04	4.16E-04	8.11E-04	1.33E-03	1.92E-03	0.	0.	0.
220000	3.19E-04	2.05E-05	8.11E-05	2.21E-04	4.94E-04	8.93E-04	1.39E-03	0.	0.	0.
228000	2.74E-04	1.91E-05	7.92E-05	2.31E-04	5.20E-04	9.42E-04	1.54E-03	0.	0.	0.
269000	1.52E-04	1.49E-05	6.04E-05	2.09E-04	7.65E-04	1.62E-03	2.09E-03	0.	0.	0.
349000	1.01E-04	8.33E-06	3.94E-05	1.28E-04	3.14E-04	6.23E-04	1.05E-03	0.	0.	0.
373000	7.17E-07	7.26E-06	4.04E-05	1.48E-04	3.98E-04	8.52E-04	1.54E-03	0.	0.	0.
391000	2.23E-07	2.89E-06	1.91E-05	6.04E-05	2.42E-04	5.89E-04	1.11E-03	0.	0.	0.
399000	1.93E-07	2.67E-06	1.87E-05	6.17E-05	2.54E-04	6.13E-04	1.22E-03	0.	0.	0.

TABLE 55. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C **

STATE	LEVEL (CM-1)	STAT.	TEMPERATURE (DEG F)												
			3200	3400	4000	4400	4800	5200	5400	6000	6400				
2s	0	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	52419	9	5.23E-10	7.17E-09	2.82E-08	3.24E-07	1.35E-06	4.52E-06	1.27E-05	3.12E-05	6.86E-05	1.34E-04	2.61E-04	4.82E-04	8.82E-04
	102378	3	3.04E-20	5.10E-18	2.02E-16	8.67E-15	1.91E-13	1.58E-12	1.13E-11	6.12E-11	3.02E-10	1.42E-09	6.34E-09	2.82E-08	1.21E-07
	137854	7	1.30E-24	1.25E-23	3.02E-21	2.72E-19	1.15E-17	2.74E-16	4.14E-15	4.34E-14	4.34E-13	4.34E-12	4.34E-11	4.34E-10	4.34E-09
	145875	5	1.64E-28	2.39E-25	6.13E-23	9.61E-21	5.12E-19	1.40E-17	2.64E-16	4.82E-15	8.82E-14	1.61E-13	2.91E-12	5.23E-11	9.52E-10
2p	182520	1	2.29E-36	2.09E-32	3.07E-29	1.20E-26	1.74E-24	1.17E-22	4.31E-21	9.01E-20	1.51E-18	2.41E-17	3.82E-16	5.82E-15	8.82E-14
	240452	4	0.	0.	1.10E-37	2.89E-34	2.00E-31	5.11E-29	9.92E-27	1.84E-25	3.44E-23	6.44E-22	1.21E-20	2.21E-19	
	259901	12	0.	0.	0.	1.64E-36	1.90E-33	7.37E-31	1.34E-28	2.44E-26	4.44E-24	8.14E-23	1.51E-21	2.71E-20	
	271031	20	0.	0.	0.	0.	0.72E-35	0.	9.82E-32	1.34E-29	1.84E-27	2.54E-25	3.54E-23	4.94E-21	
3s	310023	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	318950	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	322129	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	322104	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3p	300714	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	326459	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	318950	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	322129	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3d	37058	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	376970**	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	383400**	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	387400**	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4f	48.0302	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	48.1046	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	48.1046	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	48.1046	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	

**INCLUDES ESTIMATED SUBLEVELS
MONITORED ENERGY LEVELS FROM MOORE (1949) AND BOCKASTEN (1955)

TABLE 55 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C ++

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	6800	7200	7600	8000	8400	8800	9200	9600	10000	11000	12000	13000
0	1.00E-00	1.00E-00	1.00E-00	9.99E-01	9.99E-01	9.99E-01	9.99E-01	9.97E-01	9.95E-01	9.91E-01	9.83E-01	9.73E-01
52519	1.37E-04	2.54E-04	4.51E-04	7.24E-04	1.13E-03	1.70E-03	2.47E-03	3.47E-03	4.75E-03	6.39E-03	8.52E-03	1.12E-02
102378	1.17E-09	3.91E-09	1.15E-08	3.07E-08	7.26E-08	1.61E-07	3.33E-07	6.48E-07	1.20E-06	2.30E-06	4.34E-06	8.06E-06
137454	2.11E-12	1.04E-11	4.50E-11	1.65E-10	5.34E-10	1.56E-09	4.14E-09	1.01E-08	2.31E-08	5.39E-08	1.24E-07	2.71E-07
149875	1.97E-13	1.09E-12	5.07E-12	2.07E-11	7.03E-11	2.19E-10	6.17E-10	1.59E-09	3.82E-09	8.94E-09	2.09E-08	4.74E-08
182320	1.69E-17	1.44E-16	9.85E-16	5.54E-15	2.64E-14	1.09E-13	4.00E-13	1.31E-12	3.92E-12	1.24E-11	3.00E-10	7.44E-09
240452	3.21E-22	5.42E-21	6.80E-20	6.62E-19	5.19E-18	3.37E-17	1.84E-16	8.91E-16	3.74E-15	1.59E-14	6.19E-14	2.00E-13
259501	1.71E-23	3.61E-22	5.54E-21	6.44E-20	5.94E-19	4.49E-18	2.84E-17	1.54E-16	7.20E-16	2.18E-15	6.43E-15	1.93E-14
271631	2.19E-24	5.24E-23	9.29E-22	1.21E-20	1.24E-19	1.03E-18	7.09E-18	4.14E-17	2.12E-16	7.34E-16	1.41E-15	3.71E-15
310023	1.30E-28	4.97E-27	1.50E-25	2.44E-24	3.44E-23	3.87E-22	3.50E-21	2.64E-20	1.69E-19	9.71E-18	2.83E-17	4.80E-17
318950	5.90E-29	2.50E-27	7.17E-26	1.47E-24	2.29E-23	2.70E-22	2.40E-21	2.00E-20	1.40E-19	9.04E-18	2.91E-17	5.44E-17
322129	5.01E-29	2.21E-27	6.55E-26	1.38E-24	2.10E-23	2.67E-22	2.44E-21	2.15E-20	1.43E-19	9.94E-18	3.31E-17	6.40E-17
322184	6.94E-29	3.04E-27	9.07E-26	1.91E-24	3.02E-23	3.71E-22	3.44E-21	2.90E-20	2.04E-19	1.30E-17	4.61E-16	8.90E-15
308714	5.14E-29	1.94E-27	4.93E-25	9.25E-24	1.30E-22	1.64E-21	1.29E-20	9.43E-20	6.12E-19	3.44E-17	9.93E-16	1.60E-15
326459	3.61E-29	1.60E-27	5.19E-26	1.14E-24	1.87E-23	2.37E-22	2.41E-21	2.02E-20	1.43E-19	8.82E-17	3.53E-16	7.13E-15
337058	6.39E-30	3.24E-28	1.14E-26	2.09E-25	5.07E-24	6.99E-23	7.44E-22	6.80E-21	5.10E-20	4.24E-18	1.64E-16	3.40E-15
374970	2.75E-34	2.31E-32	1.32E-30	4.11E-28	1.09E-27	2.70E-26	2.90E-25	3.47E-24	3.23E-23	4.40E-21	2.37E-19	8.07E-18
383400	2.11E-34	1.92E-32	1.04E-30	4.13E-28	1.02E-27	2.15E-26	2.37E-25	3.04E-24	3.04E-23	3.84E-21	2.04E-19	1.31E-17
387400	1.51E-34	1.94E-32	8.52E-31	3.34E-29	9.12E-28	1.94E-26	2.52E-25	3.44E-24	3.71E-23	5.84E-21	3.97E-19	1.90E-17
388000	1.60E-34	1.70E-32	1.00E-30	4.13E-28	1.13E-27	2.36E-26	3.72E-25	4.60E-24	4.74E-23	7.30E-21	5.17E-19	1.63E-17

TABLE 55 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C ++

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	9.40E-01	9.44E-01	9.25E-01	9.03E-01	8.79E-01	8.54E-01	8.27E-01	7.15E-01	6.12E-01	5.24E-01	4.52E-01	3.94E-01
82419	3.87E-02	5.57E-02	7.47E-02	9.62E-02	1.20E-01	1.44E-01	1.71E-01	2.78E-01	3.72E-01	4.57E-01	5.03E-01	5.38E-01
102370	7.77E-03	1.54E-04	2.79E-04	4.88E-04	7.37E-04	1.10E-03	1.57E-03	4.68E-03	9.53E-03	1.57E-02	2.27E-02	2.97E-02
137454	6.33E-06	1.60E-05	3.57E-05	7.21E-05	1.34E-04	2.32E-04	3.70E-04	1.70E-03	4.71E-03	9.70E-03	1.67E-02	2.53E-02
145875	1.40E-08	3.96E-06	9.29E-06	1.90E-05	3.79E-05	6.80E-05	1.14E-04	5.69E-04	1.79E-03	3.71E-03	6.64E-03	1.04E-02
182520	6.86E-09	2.35E-08	6.89E-08	1.77E-07	4.94E-07	8.40E-07	1.64E-06	1.27E-05	5.17E-05	1.43E-04	3.07E-04	5.55E-04
240452	7.12E-11	3.44E-10	1.51E-09	5.24E-09	1.58E-08	4.22E-08	1.02E-07	1.57E-06	1.85E-05	4.23E-05	1.21E-04	2.74E-04
259901	5.02E-11	1.75E-10	6.14E-10	3.14E-09	1.03E-08	2.99E-08	7.74E-08	1.56E-06	1.10E-05	5.30E-05	1.70E-04	4.18E-04
271431	1.44E-11	9.13E-11	4.54E-10	1.87E-09	6.34E-09	1.99E-08	5.39E-08	1.21E-06	1.04E-05	5.24E-05	1.74E-04	4.50E-04
310023	5.59E-14	4.40E-13	2.89E-12	1.45E-11	6.00E-11	2.10E-10	6.01E-10	2.43E-08	2.95E-07	1.95E-06	7.52E-06	2.24E-05
318950	6.70E-14	5.86E-13	3.80E-12	2.05E-11	8.94E-11	3.33E-10	1.00E-09	4.24E-08	5.69E-07	3.72E-06	1.50E-05	4.92E-05
322189	8.05E-14	7.20E-13	4.80E-12	2.61E-11	1.05E-10	4.35E-10	1.33E-09	5.87E-08	7.92E-07	5.37E-06	2.32E-05	7.31E-05
322184	1.12E-13	1.00E-12	6.77E-12	3.64E-11	1.61E-10	6.06E-10	1.99E-09	9.19E-08	1.11E-06	7.30E-06	3.24E-05	1.02E-04
308714	1.92E-13	1.56E-12	9.79E-12	4.87E-11	2.03E-10	7.21E-10	2.25E-09	7.87E-08	9.47E-07	5.89E-06	2.30E-05	7.12E-05
326439	9.29E-14	8.58E-13	5.93E-12	3.26E-11	1.47E-10	5.64E-10	1.80E-09	6.13E-08	1.14E-06	7.96E-06	3.51E-05	1.13E-04
337058	5.21E-14	5.10E-13	3.81E-12	2.21E-11	1.05E-10	4.21E-10	1.64E-09	7.19E-08	1.10E-06	8.24E-06	3.03E-05	1.28E-04
376970	1.72E-14	2.24E-13	2.11E-12	1.51E-11	6.55E-11	2.61E-10	1.04E-09	2.84E-08	2.84E-07	1.59E-06	6.11E-06	2.11E-05
347400	2.67E-14	3.63E-13	3.54E-12	2.63E-11	1.55E-10	7.54E-10	3.13E-09	1.24E-08	6.12E-08	3.44E-07	3.44E-06	1.45E-05
347400	2.95E-14	4.12E-13	4.12E-12	3.12E-11	1.80E-10	9.31E-10	3.91E-09	8.30E-08	8.54E-07	5.12E-06	2.10E-05	7.10E-05
308000	3.08E-14	5.45E-13	5.45E-12	4.16E-11	2.51E-10	1.25E-09	5.24E-09	4.75E-08	1.13E-07	1.17E-06	7.00E-06	2.60E-05

TABLE 55 (CONT.) 1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C ++

LEVEL (CF-1)	TEMPERATURE (DEG K)									
	44000	48000	60000	80000	100000	200000	400000	600000	1000000	1800000
0	3.47E-01	3.08E-01	2.29E-01	1.40E-01	9.11E-02	2.10E-02	7.44E-03	5.11E-03	3.75E-03	0.
52619	5.62E-01	5.76E-01	5.79E-01	4.92E-01	3.84E-01	1.29E-01	5.52E-02	4.04E-02	3.13E-02	0.
102378	3.64E-02	4.29E-02	5.76E-02	6.78E-02	6.20E-02	3.01E-02	1.54E-02	1.20E-02	9.72E-03	0.
137654	3.49E-02	4.50E-02	7.66E-02	1.07E-01	1.13E-01	7.02E-02	4.00E-02	3.31E-02	2.77E-02	0.
145675	1.47E-02	1.94E-02	3.39E-02	5.09E-02	5.50E-02	3.37E-02	2.20E-02	1.60E-02	1.52E-02	0.
182328	8.87E-04	1.30E-03	2.81E-03	5.24E-03	6.59E-03	5.64E-03	3.84E-03	3.20E-03	2.89E-03	0.
244452	5.34E-04	9.12E-04	2.00E-03	7.43E-03	1.15E-02	1.69E-02	1.24E-02	1.12E-02	1.06E-02	0.
259501	8.59E-04	1.52E-03	5.33E-03	1.98E-02	2.61E-02	3.89E-02	3.71E-02	3.29E-02	3.10E-02	0.
271631	9.63E-04	1.79E-03	6.44E-03	2.13E-02	3.64E-02	5.94E-02	5.60E-02	5.33E-02	5.09E-02	0.
310023	5.49E-05	1.13E-04	5.29E-04	2.13E-03	4.21E-03	9.81E-03	9.76E-03	9.72E-03	9.61E-03	0.
318958	1.22E-04	2.69E-04	1.23E-03	5.43E-03	1.11E-02	2.93E-02	2.89E-02	2.89E-02	2.89E-02	0.
32129	1.96E-04	3.94E-04	1.98E-03	8.52E-03	1.77E-02	4.13E-02	4.67E-02	4.72E-02	4.72E-02	0.
323184	2.54E-04	3.51E-04	2.76E-03	1.20E-02	2.47E-02	5.78E-02	6.54E-02	6.61E-02	6.61E-02	0.
308716	1.72E-04	3.54E-04	1.64E-03	6.53E-03	1.29E-02	2.73E-02	2.94E-02	2.93E-02	2.93E-02	0.
328659	2.89E-04	6.23E-04	3.21E-03	1.42E-02	2.90E-02	7.20E-02	8.20E-02	8.41E-02	8.42E-02	0.
337958	3.40E-04	7.54E-04	4.19E-03	1.94E-02	4.28E-02	1.11E-01	1.33E-01	1.37E-01	1.39E-01	0.
376970	1.64E-05	6.57E-05	3.10E-04	1.91E-03	1.67E-02	2.26E-02	2.40E-02	2.40E-02	2.40E-02	0.
383400	4.48E-05	1.13E-04	8.19E-04	5.11E-03	1.32E-02	4.78E-02	6.79E-02	7.34E-02	7.82E-02	0.
307400	6.54E-03	1.67E-04	1.24E-03	7.92E-03	2.07E-02	7.75E-02	1.11E-01	1.21E-01	1.29E-01	0.
300000	9.00E-05	2.32E-04	1.71E-03	1.10E-02	2.68E-02	1.06E-01	1.59E-01	1.69E-01	1.80E-01	0.

TABLE 54. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ni⁺⁺

STATE	LEVEL (CM ⁻¹)	STAT. WT.	TEMPERATURE (DEG K)															
			3200	3400	4000	4400	4800	5200	5400	6000	6400							
2s 2p 1s 2s 2s 2p 3s 3p 4s 4p 5s 5p	0	2	3.51E-01	3.47E-01	3.42E-01	3.44E-01	3.44E-01	3.42E-01	3.43E-01	3.42E-01	3.42E-01	3.42E-01	3.42E-01	3.42E-01	3.42E-01	3.42E-01	3.42E-01	3.42E-01
	0.0216	4	6.99E-01	6.51E-01	6.53E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01	6.54E-01
	57203	12	1.37E-11	2.37E-08	2.35E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08	7.22E-08
	101027	10	3.29E-20	5.09E-18	2.07E-16	7.70E-15	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13	1.22E-13
	131004	2	9.21E-27	6.37E-24	1.19E-21	8.61E-20	3.65E-18	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17	6.28E-17
2p 3s 3s 3p 3d 4s 4p 4d 5p 5d	145950	18	1.33E-29	6.07E-26	1.45E-23	1.95E-21	1.04E-19	2.90E-18	5.34E-17	4.40E-16	5.70E-15	5.70E-15	5.70E-15	5.70E-15	5.70E-15	5.70E-15	5.70E-15	5.70E-15
	184202	6	2.34E-37	2.43E-33	4.50E-30	2.05E-27	3.32E-25	2.40E-23	9.00E-22	2.41E-20	3.92E-19	3.92E-19	3.92E-19	3.92E-19	3.92E-19	3.92E-19	3.92E-19	
	203079	10	0.	9.64E-36	3.20E-32	2.50E-29	6.31E-27	6.00E-25	3.70E-23	1.22E-21	2.64E-20	2.64E-20	2.64E-20	2.64E-20	2.64E-20	2.64E-20	2.64E-20	
	230407	6	0.	0.	1.84E-36	1.97E-33	1.82E-30	2.12E-28	2.01E-26	1.60E-24	3.20E-23	3.20E-23	3.20E-23	3.20E-23	3.20E-23	3.20E-23	3.20E-23	
	221902	2	0.	0.	9.34E-36	1.25E-32	5.34E-30	8.79E-28	6.90E-26	3.67E-24	8.60E-23	8.60E-23	8.60E-23	8.60E-23	8.60E-23	8.60E-23	8.60E-23	
3p 3d 3d 4s 4s 4p 4p 4d 5p 5d	245490	6	0.	0.	0.	1.33E-35	1.07E-32	3.69E-30	3.97E-28	2.64E-26	1.04E-24	1.04E-24	1.04E-24	1.04E-24	1.04E-24	1.04E-24	1.04E-24	
	267242	10	0.	0.	0.	1.97E-38	2.00E-35	1.33E-32	2.60E-30	2.50E-28	1.30E-26	1.30E-26	1.30E-26	1.30E-26	1.30E-26	1.30E-26	1.30E-26	
	301060	2	0.	0.	0.	0.	0.	2.27E-37	8.71E-35	1.51E-32	1.37E-30	1.37E-30	1.37E-30	1.37E-30	1.37E-30	1.37E-30		
	311700	6	0.	0.	0.	0.	0.	3.61E-34	1.71E-31	3.54E-28	3.70E-26	3.70E-26	3.70E-26	3.70E-26	3.70E-26	3.70E-26		
	319230	24	0.	0.	0.	0.	0.	0.	9.84E-36	2.33E-33	2.70E-31	2.70E-31	2.70E-31	2.70E-31	2.70E-31	2.70E-31		
2p 3p 3p 3d 3d 4s 4s 4p 4p 4d 5p 5d	370039	18	0.	0.	0.	0.	0.	6.28E-38	1.90E-35	3.40E-32	1.50E-30	1.50E-30	1.50E-30	1.50E-30	1.50E-30	1.50E-30	1.50E-30	
	316449	24	0.	0.	0.	0.	0.	0.	1.52E-37	7.90E-35	1.44E-32	1.44E-32	1.44E-32	1.44E-32	1.44E-32	1.44E-32		
	334443	90	0.	0.	0.	0.	0.	0.	0.	6.	0.	0.	0.	0.	0.	0.		
	364130**	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
	365000**	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p 3p 3p 3d 3d 4s 4s 4p 4p 4d 5p 5d	447000**	96	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
	432000**	162	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
	442700**	208	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
	444000**	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
	506100**	160	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
5s 5d 6s 6d	492000**	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
	552000**	32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		

**INCLUDES ESTIMATED SUBLEVELS
NONSTARRED ENERGY LEVELS FROM MOORE (1949)

TABLE 54 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N⁺⁺

LEVEL (CN-1)	TEMPERATURE (DEG K)														
	6800	7000	7200	7400	7600	7800	8000	8400	8800	9200	9400	10000	11000	12000	13000
0	3.42E-01	3.41E-01	3.41E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.39E-01	3.39E-01	3.39E-01	3.39E-01	3.37E-01	3.34E-01
174	6.58E-01	6.59E-01	6.59E-01	6.60E-01	6.60E-01	6.60E-01	6.60E-01	6.60E-01	6.60E-01	6.60E-01	6.61E-01	6.61E-01	6.61E-01	6.61E-01	6.60E-01
57283	1.12E-05	2.19E-05	3.90E-05	6.85E-05	1.12E-04	1.74E-04	2.33E-04	2.95E-04	3.58E-04	4.24E-04	4.96E-04	5.74E-04	6.58E-04	7.48E-04	8.44E-04
101027	8.89E-10	2.91E-09	8.42E-09	2.19E-08	5.15E-08	1.14E-07	2.33E-07	4.50E-07	8.24E-07	1.50E-06	2.71E-06	4.96E-06	9.24E-06	1.70E-05	3.14E-05
131004	3.13E-13	1.46E-12	5.77E-12	1.99E-11	6.11E-11	1.69E-10	4.29E-10	1.01E-09	2.21E-09	4.95E-09	1.08E-08	2.35E-08	5.24E-08	1.16E-07	2.54E-07
145990	3.97E-14	1.02E-13	3.02E-13	8.07E-13	2.12E-12	5.41E-12	1.24E-11	2.72E-11	5.71E-11	1.19E-10	2.42E-10	5.19E-10	1.09E-09	2.34E-09	5.04E-09
164402	4.67E-18	4.19E-17	2.90E-16	1.75E-15	8.64E-15	3.70E-14	1.39E-13	4.70E-13	1.64E-12	5.64E-12	1.94E-11	6.64E-11	2.24E-10	7.64E-10	2.54E-09
203078	3.73E-19	4.05E-18	3.42E-17	2.34E-16	1.30E-15	6.44E-15	2.73E-14	1.02E-13	3.64E-13	1.30E-12	4.64E-12	1.64E-11	5.84E-11	2.04E-10	7.24E-10
250407	6.89E-22	1.16E-20	1.03E-19	7.40E-18	4.94E-17	2.80E-16	1.62E-15	8.07E-15	4.07E-14	2.07E-13	1.02E-12	5.07E-12	2.57E-11	1.27E-10	6.27E-10
271302	1.58E-21	2.12E-20	2.17E-19	1.76E-18	1.17E-17	6.54E-17	3.48E-16	1.54E-15	5.83E-15	2.07E-14	7.48E-14	2.64E-13	9.48E-13	3.34E-12	1.24E-11
245690	2.72E-23	4.87E-22	8.07E-21	6.99E-20	5.40E-19	3.65E-18	2.09E-17	1.04E-16	4.22E-16	1.62E-15	5.84E-15	2.04E-14	7.14E-14	2.44E-13	8.44E-13
267242	4.74E-25	1.09E-23	1.82E-22	2.28E-21	2.24E-20	1.79E-19	1.20E-18	6.83E-18	3.39E-17	1.11E-16	3.64E-16	1.11E-15	3.44E-15	1.04E-14	3.14E-14
301046	7.35E-29	2.33E-27	5.99E-26	1.03E-24	1.34E-23	1.42E-22	1.20E-21	8.54E-21	5.20E-20	2.44E-19	1.04E-18	4.44E-18	1.84E-17	7.04E-17	2.74E-16
311708	2.33E-29	9.08E-28	2.41E-26	4.60E-25	6.63E-24	7.50E-23	6.87E-22	5.23E-21	3.39E-20	1.99E-19	1.04E-18	5.04E-18	2.44E-17	1.14E-16	5.14E-16
319238	1.69E-29	8.07E-28	2.31E-26	4.75E-25	7.30E-24	8.75E-23	6.44E-22	4.77E-21	3.50E-20	2.44E-19	1.64E-18	9.44E-18	5.04E-17	2.64E-16	1.34E-15
290839	5.78E-27	1.74E-25	3.74E-24	5.88E-23	7.09E-22	6.82E-21	5.39E-20	3.50E-19	2.05E-18	1.14E-17	5.84E-17	2.84E-16	1.34E-15	6.04E-15	2.74E-14
314449	1.17E-28	4.73E-27	1.20E-25	2.53E-24	3.73E-23	4.31E-22	4.03E-21	3.12E-20	2.05E-19	1.24E-18	6.84E-18	3.64E-17	1.94E-16	1.04E-15	5.44E-15
334445	2.85E-30	1.45E-28	4.84E-26	1.14E-25	2.82E-24	2.73E-23	2.04E-22	1.44E-21	1.02E-20	6.84E-20	4.64E-19	3.04E-18	1.94E-17	1.24E-16	7.84E-16
344130	2.48E-34	2.28E-32	1.28E-30	4.84E-29	1.30E-27	2.59E-26	3.97E-25	4.85E-24	4.85E-23	4.85E-22	4.85E-21	4.85E-20	4.85E-19	4.85E-18	4.85E-17
305000	3.84E-35	3.58E-33	2.04E-31	7.80E-30	2.11E-28	4.22E-27	6.50E-26	7.90E-25	8.02E-24	8.02E-23	8.02E-22	8.02E-21	8.02E-20	8.02E-19	8.02E-18
447900	0.	0.	2.64E-34	1.82E-34	8.40E-33	2.79E-31	6.50E-30	1.21E-28	1.77E-27	6.10E-25	1.64E-23	4.04E-21	9.84E-19	2.34E-17	5.84E-15
432000	0.	0.	8.91E-37	6.37E-35	4.99E-33	5.82E-31	5.82E-30	1.25E-28	2.09E-27	2.70E-26	3.44E-25	4.24E-24	5.04E-23	5.84E-22	6.64E-21
492700	0.	0.	0.	0.	1.09E-35	5.84E-34	1.64E-32	4.14E-31	7.97E-30	5.00E-28	1.07E-26	1.87E-24	3.27E-22	5.67E-20	9.07E-18
546000	0.	0.	0.	0.	3.20E-34	2.23E-34	1.02E-32	3.20E-31	7.79E-30	1.42E-28	2.60E-26	4.84E-24	8.64E-22	1.54E-20	2.74E-18
506100	0.	0.	0.	0.	6.12E-37	3.15E-35	1.15E-33	3.10E-32	6.44E-31	1.20E-29	2.34E-27	4.44E-25	8.04E-23	1.44E-21	2.64E-19
492000	0.	0.	0.	0.	7.71E-37	3.55E-35	1.17E-33	2.89E-32	5.21E-31	9.41E-29	1.64E-27	2.84E-25	4.84E-23	7.84E-21	1.24E-19
952000	0.	0.	0.	0.	0.	0.	1.75E-37	6.30E-36	1.75E-34	2.30E-32	3.04E-30	3.94E-28	5.04E-26	6.44E-24	8.04E-22

TABLE 5A (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N⁺⁺

LEVEL	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	3.35E-01	3.34E-01	3.33E-01	3.31E-01	3.29E-01	3.27E-01	3.25E-01	3.14E-01	3.00E-01	2.84E-01	2.70E-01	2.54E-01
174	4.59E-01	4.57E-01	4.55E-01	4.53E-01	4.50E-01	4.48E-01	4.45E-01	4.21E-01	4.05E-01	3.87E-01	3.71E-01	3.57E-01
57283	5.59E-03	5.24E-03	4.84E-03	4.40E-03	4.00E-03	3.64E-03	3.32E-03	2.80E-03	2.40E-03	2.00E-03	1.64E-03	1.34E-03
101037	5.19E-05	1.03E-04	1.89E-04	3.20E-04	5.12E-04	7.79E-04	1.13E-03	1.68E-03	2.40E-03	3.34E-03	4.52E-03	5.97E-03
131004	4.77E-07	1.17E-06	2.95E-06	5.87E-06	9.33E-06	1.41E-05	2.02E-05	1.22E-04	3.50E-04	7.90E-04	1.44E-03	2.29E-03
145950	3.04E-07	6.34E-07	1.99E-06	4.29E-06	6.48E-06	1.54E-05	2.60E-05	1.49E-04	4.99E-04	1.21E-03	2.37E-03	4.02E-03
164402	3.04E-09	1.11E-08	3.37E-08	9.32E-08	2.16E-07	4.71E-07	9.40E-07	1.60E-06	4.07E-06	1.29E-05	3.09E-05	4.14E-05
203479	1.45E-09	5.80E-09	1.95E-08	5.40E-08	1.47E-07	3.43E-07	7.35E-07	1.50E-06	4.01E-06	1.20E-05	3.04E-05	4.50E-05
230407	5.24E-11	2.52E-10	1.00E-09	3.30E-09	9.92E-09	2.60E-08	6.17E-08	9.44E-07	4.50E-06	2.71E-05	8.12E-05	1.93E-04
221302	4.43E-11	2.02E-10	7.54E-10	2.43E-09	6.89E-09	1.73E-08	3.96E-08	5.43E-07	3.44E-06	1.34E-05	3.90E-05	8.91E-05
245490	1.09E-11	5.84E-11	2.54E-10	9.24E-10	2.82E-09	8.17E-09	2.04E-08	3.70E-07	2.96E-06	1.37E-05	4.41E-05	1.11E-04
267252	1.98E-12	1.23E-11	6.09E-11	2.49E-10	8.70E-10	2.60E-09	7.27E-09	1.73E-07	1.43E-06	6.32E-06	3.11E-05	8.54E-05
301048	1.22E-14	9.38E-14	5.00E-13	2.64E-12	1.46E-11	4.10E-11	1.27E-10	4.52E-09	3.73E-08	3.71E-07	3.61E-06	5.87E-06
311708	1.23E-14	1.04E-13	6.70E-13	3.47E-12	1.49E-11	5.51E-11	1.70E-10	7.22E-09	9.97E-08	7.02E-07	3.15E-06	1.69E-05
319238	2.27E-14	2.02E-13	1.34E-12	7.33E-12	3.27E-11	1.25E-10	4.14E-10	1.64E-08	2.71E-07	2.60E-06	9.30E-06	3.14E-05
290839	3.15E-13	2.31E-12	1.31E-11	6.00E-11	2.30E-10	8.02E-10	2.40E-09	7.57E-08	6.74E-07	5.30E-06	2.18E-05	6.30E-05
314449	6.34E-14	7.10E-13	4.71E-12	2.47E-11	1.00E-10	4.03E-10	1.32E-09	5.51E-08	7.79E-07	5.50E-06	2.54E-05	6.44E-05
334445	1.70E-14	1.70E-13	1.30E-12	7.09E-12	3.44E-11	1.49E-10	5.20E-10	2.77E-08	4.65E-07	3.79E-06	1.91E-05	6.62E-05
364130	3.64E-16	4.70E-15	4.70E-14	3.62E-13	2.19E-12	1.10E-11	4.67E-11	4.51E-09	1.14E-07	1.30E-06	8.37E-06	3.47E-05
395000	5.93E-17	8.27E-16	8.20E-15	6.31E-14	3.64E-13	1.93E-12	8.22E-12	8.02E-10	2.00E-08	2.34E-07	1.52E-06	6.67E-06
447500	1.71E-19	3.64E-18	5.33E-17	5.64E-16	4.62E-15	3.01E-14	1.63E-13	3.37E-11	1.49E-09	2.50E-08	2.22E-07	1.25E-06
432000	1.42E-18	2.73E-17	3.63E-16	3.55E-15	2.69E-14	1.65E-13	8.39E-13	1.44E-10	5.54E-09	8.40E-08	6.92E-07	3.60E-06
492700	4.94E-21	1.44E-19	2.75E-18	3.70E-17	3.74E-16	2.95E-15	1.89E-14	6.72E-12	4.37E-10	6.04E-09	1.09E-07	7.39E-07
446000	1.87E-19	3.94E-18	5.72E-17	6.03E-16	4.08E-15	3.17E-14	1.70E-13	3.45E-11	1.51E-09	2.51E-08	2.21E-07	1.24E-06
504100	6.92E-22	2.21E-20	4.57E-19	6.42E-18	7.11E-17	5.94E-16	4.01E-15	1.67E-12	1.22E-10	2.99E-09	3.55E-08	2.54E-07
492000	3.32E-22	9.42E-21	1.83E-19	2.46E-18	2.47E-17	1.94E-16	1.24E-15	4.38E-13	2.63E-11	6.34E-10	7.02E-09	4.74E-08
552000	1.24E-24	5.41E-23	1.47E-21	2.72E-20	3.63E-19	3.40E-18	2.95E-17	2.13E-14	2.31E-12	7.60E-11	1.13E-09	9.73E-09

TABLE 56 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ni⁺⁺

LEVEL (CM ⁻¹)	TEMPERATURE (DEG K)									
	44000	48000	60000	80000	100000	200000	400000	600000	1000000	0
0	2.41E-01	2.27E-01	1.40E-01	1.39E-01	9.09E-02	2.04E-02	5.80E-03	3.44E-03	2.48E-03	0.
174	6.79E-01	4.52E-01	3.79E-01	2.70E-01	1.99E-01	6.07E-02	1.14E-02	7.28E-03	6.94E-03	0.
57283	2.42E-01	2.49E-01	2.89E-01	2.92E-01	2.89E-01	8.09E-02	2.83E-02	1.91E-02	1.37E-02	0.
101827	4.43E-02	5.50E-02	1.13E-01	1.14E-01	1.44E-01	4.92E-02	2.02E-02	1.43E-02	1.07E-02	0.
131894	3.32E-03	4.40E-03	8.23E-03	1.32E-02	1.49E-02	7.94E-03	3.62E-03	2.66E-03	2.00E-03	0.
149950	6.11E-03	8.50E-03	1.73E-02	3.01E-02	3.60E-02	2.14E-02	1.03E-02	7.78E-03	6.04E-03	0.
164402	1.07E-03	1.60E-03	4.32E-03	9.69E-03	1.33E-02	1.04E-02	5.92E-03	4.66E-03	3.80E-03	0.
203079	1.57E-03	2.50E-03	7.31E-03	1.81E-02	2.64E-02	2.34E-02	1.40E-02	1.12E-02	9.27E-03	0.
230407	3.84E-04	6.82E-04	2.28E-03	6.63E-03	1.07E-02	1.16E-02	7.59E-03	6.29E-03	5.35E-03	0.
221302	1.77E-04	2.98E-04	9.44E-04	2.60E-03	4.04E-03	4.14E-03	2.62E-03	2.14E-03	1.81E-03	0.
243690	2.34E-04	4.32E-04	1.58E-03	5.04E-03	8.57E-03	1.04E-02	7.19E-03	6.04E-03	5.23E-03	0.
267242	1.92E-04	3.70E-04	1.37E-03	5.78E-03	1.05E-02	1.49E-02	1.11E-02	9.60E-03	8.43E-03	0.
301088	1.25E-05	2.73E-05	1.39E-04	6.26E-04	1.29E-03	2.33E-03	1.96E-03	1.77E-03	1.61E-03	0.
311708	2.71E-05	5.97E-05	3.24E-04	1.54E-03	3.11E-03	6.49E-03	5.67E-03	5.10E-03	4.76E-03	0.
319234	8.44E-05	1.90E-04	1.00E-03	5.37E-03	1.19E-02	2.44E-02	2.21E-02	2.53E-02	1.80E-02	0.
290839	1.61E-04	3.35E-04	1.60E-03	6.71E-03	1.44E-02	2.24E-02	1.83E-02	1.63E-02	1.47E-02	0.
314449	2.23E-04	4.95E-04	2.73E-03	1.32E-02	2.87E-02	5.73E-02	5.05E-02	4.63E-02	4.24E-02	0.
334445	1.93E-04	4.53E-04	2.82E-03	1.53E-02	3.58E-02	8.24E-02	7.04E-02	7.33E-02	6.91E-02	0.
304130	1.27E-04	3.27E-04	2.74E-03	2.01E-02	5.61E-02	1.85E-01	2.10E-01	2.09E-01	2.04E-01	0.
305600	2.22E-05	5.97E-05	5.03E-04	3.70E-03	1.04E-02	3.45E-02	3.92E-02	3.91E-02	3.85E-02	0.
447500	5.10E-06	1.63E-05	2.00E-04	2.14E-03	7.52E-03	3.91E-02	5.57E-02	5.98E-02	6.28E-02	0.
432000	1.43E-05	4.30E-05	4.89E-04	4.77E-03	1.59E-02	7.37E-02	9.93E-02	1.05E-01	1.08E-01	0.
492700	3.49E-06	1.26E-05	2.03E-04	2.83E-03	1.10E-02	6.47E-02	1.42E-01	1.61E-01	1.76E-01	0.
444000	5.03E-06	1.60E-05	1.94E-04	2.04E-03	7.20E-03	3.70E-02	5.29E-02	5.63E-02	5.88E-02	0.
506100	1.25E-06	4.60E-06	8.17E-05	1.24E-03	5.39E-03	4.27E-02	7.51E-02	8.66E-02	9.59E-02	0.
402000	2.23E-07	8.05E-07	1.29E-05	1.80E-04	7.43E-04	5.32E-03	8.69E-03	1.01E-02	1.10E-02	0.
552000	5.58E-08	2.37E-07	5.43E-06	1.09E-04	5.57E-04	6.14E-03	1.27E-02	1.55E-02	1.80E-02	0.

TABLE 57. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O⁺⁺

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K)									
				3200	3600	4000	4400	4800	5200	5600	6000	6400	
2s ² 2p ³	0	0.0161	1	1.42E-01	1.21E-01	1.20E-01	1.19E-01	1.18E-01	1.17E-01	1.17E-01	1.16E-01	1.16E-01	
	1	0.0380	3	3.47E-01	3.44E-01	3.44E-01	3.43E-01	3.42E-01	3.41E-01	3.40E-01	3.39E-01	3.38E-01	
	2	2.5136	5	6.70E-05	1.82E-04	4.07E-04	7.64E-04	1.35E-03	2.15E-03	3.19E-03	4.50E-03	6.07E-03	
	3	4.3187	5	4.50E-10	3.85E-09	2.14E-08	8.74E-08	2.82E-07	7.59E-07	1.77E-06	3.70E-06	7.03E-06	
	4	60312	5	1.02E-12	2.05E-11	2.27E-10	1.62E-09	8.31E-09	3.32E-08	1.09E-07	3.04E-07	7.48E-07	
2s ² 2p ²	1	14.8828	15	6.63E-24	2.64E-21	3.17E-19	1.60E-17	4.10E-16	6.82E-15	7.07E-14	5.50E-13	3.51E-12	
	2	142384	9	1.73E-28	2.10E-25	6.16E-23	6.43E-21	3.10E-19	8.21E-18	1.34E-16	1.59E-15	1.51E-14	
	3	197087	3	0.	2.24E-35	5.95E-32	3.65E-29	7.81E-27	7.31E-25	5.91E-23	1.04E-21	1.99E-20	
	4	187049	5	1.82E-37	2.06E-33	3.61E-30	1.62E-27	2.64E-25	1.94E-23	7.89E-22	1.93E-20	3.16E-19	
	5	210459	5	25.0929	25.0929	4.77E-34	4.61E-31	1.42E-28	1.81E-26	1.19E-24	4.21E-23	9.83E-22	
2p ⁴	1	283866	9	0.	0.	0.	0.	1.10E-37	8.19E-35	2.23E-32	2.04E-30	2.01E-28	
	2	298289	5	0.	0.	0.	0.	0.	0.	3.04E-34	5.01E-32	4.34E-30	
	3	343303	1	0.	0.	0.	0.	0.	0.	0.	4.09E-37	3.51E-35	
	4	268899	12	0.	0.	0.	9.24E-39	1.40E-35	6.84E-33	1.39E-30	1.30E-28	7.74E-27	
	5	297966	36	0.	0.	0.	0.	0.	6.42E-34	2.34E-33	3.90E-31	3.37E-29	
2s 2p ³ (P)	1	327307	60	0.	0.	0.	0.	0.	0.	2.11E-34	5.71E-34	7.68E-32	
	2	357400	12	0.	0.	0.	0.	0.	0.	0.	8.59E-34	1.77E-35	
	3	388411	36	0.	0.	0.	0.	0.	0.	0.	0.	4.47E-34	
	4	379062	60	0.	0.	0.	0.	0.	0.	0.	0.	6.72E-37	
	5	380000*	84	0.	0.	0.	0.	0.	0.	0.	0.	7.70E-37	
2s 2p ³ (D)	1	343043	24	0.	0.	0.	0.	0.	0.	0.	5.25E-34	8.93E-34	
	2	370399	72	0.	0.	0.	0.	0.	0.	0.	0.	5.72E-34	
	3	398904	120	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4	448160**	384	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	5	398700**	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p ⁵	1	425060**	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	2	454030**	100	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	3	503000*	320	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4	491000*	108	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	5	557000*	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p ⁴ (S)	1	475000*	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	2	540000*	64	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	3	542000*	72	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4	607000*	128	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	5	544000*	180	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p ³ (P)	1	631000*	120	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	2	600000*	108	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	3	665000*	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4	82.4474	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	5	82.4474	192	0.	0.	0.	0.	0.	0.	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
MONSTARRED ENERGY LEVELS FROM MOORE (1949) AND BOMEN (1955)

TABLE 57 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O++

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	6000	7200	7400	8000	8400	8800	9200	9600	10000	11000	12000	13000
0	1.13E-01	1.15E-01	1.14E-01	1.13E-01	1.13E-01	1.13E-01	1.12E-01	1.12E-01	1.11E-01	1.10E-01	1.08E-01	1.07E-01
113	3.37E-01	3.35E-01	3.34E-01	3.34E-01	3.34E-01	3.34E-01	3.30E-01	3.28E-01	3.24E-01	3.24E-01	3.21E-01	3.17E-01
304	5.60E-01	5.39E-01	5.38E-01	5.38E-01	5.37E-01	5.35E-01	5.34E-01	5.33E-01	5.31E-01	5.27E-01	5.23E-01	5.17E-01
20274	7.89E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03
43187	1.24E-05	2.05E-05	3.21E-05	4.81E-05	6.93E-05	9.64E-05	1.31E-04	1.72E-04	2.22E-04	3.06E-04	4.17E-04	5.68E-04
40312	1.45E-06	3.34E-06	6.28E-06	1.11E-05	1.84E-05	2.84E-05	4.19E-05	6.42E-05	9.44E-05	2.04E-04	3.92E-04	6.74E-04
120041	1.61E-11	6.37E-11	2.31E-10	7.17E-10	1.99E-09	5.06E-09	1.49E-08	2.57E-08	5.25E-08	2.50E-07	9.13E-07	2.73E-06
162304	8.55E-14	4.94E-13	2.02E-12	7.73E-12	2.61E-11	7.66E-11	2.19E-10	5.42E-10	1.27E-09	6.06E-09	1.38E-08	1.38E-07
197017	2.48E-19	2.70E-18	1.44E-17	1.30E-16	4.41E-16	3.82E-15	4.97E-14	4.97E-14	1.61E-13	1.70E-12	1.70E-11	1.08E-10
107049	3.73E-18	3.35E-17	2.99E-16	1.39E-15	6.89E-15	2.94E-14	1.11E-13	3.73E-13	1.30E-11	3.06E-11	9.44E-11	5.47E-10
210459	1.50E-20	1.87E-19	1.70E-18	1.24E-17	7.50E-17	3.84E-16	1.71E-15	3.65E-15	2.35E-14	3.65E-13	3.57E-12	2.46E-11
283046	6.53E-27	2.39E-25	6.71E-24	6.80E-23	7.79E-22	7.07E-21	5.29E-20	3.35E-19	1.63E-18	7.40E-17	1.61E-15	2.19E-14
290209	7.24E-28	7.43E-27	1.70E-25	2.81E-24	3.66E-23	3.71E-22	3.08E-21	2.14E-20	1.27E-19	6.23E-18	1.59E-16	2.46E-15
343303	1.27E-33	1.04E-31	6.79E-30	1.74E-28	3.28E-27	4.73E-26	5.40E-25	5.03E-24	3.92E-23	3.44E-21	1.44E-19	3.30E-18
268899	2.70E-25	6.34E-24	1.07E-22	1.33E-21	1.35E-20	1.09E-19	7.33E-19	4.21E-18	2.10E-17	6.99E-16	1.24E-14	1.53E-13
207940	1.73E-27	5.71E-26	2.10E-25	2.10E-23	2.78E-22	2.82E-21	2.33E-20	1.62E-19	9.62E-19	4.40E-17	1.19E-15	1.84E-14
327307	5.70E-30	2.70E-28	6.41E-27	1.64E-25	3.05E-24	3.40E-23	3.95E-22	3.32E-21	2.35E-20	1.40E-18	5.68E-17	1.19E-15
257400	1.99E-33	1.32E-31	5.45E-30	1.64E-28	3.52E-27	5.64E-26	7.15E-25	7.30E-24	6.30E-23	4.56E-21	3.19E-19	6.51E-18
388411	9.81E-34	4.37E-32	2.11E-30	6.86E-29	1.60E-27	2.81E-26	3.01E-25	4.21E-24	3.51E-23	4.44E-21	2.54E-19	7.55E-18
379062	1.02E-34	6.72E-33	4.67E-31	1.68E-29	4.50E-28	6.20E-27	1.21E-25	1.42E-24	1.37E-23	1.93E-21	1.19E-19	3.67E-18
380000	1.17E-34	1.01E-32	5.40E-31	1.99E-29	5.13E-28	9.84E-27	1.44E-25	1.73E-24	1.68E-23	2.39E-21	1.49E-19	4.88E-18
343043	6.30E-32	4.64E-30	1.71E-28	4.30E-27	8.23E-26	1.38E-24	1.33E-23	1.26E-22	9.78E-21	6.50E-20	3.57E-18	8.54E-17
370399	7.63E-34	5.91E-32	2.89E-30	9.59E-29	2.20E-27	4.05E-26	5.62E-25	6.25E-24	5.73E-23	7.19E-21	4.03E-19	1.21E-17
398904	3.05E-36	3.31E-34	2.10E-32	9.49E-31	2.88E-29	6.39E-28	1.08E-26	1.49E-24	2.08E-22	2.20E-20	6.61E-19	2.20E-17
448140	0.	6.23E-36	4.32E-34	2.00E-32	6.31E-31	1.57E-29	2.89E-28	2.89E-28	4.23E-27	1.47E-24	1.92E-22	1.18E-20
398700	5.31E-37	5.74E-35	3.70E-33	1.64E-31	4.97E-30	1.10E-28	1.07E-27	2.50E-26	2.71E-25	4.93E-23	3.74E-21	1.47E-19
425000	0.	6.98E-37	7.61E-35	4.34E-33	1.65E-31	4.49E-30	9.14E-29	1.45E-27	1.85E-26	4.74E-24	4.82E-22	2.40E-20
454000	0.	5.37E-37	5.37E-37	3.93E-35	1.91E-33	6.52E-32	1.44E-30	3.14E-29	4.75E-28	1.76E-25	2.44E-23	1.61E-21
503000	0.	0.	0.	0.	0.	6.92E-35	2.44E-33	6.49E-32	1.32E-30	9.30E-28	2.23E-25	2.20E-23
491000	0.	0.	0.	0.	0.	3.65E-36	1.64E-34	1.32E-31	2.50E-30	1.52E-27	3.17E-25	2.90E-23
597000	0.	0.	0.	0.	0.	3.17E-37	1.19E-35	3.34E-34	6.32E-31	4.93E-28	2.04E-26	3.47E-24
475000	0.	0.	0.	0.	0.	2.24E-37	1.09E-35	7.56E-34	4.11E-32	4.84E-30	4.11E-27	7.20E-25
540000	0.	0.	0.	0.	0.	0.	1.51E-36	5.07E-34	1.30E-33	1.48E-30	5.28E-28	7.59E-26
542000	0.	0.	0.	0.	0.	0.	1.24E-36	4.23E-35	1.04E-33	1.29E-30	6.67E-28	6.04E-26
607000	0.	0.	0.	0.	0.	0.	0.	0.	1.87E-37	4.64E-34	3.43E-31	9.14E-29
544000	0.	0.	0.	0.	0.	0.	0.	0.	2.90E-36	8.58E-35	1.59E-31	6.57E-29
631000	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.03E-35	4.82E-32	1.60E-29
600000	0.	0.	0.	0.	0.	0.	0.	0.	3.87E-37	9.78E-34	6.69E-31	1.67E-28
645000	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.53E-37	4.90E-34	2.23E-31

TABLE 57 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTROMAGNETIC POPULATIONS OF Ga+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	1.04E-01	1.05E-01	1.03E-01	1.02E-01	1.01E-01	9.97E-02	9.84E-02	9.44E-02	9.04E-02	8.71E-02	8.34E-02	8.07E-02
113	3.14E-01	3.10E-01	3.03E-01	3.03E-01	3.00E-01	2.97E-01	2.91E-01	2.81E-01	2.70E-01	2.60E-01	2.48E-01	2.41E-01
304	3.12E-01	5.07E-01	5.02E-01	4.97E-01	4.92E-01	4.87E-01	4.82E-01	4.63E-01	4.44E-01	4.29E-01	4.14E-01	3.99E-01
20274	6.58E-02	7.47E-02	8.94E-02	9.17E-02	9.92E-02	1.07E-01	1.15E-01	1.40E-01	1.60E-01	1.78E-01	1.94E-01	1.99E-01
43187	1.25E-03	1.66E-03	2.12E-03	2.44E-03	3.20E-03	3.74E-03	4.41E-03	7.09E-03	9.85E-03	1.29E-02	1.49E-02	1.71E-02
60312	1.08E-02	1.41E-03	2.28E-03	3.10E-03	4.04E-03	5.18E-03	6.43E-03	1.27E-02	2.04E-02	2.89E-02	3.76E-02	4.61E-02
120041	6.9E-04	1.57E-05	3.18E-05	5.92E-05	1.03E-04	1.83E-04	3.04E-04	5.04E-04	8.04E-04	1.19E-03	1.74E-03	2.41E-03
142384	4.20E-07	1.10E-06	2.84E-06	5.45E-06	1.04E-05	1.84E-05	3.14E-05	5.27E-05	8.72E-05	1.39E-04	2.04E-04	2.83E-04
197087	5.07E-10	1.93E-09	6.22E-09	1.74E-08	4.34E-08	9.87E-08	2.04E-07	4.07E-07	7.68E-07	1.36E-06	2.37E-06	3.85E-06
197089	2.37E-09	8.44E-09	2.58E-08	6.80E-08	1.62E-07	3.52E-07	7.68E-07	1.57E-06	3.03E-06	5.49E-06	9.49E-06	1.48E-05
210459	1.28E-10	5.36E-10	1.87E-09	5.63E-09	1.50E-08	3.58E-08	7.86E-08	1.59E-07	3.44E-07	7.03E-07	1.39E-06	2.52E-06
283846	2.04E-13	1.41E-12	7.62E-12	3.32E-11	1.27E-10	4.14E-10	1.20E-09	3.46E-08	9.72E-07	2.49E-06	6.92E-06	1.78E-05
298269	2.57E-14	1.94E-13	1.16E-12	5.94E-12	2.23E-11	7.72E-11	2.34E-10	6.09E-09	1.98E-08	6.52E-07	2.70E-06	8.83E-06
343303	5.03E-17	5.22E-16	4.04E-15	2.46E-14	1.22E-13	5.11E-13	1.89E-12	1.09E-11	1.98E-09	1.72E-08	1.21E-07	3.50E-07
248899	1.24E-12	7.88E-12	3.91E-11	1.60E-10	5.60E-10	1.72E-09	4.70E-09	1.13E-07	1.08E-06	5.64E-06	2.14E-05	6.10E-05
297946	1.91E-13	1.44E-12	8.58E-12	4.10E-11	1.65E-10	5.70E-10	1.74E-09	5.94E-08	1.81E-07	4.76E-06	2.01E-05	6.43E-05
337307	1.56E-14	1.45E-13	1.02E-12	5.71E-12	2.63E-11	1.03E-10	3.52E-10	1.70E-08	2.70E-07	2.12E-06	1.05E-05	3.73E-05
337400	1.42E-16	1.62E-15	1.37E-14	8.94E-14	4.74E-13	2.11E-12	8.07E-12	5.61E-10	1.15E-08	1.10E-07	6.29E-07	2.53E-06
348411	1.37E-16	1.69E-15	1.32E-14	1.04E-13	5.90E-13	2.79E-12	1.10E-11	8.70E-10	1.94E-08	2.01E-07	1.22E-06	5.10E-06
379042	7.65E-17	1.02E-15	9.74E-15	7.15E-14	4.20E-13	2.04E-12	8.49E-12	7.65E-10	1.89E-08	2.07E-07	1.32E-06	5.80E-06
380000	9.73E-17	1.30E-15	1.25E-14	9.24E-14	5.45E-13	2.67E-12	1.11E-11	1.01E-09	2.52E-08	2.78E-07	1.79E-06	7.82E-06
383043	1.24E-15	1.29E-14	9.93E-14	6.03E-13	2.99E-12	1.25E-11	4.53E-11	2.64E-09	8.01E-08	4.10E-07	2.21E-06	9.44E-06
379399	2.24E-16	2.80E-15	2.55E-14	1.78E-13	1.01E-12	4.79E-12	1.90E-11	1.34E-09	3.33E-08	3.27E-07	2.28E-06	9.51E-06
389904	1.99E-17	3.03E-16	3.27E-15	2.67E-14	1.72E-13	9.18E-13	4.07E-12	1.36E-09	1.36E-08	1.70E-07	1.20E-06	5.88E-06
448160	4.04E-19	8.60E-18	1.25E-16	1.32E-15	1.07E-14	6.99E-14	3.77E-13	7.78E-11	3.87E-09	5.93E-08	5.33E-07	3.07E-06
398700	3.39E-18	5.55E-17	5.55E-16	4.32E-15	2.91E-14	1.54E-13	6.80E-13	7.66E-11	2.89E-09	2.85E-08	2.61E-07	9.54E-07
625000	6.82E-19	1.24E-17	1.56E-16	1.46E-15	6.31E-14	3.12E-13	1.44E-12	4.87E-11	1.78E-09	2.82E-08	2.11E-07	1.11E-06
454000	5.77E-20	1.20E-18	1.92E-17	2.10E-16	1.79E-15	1.17E-14	6.45E-14	1.43E-11	4.69E-10	1.19E-08	1.06E-07	6.53E-07
503000	1.20E-21	3.72E-20	7.50E-19	1.06E-17	1.12E-16	9.21E-16	6.08E-15	2.42E-12	1.73E-10	4.20E-09	4.90E-08	3.50E-07
491000	1.39E-21	3.97E-20	7.45E-19	9.88E-18	9.83E-17	7.67E-16	4.84E-15	1.60E-12	1.00E-10	2.43E-09	2.72E-08	1.84E-07
537000	2.80E-24	1.24E-22	3.50E-21	6.59E-20	8.94E-19	9.20E-18	7.50E-17	5.71E-14	4.44E-12	2.22E-10	3.44E-09	3.06E-08
478000	2.40E-21	6.14E-20	1.05E-18	1.28E-17	1.10E-16	6.50E-16	5.13E-15	1.44E-12	8.19E-11	1.64E-09	1.72E-08	1.10E-07
540000	5.34E-24	2.14E-23	5.38E-22	5.38E-21	1.11E-18	8.49E-17	5.27E-16	1.59E-14	5.16E-12	1.59E-10	2.27E-09	1.89E-08
542000	4.91E-24	1.99E-23	5.04E-21	8.79E-20	1.11E-18	1.07E-17	5.24E-16	5.23E-12	1.64E-10	2.34E-09	1.90E-08	1.90E-07
607000	1.10E-26	6.92E-25	2.60E-23	6.38E-22	1.03E-20	1.37E-18	1.90E-15	3.30E-13	1.54E-11	3.12E-10	3.40E-09	3.40E-08
546000	1.04E-24	4.97E-23	1.44E-21	2.88E-20	4.08E-19	4.34E-18	3.68E-17	3.12E-14	3.81E-12	1.39E-10	2.24E-09	2.09E-08
631900	2.32E-27	1.73E-25	7.52E-24	2.09E-22	4.02E-21	5.65E-20	6.09E-19	1.13E-15	2.40E-13	1.37E-11	2.99E-10	3.54E-09
600000	1.90E-26	1.14E-24	4.12E-23	9.74E-22	1.62E-21	1.98E-19	1.91E-18	1.41E-15	3.99E-13	1.81E-11	3.44E-10	3.94E-09
645000	4.24E-29	3.98E-27	2.12E-25	7.07E-24	1.59E-22	2.58E-21	3.17E-20	6.80E-17	2.51E-14	1.73E-12	4.61E-11	6.34E-10

TABLE 57 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O++

LEVEL (CM-1)	TEMPERATURE (DEG F)										
	44000	48000	50000	60000	80000	100000	200000	400000	600000	1000000	0
0	7.77E-02	7.49E-02	6.69E-02	5.38E-02	4.05E-02	8.12E-03	1.11E-03	7.04E-04	0.	0.	0.
113	3.32E-01	2.24E-01	2.00E-01	1.61E-01	1.21E-01	4.52E-02	5.75E-03	3.21E-03	0.	0.	0.
306	3.83E-01	3.71E-01	3.52E-01	3.32E-01	2.92E-01	4.50E-02	5.58E-03	3.21E-03	0.	0.	0.
20274	2.00E-01	2.04E-01	2.06E-01	1.87E-01	1.51E-01	3.51E-02	5.29E-03	3.43E-03	0.	0.	0.
43187	1.89E-02	2.05E-02	2.37E-02	2.47E-02	2.18E-02	5.64E-03	1.00E-03	6.63E-04	0.	0.	0.
60312	5.41E-02	6.14E-02	7.07E-02	9.09E-02	8.50E-02	2.63E-02	7.72E-03	4.81E-03	3.24E-03	0.	0.
120641	2.30E-02	3.09E-02	5.64E-02	9.31E-02	1.08E-01	5.12E-02	1.87E-02	8.91E-03	0.	0.	0.
142384	6.65E-03	9.56E-03	1.96E-02	3.74E-02	4.70E-02	7.62E-02	1.03E-02	5.18E-03	0.	0.	0.
197087	3.11E-04	6.11E-04	1.78E-03	6.64E-03	7.13E-03	5.90E-03	2.08E-03	1.59E-03	0.	0.	0.
187049	8.58E-04	1.39E-03	3.77E-03	1.78E-02	1.37E-02	1.00E-02	4.89E-03	3.59E-03	2.70E-03	0.	0.
210459	2.39E-04	4.09E-04	1.29E-03	3.64E-03	5.80E-03	5.36E-03	2.70E-03	2.01E-03	1.54E-03	0.	0.
283644	6.51E-05	1.34E-04	6.64E-04	2.93E-03	6.93E-03	9.99E-03	6.22E-03	5.04E-03	4.22E-03	0.	0.
298239	2.24E-05	4.90E-05	2.62E-04	1.24E-03	2.77E-03	4.75E-03	3.28E-03	2.72E-03	2.30E-03	0.	0.
343303	1.04E-04	2.54E-04	1.78E-03	1.12E-02	2.90E-02	6.87E-02	5.58E-02	4.88E-02	4.31E-02	0.	0.
248699	1.42E-04	2.84E-04	1.27E-03	5.12E-03	1.01E-02	1.41E-02	8.75E-03	7.06E-03	5.75E-03	0.	0.
297964	1.64E-04	3.54E-04	1.90E-03	9.11E-03	2.00E-02	3.43E-02	2.34E-02	1.94E-02	1.65E-02	0.	0.
327407	1.84E-04	2.64E-04	1.57E-03	8.94E-03	2.19E-02	4.43E-02	3.54E-02	3.04E-02	2.64E-02	0.	0.
357400	7.84E-04	2.00E-03	1.52E-03	1.04E-03	2.84E-03	7.55E-03	6.34E-03	5.64E-03	5.04E-03	0.	0.
348411	1.84E-05	4.31E-05	3.31E-04	2.57E-03	7.27E-03	2.07E-02	1.83E-02	1.64E-02	1.50E-02	0.	0.
379062	1.93E-05	5.22E-05	4.93E-04	3.33E-03	1.04E-02	3.19E-02	2.94E-02	2.69E-02	2.45E-02	0.	0.
365900	2.62E-05	7.11E-05	6.20E-04	4.84E-03	1.44E-02	4.43E-02	4.11E-02	3.75E-02	3.43E-02	0.	0.
259643	2.51E-05	6.19E-05	4.29E-04	2.70E-03	6.90E-03	1.65E-02	1.34E-02	1.17E-02	1.03E-02	0.	0.
370399	3.07E-05	8.13E-05	6.88E-04	4.92E-03	1.41E-02	4.07E-02	3.64E-02	3.29E-02	2.96E-02	0.	0.
369904	2.02E-05	5.77E-05	5.62E-04	4.94E-03	1.56E-02	5.33E-02	5.48E-02	5.12E-02	4.77E-02	0.	0.
448160	1.29E-05	4.21E-05	5.52E-04	6.52E-03	2.46E-02	1.24E-01	1.47E-01	1.44E-01	1.42E-01	0.	0.
398700	3.39E-04	9.67E-04	9.42E-03	8.27E-03	2.61E-03	9.23E-03	9.14E-03	8.54E-03	7.95E-03	0.	0.
425000	4.30E-04	1.32E-03	1.50E-03	1.59E-03	5.37E-03	2.49E-02	2.49E-02	2.41E-02	2.30E-02	0.	0.
424000	2.77E-04	9.21E-04	1.29E-04	1.53E-03	5.90E-03	3.10E-02	3.75E-02	3.74E-02	3.67E-02	0.	0.
503000	1.79E-04	6.79E-04	1.24E-04	2.03E-03	9.32E-03	6.87E-02	1.09E-01	1.04E-01	1.19E-01	0.	0.
491000	8.94E-07	3.28E-06	5.54E-05	8.49E-04	3.74E-03	2.57E-02	3.54E-02	3.70E-02	3.74E-02	0.	0.
557000	1.64E-07	8.07E-07	2.03E-05	4.60E-04	2.57E-03	2.84E-02	4.94E-02	5.61E-02	6.09E-02	0.	0.
475000	5.03E-07	1.77E-06	2.72E-05	3.77E-04	1.57E-03	9.59E-03	1.29E-02	1.28E-02	1.28E-02	0.	0.
540800	1.12E-07	4.54E-07	1.02E-05	2.08E-04	1.10E-03	1.07E-02	1.76E-02	1.95E-02	2.08E-02	0.	0.
542000	1.12E-07	4.74E-07	1.09E-05	2.24E-04	1.20E-03	1.18E-02	1.94E-02	2.18E-02	2.33E-02	0.	0.
687000	2.39E-08	1.20E-07	4.09E-06	1.23E-04	8.35E-04	1.32E-02	2.78E-02	3.32E-02	3.77E-02	0.	0.
544000	1.20E-07	5.70E-07	1.53E-05	3.47E-04	2.12E-03	2.49E-02	4.51E-02	5.15E-02	5.62E-02	0.	0.
631000	2.72E-08	1.94E-07	5.74E-06	2.03E-04	1.48E-03	2.78E-02	6.34E-02	7.82E-02	9.11E-02	0.	0.
689000	2.53E-08	1.29E-07	4.07E-06	1.20E-04	7.79E-04	1.17E-02	2.39E-02	2.85E-02	3.21E-02	0.	0.
645000	5.37E-09	3.17E-08	1.52E-06	6.60E-05	5.44E-04	1.50E-02	3.31E-02	4.33E-02	5.20E-02	0.	0.

TABLE 3A. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR⁺⁺

STATE	LEVEL (CM-1)	LEVEL (eV)	STAT. WT.	TEMPERATURE (DEG K)									
				3200	3400	4600	4400	4900	5200	5400	6000	6400	
3 ² 3 ¹ 3 ⁰	0	0.1379	5	6.83E-01	6.69E-01	6.37E-01	6.44E-01	6.37E-01	6.28E-01	6.20E-01	6.13E-01	6.04E-01	
	1112	0.1379	3	2.48E-01	2.57E-01	2.64E-01	2.70E-01	2.74E-01	2.77E-01	2.80E-01	2.82E-01	2.83E-01	
	1270	0.1947	1	6.74E-02	7.14E-02	7.57E-02	7.74E-02	7.94E-02	8.14E-02	8.34E-02	8.51E-02	8.51E-02	
	14010	1.1370	5	1.25E-03	2.7E-03	6.24E-03	6.43E-03	6.58E-03	1.30E-02	1.70E-02	2.13E-02	2.60E-02	
	33266	4.1244	1	6.36E-08	2.25E-07	8.55E-07	2.44E-06	5.59E-06	1.24E-05	2.41E-05	4.21E-05	6.85E-05	
3 ² 3 ⁰	114503	14.1714	9	5.89E-23	1.74E-20	1.65E-18	6.81E-17	1.51E-15	2.08E-14	1.97E-13	1.80E-12	7.55E-12	
	144023	17.8561	3	3.08E-29	4.03E-26	1.25E-23	1.37E-21	4.82E-20	1.86E-18	3.17E-17	3.69E-16	3.15E-15	
	169413	18.5244	40	3.69E-29	6.23E-26	2.40E-23	3.13E-21	1.81E-19	5.94E-18	1.04E-16	1.59E-15	1.25E-14	
	176739	21.9123	8	3.34E-35	2.25E-31	2.58E-28	6.23E-26	1.00E-23	5.81E-22	1.89E-20	3.85E-19	5.34E-18	
3 ² 3 ⁰ (5 ⁺) 3d	206366	25.5857	24	0.	4.86E-36	1.82E-32	1.53E-29	4.17E-27	4.80E-25	2.80E-23	9.48E-22	2.07E-20	
	248377	30.7940	40	0.	0.	0.	2.76E-35	2.36E-32	7.16E-30	9.58E-28	6.64E-26	2.72E-24	
	263000*	32.6070	56	0.	0.	0.	3.24E-37	4.13E-34	1.75E-31	3.13E-29	2.80E-27	1.42E-25	
	180000**	23.3084	100	2.64E-36	3.12E-32	5.63E-29	2.59E-26	4.23E-24	3.22E-22	1.31E-20	3.23E-19	5.35E-18	
3 ² 3 ⁰ (7 ⁺) 3d	197480**	24.8838	20	0.	1.41E-34	3.72E-31	2.33E-28	4.99E-26	4.60E-24	2.29E-22	6.64E-21	1.27E-19	
	226800**	28.1189	60	0.	0.	2.93E-35	4.80E-32	2.28E-29	4.21E-27	3.67E-25	1.77E-23	5.22E-22	
	268600**	33.3261	100	0.	0.	0.	6.68E-38	1.30E-34	4.29E-32	1.24E-29	1.24E-27	6.91E-26	
	284000**	35.2104	140	0.	0.	0.	1.91E-34	1.31E-33	3.55E-31	4.55E-29	3.17E-27	1.42E-25	
3 ² 3 ⁰ (7 ⁺) 3d	214000**	24.5319	60	0.	5.74E-37	2.93E-33	3.15E-30	1.04E-27	1.44E-25	9.65E-24	3.80E-22	9.29E-21	
	208000**	25.7880	12	0.	1.27E-36	5.97E-33	4.49E-30	1.27E-27	1.53E-25	4.20E-24	3.21E-22	1.14E-21	
	241500**	29.9414	36	0.	0.	8.89E-38	2.35E-34	1.67E-31	4.32E-29	5.05E-27	3.12E-25	1.13E-23	
	282000**	34.9424	60	0.	0.	0.	0.	1.49E-36	9.79E-34	2.55E-31	3.18E-29	2.18E-27	
3 ² 3 ⁰ (7 ⁺) 3d	298000**	36.9463	84	0.	0.	0.	0.	0.	1.64E-35	5.84E-33	9.51E-31	6.18E-29	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS MONITORED ENERGY LEVELS FROM MOORE (1949) AND BOWEN (1955,1960)

TABLE 58 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar⁺⁺

LEVEL (CP-1)	TEMPERATURE (DEG. K)											
	6000	7200	7600	8000	8400	8800	9200	9600	10000	11000	12000	13000
0	5.99E-01	5.93E-01	5.86E-01	5.79E-01	5.72E-01	5.65E-01	5.58E-01	5.51E-01	5.44E-01	5.37E-01	5.30E-01	5.22E-01
1112	2.04E-01	2.05E-01	2.05E-01	2.05E-01	2.05E-01	2.05E-01	2.04E-01	2.04E-01	2.03E-01	2.02E-01	2.01E-01	2.00E-01
1570	8.59E-02	8.66E-02	8.71E-02	8.75E-02	8.78E-02	8.81E-02	8.82E-02	8.83E-02	8.83E-02	8.83E-02	8.82E-02	8.77E-02
16010	3.09E-02	3.60E-02	4.13E-02	4.67E-02	5.21E-02	5.74E-02	6.30E-02	6.84E-02	7.38E-02	8.00E-02	8.61E-02	9.11E-02
33246	1.05E-04	1.54E-04	2.14E-04	2.93E-04	3.85E-04	4.94E-04	6.21E-04	7.64E-04	9.24E-04	1.10E-03	1.31E-03	1.54E-03
114303	3.38E-11	1.20E-10	4.23E-10	1.23E-09	3.25E-09	7.84E-09	1.75E-08	3.85E-08	7.18E-08	1.41E-07	2.71E-07	5.01E-07
144023	2.09E-14	1.13E-13	5.07E-13	1.94E-12	6.67E-12	2.03E-11	5.59E-11	1.42E-10	3.33E-10	7.14E-10	1.41E-09	2.74E-09
149413	6.53E-14	3.13E-13	2.44E-12	9.32E-12	3.32E-11	1.12E-10	3.21E-10	8.42E-10	2.04E-09	4.41E-09	9.04E-09	1.75E-08
176749	5.11E-17	4.34E-16	2.76E-15	1.64E-14	6.55E-14	2.57E-13	8.94E-13	2.80E-12	8.01E-12	2.27E-11	6.33E-11	1.67E-10
206368	3.13E-19	3.50E-18	3.04E-17	2.12E-16	1.23E-15	6.07E-15	2.61E-14	9.91E-14	3.30E-13	1.11E-12	4.38E-12	1.60E-11
249377	7.19E-23	1.32E-21	1.70E-20	1.85E-19	1.94E-18	1.92E-17	1.89E-17	1.84E-16	1.74E-15	1.61E-14	1.46E-13	1.29E-12
253000	4.58E-24	9.46E-23	1.56E-21	1.87E-20	1.76E-19	1.35E-18	6.66E-18	4.76E-17	2.20E-16	6.90E-15	1.20E-13	1.34E-12
180000	6.55E-17	5.73E-16	4.09E-15	2.40E-14	1.19E-13	5.09E-13	1.92E-12	6.48E-12	1.90E-11	2.27E-10	1.75E-09	9.60E-09
197480	1.71E-18	1.72E-17	1.36E-16	8.73E-16	4.69E-15	2.16E-14	8.72E-14	3.13E-13	1.01E-12	1.11E-11	1.11E-10	6.72E-10
226000	1.04E-20	1.48E-19	1.59E-18	1.54E-17	9.20E-17	5.37E-16	2.67E-15	1.16E-14	4.47E-14	8.51E-13	9.89E-12	7.86E-11
260000	2.39E-24	5.37E-23	9.31E-22	1.17E-20	1.16E-19	9.33E-19	6.24E-18	3.57E-17	1.77E-16	9.03E-15	1.07E-13	1.25E-12
264000	1.34E-25	3.74E-24	7.33E-23	1.07E-21	1.07E-20	1.09E-19	8.11E-19	5.12E-18	2.79E-17	1.12E-15	2.52E-14	3.27E-13
214000	1.54E-19	1.90E-18	1.79E-17	1.34E-16	8.31E-16	4.35E-15	1.90E-14	7.69E-14	2.82E-13	4.54E-12	4.59E-11	3.24E-10
208000	1.11E-19	1.26E-18	1.11E-17	7.90E-17	4.64E-16	2.32E-15	1.01E-14	3.80E-14	1.34E-13	1.90E-12	1.80E-11	1.24E-10
241500	2.77E-22	4.69E-21	5.89E-20	5.73E-19	4.49E-18	2.91E-17	1.61E-16	7.60E-16	3.24E-15	7.67E-14	1.62E-12	9.27E-12
232000	6.78E-26	2.39E-24	6.59E-23	6.54E-22	7.24E-21	6.44E-20	4.75E-19	2.94E-18	1.59E-17	6.28E-16	1.32E-14	1.75E-13
296000	4.16E-27	1.37E-25	3.11E-24	5.16E-23	3.56E-22	6.42E-21	5.45E-20	3.77E-19	2.23E-18	1.08E-16	2.71E-15	4.16E-14

TABLE 58 (CONT.), ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Mg^{++}

LEVEL (cm^{-1})	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	5.13E-01	5.03E-01	4.97E-01	4.90E-01	4.84E-01	4.78E-01	4.72E-01	4.53E-01	4.30E-01	4.23E-01	4.06E-01	3.92E-01
1112	2.73E-01	2.72E-01	2.70E-01	2.68E-01	2.66E-01	2.64E-01	2.62E-01	2.54E-01	2.44E-01	2.41E-01	2.34E-01	2.28E-01
1370	6.73E-02	6.69E-02	6.64E-02	6.59E-02	6.54E-02	6.49E-02	6.44E-02	6.29E-02	6.07E-02	6.00E-02	5.87E-02	5.82E-02
14010	1.22E-01	1.32E-01	1.41E-01	1.50E-01	1.58E-01	1.65E-01	1.72E-01	1.96E-01	2.13E-01	2.25E-01	2.33E-01	2.37E-01
33266	3.38E-03	4.15E-03	5.00E-03	5.87E-03	6.78E-03	7.70E-03	8.63E-03	1.22E-02	1.58E-02	1.90E-02	2.16E-02	2.37E-02
114303	7.31E-06	1.57E-05	3.08E-05	5.53E-05	9.38E-05	1.50E-04	2.28E-04	6.62E-04	2.23E-03	4.44E-03	7.63E-03	1.14E-02
144023	1.15E-07	3.03E-07	7.08E-07	1.50E-06	2.91E-06	5.26E-06	8.97E-06	4.84E-05	1.60E-04	3.91E-04	7.19E-04	1.32E-03
149413	8.80E-07	2.41E-06	5.82E-06	1.26E-05	2.52E-05	4.66E-05	8.12E-05	4.67E-04	1.62E-03	4.09E-03	8.32E-03	1.68E-02
176739	1.04E-08	3.51E-08	9.97E-08	2.50E-07	5.67E-07	1.18E-06	2.27E-06	1.87E-05	7.98E-05	2.40E-04	5.94E-04	1.07E-03
204346	1.52E-04	6.13E-04	2.08E-03	6.12E-03	1.59E-02	3.75E-02	8.09E-02	9.22E-04	5.21E-03	1.90E-02	5.13E-02	1.13E-01
248377	3.37E-11	1.82E-10	7.94E-10	2.91E-09	9.24E-09	2.59E-08	6.37E-08	1.24E-06	1.00E-05	4.78E-05	1.60E-04	4.14E-04
248900	1.05E-11	6.26E-11	2.98E-11	1.16E-09	4.02E-09	1.20E-08	3.21E-08	7.22E-07	6.62E-06	3.47E-05	1.25E-04	3.42E-04
188000	4.17E-08	1.49E-07	4.53E-07	1.21E-06	2.88E-06	6.28E-06	1.26E-05	1.16E-04	5.58E-04	1.80E-03	4.46E-03	9.00E-03
197480	3.11E-09	1.20E-08	3.86E-08	1.08E-07	2.70E-07	6.12E-07	1.28E-06	1.31E-05	6.84E-05	2.34E-04	6.18E-04	1.29E-03
228800	4.64E-10	2.16E-09	8.29E-09	2.71E-08	7.78E-08	1.99E-07	4.65E-07	6.77E-06	4.54E-05	1.89E-04	5.47E-04	1.35E-03
268600	1.03E-11	6.41E-11	2.14E-10	1.29E-09	4.52E-09	1.38E-08	3.78E-08	9.10E-07	9.78E-06	4.77E-05	1.76E-04	4.94E-04
294000	3.03E-12	2.09E-11	1.13E-10	5.03E-10	1.88E-09	6.12E-09	1.77E-08	5.13E-07	5.63E-06	3.37E-05	1.35E-04	4.02E-04
214000	1.73E-09	7.38E-09	2.82E-08	8.02E-08	2.14E-07	5.24E-07	1.17E-06	1.44E-05	8.80E-05	3.34E-04	9.44E-04	2.14E-03
208000	6.41E-10	2.62E-09	8.99E-09	2.64E-08	6.96E-08	1.84E-07	3.60E-07	4.18E-06	2.40E-05	8.81E-05	2.40E-04	5.30E-04
241500	6.15E-11	3.16E-10	1.33E-09	4.69E-09	1.44E-08	3.93E-08	9.70E-08	1.68E-06	1.29E-05	5.86E-05	1.89E-04	4.77E-04
287000	1.40E-12	1.08E-11	5.79E-11	2.54E-10	9.43E-10	3.05E-09	8.77E-09	2.47E-07	2.67E-06	1.58E-05	6.25E-05	1.95E-04
398000	4.31E-13	3.27E-12	1.92E-11	9.17E-11	3.68E-10	1.27E-09	3.88E-09	1.33E-07	1.64E-06	1.08E-05	4.81E-05	1.44E-04

TABLE 58 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar³⁺

LEVEL	TEMPERATURE (DEG K)													
	44000	46000	48000	50000	60000	80000	100000	200000	400000	600000	1000000	0	0	0
0	3.74E-01	3.54E-01	2.82E-01	1.74E-01	1.09E-01	2.93E-02	1.34E-02	1.01E-02	8.11E-03	0.	0.	0.	0.	0.
1112	2.14E-01	2.09E-01	1.65E-01	1.02E-01	6.43E-02	1.75E-02	7.98E-03	6.07E-03	4.84E-03	0.	0.	0.	0.	0.
1370	7.11E-02	6.79E-02	5.43E-02	3.38E-02	2.13E-02	5.80E-03	2.64E-03	2.02E-03	1.62E-03	0.	0.	0.	0.	0.
14010	2.37E-01	2.32E-01	2.02E-01	1.35E-01	8.90E-02	2.89E-02	1.27E-02	9.81E-03	7.95E-03	0.	0.	0.	0.	0.
33246	2.52E-02	2.61E-02	2.54E-02	1.91E-02	1.35E-02	6.62E-03	2.37E-03	1.87E-03	1.55E-03	0.	0.	0.	0.	0.
114303	1.60E-02	2.07E-02	3.28E-02	4.01E-02	3.78E-02	2.32E-02	1.59E-02	1.39E-02	1.24E-02	0.	0.	0.	0.	0.
154023	2.02E-03	2.83E-03	5.34E-03	7.82E-03	8.22E-03	6.25E-03	4.77E-03	4.31E-03	3.94E-03	0.	0.	0.	0.	0.
159413	2.24E-02	3.21E-02	6.27E-02	9.47E-02	1.01E-01	8.01E-02	6.24E-02	5.67E-02	5.23E-02	0.	0.	0.	0.	0.
174739	1.84E-03	2.83E-03	1.14E-02	1.37E-02	1.32E-02	1.13E-02	1.04E-02	1.01E-02	0.	0.	0.	0.	0.	0.
204368	2.11E-03	3.49E-03	6.41E-03	2.04E-02	2.68E-02	3.19E-02	3.05E-02	2.97E-02	2.89E-02	0.	0.	0.	0.	0.
248377	8.89E-04	1.55E-03	5.85E-03	1.60E-02	2.64E-02	3.93E-02	4.37E-02	4.47E-02	4.54E-02	0.	0.	0.	0.	0.
283000	7.72E-04	1.49E-03	5.70E-03	1.72E-02	2.71E-02	4.88E-02	5.81E-02	6.05E-02	6.27E-02	0.	0.	0.	0.	0.
188000	1.60E-03	2.52E-03	6.22E-02	1.18E-01	1.46E-01	1.52E-01	1.34E-01	1.29E-01	1.24E-01	0.	0.	0.	0.	0.
197480	2.35E-03	3.80E-03	9.12E-03	1.99E-02	2.94E-02	2.83E-02	2.63E-02	2.53E-02	2.44E-02	0.	0.	0.	0.	0.
226480	2.70E-03	4.74E-03	1.47E-02	3.53E-02	5.00E-02	6.89E-02	7.09E-02	7.07E-02	7.02E-02	0.	0.	0.	0.	0.
268800	1.14E-03	2.24E-03	8.94E-03	2.77E-02	4.55E-02	6.48E-02	1.02E-01	1.07E-01	1.10E-01	0.	0.	0.	0.	0.
284000	9.71E-04	1.99E-03	8.71E-03	2.95E-02	5.12E-02	1.04E-01	1.39E-01	1.44E-01	1.51E-01	0.	0.	0.	0.	0.
214000	4.10E-03	6.95E-03	2.00E-02	4.45E-02	6.01E-02	7.55E-02	7.42E-02	7.29E-02	7.16E-02	0.	0.	0.	0.	0.
208000	9.99E-04	1.66E-03	4.62E-03	9.90E-03	1.31E-02	1.58E-02	1.52E-02	1.48E-02	1.44E-02	0.	0.	0.	0.	0.
241500	1.00E-03	1.83E-03	6.21E-03	1.63E-02	2.43E-02	3.72E-02	4.04E-02	4.09E-02	4.13E-02	0.	0.	0.	0.	0.
282000	4.44E-04	9.05E-04	3.92E-03	1.31E-02	2.26E-02	4.63E-02	5.81E-02	6.19E-02	6.49E-02	0.	0.	0.	0.	0.
298000	3.68E-04	7.84E-04	3.74E-03	1.37E-02	2.51E-02	5.78E-02	7.68E-02	8.34E-02	8.88E-02	0.	0.	0.	0.	0.

TABLE 59. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C 3+

STATE	LEVEL	STAT.	TEMPERATURE (DEG K)													
			(CM-1)	(EVI)	WT.	3200	3600	4030	4400	4800	5200	5600	6000	6400		
1s 2s 2p	0		0		2	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	64556	0	0.		6	7.44E-13	1.87E-11	2.47E-10	2.04E-09	1.18E-08	5.24E-08	1.68E-07	5.48E-07	1.61E-06	5.24E-06	1.61E-05
	302849	1s 2s 2p	37.5475	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	320071	3p 4p	39.6827	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3d 4d	324886	3d 4d	40.2797	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	401348	4s 4p	49.7595	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	408320	4p 4d	50.6239	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	410339	4d 4f	50.8742	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 2s 2p 3d 4d 4f 5d	410433	4f 5d	50.8859	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	220000*	5d	27.2758	2	0.	6.32E-39	4.29E-35	5.72E-32	2.29E-29	3.64E-27	2.63E-25	0.	0.	0.	0.	0.
	300000*	5d	37.1943	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	300000*	5d	37.1943	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 2s 2p 3d 4d 4f 5d	380000*	5d	47.1128	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	6800				7600											
	7200				8000											
	7600				8400											
1s 2s 2p 3d 4d 4f 5d	1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00	
	3.51E-06		7.49E-06		1.48E-05		2.72E-05		4.73E-05		7.82E-05		1.24E-04		1.88E-04	
	1.48E-28		5.21E-27		1.26E-25		2.21E-24		2.94E-23		3.13E-22		2.70E-21		1.19E-19	
	1.14E-30		5.01E-28		1.45E-26		4.65E-24		5.62E-23		5.47E-22		4.40E-21		3.00E-20	
1s 2s 2p 3d 4d 4f 5d	7.00E-30		3.19E-28		9.71E-27		2.10E-25		3.40E-24		4.26E-23		4.29E-22		3.57E-21	
	1.32E-37		1.47E-35		1.00E-33		4.49E-32		1.39E-30		3.17E-29		5.50E-28		7.52E-27	
	9.04E-38		1.10E-35		8.05E-34		3.84E-32		1.27E-30		3.05E-29		5.55E-28		7.94E-27	
	9.82E-38		1.22E-35		9.15E-34		4.45E-32		1.50E-30		3.65E-29		6.74E-28		9.78E-27	
1s 2s 2p 3d 4d 4f 5d	410433	5d	1.23E-37		1.68E-35		1.26E-33		2.06E-30		5.03E-29		9.30E-28		1.38E-26	
	220000	5d	6.08E-21		8.07E-20		8.17E-19		6.55E-18		4.31E-17		2.39E-16		1.14E-15	
	300000	5d	2.44E-27		8.29E-26		1.94E-24		3.33E-23		4.49E-22		3.79E-20		2.68E-19	
	300000	5d	8.13E-28		2.76E-26		6.48E-25		1.11E-23		1.50E-21		1.26E-20		8.92E-19	
1s 2s 2p 3d 4d 4f 5d	380000	5d	1.81E-34		1.58E-32		8.57E-31		3.13E-29		8.10E-28		1.56E-26		2.33E-25	
	10000				11000											
	12000				13000											
	13000				14000											
1s 2s 2p 3d 4d 4f 5d	1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00		1.00E 00	
	9.97E-01		9.99E-01		9.99E-01		9.99E-01		9.99E-01		9.99E-01		9.99E-01		9.99E-01	
	1.50E-03		6.45E-04		2.77E-04		1.19E-04		6.26E-05		3.40E-05		1.97E-05		1.07E-05	
	1.70E-16		6.26E-18		5.47E-22		4.40E-21		3.00E-20		1.97E-18		8.44E-17		1.23E-15	
1s 2s 2p 3d 4d 4f 5d	6.04E-17		1.55E-18		2.50E-20		1.75E-18		6.04E-17		1.21E-15		1.21E-15		1.21E-15	
	1.24E-21		1.59E-23		8.34E-26		1.59E-23		1.24E-21		1.24E-21		1.24E-21		1.24E-21	
	1.64E-21		1.91E-23		9.18E-26		1.91E-23		1.64E-21		1.64E-21		1.64E-21		1.64E-21	
	2.14E-21		2.45E-23		1.24E-25		2.45E-23		2.14E-21		2.14E-21		2.14E-21		2.14E-21	
1s 2s 2p 3d 4d 4f 5d	3.50E-12		3.50E-12		3.50E-12		3.50E-12		3.50E-12		3.50E-12		3.50E-12		3.50E-12	
	1.24E-15		8.17E-17		1.62E-18		1.62E-18		1.24E-15		1.24E-15		1.24E-15		1.24E-15	
	2.15E-15		2.72E-17		5.39E-19		5.39E-19		2.15E-15		2.15E-15		2.15E-15		2.15E-15	
	7.16E-16		2.72E-17		7.16E-16		7.16E-16		7.16E-16		7.16E-16		7.16E-16		7.16E-16	
1s 2s 2p 3d 4d 4f 5d	4.14E-16		3.89E-21		2.70E-23		3.89E-21		4.14E-16		4.14E-16		4.14E-16		4.14E-16	
	2.45E-19		3.89E-21		2.70E-23		3.89E-21		2.45E-19		2.45E-19		2.45E-19		2.45E-19	
	8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16	
	8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16		8.13E-16	

*ESTIMATED
 **INCLUDES ESTIMATED SUBLEVELS
 †NONSTANDARD ENERGY LEVELS FROM MOORE (1949) AND BOCKASTEN (1956)

TABLE 59 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C 3+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	9.96E-01	9.94E-01	9.91E-01	9.87E-01	9.83E-01	9.79E-01	9.72E-01	9.61E-01	9.47E-01	9.59E-01	8.15E-01	7.72E-01
64556	3.93E-03	6.10E-03	8.94E-03	1.26E-02	1.89E-02	2.71E-02	2.80E-02	5.89E-02	9.81E-02	1.41E-01	1.89E-01	2.37E-01
302849	3.02E-14	1.47E-13	1.47E-12	7.29E-12	3.02E-11	1.07E-10	3.32E-10	1.32E-08	1.37E-07	1.03E-06	4.51E-06	1.53E-06
320071	1.55E-14	1.30E-13	9.40E-13	5.09E-12	2.28E-11	8.73E-11	2.92E-10	1.31E-08	1.37E-07	1.42E-06	6.68E-06	2.32E-05
324886	1.57E-14	1.49E-13	1.02E-12	5.65E-12	2.59E-11	1.01E-10	3.44E-10	1.64E-08	2.53E-07	1.94E-06	9.35E-06	3.25E-05
401348	1.22E-18	1.90E-17	2.10E-16	1.75E-15	1.15E-14	6.10E-14	2.81E-13	3.34E-11	9.97E-10	1.25E-08	2.80E-08	4.15E-07
403320	1.78E-18	2.92E-17	3.34E-16	2.91E-15	1.87E-14	1.09E-13	5.10E-13	6.60E-11	2.09E-09	2.74E-08	2.80E-07	9.69E-07
410339	2.41E-18	4.01E-17	4.64E-16	4.06E-15	2.80E-14	1.56E-13	7.35E-13	9.75E-11	3.14E-09	4.17E-08	3.67E-07	1.59E-06
410433	3.35E-18	5.56E-17	6.49E-16	5.57E-15	3.89E-14	2.17E-13	1.02E-12	1.34E-10	4.37E-09	5.81E-08	4.29E-07	2.10E-06
220000	1.51E-10	6.80E-10	2.54E-09	8.09E-09	2.27E-08	5.69E-08	1.30E-07	1.74E-06	1.11E-05	4.34E-05	1.24E-04	2.83E-04
300000	3.65E-13	2.85E-12	1.71E-11	8.35E-11	3.41E-10	1.20E-09	3.71E-09	1.31E-07	1.64E-06	1.07E-05	4.59E-05	1.63E-04
300000	1.22E-13	9.49E-13	5.72E-12	2.70E-11	1.14E-10	3.99E-10	1.24E-09	4.37E-08	5.44E-07	3.57E-06	1.52E-05	4.77E-05
380000	1.64E-16	2.21E-15	2.15E-14	1.60E-13	9.49E-13	4.67E-12	1.96E-11	1.80E-09	4.48E-08	4.89E-07	3.10E-06	1.34E-05

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	44000	48000	60000	80000	100000	200000	400000	600000	1000000	0	0	0
0	7.33E-01	6.96E-01	6.03E-01	4.84E-01	3.87E-01	1.39E-01	5.48E-02	3.62E-02	2.42E-02	0.	0.	0.
64556	2.64E-01	3.02E-01	3.83E-01	4.54E-01	4.59E-01	2.62E-01	1.30E-01	9.81E-02	7.70E-02	0.	0.	0.
302849	3.66E-05	7.95E-05	4.23E-04	2.08E-03	4.96E-03	1.57E-02	1.84E-02	1.85E-02	1.82E-02	0.	0.	0.
320071	6.76E-05	1.42E-04	8.39E-04	4.59E-03	1.16E-02	4.17E-02	5.20E-02	5.31E-02	5.33E-02	0.	0.	0.
324886	8.91E-05	2.05E-04	1.23E-03	7.01E-03	1.81E-02	6.72E-02	8.52E-02	8.74E-02	8.83E-02	0.	0.	0.
401348	1.44E-06	4.18E-06	3.99E-05	3.55E-04	1.20E-03	7.75E-03	1.29E-02	1.64E-02	1.58E-02	0.	0.	0.
403320	3.49E-06	1.01E-05	1.01E-04	9.28E-04	3.24E-03	2.21E-02	2.70E-02	4.30E-02	4.70E-02	0.	0.	0.
410339	5.85E-06	1.58E-05	1.61E-04	1.51E-03	5.28E-03	3.43E-02	4.24E-02	7.13E-02	7.41E-02	0.	0.	0.
410433	7.81E-06	2.21E-05	2.24E-04	2.11E-03	7.38E-03	5.08E-02	3.77E-02	9.94E-02	1.09E-01	0.	0.	0.
220000	5.50E-04	9.52E-04	3.08E-03	9.25E-03	1.83E-02	2.86E-02	2.48E-02	2.25E-02	2.05E-02	0.	0.	0.
300000	3.62E-04	7.79E-04	4.08E-03	1.97E-02	4.65E-02	1.48E-01	1.68E-01	1.67E-01	1.65E-01	0.	0.	0.
300000	1.21E-04	2.60E-04	1.34E-03	4.58E-03	1.55E-02	4.82E-02	5.59E-02	5.58E-02	5.49E-02	0.	0.	0.
380000	4.41E-05	1.18E-04	9.97E-04	7.81E-03	2.49E-02	1.34E-01	2.10E-01	2.30E-01	2.45E-01	0.	0.	0.

TABLE 60 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N 3+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	6800	7200	7600	8000	8400	8800	9200	9600	10000	11000	12000	13000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	9.99E-01	9.99E-01	9.97E-01	9.92E-01
67273	5.92E-06	1.31E-05	2.65E-05	5.01E-05	8.91E-05	1.50E-04	2.43E-04	3.74E-04	5.63E-04	1.34E-03	2.82E-03	5.23E-03
130695	2.93E-12	1.36E-11	5.39E-11	1.84E-10	5.69E-10	1.57E-09	3.98E-09	9.73E-09	2.04E-08	1.13E-07	4.68E-07	1.54E-06
175598	6.50E-16	5.19E-15	3.29E-14	1.73E-13	7.80E-13	3.04E-12	1.07E-11	3.35E-11	9.59E-11	9.52E-10	6.55E-09	3.25E-08
180805	2.20E-17	2.02E-16	1.48E-15	8.82E-15	4.45E-14	1.94E-13	7.41E-13	2.54E-12	7.87E-12	9.30E-11	7.28E-10	4.15E-09
235370	2.35E-22	3.74E-21	4.45E-20	4.13E-19	3.10E-18	1.94E-17	1.03E-16	4.78E-16	1.94E-15	4.24E-14	5.53E-13	4.84E-12
380119	6.70E-35	4.10E-33	2.24E-31	8.17E-30	2.12E-28	4.08E-27	6.09E-26	7.75E-25	7.08E-24	1.02E-21	6.42E-20	2.13E-18
405875	6.44E-37	7.40E-35	5.61E-33	2.52E-31	8.11E-30	3.41E-27	6.17E-26	5.45E-25	1.10E-22	9.10E-21	3.82E-19	1.82E-18
422270	0.	4.51E-34	3.83E-34	2.08E-32	7.75E-31	2.07E-29	4.17E-28	6.34E-27	2.84E-23	2.65E-21	1.00E-19	3.86E-18
492000	0.	0.	0.	0.	1.01E-34	4.64E-35	1.53E-33	7.22E-32	4.50E-28	9.59E-26	6.94E-24	0.
504474	0.	0.	0.	0.	3.57E-37	1.81E-35	6.54E-34	1.75E-32	3.80E-31	2.64E-28	6.44E-26	6.74E-24
512190	0.	0.	0.	0.	1.59E-37	8.58E-36	3.26E-34	9.18E-33	1.90E-31	1.60E-28	4.26E-26	4.78E-24
517948	0.	0.	0.	0.	0.	4.67E-36	1.84E-34	5.42E-33	1.21E-31	1.04E-28	2.99E-26	3.54E-24
447299	0.	0.	0.	0.	0.	7.91E-33	2.19E-31	4.60E-30	7.54E-29	3.47E-26	5.54E-24	4.13E-22
489600	0.	0.	0.	0.	0.	1.32E-35	5.99E-34	1.95E-32	4.74E-31	8.92E-29	1.12E-24	1.03E-22
504415	0.	0.	0.	0.	1.74E-36	8.89E-35	3.20E-33	8.57E-32	1.76E-30	1.36E-27	3.17E-25	3.33E-23
574000	0.	0.	0.	0.	0.	0.	0.	3.87E-37	1.22E-35	2.28E-32	1.22E-29	2.44E-27
587700	0.	0.	0.	0.	0.	0.	0.	0.	6.81E-36	1.48E-32	8.97E-30	7.02E-27
593000	0.	0.	0.	0.	0.	0.	0.	0.	5.29E-36	1.24E-32	7.92E-30	1.87E-27
598000	0.	0.	0.	0.	0.	0.	0.	0.	3.61E-36	9.00E-33	6.09E-30	1.51E-27

STATE	LEVEL	STAT.	TEMPERATURE (DEG K)											
			6800	7200	7600	8000	8400	8800	9200	9600	10000	11000	12000	13000
2s	0	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	
2p	0	9	6.58E-13	1.89E-11	2.79E-10	2.52E-09	1.57E-08	7.42E-08	2.80E-07	8.88E-07	8.88E-07	1.00E 00	1.00E 00	
2p	16.2037	3	9.05E-26	4.20E-23	1.15E-20	8.23E-19	2.91E-17	5.92E-16	7.83E-15	7.83E-14	5.21E-13	2.43E-04		
2p	175598	9	4.63E-34	2.90E-30	3.34E-27	1.04E-24	1.24E-22	7.14E-21	2.29E-19	4.64E-18	6.45E-17	6.45E-17		
2p	180805	5	6.54E-37	8.20E-33	1.54E-29	7.50E-27	1.29E-24	1.00E-22	4.20E-21	4.20E-21	1.07E-19	1.81E-18		
2s	235370	1	0.	0.	1.71E-37	3.75E-34	2.29E-31	5.21E-29	5.44E-27	3.07E-25	1.05E-23	3.09E-21		
2s	380119	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2s	405875	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2s	422270	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2s	492000	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	504474	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	512190	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	517948	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	461295	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	489800	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2s	504615	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2s	576000	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	587700	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	593000	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
2p	598000	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
NONSTARRED ENERGY LEVELS FROM MOORE (1949)

TABLE 60 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N 3+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	9.91E-01	9.86E-01	9.79E-01	9.71E-01	9.60E-01	9.48E-01	9.33E-01	9.16E-01	7.74E-01	6.90E-01	6.10E-01	5.41E-01
67273	8.87E-03	1.40E-02	2.05E-02	2.91E-02	3.99E-02	5.23E-02	6.64E-02	1.37E-01	2.20E-01	3.01E-01	3.73E-01	4.33E-01
130695	6.36E-05	1.03E-05	2.31E-05	4.57E-05	8.36E-05	1.43E-04	2.31E-04	1.02E-03	5.80E-03	3.01E-03	1.67E-03	1.47E-02
175598	1.30E-07	4.30E-07	1.22E-06	3.07E-06	6.93E-06	1.43E-05	2.74E-05	2.08E-04	8.42E-04	2.31E-03	4.92E-03	3.79E-03
180885	1.84E-08	6.67E-08	2.06E-07	5.54E-07	1.33E-06	2.91E-06	5.86E-06	5.20E-05	2.36E-04	7.07E-04	1.61E-03	3.03E-03
235370	3.10E-11	1.55E-10	6.29E-10	2.17E-09	6.48E-09	1.72E-08	4.13E-08	4.41E-07	4.34E-06	1.75E-05	5.01E-05	1.14E-04
380119	4.29E-17	5.77E-16	5.60E-15	4.16E-14	2.65E-13	1.20E-12	4.87E-12	4.37E-10	1.02E-08	1.04E-07	6.16E-07	2.68E-06
405375	9.41E-18	1.51E-16	1.70E-15	1.46E-14	9.65E-14	5.22E-13	2.39E-12	2.88E-10	8.28E-09	9.96E-08	6.88E-07	2.79E-06
422270	2.82E-18	5.06E-17	6.32E-16	5.85E-15	4.21E-14	2.68E-13	1.60E-12	1.75E-10	7.62E-09	7.84E-08	5.72E-07	2.74E-06
492000	4.35E-22	1.26E-20	2.39E-19	3.20E-18	3.20E-17	2.50E-16	1.59E-15	5.34E-13	3.25E-11	6.82E-10	7.04E-09	4.46E-08
504474	3.62E-22	1.14E-20	2.34E-19	3.34E-18	3.54E-17	2.92E-16	1.94E-15	7.59E-13	5.14E-11	1.17E-09	1.28E-08	8.54E-08
512190	2.73E-22	9.09E-21	1.95E-19	2.90E-18	3.78E-17	2.92E-16	1.86E-15	7.96E-13	5.76E-11	1.37E-09	1.00E-07	1.00E-07
517948	2.12E-22	7.32E-21	1.62E-19	2.49E-18	3.81E-17	2.45E-16	1.72E-15	7.89E-13	6.00E-11	1.49E-09	1.73E-08	1.23E-07
467295	1.65E-20	4.04E-19	6.61E-18	7.66E-17	6.91E-16	4.87E-15	2.82E-14	7.05E-12	3.47E-10	6.21E-09	5.67E-08	3.24E-07
469820	4.91E-21	1.40E-19	2.62E-18	3.47E-17	3.43E-16	2.66E-15	1.67E-14	5.48E-12	3.28E-10	6.77E-09	6.92E-08	4.34E-07
504615	1.79E-21	5.64E-20	1.15E-18	1.65E-17	1.75E-16	1.44E-15	9.61E-15	2.74E-12	2.55E-10	5.80E-09	6.38E-08	4.25E-07
576000	2.31E-25	1.20E-23	3.76E-22	7.04E-21	1.16E-19	1.30E-18	1.13E-17	1.04E-14	1.30E-12	4.68E-11	7.34E-10	6.52E-09
587700	2.10E-25	1.17E-23	3.94E-22	8.74E-21	1.37E-19	1.60E-18	1.59E-17	1.59E-14	2.14E-12	8.39E-11	1.38E-09	1.21E-08
593000	2.03E-25	1.17E-23	4.08E-22	9.30E-21	1.50E-19	1.79E-18	1.64E-17	1.88E-14	2.72E-12	1.09E-10	1.87E-09	1.77E-08
598020	1.70E-25	1.02E-23	3.64E-22	8.53E-21	1.40E-19	1.72E-18	1.63E-17	1.95E-14	2.94E-12	1.22E-10	2.14E-09	2.07E-08

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	44000	48000	60000	80000	100000	200000	400000	600000	1000000	0	0	0
0	4.81E-01	4.31E-01	3.21E-01	2.18E-01	1.61E-01	4.77E-02	1.30E-02	7.58E-03	4.80E-03	0.	0.	0.
67273	4.80E-01	5.16E-01	5.75E-01	5.86E-01	5.49E-01	2.64E-01	9.18E-02	5.81E-02	3.92E-02	0.	0.	0.
130695	2.01E-02	2.57E-02	4.19E-02	6.24E-02	7.39E-02	5.59E-02	2.44E-02	1.66E-02	1.19E-02	0.	0.	0.
175598	1.39E-02	2.01E-02	4.28E-02	8.55E-02	1.16E-01	1.21E-01	6.22E-02	4.48E-02	3.35E-02	0.	0.	0.
180885	5.00E-03	7.48E-03	1.73E-02	3.65E-02	5.30E-02	6.13E-02	3.29E-02	2.41E-02	1.83E-02	0.	0.	0.
235370	2.19E-04	3.72E-04	1.13E-03	3.17E-03	5.43E-03	8.77E-03	5.57E-03	3.31E-03	3.42E-03	0.	0.	0.
380119	7.69E-06	1.94E-05	1.41E-04	9.37E-04	2.71E-03	1.24E-02	1.32E-02	1.22E-02	1.11E-02	0.	0.	0.
405375	1.00E-05	2.71E-05	2.30E-04	1.70E-03	5.63E-03	3.09E-02	3.63E-02	3.44E-02	3.21E-02	0.	0.	0.
422270	9.49E-06	2.74E-05	2.57E-04	2.20E-03	7.39E-03	4.57E-02	5.69E-02	5.51E-02	5.23E-02	0.	0.	0.
492000	1.98E-07	6.78E-07	9.65E-06	1.25E-04	5.42E-04	5.54E-03	8.86E-03	9.32E-03	9.45E-03	0.	0.	0.
504474	3.95E-07	1.40E-06	2.15E-05	3.00E-04	1.34E-03	1.52E-02	2.54E-02	2.71E-02	2.79E-02	0.	0.	0.
512190	5.12E-07	1.85E-06	2.87E-05	4.38E-04	2.03E-03	2.39E-02	4.12E-02	4.44E-02	4.59E-02	0.	0.	0.
517948	5.94E-07	2.06E-06	3.62E-05	5.30E-04	2.61E-03	3.22E-02	5.85E-02	1.98E-02	4.38E-02	0.	0.	0.
467295	1.33E-06	4.27E-06	5.23E-05	5.65E-04	2.52E-03	1.98E-02	2.90E-02	2.97E-02	2.94E-02	0.	0.	0.
489800	1.92E-06	6.52E-06	9.15E-05	1.17E-03	5.03E-03	5.06E-02	8.03E-02	8.43E-02	8.34E-02	0.	0.	0.
504615	1.97E-06	6.97E-06	1.07E-04	1.50E-03	6.78E-03	7.58E-02	1.27E-01	1.34E-01	1.39E-01	0.	0.	0.
576000	3.81E-08	1.64E-07	3.86E-06	6.30E-05	4.89E-04	9.08E-03	1.94E-02	2.29E-02	2.51E-02	0.	0.	0.
587700	7.89E-08	3.44E-07	8.75E-06	1.23E-05	2.50E-04	5.20E-02	6.67E-02	6.67E-02	7.41E-02	0.	0.	0.
593000	1.09E-07	4.93E-07	1.28E-05	3.06E-04	1.90E-03	4.02E-02	5.45E-02	1.10E-01	1.23E-01	0.	0.	0.
598020	1.30E-07	5.94E-07	1.59E-05	3.91E-04	2.47E-03	5.42E-02	1.27E-01	1.52E-01	1.70E-01	0.	0.	0.

TABLE 61. ENERGY LEVELS AND FRACTIONAL ELECTROMAGNETIC POPULATIONS OF O 3+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	TEMPERATURE (DEG K)									
				3200	3600	4000	4400	4800	5200	5600	6000	6400	
2s 2p 3p 3d 4s 4p 4d	0	0.	2	3.49E-01	3.68E-01	3.65E-01	3.62E-01	3.49E-01	3.51E-01	3.58E-01	3.54E-01	3.53E-01	
	386	0.0479	4	6.27E-01	6.32E-01	6.35E-01	6.38E-01	6.49E-01	6.42E-01	6.44E-01	6.44E-01	6.47E-01	
	71379	8.8496	12	2.59E-14	9.02E-13	1.55E-11	1.99E-10	1.10E-09	5.48E-09	2.32E-08	7.83E-08	2.27E-07	
	126942	15.7384	10	3.04E-25	1.71E-22	2.70E-20	1.70E-18	5.31E-17	9.94E-16	1.22E-14	1.97E-13	1.12E-13	
	164367	20.5784	2	2.99E-33	1.09E-29	7.69E-27	1.65E-24	1.44E-22	6.34E-21	1.62E-19	2.70E-18	3.16E-17	
2p 3p 3d 4p 4d	180444	22.3984	6	5.95E-36	4.88E-32	6.61E-29	2.61E-26	3.29E-24	2.11E-22	7.44E-21	1.64E-19	2.44E-18	
	231275	28.6737	4	0.	0.	5.43E-37	1.04E-33	5.62E-31	1.16E-28	1.11E-26	5.82E-25	1.94E-23	
	255168	31.6360	10	0.	0.	0.	1.05E-36	1.09E-33	3.89E-31	6.00E-29	4.72E-27	2.16E-25	
	289021	35.8331	6	0.	0.	0.	0.	2.58E-38	2.00E-35	6.01E-33	8.45E-31	6.49E-29	
	357615	44.3375	2	0.	0.	0.	0.	0.	0.	0.	2.02E-38	4.29E-36	
2s 2p 3p 3d 4p 4d	390219	48.3797	6	0.	0.	0.	0.	0.	0.	0.	0.	8.44E-39	
	619544	52.0155	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	485823	60.2329	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	504000*	62.4864	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	511000**	63.3543	24	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2s 2p 3p 3d 4p 4d	443545	54.9912	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	474555	58.8358	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	501721	62.2039	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	594400**	73.1984	268	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	558874	69.6137	54	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p 3p 3d 4p 4d	664000**	82.5713	96	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	617000**	76.4983	142	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	721900*	89.5019	288	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	636000**	78.8519	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	740000*	91.7459	160	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3p 3d 4p 4d	693000*	85.9188	18	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	796000*	98.6889	32	0.	0.	0.	0.	0.	0.	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUM LEVELS
MONITORING ENERGY LEVELS FROM MOORE (1968)

TABLE 61 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF D 3*

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	6000	7200	7600	8000	8400	8800	9200	9600	10000	11000	12000	13000
0	3.52E-01	3.51E-01	3.50E-01	3.49E-01	3.48E-01	3.48E-01	3.47E-01	3.46E-01	3.45E-01	3.44E-01	3.44E-01	3.43E-01
386	6.48E-01	6.49E-01	6.50E-01	6.51E-01	6.52E-01	6.53E-01	6.54E-01	6.54E-01	6.55E-01	6.55E-01	6.54E-01	6.57E-01
71379	5.83E-07	1.34E-06	2.84E-06	5.31E-06	1.02E-05	1.78E-05	2.95E-05	4.64E-05	7.13E-05	1.08E-04	1.62E-04	7.82E-04
126952	3.81E-12	1.69E-11	6.39E-11	2.12E-10	6.28E-10	1.68E-09	4.14E-09	9.66E-09	2.02E-08	4.22E-07	8.72E-07	1.58E-06
164367	2.77E-16	1.91E-15	1.07E-14	5.06E-14	2.06E-13	7.41E-13	2.38E-12	6.93E-12	1.89E-11	1.59E-10	9.49E-10	4.31E-09
180644	2.65E-17	2.21E-16	1.47E-15	8.13E-15	3.81E-14	1.55E-13	5.60E-13	1.81E-12	5.35E-12	1.64E-11	4.04E-10	2.13E-09
231275	3.94E-22	5.95E-21	6.76E-20	6.02E-19	4.33E-18	2.63E-17	1.36E-16	6.12E-16	2.92E-15	5.02E-14	6.23E-13	5.54E-12
255168	6.27E-24	1.24E-22	1.83E-21	2.05E-20	1.82E-19	1.32E-18	8.10E-18	4.26E-17	1.97E-16	5.51E-15	8.87E-14	9.31E-13
289021	2.92E-27	6.69E-26	1.81E-24	2.79E-23	3.31E-22	3.13E-21	2.44E-20	1.60E-19	9.04E-19	3.93E-17	9.19E-16	1.32E-14
357615	4.84E-34	3.23E-32	1.38E-30	4.08E-29	8.70E-28	1.41E-26	1.78E-25	1.83E-24	1.56E-23	1.67E-21	8.21E-20	2.22E-18
390219	1.46E-36	1.43E-34	6.67E-33	3.47E-31	9.80E-30	2.04E-28	3.24E-27	4.14E-26	4.29E-25	7.03E-23	4.94E-21	1.90E-19
419544	0.	6.81E-37	5.61E-35	2.97E-33	1.08E-31	2.82E-30	5.55E-29	6.32E-28	1.03E-26	2.53E-24	2.45E-22	1.17E-20
485823	0.	0.	0.	3.95E-39	2.53E-37	1.11E-35	3.49E-34	8.27E-33	1.52E-31	6.71E-29	1.73E-26	1.52E-24
504000	0.	0.	0.	0.	3.37E-38	1.70E-36	6.11E-35	3.33E-32	2.42E-29	5.86E-27	6.12E-25	6.12E-25
511000	0.	0.	0.	0.	4.06E-38	2.17E-36	8.18E-35	2.28E-33	4.87E-32	3.86E-29	1.02E-26	1.13E-24
643545	0.	0.	1.07E-36	7.13E-35	3.17E-33	1.00E-31	2.34E-30	4.20E-29	5.99E-28	1.90E-25	2.44E-23	1.44E-21
674555	0.	0.	0.	6.09E-37	6.70E-35	1.89E-33	5.50E-32	1.31E-30	2.08E-29	1.03E-26	1.81E-24	1.43E-22
501721	0.	0.	0.	0.	7.47E-37	3.70E-35	1.31E-33	3.44E-32	6.94E-31	1.96E-28	1.14E-25	1.18E-23
590400	0.	0.	0.	0.	0.	0.	0.	0.	6.39E-36	1.44E-32	8.94E-30	2.07E-27
559874	0.	0.	0.	0.	0.	0.	8.82E-38	3.38E-36	9.88E-35	1.46E-31	6.51E-29	1.14E-26
664000	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.43E-37	3.45E-34	1.60E-31
617000	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.69E-34	2.07E-31	6.12E-29
721900	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.27E-36	9.87E-34
636000	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.19E-35	1.18E-32	4.15E-30
740000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.40E-35
693000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.54E-36	1.51E-33
796000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TABLE 61 (CONT.) 1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF D 3+

LEVEL	TEMPERATURE (DEG K)											
	14000	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
G												
386	3.42E-01	3.41E-01	3.40E-01	3.39E-01	3.38E-01	3.37E-01	3.35E-01	3.29E-01	3.20E-01	3.10E-01	2.98E-01	2.84E-01
71379	6.57E-01	6.57E-01	6.57E-01	6.56E-01	6.54E-01	6.54E-01	6.53E-01	6.49E-01	6.29E-01	6.09E-01	5.84E-01	5.65E-01
126942	3.69E-04	3.69E-04	3.69E-04	3.68E-04	3.67E-04	3.66E-04	3.65E-04	3.64E-04	3.63E-04	3.62E-04	3.61E-04	3.60E-04
164367	1.59E-08	1.59E-08	1.59E-08	1.58E-08	1.57E-08	1.56E-08	1.55E-08	1.54E-08	1.53E-08	1.52E-08	1.51E-08	1.50E-08
180444	8.88E-09	8.88E-09	8.88E-09	8.87E-09	8.86E-09	8.85E-09	8.84E-09	8.83E-09	8.82E-09	8.81E-09	8.80E-09	8.79E-09
231275	3.23E-11	3.23E-11	3.23E-11	3.22E-11	3.21E-11	3.20E-11	3.19E-11	3.18E-11	3.17E-11	3.16E-11	3.15E-11	3.14E-11
255168	6.98E-12	6.98E-12	6.98E-12	6.97E-12	6.96E-12	6.95E-12	6.94E-12	6.93E-12	6.92E-12	6.91E-12	6.90E-12	6.89E-12
289021	1.27E-13	1.27E-13	1.27E-13	1.26E-13	1.25E-13	1.24E-13	1.23E-13	1.22E-13	1.21E-13	1.20E-13	1.19E-13	1.18E-13
337615	3.74E-17	3.74E-17	3.74E-17	3.73E-17	3.72E-17	3.71E-17	3.70E-17	3.69E-17	3.68E-17	3.67E-17	3.66E-17	3.65E-17
390219	3.93E-18	3.93E-18	3.93E-18	3.92E-18	3.91E-18	3.90E-18	3.89E-18	3.88E-18	3.87E-18	3.86E-18	3.85E-18	3.84E-18
419344	3.22E-19	3.22E-19	3.22E-19	3.21E-19	3.20E-19	3.19E-19	3.18E-19	3.17E-19	3.16E-19	3.15E-19	3.14E-19	3.13E-19
483823	7.08E-23	7.08E-23	7.08E-23	7.07E-23	7.06E-23	7.05E-23	7.04E-23	7.03E-23	7.02E-23	7.01E-23	7.00E-23	6.99E-23
504000	3.28E-23	3.28E-23	3.28E-23	3.27E-23	3.26E-23	3.25E-23	3.24E-23	3.23E-23	3.22E-23	3.21E-23	3.20E-23	3.19E-23
511000	6.39E-23	6.39E-23	6.39E-23	6.38E-23	6.37E-23	6.36E-23	6.35E-23	6.34E-23	6.33E-23	6.32E-23	6.31E-23	6.30E-23
443345	4.91E-20	4.91E-20	4.91E-20	4.90E-20	4.89E-20	4.88E-20	4.87E-20	4.86E-20	4.85E-20	4.84E-20	4.83E-20	4.82E-20
474555	6.09E-21	6.09E-21	6.09E-21	6.08E-21	6.07E-21	6.06E-21	6.05E-21	6.04E-21	6.03E-21	6.02E-21	6.01E-21	6.00E-21
501721	6.22E-22	6.22E-22	6.22E-22	6.21E-22	6.20E-22	6.19E-22	6.18E-22	6.17E-22	6.16E-22	6.15E-22	6.14E-22	6.13E-22
590400	2.19E-25	2.19E-25	2.19E-25	2.18E-25	2.17E-25	2.16E-25	2.15E-25	2.14E-25	2.13E-25	2.12E-25	2.11E-25	2.10E-25
559874	9.47E-25	9.47E-25	9.47E-25	9.46E-25	9.45E-25	9.44E-25	9.43E-25	9.42E-25	9.41E-25	9.40E-25	9.39E-25	9.38E-25
646000	3.09E-29	3.09E-29	3.09E-29	3.08E-29	3.07E-29	3.06E-29	3.05E-29	3.04E-29	3.03E-29	3.02E-29	3.01E-29	3.00E-29
617000	9.01E-27	9.01E-27	9.01E-27	9.00E-27	8.99E-27	8.98E-27	8.97E-27	8.96E-27	8.95E-27	8.94E-27	8.93E-27	8.92E-27
721900	2.94E-31	2.94E-31	2.94E-31	2.93E-31	2.92E-31	2.91E-31	2.90E-31	2.89E-31	2.88E-31	2.87E-31	2.86E-31	2.85E-31
636000	6.32E-28	6.32E-28	6.32E-28	6.31E-28	6.30E-28	6.29E-28	6.28E-28	6.27E-28	6.26E-28	6.25E-28	6.24E-28	6.23E-28
740000	2.56E-32	2.56E-32	2.56E-32	2.55E-32	2.54E-32	2.53E-32	2.52E-32	2.51E-32	2.50E-32	2.49E-32	2.48E-32	2.47E-32
693000	3.61E-31	3.61E-31	3.61E-31	3.60E-31	3.59E-31	3.58E-31	3.57E-31	3.56E-31	3.55E-31	3.54E-31	3.53E-31	3.52E-31
796000	1.62E-33	1.62E-33	1.62E-33	1.61E-33	1.60E-33	1.59E-33	1.58E-33	1.57E-33	1.56E-33	1.55E-33	1.54E-33	1.53E-33

TABLE 61 (CONT.) 1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 3+

LEVEL	TEMPERATURE (DEG K)									
	44000	48000	50000	60000	80000	100000	200000	400000	600000	1000000
0	2.74E-01	2.42E-01	2.28E-01	1.83E-01	1.50E-01	4.92E-02	1.08E-02	5.67E-03	3.27E-03	0.
386	5.41E-01	5.10E-01	4.52E-01	3.64E-01	3.27E-01	9.81E-02	2.17E-02	1.13E-02	6.53E-03	0.
71379	1.59E-01	1.85E-01	2.17E-01	3.03E-01	3.21E-01	1.17E-01	5.03E-02	2.87E-02	1.77E-02	0.
124842	2.14E-02	2.91E-02	5.43E-02	9.34E-02	1.20E-01	9.87E-02	3.43E-02	2.09E-02	1.34E-02	0.
164367	1.27E-03	1.90E-03	4.43E-03	9.54E-03	1.41E-02	1.51E-02	6.00E-03	3.89E-03	2.50E-03	0.
180644	2.24E-03	3.50E-03	8.99E-03	2.13E-02	3.34E-02	4.02E-02	1.70E-02	1.10E-02	7.56E-03	0.
231275	2.89E-04	5.11E-04	1.70E-03	5.73E-03	1.07E-02	1.86E-02	9.44E-03	6.52E-03	4.69E-03	0.
255168	3.24E-04	6.24E-04	2.31E-03	9.31E-03	1.90E-02	3.92E-02	2.17E-02	1.54E-02	1.13E-02	0.
289921	6.44E-05	1.34E-04	6.69E-04	3.04E-03	7.01E-03	1.85E-02	1.15E-02	8.51E-03	6.47E-03	0.
357415	2.79E-06	5.79E-06	4.30E-05	2.95E-04	8.71E-04	3.76E-03	3.00E-03	2.41E-03	1.95E-03	0.
390219	2.34E-04	6.53E-04	5.91E-03	4.53E-04	1.64E-03	6.91E-03	7.99E-03	6.68E-03	5.99E-03	0.
419444	1.51E-06	4.52E-06	4.07E-05	4.84E-04	1.79E-03	1.20E-02	1.20E-02	1.04E-02	8.94E-03	0.
449123	3.45E-08	1.24E-07	1.99E-06	2.94E-05	1.38E-04	1.49E-03	1.89E-03	1.77E-03	1.62E-03	0.
504000	5.72E-08	2.14E-07	3.04E-06	6.34E-05	3.18E-04	3.93E-03	5.31E-03	5.09E-03	4.74E-03	0.
511000	1.82E-07	7.00E-07	1.30E-05	2.24E-04	1.15E-03	1.50E-02	2.07E-02	2.00E-02	1.80E-02	0.
643445	1.24E-04	3.94E-04	4.91E-03	5.64E-04	2.28E-03	1.82E-02	1.98E-02	1.74E-02	1.55E-02	0.
674555	1.58E-06	4.69E-06	7.03E-05	9.73E-04	4.37E-03	4.37E-02	5.31E-02	4.91E-02	4.44E-02	0.
901721	9.24E-07	3.97E-06	6.11E-05	6.95E-04	4.93E-03	5.99E-02	6.03E-02	7.67E-02	7.19E-02	0.
990400	1.63E-07	7.77E-07	2.33E-05	6.48E-04	4.41E-03	1.01E-01	1.87E-01	1.98E-01	2.01E-01	0.
999874	8.29E-08	3.64E-07	9.09E-06	2.10E-04	1.28E-03	2.37E-02	3.91E-02	4.00E-02	3.94E-02	0.
100000	4.58E-09	2.69E-08	1.27E-06	5.53E-05	4.95E-04	1.96E-02	4.74E-02	5.51E-02	6.02E-02	0.
617000	3.84E-08	1.97E-07	6.03E-06	2.25E-04	1.69E-03	4.71E-02	9.55E-02	1.05E-01	1.09E-01	0.
721900	2.21E-09	1.51E-08	9.96E-07	6.07E-05	6.64E-04	3.94E-02	1.16E-01	1.45E-01	1.67E-01	0.
634000	1.14E-08	6.19E-08	2.44E-06	8.89E-05	7.14E-04	2.28E-02	4.95E-02	5.54E-02	5.89E-02	0.
740000	6.79E-10	4.87E-09	3.48E-07	2.43E-05	2.84E-04	1.92E-02	6.04E-02	7.70E-02	9.02E-02	0.
693000	3.59E-10	2.24E-09	1.24E-07	6.30E-04	6.29E-03	3.03E-03	8.07E-03	9.69E-03	1.09E-02	0.
796600	2.18E-11	1.82E-10	1.37E-08	1.70E-06	2.54E-05	2.57E-03	9.90E-03	1.35E-02	1.64E-02	0.

TABLE 42. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 3*

STATE	LEVEL (CM-1)	STAT.	TEMPERATURE (DEG K)											
			3200	3400	4000	4400	4800	5200	5600	6000	6400			
3 ¹ 3 ⁰	0	4	1.06E-00	9.99E-01	9.99E-01	9.99E-01	9.94E-01	9.93E-01	9.89E-01	9.84E-01	9.78E-01	9.71E-01	9.64E-01	
	21167	10	1.84E-04	5.29E-04	1.21E-03	2.46E-03	4.37E-03	7.10E-03	1.07E-02	1.54E-02	2.10E-02	2.76E-02	3.51E-02	
	34975	6	2.22E-07	1.27E-06	5.19E-06	1.81E-05	4.18E-05	9.34E-05	1.86E-04	3.34E-04	5.65E-04	8.60E-04	1.27E-03	
	118128	12	2.51E-23	9.40E-23	1.00E-21	5.02E-21	1.29E-20	1.90E-19	2.78E-18	4.04E-17	5.80E-16	8.26E-15	1.17E-14	
3 ² 3 ⁰	145968	10	7.85E-29	1.15E-25	3.94E-23	4.65E-21	2.48E-19	7.15E-18	1.28E-16	1.55E-15	1.37E-14	1.17E-13	1.01E-12	
	166719	6	4.18E-33	1.73E-29	1.35E-26	3.15E-24	2.96E-22	1.30E-20	3.70E-19	6.41E-18	7.75E-17	8.81E-16	9.81E-15	
	177833	2	9.41E-36	6.79E-32	2.77E-26	3.52E-24	2.12E-22	7.10E-21	1.49E-19	2.82E-18	4.41E-17	6.41E-16	8.81E-15	
	290000*	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3 ² 3 ¹ (P)	23.5401	90	0.	3.95E-35	1.44E-31	1.25E-28	3.42E-26	3.84E-24	2.30E-22	7.80E-21	1.70E-19	3.10E-17	5.40E-15	
	204000*	34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	253193	18	0.	0.	0.	4.90E-36	4.91E-33	1.68E-29	2.49E-26	1.90E-23	1.00E-20	4.38E-18	1.53E-15	
	290049	54	0.	0.	0.	0.	2.13E-37	1.87E-34	5.74E-32	8.22E-30	6.31E-28	3.11E-26	1.11E-24	
(D)	333000*	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	43.7653	90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	349000*	126	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	241000*	50	0.	0.	2.81E-37	7.42E-34	5.27E-31	1.34E-28	1.59E-26	9.81E-25	3.61E-23	1.61E-21	5.61E-19	
(S)	248159	18	0.	0.	0.	2.06E-38	3.07E-35	1.48E-32	2.96E-30	2.91E-28	1.61E-26	7.61E-24	3.11E-22	
	307000**	30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	44.6250	50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	47.6087	70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
LEVEL	31.6152	10	0.	0.	0.	1.53E-36	5.64E-33	5.64E-31	8.71E-29	6.83E-27	3.10E-25	9.73E-23	2.73E-21	
	48.8648	32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	6000	7200	7600	8000	8400	8800	9200	9600	10000	11000	12000	13000		
	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	TEMPERATURE (DEG R)	
ESTIMATED NONSTARRED ENERGY LEVELS FROM MCGRE (1949) AND BOWEN (1955)	0	9.72E-01	9.64E-01	9.55E-01	9.45E-01	9.34E-01	9.23E-01	9.11E-01	8.99E-01	8.86E-01	8.72E-01	8.57E-01	8.42E-01	
	177833	2.16E-02	3.51E-02	4.34E-02	5.25E-02	6.22E-02	7.23E-02	8.31E-02	9.41E-02	1.05E-01	1.16E-01	1.27E-01	1.38E-01	
	34975	6.31E-04	1.33E-03	1.91E-03	2.63E-03	3.51E-03	4.53E-03	5.76E-03	7.13E-03	8.67E-03	1.04E-02	1.24E-02	1.46E-02	
	118128	6.07E-11	1.02E-10	5.56E-10	1.68E-09	4.57E-09	1.13E-08	2.59E-08	5.52E-08	1.10E-07	1.74E-06	2.64E-05	3.95E-04	
	145968	9.38E-14	5.17E-13	2.38E-12	9.38E-12	3.24E-11	9.96E-11	2.78E-10	7.09E-10	1.88E-09	5.14E-08	1.09E-07	1.89E-06	
	166719	6.98E-16	4.91E-15	2.81E-14	1.35E-13	5.56E-13	2.01E-12	6.49E-12	1.90E-11	5.08E-11	1.24E-10	2.54E-09	5.14E-08	
	177833	2.21E-17	1.70E-16	1.14E-15	6.09E-15	2.76E-14	1.20E-13	3.80E-13	1.20E-12	3.42E-12	8.37E-11	2.25E-10	5.11E-09	
	290000	3.27E-27	9.82E-26	2.05E-24	3.16E-23	3.75E-22	3.54E-21	2.79E-20	1.79E-19	1.01E-18	3.30E-17	9.75E-16	1.36E-14	
	204000	2.57E-18	2.87E-17	2.48E-16	1.73E-15	9.97E-15	4.90E-14	2.09E-13	7.90E-13	2.68E-12	3.81E-11	3.44E-10	2.22E-09	
	253193	2.37E-23	6.61E-22	6.55E-21	7.12E-20	6.15E-19	4.37E-18	2.61E-17	1.34E-16	6.02E-16	2.41E-15	2.39E-14	2.39E-12	
	290049	2.90E-24	8.72E-23	1.92E-22	2.81E-21	3.34E-20	2.43E-19	1.60E-18	8.94E-18	3.84E-16	7.70E-15	1.21E-13	1.21E-11	
	353000	7.98E-32	5.02E-30	2.04E-28	5.70E-27	1.70E-26	1.17E-25	7.55E-24	4.81E-23	2.92E-22	1.75E-21	1.05E-19	5.45E-17	
369000	3.78E-33	2.87E-31	1.38E-29	4.59E-28	1.05E-26	1.83E-25	2.49E-24	2.72E-23	2.45E-22	2.06E-20	1.54E-18	8.55E-16		
241000	8.48E-22	1.48E-20	1.83E-19	1.77E-18	1.38E-17	8.90E-16	4.87E-16	2.31E-15	9.67E-15	2.89E-14	2.89E-12	2.89E-10		
268159	5.55E-25	1.29E-23	2.14E-22	2.68E-21	2.83E-20	2.10E-19	1.39E-18	7.89E-18	3.88E-17	1.23E-16	2.23E-14	2.54E-13		
307000	6.64E-28	1.64E-26	4.11E-25	7.44E-24	1.02E-22	1.10E-21	9.62E-21	7.02E-20	4.36E-19	2.33E-17	6.35E-16	1.03E-14		
346000	1.84E-33	3.98E-31	6.61E-30	2.13E-28	4.93E-27	8.54E-26	1.19E-24	1.25E-23	1.12E-22	1.33E-20	7.05E-19	2.02E-17		
389000	8.80E-35	7.96E-33	4.48E-31	1.68E-29	4.55E-28	8.74E-27	1.32E-25	1.59E-24	1.37E-23	2.29E-21	1.43E-19	4.80E-18		
293000	6.98E-24	1.78E-22	2.58E-21	2.86E-20	2.51E-19	1.80E-18	1.09E-17	5.67E-17	2.58E-16	6.97E-15	1.08E-13	1.09E-12		
378000	1.43E-34	1.21E-32	6.37E-31	2.26E-29	5.69E-28	1.53E-26	1.53E-25	1.79E-24	1.70E-23	2.30E-21	1.34E-19	4.26E-18		

TABLE 62 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Na 3s

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	14070	15000	16000	17000	18000	19000	20000	24000	28000	32000	36000	40000
0	7.59E-01	7.24E-01	6.94E-01	6.69E-01	6.44E-01	6.21E-01	6.00E-01	5.79E-01	4.74E-01	4.35E-01	4.02E-01	3.74E-01
21167	2.14E-01	2.38E-01	2.59E-01	2.79E-01	2.97E-01	3.13E-01	3.27E-01	3.42E-01	4.01E-01	4.20E-01	4.31E-01	4.37E-01
34975	3.11E-02	3.78E-02	4.49E-02	5.20E-02	5.90E-02	6.59E-02	7.27E-02	7.94E-02	1.01E-01	1.08E-01	1.14E-01	1.19E-01
118128	1.21E-05	2.61E-05	5.08E-05	9.13E-05	1.58E-04	2.43E-04	3.30E-04	4.19E-04	5.30E-04	6.44E-04	7.67E-04	8.91E-04
145948	5.74E-07	1.50E-06	3.47E-06	7.21E-06	1.38E-05	2.44E-05	4.13E-05	6.09E-05	8.34E-05	1.10E-04	1.44E-04	1.83E-04
164719	4.10E-08	1.29E-07	3.22E-07	7.47E-07	1.58E-06	3.04E-06	5.54E-06	8.22E-06	1.14E-05	1.54E-05	2.02E-05	2.58E-05
177833	4.34E-09	1.42E-08	3.95E-08	9.73E-08	2.16E-07	4.40E-07	8.34E-07	1.53E-06	2.54E-06	3.62E-06	4.87E-06	6.29E-06
209000	1.29E-13	3.02E-13	6.93E-13	1.54E-12	3.40E-12	7.40E-12	1.58E-11	3.34E-11	6.20E-11	1.12E-10	2.02E-10	3.64E-10
204000	1.09E-08	3.07E-08	8.41E-08	2.20E-07	5.78E-07	1.54E-06	4.09E-06	1.06E-05	2.71E-05	6.92E-05	1.81E-04	4.64E-04
233193	1.70E-11	6.24E-11	1.99E-10	6.05E-10	1.71E-09	4.32E-09	1.04E-08	2.54E-08	6.16E-08	1.51E-07	3.62E-07	8.64E-07
290649	1.15E-12	8.07E-12	4.41E-11	1.97E-10	7.61E-10	2.42E-09	7.01E-09	2.05E-08	5.65E-08	1.51E-07	4.01E-07	1.02E-06
393600	2.98E-15	3.21E-14	2.54E-13	1.99E-12	8.07E-12	3.44E-11	1.24E-10	4.27E-09	1.42E-08	4.52E-08	1.42E-07	4.37E-07
369000	8.06E-16	9.70E-15	6.51E-14	5.76E-13	3.15E-12	1.43E-11	6.19E-11	2.51E-10	9.73E-09	3.64E-08	1.37E-07	4.93E-07
241000	1.45E-10	8.27E-10	3.77E-09	1.64E-08	6.71E-08	2.71E-07	1.04E-06	3.82E-06	1.37E-05	4.82E-05	1.67E-04	5.61E-04
288159	2.93E-12	1.22E-11	5.86E-11	2.33E-10	7.91E-10	2.34E-09	6.28E-09	1.68E-08	4.38E-08	1.10E-07	2.73E-07	6.83E-07
307000	1.12E-13	8.84E-13	5.35E-12	2.61E-11	1.04E-10	3.73E-10	1.15E-09	4.03E-08	1.31E-07	4.20E-07	1.41E-06	4.49E-06
348000	3.55E-16	4.24E-15	3.69E-14	2.49E-13	1.95E-12	6.13E-12	2.39E-11	8.73E-10	3.19E-08	1.12E-07	3.95E-06	1.34E-05
344000	9.59E-17	1.28E-15	1.23E-14	5.00E-14	2.27E-13	2.54E-12	1.04E-11	3.91E-10	1.42E-08	5.12E-07	1.82E-06	6.57E-06
255000	7.94E-12	4.32E-11	1.91E-10	7.09E-09	2.26E-08	6.34E-08	1.64E-07	4.04E-06	1.14E-05	2.73E-05	6.72E-05	1.67E-04
378000	8.12E-17	1.04E-15	9.62E-15	6.83E-14	3.89E-13	1.84E-12	7.44E-12	3.10E-10	1.40E-08	5.45E-07	2.02E-06	7.73E-06

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	44000	48000	60000	80000	100000	200000	400000	600000	1000000	0	0	0
0	3.50E-01	3.28E-01	2.71E-01	1.93E-01	1.36E-01	3.99E-02	1.44E-02	1.18E-02	8.93E-03	0.	0.	0.
21167	4.30E-01	4.35E-01	4.08E-01	3.29E-01	2.51E-01	8.57E-02	3.79E-02	2.79E-02	2.17E-02	0.	0.	0.
34975	1.67E-01	1.73E-01	1.74E-01	1.54E-01	1.23E-01	4.65E-02	2.16E-02	1.62E-02	1.27E-02	0.	0.	0.
118128	2.21E-02	2.85E-02	4.78E-02	6.91E-02	7.66E-02	5.12E-02	3.21E-02	2.64E-02	2.24E-02	0.	0.	0.
145948	7.40E-03	1.03E-02	2.04E-02	3.49E-02	4.16E-02	3.49E-02	2.42E-02	2.07E-02	1.81E-02	0.	0.	0.
164719	2.25E-03	3.33E-03	7.44E-03	1.44E-02	1.95E-02	1.80E-02	1.39E-02	1.18E-02	1.05E-02	0.	0.	0.
177833	5.22E-04	7.94E-04	1.90E-03	3.93E-03	5.21E-03	5.55E-03	4.31E-03	3.84E-03	3.44E-03	0.	0.	0.
209000	4.00E-03	6.24E-03	1.80E-02	4.57E-02	1.15E-01	7.41E-01	8.65E-01	8.82E-01	8.83E-01	0.	0.	0.
204000	9.34E-03	1.54E-02	4.34E-02	1.67E-01	1.58E-01	2.04E-01	1.73E-01	1.81E-01	1.49E-01	0.	0.	0.
233193	4.00E-04	7.47E-04	2.81E-03	9.13E-03	1.90E-02	2.90E-02	2.90E-02	2.88E-02	2.79E-02	0.	0.	0.
290649	3.59E-04	7.42E-04	3.48E-03	1.41E-02	2.83E-02	6.48E-02	7.78E-02	7.82E-02	7.94E-02	0.	0.	0.
393600	7.64E-05	1.87E-04	1.62E-03	7.96E-03	1.91E-02	7.08E-02	1.03E-01	1.13E-01	1.21E-01	0.	0.	0.
369000	6.34E-05	1.62E-04	1.22E-03	7.96E-03	2.12E-02	8.84E-02	1.37E-01	1.53E-01	1.69E-01	0.	0.	0.
241000	1.45E-03	2.99E-03	1.09E-02	3.16E-02	5.31E-02	8.8E-02	8.99E-02	8.24E-02	7.89E-02	0.	0.	0.
288159	1.34E-04	2.45E-04	1.09E-03	3.80E-03	7.18E-03	1.43E-02	1.54E-02	1.54E-02	1.52E-02	0.	0.	0.
307000	1.15E-04	2.48E-04	1.29E-03	5.78E-03	1.23E-02	3.29E-02	4.07E-02	4.22E-02	4.31E-02	0.	0.	0.
348000	2.60E-05	6.44E-05	4.90E-04	3.22E-03	8.53E-03	5.44E-02	5.44E-02	6.08E-02	6.58E-02	0.	0.	0.
344000	2.14E-05	5.76E-05	4.71E-04	3.30E-03	9.49E-03	6.11E-02	7.19E-02	8.19E-02	8.68E-02	0.	0.	0.
255000	2.89E-04	3.93E-04	1.50E-03	4.91E-03	8.87E-03	1.59E-02	1.63E-02	1.59E-02	1.59E-02	0.	0.	0.
378000	1.20E-05	3.15E-05	2.51E-04	1.72E-03	6.73E-03	2.10E-02	3.36E-02	3.82E-02	4.15E-02	0.	0.	0.

TABLE 63. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C ++

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	TEMPERATURE (DEG K)											
				5200	5400	6000	6400	6800	7200	7600	8000	8400			
1s	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2s	2411244	298.9484	3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p	2456000	304.4973	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s	2442215	303.2879	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3p	2841000	352.2300	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3d	2857000	354.2137	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4s	2858000	354.3377	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4p	2487500	370.3312	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4d	2939000	370.7032	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4f	2991000	370.8272	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5s	2991000	370.8272	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)													
	8000	8200	8600	9000	10000	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2411244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2456000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2442215	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2841000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2857000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2858000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2487500	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2939000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2991000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 INDICATED ENERGY LEVELS FROM MOORE (1949) AND EDLER (1952)

TABLE 63 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTROMIC POPULATIONS OF C 4+

LEVEL (C-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
2411244	0.	0.	0.	0.	0.	0.	6.46E-30	1.27E-31	1.27E-31	2.32E-29	4.40E-15	2.57E-15
2454000	0.	0.	0.	0.	0.	0.	0.	1.32E-35	1.07E-32	2.65E-26	6.56E-20	4.50E-16
2462215	0.	0.	0.	0.	0.	0.	0.	1.30E-34	1.04E-31	2.71E-25	7.04E-19	4.94E-15
2441000	0.	0.	0.	0.	0.	0.	0.	4.15E-37	1.04E-29	2.58E-22	7.38E-18	0.
2857000	0.	0.	0.	0.	0.	0.	0.	7.71E-17	2.12E-29	5.81E-22	1.69E-17	0.
2898000	0.	0.	0.	0.	0.	0.	0.	1.23E-36	3.44E-29	9.51E-22	2.77E-17	0.
2987000	0.	0.	0.	0.	0.	0.	0.	0.	3.12E-31	1.87E-23	8.84E-19	0.
2995000	0.	0.	0.	0.	0.	0.	0.	0.	8.72E-31	5.31E-23	2.49E-18	0.
2991000	0.	0.	0.	0.	0.	0.	0.	0.	1.47E-10	8.59E-23	4.09E-18	0.
2991000	0.	0.	0.	0.	0.	0.	0.	0.	1.37E-30	1.22E-22	5.72E-18	0.
TEMPERATURE (DEG K)												
LEVEL (C-1)	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0	0	0
0	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
2411244	0.	9.95E-01	4.83E-01	3.42E-01	2.34E-02	1.49E-02	1.49E-02	1.29E-02	0.	0.	0.	0.
2454000	0.	5.11E-04	8.17E-03	2.19E-02	3.35E-02	2.90E-02	2.84E-02	2.41E-02	0.	0.	0.	0.
2462215	0.	2.12E-08	2.15E-04	9.37E-03	1.08E-02	9.74E-03	9.30E-03	9.03E-03	0.	0.	0.	0.
2441000	0.	1.70E-07	2.59E-02	1.19E-01	1.29E-01	1.17E-01	1.12E-01	1.09E-01	0.	0.	0.	0.
2857000	0.	5.32E-09	1.43E-04	3.49E-03	3.29E-02	3.40E-02	3.41E-02	3.42E-02	0.	0.	0.	0.
2898000	0.	1.42E-08	4.11E-04	1.12E-02	6.72E-02	1.01E-01	1.02E-01	1.02E-01	0.	0.	0.	0.
2987000	0.	2.39E-08	6.89E-04	1.87E-02	1.12E-01	1.69E-01	1.70E-01	1.71E-01	0.	0.	0.	0.
2995000	0.	1.86E-09	8.58E-05	2.74E-03	1.46E-02	2.92E-02	3.23E-02	3.35E-02	0.	0.	0.	0.
2991000	0.	5.44E-09	2.58E-04	8.15E-03	5.55E-02	8.84E-02	9.68E-02	1.00E-01	0.	0.	0.	0.
2991000	0.	9.04E-09	4.23E-04	1.36E-02	9.24E-02	1.47E-01	1.65E-01	1.67E-01	0.	0.	0.	0.
2991000	0.	1.27E-08	5.92E-04	1.90E-02	1.29E-01	2.04E-01	2.31E-01	2.34E-01	0.	0.	0.	0.

TABLE 64. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N⁺⁺

STATE	LEVEL (CM-1)	STATE (EV)	WT.	TEMPERATURE (DEG K)											
				5200	5600	6000	6400	6800	7200	7600	8000	8400			
1s 2s 2s	0	0.	2	1.30E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2p 3s	80637	4.9975	6	6.13E-10	3.02E-09	1.20E-08	4.02E-08	1.17E-07	3.01E-07	7.04E-07	3.15E-06	1.51E-05	3.61E-04	1.00E 00	1.00E 00
3p 3p	456127	56.5311	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3d 3d	477851	58.2844	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	484413	60.0580	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4s 4s	606343	75.1750	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4p 4p	615135	76.2451	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4d 4d	617908	76.6089	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4f 4f	619050*	76.6265	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
80637	5.64E-06	1.00E-05	1.00E-05	2.74E-05	7.88E-05	3.99E-04	7.55E-04	1.31E-03	2.12E-03	3.25E-03	4.74E-03
456127	4.09E-33	1.05E-31	2.05E-30	3.15E-29	1.23E-26	1.19E-22	4.30E-21	9.94E-20	1.53E-18	1.71E-17	1.44E-16
477851	3.52E-34	1.05E-32	2.37E-31	4.15E-30	3.93E-25	3.23E-23	1.51E-21	3.72E-20	6.52E-19	8.16E-18	7.70E-17
484413	2.01E-34	6.29E-33	1.48E-31	2.59E-30	1.52E-27	2.98E-25	1.20E-23	3.30E-20	6.02E-19	7.80E-18	7.60E-17
606343	0.	0.	0.	1.29E-38	3.60E-35	2.67E-32	7.17E-30	8.65E-28	5.51E-26	2.09E-24	5.15E-23
615135	0.	0.	0.	0.	3.42E-35	2.79E-32	8.13E-30	1.05E-27	7.11E-26	2.84E-24	7.34E-23
617908	0.	0.	0.	0.	3.97E-35	3.34E-32	9.36E-30	1.32E-27	9.08E-26	3.69E-24	9.67E-23
619050	0.	0.	0.	0.	5.45E-35	4.89E-32	1.37E-29	1.82E-27	1.23E-25	5.09E-24	1.34E-22

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 NONSTARRED ENERGY LEVELS FROM MOORE (1949) AND TILFORD (1963)

TABLE 64 (CONT.) I. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N⁺⁺

LFVEL (CM ⁻¹)	TEMPERATURE (DEG K)											
	17000	20000	24000	28000	32000	36000	40000	44000	48000	50000		
0	9.93E-01	9.91E-01	9.77E-01	9.59E-01	9.26E-01	8.93E-01	8.58E-01	8.23E-01	7.87E-01	6.97E-01	5.86E-01	5.12E-01
80637	6.64E-03	5.99E-03	2.33E-02	4.54E-02	7.40E-02	1.07E-01	1.42E-01	1.77E-01	2.11E-01	3.03E-01	4.11E-01	4.82E-01
456127	7.92E-16	5.56E-15	1.30E-12	5.32E-11	1.15E-09	1.08E-08	6.43E-08	2.74E-07	9.10E-07	1.24E-05	1.51E-04	7.23E-04
477851	5.74E-16	3.50E-15	1.76E-12	6.71E-11	1.30E-09	1.36E-08	8.83E-08	4.04E-07	1.42E-06	2.21E-05	3.24E-04	1.59E-03
484413	5.82E-16	3.64E-15	1.19E-12	7.39E-11	1.61E-09	1.75E-08	1.16E-07	5.43E-07	1.95E-06	3.14E-05	4.83E-04	2.41E-03
606343	1.14E-20	1.13E-19	1.60E-16	2.31E-14	1.34E-12	2.67E-11	2.90E-10	2.02E-09	1.01E-08	3.39E-07	1.08E-05	8.33E-05
615135	1.75E-20	1.80E-19	2.83E-16	5.14E-14	2.70E-12	5.44E-11	6.33E-10	4.54E-09	2.32E-08	8.21E-07	2.74E-05	2.20E-04
617938	2.37E-20	2.43E-19	3.97E-16	7.75E-14	3.98E-12	8.41E-11	9.55E-10	6.91E-09	3.57E-08	1.28E-06	4.37E-05	3.53E-04
618050	3.24E-20	4.06E-19	5.54E-16	1.08E-13	5.64E-12	1.17E-10	1.33E-09	9.63E-09	4.97E-08	1.79E-06	6.11E-05	4.57E-04

LFVEL (CM ⁻¹)	TEMPERATURE (DEG K)											
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0	0	
0	3.17E-01	1.52E-01	1.00E-01	6.77E-02	4.88E-02	4.11E-02	3.86E-02	3.70E-02	0.	0.	0.	0.
80157	5.32E-01	3.40E-01	2.48E-01	1.31E-01	1.38E-01	1.20E-01	1.14E-01	1.10E-01	0.	0.	0.	0.
456127	1.19E-02	2.94E-02	3.36E-02	3.51E-02	3.52E-02	3.47E-02	3.44E-02	3.47E-02	0.	0.	0.	0.
477851	3.05E-02	8.16E-02	1.02E-01	1.04E-01	1.04E-01	1.04E-01	1.04E-01	1.04E-01	0.	0.	0.	0.
484413	4.66E-02	1.33E-01	1.57E-01	1.69E-01	1.72E-01	1.73E-01	1.73E-01	1.73E-01	0.	0.	0.	0.
606343	4.04E-03	1.71E-02	2.34E-02	2.81E-02	3.14E-02	3.31E-02	3.36E-02	3.39E-02	0.	0.	0.	0.
615135	1.14E-02	4.98E-02	6.88E-02	6.36E-02	9.41E-02	9.89E-02	1.00E-01	1.02E-01	0.	0.	0.	0.
617938	1.84E-02	8.22E-02	1.14E-01	1.39E-01	1.57E-01	1.65E-01	1.67E-01	1.67E-01	0.	0.	0.	0.
618050	2.80E-02	1.15E-01	1.59E-01	1.93E-01	2.19E-01	2.31E-01	2.34E-01	2.37E-01	0.	0.	0.	0.

TABLE 65. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF D 44

STATE	LEVEL	STAT.	TEMPERATURE (DEG K)											
			(CM-1)	1E1V	WT.	5200	5600	6000	6400	6800	7200	7600	8000	8400
2s ¹	U	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	82413	9	1.12E-09	5.73E-09	2.35E-08	8.09E-08	2.41E-07	6.34E-07	1.51E-06	3.29E-06	6.44E-06	1.27E-05	2.50E-05	4.97E-05
	158798	3	2.48E-19	5.73E-18	8.70E-17	9.40E-16	7.67E-15	4.96E-14	1.39E-13	3.76E-12	1.02E-11	2.81E-11	7.52E-11	2.08E-10
	213929	9	1.77E-25	1.21E-23	6.73E-22	1.17E-20	1.98E-19	2.44E-18	2.32E-17	1.76E-16	1.10E-15	7.25E-15	4.97E-14	3.32E-13
	231722	5	7.15E-28	6.97E-26	3.69E-24	1.19E-22	2.55E-21	3.88E-20	4.44E-19	3.98E-18	2.90E-17	2.10E-16	1.47E-15	1.05E-14
2s	287909	35.6952	1	2.53E-35	7.49E-33	1.04E-30	7.77E-29	3.50E-27	1.03E-25	2.13E-24	3.25E-23	4.74E-22	6.75E-21	
	550682	68.2761	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	582501	72.2191	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	603862	74.5674	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	724916	89.8758	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p	736558	91.3192	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	743379	92.1649	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	749857	92.9680	26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	656197	81.3560	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	684352	84.8466	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3p	703506	87.2214	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	824280	102.1951	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	833186	103.2992	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	845389	108.8122	80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	853000*	105.7558	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	3d	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
		1.27E-05	2.27E-05	3.89E-05	6.38E-05	1.87E-04	4.40E-04	9.93E-04	2.81E-03	7.48E-03	1.68E-02	3.31E-02	5.95E-02	9.88E-02
		1.59E-11	4.92E-11	1.38E-10	3.88E-10	2.86E-09	1.61E-08	8.99E-08	2.45E-07	7.25E-07	1.88E-06	4.33E-06	9.10E-06	1.87E-05
		5.81E-15	2.66E-14	1.07E-13	4.36E-13	6.92E-12	6.92E-11	4.69E-10	2.54E-09	1.10E-08	3.86E-08	1.32E-07	3.23E-07	6.44E-07
		1.76E-16	9.13E-16	4.15E-15	1.66E-14	3.43E-13	4.27E-12	3.64E-11	2.27E-10	1.11E-09	4.44E-09	1.51E-08	4.44E-08	1.24E-07
		3.60E-21	2.79E-20	1.82E-19	4.82E-17	1.02E-15	1.45E-14	1.42E-13	1.01E-12	5.67E-12	2.59E-11	1.02E-10	3.92E-09	1.37E-08
		550682	1.59E-37	5.73E-36	2.09E-34	8.49E-33	1.56E-31	1.45E-29	1.05E-28	4.38E-28	1.24E-27	2.28E-26	3.02E-25	3.92E-24
		582501	0.	1.46E-37	4.80E-36	9.77E-35	5.59E-34	1.20E-32	1.20E-25	6.99E-24	2.13E-22	4.62E-21	7.12E-20	1.12E-18
603862		0.	0.	0.	9.76E-34	7.19E-31	1.09E-28	2.23E-26	1.99E-24	5.20E-23	1.24E-21	2.15E-20	3.92E-19	
724916		0.	0.	0.	0.	7.15E-38	5.73E-35	1.76E-32	2.53E-30	1.95E-28	8.94E-27	2.79E-25	8.44E-24	
736558		0.	0.	0.	0.	0.	4.74E-35	1.60E-32	2.94E-30	2.05E-28	1.01E-26	3.20E-25	1.02E-23	
743379		0.	0.	0.	0.	0.	3.71E-35	1.32E-32	2.15E-30	1.85E-28	9.41E-27	3.09E-25	1.02E-23	
749857		0.	0.	0.	0.	0.	2.54E-35	9.51E-33	1.62E-30	1.45E-28	7.61E-27	2.50E-25	8.44E-24	
656197	0.	0.	0.	6.36E-37	8.12E-34	6.17E-29	5.53E-27	5.53E-27	2.82E-25	9.04E-24	1.97E-22	4.22E-21		
684352	0.	0.	0.	0.	0.	6.33E-35	1.03E-29	1.11E-27	6.72E-26	2.50E-24	6.22E-23	1.62E-21		
703506	0.	0.	0.	1.40E-35	2.39E-30	1.06E-33	2.39E-30	2.94E-28	2.94E-28	8.24E-25	2.24E-23	5.97E-22		
824280	0.	0.	0.	0.	0.	1.94E-34	5.90E-32	5.90E-32	8.40E-30	4.00E-28	2.88E-26	2.08E-24		
833186	0.	0.	0.	0.	0.	1.93E-34	7.02E-34	7.02E-34	1.04E-31	8.47E-30	4.24E-28	1.58E-26		
845389	0.	0.	0.	0.	0.	1.11E-36	6.93E-34	5.76E-32	5.76E-32	1.02E-30	2.69E-28	8.44E-26		
853000	0.	0.	0.	0.	0.	7.11E-37	2.95E-34	2.95E-34	4.07E-32	3.69E-30	2.03E-28	7.03E-26		

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 †NONSTARRED ENERGY LEVELS FROM MOORE (1949)

TABLE 65 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 4+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	9.63E-01	9.77E-01	9.94E-01	9.84E-01	8.17E-01	7.45E-01	6.76E-01	6.11E-01	5.54E-01	4.19E-01	2.86E-01	2.14E-01
82413	3.05E-18	2.44E-17	1.73E-16	1.15E-16	7.37E-17	4.59E-17	2.81E-17	1.64E-17	9.21E-18	5.22E-18	3.05E-18	1.88E-18
158708	1.71E-05	3.20E-05	2.07E-04	1.94E-04	1.94E-03	1.94E-03	3.32E-03	1.02E-02	1.02E-02	2.79E-02	6.53E-02	6.53E-02
213929	8.15E-07	1.82E-06	2.28E-05	1.34E-04	4.89E-04	1.30E-03	2.77E-03	8.04E-03	8.18E-03	2.23E-02	5.50E-02	8.86E-02
231722	1.18E-07	2.81E-07	4.58E-06	2.98E-05	1.22E-04	3.54E-04	8.11E-04	1.57E-03	2.66E-03	8.09E-03	2.22E-02	3.81E-02
287909	3.34E-10	9.88E-10	3.00E-08	1.32E-07	1.95E-06	7.50E-06	2.15E-05	4.98E-05	9.89E-05	4.20E-04	1.61E-03	3.39E-03
506802	3.05E-18	2.44E-17	1.73E-16	1.15E-16	7.37E-17	4.59E-17	2.81E-17	1.64E-17	9.21E-18	5.22E-18	3.05E-18	1.88E-18
603882	2.72E-19	7.91E-18	6.89E-15	1.08E-12	4.14E-11	8.61E-10	6.45E-09	3.92E-08	1.74E-07	4.31E-06	9.65E-05	5.88E-04
724916	5.64E-24	8.76E-23	5.02E-19	2.35E-16	2.68E-14	7.80E-13	1.29E-11	1.24E-10	8.10E-10	4.73E-08	1.10E-04	7.20E-04
736958	7.05E-24	1.14E-22	7.50E-19	3.87E-16	4.04E-14	1.47E-12	2.53E-11	2.54E-10	1.71E-09	1.07E-07	4.07E-06	6.41E-05
743379	7.01E-24	1.14E-22	8.31E-19	4.59E-16	4.98E-14	1.86E-12	3.39E-11	3.39E-10	2.31E-09	1.52E-07	8.94E-06	9.68E-05
749857	6.01E-24	1.02E-22	7.89E-19	4.57E-16	5.21E-14	1.86E-12	3.66E-11	3.64E-10	2.68E-09	1.84E-07	1.11E-05	1.23E-04
684352	1.10E-21	1.46E-20	9.28E-17	2.41E-14	1.51E-12	3.65E-11	4.57E-10	1.91E-09	1.91E-08	3.73E-07	2.57E-05	4.07E-04
703506	4.31E-22	6.14E-21	2.72E-17	1.04E-14	8.97E-13	2.75E-11	4.15E-10	3.75E-09	2.31E-08	1.18E-06	5.50E-05	5.15E-04
824280	9.19E-27	2.07E-25	3.90E-21	4.27E-18	7.86E-16	4.41E-14	1.08E-12	1.44E-11	1.24E-10	1.31E-08	1.25E-06	1.81E-05
831186	1.40E-26	3.27E-25	6.86E-21	8.11E-18	1.58E-15	9.27E-14	2.39E-12	3.24E-11	2.84E-10	3.17E-08	3.20E-06	4.79E-05
845389	9.29E-27	2.27E-25	5.40E-21	7.22E-18	1.52E-15	9.48E-14	2.52E-12	3.62E-11	3.28E-10	3.95E-08	4.28E-06	6.69E-05
853000	7.31E-27	1.84E-25	4.88E-21	6.94E-18	1.51E-15	9.40E-14	2.69E-12	3.95E-11	3.66E-10	4.60E-08	5.23E-06	8.40E-05

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0	0	0
0	8.37E-02	2.33E-02	1.18E-02	6.39E-03	3.90E-03	3.03E-03	2.78E-03	2.59E-03	0.	0.	0.	0.
82413	4.16E-01	1.56E-01	8.73E-02	5.11E-02	3.31E-02	2.64E-02	2.43E-02	2.31E-02	0.	0.	0.	0.
158708	8.01E-02	3.94E-02	2.42E-02	1.53E-02	1.04E-02	8.38E-03	8.02E-03	7.60E-03	0.	0.	0.	0.
213929	1.62E-01	9.70E-02	6.37E-02	4.23E-02	3.01E-02	2.32E-02	2.38E-02	2.26E-02	0.	0.	0.	0.
231722	7.90E-02	5.06E-02	3.39E-02	2.29E-02	1.65E-02	1.39E-02	1.31E-02	1.25E-02	0.	0.	0.	0.
287909	1.04E-02	8.26E-03	5.93E-03	4.22E-03	3.17E-03	2.73E-03	2.59E-03	2.49E-03	0.	0.	0.	0.
506802	6.37E-03	1.28E-02	1.26E-02	1.14E-02	1.05E-02	9.93E-03	9.74E-03	9.50E-03	0.	0.	0.	0.
603882	2.17E-02	3.44E-02	3.51E-02	3.34E-02	3.08E-02	2.95E-02	2.90E-02	2.86E-02	0.	0.	0.	0.
724916	1.82E-03	6.86E-03	8.32E-03	9.01E-03	9.27E-03	9.33E-03	9.34E-03	9.34E-03	0.	0.	0.	0.
736958	5.02E-03	1.97E-02	2.43E-02	2.56E-02	2.76E-02	2.79E-02	2.79E-02	2.80E-02	0.	0.	0.	0.
743379	7.97E-03	3.21E-02	3.98E-02	4.39E-02	4.57E-02	4.63E-02	4.65E-02	4.66E-02	0.	0.	0.	0.
749857	1.04E-02	4.39E-02	5.48E-02	6.09E-02	6.37E-02	6.47E-02	6.50E-02	6.52E-02	0.	0.	0.	0.
656197	8.95E-03	2.64E-02	2.94E-02	2.98E-02	2.92E-02	2.87E-02	2.85E-02	2.83E-02	0.	0.	0.	0.
684352	2.19E-02	7.15E-02	8.25E-02	8.60E-02	8.59E-02	8.52E-02	8.49E-02	8.46E-02	0.	0.	0.	0.
703506	3.18E-02	1.11E-01	1.31E-01	1.39E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	0.	0.	0.	0.
824280	2.67E-03	1.44E-02	1.97E-02	2.34E-02	2.59E-02	2.76E-02	2.76E-02	2.76E-02	0.	0.	0.	0.
831186	7.52E-03	4.18E-02	5.77E-02	6.94E-02	7.72E-02	8.08E-02	8.19E-02	8.28E-02	0.	0.	0.	0.
845389	1.15E-02	4.67E-02	9.34E-02	1.14E-01	1.28E-01	1.34E-01	1.34E-01	1.38E-01	0.	0.	0.	0.
853000	1.52E-02	9.09E-02	1.28E-01	1.57E-01	1.78E-01	1.87E-01	1.90E-01	1.93E-01	0.	0.	0.	0.

TABLE 66. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR ⁴⁺

STATE	LEVEL (CM-1)	STAT. WT.	TEMPERATURE (DEG K)									
			5200	5600	6000	6400	6800	7200	7600	8000	8400	
3s 3p 3d	0	1	1.58E-01	1.54E-01	1.50E-01	1.47E-01	1.44E-01	1.41E-01	1.38E-01	1.36E-01	1.34E-01	
	765	3	3.43E-01	3.79E-01	3.74E-01	3.70E-01	3.66E-01	3.63E-01	3.59E-01	3.56E-01	3.52E-01	
	2032	5	4.50E-01	4.56E-01	4.61E-01	4.64E-01	4.67E-01	4.69E-01	4.71E-01	4.72E-01	4.73E-01	
	16301	5	8.68E-03	1.17E-02	1.50E-02	1.88E-02	2.28E-02	2.71E-02	3.16E-02	3.63E-02	4.10E-02	
	37914	1	4.39E-06	9.04E-06	1.69E-05	2.91E-05	4.71E-05	7.22E-05	1.06E-04	1.49E-04	2.02E-04	
3s 3p 3d	100000*	5	7.50E-13	5.34E-12	2.89E-11	1.26E-10	4.63E-10	1.48E-09	4.15E-09	1.05E-08	2.44E-08	
	121730	15	5.58E-15	6.02E-14	4.73E-13	2.87E-12	1.40E-11	5.76E-11	2.04E-10	6.33E-10	1.77E-09	
	141768	9	1.31E-17	2.10E-16	2.32E-15	1.90E-14	1.21E-13	6.30E-13	2.75E-12	1.03E-11	3.43E-11	
	191537	3	4.57E-24	1.96E-22	5.08E-21	8.76E-20	1.08E-18	1.01E-17	7.42E-17	4.47E-16	2.27E-15	
	160000*	5	4.69E-20	1.08E-18	1.63E-17	1.75E-16	1.42E-15	9.16E-15	4.84E-14	2.16E-13	8.34E-13	
3s 3p 3d	195356	3	1.59E-24	7.34E-23	2.03E-21	3.71E-20	4.87E-19	4.70E-18	3.60E-17	2.25E-16	1.18E-15	
	270000*	15	8.51E-33	1.72E-30	1.71E-28	9.57E-27	3.31E-25	7.81E-24	1.31E-22	1.66E-20	1.65E-20	
	220000**	60	3.47E-26	2.61E-24	1.10E-22	2.92E-21	5.24E-20	6.82E-19	6.78E-18	5.35E-17	3.44E-16	
	294155	12	2.82E-36	9.93E-34	1.60E-31	1.37E-29	6.90E-28	2.25E-26	5.09E-25	8.41E-24	1.04E-22	
	340000*	36	0.	6.38E-30	2.11E-25	3.34E-23	2.95E-21	1.58E-20	5.53E-20	1.36E-26	2.44E-23	
3s 3p 3d	400000*	60	0.	0.	0.	0.	0.	1.51E-36	1.63E-34	1.08E-32	4.67E-31	
	495924	60	0.	0.	0.	0.	0.	0.	0.	0.	1.41E-29	
	520000*	84	4.23E-35	1.55E-32	2.57E-30	2.25E-28	1.17E-26	3.69E-25	8.97E-24	1.79E-22	6.43E-21	
	500000*	300	0.	0.	0.	0.	0.	0.	0.	0.	1.94E-21	
	380000*	60	0.	0.	0.	0.	0.	0.	0.	0.	1.70E-29	
3s 3p 3d	430000*	180	0.	0.	0.	0.	0.	1.22E-36	1.10E-34	6.35E-33	2.48E-31	
	500000*	300	0.	0.	0.	0.	0.	0.	0.	0.	2.57E-34	
3s 3p 3d	520000*	420	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	644701	420	0.	0.	0.	0.	0.	0.	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
NONSTARRED ENERGY LEVELS FROM MOORE (1949) AND BOWEN (1955)

TABLE 66 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 4+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	8000	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	1.32E-01	1.30E-01	1.28E-01	1.27E-01	1.23E-01	1.17E-01	1.16E-01	1.14E-01	1.11E-01	1.09E-01	1.07E-01	1.05E-01
765	3.49E-01	3.46E-01	3.43E-01	3.40E-01	3.33E-01	3.27E-01	3.21E-01	3.16E-01	3.11E-01	3.08E-01	3.02E-01	2.98E-01
2032	4.73E-01	4.73E-01	4.73E-01	4.72E-01	4.70E-01	4.68E-01	4.64E-01	4.62E-01	4.58E-01	4.55E-01	4.52E-01	4.48E-01
16301	4.59E-02	5.08E-02	5.57E-02	6.06E-02	7.28E-02	9.48E-02	9.58E-02	1.07E-01	1.17E-01	1.26E-01	1.35E-01	1.43E-01
37914	2.68E-04	3.46E-04	4.37E-04	5.41E-04	6.62E-04	1.27E-03	1.79E-03	2.31E-03	2.93E-03	3.51E-03	4.33E-03	5.09E-03
100000	5.23E-08	1.09E-07	1.99E-07	3.51E-07	1.28E-06	3.71E-06	9.09E-06	1.96E-05	3.80E-05	6.79E-05	1.13E-04	1.76E-04
121730	4.49E-09	1.05E-08	2.29E-08	4.70E-08	2.24E-07	6.21E-07	2.44E-06	6.30E-06	1.62E-05	2.89E-05	5.40E-05	9.41E-05
141768	1.02E-10	2.75E-10	6.81E-10	1.50E-09	9.77E-09	4.48E-08	1.61E-07	4.87E-07	1.25E-06	2.86E-06	5.94E-06	1.14E-05
191537	9.93E-15	3.82E-14	1.31E-13	4.04E-13	4.85E-12	3.81E-11	2.17E-10	9.65E-10	3.51E-09	1.08E-08	2.93E-08	7.10E-08
160000	2.87E-12	8.83E-12	2.47E-11	6.36E-11	5.00E-10	2.78E-09	1.19E-08	4.11E-08	1.20E-07	3.08E-07	7.05E-07	1.47E-06
193356	5.32E-15	2.10E-14	7.40E-14	2.36E-13	2.94E-12	2.31E-11	1.42E-10	6.52E-10	2.43E-09	7.69E-09	2.12E-08	5.23E-08
270000	1.37E-19	6.94E-19	5.13E-18	2.55E-17	6.47E-16	1.56E-14	1.84E-13	1.52E-12	9.45E-12	4.68E-11	1.92E-10	6.70E-10
220000	1.59E-15	6.41E-15	3.68E-14	1.36E-13	2.34E-12	2.51E-11	1.84E-10	1.04E-09	4.58E-09	1.68E-08	5.28E-08	1.46E-07
298155	1.07E-21	8.76E-21	6.03E-20	3.56E-19	1.70E-17	4.27E-16	6.52E-15	6.73E-14	5.08E-13	2.98E-12	1.41E-11	5.65E-11
340600	3.42E-24	3.78E-23	3.42E-22	2.59E-21	2.15E-19	9.49E-18	1.91E-16	2.74E-15	2.75E-14	2.07E-13	1.23E-12	5.98E-12
400000	3.13E-28	5.30E-27	7.08E-26	7.49E-25	1.40E-23	1.04E-20	4.13E-19	9.59E-18	1.45E-16	1.57E-15	1.28E-14	8.23E-14
420000	1.67E-29	3.23E-28	4.99E-27	6.06E-26	1.41E-23	1.39E-21	6.35E-20	1.72E-18	2.59E-17	3.63E-16	2.59E-15	2.33E-14
300000	1.97E-20	1.64E-19	1.14E-18	6.32E-18	3.35E-16	6.58E-15	1.33E-13	1.39E-12	1.04E-11	6.30E-10	3.02E-09	1.22E-09
380000	8.24E-27	1.21E-25	1.42E-24	1.37E-23	1.91E-19	3.79E-18	7.97E-16	7.48E-15	9.80E-14	6.95E-13	4.07E-12	1.07E-11
430000	6.96E-30	1.46E-28	2.37E-27	3.08E-26	8.28E-24	6.74E-22	4.50E-20	1.32E-18	2.95E-17	3.11E-16	3.02E-15	2.24E-14
500000	1.24E-34	4.28E-33	1.10E-31	2.17E-30	1.46E-27	3.30E-25	3.24E-23	1.65E-21	4.86E-20	9.74E-19	1.35E-17	1.39E-16
520000	6.61E-36	2.62E-34	7.67E-33	1.71E-31	1.49E-28	4.20E-26	4.99E-24	2.95E-22	1.02E-20	2.26E-19	3.47E-18	3.93E-17

TABLE 66 (CONT.) 1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar ++

LEVEL (C-1)	TEMPERATURE (DEC K)											
	13000	20000	24000	28000	32000	34000	40000	44000	48000	60000	100000	
0	1.04E-01	1.02E-01	9.71E-02	9.29E-02	8.94E-02	8.62E-02	8.31E-02	8.01E-02	7.70E-02	6.75E-02	5.04E-02	3.58E-02
765	2.94E-01	2.90E-01	2.78E-01	2.68E-01	2.59E-01	2.51E-01	2.43E-01	2.34E-01	2.26E-01	1.99E-01	1.50E-01	1.04E-01
2032	4.45E-01	4.42E-01	4.30E-01	4.19E-01	4.08E-01	3.97E-01	3.86E-01	3.75E-01	3.62E-01	3.21E-01	2.44E-01	1.74E-01
15201	1.81E-01	1.80E-01	1.83E-01	2.01E-01	2.15E-01	2.25E-01	2.31E-01	2.35E-01	2.34E-01	2.28E-01	1.89E-01	1.42E-01
37914	5.88E-03	6.89E-03	1.00E-02	1.32E-02	1.53E-02	1.89E-02	2.12E-02	2.32E-02	2.47E-02	2.72E-02	2.94E-02	2.07E-02
100000	2.87E-04	3.84E-04	1.21E-03	2.73E-03	4.98E-03	7.92E-03	1.14E-02	1.52E-02	1.92E-02	3.07E-02	4.19E-02	4.24E-02
121730	1.44E-04	2.41E-04	9.88E-04	2.68E-03	5.93E-03	9.77E-03	1.34E-02	1.74E-02	2.01E-02	2.64E-02	3.50E-02	4.32E-02
141768	2.03E-05	3.43E-05	1.78E-04	5.74E-04	1.37E-03	2.68E-03	4.54E-03	6.94E-03	9.89E-03	1.41E-02	2.34E-02	4.19E-02
191537	1.96E-07	3.18E-07	3.00E-06	1.48E-05	4.88E-05	1.22E-04	2.54E-04	4.58E-04	7.82E-04	1.25E-03	2.02E-03	4.82E-03
160000	2.84E-06	5.13E-06	3.31E-05	1.25E-04	3.56E-04	7.20E-04	1.32E-03	2.14E-03	3.18E-03	4.72E-03	6.82E-03	1.04E-02
193156	1.17E-07	2.42E-07	2.39E-06	1.22E-05	4.11E-05	1.05E-04	2.21E-04	4.04E-04	6.62E-04	1.07E-03	1.52E-03	2.04E-03
270000	2.05E-09	5.63E-09	1.36E-08	1.31E-06	7.16E-06	2.66E-05	7.53E-05	1.74E-04	3.93E-04	1.56E-03	5.91E-03	1.18E-02
220000	3.62E-07	8.21E-07	1.09E-05	6.87E-05	2.71E-04	7.85E-04	1.82E-03	3.61E-03	6.32E-03	2.07E-02	5.81E-02	9.04E-02
298155	1.95E-10	5.94E-10	2.01E-08	2.47E-07	1.62E-06	6.91E-06	2.19E-05	5.60E-05	1.21E-04	6.36E-04	2.89E-03	5.89E-03
340000	2.46E-11	8.78E-11	4.91E-09	8.65E-08	7.39E-07	3.89E-06	1.44E-05	4.28E-05	1.04E-04	6.99E-04	4.03E-03	9.57E-03
400000	4.36E-13	1.99E-12	2.24E-10	6.60E-09	8.29E-08	5.90E-07	2.81E-06	1.00E-05	2.87E-05	2.76E-04	2.26E-03	6.89E-03
420000	1.34E-13	6.49E-13	9.47E-11	3.31E-09	4.72E-08	3.71E-07	1.92E-06	7.32E-06	2.21E-05	2.40E-04	2.23E-03	7.14E-03
300000	4.24E-09	1.30E-08	4.50E-07	5.63E-06	3.72E-05	1.40E-04	5.13E-04	1.32E-03	2.87E-03	1.52E-02	6.89E-02	1.43E-01
380000	1.88E-12	8.23E-12	7.44E-10	1.85E-08	2.04E-07	1.31E-06	5.77E-06	1.93E-05	5.23E-05	4.44E-04	3.21E-03	9.07E-03
430000	1.35E-13	6.77E-13	1.11E-10	4.24E-09	6.46E-08	5.33E-07	2.87E-06	1.13E-05	3.50E-05	4.04E-04	3.99E-03	1.32E-02
500000	1.12E-15	7.33E-15	2.79E-12	1.94E-10	4.62E-09	5.42E-08	3.89E-07	1.91E-06	7.14E-06	1.26E-04	1.89E-03	8.04E-03
520000	3.45E-16	2.44E-15	1.18E-12	9.70E-11	2.63E-09	3.41E-08	2.63E-07	1.39E-06	5.50E-06	1.09E-04	1.84E-03	8.47E-03

TABLE 66 (CONT.) ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 4+

LEVEL (CM-1)	TEMPERATURE (DEG K)										
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	20000000	0	
0	8.30E-03	2.57E-03	1.65E-03	1.13E-03	8.59E-04	7.33E-04	6.98E-04	6.71E-04	0.	0.	0.
765	2.49E-02	7.69E-03	4.93E-03	3.40E-03	2.55E-03	2.20E-03	2.09E-03	2.01E-03	0.	0.	0.
7037	4.09E-02	1.28E-02	8.19E-03	5.65E-03	4.24E-03	3.66E-03	3.49E-03	3.35E-03	0.	0.	0.
16301	3.69E-02	1.21E-02	7.91E-03	5.53E-03	4.20E-03	3.65E-03	3.48E-03	3.35E-03	0.	0.	0.
37914	6.37E-03	2.24E-03	1.50E-03	1.07E-03	8.28E-04	7.23E-04	6.92E-04	6.67E-04	0.	0.	0.
100000	2.02E-02	8.96E-03	6.47E-03	4.91E-03	3.95E-03	3.54E-03	3.41E-03	3.31E-03	0.	0.	0.
121740	5.19E-02	2.49E-02	1.84E-02	1.43E-02	1.17E-02	1.05E-02	1.02E-02	9.89E-03	0.	0.	0.
141748	2.69E-02	1.39E-02	1.05E-02	8.32E-03	6.90E-03	6.27E-03	6.07E-03	5.92E-03	0.	0.	0.
191537	6.28E-03	3.87E-03	3.12E-03	2.58E-03	2.22E-03	2.05E-03	2.00E-03	1.96E-03	0.	0.	0.
160000	1.31E-02	7.22E-03	5.61E-03	4.50E-03	3.78E-03	3.46E-03	3.36E-03	3.28E-03	0.	0.	0.
195356	6.11E-03	3.87E-03	3.09E-03	2.57E-03	2.21E-03	2.03E-03	2.00E-03	1.96E-03	0.	0.	0.
270000	1.78E-02	1.44E-02	1.29E-02	1.15E-02	1.05E-02	9.98E-03	9.81E-03	9.68E-03	0.	0.	0.
220000	1.07E-01	6.98E-02	5.83E-02	4.95E-02	4.35E-02	4.07E-02	3.97E-02	3.90E-02	0.	0.	0.
298155	1.17E-02	1.03E-02	9.68E-03	8.86E-03	8.22E-03	7.90E-03	7.80E-03	7.71E-03	0.	0.	0.
340000	2.57E-02	2.72E-02	2.62E-02	2.50E-02	2.39E-02	2.34E-02	2.32E-02	2.30E-02	0.	0.	0.
400000	2.80E-02	3.66E-02	3.78E-02	3.82E-02	3.82E-02	3.81E-02	3.81E-02	3.80E-02	0.	0.	0.
420000	3.40E-02	4.76E-02	5.05E-02	5.20E-02	5.27E-02	5.30E-02	5.30E-02	5.31E-02	0.	0.	0.
300000	2.88E-01	2.62E-01	2.40E-01	2.21E-01	2.05E-01	1.97E-01	1.95E-01	1.93E-01	0.	0.	0.
380000	3.24E-02	3.93E-02	3.97E-02	3.94E-02	3.88E-02	3.84E-02	3.82E-02	3.81E-02	0.	0.	0.
430000	6.77E-02	9.85E-02	1.06E-01	1.10E-01	1.12E-01	1.13E-01	1.13E-01	1.14E-01	0.	0.	0.
500000	6.82E-02	1.28E-01	1.49E-01	1.66E-01	1.78E-01	1.84E-01	1.86E-01	1.87E-01	0.	0.	0.
520000	8.27E-02	1.66E-01	1.99E-01	2.25E-01	2.45E-01	2.55E-01	2.59E-01	2.61E-01	0.	0.	0.

TABLE 67. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C 5*

STATE	LEVEL (CM-1)	LEVEL (EVI)	STAT. WT.	TEMPERATURE (DEG K)										
				5200	5400	6000	6400	6800	7200	7600	8000	8400		
1s	0	0.	2	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2s	2963904	367.4678	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p	2964195	367.5039	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s	3512929	435.5344	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3p	3513015	435.5671	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3d	3513090	435.5564	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4s	3705071	459.3784	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4p	3705107	459.3629	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4d	3705138	459.3667	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4f	3705151	459.3683	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	8800	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2963904	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2964195	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3512929	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3513015	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3513090	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3705071	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3705107	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3705138	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3705151	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
MONITORING ENERGY LEVELS FROM GARCIA AND HALL (1965)

TABLE 57 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF C 5+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	10000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
2963904	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.36E-31	7.08E-26	3.02E-19
2964195	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.09E-31	2.11E-23	9.02E-19
3512929	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.60E-37	3.64E-28	1.12E-22
3517015	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.79E-37	1.09E-27	3.34E-22
3513090	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.30E-34	1.62E-27	5.59E-22
3705071	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.15E-29	7.04E-24
3705107	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.45E-29	2.12E-23
3705138	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.74E-29	3.52E-23
3705151	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.04E-29	4.93E-23

LEVEL (CM-1)	TEMPERATURE (DEG K)										
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	20000000	40000000	100000000
0	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
2963904	5.49E-10	2.34E-05	8.13E-04	1.18E-02	3.59E-02	3.77E-02	3.66E-02	3.54E-02	0.	0.	0.
2964195	1.64E-09	7.02E-05	2.44E-03	3.54E-02	1.08E-01	1.13E-01	1.10E-01	1.04E-01	0.	0.	0.
3512929	1.06E-11	3.25E-06	2.18E-04	5.16E-03	2.42E-02	3.09E-02	3.21E-02	3.27E-02	0.	0.	0.
3517015	3.17E-11	9.75E-06	6.54E-04	1.61E-02	7.25E-02	9.63E-02	9.82E-02	9.82E-02	0.	0.	0.
3513090	5.29E-11	1.63E-05	1.09E-03	2.68E-02	1.21E-01	1.55E-01	1.60E-01	1.64E-01	0.	0.	0.
3705071	2.64E-12	1.63E-06	1.37E-04	4.06E-03	2.10E-02	2.89E-02	3.26E-02	3.26E-02	0.	0.	0.
3705107	7.97E-12	4.80E-06	4.12E-04	1.22E-02	6.31E-02	8.64E-02	9.19E-02	9.58E-02	0.	0.	0.
3705138	1.33E-11	8.15E-06	6.81E-04	2.03E-02	1.05E-01	1.44E-01	1.53E-01	1.59E-01	0.	0.	0.
3705151	1.88E-11	1.14E-05	9.62E-04	2.84E-02	1.57E-01	2.02E-01	2.15E-01	2.23E-01	0.	0.	0.

TABLE 48. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N 5+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEC K)											
				5200	5600	6000	6400	6800	7200	7600	8000	8400			
1s 5	0	0.	1	1.70E 00	1.70E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	
	3385900	419.7843	3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	3448000	426.4946	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	3447308	427.4007	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
1s 3	3990000	494.8842	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4008000	496.8158	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4811000	497.5358	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4200000	520.7202	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
1s 4p	4202000	520.8482	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4203000	521.0921	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4203000	521.0921	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
	4203000	521.0921	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	

LEVEL (CM-1)	TEMPERATURE (DEC K)												
	8800	9200	9600	10000	10400	10800	11200	11600	12000	12400	12800	13200	13600
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
3385900	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3447000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3447308	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3990000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4008000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4811000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4200000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4202000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4203000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLLEVELS
 MONITORABLE ENERGY LEVELS FROM MOORE (1949) AND EDLEN (1952)

TABLE 408 (CONT'D.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N 5+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
3385890	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3440000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3447308	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3990000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4208200	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4213000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4200000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4202000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4203000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4203000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)										
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	20000000	40000000	60000000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
3385890	7.92E-11	1.54E-05	8.85E-04	1.67E-02	3.51E-02	3.14E-02	2.97E-02	2.80E-02	2.60E-02	2.40E-02	2.20E-02
3440000	1.79E-11	4.23E-06	2.59E-04	5.14E-03	1.13E-02	1.03E-02	9.71E-03	9.24E-03	8.77E-03	8.30E-03	7.83E-03
3447308	2.04E-10	4.94E-05	3.04E-03	6.11E-02	1.34E-01	1.53E-01	1.74E-01	1.95E-01	2.16E-01	2.37E-01	2.58E-01
3990000	1.37E-12	2.34E-06	2.77E-04	9.32E-03	3.03E-02	3.37E-02	3.68E-02	3.92E-02	4.16E-02	4.40E-02	4.64E-02
4008000	3.61E-12	6.50E-06	7.96E-04	2.73E-02	8.98E-02	1.00E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01
4013000	5.80E-12	1.06E-05	1.31E-03	4.51E-02	1.49E-01	1.67E-01	1.69E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
4200000	3.02E-13	1.10E-06	1.68E-04	6.89E-03	2.61E-02	3.12E-02	3.24E-02	3.31E-02	3.31E-02	3.31E-02	3.31E-02
4202000	8.93E-13	3.27E-06	5.00E-04	2.06E-02	7.81E-02	9.36E-02	9.79E-02	9.94E-02	9.94E-02	9.94E-02	9.94E-02
4203000	1.48E-12	5.44E-06	8.31E-04	3.43E-02	1.30E-01	1.56E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
4203000	2.07E-12	7.61E-06	1.16E-03	4.80E-02	1.82E-01	2.18E-01	2.26E-01	2.32E-01	2.32E-01	2.32E-01	2.32E-01

TABLE 69. ENERGY LEVELS AND FRACTIONAL ELECTROMIC POPULATIONS OF O 5+

STATE	LEVEL (CM-1)	STAT. (EV)	WT.	TEMPERATURE (DEG K)										
				5200	5600	6000	6400	6800	7200	7600	8000	8400		
1P	0	0.	2	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
2P	96730	11.9927	6	7.14E-12	4.83E-11	2.53E-10	1.08E-09	3.88E-09	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08
3P	640040	79.3528	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3D	646218	82.5984	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3F	676656	83.6445	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4S	852694	105.7181	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4P	863376	107.0422	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4D	866893	107.4783	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4F	867083	107.5018	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	8000	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
96730	4.06E-07	8.08E-07	1.52E-06	2.71E-06	9.60E-06	2.74E-05	6.72E-05	1.64E-04	2.80E-04	5.70E-04	9.99E-04	9.99E-04
640040	0.	0.	0.	0.	4.39E-37	4.70E-34	1.72E-31	2.71E-29	2.18E-27	1.01E-25	2.98E-24	1.31E-03
646218	0.	0.	0.	0.	4.29E-38	6.11E-35	2.85E-32	5.52E-30	5.30E-28	2.88E-26	9.75E-25	6.04E-23
676656	0.	0.	0.	0.	0.	3.70E-42	1.87E-32	3.97E-30	3.93E-28	2.24E-26	7.94E-25	2.23E-23
852694	0.	0.	0.	0.	0.	0.	0.	8.75E-39	3.01E-36	5.00E-34	4.55E-32	1.90E-23
863376	0.	0.	0.	0.	0.	0.	0.	0.	3.24E-36	5.74E-34	5.52E-32	2.50E-30
866893	0.	0.	0.	0.	0.	0.	0.	0.	3.84E-36	6.97E-34	6.46E-32	4.02E-30
867083	0.	0.	0.	0.	0.	0.	0.	0.	5.31E-34	9.40E-34	9.42E-32	5.55E-30

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 †UNSTABLE ENERGY LEVELS FROM MOORE (1949)

TABLE 69 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 5+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	90000	160000
0	9.98E-01	9.97E-01	9.91E-01	9.80E-01	9.63E-01	9.41E-01	9.15E-01	8.87E-01	8.58E-01	7.72E-01	6.55E-01	5.73E-01
96730	1.97E-03	2.84E-03	9.01E-03	2.74E-02	3.73E-02	5.91E-02	8.47E-02	1.13E-01	1.42E-01	2.28E-01	3.45E-01	4.27E-01
640040	8.91E-22	1.00E-20	2.15E-17	5.10E-15	2.06E-13	7.52E-12	9.19E-11	7.22E-10	4.00E-09	1.67E-07	6.56E-06	5.73E-05
666218	3.68E-22	4.58E-21	1.34E-17	3.79E-15	2.83E-13	7.71E-12	1.07E-10	9.21E-10	5.47E-09	2.07E-07	1.23E-05	1.18E-04
674656	3.24E-22	4.16E-21	1.35E-17	4.31E-15	3.23E-13	9.17E-12	1.32E-10	1.16E-09	7.08E-09	3.64E-07	1.76E-05	1.74E-04
952696	9.04E-29	2.28E-27	6.24E-23	9.14E-20	2.15E-17	1.49E-15	4.30E-14	6.90E-13	6.81E-12	1.02E-09	1.43E-07	2.69E-06
863376	1.21E-28	3.17E-27	9.87E-23	1.59E-19	4.00E-17	2.92E-15	8.94E-14	1.44E-12	1.40E-11	2.36E-09	3.55E-07	6.92E-06
866893	1.54E-28	4.11E-27	1.35E-22	2.31E-19	5.69E-17	4.22E-15	1.31E-13	2.17E-12	2.23E-11	3.42E-09	5.55E-07	1.10E-05
867093	2.13E-28	5.67E-27	1.84E-22	3.74E-19	7.89E-17	5.87E-15	1.83E-13	3.02E-12	3.10E-11	5.04E-09	7.74E-07	1.53E-05

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	200000	400000	600000	800000	1000000	2000000	4000000	6000000	10000000	0	0	0
0	3.84E-01	2.15E-01	1.39E-01	8.58E-02	5.57E-02	4.41E-02	4.04E-02	3.81E-02	0.	0.	0.	0.
96730	5.75E-01	4.54E-01	3.30E-01	2.74E-01	1.56E-01	1.27E-01	1.19E-01	1.13E-01	0.	0.	0.	0.
640040	3.85E-03	2.15E-02	2.99E-02	3.42E-02	3.52E-02	3.50E-02	3.49E-02	3.47E-02	0.	0.	0.	0.
666218	9.58E-03	5.80E-02	8.43E-02	9.87E-02	1.03E-01	1.04E-01	1.04E-01	1.04E-01	0.	0.	0.	0.
674656	1.50E-02	9.51E-02	1.38E-01	1.62E-01	1.71E-01	1.73E-01	1.73E-01	1.73E-01	0.	0.	0.	0.
952696	8.33E-04	1.09E-02	1.60E-02	2.51E-02	3.02E-02	3.24E-02	3.31E-02	3.37E-02	0.	0.	0.	0.
863376	2.31E-03	2.89E-02	5.25E-02	7.43E-02	9.98E-02	9.69E-02	9.91E-02	1.01E-01	0.	0.	0.	0.
866893	3.74E-03	4.74E-02	8.68E-02	1.23E-01	1.49E-01	1.61E-01	1.65E-01	1.68E-01	0.	0.	0.	0.
867093	5.26E-03	6.64E-02	1.22E-01	1.72E-01	2.09E-01	2.26E-01	2.31E-01	2.35E-01	0.	0.	0.	0.

TABLE 70. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 5*

STATE	LEVEL (CM ⁻¹)	LEVEL (EV)	STAT.	WT.	TEMPERATURE (DEG R)								0400	
					5200	5400	6000	6400	6800	7200	7600	8000		
3s ² 3p	1470	0.1623	6		1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
3s ² 3d	218631	27.1061	19		1.34E-28	9.79E-29	4.04E-23	1.03E-21	1.89E-20	2.37E-19	2.93E-18	3.58E-18	4.25E-17	4.93E-16
3s ² 4p	101284	12.5574	12		2.93E-12	1.44E-11	8.06E-11	3.60E-10	1.93E-09	9.35E-09	4.24E-08	1.82E-06	7.32E-06	2.97E-05
3s ² 4d	132530	16.4312	10		2.97E-18	3.98E-18	3.74E-14	2.87E-13	1.94E-12	7.94E-12	2.79E-11	9.68E-11	3.37E-10	1.21E-09
3s ² 4f	183112	22.7024	6		1.49E-22	5.40E-21	1.21E-19	1.84E-18	2.04E-17	1.72E-16	1.16E-15	6.49E-15	2.10E-14	7.00E-14
3s ² 5s	169801	21.0521	2		1.97E-21	3.40E-20	9.63E-19	1.22E-17	1.13E-16	8.21E-16	4.82E-15	2.37E-14	1.00E-13	4.00E-13
3s ² 5p	315000*	39.0540	90		3.17E-37	1.54E-34	3.34E-32	3.67E-30	2.32E-28	9.74E-27	2.50E-25	.87E-24	7.13E-23	2.50E-22
3s ² 5d	370000*	45.8730	30		0.	0.	0.	5.22E-36	6.83E-34	9.20E-32	2.51E-30	8.21E-29	1.93E-27	3.53E-26
3s ² 5f	270000*	33.4749	20		1.80E-32	3.63E-30	3.61E-28	2.02E-26	7.04E-25	1.64E-23	3.64E-22	3.64E-21	3.64E-20	3.64E-19
3s ² 6s	342246	42.4370	2		0.	3.12E-39	1.07E-34	1.77E-34	1.60E-32	8.81E-31	3.17E-29	7.99E-28	1.48E-26	4.00E-25
3s ² 6p	410300*	50.8322	6		0.	0.	0.	0.	2.88E-38	3.51E-36	2.58E-34	1.23E-32	4.00E-31	1.00E-30
3s ² 6d	454780	54.3653	10		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 6f	480000*	57.0313	14		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 7s	469000*	58.1472	24		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 7p	540000*	66.9497	72		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 7d	590000*	71.9090	120		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 7f	600000*	74.3886	168		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 8s	420000*	52.0720	150		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 8p	600000*	74.3886	30		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 8d	670000*	83.0673	90		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 8f	710000*	88.0265	150		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s ² 9s	730000*	90.5061	710		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
NONSTARRED ENERGY LEVELS FROM MOORE (1949) AND FANCIETI ET AL. (1961)

TABLE 70 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar 5+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	8870	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
1470	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
21631	6.34E-16	1.22E-14	4.49E-14	7.69E-13	8.20E-12	6.08E-11	3.38E-10	1.50E-09	5.51E-09	1.74E-08	4.82E-08	9.99E-08
101284	1.64E-07	3.32E-07	1.16E-06	4.28E-06	1.27E-05	3.19E-05	7.01E-05	1.39E-04	2.53E-04	4.29E-04	6.85E-04	9.85E-04
137536	8.24E-10	4.91E-09	1.08E-08	5.98E-08	2.50E-07	8.36E-07	2.36E-06	5.78E-06	1.27E-05	2.54E-05	4.70E-05	7.40E-05
183112	1.27E-13	4.50E-13	4.47E-12	4.81E-11	3.48E-10	1.86E-09	7.81E-09	2.71E-08	8.04E-08	2.11E-07	4.94E-07	9.94E-07
169801	3.72E-13	1.23E-12	3.68E-12	1.01E-11	9.14E-11	5.72E-10	2.70E-09	1.02E-08	3.24E-08	8.69E-08	2.14E-07	4.78E-07
315000	8.19E-21	7.61E-21	5.87E-20	3.35E-19	2.32E-17	7.08E-16	1.28E-14	1.32E-13	8.54E-12	4.48E-11	1.84E-10	4.82E-09
170000	3.40E-24	6.64E-24	5.15E-24	4.69E-23	5.81E-21	3.23E-18	9.64E-16	1.76E-14	2.22E-13	2.02E-12	1.42E-11	8.04E-11
270000	2.85E-18	1.93E-18	1.11E-17	5.54E-17	1.86E-16	3.67E-14	4.13E-13	3.45E-12	2.11E-11	1.09E-10	4.99E-10	1.99E-09
342236	2.10E-23	2.37E-24	2.18E-23	1.69E-22	1.45E-20	5.97E-19	1.38E-17	2.95E-16	2.12E-15	1.63E-14	5.90E-14	4.91E-13
410000	9.81E-30	1.79E-28	2.56E-27	2.97E-26	6.21E-24	5.34E-22	2.31E-20	5.84E-19	9.59E-18	1.11E-16	9.63E-16	6.57E-15
454700	1.08E-32	2.71E-31	5.19E-30	7.47E-29	2.96E-26	4.14E-24	2.71E-22	9.75E-21	2.18E-19	3.30E-18	3.62E-17	3.05E-16
469000	6.45E-33	1.68E-31	3.33E-30	5.20E-29	2.09E-26	3.10E-24	2.13E-22	7.99E-21	1.89E-19	2.89E-18	3.26E-17	2.82E-16
469000	2.54E-33	7.04E-32	1.48E-30	2.44E-29	1.11E-26	1.81E-24	1.35E-22	5.83E-21	1.34E-19	2.20E-18	2.61E-17	2.35E-16
540000	0.	3.18E-36	1.06E-34	2.68E-33	3.07E-30	1.09E-27	1.56E-25	1.10E-23	4.42E-22	1.12E-20	1.93E-19	2.42E-18
590000	0.	0.	4.41E-37	1.42E-35	2.74E-32	1.50E-29	3.11E-27	3.02E-25	1.59E-23	5.10E-22	1.09E-20	1.65E-19
600000	0.	0.	0.	1.12E-36	2.80E-33	1.91E-30	4.77E-28	5.41E-26	3.27E-24	1.18E-22	2.80E-21	4.67E-20
420000	4.78E-29	9.37E-28	1.43E-26	1.76E-25	4.20E-23	4.02E-21	1.91E-19	5.22E-18	9.19E-17	1.13E-15	1.03E-14	7.39E-14
600000	0.	0.	0.	1.99E-37	5.00E-34	3.41E-31	8.51E-29	9.64E-27	5.89E-25	2.11E-23	5.00E-22	8.34E-21
670000	0.	0.	0.	0.	1.58E-37	2.32E-34	1.10E-31	2.18E-29	2.12E-27	1.17E-25	4.01E-24	9.29E-23
710000	0.	0.	0.	0.	3.19E-36	2.20E-33	7.63E-31	5.95E-29	5.34E-27	2.24E-25	6.33E-24	1.79E-24
730000	0.	0.	0.	0.	4.06E-37	3.36E-34	1.07E-31	1.57E-29	1.24E-27	5.83E-26	1.79E-26	0.

TABLE 70 (CONT.), ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 5+

LFVEL	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
(CM-1)												
1470	9.99E-01	9.98E-01	9.94E-01	9.86E-01	9.73E-01	9.55E-01	9.32E-01	9.04E-01	8.74E-01	7.70E-01	5.94E-01	4.43E-01
218631	1.20E-01	2.78E-01	1.68E-04	2.16E-05	9.32E-05	2.71E-04	6.29E-04	1.24E-03	2.17E-03	7.03E-03	1.89E-02	3.24E-02
101244	1.04E-03	1.52E-03	5.01E-03	1.17E-02	2.19E-02	3.54E-02	5.14E-02	6.92E-02	8.77E-02	1.41E-01	1.97E-01	2.11E-01
132530	4.15E-05	1.34E-04	6.41E-04	1.35E-03	6.44E-03	6.44E-03	1.39E-02	2.07E-02	2.84E-02	5.54E-02	9.37E-02	1.12E-01
183112	1.06E-06	2.11E-06	1.85E-05	9.72E-05	2.76E-04	6.72E-04	1.39E-03	2.38E-03	3.77E-03	9.69E-03	2.26E-02	3.24E-02
169801	9.69E-07	1.83E-06	1.37E-05	5.76E-05	1.68E-04	3.81E-04	7.29E-04	1.23E-03	1.87E-03	4.13E-03	9.59E-03	1.31E-02
319000	7.32E-10	2.40E-05	1.02E-07	1.69E-06	1.10E-05	5.18E-05	1.77E-04	4.78E-04	1.04E-03	6.27E-03	3.17E-02	7.29E-02
370000	3.79E-12	1.53E-11	1.26E-09	2.34E-08	3.10E-07	1.92E-06	8.19E-06	2.64E-05	6.94E-05	5.94E-04	3.93E-03	1.10E-02
270000	4.91E-09	1.36E-08	3.38E-07	1.34E-06	1.85E-05	6.95E-05	1.94E-04	4.53E-04	9.30E-04	4.10E-03	1.58E-02	3.10E-02
342286	2.06E-12	7.48E-12	4.44E-10	8.15E-09	7.18E-08	3.87E-07	1.67E-06	4.36E-06	1.07E-05	7.25E-05	4.31E-04	1.69E-03
410000	3.66E-14	1.72E-13	2.30E-11	7.53E-10	1.03E-08	7.74E-08	3.87E-07	1.43E-06	4.20E-06	4.29E-05	3.83E-04	1.24E-03
434740	2.08E-15	1.14E-14	2.61E-12	1.26E-12	2.76E-09	2.15E-08	1.29E-07	5.50E-07	1.83E-06	2.44E-05	2.85E-04	1.08E-03
460000	1.94E-15	1.19E-14	2.67E-12	1.39E-10	2.53E-08	2.45E-08	1.49E-07	6.59E-07	2.19E-06	3.02E-05	3.43E-04	1.41E-03
469000	1.68E-15	9.87E-15	2.67E-12	1.45E-10	2.89E-08	2.93E-08	1.85E-07	6.29E-07	2.87E-06	4.17E-05	5.38E-04	2.12E-03
540000	2.33E-17	1.79E-16	1.14E-13	1.14E-11	3.56E-10	5.15E-09	4.32E-08	2.44E-07	1.02E-06	2.28E-05	4.43E-04	2.29E-03
580000	1.88E-18	1.68E-17	1.72E-14	2.42E-12	9.82E-11	1.73E-09	1.71E-08	1.10E-07	5.14E-07	1.35E-05	3.46E-04	2.15E-03
600000	5.79E-19	5.58E-18	7.27E-14	1.21E-12	5.60E-11	1.09E-09	1.17E-08	6.01E-08	3.95E-07	1.26E-05	3.52E-04	2.24E-03
420000	4.30E-13	2.09E-12	3.15E-10	1.15E-08	1.64E-07	1.30E-06	6.75E-06	2.57E-05	7.78E-05	8.43E-04	7.99E-03	2.64E-02
600000	1.03E-19	9.94E-19	1.30E-15	2.17E-13	9.99E-12	1.95E-10	2.08E-09	1.43E-08	7.04E-08	2.25E-06	6.29E-05	4.03E-04
670000	1.55E-21	1.94E-20	3.86E-17	1.78E-14	1.29E-12	3.57E-11	5.03E-10	4.35E-09	2.60E-08	1.26E-06	5.35E-05	4.41E-04
710000	1.25E-22	1.82E-21	3.88E-18	3.50E-15	3.55E-13	1.20E-11	1.99E-10	1.94E-09	1.31E-08	8.05E-07	4.34E-05	4.14E-04
730000	3.8E-73	6.05E-72	3.74E-18	1.90E-15	2.02E-13	7.56E-12	1.34E-10	1.43E-09	1.00E-08	6.98E-07	4.24E-05	4.34E-04

TABLE 70 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 5+

LEVEL (CM ⁻¹)	TEMPERATURE (DEG K)									
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0
1470	1.13E-01	2.97E-02	1.70E-02	1.04E-02	7.22E-03	5.94E-03	5.56E-03	5.27E-03	0.	0.
21631	3.94E-02	2.27E-02	1.69E-02	1.07E-02	7.03E-03	5.15E-03	4.80E-03	4.52E-03	0.	0.
101284	1.11E-01	4.15E-02	2.88E-02	1.93E-02	1.34E-02	1.15E-02	1.09E-02	1.04E-02	0.	0.
137930	7.36E-02	3.09E-02	2.07E-02	1.45E-02	1.09E-02	9.47E-03	8.98E-03	8.52E-03	0.	0.
183112	3.07E-02	1.55E-02	1.10E-02	8.11E-03	6.33E-03	5.56E-03	5.32E-03	5.14E-03	0.	0.
169801	1.13E-02	5.40E-03	3.79E-03	2.76E-03	2.13E-03	1.86E-03	1.78E-03	1.72E-03	0.	0.
315000	1.79E-01	1.44E-01	1.20E-01	1.01E-01	8.64E-02	7.96E-02	7.74E-02	7.56E-02	0.	0.
370000	4.00E-02	3.95E-02	3.52E-02	3.10E-02	2.77E-02	2.60E-02	2.55E-02	2.50E-02	0.	0.
270000	5.49E-02	3.77E-02	2.94E-02	2.39E-02	1.98E-02	1.80E-02	1.74E-02	1.69E-02	0.	0.
342286	3.26E-03	2.91E-03	2.51E-03	2.15E-03	1.88E-03	1.75E-03	1.71E-03	1.67E-03	0.	0.
410000	6.09E-03	6.83E-03	6.39E-03	5.89E-03	5.38E-03	5.13E-03	5.04E-03	4.97E-03	0.	0.
454790	7.25E-03	9.69E-03	9.57E-03	9.15E-03	8.68E-03	8.41E-03	8.31E-03	8.24E-03	0.	0.
460000	9.77E-03	1.36E-02	1.32E-02	1.27E-02	1.21E-02	1.17E-02	1.15E-02	1.15E-02	0.	0.
469000	1.57E-02	2.21E-02	2.22E-02	2.15E-02	2.06E-02	2.01E-02	1.99E-02	1.97E-02	0.	0.
540000	2.89E-02	5.14E-02	5.62E-02	5.81E-02	5.88E-02	5.87E-02	5.86E-02	5.86E-02	0.	0.
560000	3.53E-02	7.41E-02	8.31E-02	9.17E-02	9.52E-02	9.65E-02	9.68E-02	9.71E-02	0.	0.
600000	4.29E-02	9.64E-02	1.14E-01	1.29E-01	1.31E-01	1.34E-01	1.35E-01	1.35E-01	0.	0.
420000	1.40E-01	1.56E-01	1.56E-01	1.44E-01	1.33E-01	1.29E-01	1.26E-01	1.24E-01	0.	0.
600500	7.65E-03	1.73E-02	2.03E-02	2.27E-02	2.35E-02	2.39E-02	2.41E-02	2.42E-02	0.	0.
670000	1.39E-02	4.02E-02	5.14E-02	6.04E-02	6.69E-02	7.00E-02	7.11E-02	7.19E-02	0.	0.
710000	1.73E-02	5.11E-02	7.79E-02	9.51E-02	1.08E-01	1.15E-01	1.17E-01	1.19E-01	0.	0.
730000	2.10E-02	7.57E-02	1.04E-01	1.29E-01	1.50E-01	1.60E-01	1.63E-01	1.64E-01	0.	0.

TABLE 71. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF R 6+

STATE	LEVEL	LEVEL (CM-1)	STAT.	TEMPERATURE (DEG K)														
				5200	5600	6000	6400	6800	7200	7600	8000	8400						
1s	0	0	Z	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2s	0	500.2393	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p	0	500.3065	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3s	0	512.0114	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3p	0	512.0313	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3d	0	552.0484	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4s	0	625.3427	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4p	0	625.3510	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4d	0	625.3583	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4f	0	625.3614	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL	LEVEL (CM-1)	TEMPERATURE (DEG K)											
		8000	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
4034806	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4035346	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4782276	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4782437	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4782575	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5043859	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5043926	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5043985	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5044010	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 NONSTARRED ENERGY LEVELS FROM GARCIA AND HACK (1965)

TABLE 71 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF N 6+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	100000	
0	1.00E 00	1.00E 00	1.00E 00	1.30E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
4034806	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4035348	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4782276	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4782437	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4782575	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5043859	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5043926	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5043985	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5044010	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)										
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0	0
0	1.00E 00	1.00E 00	1.00E 00	9.68E-01	5.17E-01	1.62E-01	9.85E-02	6.44E-02	0.	0	0
4034806	2.48E-13	4.98E-07	6.28E-05	2.92E-03	2.84E-02	3.81E-02	3.74E-02	3.61E-02	0.	0	0.
4035348	7.40E-13	1.49E-06	1.88E-04	9.74E-03	8.52E-02	1.14E-01	1.12E-01	1.08E-01	0.	0	0.
4782276	1.14E-15	3.38E-08	1.05E-05	9.95E-04	1.66E-02	2.91E-02	3.13E-02	3.24E-02	0.	0	0.
4782437	3.43E-15	1.01E-07	3.14E-05	2.98E-03	4.97E-02	8.73E-02	9.39E-02	9.72E-02	0.	0	0.
4782575	5.71E-15	1.69E-07	5.22E-05	4.97E-03	8.29E-02	1.45E-01	1.56E-01	1.62E-01	0.	0	0.
5043859	1.74E-14	1.32E-08	5.58E-06	6.81E-04	1.31E-02	2.65E-02	2.94E-02	3.12E-02	0.	0	0.
5043926	5.23E-16	3.94E-08	1.68E-5	2.05E-03	4.12E-02	7.94E-02	8.82E-02	9.36E-02	0.	0	0.
5043985	8.71E-16	6.60E-08	2.79E-05	3.41E-03	6.87E-02	1.32E-01	1.47E-01	1.54E-01	0.	0	0.
5044010	1.22E-15	9.24E-08	3.91E-05	4.78E-03	9.62E-02	1.85E-01	2.04E-01	2.19E-01	0.	0	0.

TABLE 1. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 6+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	TEMPERATURE (DEG K)										
				5200	5400	6000	6400	6800	7200	7600	8000	8400		
1s 1S	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
1s 2s 1S	4525270	561.0475	3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 2s 3S	4590000*	561.0728	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 2p	4597259	569.9728	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3s	5340000*	662.0385	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3p	4359363	540.4782	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3d	5365010	665.1593	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4s	5620000*	696.7732	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4p	5623000*	697.1452	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4d	5624000*	697.2691	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4f	5624000*	697.2691	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	TEMPERATURE (DEG K)											
				9600	10000	11000	12000	13000	14000	15000	16000	17000	18000		
1s 1S	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
1s 2s 1S	4525270	0.	3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 2s 3S	4590000	0.	1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 2p	4597259	0.	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3s	5340000	0.	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3p	4359363	0.	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3d	5365010	0.	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4s	5620000	0.	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4p	5623000	0.	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4d	5624000	0.	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4f	5624000	0.	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 *UNSTARRED ENERGY LEVELS FROM MOORE (1969) AND EDLEN (1952)

TABLE 72 (CONT.) ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 6+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
4525270	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.35E-35	1.59E-28
4590000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.41E-36	2.08E-29
4597259	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.44E-35	2.25E-28
5340000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.72E-33
4359363	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.07E-33	6.91E-27
5365010	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.99E-33
5620000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.05E-35
5623000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.78E-35
5624000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.44E-34
5624000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.02E-34

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	20000000	40000000	60000000	100000000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
4525270	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4590000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4597259	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5340000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4359363	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5365010	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5620000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5623000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5624000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5624000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TABLE 73. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar 6+

STATE	LEVEL	(CM-1)	(EV)	WT.	STAT.	TEMPERATURE (DEG K)								
						5200	5500	6000	6400	7200	7400	8000	8400	
2p ³ 3s ¹	0	0.	0.	1	1	1.70E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00	1.00E-00
	1	114744	14.2261	9	1	1.47E-13	1.42E-12	1.01E-11	5.64E-11	2.37E-10	9.91E-10	3.31E-09	9.82E-09	2.43E-08
	2	170720	21.1640	3	3	9.17E-21	2.64E-19	4.99E-18	6.64E-17	6.16E-16	4.50E-15	2.74E-14	1.39E-13	5.99E-13
	3	324151	40.1884	15	5	5.43E-32	1.02E-30	2.62E-33	3.37E-31	2.49E-29	1.11E-27	3.39E-26	7.29E-25	1.10E-23
	4	266000*	32.9789	5	5	5.43E-32	1.04E-29	9.93E-28	5.95E-26	1.80E-24	4.11E-23	8.74E-22	8.36E-21	8.16E-20
2p ³ 3d ¹	0	271000*	33.5989	15	15	4.09E-32	8.64E-30	8.98E-28	5.21E-26	1.80E-24	4.54E-23	7.95E-22	1.82E-20	1.84E-19
	1	310000*	38.4351	40	40	3.34E-34	1.54E-33	5.12E-31	3.25E-29	1.94E-27	7.49E-26	1.95E-24	3.67E-23	5.22E-22
	2	350000*	43.3934	45	45	0.	0.	1.60E-35	3.03E-33	3.10E-31	1.90E-29	7.53E-28	2.87E-26	4.14E-25
	3	515383	63.7365	3	3	0.	0.	0.	0.	0.	0.	0.	0.	0.
	4	526000*	65.2140	1	1	0.	0.	0.	0.	0.	0.	0.	0.	0.
4p ³ 3p ¹	0	544000*	70.1732	9	9	0.	0.	0.	0.	0.	0.	0.	0.	0.
	1	566362	70.2181	3	3	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2	636490	78.9127	15	15	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3	638000*	79.0999	5	5	0.	0.	0.	0.	0.	0.	0.	0.	0.
	4	640092	81.8389	21	21	0.	0.	0.	0.	0.	0.	0.	0.	0.
2p ³ 3d ¹	0	465000*	57.6512	60	60	0.	0.	0.	0.	0.	0.	0.	2.87E-28	1.94E-23
	1	640000*	79.3478	12	12	0.	0.	0.	0.	0.	0.	0.	0.	0.

TEMPERATURE (DEG K)

LEVEL

STATE	LEVEL	(CM-1)	8000	9200	9400	10000	11000	12000	13000	14000	15000	16000	17000	18000	
															0
2p ³ 3p ¹	1	114744	6.41E-08	1.45E-07	3.06E-07	6.09E-07	2.73E-06	9.34E-06	2.75E-05	6.81E-05	1.49E-04	2.97E-04	5.45E-04	9.99E-04	9.99E-04
	2	170720	2.20E-12	7.62E-11	2.32E-11	6.45E-11	6.02E-10	3.87E-09	1.87E-08	7.20E-08	2.32E-07	4.49E-07	1.59E-06	3.55E-06	3.55E-06
	3	324151	1.64E-22	1.49E-20	1.19E-20	8.34E-20	5.79E-18	1.98E-16	3.94E-15	5.11E-14	6.71E-13	3.29E-12	1.87E-11	8.30E-11	2.91E-09
	4	266000*	6.47E-19	4.29E-18	2.43E-17	1.20E-16	3.88E-15	7.05E-14	8.19E-13	6.71E-12	4.19E-11	2.04E-10	8.35E-10	2.91E-09	2.91E-09
	5	271000*	8.58E-19	5.89E-18	3.64E-17	1.75E-16	6.05E-15	1.14E-14	1.20E-13	1.41E-12	1.20E-11	7.71E-11	3.91E-10	1.64E-09	5.84E-09
2p ³ 3d ¹	1	310000*	5.84E-21	5.29E-20	3.99E-19	2.76E-18	1.47E-16	4.32E-15	7.55E-14	8.79E-13	7.32E-12	4.69E-11	2.42E-10	1.04E-09	1.04E-09
	2	350000*	8.37E-24	7.61E-23	7.45E-22	6.07E-21	2.68E-20	6.74E-18	1.04E-16	1.04E-14	1.04E-13	9.65E-13	6.14E-12	3.18E-11	3.18E-11
	3	514083	9.41E-37	3.64E-35	1.04E-33	3.26E-32	1.88E-29	5.11E-27	5.89E-25	3.41E-23	1.19E-21	2.51E-20	3.91E-19	6.27E-18	6.27E-18
	4	526000*	6.47E-38	1.88E-36	5.79E-35	1.34E-33	1.32E-30	4.04E-28	5.21E-26	3.34E-24	1.23E-22	2.87E-21	4.63E-20	5.69E-19	5.69E-19
	5	566000	0.	0.	1.30E-34	3.87E-33	6.34E-32	3.01E-29	5.11E-27	4.92E-25	2.30E-23	7.09E-22	1.61E-20	2.82E-19	2.82E-19
2p ³ 3d ¹	2	636490	0.	0.	4.10E-37	1.22E-35	2.02E-32	9.64E-30	1.89E-27	1.89E-25	7.44E-24	2.28E-22	4.37E-21	6.54E-20	
	3	638000	0.	0.	0.	1.05E-35	1.00E-33	3.82E-30	5.84E-28	5.84E-26	2.80E-24	6.04E-23	1.28E-21	1.28E-21	
	4	640092	0.	0.	0.	0.	6.89E-34	3.00E-33	1.04E-31	7.29E-29	6.04E-27	3.69E-25	1.77E-23	3.95E-22	
2p ³ 3d ¹	0	465000*	5.76E-32	1.57E-30	3.25E-29	5.28E-28	2.31E-25	3.67E-23	2.64E-21	1.04E-19	2.54E-18	4.19E-17	4.06E-16	4.32E-15	
	1	640000*	0.	0.	0.	5.29E-36	5.67E-33	2.07E-30	3.27E-28	2.62E-26	1.22E-24	3.59E-23	7.27E-22	7.27E-22	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
NONSTARRED ENERGY LEVELS FROM MOORE (1949)

TABLE 73 (CONT.) ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 4+

LEVEL	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
ICM-11	0	0	0	0	0	0	0	0	0	0	0	0
116744	9.28E-01	7.98E-01	9.91E-01	5.75E-01	9.49E-01	9.13E-01	9.67E-01	8.14E-01	7.57E-01	5.81E-01	3.54E-01	2.17E-01
170720	1.51E-03	2.38E-03	9.18E-03	2.51E-02	4.91E-02	8.31E-02	1.24E-01	1.72E-01	2.19E-01	3.34E-01	4.07E-01	3.75E-01
328151	3.27E-10	1.12E-09	1.07E-08	4.53E-08	1.32E-07	2.98E-07	5.60E-07	9.19E-07	1.34E-06	2.93E-06	4.94E-06	5.38E-06
268000	1.92E-09	2.44E-08	5.86E-07	5.65E-06	3.04E-05	1.10E-04	3.03E-04	6.79E-04	1.30E-03	4.97E-03	1.49E-02	2.36E-02
271000	1.83E-08	5.11E-08	1.31E-06	1.71E-05	7.27E-05	2.71E-04	7.59E-04	1.73E-03	3.37E-03	1.32E-02	4.80E-02	6.59E-02
310000	3.82E-09	1.24E-08	5.05E-07	7.07E-06	5.04E-05	2.29E-04	7.47E-04	1.93E-03	4.19E-03	2.08E-02	8.10E-02	1.58E-01
350000	1.19E-10	5.21E-10	3.44E-08	6.79E-07	6.24E-06	3.44E-05	1.33E-04	3.92E-04	9.47E-04	5.94E-03	2.96E-02	4.59E-02
514083	3.71E-17	2.60E-16	1.27E-13	9.25E-12	1.23E-10	1.27E-09	2.42E-08	4.61E-07	7.78E-06	1.83E-04	3.99E-04	3.99E-04
526000	5.02E-18	3.67E-17	2.00E-14	1.74E-12	5.09E-11	6.77E-10	5.24E-09	2.74E-08	1.08E-07	1.99E-06	2.77E-05	1.12E-04
564000	2.16E-18	1.86E-17	1.64E-14	2.05E-12	7.58E-11	1.23E-09	1.12E-08	6.71E-08	2.92E-07	4.72E-06	1.22E-05	5.47E-04
566362	7.09E-19	6.04E-18	5.34E-15	6.72E-13	2.48E-11	4.03E-10	3.49E-09	2.21E-08	9.63E-08	2.22E-06	4.03E-05	1.38E-04
634490	1.75E-20	1.92E-19	3.99E-16	9.14E-14	5.31E-12	1.23E-10	1.40E-09	1.12E-08	5.88E-08	2.04E-06	5.70E-05	3.13E-04
638000	5.20E-21	5.87E-20	1.21E-16	2.82E-14	1.65E-12	3.81E-11	4.48E-10	3.54E-09	1.87E-08	6.44E-07	1.95E-05	1.12E-04
660092	4.10E-21	4.98E-20	1.36E-16	3.91E-14	2.57E-12	6.69E-11	8.88E-10	7.22E-09	4.04E-08	1.64E-06	5.22E-05	3.42E-04
663000	3.05E-14	1.77E-13	4.65E-11	2.44E-09	6.74E-08	4.63E-07	2.83E-06	1.22E-05	4.82E-05	3.09E-04	4.97E-03	1.62E-02
640090	1.07E-20	1.21E-19	2.58E-16	6.11E-14	3.63E-12	8.53E-11	1.05E-09	7.96E-09	4.24E-08	1.52E-06	4.28E-05	2.81E-04

LEVEL	TEMPERATURE (DEG K)											
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	20000000	40000000	60000000	100000000
ICM-11	0	0	0	0	0	0	0	0	0	0	0	0
0	4.32E-02	1.39E-02	9.06E-03	4.31E-03	4.74E-03	3.92E-03	3.74E-03	3.74E-03	0.	0.	0.	0.
116744	1.25E-01	8.28E-02	4.20E-02	4.82E-02	3.94E-02	3.54E-02	3.43E-02	3.37E-02	0.	0.	0.	0.
170720	3.79E-72	2.28E-72	1.81E-72	1.48E-72	1.26E-72	1.14E-72	1.13E-72	1.12E-72	0.	0.	0.	0.
328151	6.29E-02	6.50E-02	6.75E-02	5.94E-02	5.49E-02	5.49E-02	5.43E-02	5.37E-02	0.	0.	0.	0.
268000	3.13E-02	2.67E-02	2.59E-02	2.15E-02	1.94E-02	1.87E-02	1.84E-02	1.81E-02	0.	0.	0.	0.
271000	9.22E-02	7.87E-02	7.10E-02	6.41E-02	5.87E-02	5.60E-02	5.50E-02	5.43E-02	0.	0.	0.	0.
310000	2.79E-01	2.74E-01	2.59E-01	2.52E-01	2.29E-01	2.21E-01	2.18E-01	2.16E-01	0.	0.	0.	0.
350000	1.57E-01	1.78E-01	1.73E-01	1.72E-01	1.64E-01	1.63E-01	1.62E-01	1.61E-01	0.	0.	0.	0.
514083	3.21E-03	6.54E-03	7.93E-03	9.04E-03	9.84E-03	1.03E-02	1.04E-02	1.04E-02	0.	0.	0.	0.
526000	9.82E-04	2.10E-03	2.57E-03	2.96E-03	3.28E-03	3.40E-03	3.45E-03	3.49E-03	0.	0.	0.	0.
564000	6.43E-03	1.63E-02	2.10E-02	2.52E-02	2.83E-02	3.02E-02	3.08E-02	3.12E-02	0.	0.	0.	0.
566362	2.20E-03	5.44E-03	6.99E-03	8.38E-03	9.49E-03	1.01E-02	1.03E-02	1.04E-02	0.	0.	0.	0.
634490	6.85E-03	2.11E-02	2.99E-02	3.79E-02	4.31E-02	4.91E-02	5.04E-02	5.15E-02	0.	0.	0.	0.
638000	2.12E-03	7.01E-03	9.81E-03	1.24E-02	1.50E-02	1.68E-02	1.68E-02	1.68E-02	0.	0.	0.	0.
660092	7.86E-03	2.72E-02	3.91E-02	5.13E-02	6.21E-02	6.81E-02	7.02E-02	7.19E-02	0.	0.	0.	0.
663000	9.14E-02	1.57E-01	1.78E-01	1.94E-01	2.04E-01	2.09E-01	2.10E-01	2.11E-01	0.	0.	0.	0.
640090	5.19E-03	1.67E-02	2.34E-02	3.02E-02	3.60E-02	3.92E-02	4.03E-02	4.12E-02	0.	0.	0.	0.

TABLE 74. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 7+

STATE	LEVEL (CM-1)	(EV)	STAT. WT.	TEMPERATURE (DEG K)											
				5200	5600	6000	6400	6800	7200	7600	8000	8400			
1s	0	0.	2	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	
2s	5270855	653.4859	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
2p	5271783	653.4009	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3s	6247421	774.5415	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3p	6247696	774.5956	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3d	6247933	774.6290	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4s	6589164	818.9311	2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4p	6589279	818.9454	6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4d	6589379	818.9578	10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4f	6589422	818.9631	14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	8000	9200	9600	10000	11000	12000	13000	14000	15000	16000	17000	18000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
5270855	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5271783	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6247421	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6247696	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6247933	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589164	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589279	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589379	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589422	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 MONITORING ENERGY LEVELS FROM GAMMA AND X-RAY (1965)

TABLE 74 (CONT.) - ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF O 7+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
5270855	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5271783	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6247421	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6247696	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6247933	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589164	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589279	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589379	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6589422	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)										
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	20000000	40000000	60000000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
5270855	1.41E-17	5.84E-09	3.24E-06	9.04E-01	7.52E-01	2.47E-01	1.34E-01	7.89E-02	0.	0.	0.
5271783	1.02E-16	1.74E-08	9.70E-06	1.52E-03	5.08E-02	1.11E-01	1.14E-01	1.10E-01	0.	0.	0.
6247421	3.03E-20	1.74E-10	3.12E-07	1.74E-04	8.40E-03	2.61E-02	3.01E-02	3.20E-02	0.	0.	0.
6247696	9.07E-20	5.22E-10	9.34E-07	3.73E-04	2.52E-02	7.83E-02	9.82E-02	9.59E-02	0.	0.	0.
6247933	1.51E-19	8.69E-10	1.56E-06	6.21E-04	4.20E-02	1.31E-01	1.50E-01	1.60E-01	0.	0.	0.
6589164	2.59E-21	5.09E-11	1.37E-07	7.60E-05	6.97E-03	2.31E-02	2.77E-02	3.04E-02	0.	0.	0.
6589279	7.77E-21	1.53E-10	4.12E-07	2.28E-04	1.97E-02	6.31E-02	8.31E-02	9.13E-02	0.	0.	0.
6589379	1.29E-20	2.54E-10	6.84E-07	3.80E-04	3.28E-02	1.15E-01	1.34E-01	1.52E-01	0.	0.	0.
6589422	1.81E-20	3.54E-10	9.61E-07	5.32E-04	4.60E-02	1.62E-01	1.94E-01	2.13E-01	0.	0.	0.

TABLE 75. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF CR 7.

STATE	LEVEL (CM-1)	(EV)	STAT.	WT.	TEMPERATURE (DEC A)										
					5200	5600	6000	6400	6800	7200	7600	8000	8400		
2p ³	0	0.		2	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	3a	17.5892		6	2.69E-17	4.44E-16	5.04E-15	6.22E-14	2.78E-13	1.44E-12	6.50E-12	6.50E-12	2.49E-11	8.39E-11	1.00E 00
	3d	41.2444		10	0.	3.80E-37	1.13E-34	1.64E-32	1.33E-30	6.73E-29	2.23E-27	5.19E-26	8.97E-25	0.	0.
	4s	71.4019		2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	4p	77.9723		6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	4d	86.4789		10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4f	716837	88.8742		14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
LEVEL					TEMPERATURE (DEC K)										
(CM-1)	8800	9200		9600	TEMPERATURE (DEC K)										
					10000	11000	12000	13000	14000	15000	16000	17000	18000		
	0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00		
	141870	2.53E-10	6.94E-10	1.75E-09	4.09E-09	2.62E-08	1.23E-07	4.55E-07	1.40E-06	3.69E-06	8.64E-06	1.83E-05	3.37E-05		
	132667	1.20E-23	1.27E-22	1.11E-21	6.17E-21	6.33E-19	2.38E-17	3.12E-16	7.10E-15	6.93E-14	5.09E-13	2.96E-12	1.41E-11		
	575910	0.	0.	3.27E-38	1.03E-36	1.93E-35	1.03E-30	2.08E-28	1.97E-26	1.62E-24	3.23E-23	6.79E-22	1.02E-20		
628905	0.	0.	0.	0.	5.65E-36	5.36E-33	1.77E-30	2.55E-28	1.90E-26	6.24E-25	2.50E-23	4.42E-22			
697517	0.	0.	0.	0.	0.	2.39E-36	1.49E-33	3.69E-31	4.39E-29	2.87E-27	1.15E-25	3.04E-24			
716837	0.	0.	0.	0.	0.	3.30E-37	2.45E-34	7.09E-32	9.63E-30	7.08E-28	3.14E-26	5.13E-25			

TABLE 75 (CONT.-1). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 7+

LEVEL (CM ⁻¹)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E-00	1.00E-00	9.99E-01	9.78E-01	9.95E-01	9.90E-01	9.82E-01	9.72E-01	9.59E-01	9.08E-01	8.02E-01	6.98E-01
141070	6.48E-05	1.11E-04	6.07E-04	2.04E-03	5.07E-03	1.02E-02	1.79E-02	2.82E-02	4.09E-02	9.07E-02	1.88E-01	2.72E-01
332667	5.73E-11	2.02E-10	1.09E-09	3.88E-07	1.59E-06	6.32E-06	3.12E-05	9.17E-05	2.24E-04	1.58E-03	1.01E-02	2.91E-02
575910	1.15E-19	1.02E-18	1.01E-15	2.40E-13	5.65E-12	9.99E-11	9.90E-10	6.44E-09	3.05E-08	9.13E-07	2.55E-05	1.76E-04
628905	6.22E-21	6.73E-20	1.27E-16	2.76E-14	1.56E-12	3.60E-11	4.41E-10	3.41E-09	1.87E-08	7.68E-07	2.95E-05	2.46E-04
697517	5.75E-23	8.04E-22	3.45E-18	1.36E-15	1.19E-13	3.07E-12	6.24E-11	4.04E-10	3.99E-09	2.47E-07	1.43E-05	1.53E-04
716037	1.04E-23	2.61E-22	1.52E-18	7.03E-16	7.00E-14	2.50E-12	4.36E-11	4.49E-10	3.13E-09	2.18E-07	1.41E-05	1.62E-04

LEVEL (CM ⁻¹)	TEMPERATURE (DEG K)											
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0	0	0
0	3.76E-01	1.74E-01	1.18E-01	7.39E-02	5.74E-02	4.81E-02	4.53E-02	4.31E-02	0.	0.	0.	0.
141070	4.04E-01	3.17E-01	2.31E-01	1.95E-01	1.56E-01	1.37E-01	1.31E-01	1.27E-01	0.	0.	0.	0.
332667	1.77E-01	2.64E-01	2.65E-01	2.47E-01	2.26E-01	2.13E-01	2.09E-01	2.05E-01	0.	0.	0.	0.
575910	5.97E-03	2.21E-02	2.96E-02	3.49E-02	3.79E-02	3.91E-02	3.94E-02	3.97E-02	0.	0.	0.	0.
628905	1.22E-02	5.44E-02	7.82E-02	9.69E-02	1.10E-01	1.15E-01	1.17E-01	1.18E-01	0.	0.	0.	0.
697517	1.24E-02	7.13E-02	1.11E-01	1.46E-01	1.74E-01	1.87E-01	1.91E-01	1.95E-01	0.	0.	0.	0.
716037	1.52E-02	9.34E-02	1.48E-01	1.99E-01	2.40E-01	2.60E-01	2.67E-01	2.72E-01	0.	0.	0.	0.

TABLE 7a. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar 0+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K.)										
				5200	5600	6000	6400	6800	7200	7600	8000	8400		
2s ² 2p ⁶	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	2039000*	252.7973	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2220000*	275.2378	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2380000*	295.0748	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s 2p ⁵	2710000*	335.9885	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2790000*	345.9079	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2840000*	352.1060	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2860000*	354.5857	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s 2p ⁴	2600000*	322.3506	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2787000*	344.6672	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2840000*	364.5041	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3270000*	405.4179	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s 2p ³	3380000*	418.3363	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3400000*	421.5324	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3470000*	424.0150	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K.)										
				5200	5600	6000	6400	6800	7200	7600	8000	8400		
2s 2p ³	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	2039000	252.7973	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2220000	275.2378	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2380000	295.0748	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s 2p ²	2710000	335.9885	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2790000	345.9079	36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2840000	352.1060	60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2860000	354.5857	84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s 2p	2600000	322.3506	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2787000	344.6672	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	2840000	364.5041	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3270000	405.4179	4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2s	3380000	418.3363	12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3400000	421.5324	20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	3470000	424.0150	28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 †NONSTARRED ENERGY LEVELS FROM MOORE (1949)

TABLE 76 (CONT.). ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 8+

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	19000	20000	24000	28000	32000	36000	40000	44000	48000	60000	80000	100000
0	1.00E 00	1.00E 00	1.00E 00	1.30E 00	1.00E 00	4.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2039000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2220000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2380000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2710000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2790000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2840000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2860000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2870000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2940000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3270000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3350000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3400000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3420000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

LEVEL (CM-1)	TEMPERATURE (DEG K)											
	200000	400000	600000	1000000	2000000	4000000	6000000	10000000	0	0	0	0
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
2039000	5.11E-04	7.53E-03	5.13E-02	6.77E-02	1.75E-02	6.48E-03	4.82E-03	3.71E-03	0.	0.	0.	0.
2220000	4.17E-04	1.10E-02	1.01E-01	1.54E-01	4.84E-02	3.83E-02	3.55E-02	3.32E-02	0.	0.	0.	0.
2380000	2.70E-04	1.10E-02	1.14E-01	2.07E-01	1.27E-01	1.08E-01	1.02E-01	9.70E-02	0.	0.	0.	0.
2710000	4.10E-08	6.74E-06	1.04E-02	2.58E-02	2.99E-02	3.03E-02	3.02E-02	3.01E-02	0.	0.	0.	0.
2790000	6.91E-08	1.32E-03	2.57E-02	6.89E-02	8.44E-02	8.82E-02	8.89E-02	8.94E-02	0.	0.	0.	0.
2840000	8.04E-08	2.11E-03	3.80E-02	1.07E-01	1.56E-01	1.44E-01	1.46E-01	1.48E-01	0.	0.	0.	0.
2860000	9.75E-08	2.75E-03	5.07E-02	1.45E-01	1.88E-01	2.01E-01	2.04E-01	2.06E-01	0.	0.	0.	0.
2870000	3.01E-08	3.34E-04	4.50E-03	1.01E-02	1.08E-02	1.09E-02	1.09E-02	1.02E-02	0.	0.	0.	0.
2940000	2.48E-08	5.24E-04	8.77E-03	2.13E-02	2.84E-02	2.92E-02	2.97E-02	2.98E-02	0.	0.	0.	0.
3270000	1.30E-08	4.91E-04	9.94E-03	3.08E-02	4.22E-02	4.64E-02	4.77E-02	4.84E-02	0.	0.	0.	0.
3350000	4.10E-10	6.74E-05	2.24E-03	1.03E-02	1.89E-02	2.40E-02	2.59E-02	2.75E-02	0.	0.	0.	0.
3400000	4.77E-10	9.38E-05	3.31E-03	1.59E-02	3.03E-02	3.93E-02	4.27E-02	4.55E-02	0.	0.	0.	0.
3420000	5.78E-10	1.22E-04	4.41E-03	2.16E-02	4.18E-02	5.47E-02	5.85E-02	6.35E-02	0.	0.	0.	0.

TABLE 77. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 9+

STATE	LEVEL	LEVEL (CM-1)	LEVEL (EV)	STAT.	WT.	TEMPERATURE (DEG K)									
						22000	24000	30000	34000	38000	42000	44000	50000	76000	
2s 2p	0	0	0	4	0	0.67E-01	0.43E-01	0.26E-01	0.11E-01	7.90E-01	7.88E-01	7.79E-01	7.71E-01	7.43E-01	
	1	18053	2.23E2	2	1.33E-01	1.93E-01	1.74E-01	1.89E-01	2.02E-01	2.12E-01	2.21E-01	2.29E-01	2.37E-01		
	2	604300	74.9217	2	2.97E-18	1.27E-15	1.07E-13	3.18E-12	4.62E-11	6.03E-10	2.41E-09	1.00E-08	1.50E-08		
	3	2260000	280.1971	18	0	0	0	0	2.47E-37	0.44E-34	7.00E-31	1.90E-28	2.24E-26		
2s 2p (P)	3	2440000	302.5136	54	0	0	0	0	0	5.31E-34	7.53E-33	3.34E-30	1.60E-21		
	3	2800000	322.3506	90	0	0	0	0	0	0	8.42E-35	5.50E-32	1.03E-22		
	4	3000000	371.9430	288	0	0	0	0	0	0	0	1.79E-36	8.09E-26		
	4	2330000	288.8757	10	0	0	0	0	0	0	4.26E-35	1.97E-29	2.99E-21		
(D)	3	2510000	311.1923	30	0	0	0	0	0	0	2.60E-37	2.40E-34	2.19E-22		
	3	2670000	331.0293	50	0	0	0	0	0	0	0	5.24E-34	1.34E-23		
	4	3100000	384.3411	160	0	0	0	0	0	0	0	0	6.32E-27		
	3	2500000	309.9525	2	0	0	0	0	0	0	0	2.20E-32	1.70E-23		
(S)	3	2700000	354.7487	60	0	0	0	0	0	0	0	2.00E-33	8.02E-24		
	3	7750000	340.9476	11	0	0	0	0	0	0	0	8.50E-30	8.27E-25		
	4	3200000	396.7392	18	0	0	0	0	0	0	0	0	9.11E-29		
	3	3000000	371.9430	216	0	0	0	0	0	0	0	1.34E-36	6.67E-26		
4	3400000	421.5354	384	0	0	0	0	0	0	0	0	3.19E-29			
						TEMPERATURE (DEG K)									
LEVEL	LEVEL (CM-1)	90000	150000	300000	500000	800000	1500000	3000000	5000000	8000000	0	0	0	0	
0	7.27E-01	7.03E-01	6.73E-01	6.06E-01	2.92E-01	4.60E-02	1.19E-02	4.90E-03	4.90E-03	0	0	0	0	0	
18053	2.73E-01	2.96E-01	3.08E-01	2.88E-01	1.42E-01	2.24E-02	5.89E-03	3.34E-03	2.44E-03	0	0	0	0	0	
604300	2.32E-05	1.07E-03	1.85E-02	5.33E-02	4.93E-02	1.29E-02	4.44E-03	2.20E-03	2.20E-03	0	0	0	0	0	
2260000	6.67E-16	1.22E-09	5.94E-05	4.09E-03	2.26E-02	2.37E-02	1.81E-02	1.59E-02	1.57E-02	0	0	0	0	0	
2440000	1.13E-16	6.50E-10	7.52E-05	7.31E-03	4.90E-02	5.90E-02	4.97E-02	4.52E-02	4.27E-02	0	0	0	0	0	
2800000	1.45E-17	2.34E-10	5.81E-05	7.68E-03	6.13E-02	8.55E-02	7.68E-02	7.19E-02	6.91E-02	0	0	0	0	0	
3000000	7.77E-20	1.61E-11	2.73E-05	9.57E-03	9.57E-02	1.94E-01	2.03E-01	2.03E-01	2.04E-01	0	0	0	0	0	
2330000	1.21E-16	3.46E-10	2.38E-05	1.86E-03	1.11E-02	1.23E-02	9.71E-03	8.64E-03	8.04E-03	0	0	0	0	0	
2510000	2.04E-17	1.85E-10	2.98E-05	3.32E-03	2.40E-02	3.11E-02	2.67E-02	2.46E-02	2.34E-02	0	0	0	0	0	
2670000	2.64E-18	6.63E-11	2.31E-05	3.49E-03	3.00E-02	4.44E-02	4.12E-02	3.92E-02	3.79E-02	0	0	0	0	0	
3100000	6.73E-21	3.43E-12	9.40E-06	3.24E-03	4.43E-02	9.41E-02	1.07E-01	1.11E-01	1.12E-01	0	0	0	0	0	
2500000	1.60E-18	1.35E-11	2.09E-06	2.28E-04	1.63E-03	1.79E-03	1.65E-03	1.54E-03	1.54E-03	0	0	0	0	0	
2700000	1.96E-18	5.97E-11	2.40E-05	3.64E-03	3.41E-02	5.10E-02	4.88E-02	4.64E-02	4.53E-02	0	0	0	0	0	
2750000	1.47E-19	6.16E-12	3.15E-06	5.54E-04	5.20E-03	7.94E-03	7.94E-03	7.64E-03	7.40E-03	0	0	0	0	0	
3200000	1.99E-22	1.48E-13	6.54E-07	2.73E-04	9.62E-03	9.62E-03	1.15E-02	1.21E-02	1.24E-02	0	0	0	0	0	
3000000	5.83E-20	1.21E-11	2.05E-05	5.83E-03	7.16E-02	1.40E-01	1.52E-01	1.54E-01	1.54E-01	0	0	0	0	0	
3400000	1.73E-22	4.63E-13	5.35E-06	3.28E-03	6.20E-02	1.69E-01	2.23E-01	2.44E-01	2.55E-01	0	0	0	0	0	

*ESTIMATED
*INCLUDES ESTIMATED SUBLEVELS
*NONSTARRED ENERGY LEVELS FROM PRYCE (1964).

TABLE 78. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 10*

STATE	LEVEL (CM ⁻¹)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K)									
				28000	30000	34000	38000	42000	44000	50000	70000		
2s 2p ³ P ²	0	0.	5	7.66E-01	7.33E-01	6.90E-01	6.58E-01	6.39E-01	6.21E-01	6.04E-01	5.84E-01	5.64E-01	
	14457	1.7924	3	1.79E-01	1.98E-01	2.11E-01	2.28E-01	2.34E-01	2.37E-01	2.40E-01	2.44E-01	2.44E-01	
	18000	2.2317	1	4.72E-02	5.41E-02	5.94E-02	6.44E-02	6.89E-02	7.09E-02	7.22E-02	7.31E-02	7.35E-02	
	70000	8.6787	5	7.67E-03	1.52E-02	2.45E-02	3.52E-02	4.65E-02	5.81E-02	6.96E-02	8.08E-02	1.30E-01	
	150000	18.5972	1	8.41E-06	3.64E-05	1.06E-04	2.38E-04	7.49E-04	1.14E-03	1.62E-03	5.01E-03		
2s 2p ³ P ⁰	531000	65.8339	9	1.14E-15	2.28E-13	1.10E-11	2.13E-10	2.20E-09	1.45E-08	6.85E-08	2.52E-07	1.79E-05	
	700000	86.7867	3	6.03E-21	6.81E-18	1.11E-15	5.57E-14	1.22E-12	1.48E-11	1.16E-10	6.49E-10	1.85E-07	
LEVEL				TEMPERATURE (DEG K)									
(CM ⁻¹)	90000	150000	300000	500000	800000	1500000	3000000	5000000	8000000	0	0	0	
2s 2p ³ P ²	0	5.07E-01	4.47E-01	3.68E-01	3.14E-01	2.72E-01	2.33E-01	2.10E-01	2.00E-01	1.94E-01	0.	0.	
	14457	2.42E-01	2.31E-01	2.06E-01	1.81E-01	1.59E-01	1.38E-01	1.25E-01	1.19E-01	1.16E-01	0.	0.	
	18000	7.61E-02	7.44E-02	6.75E-02	5.97E-02	5.27E-02	4.59E-02	4.16E-02	3.98E-02	3.87E-02	0.	0.	
	70000	1.66E-01	2.26E-01	2.63E-01	2.57E-01	2.40E-01	2.18E-01	2.03E-01	1.94E-01	1.92E-01	0.	0.	
	150000	9.22E-03	2.10E-02	3.58E-02	4.08E-02	4.15E-02	4.04E-02	3.90E-02	3.83E-02	3.78E-02	0.	0.	
2s 2p ³ P ⁰	531000	1.88E-04	4.69E-03	5.19E-02	1.23E-01	1.88E-01	2.52E-01	2.92E-01	3.09E-01	3.18E-01	0.	0.	
	700000	4.20E-06	3.22E-04	7.69E-03	2.51E-02	4.64E-02	7.16E-02	8.99E-02	9.80E-02	1.03E-01	0.	0.	

*ESTIMATED
NONSTARRED ENERGY LEVELS FROM PRYCE (1964).

TABLE 79. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar II*

STATE	LEVEL		STAT.		TEMPERATURE (DEG K)											
	(CM-1)	(EV)	WT.	26203	30000	34000	30000	42000	46000	50000	70000					
2s ² 3p ⁴	0	0.	4	9.91E-01	9.91E-01	9.73E-01	9.65E-01	9.56E-01	9.47E-01	9.38E-01	9.29E-01					
	107000*	13.2660	10	2.21E-03	6.66E-03	1.45E-02	2.63E-02	4.81E-02	8.99E-02	1.62E-01	2.10E-01	7.54E-01				
	170000*	21.0768	6	2.22E-05	1.22E-04	6.25E-04	1.10E-03	2.06E-03	4.15E-03	6.72E-03	1.00E-02	3.44E-02				
LEVEL					TEMPERATURE (DEG K)											
(CM-1)	90000	150000	300000	700000	8000	1500000	3000000	5000000	8000000							
0	6.45E-01	4.57E-01	3.16E-01	2.12E-01	2.43E-01	2.21E-01	2.10E-01	2.04E-01	2.04E-01	0.	0.	0.				
107000	2.91E-01	4.09E-01	4.74E-01	6.11E-01	4.93E-01	4.98E-01	4.89E-01	4.80E-01	4.80E-01	0.	0.	0.				
170000	6.37E-02	1.34E-01	2.10E-01	2.43E-01	2.65E-01	2.81E-01	2.91E-01	2.94E-01	2.94E-01	0.	0.	0.				

*ESTIMATED AND **INCLUDES ESTIMATED SUBLEVELS
 ***STARRED ENERGY LEVELS FROM

TABLE 80. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar 12*

STATE	LEVEL		STAT.	TEMPERATURE (DEG K)									
	(CM-1)	(EV)		MT.	22000	26000	30000	34070	38000	42000	44000	50000	70000
2s 2p ⁴	0	0.	1	2.60E-01	2.30E-01	2.09E-01	1.93E-01	1.80E-01	1.70E-01	1.61E-01	1.54E-01	1.30E-01	
	10000*	1.2398	3	4.05E-01	3.97E-01	3.88E-01	3.78E-01	3.70E-01	3.61E-01	3.54E-01	3.46E-01	3.17E-01	
	21000*	2.6034	5	3.29E-01	3.40E-01	3.81E-01	3.94E-01	4.08E-01	4.13E-01	4.18E-01	4.21E-01	4.22E-01	
	40000*	9.9185	5	6.93E-03	1.37E-02	2.25E-02	3.20E-02	4.35E-02	5.48E-02	6.64E-02	7.70E-02	1.25E-01	
	153000*	18.9691	1	1.17E-05	4.84E-05	1.34E-04	2.97E-04	5.49E-04	8.98E-04	1.35E-03	1.89E-03	5.40E-03	
LEVEL	(CM-1)	150000	300000	500000	800000	1500000	3000000	5000000	6000000	0	0	0	
LEVEL	(CM-1)	90000	150000	300000	500000	800000	1500000	3000000	5000000	6000000	0	0	
10000	1.14E-01	9.65E-02	8.15E-02	7.55E-02	7.22E-02	6.94E-02	6.81E-02	6.74E-02	6.72E-02	0.	0.	0.	
21000	4.15E-01	3.94E-01	3.69E-01	2.20E-01	2.13E-01	2.07E-01	2.03E-01	2.02E-01	2.01E-01	0.	0.	0.	
40000	1.62E-01	2.74E-01	2.78E-01	3.56E-01	3.48E-01	3.41E-01	3.37E-01	3.34E-01	3.33E-01	0.	0.	0.	
153000	1.01E-02	2.22E-02	3.91E-02	4.84E-02	5.48E-02	6.01E-02	6.33E-02	6.54E-02	6.54E-02	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
NONSTARRED ENERGY LEVELS FROM

TABLE 81. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF Ar 13+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K)									
				25000	26000	30000	34000	38000	42000	46000	50000	70000	
2p	0	0.	2	6.88E-01	6.37E-01	5.97E-01	5.64E-01	5.41E-01	5.28E-01	5.07E-01	4.88E-01	4.74E-01	
	22443	2.8098	4	3.12E-01	3.63E-01	4.03E-01	4.34E-01	4.59E-01	4.79E-01	4.92E-01	5.00E-01	5.04E-01	
	239000*	29.6315	12	6.72E-07	6.89E-06	3.77E-05	1.38E-04	3.81E-04	8.68E-04	1.71E-03	3.02E-03	1.92E-02	
	407000*	50.4403	10	7.47E-12	5.27E-10	7.95E-09	9.37E-08	5.99E-07	2.89E-06	7.45E-06	2.00E-05	5.86E-06	
	510000*	63.2303	2	2.25E-15	3.52E-13	1.42E-11	2.40E-10	2.22E-09	1.34E-08	5.94E-08	2.07E-07	1.22E-05	
3p	0	44.9497	6	9.48E-16	2.01E-13	1.01E-11	2.02E-10	2.14E-09	1.44E-08	5.97E-08	2.61E-07	1.97E-05	
	709000*	87.9025	4	1.00E-20	1.16E-17	2.04E-15	1.04E-13	2.37E-12	2.95E-11	3.75E-10	1.35E-09	4.00E-07	
	805000*	99.8047	10	4.70E-23	1.43E-19	5.11E-17	4.54E-15	1.57E-13	2.75E-12	4.72E-11	2.11E-10	1.42E-07	
	897000*	111.2110	6	6.88E-26	5.29E-22	3.71E-19	5.54E-17	2.89E-15	7.05E-14	1.72E-13	9.03E-12	1.28E-09	
				TEMPERATURE (DEG K)									
3s	0	150000	300000	500000	800000	1500000	3000000	5000000	8000000	9	0	0	
	22443	2.99E-01	1.49E-01	1.08E-01	7.84E-02	5.52E-02	4.11E-02	3.19E-02	2.49E-02	0.	0.	0.	
	239000*	5.19E-02	1.81E-01	3.21E-01	2.98E-01	2.64E-01	2.40E-01	2.30E-01	2.24E-01	0.	0.	0.	
	407000*	2.92E-03	3.01E-02	1.20E-01	1.47E-01	1.84E-01	1.87E-01	1.82E-01	1.81E-01	0.	0.	0.	
	510000*	1.16E-04	2.24E-03	1.40E-02	3.05E-02	3.39E-02	3.51E-02	3.54E-02	3.54E-02	0.	0.	0.	
3d	0	2.11E-04	3.79E-02	6.83E-02	8.67E-02	1.04E-01	1.02E-01	1.02E-01	1.04E-01	0.	0.	0.	
	709000*	9.44E-04	6.65E-04	1.12E-02	2.80E-02	5.60E-02	6.96E-02	6.96E-02	6.96E-02	0.	0.	0.	
	805000*	5.09E-06	6.62E-04	1.77E-02	5.31E-02	9.98E-02	1.28E-01	1.52E-01	1.69E-01	0.	0.	0.	
	897000*	7.01E-07	1.64E-04	6.84E-03	2.45E-02	6.54E-02	7.01E-02	8.74E-02	9.51E-02	9.95E-02	0.	0.	

*ESTIMATED
NONSTARRED ENERGY LEVELS FROM PRYCE (1964)

TABLE 82 ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 14+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	TEMPERATURE (DEG K)										
				22000	24000	30000	34000	38000	42000	44000	50000	70000		
2s 2p	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	9.97E-01	9.94E-01	9.99E-01	9.94E-01	9.94E-01
	236000*	29.2595	9	1.78E-06	1.92E-05	1.00E-04	4.14E-04	1.10E-03	4.14E-04	2.77E-03	5.37E-03	1.00E-02	6.34E-02	6.34E-02
	450000*	59.7915	3	4.97E-13	4.59E-11	1.27E-09	1.61E-08	1.19E-07	6.04E-07	2.30E-06	7.04E-06	2.69E-05	2.69E-05	2.69E-05
	620000*	76.6482	9	2.21E-17	1.13E-14	1.10E-12	3.63E-11	5.74E-10	5.34E-09	3.39E-08	1.59E-07	2.44E-06	2.44E-06	2.44E-06
	870000*	83.0673	5	4.67E-19	3.99E-16	5.54E-14	2.43E-12	4.60E-11	5.37E-10	3.94E-09	2.10E-08	4.80E-08	4.80E-08	4.80E-08
15	876000*	102.9042	1	7.47E-24	1.13E-20	5.15E-18	5.57E-16	2.29E-14	4.47E-13	5.20E-12	4.20E-11	3.64E-10	3.64E-10	

LEVEL:		TEMPERATURE (DEG K)											
(CM-1)	150000	300000	500000	800000	1500000	3000000	5000000	8000000	0	0	0	0	0
0	8.27E-01	4.98E-01	2.03E-01	1.15E-01	7.75E-02	5.50E-02	4.46E-02	4.08E-02	4.08E-02	4.08E-02	4.08E-02	4.08E-02	4.08E-02
236000	1.71E-01	4.86E-01	5.89E-01	5.24E-01	4.54E-01	3.89E-01	3.38E-01	3.43E-01	3.43E-01	3.43E-01	3.43E-01	3.43E-01	3.43E-01
450000	1.86E-03	1.99E-02	7.03E-02	9.43E-02	1.04E-01	1.07E-01	1.08E-01	1.08E-01	1.08E-01	1.08E-01	1.08E-01	1.08E-01	1.08E-01
620000	3.69E-04	1.17E-02	9.34E-02	2.73E-01	2.29E-01	2.73E-01	2.98E-01	3.08E-01	3.13E-01	3.13E-01	3.13E-01	3.13E-01	3.13E-01
870000	4.22E-05	4.03E-03	4.08E-02	6.34E-02	1.18E-01	1.49E-01	1.62E-01	1.68E-01	1.72E-01	1.72E-01	1.72E-01	1.72E-01	1.72E-01
830000	1.43E-06	1.74E-04	3.79E-03	1.05E-02	1.74E-02	2.48E-02	2.99E-02	3.22E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 †NONSTARRED ENERGY LEVELS FROM

TABLE 83. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 15*

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	WT.	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)	TEMPERATURE (DEG K)
1s ² 2s	0	0.			0.	0.	0.	0.	0.	0.	0.	0.	0.
	271000*	33.5989		2	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08
	4190000*	519.4804		6	6.03E-08	6.03E-08	6.03E-08	6.03E-08	6.03E-08	6.03E-08	6.03E-08	6.03E-08	6.03E-08
	4260000*	528.1592		6	0.	0.	0.	0.	0.	0.	0.	0.	0.
	4290000*	531.8785		10	0.	0.	0.	0.	0.	0.	0.	0.	0.
4sp ²	5600090*	719.0898		32	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0	0.			0.	0.	0.	0.	0.	0.	0.	0.	0.
	90000	150000		300000	500000	800000	1500000	3000000	5000000	8000000	15000000	30000000	50000000
	271000	8.18E-01		5.50E-01	4.21E-01	3.51E-01	2.84E-01	1.73E-01	1.04E-01	6.06E-01	7.31E-02	0.	0.
	4190000	7.81E-01		4.50E-01	5.79E-01	6.47E-01	6.56E-01	4.55E-01	2.94E-01	2.09E-01	0.	0.	0.
4260000	7.45E-01		1.03E-09	2.44E-06	1.87E-04	5.10E-03	2.32E-02	3.18E-02	0.	0.	0.	0.	
4290000	7.89E-01		2.21E-09	5.99E-06	5.94E-04	1.93E-02	6.72E-02	9.34E-02	1.02E-01	0.	0.	0.	
5600090	9.03E-01		3.19E-09	9.16E-06	7.83E-04	2.32E-02	1.10E-01	1.54E-01	1.69E-01	0.	0.	0.	
0	0.			0.	0.	0.	0.	0.	0.	0.	0.	0.	
90000	150000		300000	500000	800000	1500000	3000000	5000000	8000000	15000000	30000000	50000000	
271000	8.18E-01		5.50E-01	4.21E-01	3.51E-01	2.84E-01	1.73E-01	1.04E-01	6.06E-01	7.31E-02	0.	0.	
4190000	7.81E-01		4.50E-01	5.79E-01	6.47E-01	6.56E-01	4.55E-01	2.94E-01	2.09E-01	0.	0.	0.	
4260000	7.45E-01		1.03E-09	2.44E-06	1.87E-04	5.10E-03	2.32E-02	3.18E-02	0.	0.	0.	0.	
4290000	7.89E-01		2.21E-09	5.99E-06	5.94E-04	1.93E-02	6.72E-02	9.34E-02	1.02E-01	0.	0.	0.	
5600090	9.03E-01		3.19E-09	9.16E-06	7.83E-04	2.32E-02	1.10E-01	1.54E-01	1.69E-01	0.	0.	0.	
0	0.			0.	0.	0.	0.	0.	0.	0.	0.	0.	
90000	150000		300000	500000	800000	1500000	3000000	5000000	8000000	15000000	30000000	50000000	
271000	8.18E-01		5.50E-01	4.21E-01	3.51E-01	2.84E-01	1.73E-01	1.04E-01	6.06E-01	7.31E-02	0.	0.	
4190000	7.81E-01		4.50E-01	5.79E-01	6.47E-01	6.56E-01	4.55E-01	2.94E-01	2.09E-01	0.	0.	0.	
4260000	7.45E-01		1.03E-09	2.44E-06	1.87E-04	5.10E-03	2.32E-02	3.18E-02	0.	0.	0.	0.	
4290000	7.89E-01		2.21E-09	5.99E-06	5.94E-04	1.93E-02	6.72E-02	9.34E-02	1.02E-01	0.	0.	0.	
5600090	9.03E-01		3.19E-09	9.16E-06	7.83E-04	2.32E-02	1.10E-01	1.54E-01	1.69E-01	0.	0.	0.	
0	0.			0.	0.	0.	0.	0.	0.	0.	0.	0.	
90000	150000		300000	500000	800000	1500000	3000000	5000000	8000000	15000000	30000000	50000000	
271000	8.18E-01		5.50E-01	4.21E-01	3.51E-01	2.84E-01	1.73E-01	1.04E-01	6.06E-01	7.31E-02	0.	0.	
4190000	7.81E-01		4.50E-01	5.79E-01	6.47E-01	6.56E-01	4.55E-01	2.94E-01	2.09E-01	0.	0.	0.	
4260000	7.45E-01		1.03E-09	2.44E-06	1.87E-04	5.10E-03	2.32E-02	3.18E-02	0.	0.	0.	0.	
4290000	7.89E-01		2.21E-09	5.99E-06	5.94E-04	1.93E-02	6.72E-02	9.34E-02	1.02E-01	0.	0.	0.	
5600090	9.03E-01		3.19E-09	9.16E-06	7.83E-04	2.32E-02	1.10E-01	1.54E-01	1.69E-01	0.	0.	0.	

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
 *NONSTARRED ENERGY LEVELS FROM

TABLE 84. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 16+

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT. WT.	TEMPERATURE (DEG K)										
				27000	26000	30000	34000	38000	42000	46000	50000	70000		
1s	0	0.	1	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
1s 2p	24300000*	3012.7383	16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 3p	24800000*	3575.6528	34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1s 4p	30400000*	3769.0224	64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	LEVEL			TEMPERATURE (DEG K):										
	(CM-1)			90000	150000	300000	500000	800000	1500000	3000000	5000000	8000000	0	0
	0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
	24300000	0.	0.	6.85E-30	1.68E-18	1.21E-09	1.34E-04	1.42E-02	1.21E-01	5.97E-01	0.	0.	0.	0.
	28800000	0.	0.	3.67E-35	1.15E-21	3.62E-11	3.61E-05	8.76E-03	1.21E-01	0.	0.	0.	0.	0.
	30400000	0.	0.	6.53E-37	1.15E-22	1.39E-11	2.98E-05	9.83E-03	1.61E-01	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
MONSTARRED ENERGY LEVELS FROM

TABLE 85. ENERGY LEVELS AND FRACTIONAL ELECTRONIC POPULATIONS OF AR 17*

STATE	LEVEL (CM-1)	LEVEL (EV)	STAT.	WT.	TEMPERATURE (DEG K)																
					22000	24000	30000	34000	38000	42000	46000	50000	70000								
1s	0	0.																			
2s	26764214	3118.2540		2	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	
2p	26788837	3121.3068		2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3s	31732440	3924.2444		2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3p	31739934	3935.1488		6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
3d	31744034	3935.9051		10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4s	33470098	4149.6562		2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4p	33473174	4150.0376		6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4d	33475746	4150.3564		10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
4f	33476844	4150.4926		14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
LEVEL					TEMPERATURE (DEG K)																
1CM-1)					90000	150000	300000	800000	1500000	3000000	5000000	8000000	15000000	30000000	50000000	80000000	150000000	300000000	500000000	800000000	1500000000
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00	1.00E 00
26764214	0.	0.	0.	0.	3.57E-34	1.23E-21	7.09E-12	2.64E-04	4.50E-04	7.37E-03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
26788837	0.	0.	0.	0.	9.97E-34	3.31E-21	7.90E-11	7.90E-08	1.34E-03	2.40E-02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31732440	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31739934	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31744034	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33470098	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33473174	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33475746	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33476844	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*ESTIMATED **INCLUDES ESTIMATED SUBLEVELS
MINSTARRED ENERGY LEVELS FROM GARCIA AND MACK (1965)

TABLE 86. DIATOMIC SPECTROSCOPIC CONSTANTS (UNITS: CM-1)

MOLLEC.	STATE	T_0	ω_e	$\omega_e x_e$	$\omega_e y_e$	$\omega_e z_e$	$\omega_e^2 x_e$	$\omega_e^2 y_e$	B_e	α_e	γ_e	δ_e	
N_2	$X^1\Sigma^+$	0.	2358.070	14.1880	-1.240E-02	-0.	1.99870	0.0178000	1.99870	0.0178000	-0.	-0.	
	$A^3\Sigma^+$	49756.6	1460.600	13.8500	6.500E-03	1.800E-03	1.45450	0.0179400	1.45450	0.0179400	-9.200E-05	-0.	
	B^3A_1	58000.0	1490.200	13.0000	-0.	-0.	1.46000	0.0170000	1.46000	0.0170000	-0.	-0.	
	$B^3\Pi_g$	59313.4	1723.880	14.3500	-1.100E-02	2.000E-04	1.63750	0.0179400	1.63750	0.0179400	-7.400E-05	-0.	
	$B^3\Sigma^-$	65852.3	1516.883	12.1810	4.186E-02	7.323E-04	1.47359	0.0168610	1.47359	0.0168610	3.619E-05	9.460E-07	
	$a^1\Sigma^-$	67739.3	1530.254	12.0747	4.129E-02	2.896E-04	1.47984	0.0165740	1.47984	0.0165740	2.410E-05	-0.	
	$a^1\Pi_g$	68951.2	1696.200	13.9491	7.935E-03	-2.911E-04	1.61688	0.0179330	1.61688	0.0179330	-2.930E-05	-0.	
	w^1A_1	71698.3	1558.580	11.5300	-4.000E-02	-4.800E-03	1.49830	0.0166500	1.49830	0.0166500	-0.	-0.	
	N_2^+	$X^2\Sigma^+$	0.	2207.170	16.1460	-2.850E-02	9.200E-04	1.92580	0.0174300	1.92580	0.0174300	-1.640E-04	-0.
		$A^3\Pi_u$	8068.0	1903.420	15.0000	-0.	-0.	1.74800	0.0200000	1.74800	0.0200000	-0.	-0.
		$B^3\Sigma^+$	25586.0	2418.700	22.5300	-6.700E-01	4.000E-02	2.08300	0.0183000	2.08300	0.0183000	-1.650E-03	-0.
		$4\Sigma^+$	44328.0	1700.000	16.0000	-0.	-0.	1.60000	0.0200000	1.60000	0.0200000	-0.	-0.
$4A_1$		51328.0	1600.000	14.0000	-0.	-0.	1.60000	0.0200000	1.60000	0.0200000	-0.	-0.	
$D^3\Pi_g$		51203.0	914.780	13.1200	8.300E-02	-0.	1.11300	0.0200000	1.11300	0.0200000	-0.	-0.	
$4\Sigma^-$		60328.0	1500.000	14.0000	-0.	-0.	1.40000	0.0150000	1.40000	0.0150000	-0.	-0.	
$C^3\Sigma^+$		64542.0	2073.700	10.9700	-2.400E-01	-0.	1.51240	0.0017000	1.51240	0.0017000	-7.500E-04	-0.	

TABLE 86 (CONT.). DIATOMIC SPECTROSCOPIC CONSTANTS

MOLEC.	STATE	T_0	ω_0	ω_0^2	ω_0^3	ω_0^4	B_0	C_0	γ_0	δ_0	
NO	X $^2\Pi$	62.2	1903.980	14.0150	1.000E-02	-5.800E-04	1.70420	0.0172500	-4.000E-05	-0.	
	a $^4\Pi$	37965.0	1017.000	11.0000	-0.	-0.	1.17000	0.0170000	-0.	-0.	
	A $^2\Sigma^+$	44199.2	2374.860	16.4600	-0.	-0.	1.99720	0.0192800	-0.	-0.	
	B $^3\Pi$	45505.0	1037.640	7.5450	8.330E-02	-0.	1.12450	0.0132000	-0.	-0.	
	b $^4\Sigma^-$	47092.0	1203.000	14.5000	-0.	-0.	1.36000	0.0240000	-0.	-0.	
	C $^2\Pi$	52380.0	2395.000	15.0000	-0.	-0.	2.00200	0.0300000	-0.	-0.	
	D $^2\Sigma^+$	53291.2	2323.900	22.8850	7.500E-01	2.200E-01	2.00260	0.0217500	-0.	-0.	
	NO ⁺	X $^1\Sigma^+$	0.	2377.100	16.3500	1.000E-02	-0.	2.00200	0.0202000	-0.	-0.
		a $^2\Sigma^+$	39934.0	1600.000	14.0000	-0.	-0.	1.65000	0.0200000	-0.	-0.
		3A	58804.0	2000.000	14.0000	-0.	-0.	1.50000	0.0200000	-0.	-0.
3\Pi		63764.0	1700.000	14.0000	-0.	-0.	1.84000	0.0200000	-0.	-0.	
A $^1\Pi$		73084.0	1608.900	23.3000	-0.	-0.	1.58700	0.0240000	-0.	-0.	
3\Sigma^-		73334.0	1200.000	12.0000	-0.	-0.	1.22000	0.0150000	-0.	-0.	

TABLE B7. IDEAL GAS FUNCTIONS FOR N₂ (MOLECULAR WEIGHT 28.0134, R = 1.98717 CAL./MOLE, 8 STATES INCLUDED)

TEMP. (°K)	PARTIT. FUNCT.	$\frac{H^0 - E^0}{RT}$	$\frac{F^0 - E^0}{RT}$	$\frac{S^0}{R}$	$\ln \frac{H^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$\ln \frac{H^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$F^0 - E^0$	$H^0 - E^0$	$\frac{H^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	TEMP. (°K)
1000	1-8159E 02	3-62519	23-8052	27-5294	7-20187	47-3049	54-2068	7-2019E 03	4-7305E 04	1000
1200	2-2413E 02	3-68633	24-4715	28-1576	7-32534	48-6789	55-9543	8-7904E 03	5-9355E 04	1200
1400	2-7033E 02	3-74630	25-0443	28-7906	7-44452	49-7672	57-2117	7-6403E 03	6-9674E 04	1400
1600	3-2046E 02	3-80178	25-5482	29-3500	7-55476	50-7485	58-3233	7-2088E 03	8-1230E 04	1600
1800	3-7467E 02	3-85210	25-9980	29-8511	7-65477	51-6442	59-3190	1-0202E 04	9-2996E 04	1800
2000	4-3307E 02	3-89741	26-4072	30-3046	7-74480	52-4795	60-2203	1-1518E 04	1-0491E 05	2000
2200	4-9572E 02	3-93811	26-7806	30-7187	7-82563	53-2575	61-0632	1-2217E 04	1-1708E 05	2200
2400	5-6270E 02	3-97474	27-1249	31-0986	7-89846	53-9916	61-8001	1-2854E 04	1-2936E 05	2400
2600	6-3404E 02	4-00778	27-4444	31-4521	7-96441	54-6748	62-5006	1-3506E 04	1-4179E 05	2600
2800	7-0979E 02	4-03768	27-7425	31-7862	8-02354	55-3129	63-1524	1-4180E 04	1-5436E 05	2800
3000	7-8979E 02	4-06488	28-0220	32-0869	8-07758	55-9043	63-7619	1-4821E 04	1-6705E 05	3000
3200	8-7463E 02	4-08971	28-2851	32-3548	8-12658	56-4542	64-3342	1-5467E 04	1-7986E 05	3200
3400	9-6378E 02	4-11247	28-5338	32-6462	8-17115	56-9713	64-8735	1-6129E 04	1-9270E 05	3400
3600	1-0575E 03	4-13342	28-7694	32-9028	8-21379	57-4566	65-3834	1-6814E 04	2-0561E 05	3600
3800	1-1957E 03	4-15278	28-9934	33-1462	8-25527	57-9147	65-8670	1-7513E 04	2-1864E 05	3800
4000	1-2585E 03	4-17075	29-2069	33-3776	8-29569	58-3589	66-3269	1-8223E 04	2-3186E 05	4000
4200	1-3660E 03	4-18747	29-4108	33-5983	8-33519	58-7841	66-7653	1-8949E 04	2-4547E 05	4200
4400	1-4781E 03	4-20309	29-6040	33-8091	8-37224	59-1942	67-1842	1-9690E 04	2-5946E 05	4400
4600	1-5948E 03	4-21774	29-7931	34-0134	8-40813	59-5899	67-5852	2-0446E 04	2-7384E 05	4600
4800	1-7163E 03	4-23152	29-9729	34-2045	8-44287	59-9712	67-9699	2-1217E 04	2-8869E 05	4800
5000	1-8425E 03	4-24453	30-1459	34-3905	8-47650	60-3393	68-3333	2-2013E 04	3-0402E 05	5000
5200	1-9734E 03	4-25684	30-3127	34-5695	8-50908	60-6953	68-6853	2-2823E 04	3-1983E 05	5200
5400	2-1092E 03	4-26859	30-4755	34-7421	8-54059	61-0403	69-0303	2-3647E 04	3-3613E 05	5400
5600	2-2498E 03	4-27978	30-6290	34-9088	8-57104	61-3748	69-3688	2-4485E 04	3-5294E 05	5600
5800	2-3952E 03	4-29051	30-7793	35-0699	8-60044	61-7000	69-6999	2-5337E 04	3-7026E 05	5800
6000	2-5456E 03	4-30085	30-9250	35-2258	8-62880	62-0163	70-0250	2-6194E 04	3-8809E 05	6000
6200	2-7009E 03	4-31087	31-0662	35-3770	8-65613	62-3236	70-3380	2-7065E 04	4-0642E 05	6200
6400	2-8611E 03	4-32064	31-2032	35-5236	8-68244	62-6224	70-6457	2-7949E 04	4-2536E 05	6400
6600	3-0262E 03	4-33021	31-3363	35-6665	8-70774	62-9134	70-9482	2-8846E 04	4-4483E 05	6600
6800	3-1969E 03	4-33967	31-4657	35-8054	8-73204	63-1970	71-2464	2-9756E 04	4-6494E 05	6800
7000	3-3724E 03	4-34907	31-5916	35-9407	8-75634	63-4736	71-5401	3-0689E 04	4-8566E 05	7000
7200	3-5532E 03	4-35850	31-7143	36-0728	8-78064	63-7434	71-8301	3-1659E 04	5-0700E 05	7200
7400	3-7393E 03	4-36802	31-8338	36-2018	8-80494	64-0066	72-1164	3-2613E 04	5-2893E 05	7400
7600	3-9308E 03	4-37771	31-9504	36-3282	8-82924	64-2734	72-4001	3-3594E 04	5-5146E 05	7600
7800	4-1278E 03	4-38765	32-0643	36-4519	8-85354	64-5344	72-6814	3-4600E 04	5-7460E 05	7800
8000	4-3305E 03	4-39791	32-1755	36-5734	8-87784	64-7900	72-9601	3-5631E 04	5-9834E 05	8000
8200	4-5388E 03	4-40854	32-2842	36-6928	8-90214	65-0414	73-2364	3-6687E 04	6-2268E 05	8200
8400	4-7531E 03	4-41967	32-3906	36-8103	8-92644	65-2888	73-5101	3-7768E 04	6-4762E 05	8400
8600	4-9734E 03	4-43133	32-4947	36-9260	8-95074	65-5324	73-7824	3-8874E 04	6-7316E 05	8600
8800	5-1998E 03	4-44358	32-5967	37-0403	8-97504	65-7724	74-0534	3-9999E 04	7-0030E 05	8800
9000	5-4328E 03	4-45651	32-6967	37-1532	8-99934	66-0089	74-3224	4-1144E 04	7-2804E 05	9000
9200	5-6724E 03	4-47018	32-7948	37-2650	9-02364	66-2414	74-5894	4-2319E 04	7-5638E 05	9200
9400	5-9180E 03	4-48463	32-8911	37-3758	9-04794	66-4704	74-8544	4-3524E 04	7-8532E 05	9400
9600	6-1723E 03	4-49993	32-9857	37-4856	9-07224	66-6964	75-1174	4-4759E 04	8-1486E 05	9600
9800	6-4333E 03	4-51612	33-0786	37-5948	9-09654	66-9194	75-3784	4-6024E 04	8-4510E 05	9800

TABLE N7 (CONT.) IDEAL GAS FUNCTIONS FOR N₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^3}{RT^3}$	$\ln \left(\frac{h^3}{RT^3} \right)$	$\frac{h^3}{RT^3} - \frac{h^3}{RT^3}$	$\frac{h^3}{RT^3}$	$\ln \left(\frac{h^3}{RT^3} \right)$	$\frac{h^3}{RT^3} - \frac{h^3}{RT^3}$	$\frac{h^3}{RT^3}$	$\ln \left(\frac{h^3}{RT^3} \right)$	$\frac{h^3}{RT^3} - \frac{h^3}{RT^3}$	$\frac{h^3}{RT^3}$	$\ln \left(\frac{h^3}{RT^3} \right)$	TEMP. (°K)
10000	6.7019E 03	4.53323	33.1701	37.7033	9.00829	65.9144	76.9227	7.0211E 04	9.6093E 04	6.5914E 05	1.00000	10000	
10500	7.4090E 03	4.58028	33.3924	37.9728	9.10178	66.3561	75.4379	7.4703E 04	9.3548E 04	6.5974E 05	10500	10500	
11000	8.1718E 03	4.63360	33.6064	38.2402	9.20712	66.7819	74.9897	7.9428E 04	9.1288E 04	6.6060E 05	11000	11000	
11500	8.9933E 03	4.68315	33.8139	38.5070	9.31606	67.1934	74.5199	8.4272E 04	8.9272E 04	6.6152E 05	11500	11500	
12000	9.8700E 03	4.73857	34.0150	38.7734	9.42667	67.5934	74.0499	8.9127E 04	8.7347E 04	6.6244E 05	12000	12000	
12500	1.0661E 04	4.82920	34.2107	39.0399	9.54642	67.9823	73.5787	9.4118E 04	8.5486E 04	6.6336E 05	12500	12500	
13000	1.1917E 04	4.90413	34.4015	39.3057	9.67532	68.3615	73.1068	9.9088E 04	8.3680E 04	6.6428E 05	13000	13000	
13500	1.3067E 04	4.96223	34.5881	39.5703	9.80952	68.7322	72.6327	1.0403E 05	8.1924E 04	6.6520E 05	13500	13500	
14000	1.4132E 04	5.04227	34.7707	39.8330	10.05937	69.0951	72.1547	1.1301E 05	8.0208E 04	6.6612E 05	14000	14000	
14500	1.5092E 04	5.14293	34.9497	40.0927	10.21984	69.4509	71.6708	1.1937E 05	7.8542E 04	6.6704E 05	14500	14500	
15000	1.7164E 04	5.23294	35.1255	40.3484	10.37629	69.8001	71.1789	1.2539E 05	7.6916E 04	6.6796E 05	15000	15000	
15500	1.8816E 04	5.30107	35.2980	40.5991	10.53111	70.1630	70.6771	1.3248E 05	7.5328E 04	6.6888E 05	15500	15500	
16000	2.0590E 04	5.37625	35.4675	40.8437	10.68351	70.4798	70.1633	1.3984E 05	7.3780E 04	6.6980E 05	16000	16000	
16500	2.2320E 04	5.44735	35.6340	41.0816	10.83318	70.8107	69.6359	1.4746E 05	7.2272E 04	6.7072E 05	16500	16500	
17000	2.4616E 04	5.51420	35.7977	41.3115	10.97962	71.1359	69.0935	1.5536E 05	7.0804E 04	6.7164E 05	17000	17000	
17500	2.6888E 04	5.57563	35.9584	41.5340	11.07970	71.4553	68.5350	1.6362E 05	6.9376E 04	6.7256E 05	17500	17500	
18000	2.9345E 04	5.63145	36.1163	41.7477	11.19082	71.7690	67.9596	1.7224E 05	6.7988E 04	6.7348E 05	18000	18000	
18500	3.1994E 04	5.68142	36.2713	41.9527	11.28992	72.0770	67.3669	1.8116E 05	6.6640E 04	6.7440E 05	18500	18500	
19000	3.4850E 04	5.72544	36.4234	42.1488	11.37740	72.3793	66.7567	1.9038E 05	6.5332E 04	6.7532E 05	19000	19000	
19500	3.7915E 04	5.76355	36.5725	42.3361	11.45313	72.6758	66.1289	1.9990E 05	6.4064E 04	6.7624E 05	19500	19500	
20000	4.1190E 04	5.79588	36.7189	42.5148	11.51738	72.9664	65.4940	2.0962E 05	6.2836E 04	6.7716E 05	20000	20000	
20500	4.4641E 04	5.87230	37.2756	43.1479	11.64923	74.0727	65.7419	2.1301E 05	6.1648E 04	6.7808E 05	20500	20500	
21000	4.8313E 04	5.87963	37.8772	43.6449	11.83379	75.0895	64.9895	2.1772E 05	6.0500E 04	6.7900E 05	21000	21000	
21500	5.2245E 04	5.83899	38.2545	44.0955	11.60304	76.0220	64.2251	2.2272E 05	5.9382E 04	6.7992E 05	21500	21500	
22000	5.6478E 04	5.76785	38.6868	44.4544	11.44164	76.8770	63.3387	2.2804E 05	5.8294E 04	6.8084E 05	22000	22000	
22500	6.1019E 04	5.67885	39.0818	44.7404	11.28481	77.6419	62.3461	2.3368E 05	5.7236E 04	6.8176E 05	22500	22500	
23000	6.5842E 04	5.58058	39.4452	45.0257	11.08954	78.3841	61.2734	2.3964E 05	5.6208E 04	6.8268E 05	23000	23000	
23500	7.0933E 04	5.47385	39.7804	45.2591	10.88618	79.0503	60.1373	2.4592E 05	5.5210E 04	6.8360E 05	23500	23500	
24000	7.6288E 04	5.37638	40.0907	45.4473	10.68416	79.6448	58.9310	2.5252E 05	5.4242E 04	6.8452E 05	24000	24000	
24500	8.1900E 04	5.27855	40.3787	45.6352	10.48358	80.1725	57.6745	2.5944E 05	5.3304E 04	6.8544E 05	24500	24500	
25000	8.7778E 04	5.17983	40.6469	45.8267	10.29317	80.7721	56.3852	2.6668E 05	5.2406E 04	6.8636E 05	25000	25000	

TABLE 8B. IDEAL GAS FUNCTIONS FOR N₂* (MOLECULAR WEIGHT 28.0129; R = 1.98717 CAL/MOLE, 8 STATES INCLUDED)

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2}{RT^2}$	$\frac{5R}{T}$	$\ln \frac{h^2}{RT^2} - \frac{5R}{T}$	$\ln \frac{h^2}{RT^2} - \frac{5R}{T} - \ln \frac{h^2}{RT^2}$	$\ln \frac{h^2}{RT^2} - \frac{5R}{T} - \ln \frac{h^2}{RT^2}$	$\ln \frac{h^2}{RT^2} - \frac{5R}{T} - \ln \frac{h^2}{RT^2}$	TEMP. (°K)
1000	3.8059E 02	3.64675	24.5451	28.1918	7.24689	48.7751	56.0218	1.000
1200	4.7189E 02	3.71419	25.1934	28.9301	7.38071	50.1082	57.4899	1200
1400	5.7181E 02	3.78001	25.7954	29.5754	7.51151	51.2558	58.7873	1400
1600	6.8124E 02	3.84396	26.3524	30.1463	7.63859	52.2677	59.9957	1600
1800	8.0100E 02	3.90693	26.7588	30.6457	7.76372	53.1741	61.0378	1800
2000	9.3201E 02	3.96982	27.1136	31.1435	7.88868	53.9985	61.8872	2000
2200	1.0753E 03	4.03303	27.5550	31.6400	8.01430	54.7563	62.5706	2200
2400	1.2321E 03	4.09653	27.9866	32.0951	8.14048	55.4590	63.1995	2400
2600	1.4034E 03	4.15991	28.4290	32.5689	8.26642	56.1154	63.7820	2600
2800	1.5810E 03	4.22257	28.8496	32.7722	8.39094	56.7327	64.3237	2800
3000	1.7658E 03	4.28389	29.2620	33.1269	8.51200	57.3158	64.8286	3000
3200	2.0189E 03	4.34328	29.6714	33.4647	8.63077	57.8640	65.2998	3200
3400	2.2810E 03	4.40018	29.9864	33.7866	8.74838	58.3937	65.7386	3400
3600	2.5243E 03	4.45425	30.2995	34.0937	8.86513	58.9086	66.1499	3600
3800	2.8095E 03	4.50524	30.6117	34.3869	8.98265	59.3799	66.5325	3800
4000	3.1177E 03	4.55299	30.9140	34.6670	9.04754	59.8415	66.8891	4000
4200	3.4499E 03	4.59747	31.1972	34.9347	9.13594	60.2851	67.2211	4200
4400	3.8072E 03	4.63873	31.4721	35.1908	9.21792	60.7120	67.5300	4400
4600	4.1904E 03	4.67686	31.7391	35.4360	9.29369	61.1235	67.8172	4600
4800	4.6007E 03	4.71201	31.9989	35.6709	9.36354	61.5205	68.0841	4800
5000	5.0389E 03	4.74436	32.2519	35.8963	9.42783	61.9041	68.3319	5000
5200	5.5057E 03	4.77411	32.4986	36.1127	9.48695	62.2750	68.5620	5200
5400	6.0022E 03	4.80146	32.7393	36.3208	9.54129	62.6341	68.7754	5400
5600	6.5295E 03	4.82641	32.9744	36.5210	9.59128	62.9820	68.9733	5600
5800	7.0879E 03	4.84978	33.2042	36.7140	9.63732	63.3194	69.1567	5800
6000	7.6780E 03	4.87117	33.4289	36.9001	9.67982	63.6468	69.3265	6000
6200	8.3015E 03	4.89098	33.6486	37.0800	9.71914	63.9645	69.4840	6200
6400	8.9599E 03	4.90933	33.8646	37.2539	9.75564	64.2740	69.6297	6400
6600	9.6509E 03	4.92645	34.0769	37.4224	9.78966	64.5747	69.7644	6600
6800	1.0378E 04	4.94247	34.2843	37.5857	9.82150	64.8675	69.8890	6800
7000	1.1142E 04	4.95753	34.4867	37.7442	9.85143	65.1526	69.9940	7000
7200	1.1943E 04	4.97176	34.6843	37.8983	9.87971	65.4305	70.0812	7200
7400	1.2783E 04	4.98528	34.8773	38.0483	9.90637	65.7016	70.1562	7400
7600	1.3661E 04	4.99818	35.0661	38.1943	9.93221	65.9661	70.2244	7600
7800	1.4579E 04	5.01055	35.2501	38.3364	9.95679	66.2244	70.2812	7800
8000	1.5538E 04	5.02247	35.4331	38.4756	9.98048	66.4768	70.3273	8000
8200	1.6539E 04	5.03400	35.6173	38.6113	10.00339	66.7236	70.3620	8200
8400	1.7582E 04	5.04520	35.8037	38.7539	10.02565	66.9649	70.3859	8400
8600	1.8671E 04	5.05612	35.9915	38.8937	10.04734	67.2011	70.4084	8600
8800	1.9803E 04	5.06678	36.1815	39.0307	10.06852	67.4323	70.4298	8800
9000	2.0982E 04	5.07721	36.3749	39.1751	10.08926	67.6580	70.4490	9000
9200	2.2207E 04	5.08745	36.5706	39.3270	10.10956	67.8808	70.4660	9200
9400	2.3480E 04	5.09749	36.7691	39.4766	10.12956	68.0984	70.4810	9400
9600	2.4802E 04	5.10735	36.9703	39.6239	10.14915	68.3119	70.4940	9600
9800	2.6179E 04	5.11703	37.1741	39.7690	10.16838	68.5213	70.5050	9800

TABLE 88 (CONT.). IDEAL GAS FUNCTIONS FOR N₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\ln \frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	$\frac{H^0 - E^0}{RT} - \frac{H^0 - E^0}{RT}$	TEMP. (°K)
1000	2.7599E 04	5.12652	34.5854	39.7119	10.18724	94.7270	78.9142	8.2061E 04	1.0197E 05	6.8727E 05	10000
1050	3.1390E 04	5.14938	34.9361	39.9855	10.23258	66.2251	79.4578	8.4573E 04	1.0744E 05	7.2604E 05	10500
11000	3.5525E 04	5.17087	35.3762	40.2470	10.27816	66.7021	79.9775	9.1170E 04	1.1303E 05	7.6447E 05	11000
11500	4.0021E 04	5.19075	35.8065	40.4972	10.31488	70.1590	80.4747	9.3749E 04	1.1862E 05	8.0406E 05	11500
12000	4.4894E 04	5.20874	35.5278	40.7365	10.35057	70.5995	80.9502	1.0030E 05	1.2421E 05	8.4719E 05	12000
12500	5.0160E 04	5.22465	35.7407	40.9654	10.38225	71.0237	81.4050	1.0494E 05	1.2978E 05	8.9379E 05	12500
13000	5.5837E 04	5.23822	35.9459	41.1841	10.40922	71.4305	81.8397	1.0949E 05	1.3532E 05	9.4364E 05	13000
13500	6.1942E 04	5.24932	36.1438	41.3931	10.43127	71.8277	82.2580	1.1400E 05	1.4082E 05	9.9682E 05	13500
14000	6.8474E 04	5.25784	36.3349	41.5927	10.44819	72.20	82.6516	1.1848E 05	1.4627E 05	1.0108E 06	14000
14500	7.5410E 04	5.26373	36.5195	41.7832	10.45990	72.5761	83.0302	1.2289E 05	1.5167E 05	1.0523E 06	14500
15000	8.2833E 04	5.26700	36.6980	41.9650	10.46640	72.9250	83.3914	1.2719E 05	1.5700E 05	1.0939E 06	15000
15500	9.0690E 04	5.26769	36.8707	42.1384	10.46878	73.2662	83.7340	1.3143E 05	1.6229E 05	1.1357E 06	15500
16000	9.9017E 04	5.26589	37.0360	42.3038	10.46620	73.6005	84.0647	1.3563E 05	1.6753E 05	1.1776E 06	16000
16500	1.0781E 05	5.26172	37.1999	42.4617	10.45950	73.9224	84.3783	1.3973E 05	1.7272E 05	1.2197E 06	16500
17000	1.1706E 05	5.25530	37.3569	42.6122	10.44914	74.2344	84.6775	1.4373E 05	1.7783E 05	1.2620E 06	17000
17500	1.2678E 05	5.24674	37.5091	42.7559	10.42622	74.5369	84.9631	1.4768E 05	1.8244E 05	1.3044E 06	17500
18000	1.3696E 05	5.23633	37.6568	42.8931	10.40545	74.8303	85.2357	1.5153E 05	1.8730E 05	1.3469E 06	18000
18500	1.4760E 05	5.22410	37.8001	43.0242	10.38116	75.1151	85.4962	1.5529E 05	1.9205E 05	1.3894E 06	18500
19000	1.5869E 05	5.21027	37.9392	43.1495	10.35367	75.3916	85.7452	1.5894E 05	1.9672E 05	1.4324E 06	19000
19500	1.7023E 05	5.19498	38.0744	43.2684	10.32329	75.6601	85.9834	1.6259E 05	2.0130E 05	1.4754E 06	19500
20000	1.8222E 05	5.17841	38.2057	43.3841	10.29035	75.9211	86.2114	1.6606E 05	2.0581E 05	1.5184E 06	20000
20000	2.9499E 05	5.10198	38.6958	43.7978	10.13847	76.8649	87.0334	1.7933E 05	2.2303E 05	1.6917E 06	22000
24000	3.5689E 05	5.21508	39.1360	44.1511	9.94580	77.7658	87.7351	1.9149E 05	2.3910E 05	1.8462E 06	24000
28000	4.2566E 05	4.92352	39.5339	44.4574	9.76384	78.5603	88.3442	2.0271E 05	2.5430E 05	2.0424E 06	28000
30000	4.9839E 05	4.83115	39.8953	44.7265	9.60030	79.2787	88.8789	2.1317E 05	2.6881E 05	2.2196E 06	30000
32000	5.7430E 05	4.74043	40.2254	44.9460	9.45001	79.9348	89.3548	2.2299E 05	2.8260E 05	2.3900E 06	32000
34000	6.5271E 05	4.65280	40.5267	45.1215	9.31588	80.5372	89.7851	2.3228E 05	2.9587E 05	2.5737E 06	34000
36000	7.3299E 05	4.56907	40.8032	45.2773	9.07950	81.1722	90.1722	2.4114E 05	3.0870E 05	2.7712E 06	36000
38000	8.1458E 05	4.48961	41.0671	45.5367	8.82159	81.6071	90.5267	2.4948E 05	3.2118E 05	2.9737E 06	38000
40000	8.9700E 05	4.41452	41.3078	45.7223	8.77239	82.0855	90.8579	2.5784E 05	3.3339E 05	3.1192E 06	40000
40000	8.9700E 05	4.34376	41.5324	45.8762	8.63177	82.5318	91.1636	2.6578E 05	3.4527E 05	3.3013E 06	40000

TABLE 89. IDEAL GAS FUNCTIONS FOR MOLECULAR WEIGHT 30.0661, R = 1.98717 CAL/MOLE, 7 STATES INCLUDED

TEMP. (°K)	PARTIT. FUNCT.	$\frac{M^0 - E^0}{RT}$	$\frac{E^0 - E^1}{RT}$	S/R	$(M^0 - E^0)VT - \frac{M^0 - E^0}{RT}$	$\frac{E^0 - E^1}{RT}$	$\frac{E^0 - E^1}{RT}$	$\frac{E^0 - E^1}{RT}$	$\frac{E^0 - E^1}{RT}$	$\frac{E^0 - E^1}{RT}$	$\frac{E^0 - E^1}{RT}$	TEMP. (°K)
1000	1-6145E 03	3-78923	26-0933	29-8826	7-52984	59-3816	5-5427E 03	7-52984	5-5427E 03	5-18952E 04	5-18952E 04	1000
1200	2-0529E 03	3-84743	26-7894	30-6368	7-64548	60-8804	6-7900E 03	7-64548	6-7900E 03	6-3082E 04	6-3082E 04	1200
1400	2-5375E 03	3-90240	27-3846	31-2890	7-75471	62-1765	8-0744E 03	7-75471	8-0744E 03	7-6190E 04	7-6190E 04	1400
1600	3-0702E 03	3-95220	27-9110	31-8632	7-85368	63-3175	9-3864E 03	7-85368	9-3864E 03	8-8742E 04	8-8742E 04	1600
1800	3-6525E 03	3-99667	28-3792	32-3758	7-94200	64-3361	1-0719E 04	7-94200	1-0719E 04	1-0151E 05	1-0151E 05	1800
2000	4-2853E 03	4-03623	28-8023	32-8386	8-02065	65-2557	1-2047E 04	8-02065	1-2047E 04	1-4041E 04	1-4041E 04	2000
2200	4-9683E 03	4-07148	29-1887	33-2402	8-09070	66-0928	1-3780E 04	8-09070	1-3780E 04	1-7616E 04	1-7616E 04	2200
2400	5-7083E 03	4-10302	29-5444	33-6474	8-15338	66-8429	1-5950E 04	8-15338	1-5950E 04	2-0906E 04	2-0906E 04	2400
2600	6-4983E 03	4-13138	29-8759	34-0053	8-20974	67-5741	1-8519E 04	8-20974	1-8519E 04	2-3948E 04	2-3948E 04	2600
2800	7-3353E 03	4-15704	30-1810	34-3381	8-26073	68-2354	2-1504E 04	8-26073	2-1504E 04	2-6793E 04	2-6793E 04	2800
3000	8-2304E 03	4-18038	30-4687	34-6490	8-30711	68-8534	2-4921E 04	8-30711	2-4921E 04	2-9464E 04	2-9464E 04	3000
3200	9-1795E 03	4-20173	30-7391	34-9409	8-34954	69-4333	2-8780E 04	8-34954	2-8780E 04	3-1978E 04	3-1978E 04	3200
3400	1-0193E 04	4-22138	30-9945	35-2158	8-38858	69-9791	3-3090E 04	8-38858	3-3090E 04	3-4352E 04	3-4352E 04	3400
3600	1-1242E 04	4-23955	31-2343	35-4758	8-42468	70-4963	3-7859E 04	8-42468	3-7859E 04	3-6511E 04	3-6511E 04	3600
3800	1-2356E 04	4-25645	31-4640	35-7224	8-45827	70-9863	4-3087E 04	8-45827	4-3087E 04	3-8479E 04	3-8479E 04	3800
4000	1-3527E 04	4-27225	31-6647	35-9569	8-48966	71-4524	4-8780E 04	8-48966	4-8780E 04	4-0185E 04	4-0185E 04	4000
4200	1-4754E 04	4-28710	31-8935	36-1806	8-51918	71-8968	5-4944E 04	8-51918	5-4944E 04	4-1661E 04	4-1661E 04	4200
4400	1-6038E 04	4-30115	32-0933	36-3944	8-54709	72-3217	6-1580E 04	8-54709	6-1580E 04	4-3361E 04	4-3361E 04	4400
4600	1-7380E 04	4-31452	32-2847	36-5993	8-57366	72-7280	6-8693E 04	8-57366	6-8693E 04	4-5248E 04	4-5248E 04	4600
4800	1-8780E 04	4-32730	32-4686	36-7959	8-59907	73-1196	7-6200E 04	8-59907	7-6200E 04	4-7376E 04	4-7376E 04	4800
5000	2-0240E 04	4-33962	32-6455	36-9852	8-62355	73-4954	8-4122E 04	8-62355	8-4122E 04	4-9690E 04	4-9690E 04	5000
5200	2-1759E 04	4-35156	32-8160	37-1675	8-64727	73-8500	9-2433E 04	8-64727	9-2433E 04	5-2240E 04	5-2240E 04	5200
5400	2-3339E 04	4-36320	32-9804	37-3436	8-67041	74-2000	1-0190E 04	8-67041	1-0190E 04	5-4990E 04	5-4990E 04	5400
5600	2-4981E 04	4-37464	33-1363	37-5139	8-69312	74-5444	1-8333E 04	8-69312	1-8333E 04	5-7890E 04	5-7890E 04	5600
5800	2-6685E 04	4-38592	33-2950	37-6789	8-71556	74-8743	2-6950E 04	8-71556	2-6950E 04	6-0950E 04	6-0950E 04	5800
6000	2-8452E 04	4-39713	33-4419	37-8390	8-73782	75-1924	3-6104E 04	8-73782	3-6104E 04	6-4173E 04	6-4173E 04	6000
6200	3-0284E 04	4-40831	33-5863	37-9946	8-76004	75-5015	4-5820E 04	8-76004	4-5820E 04	6-7540E 04	6-7540E 04	6200
6400	3-2181E 04	4-41950	33-7284	38-1459	8-78228	75-8022	5-6149E 04	8-78228	5-6149E 04	7-1060E 04	7-1060E 04	6400
6600	3-4145E 04	4-43074	33-8686	38-2933	8-80462	76-0951	6-7100E 04	8-80462	6-7100E 04	7-4740E 04	7-4740E 04	6600
6800	3-6177E 04	4-44207	33-9990	38-4371	8-82712	76-3808	7-8700E 04	8-82712	7-8700E 04	7-8540E 04	7-8540E 04	6800
7000	3-8278E 04	4-45349	34-1239	38-5774	8-84982	76-6597	9-0930E 04	8-84982	9-0930E 04	8-3460E 04	8-3460E 04	7000
7200	4-0450E 04	4-46502	34-2496	38-7146	8-87273	76-9323	1-0390E 04	8-87273	1-0390E 04	8-8400E 04	8-8400E 04	7200
7400	4-2694E 04	4-47666	34-3721	38-8487	8-89587	77-1988	1-1020E 04	8-89587	1-1020E 04	9-3440E 04	9-3440E 04	7400
7600	4-5012E 04	4-48842	34-4916	38-9800	8-91923	77-4597	1-1760E 04	8-91923	1-1760E 04	9-8700E 04	9-8700E 04	7600
7800	4-7406E 04	4-50027	34-6083	39-1086	8-94278	77-7153	1-2600E 04	8-94278	1-2600E 04	1-0440E 04	1-0440E 04	7800
8000	4-9876E 04	4-51220	34-7224	39-2346	8-96649	77-9657	1-3540E 04	8-96649	1-3540E 04	1-1300E 04	1-1300E 04	8000
8200	5-2424E 04	4-52419	34-8340	39-3582	8-99032	78-2112	1-4580E 04	8-99032	1-4580E 04	1-2180E 04	1-2180E 04	8200
8400	5-5053E 04	4-53622	34-9432	39-4794	9-01422	78-4521	1-5720E 04	9-01422	1-5720E 04	1-3080E 04	1-3080E 04	8400
8600	5-7763E 04	4-54825	35-0500	39-5983	9-03813	78-6884	1-6960E 04	9-03813	1-6960E 04	1-4000E 04	1-4000E 04	8600
8800	6-0566E 04	4-56027	35-1547	39-7150	9-06199	78-9203	1-8300E 04	9-06199	1-8300E 04	1-4940E 04	1-4940E 04	8800
9000	6-3459E 04	4-57221	35-2574	39-8296	9-08573	79-1479	1-9740E 04	9-08573	1-9740E 04	1-5900E 04	1-5900E 04	9000
9200	6-6432E 04	4-58406	35-3580	39-9420	9-10929	79-3714	2-1280E 04	9-10929	2-1280E 04	1-6880E 04	1-6880E 04	9200
9400	6-9482E 04	4-59574	35-4567	40-0525	9-13259	79-5909	2-2920E 04	9-13259	2-2920E 04	1-7880E 04	1-7880E 04	9400
9600	7-2594E 04	4-60734	35-5536	40-1609	9-15556	79-8064	2-4660E 04	9-15556	2-4660E 04	1-8900E 04	1-8900E 04	9600
9800	7-5826E 04	4-61870	35-6487	40-2674	9-17813	80-0180	2-6500E 04	9-17813	2-6500E 04	2-0040E 04	2-0040E 04	9800

TABLE 89 (CONT.). IDEAL GAS FUNCTIONS FOR NO

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^2 C_p}{RT^2}$	$\frac{W^2 C_p}{RT^2} - \frac{5}{2}$	$\ln \frac{W^2 C_p}{RT^2} - \frac{5}{2}$	$\ln \frac{W^2 C_p}{RT^2} - \frac{5}{2} - \frac{5}{2}$	$e^{\frac{5}{2} - \ln \frac{W^2 C_p}{RT^2}}$	$\frac{W^2 C_p}{RT^2} - \frac{5}{2} - \frac{5}{2}$	$\frac{W^2 C_p}{RT^2} - \frac{5}{2} - \frac{5}{2}$	TEMP. (°K)
10000	7.9457E 04	35.7421	40.3719	9.20024	71.0255	90.2237	7.2131E 04	9.2002E 04	7.1825E 05
10500	8.7874E 04	4.85641	40.8751	9.25366	71.8757	90.7287	7.8270E 04	9.7157E 04	7.5040E 05
11000	9.7205E 04	4.80088	41.1858	9.30167	71.9973	91.2009	8.0440E 04	1.0232E 05	7.9090E 05
11500	1.0715E 05	4.70285	41.0973	9.34535	72.3217	91.6671	8.4619E 04	1.0747E 05	8.3170E 05
12000	1.1777E 05	4.72207	41.3170	9.38393	72.7203	92.1030	8.8794E 04	1.1260E 05	8.7264E 05
12500	1.2894E 05	4.73034	41.5264	9.41837	73.1040	92.5199	9.2897E 04	1.1770E 05	9.1300E 05
13000	1.4083E 05	4.75159	41.7258	9.44217	73.5736	92.9140	9.6915E 04	1.2275E 05	9.5316E 05
13500	1.5335E 05	4.76180	41.9155	9.46237	73.0306	93.2931	1.0092E 05	1.2774E 05	9.9307E 05
14000	1.6652E 05	4.76902	42.0960	9.47842	74.1750	93.6518	1.0446E 05	1.3268E 05	1.0304E 06
14500	1.8033E 05	4.77335	42.2678	9.48944	74.5077	93.9931	1.0672E 05	1.3754E 05	1.0690E 06
15000	1.9479E 05	4.77695	42.4313	9.49661	74.8293	94.3180	1.1252E 05	1.4233E 05	1.1224E 06
15500	2.0987E 05	4.77997	42.5869	9.49847	75.1405	94.6271	1.1424E 05	1.4704E 05	1.1847E 06
16000	2.2557E 05	4.77961	42.7360	9.49789	75.4415	94.9213	1.1590E 05	1.5168E 05	1.2511E 06
16500	2.4188E 05	4.78506	42.8762	9.49496	75.7331	95.2021	1.1749E 05	1.5624E 05	1.3216E 06
17000	2.5877E 05	4.78751	43.0108	9.48996	76.0156	95.4695	1.1904E 05	1.6072E 05	1.3962E 06
17500	2.7633E 05	4.78816	43.1392	9.48338	76.2893	95.7247	1.2056E 05	1.6512E 05	1.4748E 06
18000	2.9456E 05	4.78720	43.2619	9.47540	76.5548	95.9685	1.2204E 05	1.6944E 05	1.5578E 06
18500	3.1280E 05	4.78481	43.3791	9.46608	76.8124	96.2014	1.2349E 05	1.7370E 05	1.6454E 06
19000	3.3104E 05	4.78115	43.4913	9.45564	77.0625	96.4253	1.2492E 05	1.7788E 05	1.7378E 06
19500	3.5141E 05	4.67640	43.5987	9.44322	77.3053	96.6378	1.2632E 05	1.8190E 05	1.8350E 06
20000	3.7143E 05	4.68048	43.7017	9.43012	77.5412	96.8424	1.2768E 05	1.8583E 05	1.9374E 06
20500	4.5178E 05	4.61075	44.0747	9.41623	77.8213	97.0384	1.2785E 05	1.8963E 05	2.0450E 06
21000	5.4509E 05	4.53427	44.3961	9.40135	78.1211	97.2224	1.2794E 05	1.9332E 05	2.1580E 06
21500	6.4043E 05	4.45573	44.6774	8.85428	78.4271	97.3944	1.2794E 05	1.9692E 05	2.2764E 06
22000	7.3820E 05	4.37791	44.9269	8.69963	80.5776	97.5572	1.2785E 05	2.0048E 05	2.3992E 06
23000	8.3815E 05	4.30244	45.1509	8.54965	81.1727	97.7223	1.2768E 05	2.0400E 05	2.5262E 06
24000	9.3936E 05	4.23022	45.3540	8.40615	81.7190	97.8800	1.2749E 05	2.0750E 05	2.6574E 06
25000	1.0411E 06	4.16169	45.5399	8.26953	82.2253	98.0355	1.2729E 05	2.1100E 05	2.7926E 06
26000	1.1427E 06	4.09700	45.7112	8.14162	82.6944	98.1898	1.2709E 05	2.1450E 05	2.9318E 06
27000	1.2437E 06	4.03612	45.8761	8.02043	83.1313	98.3431	1.2689E 05	2.1800E 05	3.0740E 06
28000	1.3437E 06	3.97691	46.0366	7.90676	83.5390	98.4965	1.2669E 05	2.2150E 05	3.2192E 06
29000	1.4437E 06	3.91891	46.1926	7.79976	83.9276	98.6498	1.2649E 05	2.2500E 05	3.3674E 06
30000	1.5437E 06	3.86216	46.3446	7.69876	84.3023	98.8031	1.2629E 05	2.2850E 05	3.5186E 06
31000	1.6437E 06	3.80716	46.4926	7.60376	84.6683	98.9564	1.2609E 05	2.3200E 05	3.6728E 06
32000	1.7437E 06	3.75316	46.6366	7.51476	85.0273	99.1097	1.2589E 05	2.3550E 05	3.8290E 06
33000	1.8437E 06	3.70016	46.7766	7.43176	85.3823	99.2630	1.2569E 05	2.3900E 05	3.9872E 06
34000	1.9437E 06	3.64816	46.9126	7.35476	85.7343	99.4163	1.2549E 05	2.4250E 05	4.1484E 06
35000	2.0437E 06	3.59816	47.0446	7.28376	86.0843	99.5696	1.2529E 05	2.4600E 05	4.3126E 06
36000	2.1437E 06	3.54916	47.1726	7.21876	86.4323	99.7229	1.2509E 05	2.4950E 05	4.4808E 06
37000	2.2437E 06	3.50116	47.2966	7.15976	86.7783	99.8762	1.2489E 05	2.5300E 05	4.6530E 06
38000	2.3437E 06	3.45416	47.4166	7.10676	87.1223	99.9995	1.2469E 05	2.5650E 05	4.8292E 06
39000	2.4437E 06	3.40816	47.5326	7.05976	87.4643	100.1228	1.2449E 05	2.6000E 05	5.0094E 06
40000	2.5437E 06	3.36316	47.6446	7.01876	87.8043	100.2461	1.2429E 05	2.6350E 05	5.1936E 06

TABLE 90. IDEAL GAS FUNCTIONS FOR NO₂ (MOLECULAR WEIGHT 30.0056, R = 1.98717 CAL/MOLE, 6 STATES INCLUDED)

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2} - \frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2}$	$\frac{h^2 \nu^2}{RT^2}$	TEMP. (°K)
1000	3.6284E 02	3.62244	24.5996	20.2221	7.19039	48.8835	54.0819	5.2112E 03	7.1904E 03	4.8804E 05
1200	4.49730E 02	3.68433	25.2656	28.9999	7.32137	50.2068	57.5282	6.4010E 03	8.7054E 03	6.8204E 05
1400	5.3734E 02	3.74424	25.8300	29.5823	7.44043	51.3445	58.7849	7.4344E 03	1.0417E 04	7.1602E 05
1600	6.2517E 02	3.79978	26.3417	30.1453	7.55080	52.4833	59.9961	8.3021E 03	1.2071E 04	8.3752E 05
1800	7.1271E 02	3.85027	26.7922	30.6425	7.65111	53.6245	60.9917	9.0192E 03	1.3701E 04	9.5033E 05
2000	8.0041E 02	3.89578	27.2003	31.0961	7.74156	54.7694	61.7930	1.1509E 04	1.5403E 04	1.0610E 05
2200	8.8820E 02	3.93473	27.5735	31.5103	7.82293	55.9192	62.5161	1.7210E 04	1.7209E 04	1.2094E 05
2400	9.7612E 02	3.97177	27.9177	31.8913	7.89623	57.0733	63.1733	1.4182E 04	1.8951E 04	1.3314E 05
2600	1.0637E 03	4.00693	28.2371	32.2440	7.96245	58.1117	64.0742	1.5534E 04	2.0702E 04	1.4509E 05
2800	1.1516E 03	4.03712	28.5351	32.5723	8.02263	59.1040	64.7265	1.6849E 04	2.2463E 04	1.5677E 05
3000	1.2430E 03	4.06460	28.8146	32.8792	8.07704	57.2594	65.3345	1.8270E 04	2.4231E 04	1.7177E 05
3200	1.3380E 03	4.08972	29.0778	33.1675	8.12676	65.9923	1.9647E 04	2.6004E 04	2.6004E 04	1.8699E 05
3400	1.4370E 03	4.11278	29.3264	33.4392	8.17278	59.2764	66.4492	2.1031E 04	2.7707E 04	1.9814E 05
3600	1.5395E 03	4.13403	29.5621	33.6961	8.21501	59.7439	66.9298	2.2428E 04	2.9374E 04	2.1140E 05
3800	1.6454E 03	4.15376	29.7861	33.9398	8.25409	59.1900	67.4441	2.3814E 04	3.1004E 04	2.2492E 05
4000	1.7548E 03	4.17198	29.9997	34.1714	8.29041	59.6143	67.9047	2.5213E 04	3.2604E 04	2.3864E 05
4200	1.8678E 03	4.18803	30.2036	34.3927	8.32429	60.0194	68.3139	2.6614E 04	3.4194E 04	2.5200E 05
4400	1.9845E 03	4.20201	30.3989	34.6059	8.35604	60.4076	68.6736	2.8022E 04	3.5762E 04	2.6507E 05
4600	2.1052E 03	4.22004	30.5861	34.8082	8.38591	60.7787	69.1686	2.9434E 04	3.7307E 04	2.7789E 05
4800	2.2291E 03	4.23925	30.7660	35.0003	8.41413	61.1372	69.5914	3.0850E 04	3.8830E 04	2.9044E 05
5000	2.3564E 03	4.24775	30.9392	35.1849	8.44099	61.4813	69.9222	3.2269E 04	4.0292E 04	3.0274E 05
5200	2.4878E 03	4.26065	31.1060	35.3467	8.46661	61.8128	70.2794	3.3693E 04	4.1692E 04	3.1482E 05
5400	2.6232E 03	4.27304	31.2671	35.5401	8.49123	62.1328	70.6490	3.5122E 04	4.3032E 04	3.2652E 05
5600	2.7626E 03	4.28500	31.4227	35.7077	8.51500	62.4420	70.9970	3.6550E 04	4.4312E 04	3.3782E 05
5800	2.9059E 03	4.29661	31.5732	35.8499	8.53806	62.7413	71.2793	3.7979E 04	4.5532E 04	3.4872E 05
6000	3.0531E 03	4.30789	31.7191	36.0271	8.56068	63.0311	71.5918	3.9441E 04	4.6702E 04	3.5912E 05
6200	3.2043E 03	4.31919	31.8605	36.1797	8.58294	63.3122	71.8951	4.0949E 04	4.7832E 04	3.6942E 05
6400	3.3595E 03	4.33030	31.9978	36.3281	8.60502	63.5850	72.1900	4.2494E 04	4.8922E 04	3.7972E 05
6600	3.5187E 03	4.34140	32.1313	36.4727	8.62708	63.8501	72.4772	4.4072E 04	5.0072E 04	3.8992E 05
6800	3.6820E 03	4.35256	32.2610	36.6136	8.64926	64.1080	72.7573	4.5682E 04	5.1192E 04	4.0002E 05
7000	3.8494E 03	4.36385	32.3874	36.7512	8.67170	64.3590	73.0307	4.7322E 04	5.2282E 04	4.1012E 05
7200	4.0218E 03	4.37535	32.5105	36.8858	8.69454	64.6037	73.2982	4.8992E 04	5.3342E 04	4.2022E 05
7400	4.1992E 03	4.38711	32.6305	37.0174	8.71791	64.8422	73.5601	5.0692E 04	5.4382E 04	4.3032E 05
7600	4.3816E 03	4.39921	32.7477	37.1469	8.74195	65.0750	73.8170	5.2422E 04	5.5402E 04	4.4042E 05
7800	4.5690E 03	4.41171	32.8621	37.2738	8.76660	65.3024	74.0692	5.4182E 04	5.6392E 04	4.5052E 05
8000	4.7614E 03	4.42467	32.9739	37.3986	8.79255	65.5247	74.3172	5.5992E 04	5.7352E 04	4.6062E 05
8200	4.9588E 03	4.43813	33.0834	37.5215	8.81930	65.7421	74.5614	5.7842E 04	5.8282E 04	4.7072E 05
8400	5.1612E 03	4.45216	33.1905	37.6426	8.84717	65.9550	74.8021	5.9722E 04	5.9192E 04	4.8082E 05
8600	5.3686E 03	4.46678	33.2954	37.7622	8.87624	66.1639	75.0397	6.1642E 04	6.0082E 04	4.9092E 05
8800	5.5810E 03	4.48206	33.3983	37.8803	8.90659	66.3679	75.2745	6.3592E 04	6.0952E 04	5.0002E 05
9000	5.7984E 03	4.49801	33.4992	37.9972	8.93829	66.5684	75.5067	6.5562E 04	6.1802E 04	5.0912E 05
9200	6.0218E 03	4.51468	33.5982	38.1129	8.97141	66.7652	75.7366	6.7542E 04	6.2632E 04	5.1822E 05
9400	6.2512E 03	4.53207	33.6955	38.2276	9.00597	66.9585	75.9644	6.9542E 04	6.3452E 04	5.2732E 05
9600	6.4866E 03	4.55021	33.7911	38.3413	9.04203	67.1485	76.1905	7.1562E 04	6.4272E 04	5.3642E 05
9800	6.7280E 03	4.56912	33.8851	38.4542	9.07959	67.3353	76.4149	7.3602E 04	6.5092E 04	5.4552E 05

TABLE 90 (CONT.). IDEAL GAS FUNCTIONS FOR NO.

TEMP. (°C)	PARTIT. FUNCT.	$\frac{h^3}{RT^3}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	$\frac{h^3}{RT^3} - \frac{5}{2}$	TEMP. (°C)
10000	1.3557E 04	4.58879	33.8776	38.5664	47.5192	76.6378	7.1315E 04	9.1107E 04	6.7519E 05	10000	
10500	1.5030E 04	4.64126	34.2028	38.8640	47.9665	77.1895	7.5976E 04	9.6041E 04	7.1345E 05	10500	
11000	1.6626E 04	4.69822	34.8202	39.1182	48.3361	77.7343	8.0877E 04	1.0077E 05	7.5238E 05	11000	
11500	1.8357E 04	4.75918	35.4302	39.3389	48.7128	78.2721	8.5904E 04	1.0574E 05	7.9136E 05	11500	
12000	2.0237E 04	4.82363	36.0340	39.5575	49.1046	78.8040	9.1117E 04	1.1102E 05	8.3065E 05	12000	
12500	2.2280E 04	4.89210	36.6323	39.7924	49.5150	79.3324	9.6420E 04	1.1657E 05	8.7019E 05	12500	
13000	2.4503E 04	4.96488	37.2254	40.0434	49.9472	79.8514	1.0222E 05	1.2240E 05	9.1099E 05	13000	
13500	2.6919E 04	5.04201	37.8138	40.3084	50.4011	80.3618	1.0840E 05	1.2843E 05	9.5304E 05	13500	
14000	2.9546E 04	5.09435	38.3979	40.5822	50.8768	80.8621	1.1501E 05	1.3467E 05	9.9634E 05	14000	
14500	3.2400E 04	5.16038	38.9778	40.8632	51.3744	81.3509	1.2206E 05	1.4113E 05	1.0309E 06	14500	
15000	3.5496E 04	5.22340	39.5538	41.1516	51.8956	81.8267	1.2956E 05	1.4783E 05	1.0671E 06	15000	
15500	3.8850E 04	5.28382	40.1261	41.4469	52.4403	82.2883	1.3752E 05	1.5473E 05	1.1057E 06	15500	
16000	4.2478E 04	5.33981	40.6957	41.7494	52.9987	82.7347	1.4585E 05	1.6183E 05	1.1468E 06	16000	
16500	4.6393E 04	5.39125	41.2618	42.0591	53.5700	83.1651	1.5433E 05	1.6913E 05	1.1901E 06	16500	
17000	5.0613E 04	5.43783	41.8215	42.3759	54.1543	83.5788	1.6317E 05	1.7663E 05	1.2357E 06	17000	
17500	5.5143E 04	5.47931	42.3797	42.6999	54.7514	83.9757	1.7237E 05	1.8433E 05	1.2836E 06	17500	
18000	6.0003E 04	5.51562	42.9346	43.0322	55.3614	84.3556	1.8193E 05	1.9233E 05	1.3338E 06	18000	
18500	6.5201E 04	5.54676	43.4862	43.3729	55.9844	84.7187	1.9185E 05	2.0061E 05	1.3864E 06	18500	
19000	7.0746E 04	5.57286	44.0345	43.7203	56.6304	85.0652	2.0214E 05	2.0923E 05	1.4416E 06	19000	
19500	7.6646E 04	5.59407	44.5795	44.0736	57.2994	85.3956	2.1300E 05	2.1817E 05	1.4994E 06	19500	
20000	8.2909E 04	5.61043	45.1213	44.4320	58.0029	85.7104	2.2432E 05	2.2739E 05	1.5600E 06	20000	
22000	1.1171E 05	5.63589	46.1936	45.1944	60.0644	87.4271	2.4826E 05	2.4433E 05	1.6638E 06	22000	
24000	1.4663E 05	5.60980	47.2573	46.1571	62.4759	89.1475	2.7495E 05	2.6754E 05	1.8304E 06	24000	
26000	1.8766E 05	5.54947	48.3142	47.3210	65.2410	90.8719	3.0464E 05	2.9733E 05	2.0719E 06	26000	
28000	2.3458E 05	5.46888	49.3666	48.6714	68.4757	92.6004	3.3846E 05	3.3427E 05	2.3824E 06	28000	
30000	2.8701E 05	5.37684	49.7768	45.1536	70.0648	93.3277	3.7609E 05	3.7504E 05	2.7313E 06	30000	
32000	3.4451E 05	5.27981	49.1207	45.4005	70.7265	94.0514	4.1745E 05	4.1913E 05	3.1122E 06	32000	
34000	4.0754E 05	5.18180	48.4039	45.6197	70.3709	94.7719	4.6246E 05	4.6654E 05	3.5291E 06	34000	
36000	4.7268E 05	5.08529	47.7313	45.8166	70.0031	95.4891	5.1100E 05	5.1733E 05	3.9768E 06	36000	
38000	5.4213E 05	4.99177	47.1003	45.9955	69.6282	96.2034	5.6317E 05	5.7194E 05	4.4583E 06	38000	
40000	6.1463E 05	4.90206	46.5135	46.1575	69.2464	96.9154	6.1900E 05	6.2946E 05	4.9764E 06	40000	

TABLE 91. IDEAL GAS FUNCTIONS FOR O₂ (MOLECULAR WEIGHT 31.9994, R = 1.98717 CAL/MOLE, 1 STATES INCLUDED)

TEMP. (°K)	PARTIT. FUNCT.	$\frac{H^0 - E_0^0}{RT}$	$\frac{S^0}{R}$	$\ln \frac{P^0 - E_0^0}{P} - \frac{E^0 - E_0^0}{RT}$	$\ln \frac{P^0 - E_0^0}{P} - \frac{S^0}{R}$	$E^0 - E_0^0$	$\frac{H^0 - E_0^0}{CAL/MOLE}$	$-\ln \frac{P^0 - E_0^0}{P} - \frac{E^0 - E_0^0}{RT}$	TEMP. (°K)
1000	1.4789E 03	3.90526	30.0073	7.76040	51.8691	59.6295	7.7604E 03	5.1869E 04	1000
1200	1.9246E 03	3.98363	30.8249	7.91613	53.2963	61.2144	7.9161E 03	6.3950E 04	1200
1400	2.4312E 03	4.04760	31.4879	8.04326	54.9284	62.5717	8.0432E 03	7.6340E 04	1400
1600	2.9999E 03	4.10065	32.0850	8.14866	56.6096	63.7982	8.1486E 03	8.8975E 04	1600
1800	3.6320E 03	4.14536	32.6194	8.23755	58.2746	64.9122	8.2375E 04	1.0163E 05	1800
2000	4.3282E 03	4.18346	33.0924	8.31362	59.9465	65.9602	8.3136E 04	1.1249E 05	2000
2200	5.0897E 03	4.21679	33.5259	8.37845	61.6231	66.9625	8.3784E 04	1.2243E 05	2200
2400	5.9172E 03	4.24569	33.9230	8.43689	63.3037	67.9186	8.4368E 04	1.3154E 05	2400
2600	6.8116E 03	4.27102	34.2892	8.48911	65.0011	68.8303	8.4891E 04	1.4000E 05	2600
2800	7.7733E 03	4.29327	34.6268	8.53544	66.7017	69.7019	8.5354E 04	1.4799E 05	2800
3000	8.8031E 03	4.31281	34.9432	8.57627	68.5116	70.5419	8.5762E 04	1.5550E 05	3000
3200	9.9012E 03	4.32994	35.2412	8.61231	70.4359	71.3582	8.6123E 04	1.6261E 05	3200
3400	1.1048E 04	4.34493	35.5192	8.64409	72.4084	72.1572	8.6440E 04	1.6934E 05	3400
3600	1.2204E 04	4.35800	35.7810	8.67204	74.4627	72.9427	8.6720E 04	1.7579E 05	3600
3800	1.3368E 04	4.36934	36.0283	8.69661	76.5915	73.7037	8.6966E 04	1.8196E 05	3800
4000	1.4541E 04	4.37914	36.2624	8.71808	78.8055	74.4389	8.7180E 04	1.8786E 05	4000
4200	1.5723E 04	4.38754	36.4837	8.73677	81.1052	75.1585	8.7367E 04	1.9350E 05	4200
4400	1.6914E 04	4.39467	36.6931	8.75294	83.4915	75.8636	8.7529E 04	1.9889E 05	4400
4600	1.8112E 04	4.40063	36.8916	8.76679	85.9585	76.5548	8.7667E 04	2.0404E 05	4600
4800	1.9318E 04	4.40551	37.0890	8.77849	88.5005	77.2333	8.7784E 04	2.0896E 05	4800
5000	2.0522E 04	4.40936	37.2736	8.78836	91.1224	77.8999	8.7883E 04	2.1366E 05	5000
5200	2.1734E 04	4.41230	37.4466	8.79677	93.8305	78.5569	8.7967E 04	2.1816E 05	5200
5400	2.2958E 04	4.41431	37.6101	8.80396	96.6196	79.2066	8.8039E 04	2.2246E 05	5400
5600	2.4194E 04	4.41545	37.7798	8.80998	99.4853	79.8445	8.8099E 04	2.2656E 05	5600
5800	2.5442E 04	4.41576	37.9351	8.81494	102.4233	80.4699	8.8149E 04	2.3046E 05	5800
6000	2.6702E 04	4.41526	38.0850	8.81896	105.4299	81.0899	8.8189E 04	2.3416E 05	6000
6200	2.7974E 04	4.41399	38.2278	8.82133	108.4999	81.7000	8.8213E 04	2.3766E 05	6200
6400	2.9258E 04	4.41197	38.3659	8.82322	111.6279	82.2969	8.8232E 04	2.4096E 05	6400
6600	3.0554E 04	4.40923	38.4996	8.82477	114.8177	82.8769	8.8247E 04	2.4406E 05	6600
6800	3.1862E 04	4.40579	38.6270	8.82594	118.0632	83.4369	8.8259E 04	2.4696E 05	6800
7000	3.3184E 04	4.40168	38.7495	8.82677	121.3607	83.9824	8.8267E 04	2.4966E 05	7000
7200	3.4520E 04	4.39694	38.8672	8.82729	124.7154	84.5100	8.8272E 04	2.5216E 05	7200
7400	3.5872E 04	4.39158	38.9808	8.82754	128.1224	85.0244	8.8275E 04	2.5446E 05	7400
7600	3.7240E 04	4.38564	39.0903	8.82749	131.5869	85.5211	8.8274E 04	2.5656E 05	7600
7800	3.8624E 04	4.37915	39.2032	8.82716	135.1053	86.0055	8.8271E 04	2.5846E 05	7800
8000	4.0024E 04	4.37214	39.3200	8.82657	138.6737	86.4737	8.8265E 04	2.6016E 05	8000
8200	4.1440E 04	4.36465	39.4427	8.82576	142.2882	86.9211	8.8257E 04	2.6166E 05	8200
8400	4.2872E 04	4.35676	39.5705	8.82476	145.9453	87.3524	8.8247E 04	2.6296E 05	8400
8600	4.4320E 04	4.34832	39.7035	8.82354	149.6419	87.7724	8.8235E 04	2.6406E 05	8600
8800	4.5784E 04	4.33935	39.8416	8.82216	153.3743	88.1769	8.8221E 04	2.6496E 05	8800
9000	4.7264E 04	4.33002	39.9847	8.82067	157.1387	88.5611	8.8206E 04	2.6566E 05	9000
9200	4.8760E 04	4.32045	40.1328	8.81902	160.9313	88.9211	8.8190E 04	2.6616E 05	9200
9400	5.0272E 04	4.31118	40.2859	8.81724	164.7499	89.2611	8.8172E 04	2.6646E 05	9400
9600	5.1800E 04	4.30181	40.4430	8.81536	168.5907	89.5869	8.8153E 04	2.6666E 05	9600
9800	5.3344E 04	4.29245	40.6041	8.81341	172.4507	89.9033	8.8134E 04	2.6666E 05	9800
10000	5.4904E 04	4.28318	40.7692	8.81140	176.3369	90.2069	8.8114E 04	2.6646E 05	10000

TABLE 91 (CONTY.). IDEAL GAS FUNCTIONS FOR O₂

TEMP. (°K)	PARTIT. FUNC.	$\frac{W}{RT} \ln \frac{W}{RT}$	$\frac{W}{RT} \ln \frac{W}{RT} - \frac{f^0}{RT}$	$\ln \frac{W}{RT} - \frac{f^0}{RT} - \frac{f^0 - f^0}{RT}$	$\ln \frac{W}{RT} - \frac{f^0}{RT} - \frac{f^0 - f^0}{RT} - \frac{f^0 - f^0}{RT}$	$\ln \frac{W}{RT} - \frac{f^0}{RT} - \frac{f^0 - f^0}{RT} - \frac{f^0 - f^0}{RT} - \frac{f^0 - f^0}{RT}$	$\ln \frac{W}{RT} - \frac{f^0}{RT} - \frac{f^0 - f^0}{RT} - \frac{f^0 - f^0}{RT} - \frac{f^0 - f^0}{RT} - \frac{f^0 - f^0}{RT}$	TEMP. (°K)			
1800	8.4267E 04	4.20030	39.9012	40.1819	0.50966	71.3416	79.0473	6.5185E 04	0.5037E 04	1.1342E 05	18000
1850	9.11853E 04	4.25314	36.1094	40.3425	0.45169	71.7953	80.2039	0.7870E 04	0.8742E 04	7.5343E 05	18500
1900	9.9594E 04	4.28507	34.3066	40.5317	0.39591	72.1472	90.5431	7.0490E 04	9.2358E 04	7.9362E 05	19000
1950	1.0744E 05	4.19638	34.4430	40.6902	0.33690	72.5192	98.0301	7.3064E 04	9.5897E 04	8.3397E 05	19500
2000	1.1544E 05	4.16733	34.6710	40.8391	0.28117	72.8129	101.1560	7.5322E 04	9.9374E 04	8.7447E 05	20000
2200	1.2350E 05	4.13013	34.9013	40.9794	0.22315	73.2097	11.4339	7.7950E 04	1.0279E 05	9.1512E 05	22000
2300	1.3162E 05	4.10097	37.0030	41.1120	0.16519	73.5311	81.6943	8.0314E 04	1.0619E 05	9.5590E 05	23000
2350	1.3970E 05	4.07990	37.1375	41.2375	0.15759	73.8362	81.9458	8.2624E 04	1.0949E 05	9.9682E 05	23500
2400	1.4787E 05	4.05128	37.3054	41.3567	0.15037	74.1320	82.1828	8.4888E 04	1.1271E 05	1.0378E 06	24000
2450	1.5617E 05	4.02298	37.4471	41.4701	0.14432	74.4135	82.4078	8.7104E 04	1.1592E 05	1.0790E 06	24500
2500	1.6437E 05	3.99514	37.5630	41.5791	0.13899	74.6836	82.6236	8.9277E 04	1.1908E 05	1.1203E 06	25000
2550	1.7259E 05	3.96781	37.7135	41.6813	0.13449	74.9430	82.8277	9.1412E 04	1.2221E 05	1.1614E 06	25500
2600	1.8079E 05	3.94104	37.8391	41.7791	0.13050	75.1925	83.0240	9.3509E 04	1.2530E 05	1.2031E 06	26000
2650	1.8902E 05	3.91406	37.9480	41.8740	0.12700	75.4327	83.2122	9.5573E 04	1.2836E 05	1.2444E 06	26500
2700	1.9699E 05	3.88930	38.0764	41.9657	0.12380	75.6642	83.3929	9.7604E 04	1.3139E 05	1.2863E 06	27000
2750	2.0491E 05	3.86435	38.1888	42.0532	0.12091	75.8875	83.5664	9.9609E 04	1.3438E 05	1.3280E 06	27500
2800	2.1286E 05	3.84004	38.2973	42.1374	0.11820	76.1032	83.7339	1.0159E 05	1.3735E 05	1.3699E 06	28000
2850	2.2079E 05	3.81635	38.4022	42.2186	0.11560	76.3116	83.8953	1.0354E 05	1.4030E 05	1.4119E 06	28500
2900	2.2857E 05	3.79329	38.5037	42.2970	0.11310	76.5132	84.0511	1.0544E 05	1.4322E 05	1.4530E 06	29000
2950	2.3631E 05	3.77064	38.6019	42.3728	0.11070	76.7084	84.2017	1.0737E 05	1.4612E 05	1.4958E 06	29500
3000	2.4397E 05	3.74901	38.6971	42.4461	0.10840	76.8976	84.3475	1.0925E 05	1.4900E 05	1.5380E 06	30000
3050	2.5156E 05	3.72794	38.7894	42.5171	0.10620	77.0800	84.4879	1.1107E 05	1.5184E 05	1.5804E 06	30500
3100	2.5909E 05	3.70743	38.8790	42.5862	0.10410	77.2557	84.6227	1.1284E 05	1.5464E 05	1.6230E 06	31000
3150	2.6656E 05	3.68746	38.9660	42.6536	0.10210	77.4247	84.7522	1.1456E 05	1.5740E 05	1.6658E 06	31500
3200	2.7400E 05	3.66804	39.0507	42.7195	0.10020	77.5870	84.8764	1.1623E 05	1.6013E 05	1.7089E 06	32000
3250	2.8140E 05	3.64916	39.1332	42.7840	0.09840	77.7427	84.9954	1.1785E 05	1.6283E 05	1.7522E 06	32500
3300	2.8877E 05	3.63081	39.2137	42.8472	0.09670	77.8919	85.1094	1.1942E 05	1.6550E 05	1.7958E 06	33000
3350	2.9611E 05	3.61299	39.2923	42.9092	0.09510	78.0346	85.2184	1.2094E 05	1.6814E 05	1.8396E 06	33500
3400	3.0342E 05	3.59570	39.3690	42.9701	0.09360	78.1710	85.3225	1.2241E 05	1.7076E 05	1.8836E 06	34000
3450	3.1070E 05	3.57893	39.4438	43.0299	0.09220	78.3013	85.4217	1.2383E 05	1.7336E 05	1.9278E 06	34500
3500	3.1796E 05	3.56268	39.5168	43.0886	0.09090	78.4256	85.5160	1.2520E 05	1.7594E 05	1.9722E 06	35000
3550	3.2519E 05	3.54694	39.5880	43.1462	0.08970	78.5439	85.6054	1.2652E 05	1.7850E 05	2.0168E 06	35500
3600	3.3239E 05	3.53170	39.6574	43.2027	0.08860	78.6563	85.6900	1.2779E 05	1.8104E 05	2.0616E 06	36000
3650	3.3956E 05	3.51696	39.7250	43.2581	0.08760	78.7628	85.7708	1.2901E 05	1.8356E 05	2.1066E 06	36500
3700	3.4670E 05	3.50271	39.7908	43.3124	0.08670	78.8635	85.8478	1.3018E 05	1.8606E 05	2.1518E 06	37000
3750	3.5381E 05	3.48895	39.8549	43.3656	0.08590	78.9584	85.9210	1.3130E 05	1.8854E 05	2.1972E 06	37500
3800	3.6089E 05	3.47568	39.9173	43.4177	0.08520	79.0476	85.9904	1.3237E 05	1.9100E 05	2.2428E 06	38000
3850	3.6794E 05	3.46290	39.9781	43.4687	0.08460	79.1311	86.0561	1.3339E 05	1.9344E 05	2.2886E 06	38500
3900	3.7496E 05	3.45061	40.0373	43.5186	0.08410	79.2090	86.1184	1.3436E 05	1.9586E 05	2.3346E 06	39000
3950	3.8195E 05	3.43881	40.0949	43.5674	0.08370	79.2814	86.1774	1.3528E 05	1.9826E 05	2.3808E 06	39500
4000	3.8891E 05	3.42750	40.1509	43.6151	0.08340	79.3484	86.2332	1.3615E 05	2.0064E 05	2.4272E 06	40000

TABLE 92. IDEAL GAS FUNCTIONS FOR O₂ (MOLECULAR WEIGHT 31.9988, R = 1.98717 CAL/MOLE, 7 STATES INCLUDED)

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^0 - E^0}{RT}$	$\frac{S^0}{R}$	$(W^0 - E^0)_{VT} - (W^0 - E^0)_{VT} - \frac{S^0}{R}$	$(W^0 - E^0)_{VT} - (W^0 - E^0)_{VT} - \frac{S^0}{R}$	$(W^0 - E^0)_{VT} - (W^0 - E^0)_{VT} - \frac{S^0}{R}$	$(W^0 - E^0)_{VT} - (W^0 - E^0)_{VT} - \frac{S^0}{R}$	$(W^0 - E^0)_{VT} - (W^0 - E^0)_{VT} - \frac{S^0}{R}$	$(W^0 - E^0)_{VT} - (W^0 - E^0)_{VT} - \frac{S^0}{R}$	TEMP. (°K)	
1000	6.1641E 02	3.77504	29.2829	7.50164	50.6884	58.1900	5.5145E 03	7.5014E 03	7.5014E 03	5.0688E 04	1000
1200	1.0374E 03	3.65341	30.0587	7.55137	52.0702	59.7276	6.1024E 03	9.1888E 03	9.1888E 03	6.2484E 04	1200
1400	1.2848E 03	3.52139	30.7825	7.59246	53.2610	61.0535	6.8027E 03	1.0909E 04	1.0909E 04	7.4545E 04	1400
1600	1.5595E 03	3.39088	31.4510	7.61067	54.3034	62.2201	7.4774E 03	1.2457E 04	1.2457E 04	8.6895E 04	1600
1800	1.8624E 03	3.26389	31.8360	7.61661	55.2473	63.2634	8.0852E 04	1.4422E 04	1.4422E 04	9.9443E 04	1800
2000	2.1947E 03	3.14208	32.2296	7.61177	56.0969	64.2087	1.2249E 04	1.6224E 04	1.6224E 04	1.1219E 05	2000
2200	2.5573E 03	3.02665	32.6208	7.60034	56.8783	65.0746	1.3609E 04	1.8041E 04	1.8041E 04	1.2512E 05	2200
2400	2.9514E 03	2.91843	33.0151	7.58336	57.5914	65.8748	1.5111E 04	1.9880E 04	1.9880E 04	1.3822E 05	2400
2600	3.3784E 03	2.81798	33.5249	7.56193	58.2576	66.6193	1.6574E 04	2.1741E 04	2.1741E 04	1.5147E 05	2600
2800	3.8396E 03	2.72454	33.8758	7.53678	58.8800	67.3168	1.8035E 04	2.3623E 04	2.3623E 04	1.6486E 05	2800
3000	4.3344E 03	2.63813	34.2059	7.50831	59.4645	67.9728	1.9503E 04	2.5525E 04	2.5525E 04	1.7839E 05	3000
3200	4.8702E 03	2.55812	34.5179	7.47685	60.0159	68.5927	2.1087E 04	2.7446E 04	2.7446E 04	1.9205E 05	3200
3400	5.4452E 03	2.48320	34.8136	7.44259	60.5378	69.1804	2.2682E 04	2.9380E 04	2.9380E 04	2.0583E 05	3400
3600	6.0547E 03	2.41309	35.0949	7.40567	61.0336	69.7393	2.4187E 04	3.1320E 04	3.1320E 04	2.1972E 05	3600
3800	6.7043E 03	2.34741	35.3630	7.36621	61.5059	70.2721	2.5760E 04	3.3312E 04	3.3312E 04	2.3372E 05	3800
4000	7.3949E 03	2.28565	35.6193	7.32430	61.9571	70.7814	2.7349E 04	3.5292E 04	3.5292E 04	2.4783E 05	4000
4200	8.1289E 03	2.22839	35.8647	7.28003	62.3890	71.2690	2.8950E 04	3.7296E 04	3.7296E 04	2.6203E 05	4200
4400	8.9072E 03	2.17518	36.1001	7.23346	62.8033	71.7348	3.0564E 04	3.9307E 04	3.9307E 04	2.7633E 05	4400
4600	9.7309E 03	2.12537	31.8049	7.18468	63.2016	72.1863	3.2190E 04	4.1350E 04	4.1350E 04	2.9073E 05	4600
4800	1.0609E 04	2.07854	31.9978	7.13374	63.5850	72.6187	3.3824E 04	4.3342E 04	4.3342E 04	3.0521E 05	4800
5000	1.1583E 04	2.03465	32.1839	7.08065	63.9547	73.0354	3.5467E 04	4.5403E 04	4.5403E 04	3.1977E 05	5000
5200	1.2568E 04	2.00018	32.3636	7.02543	64.3117	73.4372	3.7119E 04	4.7452E 04	4.7452E 04	3.3442E 05	5200
5400	1.3607E 04	1.96463	32.5373	6.96808	64.6570	73.8250	3.8777E 04	4.9500E 04	4.9500E 04	3.4915E 05	5400
5600	1.4699E 04	1.92754	32.7054	6.90861	64.9911	74.1997	4.0440E 04	5.1548E 04	5.1548E 04	3.6385E 05	5600
5800	1.5848E 04	1.88936	32.8684	6.84749	65.3149	74.5619	4.2107E 04	5.3603E 04	5.3603E 04	3.7853E 05	5800
6000	1.7053E 04	1.85057	33.0265	6.78318	65.6290	74.9122	4.3776E 04	5.5699E 04	5.5699E 04	3.9377E 05	6000
6200	1.8317E 04	1.81166	33.1799	6.71666	65.9340	75.2512	4.5446E 04	5.7764E 04	5.7764E 04	4.0879E 05	6200
6400	1.9640E 04	1.77203	33.3290	6.64888	66.2303	75.5792	4.7115E 04	5.9833E 04	5.9833E 04	4.2387E 05	6400
6600	2.1023E 04	1.73195	33.4740	6.57933	66.5185	75.9068	4.8782E 04	6.1897E 04	6.1897E 04	4.3902E 05	6600
6800	2.2468E 04	1.69151	33.6151	6.50847	66.7988	76.2243	5.0444E 04	6.3957E 04	6.3957E 04	4.5423E 05	6800
7000	2.3975E 04	1.65157	33.7525	6.43628	67.0718	76.5021	5.2102E 04	6.6012E 04	6.6012E 04	4.6950E 05	7000
7200	2.5545E 04	1.61166	33.8864	6.36274	67.3378	76.7904	5.3752E 04	6.8047E 04	6.8047E 04	4.8483E 05	7200
7400	2.7176E 04	1.57168	34.0168	6.28787	67.5971	77.0700	5.5394E 04	7.0099E 04	7.0099E 04	5.0022E 05	7400
7600	2.8875E 04	1.53141	34.1441	6.21166	67.8500	77.3406	5.7027E 04	7.2129E 04	7.2129E 04	5.1564E 05	7600
7800	3.0637E 04	1.49176	34.2683	6.13433	68.0967	77.6028	5.8648E 04	7.4148E 04	7.4148E 04	5.3115E 05	7800
8000	3.2464E 04	1.45260	34.3895	6.05632	68.3375	77.8549	6.0257E 04	7.6155E 04	7.6155E 04	5.4670E 05	8000
8200	3.4355E 04	1.41390	34.5078	5.97765	68.5727	78.1030	6.1853E 04	7.8148E 04	7.8148E 04	5.6230E 05	8200
8400	3.6311E 04	1.37564	34.6234	5.89839	68.8025	78.3415	6.3435E 04	8.0128E 04	8.0128E 04	5.7794E 05	8400
8600	3.8332E 04	1.33784	34.7364	5.81858	69.0270	78.5726	6.5002E 04	8.2092E 04	8.2092E 04	5.9363E 05	8600
8800	4.0418E 04	1.30059	34.8469	5.73828	69.2465	78.7966	6.6554E 04	8.4041E 04	8.4041E 04	6.0937E 05	8800
9000	4.2569E 04	1.26389	34.9549	5.65759	69.4612	79.0138	6.8090E 04	8.5973E 04	8.5973E 04	6.2515E 05	9000
9200	4.4783E 04	1.22764	35.0606	5.57642	69.6712	79.2243	6.9610E 04	8.7880E 04	8.7880E 04	6.4097E 05	9200
9400	4.7061E 04	1.19184	35.1640	5.49486	69.8766	79.4285	7.1116E 04	8.9770E 04	8.9770E 04	6.5684E 05	9400
9600	4.9402E 04	1.15651	35.2651	5.41297	70.0777	79.6265	7.2592E 04	9.1648E 04	9.1648E 04	6.7275E 05	9600
9800	5.1806E 04	1.12163	35.3642	5.33072	70.2745	79.8185	7.4057E 04	9.3531E 04	9.3531E 04	6.8869E 05	9800

TABLE 92 (CONT.) IDEAL GAS FUNCTIONS FOR O₂

TEMP. (°K)	PARTI- FUNCT.	$\frac{h^0 - E^0}{RT}$	$\frac{h^0 - E^0}{RT} - \frac{F^0 - E^0}{RT}$	$\frac{h^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$\ln \frac{h^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R}$	$\ln \frac{h^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R} - \frac{5}{2}$	$\ln \frac{h^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R} - \frac{5}{2} - \frac{5}{2}$	$\ln \frac{h^0 - E^0}{RT} - \frac{F^0 - E^0}{RT} - \frac{S^0}{R} - \frac{5}{2} - \frac{5}{2} - \frac{5}{2}$	TEMP. (°K)
10000	5.4271E 04	4.79963	35.4612	40.2408	9.33765	70.6673	90.0049	1.0000E 04	10000
10500	6.0700E 04	4.78835	35.6551	40.4835	9.31523	70.3221	89.4473	9.9910E 04	10500
11000	6.7495E 04	4.77295	35.9175	40.8905	9.28448	71.3761	88.7872	1.0433E 05	11000
11500	7.4640E 04	4.75406	36.1293	41.4833	9.24710	71.7449	88.2392	1.0884E 05	11500
12000	8.2118E 04	4.73227	36.3312	42.2464	9.20380	72.1960	87.7000E 04	1.1283E 05	12000
12500	8.9909E 04	4.70811	36.5239	43.1830	9.15579	72.7389	87.1737	1.1692E 05	12500
13000	9.7994E 04	4.68205	36.7080	44.3901	9.10401	73.3649	86.6589	1.2045E 05	13000
13500	1.0635E 05	4.65452	36.8842	45.7887	9.04930	74.0750	86.1543	1.2364E 05	13500
14000	1.1496E 05	4.62587	37.0530	47.3888	9.19237	73.8304	85.6597	1.2649E 05	14000
14500	1.2380E 05	4.59641	37.2146	49.1812	9.13383	73.9519	85.1857	1.2904E 05	14500
15000	1.3285E 05	4.56640	37.3701	51.1745	9.07420	74.2605	84.7347	1.3131E 05	15000
15500	1.4209E 05	4.53607	37.5193	53.3710	9.01392	74.7571	84.3010	1.3332E 05	15500
16000	1.5151E 05	4.50559	37.6629	55.7685	8.95354	75.4423	83.8897	1.3508E 05	16000
16500	1.6109E 05	4.47512	37.8010	58.3720	8.89281	75.1149	83.5067	1.3673E 05	16500
17000	1.7079E 05	4.44479	37.9342	61.1890	8.83254	75.5815	83.1440	1.3815E 05	17000
17500	1.8061E 05	4.41470	38.0626	64.2373	8.77274	75.6367	82.8004	1.3932E 05	17500
18000	1.9054E 05	4.38493	38.1865	67.5215	8.71349	75.9830	82.4845	1.4036E 05	18000
18500	2.0058E 05	4.35556	38.3065	71.0568	8.65521	76.1209	82.1948	1.4128E 05	18500
19000	2.1065E 05	4.32662	38.4220	74.8487	8.59771	76.2510	81.9287	1.4208E 05	19000
19500	2.2081E 05	4.29817	38.5341	78.8922	8.54117	76.3735	81.6847	1.4278E 05	19500
20000	2.3101E 05	4.27023	38.6425	83.1928	8.48565	76.7891	81.4617	1.4338E 05	20000
22000	2.7209E 05	4.16399	39.0445	98.8285	8.27454	77.5878	80.8624	1.4582E 05	22000
24000	3.1315E 05	4.06683	39.4026	134.466	8.06166	78.2994	80.3608	1.4626E 05	24000
26000	3.5374E 05	3.97847	39.7245	181.7030	7.85057	78.9392	86.8451	1.5389E 05	26000
28000	3.9352E 05	3.89825	40.0164	249.9146	7.74646	79.5192	87.2654	1.6126E 05	28000
30000	4.3228E 05	3.82540	40.2828	349.1082	7.60171	80.0406	87.6503	1.6844E 05	30000
32000	4.6988E 05	3.75914	40.5276	489.2867	7.43004	80.5350	88.0050	1.7545E 05	32000
34000	5.0422E 05	3.69875	40.7536	674.4524	7.24002	80.9842	88.3342	1.8234E 05	34000
36000	5.4127E 05	3.64355	40.9634	910.6070	7.04034	81.4011	88.6415	1.8911E 05	36000
38000	5.7500E 05	3.59297	41.1591	1214.7520	7.13982	81.7899	88.9297	1.9580E 05	38000
40000	6.0743E 05	3.54648	41.3422	1604.8887	7.04744	82.1537	89.2012	2.0241E 05	40000

TABLE 93. IDEAL GAS FUNCTIONS FOR O₂. MOLECULAR WEIGHT 31.9983, R = 1.98717 CAL/MOLE, 4 STATES INCLUDED

TEMP. (°K)	PARTIT. FUNCT.	$\frac{H^0 - E_0^0}{RT}$	$\frac{S^0 - E_0^0}{RT}$	$\frac{S^0}{R}$	$\ln \frac{H^0 - E_0^0}{RT} - \frac{S^0 - E_0^0}{RT} - \frac{S^0}{R}$	$\frac{S^0 - E_0^0}{RT} - \frac{S^0}{R}$	$\frac{H^0 - E_0^0}{RT} - \frac{S^0 - E_0^0}{RT}$	$\frac{H^0 - E_0^0}{RT} - \frac{S^0 - E_0^0}{RT} - \frac{S^0}{R}$	TEMP. (°K)	
1000	9.0389E 02	3.70707	25.6097	29.3167	7.36656	50.8906	58.2572	5.3794E 03	5.3794E 03	1000
1200	1.1339E 03	3.78118	26.2922	30.0734	7.51382	52.2470	59.7608	6.6320E 03	9.0168E 03	1200
1400	1.3886E 03	3.84745	26.8802	30.7276	7.64522	53.4153	61.0808	7.9217E 03	1.0704E 04	1400
1600	1.6488E 03	3.90371	27.3978	31.3035	7.76129	54.4440	62.2053	9.2306E 03	1.2410E 04	1600
1800	1.9752E 03	3.95677	27.8660	31.8176	7.86275	55.3641	63.2268	1.0576E 04	1.4153E 04	1800
2000	2.3683E 03	4.00163	28.2801	32.2817	7.95190	56.1972	64.1491	1.1929E 04	1.5904E 04	2000
2200	2.8268E 03	4.04127	28.6634	32.7047	8.03068	56.9589	64.9896	1.3296E 04	1.7667E 04	2200
2400	3.3562E 03	4.07654	29.0166	33.0931	8.10076	57.6607	65.7615	1.4675E 04	1.9442E 04	2400
2600	3.9471E 03	4.10813	29.3441	33.4523	8.16355	58.3116	66.4752	1.6059E 04	2.1222E 04	2600
2800	4.5915E 03	4.13664	29.6496	33.7863	8.22018	58.9187	67.1369	1.7452E 04	2.3017E 04	2800
3000	5.2872E 03	4.16255	29.9359	34.0985	8.27167	59.4877	67.7593	1.8854E 04	2.4815E 04	3000
3200	6.0379E 03	4.18624	30.2053	34.3916	8.31874	60.0230	68.3418	2.0262E 04	2.6620E 04	3200
3400	6.8471E 03	4.20807	30.4598	34.6659	8.36212	60.5287	68.8908	2.1675E 04	2.8431E 04	3400
3600	7.7166E 03	4.22831	30.7009	34.9232	8.40236	61.0078	69.4101	2.3095E 04	3.0248E 04	3600
3800	8.6564E 03	4.24724	30.9300	35.1773	8.43996	61.4631	69.9031	2.4521E 04	3.2072E 04	3800
4000	9.6692E 03	4.26505	31.1483	35.4194	8.47537	61.8969	70.3723	2.5953E 04	3.3901E 04	4000
4200	1.0755E 04	4.28198	31.3569	35.6388	8.50900	62.3112	70.8202	2.7392E 04	3.5738E 04	4200
4400	1.1939E 04	4.29820	31.5964	35.8566	8.54123	62.7078	71.2491	2.8838E 04	3.7581E 04	4400
4600	1.3225E 04	4.31388	31.7478	36.0617	8.57240	63.0882	71.6606	3.0292E 04	3.9433E 04	4600
4800	1.4613E 04	4.32920	31.9318	36.2632	8.60284	63.4537	72.0565	3.1759E 04	4.1294E 04	4800
5000	1.6104E 04	4.34430	32.1088	36.4531	8.63285	63.8055	72.4383	3.3228E 04	4.3164E 04	5000
5200	1.7705E 04	4.35933	32.2795	36.6388	8.66271	64.1446	72.8074	3.4713E 04	4.5046E 04	5200
5400	1.9429E 04	4.37442	32.4443	36.8187	8.69270	64.4721	73.1648	3.6210E 04	4.6941E 04	5400
5600	2.1277E 04	4.38968	32.6036	36.9933	8.72303	64.7888	73.5118	3.7721E 04	4.8849E 04	5600
5800	2.3249E 04	4.40522	32.7579	37.1632	8.75390	65.0955	73.8494	3.9247E 04	5.0773E 04	5800
6000	2.5346E 04	4.42111	32.9076	37.3287	8.78547	65.3928	74.1782	4.0790E 04	5.2713E 04	6000
6200	2.7571E 04	4.43741	33.0528	37.4902	8.81786	65.6814	74.4992	4.2350E 04	5.4671E 04	6200
6400	2.9931E 04	4.45417	33.1939	37.6481	8.85118	65.9618	74.8130	4.3930E 04	5.6649E 04	6400
6600	3.2426E 04	4.47142	33.3313	37.8037	8.88545	66.2347	75.1202	4.5529E 04	5.8644E 04	6600
6800	3.5046E 04	4.48916	33.4650	37.9562	8.92070	66.5005	75.4212	4.7144E 04	6.0661E 04	6800
7000	3.7794E 04	4.50737	33.5954	38.1078	8.95690	66.7596	75.7165	4.8798E 04	6.2699E 04	7000
7200	4.0671E 04	4.52605	33.7226	38.2587	8.99401	67.0125	76.0065	5.0490E 04	6.4757E 04	7200
7400	4.3683E 04	4.54513	33.8469	38.4090	9.03193	67.2594	76.2913	5.2213E 04	6.6834E 04	7400
7600	4.6831E 04	4.56458	33.9684	38.5590	9.07057	67.5008	76.5714	5.3934E 04	6.8934E 04	7600
7800	5.0123E 04	4.58431	34.0872	38.7073	9.10979	67.7369	76.8467	5.5658E 04	7.1054E 04	7800
8000	5.3564E 04	4.60427	34.2035	38.8548	9.14944	67.9680	77.1175	5.7292E 04	7.3194E 04	8000
8200	5.7161E 04	4.62436	34.3175	38.9918	9.18936	68.1945	77.3838	5.9058E 04	7.5353E 04	8200
8400	6.0921E 04	4.64469	34.4291	39.0736	9.22938	68.4164	77.6458	6.0839E 04	7.7521E 04	8400
8600	6.4845E 04	4.66529	34.5387	39.2032	9.26931	68.6340	77.9033	6.2628E 04	7.9716E 04	8600
8800	6.8934E 04	4.68616	34.6461	39.3307	9.30899	68.8476	78.1566	6.4432E 04	8.1919E 04	8800
9000	7.3194E 04	4.70731	34.7516	39.4559	9.34823	69.0572	78.4055	6.6250E 04	8.4134E 04	9000
9200	7.7631E 04	4.72875	34.8552	39.5790	9.38687	69.2631	78.6500	6.8077E 04	8.6359E 04	9200
9400	8.2246E 04	4.74280	34.9570	39.6998	9.42473	69.4654	78.8910	6.9922E 04	8.8592E 04	9400
9600	8.7033E 04	4.76139	35.0571	39.8185	9.46167	69.6642	79.1259	7.1754E 04	9.0832E 04	9600
9800	9.2096E 04	4.77944	35.1554	39.9349	9.49753	69.8597	79.3572	7.3602E 04	9.3074E 04	9800

TABLE 93 (CONT.) IDEAL GAS FUNCTIONS FOR O₂

TEMP. (°K)	PARTIT. FUNCT.	$\frac{W^*}{RT}$	$-\frac{F^*}{RT}$	$\frac{S^*}{R}$	$\ln \frac{W^* - \epsilon_{0,VT}}{RT} - \frac{F^* - \epsilon_{0,VT}}{CAL/MOLE}$	$-\frac{S^* - \epsilon_{0,VT}}{CAL/MOLE}$	$e^{-\epsilon_{0,VT}}$	$\frac{W^* - \epsilon_{0,VT}}{CAL/MOLE}$	$-(F^* - \epsilon_{0,VT})$	TEMP. (°K)	
10000	4.4084E 04	4.79688	35.2522	40.0490	9.53218	70.0519	79.5641	7.5450E 04	9.9382E 04	7.0052E 05	10000
10500	4.9307E 04	4.83744	35.4872	40.3247	9.61280	70.5190	80.1318	8.0049E 04	1.0093E 05	7.4049E 05	10500
11000	5.5017E 04	4.87312	35.7131	40.5862	9.68370	70.9678	80.8515	8.4682E 04	1.0452E 05	7.8065E 05	11000
11500	6.1180E 04	4.90344	35.9304	40.8338	9.74394	71.3997	81.1436	8.9203E 04	1.1204E 05	8.2110E 05	11500
12000	6.7806E 04	4.92817	36.1396	41.0678	9.79310	71.8154	81.6085	9.3671E 04	1.1752E 05	8.6179E 05	12000
12500	7.4902E 04	4.94732	36.3412	41.2895	9.83114	72.2160	82.0472	9.8050E 04	1.2209E 05	9.0270E 05	12500
13000	8.2472E 04	4.96103	36.5355	41.4766	9.85838	72.6022	82.4605	1.0233E 05	1.2614E 05	9.4383E 05	13000
13500	9.0515E 04	4.96957	36.7229	41.6925	9.87536	72.9746	82.8499	1.0449E 05	1.3322E 05	9.8516E 05	13500
14000	9.9028E 04	4.97332	36.9038	41.8771	9.88281	73.3339	83.2187	1.1054E 05	1.3836E 05	1.0287E 06	14000
14500	1.0801E 05	4.97267	37.0783	42.0510	9.88153	73.6807	83.5622	1.1447E 05	1.4328E 05	1.0684E 06	14500
15000	1.1744E 05	4.96807	37.2468	42.2149	9.87237	74.0155	83.8879	1.1828E 05	1.4809E 05	1.1102E 06	15000
15500	1.2733E 05	4.95994	37.4096	42.3695	9.85622	74.3390	84.1952	1.2197E 05	1.5277E 05	1.1523E 06	15500
16000	1.3765E 05	4.94870	37.5669	42.5156	9.83389	74.6516	84.4855	1.2555E 05	1.5734E 05	1.1944E 06	16000
16500	1.4839E 05	4.93476	37.7189	42.6537	9.80619	74.9538	84.7600	1.2901E 05	1.6180E 05	1.2367E 06	16500
17000	1.5954E 05	4.91849	37.8660	42.7845	9.77386	75.2460	85.0199	1.3237E 05	1.6616E 05	1.2792E 06	17000
17500	1.7108E 05	4.90074	38.0083	42.9086	9.73758	75.5289	85.2644	1.3563E 05	1.7041E 05	1.3218E 06	17500
18000	1.8308E 05	4.88031	38.1461	43.0264	9.69798	75.8026	85.5004	1.3879E 05	1.7454E 05	1.3644E 06	18000
18500	1.9527E 05	4.85898	38.2793	43.1385	9.65589	76.0678	85.7234	1.4187E 05	1.7843E 05	1.4073E 06	18500
19000	2.0789E 05	4.83650	38.4088	43.2455	9.61092	76.3257	85.9336	1.4485E 05	1.8211E 05	1.4502E 06	19000
19500	2.2083E 05	4.81309	38.5341	43.3472	9.56441	76.5737	86.1381	1.4776E 05	1.8565E 05	1.4931E 06	19500
20000	2.3408E 05	4.78895	38.6557	43.4446	9.51643	76.8153	86.3317	1.5059E 05	1.9033E 05	1.5363E 06	20000
22000	2.8978E 05	4.68811	39.1074	43.7956	9.31605	77.7130	87.0290	1.6124E 05	2.0449E 05	1.7097E 06	22000
24000	3.4902E 05	4.58566	39.5110	44.0966	9.11247	78.5168	87.6273	1.7101E 05	2.1870E 05	1.8844E 06	24000
26000	4.1079E 05	4.48591	39.8740	44.3600	8.91424	79.2363	88.1506	1.8010E 05	2.3177E 05	2.0601E 06	26000
28000	4.7426E 05	4.39099	40.2030	44.5940	8.72563	79.8900	88.6156	1.8868E 05	2.4432E 05	2.2349E 06	28000
30000	5.3869E 05	4.30186	40.5029	44.8047	8.54851	80.4859	89.0344	1.9684E 05	2.5646E 05	2.4146E 06	30000
32000	6.0315E 05	4.21876	40.7778	44.9966	8.38338	81.0322	89.4156	2.0468E 05	2.6827E 05	2.5930E 06	32000
34000	6.6822E 05	4.14158	41.0312	45.1728	8.22001	81.5358	89.7658	2.1226E 05	2.7982E 05	2.7722E 06	34000
36000	7.3245E 05	4.07002	41.2659	45.3359	8.06180	82.0022	90.0900	2.1982E 05	2.9114E 05	2.9521E 06	36000
38000	7.9590E 05	4.00369	41.4842	45.4878	7.90599	82.4359	90.3919	2.2682E 05	3.0233E 05	3.1326E 06	38000
40000	8.5836E 05	3.94217	41.6879	45.6301	7.83375	82.8408	90.6746	2.3386E 05	3.1335E 05	3.3134E 06	40000

TABLE 9A. IDEAL GAS FUNCTIONS FOR CO (MOLECULAR WEIGHT 28.0106, R = 1.98717 CAL/MOLE, 7 STATES INCLUDED)

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 E_0}{RT}$	$-\frac{E_0}{RT}$	$\frac{5}{2} \ln \frac{2\pi m}{h^2}$	$\ln \frac{V}{N} - \ln \frac{V_0}{N_0}$	$\ln \frac{V}{N} - \ln \frac{V_0}{N_0} - \ln \frac{V_0}{N_0}$	$\ln \frac{V}{N} - \ln \frac{V_0}{N_0} - \ln \frac{V_0}{N_0}$	$\ln \frac{V}{N} - \ln \frac{V_0}{N_0} - \ln \frac{V_0}{N_0}$	TEMP. (°K)		
1000	3.8038E 02	3.6131	24.5443	28.1556	7.5576	46.7735	56.0293	5.2688E 03	7.2558E 03	4.8774E 04	1600
1200	4.7192E 02	3.71824	25.2159	28.9342	7.38876	50.1082	57.4970	6.4819E 03	8.8665E 03	6.0130E 04	1800
1400	5.7214E 02	3.77087	25.7939	29.5147	7.31321	51.8562	58.7699	7.7365E 03	1.0510E 04	7.1759E 04	2000
1600	6.8143E 02	3.81758	26.3025	30.1401	7.22590	52.6274	59.8933	9.0220E 03	1.2201E 04	8.3628E 04	2200
1800	8.0008E 02	3.84824	26.7575	30.6457	7.12661	53.1716	60.8982	1.0331E 04	1.3908E 04	9.5709E 04	2400
2000	9.2831E 02	3.93339	27.1695	31.1029	7.01629	53.5904	61.8067	1.1658E 04	1.5633E 04	1.0798E 05	2600
2200	1.0652E 03	3.97360	27.5464	31.5200	7.89621	54.7392	62.6354	1.3000E 04	1.7372E 04	1.2043E 05	2800
2400	1.2140E 03	4.03956	27.8937	31.9032	7.96766	55.4293	63.3970	1.4353E 04	1.9122E 04	1.3302E 05	3000
2600	1.3711E 03	4.08185	28.2159	32.2578	8.03182	56.0697	64.1015	1.5716E 04	2.0883E 04	1.4578E 05	3200
2800	1.5394E 03	4.07097	28.5165	32.5875	8.08969	56.6670	64.7567	1.7087E 04	2.2651E 04	1.5867E 05	3400
3000	1.7173E 03	4.09758	28.7983	32.8957	8.14218	57.2270	65.3692	1.8455E 04	2.4427E 04	1.7146E 05	3600
3200	1.9052E 03	4.12145	29.0635	33.1850	8.19000	57.7540	65.9440	1.9849E 04	2.6208E 04	1.8481E 05	3800
3400	2.1038E 03	4.14350	29.3141	33.4575	8.23381	58.2519	66.4857	2.1239E 04	2.7993E 04	1.9868E 05	4000
3600	2.3119E 03	4.16375	29.5515	33.7152	8.27406	58.7237	66.9977	2.2633E 04	2.9787E 04	2.1141E 05	4200
3800	2.5308E 03	4.18247	29.7771	33.9596	8.31126	59.1720	67.4833	2.4032E 04	3.1580E 04	2.2405E 05	4400
4000	2.7601E 03	4.19984	29.9921	34.1919	8.34577	59.5992	67.9450	2.5434E 04	3.3383E 04	2.3640E 05	4600
4200	3.0000E 03	4.21601	30.1974	34.4134	8.37791	60.0072	68.3851	2.6841E 04	3.5187E 04	2.4875E 05	4800
4400	3.2503E 03	4.23112	30.3939	34.6250	8.40793	60.3976	68.8056	2.8251E 04	3.6995E 04	2.6110E 05	5000
4600	3.5115E 03	4.24531	30.5823	34.8276	8.43613	60.7720	69.2081	2.9665E 04	3.8806E 04	2.7345E 05	5200
4800	3.7834E 03	4.25868	30.7632	35.0219	8.46270	61.1316	69.5943	3.1083E 04	4.0621E 04	2.8580E 05	5400
5000	4.0661E 03	4.27133	30.9373	35.2087	8.48783	61.4776	69.9654	3.2503E 04	4.2439E 04	2.9815E 05	5600
5200	4.3596E 03	4.28335	31.1051	35.3884	8.51173	61.8110	70.3227	3.3928E 04	4.4261E 04	3.1050E 05	5800
5400	4.6641E 03	4.29481	31.2670	35.5618	8.53450	62.1326	70.6671	3.5356E 04	4.6084E 04	3.2285E 05	6000
5600	4.9797E 03	4.30579	31.4234	35.7291	8.55631	62.4434	70.9997	3.6787E 04	4.7915E 04	3.3520E 05	6200
5800	5.3069E 03	4.31637	31.5746	35.8910	8.57735	62.7440	71.3214	3.8223E 04	4.9749E 04	3.4755E 05	6400
6000	5.6445E 03	4.32664	31.7211	36.0478	8.59774	63.0352	71.6329	3.9663E 04	5.1586E 04	3.5990E 05	6600
6200	5.9938E 03	4.33665	31.8632	36.1998	8.61764	63.3174	71.9350	4.1109E 04	5.3429E 04	3.7225E 05	6800
6400	6.3548E 03	4.34649	32.0010	36.3475	8.63720	63.5913	72.2285	4.2560E 04	5.5278E 04	3.8460E 05	7000
6600	6.7273E 03	4.35624	32.1349	36.4912	8.65657	63.8574	72.5140	4.4018E 04	5.7133E 04	3.9695E 05	7200
6800	7.1117E 03	4.36598	32.2651	36.6311	8.67572	64.1161	72.7920	4.5484E 04	5.8996E 04	4.0930E 05	7400
7000	7.5080E 03	4.37577	32.3928	36.7676	8.69459	64.3679	73.0633	4.6958E 04	6.0866E 04	4.2165E 05	7600
7200	7.9164E 03	4.38552	32.5152	36.9009	8.71316	64.6131	73.3283	4.8442E 04	6.2749E 04	4.3400E 05	7800
7400	8.3374E 03	4.39522	32.6355	37.0314	8.73163	64.8522	73.5876	4.9937E 04	6.4642E 04	4.4635E 05	8000
7600	8.7710E 03	4.40484	32.7529	37.1593	8.75003	65.0854	73.8417	5.1446E 04	6.6546E 04	4.5870E 05	8200
7800	9.2176E 03	4.41438	32.8675	37.2849	8.76806	65.3131	74.0912	5.2969E 04	6.8469E 04	4.7105E 05	8400
8000	9.6775E 03	4.42382	32.9795	37.4083	8.78599	65.5357	74.3364	5.4509E 04	7.0404E 04	4.8340E 05	8600
8200	1.0151E 04	4.43316	33.0890	37.5298	8.80389	65.7533	74.5779	5.6064E 04	7.2362E 04	4.9571E 05	8800
8400	1.0633E 04	4.44241	33.1984	37.6497	8.82169	65.9662	74.8161	5.7644E 04	7.4347E 04	5.0802E 05	9000
8600	1.1124E 04	4.45156	33.3071	37.7681	8.83946	66.1748	75.0514	5.9250E 04	7.6359E 04	5.2033E 05	9200
8800	1.1624E 04	4.46062	33.4153	37.8857	8.85717	66.3792	75.2842	6.0877E 04	7.8394E 04	5.3264E 05	9400
9000	1.2134E 04	4.46958	33.5230	38.0013	8.87483	66.5796	75.5148	6.2533E 04	8.0461E 04	5.4495E 05	9600
9200	1.2653E 04	4.47835	33.6303	38.1165	8.89244	66.7764	75.7437	6.4218E 04	8.2569E 04	5.5726E 05	9800
9400	1.3181E 04	4.48701	33.7371	38.2309	8.91000	66.9696	75.9711	6.5985E 04	8.4718E 04	5.6957E 05	10000
9600	1.3718E 04	4.49557	33.8434	38.3447	8.92751	67.1599	76.1972	6.7786E 04	8.6910E 04	5.8188E 05	10200
9800	1.4264E 04	4.50404	33.9496	38.4580	8.94497	67.3462	76.4225	6.9621E 04	8.9145E 04	5.9419E 05	10400

TABLE 94 (CONT.). IDEAL GAS FUNCTIONS FOR CO

TEMP. (°K)	PARTIT. FUNCT.	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	$\frac{h^2 - E_0}{RT}$	TEMP. (°K)
10000	1.5119E 04	4.58797	33.9831	38.5710	9.11705	67.5300	76.6470	7.1299E 04	9.1170E 04	9.1170E 04	6.7530E 05	10000
10000	1.6756E 04	3.64435	34.2083	38.8526	9.22910	67.9775	77.2086	7.6090E 04	9.6906E 04	9.6906E 04	7.1376E 05	10500
11000	1.8540E 04	4.70705	34.6257	39.1337	9.35548	68.4087	77.7651	8.1051E 04	1.0292E 05	1.0292E 05	7.5251E 05	11000
11500	2.0484E 04	4.77827	34.6366	39.4148	9.49322	68.8284	78.3238	8.6434E 04	1.0927E 05	1.0927E 05	7.9153E 05	11500
12000	2.2605E 04	4.85446	34.8415	39.6960	9.64661	69.2358	78.8824	9.1913E 04	1.1576E 05	1.1576E 05	8.3083E 05	12000
12500	2.4926E 04	4.93528	35.0413	39.9768	9.80722	69.6379	79.4401	9.7515E 04	1.2239E 05	1.2239E 05	8.7041E 05	12500
13000	2.7469E 04	5.01925	35.2365	40.2558	9.97408	70.0207	79.9948	1.0303E 05	1.2928E 05	1.2928E 05	9.1027E 05	13000
13500	3.0257E 04	5.10475	35.4275	40.5323	10.14349	70.5084	80.5443	1.1012E 05	1.3639E 05	1.3639E 05	9.5040E 05	13500
14000	3.3315E 04	5.19017	35.6147	40.8048	10.31863	70.7723	81.0860	1.1657E 05	1.4439E 05	1.4439E 05	9.9081E 05	14000
14500	3.6657E 04	5.27375	35.7983	41.0721	10.49681	71.1372	81.6170	1.2314E 05	1.5194E 05	1.5194E 05	1.0315E 06	14500
15000	4.0318E 04	5.35420	35.9785	41.3327	10.63867	71.4952	82.1348	1.2979E 05	1.5960E 05	1.5960E 05	1.0724E 06	15000
15500	4.4351E 04	5.43021	36.1553	41.5855	10.79072	71.8465	82.6373	1.3646E 05	1.6726E 05	1.6726E 05	1.1136E 06	15500
16000	4.8730E 04	5.50080	36.3288	41.8296	10.93099	72.1914	83.1224	1.4310E 05	1.7490E 05	1.7490E 05	1.1551E 06	16000
16500	5.3497E 04	5.56520	36.4991	42.0643	11.05897	72.5297	83.5887	1.4968E 05	1.8247E 05	1.8247E 05	1.1967E 06	16500
17000	5.8675E 04	5.62291	36.6661	42.2890	11.17366	72.8616	84.0353	1.5617E 05	1.8995E 05	1.8995E 05	1.2386E 06	17000
17500	6.4282E 04	5.67366	36.8298	42.5035	11.27451	73.1870	84.4615	1.6253E 05	1.9730E 05	1.9730E 05	1.2808E 06	17500
18000	7.0339E 04	5.71739	36.9903	42.7077	11.36137	73.5059	84.8672	1.6874E 05	2.0450E 05	2.0450E 05	1.3231E 06	18000
18500	7.6860E 04	5.75413	37.1475	42.9016	11.43442	73.8182	85.2526	1.7477E 05	2.1154E 05	2.1154E 05	1.3656E 06	18500
19000	8.3865E 04	5.78416	37.3013	43.0855	11.49407	74.1239	85.6180	1.8063E 05	2.1839E 05	2.1839E 05	1.4084E 06	19000
19500	9.1380E 04	5.80775	37.4519	43.2597	11.54097	74.4231	85.9641	1.8630E 05	2.2505E 05	2.2505E 05	1.4513E 06	19500
20000	9.9364E 04	5.82531	37.5992	43.4245	11.57586	74.7158	86.2916	1.9177E 05	2.3152E 05	2.3152E 05	1.4943E 06	20000
22000	1.3662E 05	5.84391	38.1559	43.9958	11.61282	75.8220	87.4348	2.1176E 05	2.5548E 05	2.5548E 05	1.6881E 06	22000
24000	1.8248E 05	5.85062	38.6829	44.6039	11.52739	76.8295	88.3569	2.2897E 05	2.7868E 05	2.7868E 05	1.8439E 06	24000
26000	2.3698E 05	5.72011	39.1242	44.8443	11.36681	77.7402	89.1130	2.4307E 05	2.9554E 05	2.9554E 05	2.0214E 06	26000
28000	2.9973E 05	5.61845	39.5445	45.1629	11.16480	78.5816	89.7462	2.5697E 05	3.1261E 05	3.1261E 05	2.2003E 06	28000
30000	3.7028E 05	5.50705	39.9283	45.4355	10.94342	79.3442	90.2876	2.6869E 05	3.2830E 05	3.2830E 05	2.3803E 06	30000
32000	4.4798E 05	5.39278	40.2301	45.6729	10.71634	80.0432	90.7595	2.7933E 05	3.4292E 05	3.4292E 05	2.5614E 06	32000
34000	5.3201E 05	5.27975	40.6036	45.8934	10.49173	80.6861	91.1778	2.8916E 05	3.5672E 05	3.5672E 05	2.7433E 06	34000
36000	6.2168E 05	5.17029	40.9023	46.0726	10.27423	81.2796	91.5538	2.9833E 05	3.6987E 05	3.6987E 05	2.9241E 06	36000
38000	7.1622E 05	5.06567	41.1790	46.2447	10.06632	81.8295	91.8958	3.0701E 05	3.8252E 05	3.8252E 05	3.1095E 06	38000
40000	8.1488E 05	4.96644	41.4363	46.4027	9.86914	82.3408	92.2069	3.1528E 05	3.9477E 05	3.9477E 05	3.2936E 06	40000

TABLE 95. FRACTIONAL ELECTRONIC POPULATIONS OF NZ

TEMP. (°K)	$X^{1\Sigma^+}$	$A^{2\Sigma^+}$	Δ_u	STATE	$B^3\Pi_g$	$B^3\Sigma_u^-$	$a^1\Sigma_u^-$	$a^1\Pi_g$	$w^1\Delta_u$
1200	1.03E-00	5.86E-26	5.90E-30	1.03E-30	2.36E-34	8.10E-34	3.31E-34	3.31E-34	1.05E-37
1600	1.00E-00	1.87E-19	2.22E-22	5.85E-23	9.33E-26	5.62E-27	3.32E-27	3.32E-27	3.14E-28
2000	1.00E-00	1.51E-15	7.87E-18	2.50E-18	1.38E-18	1.15E-21	6.32E-22	6.32E-22	1.30E-22
2400	1.00E-00	6.10E-13	6.54E-15	3.14E-15	3.14E-15	4.01E-18	3.33E-18	3.33E-18	7.28E-19
2800	1.00E-00	4.46E-11	1.26E-12	5.15E-13	1.09E-14	1.36E-15	1.25E-15	1.25E-15	3.47E-16
3200	1.00E-00	1.12E-09	5.37E-11	2.36E-11	7.64E-13	1.00E-13	1.04E-13	1.04E-13	3.54E-14
3600	1.00E-00	1.37E-08	9.93E-10	4.04E-10	2.69E-11	3.24E-12	3.39E-12	3.39E-12	1.30E-12
4000	1.00E-00	1.02E-07	1.03E-08	5.03E-09	2.94E-10	4.94E-11	5.60E-11	5.60E-11	2.31E-11
4400	1.00E-00	5.10E-07	6.95E-08	3.54E-08	2.59E-09	4.59E-10	5.21E-10	5.21E-10	2.44E-10
4800	1.00E-00	2.09E-06	3.42E-07	1.80E-07	1.58E-08	2.95E-09	3.45E-09	3.45E-09	1.75E-09
5200	1.00E-00	4.67E-06	1.32E-06	7.13E-07	7.30E-08	1.42E-08	1.71E-08	1.71E-08	9.23E-09
5600	1.00E-00	1.81E-05	4.21E-06	2.32E-06	2.71E-07	5.48E-08	6.73E-08	6.73E-08	3.85E-08
6000	1.00E-00	4.28E-05	1.15E-05	6.48E-06	6.48E-06	1.77E-07	2.21E-07	2.21E-07	1.33E-07
6400	1.00E-00	9.10E-05	2.78E-05	1.58E-05	2.30E-06	4.37E-07	6.27E-07	6.27E-07	3.93E-07
6800	1.00E-00	1.77E-04	6.00E-05	3.49E-05	5.59E-06	1.22E-06	1.57E-06	1.57E-06	1.02E-06
7200	9.99E-01	3.19E-04	1.20E-04	7.05E-05	1.21E-05	2.72E-06	3.56E-06	3.56E-06	2.40E-06
7600	9.99E-01	5.41E-04	2.22E-04	1.32E-04	2.44E-05	5.59E-06	7.41E-06	7.41E-06	5.14E-06
8000	9.98E-01	8.67E-04	3.86E-04	2.33E-04	4.59E-05	1.07E-05	1.43E-05	1.43E-05	1.02E-05
8400	9.98E-01	1.33E-03	6.37E-04	3.87E-04	8.12E-05	1.92E-05	2.60E-05	2.60E-05	1.90E-05
8800	9.94E-01	1.95E-03	1.00E-03	6.16E-04	1.36E-04	3.27E-05	4.47E-05	4.47E-05	3.34E-05
9200	9.94E-01	2.77E-03	1.52E-03	9.38E-04	2.19E-04	5.31E-05	7.33E-05	7.33E-05	5.58E-05
9600	9.89E-01	3.80E-03	2.22E-03	1.38E-03	3.34E-04	8.28E-05	1.15E-04	1.15E-04	8.94E-05
10000	9.89E-01	5.08E-03	3.13E-03	1.96E-03	5.00E-04	1.25E-04	1.75E-04	1.75E-04	1.31E-04
11000	9.77E-01	9.45E-03	6.61E-03	4.19E-03	1.12E-03	3.02E-04	4.30E-04	4.30E-04	3.51E-04
12000	9.66E-01	1.56E-02	1.22E-02	7.79E-03	2.37E-03	6.23E-04	9.01E-04	9.01E-04	7.58E-04
13000	9.39E-01	2.33E-02	2.00E-02	1.29E-02	4.23E-03	1.14E-03	1.64E-03	1.64E-03	1.43E-03
14000	9.04E-01	3.23E-02	3.02E-02	1.96E-02	6.83E-03	1.88E-03	2.37E-03	2.37E-03	2.44E-03
15000	8.67E-01	4.17E-02	4.23E-02	2.77E-02	1.02E-02	2.83E-03	4.24E-03	4.24E-03	3.80E-03
16000	8.26E-01	5.17E-02	5.59E-02	3.68E-02	1.42E-02	4.05E-03	6.09E-03	6.09E-03	5.32E-03
17000	7.82E-01	6.12E-02	7.04E-02	4.63E-02	1.87E-02	5.63E-03	8.24E-03	8.24E-03	7.58E-03
18000	7.37E-01	7.00E-02	8.52E-02	5.64E-02	2.36E-02	6.97E-03	1.04E-02	1.04E-02	9.89E-03
19000	6.93E-01	7.79E-02	9.97E-02	6.62E-02	2.87E-02	8.61E-03	1.37E-02	1.37E-02	1.23E-02
20000	6.51E-01	8.47E-02	1.14E-01	7.56E-02	3.39E-02	1.03E-02	1.59E-02	1.59E-02	1.50E-02
24000	5.08E-01	1.02E-01	1.60E-01	1.07E-01	5.32E-02	1.70E-02	2.67E-02	2.67E-02	2.57E-02
28000	4.07E-01	1.09E-01	1.91E-01	1.29E-01	6.88E-02	2.30E-02	3.64E-02	3.64E-02	3.55E-02
32000	3.39E-01	1.10E-01	2.11E-01	1.42E-01	8.08E-02	2.78E-02	4.45E-02	4.45E-02	4.38E-02
36000	2.92E-01	1.09E-01	2.24E-01	1.51E-01	8.99E-02	3.18E-02	5.12E-02	5.12E-02	5.07E-02
40000	2.57E-01	1.07E-01	2.33E-01	1.57E-01	9.69E-02	3.51E-02	5.61E-02	5.61E-02	5.65E-02

TABLE 96. FRACTIONAL ELECTRONIC POPULATIONS OF N2+

TEMP. (°K)	STATE									
	X ² _g ⁺	A ² _u	B ² _u	4 _g ⁺	4 _u	D ² _u	4 _g ⁺	C ² _g ⁺		
1200	1.00E-00	1.44E-04	4.43E-14	2.14E-23	9.91E-37	1.10E-26	1.19E-31	3.14E-34		
1600	9.98E-01	1.64E-03	9.32E-11	1.30E-17	4.92E-20	5.68E-20	9.92E-24	8.07E-26		
2000	9.93E-01	7.08E-03	9.13E-09	3.88E-14	3.19E-16	6.18E-16	6.74E-19	8.81E-21		
2400	9.81E-01	1.96E-02	1.92E-07	7.92E-12	2.46E-13	3.22E-13	6.68E-16	2.01E-17		
2800	9.63E-01	3.68E-02	1.84E-06	3.52E-10	2.01E-11	2.52E-11	1.18E-13	4.96E-15		
3200	9.39E-01	6.08E-02	9.43E-06	5.99E-09	5.39E-10	6.92E-10	5.64E-12	3.06E-13		
3600	9.11E-01	8.89E-02	2.93E-05	5.37E-08	6.89E-09	9.03E-09	1.13E-10	7.48E-12		
4000	8.81E-01	1.19E-01	7.89E-05	3.07E-07	5.24E-08	6.99E-08	1.24E-09	9.54E-11		
4400	8.49E-01	1.51E-01	1.75E-04	1.27E-06	2.73E-07	3.70E-07	8.69E-09	7.59E-10		
4800	8.18E-01	1.82E-01	3.38E-04	4.09E-06	1.08E-06	1.47E-06	4.30E-08	4.24E-09		
5200	7.88E-01	2.11E-01	5.87E-04	1.10E-05	3.41E-06	4.68E-06	1.71E-07	1.80E-08		
5600	7.59E-01	2.40E-01	9.40E-04	2.51E-05	9.11E-06	1.26E-05	5.47E-07	6.20E-08		
6000	7.32E-01	2.67E-01	1.41E-03	5.19E-05	2.13E-05	2.93E-05	1.49E-06	1.80E-07		
6400	7.06E-01	2.91E-01	2.00E-03	9.68E-05	4.54E-05	6.11E-05	3.57E-06	4.54E-07		
6800	6.83E-01	3.14E-01	2.72E-03	1.67E-04	8.50E-05	1.16E-04	7.67E-06	1.02E-06		
7200	6.61E-01	3.35E-01	3.58E-03	2.69E-04	1.51E-04	2.04E-04	1.51E-05	2.09E-06		
7600	6.40E-01	3.52E-01	4.56E-03	4.12E-04	2.51E-04	3.36E-04	2.75E-05	3.95E-06		
8000	6.21E-01	3.72E-01	5.67E-03	6.00E-04	3.98E-04	5.22E-04	4.71E-05	6.97E-06		
8400	6.03E-01	3.88E-01	6.89E-03	8.41E-04	5.94E-04	7.78E-04	7.62E-05	1.16E-05		
8800	5.86E-01	4.03E-01	8.22E-03	1.14E-03	8.62E-04	1.11E-03	1.18E-04	1.84E-05		
9200	5.70E-01	4.16E-01	9.64E-03	1.49E-03	1.21E-03	1.53E-03	1.74E-04	2.76E-05		
9600	5.55E-01	4.28E-01	1.12E-02	1.91E-03	1.63E-03	2.04E-03	2.49E-04	4.06E-05		
10000	5.41E-01	4.38E-01	1.28E-02	2.38E-03	2.14E-03	2.65E-03	3.49E-04	5.72E-05		
11000	5.09E-01	4.80E-01	1.70E-02	3.82E-03	3.91E-03	4.61E-03	6.92E-04	1.19E-04		
12000	4.82E-01	4.77E-01	2.14E-02	5.54E-03	6.33E-03	7.16E-03	1.21E-03	2.14E-04		
13000	4.57E-01	4.88E-01	2.58E-02	7.51E-03	9.40E-03	1.02E-02	1.92E-03	3.51E-04		
14000	4.35E-01	4.95E-01	3.01E-02	9.60E-03	1.31E-02	1.37E-02	2.82E-03	5.24E-04		
15000	4.15E-01	5.00E-01	3.42E-02	1.17E-02	1.72E-02	1.73E-02	3.88E-03	7.37E-04		
16000	3.98E-01	5.02E-01	3.80E-02	1.38E-02	2.17E-02	2.11E-02	5.08E-03	9.81E-04		
17000	3.82E-01	5.02E-01	4.19E-02	1.59E-02	2.64E-02	2.49E-02	6.38E-03	1.25E-03		
18000	3.68E-01	5.01E-01	4.64E-02	1.78E-02	3.12E-02	2.87E-02	7.77E-03	1.54E-03		
19000	3.55E-01	4.98E-01	4.74E-02	1.98E-02	3.62E-02	3.22E-02	9.21E-03	1.85E-03		
20000	3.44E-01	4.96E-01	4.99E-02	2.13E-02	4.11E-02	3.57E-02	1.07E-02	2.16E-03		
24000	3.08E-01	4.81E-01	5.76E-02	2.68E-02	5.98E-02	4.75E-02	1.65E-02	3.46E-03		
28000	2.83E-01	4.65E-01	6.24E-02	3.06E-02	7.60E-02	5.83E-02	2.19E-02	4.66E-03		
32000	2.65E-01	4.51E-01	6.54E-02	3.32E-02	8.97E-02	6.29E-02	2.64E-02	5.77E-03		
36000	2.52E-01	4.39E-01	6.74E-02	3.51E-02	1.01E-01	6.78E-02	3.06E-02	6.79E-03		
40000	2.41E-01	4.29E-01	6.88E-02	3.65E-02	1.11E-01	7.16E-02	3.40E-02	7.56E-03		

TABLE 97. FRACTIONAL ELECTRONIC POPULATIONS OF NO

TEMP. (°K)	STATE						
	X ² Π	a ⁴ Π	A ² Σ ⁺	B ² Π	b ⁴ Σ ⁻	C ² Π	D ² Σ ⁺
1200	1.00E 00	6.98E-20	4.22E-24	4.22E-24	4.69E-25	4.63E-28	7.80E-29
1600	1.00E 00	6.50E-15	2.29E-18	3.74E-18	6.89E-19	2.91E-21	6.47E-22
2000	1.00E 00	6.31E-12	6.26E-15	1.40E-14	3.40E-15	3.48E-17	9.07E-18
2400	1.00E 00	6.23E-10	1.22E-12	3.38E-12	9.93E-13	1.81E-14	5.21E-15
2800	1.00E 00	1.67E-08	5.22E-11	1.71E-10	5.76E-11	1.57E-12	4.81E-13
3200	1.00E 00	1.96E-07	8.67E-10	3.26E-09	1.21E-09	4.42E-11	1.41E-11
3600	1.00E 00	1.33E-06	7.64E-09	3.23E-08	1.30E-08	5.90E-10	1.93E-10
4000	1.00E 00	6.17E-06	4.37E-08	2.02E-07	8.74E-08	4.65E-09	1.54E-09
4400	1.00E 00	2.15E-05	1.76E-07	9.08E-07	4.14E-07	2.50E-08	8.35E-09
4800	1.00E 00	6.05E-05	5.65E-07	3.18E-06	1.52E-06	1.01E-07	3.37E-08
5200	1.00E 00	1.45E-04	1.50E-06	9.17E-06	4.54E-06	3.26E-07	1.09E-07
5600	1.00E 00	3.03E-04	3.44E-06	2.27E-05	1.16E-05	8.84E-07	2.94E-07
6000	9.99E-01	5.73E-04	7.00E-06	4.98E-05	2.81E-05	2.09E-06	6.89E-07
6400	9.97E-01	9.34E-04	1.29E-05	9.88E-05	5.29E-05	4.39E-06	1.44E-06
6800	9.96E-01	1.61E-03	2.21E-05	1.60E-04	9.84E-05	8.41E-06	2.75E-06
7200	9.97E-01	2.48E-03	3.54E-05	3.08E-04	1.70E-04	1.49E-05	4.94E-06
7600	9.86E-01	3.58E-03	5.36E-05	4.94E-04	2.77E-04	2.47E-05	7.98E-06
8000	9.94E-01	4.94E-03	7.79E-05	7.56E-04	4.28E-04	3.88E-05	1.24E-05
8400	9.91E-01	6.63E-03	1.08E-04	1.11E-03	6.32E-04	5.81E-05	1.84E-05
8800	9.89E-01	8.62E-03	1.44E-04	1.56E-03	8.98E-04	8.34E-05	2.64E-05
9200	9.85E-01	1.09E-02	1.87E-04	2.13E-03	1.23E-03	1.15E-04	3.62E-05
9600	9.82E-01	1.35E-02	2.58E-04	2.83E-03	1.64E-03	1.55E-04	4.85E-05
10000	9.77E-01	1.63E-02	2.94E-04	3.65E-03	2.13E-03	2.02E-04	6.29E-05
11000	9.65E-01	2.44E-02	4.62E-04	6.33E-03	3.73E-03	3.56E-04	1.09E-04
12000	9.49E-01	3.35E-02	6.59E-04	9.67E-03	5.83E-03	5.61E-04	1.70E-04
13000	9.37E-01	4.31E-02	8.77E-04	1.42E-02	8.40E-03	8.10E-04	2.44E-04
14000	9.14E-01	5.28E-02	1.11E-03	1.92E-02	1.13E-02	1.10E-03	3.26E-04
15000	8.95E-01	6.22E-02	1.34E-03	2.46E-02	1.46E-02	1.41E-03	4.16E-04
16000	8.76E-01	7.13E-02	1.56E-03	3.04E-02	1.80E-02	1.74E-03	5.09E-04
17000	8.58E-01	7.97E-02	1.78E-03	3.64E-02	2.16E-02	2.08E-03	6.05E-04
18000	8.40E-01	8.76E-02	1.99E-03	4.26E-02	2.51E-02	2.42E-03	7.00E-04
19000	8.22E-01	9.47E-02	2.18E-03	4.87E-02	2.87E-02	2.76E-03	7.93E-04
20000	8.05E-01	1.01E-01	2.34E-03	5.47E-02	3.22E-02	3.09E-03	8.84E-04
24000	7.47E-01	1.27E-01	2.94E-03	7.74E-02	4.53E-02	4.31E-03	1.21E-03
28000	7.11E-01	1.35E-01	3.38E-03	9.70E-02	5.64E-02	5.32E-03	1.48E-03
32000	6.65E-01	1.44E-01	3.69E-03	1.13E-01	6.54E-02	6.15E-03	1.69E-03
36000	6.36E-01	1.51E-01	3.91E-03	1.27E-01	7.32E-02	6.83E-03	1.87E-03
40000	6.13E-01	1.55E-01	4.08E-03	1.39E-01	7.95E-02	7.39E-03	2.01E-03

TABLE 98. FRACTIONAL ELECTRONIC POPULATIONS OF MO+

TEMP. (°K)	X ¹ Z ⁺	STATE					Σ ⁻
		a ³ Z ⁺	3Δ	3Π	A ¹ Π	3Σ ⁻	
1200	1.00E 00	6.51E-21	2.00E-30	4.46E-33	7.21E-39	0.	
1600	1.00E 00	1.06E-15	9.22E-23	9.30E-25	6.54E-29	1.54E-28	
2000	1.00E 00	1.48E-12	3.67E-18	9.19E-20	3.55E-23	8.79E-23	
2400	1.00E 00	1.83E-10	4.29E-15	1.97E-16	3.01E-19	6.05E-19	
2800	1.00E 00	5.74E-09	6.68E-13	4.74E-14	1.62E-16	3.32E-16	
3200	1.00E 00	7.62E-08	2.95E-11	2.90E-12	1.82E-14	3.74E-14	
3600	1.00E 00	5.71E-07	5.82E-10	7.14E-11	7.18E-13	1.46E-12	
4000	1.00E 00	2.86E-06	5.94E-09	9.27E-10	1.36E-11	2.72E-11	
4400	1.00E 00	1.07E-05	4.10E-08	7.58E-09	1.51E-10	2.94E-10	
4800	1.00E 00	3.22E-05	2.06E-07	4.37E-08	1.13E-09	2.12E-09	
5200	1.00E 00	8.16E-05	8.07E-07	1.93E-07	6.16E-09	1.12E-08	
5600	1.00E 00	1.82E-04	2.61E-06	6.89E-07	2.64E-08	4.62E-08	
6000	1.00E 00	3.63E-04	7.22E-06	2.08E-06	9.30E-08	1.57E-07	
6400	9.99E-01	6.65E-04	1.76E-05	5.47E-06	2.79E-07	4.53E-07	
6800	9.99E-01	1.14E-03	3.88E-05	1.28E-05	7.35E-07	1.15E-06	
7200	9.98E-01	1.83E-03	7.83E-05	2.74E-05	1.73E-06	2.61E-06	
7600	9.97E-01	2.80E-03	1.87E-04	5.40E-05	3.72E-06	5.40E-06	
8000	9.94E-01	4.10E-03	2.58E-04	9.93E-05	7.39E-06	1.04E-05	
8400	9.94E-01	5.78E-03	4.30E-04	1.72E-04	1.37E-05	1.85E-05	
8800	9.91E-01	7.90E-03	6.84E-04	2.83E-04	2.39E-05	3.14E-05	
9200	9.88E-01	1.05E-02	1.04E-03	4.45E-04	3.94E-05	5.04E-05	
9600	9.84E-01	1.34E-02	1.53E-03	6.71E-04	6.26E-05	7.75E-05	
10000	9.79E-01	1.72E-02	2.18E-03	9.78E-04	9.52E-05	1.15E-04	
11000	9.64E-01	2.87E-02	4.64E-03	2.20E-03	2.34E-04	2.64E-04	
12000	9.43E-01	4.53E-02	8.85E-03	4.25E-03	4.84E-04	5.16E-04	
13000	9.16E-01	6.04E-02	1.44E-02	7.27E-03	8.77E-04	8.89E-04	
14000	8.85E-01	7.93E-02	2.18E-02	1.13E-02	1.43E-03	1.38E-03	
15000	8.50E-01	9.89E-02	3.08E-02	1.63E-02	2.14E-03	1.99E-03	
16000	8.13E-01	1.18E-01	4.10E-02	2.21E-02	2.99E-03	2.68E-03	
17000	7.75E-01	1.37E-01	5.21E-02	2.85E-02	3.95E-03	3.43E-03	
18000	7.38E-01	1.54E-01	6.34E-02	3.52E-02	5.00E-03	4.22E-03	
19000	7.02E-01	1.70E-01	7.52E-02	4.21E-02	6.10E-03	5.01E-03	
20000	6.67E-01	1.84E-01	8.68E-02	4.90E-02	7.22E-03	5.78E-03	
24000	5.53E-01	2.24E-01	1.28E-01	7.44E-02	1.16E-02	8.53E-03	
28000	4.73E-01	2.46E-01	1.61E-01	9.49E-02	1.52E-02	1.06E-02	
32000	4.18E-01	2.57E-01	1.85E-01	1.10E-01	1.82E-02	1.21E-02	
36000	3.78E-01	2.63E-01	2.03E-01	1.22E-01	2.05E-02	1.31E-02	
40000	3.49E-01	2.65E-01	2.17E-01	1.32E-01	2.24E-02	1.39E-02	

TABLE 99. FRACTIONAL ELECTRONIC POPULATIONS OF O₂

TEMP. (°K)	STATE						
	X ^{3Σ⁻} a ^{1Δ_g}	b ^{1Σ⁺}	C ^{2Δ_g}	A ^{3Σ⁺}	c ^{1Σ⁻}	B ^{3Σ⁻}	B ^{3Σ⁻}
1200	1.00E-00	5.51E-05	5.27E-06	5.70E-18	1.35E-18	1.44E-19	5.51E-26
1600	9.99E-01	5.73E-04	2.73E-06	1.84E-13	5.20E-14	8.18E-15	1.63E-19
2000	9.98E-01	2.39E-03	2.91E-05	9.23E-11	2.69E-11	5.68E-12	1.25E-15
2400	9.94E-01	6.16E-01	1.41E-04	5.73E-09	1.90E-09	4.29E-10	4.80E-13
2800	9.88E-01	1.21E-02	4.35E-04	1.08E-07	3.68E-08	9.11E-09	3.31E-11
3200	9.79E-01	1.99E-02	1.01E-03	9.54E-07	3.30E-07	8.73E-08	7.76E-10
3600	9.69E-01	2.91E-02	1.03E-03	5.04E-06	1.78E-06	4.92E-07	8.84E-09
4000	9.57E-01	3.88E-02	1.23E-03	1.88E-05	6.68E-06	1.92E-06	6.08E-08
4400	9.44E-01	5.09E-02	1.49E-03	3.41E-05	1.94E-05	5.72E-06	2.89E-07
4800	9.30E-01	6.23E-02	1.78E-03	6.62E-05	4.62E-05	1.39E-05	1.04E-06
5200	9.16E-01	7.38E-02	2.02E-03	1.26E-04	9.50E-05	2.92E-05	3.05E-06
5600	8.98E-01	8.51E-02	2.20E-03	2.78E-04	1.74E-04	5.43E-05	7.34E-06
6000	8.86E-01	9.60E-02	2.48E-03	4.96E-04	2.90E-04	9.17E-05	1.64E-05
6400	8.74E-01	1.07E-01	2.78E-03	8.49E-04	4.49E-04	1.44E-04	3.19E-05
6800	8.60E-01	1.16E-01	2.99E-03	1.79E-03	6.54E-04	2.11E-04	5.69E-05
7200	8.46E-01	1.26E-01	3.19E-03	2.47E-03	9.07E-04	2.95E-04	9.44E-05
7600	8.31E-01	1.35E-01	3.28E-03	3.28E-03	1.21E-03	3.95E-04	1.48E-04
8000	8.21E-01	1.43E-01	3.00E-03	4.20E-03	1.55E-03	5.10E-04	2.19E-04
8400	8.09E-01	1.50E-01	3.30E-03	4.23E-03	1.93E-03	6.39E-04	3.11E-04
8800	7.97E-01	1.57E-01	3.58E-03	6.31E-03	2.34E-03	7.81E-04	4.27E-04
9200	7.86E-01	1.64E-01	3.85E-03	7.55E-03	2.79E-03	9.33E-04	5.44E-04
9600	7.75E-01	1.70E-01	4.11E-03	8.80E-03	3.25E-03	1.09E-03	7.31E-04
10000	7.65E-01	1.75E-01	4.36E-03	1.01E-02	3.74E-03	1.26E-03	9.21E-04
11000	7.42E-01	1.87E-01	4.93E-03	1.34E-02	4.99E-03	1.70E-03	1.51E-03
12000	7.22E-01	1.96E-01	5.41E-03	1.69E-02	6.27E-03	2.15E-03	2.24E-03
13000	7.05E-01	2.04E-01	5.83E-03	2.03E-02	7.53E-03	2.59E-03	3.10E-03
14000	6.89E-01	2.10E-01	6.19E-03	2.33E-02	8.73E-03	3.02E-03	4.07E-03
15000	6.76E-01	2.14E-01	6.49E-03	2.63E-02	9.87E-03	3.43E-03	5.11E-03
16000	6.64E-01	2.18E-01	6.75E-03	2.94E-02	1.09E-02	3.81E-03	6.21E-03
17000	6.53E-01	2.22E-01	6.97E-03	3.20E-02	1.19E-02	4.17E-03	7.33E-03
18000	6.44E-01	2.24E-01	7.16E-03	3.43E-02	1.28E-02	4.50E-03	8.52E-03
19000	6.35E-01	2.26E-01	7.33E-03	3.63E-02	1.37E-02	4.81E-03	9.69E-03
20000	6.28E-01	2.28E-01	7.48E-03	3.88E-02	1.45E-02	5.09E-03	1.09E-02
2400	6.04E-01	2.33E-01	7.90E-03	4.57E-02	1.70E-02	6.04E-03	1.54E-02
28000	5.87E-01	2.35E-01	8.16E-03	5.08E-02	1.89E-02	6.75E-03	1.94E-02
32000	5.74E-01	2.37E-01	8.34E-03	5.44E-02	2.04E-02	7.29E-03	2.33E-02
36000	5.65E-01	2.37E-01	8.46E-03	5.78E-02	2.15E-02	7.72E-03	2.64E-02
40000	5.57E-01	2.38E-01	8.55E-03	6.00E-02	2.24E-02	8.06E-03	2.95E-02

TABLE 100. FRACTIONAL ELECTRONIC POPULATIONS OF $52+$

TEMP. (%)	$X^{2F_{7/2}}$	$a^{4F_{3/2}}$	$\lambda^{2H_{1/2}}$	STATE 5^4F_6
1200	1.00E-00	5.40E-17	2.04E-20	4.55E-26
1600	1.00E-00	9.53E-13	2.95E-15	1.17E-19
2000	1.00E-00	5.40E-10	3.06E-12	6.30E-16
2400	1.00E-00	1.72E-08	3.17E-10	3.08E-13
2800	1.00E-00	2.86E-07	6.76E-09	2.12E-11
3200	1.00E-00	2.34E-06	1.06E-07	5.10E-10
3600	1.00E-00	1.22E-05	7.36E-07	6.07E-09
4000	1.00E-00	4.55E-05	3.57E-06	4.41E-08
4400	1.00E-00	1.34E-04	1.23E-05	2.24E-07
4800	1.00E-00	3.29E-04	3.50E-05	8.64E-07
5200	9.99E-01	7.02E-04	6.44E-05	4.71E-06
5600	9.99E-01	1.34E-03	1.79E-04	7.20E-06
6000	9.97E-01	2.35E-03	3.41E-04	1.67E-05
6400	9.96E-01	3.81E-03	5.36E-04	3.45E-05
6800	9.93E-01	5.65E-03	9.70E-04	6.64E-05
7200	9.90E-01	8.46E-03	1.49E-03	1.17E-04
7600	9.86E-01	1.18E-02	2.16E-03	1.94E-04
8000	9.81E-01	1.57E-02	3.01E-03	3.04E-04
8400	9.75E-01	2.04E-02	4.05E-03	4.54E-04
8800	9.68E-01	2.57E-02	5.26E-03	6.52E-04
9200	9.61E-01	3.16E-02	6.65E-03	9.02E-04
9600	9.52E-01	3.81E-02	8.21E-03	1.21E-03
10000	9.44E-01	4.50E-02	9.91E-03	1.58E-03
10400	9.19E-01	6.37E-02	1.47E-02	2.77E-03
12000	8.92E-01	8.35E-02	2.00E-02	4.35E-03
13000	8.65E-01	1.03E-01	2.55E-02	6.26E-03
14000	8.38E-01	1.22E-01	3.09E-02	8.45E-03
15000	8.13E-01	1.40E-01	3.62E-02	1.08E-02
16000	7.89E-01	1.57E-01	4.11E-02	1.34E-02
17000	7.67E-01	1.72E-01	4.58E-02	1.60E-02
18000	7.46E-01	1.85E-01	5.00E-02	1.86E-02
19000	7.27E-01	1.98E-01	5.39E-02	2.13E-02
20000	7.10E-01	2.08E-01	5.74E-02	2.39E-02
24000	6.55E-01	2.42E-01	6.87E-02	3.38E-02
28000	6.17E-01	2.64E-01	7.66E-02	4.25E-02
32000	5.88E-01	2.80E-01	8.22E-02	4.99E-02
36000	5.67E-01	2.91E-01	8.64E-02	5.63E-02
40000	5.50E-01	2.99E-01	8.95E-02	6.17E-02

TABLE 101. FRACTIONAL ELECTRONIC POPULATIONS OF CO

TEMP. (°K)	STATE					
	$X^1\Sigma^+$	$a^3\Pi$	$a^3\Sigma^+$	$d^3\Delta$	$e^3\Sigma^-$	$I^1\Sigma^-$
1200	1.00E-00	4.18E-25	7.89E-29	2.92E-31	3.87E-33	5.10E-34
1600	1.00E-00	8.78E-19	1.36E-21	6.28E-23	1.46E-25	1.30E-26
2000	1.00E-00	5.49E-15	3.03E-17	1.44E-18	6.34E-20	1.73E-20
2400	1.00E-00	1.87E-12	2.41E-14	2.16E-15	1.82E-16	4.19E-17
2800	1.00E-00	1.20E-10	2.86E-12	4.04E-13	4.44E-14	1.10E-14
3200	1.00E-00	2.74E-09	1.03E-10	2.05E-11	2.75E-12	7.18E-13
3600	1.00E-00	3.12E-08	1.67E-09	4.16E-10	6.84E-11	1.14E-11
4000	1.00E-00	2.19E-07	1.56E-08	5.04E-09	8.94E-10	2.51E-10
4400	1.00E-00	1.04E-06	9.74E-08	1.14E-08	7.17E-09	2.12E-09
4800	1.00E-00	4.06E-06	4.48E-07	1.93E-07	4.21E-08	1.55E-08
5200	1.00E-00	1.25E-05	1.63E-06	9.20E-07	1.83E-07	5.62E-08
5600	1.00E-00	3.28E-05	4.95E-06	2.76E-06	6.78E-07	2.04E-07
6000	1.00E-00	7.58E-05	1.29E-05	7.31E-06	2.03E-06	6.21E-07
6400	1.00E-00	1.58E-04	3.90E-05	1.99E-05	5.37E-06	1.64E-06
6800	1.00E-00	3.01E-04	6.31E-05	4.47E-05	1.26E-05	3.87E-06
7200	9.93E-01	5.34E-04	1.22E-04	9.19E-05	2.68E-05	8.20E-06
7600	9.99E-01	8.96E-04	2.20E-04	1.75E-04	5.25E-05	1.63E-05
8000	9.93E-01	1.42E-03	3.74E-04	3.12E-04	9.60E-05	2.99E-05
8400	9.96E-01	2.16E-03	6.04E-04	5.24E-04	1.65E-04	5.17E-05
8800	9.95E-01	3.16E-03	9.32E-04	8.40E-04	2.70E-04	8.47E-05
9200	9.92E-01	4.44E-03	1.38E-03	1.29E-03	4.23E-04	1.33E-04
9600	9.89E-01	6.11E-03	1.99E-03	1.90E-03	6.34E-04	1.99E-04
10000	9.85E-01	8.15E-03	2.75E-03	2.71E-03	9.11E-04	2.89E-04
11000	9.79E-01	1.51E-02	5.56E-03	5.82E-03	2.03E-03	6.40E-04
12000	9.68E-01	2.50E-02	9.82E-03	1.08E-02	3.84E-03	1.22E-03
13000	9.19E-01	3.75E-02	1.56E-02	1.77E-02	6.43E-03	2.04E-03
14000	8.81E-01	5.21E-02	2.27E-02	2.66E-02	9.92E-03	3.11E-03
15000	8.43E-01	6.80E-02	3.07E-02	3.70E-02	1.36E-02	4.39E-03
16000	7.99E-01	8.49E-02	3.94E-02	4.84E-02	1.83E-02	5.81E-03
17000	7.55E-01	1.01E-01	4.82E-02	6.03E-02	2.31E-02	7.32E-03
18000	7.11E-01	1.16E-01	5.69E-02	7.23E-02	2.79E-02	8.84E-03
19000	6.69E-01	1.30E-01	6.52E-02	8.40E-02	3.26E-02	1.03E-02
20000	6.30E-01	1.44E-01	7.30E-02	9.51E-02	3.71E-02	1.18E-02
24000	5.05E-01	1.61E-01	9.78E-02	1.32E-01	5.27E-02	1.66E-02
28000	4.23E-01	2.06E-01	1.14E-01	1.58E-01	6.34E-02	2.01E-02
32000	3.63E-01	2.21E-01	1.25E-01	1.79E-01	7.10E-02	2.25E-02
36000	3.11E-01	2.30E-01	1.32E-01	1.88E-01	7.69E-02	2.42E-02
40000	3.05E-01	2.33E-01	1.37E-01	1.97E-01	8.06E-02	2.55E-02

TABLE 102. DIMENSIONLESS PRESSURE, PV/RT, OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO										
	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
1000	3.982E 00	3.981E 00	3.979E 00	3.973E 00	3.956E 00	3.905E 00	3.773E 00	3.508E 00	3.135E 00	2.766E 00	2.477E 00
1050	3.982E 00	3.982E 00	3.981E 00	3.978E 00	3.970E 00	3.945E 00	3.800E 00	3.717E 00	3.417E 00	3.035E 00	2.682E 00
1100	3.985E 00	3.983E 00	3.982E 00	3.980E 00	3.974E 00	3.945E 00	3.932E 00	3.840E 00	3.634E 00	3.296E 00	2.913E 00
1150	3.994E 00	3.986E 00	3.983E 00	3.981E 00	3.979E 00	3.973E 00	3.956E 00	3.906E 00	3.777E 00	3.517E 00	3.149E 00
1200	4.025E 00	3.994E 00	3.986E 00	3.983E 00	3.981E 00	3.977E 00	3.947E 00	3.939E 00	3.862E 00	3.681E 00	3.365E 00
1250	4.109E 00	4.027E 00	3.997E 00	3.986E 00	3.982E 00	3.979E 00	3.973E 00	3.957E 00	3.911E 00	3.791E 00	3.544E 00
1300	4.287E 00	4.104E 00	4.025E 00	3.996E 00	3.986E 00	3.981E 00	3.977E 00	3.966E 00	3.938E 00	3.860E 00	3.680E 00
1350	4.572E 00	4.262E 00	4.092E 00	4.020E 00	3.994E 00	3.984E 00	3.979E 00	3.972E 00	3.953E 00	3.903E 00	3.775E 00
1400	4.904E 00	4.511E 00	4.224E 00	4.075E 00	4.013E 00	3.991E 00	3.982E 00	3.976E 00	3.963E 00	3.929E 00	3.840E 00
1450	5.205E 00	4.815E 00	4.435E 00	4.180E 00	4.055E 00	4.006E 00	3.988E 00	3.979E 00	3.969E 00	3.945E 00	3.883E 00
1500	5.438E 00	5.109E 00	4.705E 00	4.351E 00	4.135E 00	4.036E 00	3.998E 00	3.983E 00	3.973E 00	3.956E 00	3.911E 00
1550	5.618E 00	5.352E 00	4.987E 00	4.581E 00	4.266E 00	4.093E 00	4.019E 00	3.991E 00	3.978E 00	3.963E 00	3.930E 00
1600	5.755E 00	5.543E 00	5.237E 00	4.840E 00	4.452E 00	4.198E 00	4.058E 00	4.005E 00	3.984E 00	3.968E 00	3.942E 00
1650	5.851E 00	5.692E 00	5.442E 00	5.091E 00	4.678E 00	4.329E 00	4.123E 00	4.030E 00	3.993E 00	3.974E 00	3.952E 00
1700	5.908E 00	5.802E 00	5.606E 00	5.309E 00	4.916E 00	4.513E 00	4.223E 00	4.072E 00	4.008E 00	3.981E 00	3.959E 00
1750	5.940E 00	5.875E 00	5.733E 00	5.490E 00	5.141E 00	4.723E 00	4.360E 00	4.137E 00	4.034E 00	3.991E 00	3.966E 00
1800	5.958E 00	5.919E 00	5.824E 00	5.635E 00	5.337E 00	4.940E 00	4.531E 00	4.232E 00	4.074E 00	4.007E 00	3.974E 00
1850	5.969E 00	5.944E 00	5.894E 00	5.747E 00	5.502E 00	5.145E 00	4.722E 00	4.357E 00	4.135E 00	4.030E 00	3.984E 00
1900	5.980E 00	5.960E 00	5.921E 00	5.820E 00	5.636E 00	5.327E 00	4.919E 00	4.510E 00	4.218E 00	4.066E 00	3.999E 00
1950	5.994E 00	5.972E 00	5.944E 00	5.882E 00	5.740E 00	5.482E 00	5.108E 00	4.680E 00	4.326E 00	4.117E 00	4.019E 00
2000	6.016E 00	5.984E 00	5.960E 00	5.918E 00	5.817E 00	5.611E 00	5.280E 00	4.858E 00	4.457E 00	4.185E 00	4.048E 00
2200	6.371E 00	6.136E 00	6.031E 00	5.986E 00	5.951E 00	5.888E 00	5.745E 00	5.473E 00	5.076E 00	4.639E 00	4.293E 00
2400	7.181E 00	6.745E 00	6.356E 00	6.127E 00	6.023E 00	5.972E 00	5.917E 00	5.803E 00	5.568E 00	5.191E 00	4.744E 00
2600	7.719E 00	7.446E 00	7.050E 00	6.604E 00	6.261E 00	6.078E 00	5.994E 00	5.930E 00	5.822E 00	5.598E 00	5.225E 00
2800	7.919E 00	7.815E 00	7.607E 00	7.252E 00	6.802E 00	6.392E 00	6.138E 00	6.014E 00	5.934E 00	5.815E 00	5.579E 00
3000	7.997E 00	7.945E 00	7.863E 00	7.686E 00	7.365E 00	6.929E 00	6.486E 00	6.185E 00	6.028E 00	5.926E 00	5.784E 00
3200	8.190E 00	8.041E 00	7.966E 00	7.886E 00	7.728E 00	7.424E 00	6.988E 00	6.531E 00	6.205E 00	6.026E 00	5.901E 00
3400	8.705E 00	8.313E 00	8.093E 00	7.886E 00	7.896E 00	7.735E 00	7.431E 00	6.988E 00	6.526E 00	6.055E 00	5.901E 00
3600	9.316E 00	8.856E 00	8.418E 00	8.141E 00	8.002E 00	7.895E 00	7.718E 00	7.395E 00	6.937E 00	6.477E 00	6.154E 00
3800	9.712E 00	9.394E 00	8.944E 00	8.485E 00	8.174E 00	8.008E 00	7.880E 00	7.676E 00	7.318E 00	6.840E 00	6.393E 00
4000	9.927E 00	9.737E 00	9.424E 00	8.977E 00	8.509E 00	8.182E 00	7.959E 00	7.797E 00	7.401E 00	7.197E 00	6.704E 00
4200	1.013E 01	9.941E 00	9.739E 00	9.416E 00	8.960E 00	8.672E 00	8.166E 00	7.973E 00	7.788E 00	7.486E 00	7.031E 00
4400	1.048E 01	1.015E 01	9.740E 00	9.717E 00	9.372E 00	8.901E 00	8.439E 00	8.126E 00	7.925E 00	7.695E 00	7.323E 00
4600	1.094E 01	1.049E 01	1.015E 01	9.921E 00	9.671E 00	9.292E 00	8.802E 00	8.358E 00	8.065E 00	7.847E 00	7.553E 00
4800	1.133E 01	1.091E 01	1.046E 01	1.012E 01	9.880E 00	9.594E 00	9.172E 00	8.671E 00	8.257E 00	7.983E 00	7.728E 00
5000	1.166E 01	1.128E 01	1.085E 01	1.040E 01	1.007E 01	9.814E 00	9.481E 00	9.014E 00	8.517E 00	8.143E 00	7.871E 00
6000	1.204E 01	1.197E 01	1.189E 01	1.176E 01	1.108E 01	1.058E 01	1.058E 01	1.015E 01	9.802E 00	9.389E 00	8.863E 00
7000	1.236E 01	1.231E 01	1.220E 01	1.208E 01	1.197E 01	1.187E 01	1.167E 01	1.132E 01	1.082E 01	1.030E 01	9.856E 00
8000	1.239E 01	1.239E 01	1.238E 01	1.234E 01	1.227E 01	1.214E 01	1.201E 01	1.188E 01	1.166E 01	1.127E 01	1.079E 01

TABLE 102(CONT) DIMENSIONLESS PRESSURE, PV/RT, OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO									
	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
1000	2.282E 00	2.160E 00	2.087E 00	2.042E 00	2.008E 00	1.966E 00	1.886E 00	1.757E 00	1.597E 00	1.451E 00
1050	2.419E 00	2.245E 00	2.138E 00	2.073E 00	2.031E 00	1.992E 00	1.934E 00	1.827E 00	1.675E 00	1.517E 00
1100	2.587E 00	2.354E 00	2.205E 00	2.113E 00	2.077E 00	2.015E 00	1.967E 00	1.832E 00	1.746E 00	1.584E 00
1150	2.779E 00	2.487E 00	2.289E 00	2.165E 00	2.088E 00	2.038E 00	1.993E 00	1.824E 00	1.807E 00	1.650E 00
1200	2.983E 00	2.642E 00	2.392E 00	2.228E 00	2.127E 00	2.064E 00	2.015E 00	1.957E 00	1.850E 00	1.711E 00
1250	3.184E 00	2.811E 00	2.512E 00	2.305E 00	2.174E 00	2.093E 00	2.036E 00	1.983E 00	1.900E 00	1.767E 00
1300	3.366E 00	2.966E 00	2.646E 00	2.395E 00	2.231E 00	2.128E 00	2.062E 00	2.007E 00	1.933E 00	1.815E 00
1350	3.520E 00	3.157E 00	2.789E 00	2.296E 00	2.296E 00	2.169E 00	2.088E 00	2.025E 00	1.962E 00	1.857E 00
1400	3.642E 00	3.315E 00	2.937E 00	2.609E 00	2.371E 00	2.215E 00	2.116E 00	2.050E 00	1.986E 00	1.893E 00
1450	3.733E 00	3.453E 00	3.083E 00	2.727E 00	2.454E 00	2.269E 00	2.151E 00	2.073E 00	2.008E 00	1.923E 00
1500	3.799E 00	3.568E 00	3.221E 00	2.850E 00	2.543E 00	2.328E 00	2.188E 00	2.098E 00	2.029E 00	1.950E 00
1550	3.846E 00	3.660E 00	3.346E 00	2.972E 00	2.639E 00	2.393E 00	2.230E 00	2.125E 00	2.050E 00	1.973E 00
1600	3.879E 00	3.731E 00	3.456E 00	3.092E 00	2.738E 00	2.463E 00	2.275E 00	2.154E 00	2.071E 00	1.995E 00
1650	3.903E 00	3.785E 00	3.550E 00	3.204E 00	2.838E 00	2.537E 00	2.325E 00	2.186E 00	2.093E 00	2.015E 00
1700	3.919E 00	3.826E 00	3.627E 00	3.307E 00	2.938E 00	2.615E 00	2.378E 00	2.220E 00	2.116E 00	2.035E 00
1750	3.932E 00	3.856E 00	3.690E 00	3.400E 00	3.035E 00	2.694E 00	2.434E 00	2.257E 00	2.140E 00	2.054E 00
1800	3.942E 00	3.880E 00	3.746E 00	3.481E 00	3.128E 00	2.774E 00	2.492E 00	2.296E 00	2.166E 00	2.073E 00
1850	3.951E 00	3.898E 00	3.789E 00	3.551E 00	3.215E 00	2.854E 00	2.553E 00	2.337E 00	2.193E 00	2.092E 00
1900	3.960E 00	3.912E 00	3.812E 00	3.611E 00	3.295E 00	2.933E 00	2.615E 00	2.380E 00	2.221E 00	2.111E 00
1950	3.971E 00	3.924E 00	3.838E 00	3.662E 00	3.368E 00	3.009E 00	2.678E 00	2.425E 00	2.251E 00	2.131E 00
2000	3.983E 00	3.935E 00	3.859E 00	3.704E 00	3.433E 00	3.082E 00	2.740E 00	2.471E 00	2.282E 00	2.151E 00
2050	4.092E 00	3.990E 00	3.918E 00	3.815E 00	3.527E 00	3.131E 00	2.981E 00	2.660E 00	2.414E 00	2.238E 00
2100	4.360E 00	4.118E 00	3.985E 00	3.883E 00	3.742E 00	3.509E 00	3.186E 00	2.845E 00	2.552E 00	2.329E 00
2150	4.772E 00	4.374E 00	4.113E 00	3.957E 00	3.821E 00	3.630E 00	3.348E 00	3.011E 00	2.686E 00	2.422E 00
2200	5.193E 00	4.734E 00	4.338E 00	4.075E 00	3.898E 00	3.720E 00	3.473E 00	3.154E 00	2.810E 00	2.513E 00
2250	5.517E 00	5.104E 00	4.641E 00	4.261E 00	4.003E 00	3.802E 00	3.572E 00	3.274E 00	2.923E 00	2.600E 00
2300	5.724E 00	5.409E 00	4.963E 00	4.507E 00	4.151E 00	3.895E 00	3.659E 00	3.376E 00	3.023E 00	2.682E 00
2350	5.853E 00	5.624E 00	5.250E 00	4.779E 00	4.344E 00	4.014E 00	3.748E 00	3.467E 00	3.113E 00	2.758E 00
2400	5.959E 00	5.770E 00	5.407E 00	5.049E 00	4.584E 00	4.161E 00	3.847E 00	3.555E 00	3.198E 00	2.829E 00
2450	6.092E 00	5.883E 00	5.639E 00	5.265E 00	4.790E 00	4.333E 00	3.962E 00	3.643E 00	3.275E 00	2.897E 00
2500	6.284E 00	6.002E 00	5.766E 00	5.446E 00	5.002E 00	4.517E 00	4.093E 00	3.736E 00	3.353E 00	2.962E 00
2550	6.539E 00	6.155E 00	5.881E 00	5.591E 00	5.188E 00	4.701E 00	4.236E 00	3.837E 00	3.433E 00	3.025E 00
2600	6.827E 00	6.356E 00	6.008E 00	5.713E 00	5.345E 00	4.875E 00	4.385E 00	3.947E 00	3.516E 00	3.070E 00
2650	7.108E 00	6.595E 00	6.163E 00	5.830E 00	5.480E 00	5.033E 00	4.534E 00	4.063E 00	3.603E 00	3.157E 00
2700	7.353E 00	6.849E 00	6.351E 00	5.957E 00	5.601E 00	5.175E 00	4.678E 00	4.181E 00	3.695E 00	3.255E 00
2750	7.553E 00	7.092E 00	6.562E 00	6.101E 00	5.716E 00	5.302E 00	4.813E 00	4.301E 00	3.789E 00	3.356E 00
2800	7.845E 00	7.328E 00	6.819E 00	6.402E 00	6.022E 00	5.682E 00	5.377E 00	4.847E 00	4.269E 00	3.673E 00
2850	8.101E 00	7.581E 00	7.171E 00	6.717E 00	6.355E 00	6.051E 00	5.723E 00	5.223E 00	4.712E 00	4.057E 00
2900	8.303E 00	7.810E 00	7.454E 00	7.041E 00	6.641E 00	6.341E 00	6.041E 00	5.507E 00	5.133E 00	4.425E 00
2950	8.517E 00	8.050E 00	7.741E 00	7.331E 00	6.931E 00	6.631E 00	6.341E 00	5.807E 00	5.433E 00	4.713E 00

15CC00	1.231E 01	1.222E 01	1.192E 00	9.041E 00	9.276E 00	7.497E 00	6.721E 00	5.942E 00	5.119E 00
2CC000	1.236E 01	1.233E 01	1.171E 01	1.121E 01	1.050E 01	9.023E 00	8.664E 00	7.674E 00	6.638E 00
300C00	1.240E 01	1.237E 01	1.215E 01	1.193E 01	1.152E 01	1.090E 01	1.004E 01	9.019E 00	7.884E 00
400C00	1.359E 01	1.314E 01	1.229E 01	1.220E 01	1.204E 01	1.175E 01	1.127E 01	1.054E 01	9.559E 00
			1.248E 01	1.233E 01	1.219E 01	1.200E 01	1.169E 01	1.120E 01	1.045E 01
5CC000	1.512E 01	1.454E 01	1.362E 01	1.312E 01	1.244E 01	1.228E 01	1.194E 01	1.155E 01	1.094E 01
600C00	1.603E 01	1.579E 01	1.479E 01	1.419E 01	1.343E 01	1.305E 01	1.246E 01	1.192E 01	1.134E 01
80C000	1.641E 01	1.638E 01	1.614E 01	1.584E 01	1.542E 01	1.478E 01	1.401E 01	1.322E 01	1.239E 01
1000C00	1.642E 01	1.642E 01	1.637E 01	1.629E 01	1.612E 01	1.580E 01	1.528E 01	1.452E 01	1.368E 01
1500C00	1.643E 01	1.642E 01	1.641E 01	1.639E 01	1.635E 01	1.629E 01	1.619E 01	1.589E 01	1.541E 01
2000C00	1.643E 01	1.643E 01	1.642E 01	1.641E 01	1.638E 01	1.635E 01	1.627E 01	1.614E 01	1.590E 01
3000C00	1.643E 01	1.644E 01	1.643E 01	1.642E 01	1.641E 01	1.639E 01	1.635E 01	1.628E 01	1.616E 01
4000C00	1.643E 01	1.645E 01	1.644E 01	1.644E 01	1.643E 01	1.641E 01	1.638E 01	1.634E 01	1.626E 01
5000C00	1.643E 01	1.645E 01	1.644E 01	1.644E 01	1.644E 01	1.643E 01	1.641E 01	1.638E 01	1.632E 01
6000C00	1.643E 01	1.645E 01	1.645E 01	1.645E 01	1.644E 01	1.643E 01	1.642E 01	1.640E 01	1.635E 01
8000C00	1.643E 01	1.645E 01	1.645E 01	1.645E 01	1.644E 01	1.644E 01	1.643E 01	1.642E 01	1.639E 01
10000C00	1.643E 01	1.645E 01	1.645E 01	1.645E 01	1.645E 01	1.644E 01	1.644E 01	1.643E 01	1.641E 01

TABLE 103. PRESSURE (ATM) OF EQUILIBRIUM AIR

TEMP. (DEC K)	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
10500	1.450E-07	4.609E-07	1.457E-06	4.600E-06	1.448E-05	4.521E-05	1.301E-04	4.061E-04	1.140E-03	3.202E-03	9.048E-03
10500	1.531E-07	4.840E-07	1.530E-06	4.836E-06	1.528E-05	4.798E-05	1.492E-04	4.519E-04	1.314E-03	3.690E-03	1.031E-02
11000	1.659E-07	5.072E-07	1.603E-06	5.068E-06	1.601E-05	5.049E-05	1.503E-04	4.890E-04	1.463E-03	4.198E-03	1.173E-02
11500	1.822E-07	5.304E-07	1.677E-06	5.300E-06	1.675E-05	5.289E-05	1.645E-04	5.200E-04	1.590E-03	4.602E-03	1.326E-02
12000	1.768E-07	5.552E-07	1.751E-06	5.533E-06	1.749E-05	5.525E-05	1.743E-04	5.473E-04	1.697E-03	5.113E-03	1.478E-02
12500	1.808E-07	5.827E-07	1.829E-06	5.769E-06	1.822E-05	5.758E-05	1.818E-04	5.726E-04	1.790E-03	5.486E-03	1.627E-02
13000	2.040E-07	6.177E-07	1.916E-06	6.014E-06	1.897E-05	5.992E-05	1.893E-04	5.969E-04	1.874E-03	5.810E-03	1.751E-02
13500	2.259E-07	6.640E-07	2.022E-06	6.283E-06	1.974E-05	6.227E-05	1.967E-04	6.208E-04	1.954E-03	6.100E-03	1.866E-02
14000	2.514E-07	7.311E-07	2.165E-06	6.604E-06	2.057E-05	6.469E-05	2.041E-04	6.443E-04	2.031E-03	6.368E-03	1.968E-02
14500	2.763E-07	8.083E-07	2.354E-06	7.016E-06	2.153E-05	6.724E-05	2.117E-04	6.479E-04	2.107E-03	6.622E-03	2.061E-02
15000	2.986E-07	8.872E-07	2.584E-06	7.555E-06	2.270E-05	7.009E-05	2.196E-04	6.917E-04	2.182E-03	6.869E-03	2.148E-02
15500	3.188E-07	9.604E-07	2.830E-06	8.220E-06	2.421E-05	7.344E-05	2.281E-04	7.162E-04	2.257E-03	7.111E-03	2.230E-02
16000	3.371E-07	1.027E-06	3.068E-06	8.965E-06	2.608E-05	7.758E-05	2.377E-04	7.418E-04	2.333E-03	7.351E-03	2.309E-02
16500	3.534E-07	1.087E-06	3.287E-06	9.724E-06	2.826E-05	8.270E-05	2.480E-04	7.698E-04	2.412E-03	7.591E-03	2.387E-02
17000	3.677E-07	1.142E-06	3.489E-06	1.045E-05	3.060E-05	8.822E-05	2.628E-04	8.013E-04	2.493E-03	7.835E-03	2.465E-02
17500	3.805E-07	1.190E-06	3.673E-06	1.112E-05	3.293E-05	9.569E-05	2.793E-04	8.382E-04	2.584E-03	8.086E-03	2.541E-02
18000	3.928E-07	1.233E-06	3.838E-06	1.174E-05	3.517E-05	1.029E-04	2.986E-04	8.819E-04	2.685E-03	8.349E-03	2.619E-02
18500	4.043E-07	1.273E-06	3.985E-06	1.231E-05	3.726E-05	1.102E-04	3.190E-04	9.332E-04	2.800E-03	8.632E-03	2.698E-02
19000	4.160E-07	1.311E-06	4.119E-06	1.282E-05	3.920E-05	1.172E-04	3.421E-04	9.919E-04	2.934E-03	8.943E-03	2.781E-02
19500	4.279E-07	1.348E-06	4.244E-06	1.328E-05	4.098E-05	1.238E-04	3.646E-04	1.056E-03	3.088E-03	9.293E-03	2.869E-02
20000	4.403E-07	1.386E-06	4.364E-06	1.370E-05	4.259E-05	1.299E-04	3.866E-04	1.125E-03	3.263E-03	9.691E-03	2.964E-02
22000	5.132E-07	1.563E-06	4.857E-06	1.524E-05	4.793E-05	1.500E-04	4.627E-04	1.394E-03	4.088E-03	1.182E-02	3.458E-02
24000	6.310E-07	1.874E-06	5.585E-06	1.702E-05	5.292E-05	1.659E-04	5.199E-04	1.612E-03	4.892E-03	1.442E-02	4.169E-02
26000	7.347E-07	2.241E-06	6.711E-06	1.988E-05	5.959E-05	1.830E-04	5.705E-04	1.785E-03	5.541E-03	1.685E-02	4.974E-02
28000	8.119E-07	2.533E-06	7.792E-06	2.351E-05	6.973E-05	2.072E-04	6.292E-04	1.950E-03	6.402E-03	1.885E-02	5.719E-02
30000	8.783E-07	2.759E-06	8.635E-06	2.669E-05	8.093E-05	2.404E-04	7.124E-04	2.148E-03	7.263E-03	2.058E-02	6.353E-02
32000	9.594E-07	2.979E-06	9.332E-06	2.921E-05	9.050E-05	2.750E-04	8.186E-04	2.420E-03	7.269E-03	2.232E-02	6.913E-02
34000	1.084E-06	3.272E-06	1.007E-05	3.143E-05	9.828E-05	3.044E-04	9.250E-04	2.751E-03	8.123E-03	2.438E-02	7.474E-02
36000	1.229E-06	3.691E-06	1.109E-05	3.393E-05	1.055E-04	3.290E-04	1.017E-03	3.082E-03	9.142E-03	2.700E-02	8.113E-02
38000	1.351E-06	4.132E-06	1.244E-05	3.733E-05	1.137E-04	3.523E-04	1.096E-03	3.377E-03	1.010E-02	3.009E-02	8.894E-02
40000	1.454E-06	4.509E-06	1.380E-05	4.157E-05	1.246E-04	3.789E-04	1.171E-03	3.634E-03	1.113E-02	3.333E-02	9.816E-02
42000	1.559E-06	4.834E-06	1.517E-05	4.579E-05	1.378E-04	4.129E-04	1.256E-03	3.877E-03	1.198E-02	3.640E-02	1.081E-01
44000	1.689E-06	5.171E-06	1.601E-05	4.950E-05	1.510E-04	4.534E-04	1.359E-03	4.139E-03	1.274E-02	3.919E-02	1.193E-01
46000	1.842E-06	5.585E-06	1.709E-05	5.283E-05	1.629E-04	4.948E-04	1.482E-03	4.451E-03	1.358E-02	4.179E-02	1.272E-01
48000	1.990E-06	6.063E-06	1.838E-05	5.624E-05	1.736E-04	5.331E-04	1.612E-03	4.819E-03	1.451E-02	4.436E-02	1.359E-01
50000	2.129E-06	6.532E-06	1.986E-05	6.019E-05	1.844E-04	5.681E-04	1.735E-03	5.217E-03	1.559E-02	4.713E-02	1.441E-01
60000	2.645E-06	8.133E-06	2.613E-05	8.166E-05	2.524E-04	7.694E-04	2.324E-03	7.052E-03	2.153E-02	6.522E-02	1.947E-01
70000	3.168E-06	9.973E-06	3.127E-05	9.787E-05	3.069E-04	9.617E-04	2.922E-03	9.173E-03	2.772E-02	8.347E-02	2.576E-01
80000	3.629E-06	1.147E-05	3.625E-05	1.143E-04	3.593E-04	1.123E-03	3.517E-03	1.100E-02	3.415E-02	1.044E-01	3.142E-01

190500	6.608E-06	2.172E-03	9.887E-04	2.172E-04	9.887E-04	2.172E-03	9.887E-03	2.172E-02	9.887E-02	2.172E-01	9.887E-01	2.172E-01	9.887E-01
200500	9.128E-04	2.877E-05	9.087E-05	2.877E-04	9.087E-04	2.877E-03	9.087E-03	2.877E-02	9.087E-02	2.877E-01	9.087E-01	2.877E-01	9.087E-01
300500	1.716E-05	5.285E-05	1.615E-04	4.969E-04	1.543E-03	4.813E-03	4.813E-03	1.491E-02	9.074E-03	1.402E-01	4.355E-01	1.402E-01	4.355E-01
400500	2.402E-05	7.574E-05	2.381E-04	7.470E-04	2.346E-03	7.363E-03	2.297E-02	7.074E-02	2.297E-02	7.074E-01	2.297E-01	7.074E-01	2.297E-01
500500	3.008E-05	9.511E-05	3.007E-04	9.509E-04	3.005E-03	9.488E-03	2.989E-02	9.383E-02	2.989E-02	9.383E-01	2.989E-01	9.383E-01	2.989E-01
600500	3.609E-05	1.141E-04	3.609E-04	1.141E-03	3.609E-03	1.141E-02	3.609E-02	1.140E-01	3.609E-01	1.140E-01	3.609E-01	1.140E-01	3.609E-01
800500	4.812E-05	1.522E-04	4.812E-04	1.522E-03	4.812E-03	1.522E-02	4.812E-02	1.522E-01	4.812E-01	1.522E-01	4.812E-01	1.522E-01	4.812E-01
1000500	6.015E-05	1.902E-04	6.015E-04	1.902E-03	6.015E-03	1.902E-02	6.015E-02	1.902E-01	6.015E-01	1.902E-01	6.015E-01	1.902E-01	6.015E-01
1500500	9.025E-05	2.854E-04	9.024E-04	2.853E-03	9.023E-03	2.853E-02	9.023E-02	2.853E-01	9.023E-01	2.853E-01	9.023E-01	2.853E-01	9.023E-01
2000500	1.204E-04	3.809E-04	1.204E-03	3.808E-03	1.204E-02	3.807E-02	1.204E-01	3.806E-01	1.203E-01	3.805E-01	1.203E-01	3.805E-01	1.203E-01
3000500	1.807E-04	5.713E-04	1.807E-03	5.713E-03	1.807E-02	5.713E-02	1.807E-01	5.713E-01	1.807E-01	5.713E-01	1.807E-01	5.713E-01	1.807E-01
4000500	2.409E-04	7.618E-04	2.409E-03	7.618E-03	2.409E-02	7.618E-02	2.409E-01	7.618E-01	2.409E-01	7.618E-01	2.409E-01	7.618E-01	2.409E-01
5000500	3.011E-04	9.522E-04	3.011E-03	9.522E-03	3.011E-02	9.522E-02	3.011E-01	9.522E-01	3.011E-01	9.522E-01	3.011E-01	9.522E-01	3.011E-01
6000500	3.613E-04	1.143E-03	3.613E-03	1.143E-02	3.613E-02	1.143E-01	3.613E-01	1.143E-01	3.613E-01	1.143E-01	3.613E-01	1.143E-01	3.613E-01
8000500	4.816E-04	1.524E-03	4.816E-03	1.524E-02	4.816E-02	1.524E-01	4.816E-01	1.524E-01	4.816E-01	1.524E-01	4.816E-01	1.524E-01	4.816E-01
10000500	6.022E-04	1.904E-03	6.022E-03	1.904E-02	6.022E-02	1.904E-01	6.022E-01	1.904E-01	6.022E-01	1.904E-01	6.022E-01	1.904E-01	6.022E-01

TABLE 103(CONT) PRESSURE (ATM) OF EQUILIBRIUM AIR

TEMP. (DEG K)	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
1000	2.642E-02	7.909E-02	2.416E-01	7.475E-01	2.326E 00	7.196E 00	2.186E 01	6.433E 01	1.848E 02	5.314E 02
1050	2.940E-02	8.630E-02	2.599E-01	7.948E-01	2.448E 00	7.658E 00	2.350E 01	7.024E 01	2.035E 02	5.822E 02
1100	3.294E-02	9.480E-02	2.808E-01	8.510E-01	2.619E 00	8.115E 00	2.504E 01	7.580E 01	2.225E 02	6.300E 02
1150	3.700E-02	1.047E-01	3.048E-01	9.113E-01	2.780E 00	8.581E 00	2.653E 01	8.102E 01	2.406E 02	6.944E 02
1200	4.144E-02	1.161E-01	3.323E-01	9.790E-01	2.955E 00	9.066E 00	2.800E 01	8.597E 01	2.581E 02	7.517E 02
1250	4.607E-02	1.284E-01	3.635E-01	1.055E 00	3.147E 00	9.579E 00	2.949E 01	9.077E 01	2.749E 02	8.044E 02
1300	5.066E-02	1.421E-01	3.982E-01	1.140E 00	3.357E 00	1.013E 01	3.103E 01	9.550E 01	2.910E 02	8.639E 02
1350	5.502E-02	1.560E-01	4.359E-01	1.234E 00	3.589E 00	1.072E 01	3.263E 01	1.003E 02	3.066E 02	9.178E 02
1400	5.902E-02	1.699E-01	4.761E-01	1.337E 00	3.842E 00	1.135E 01	3.432E 01	1.051E 02	3.219E 02	9.701E 02
1450	6.266E-02	1.833E-01	5.175E-01	1.448E 00	4.119E 00	1.204E 01	3.611E 01	1.101E 02	3.371E 02	1.021E 03
1500	6.597E-02	1.959E-01	5.593E-01	1.565E 00	4.417E 00	1.278E 01	3.800E 01	1.152E 02	3.524E 02	1.071E 03
1550	6.901E-02	2.077E-01	6.005E-01	1.687E 00	4.735E 00	1.358E 01	4.001E 01	1.206E 02	3.679E 02	1.120E 03
1600	7.185E-02	2.185E-01	6.402E-01	1.811E 00	5.071E 00	1.445E 01	4.215E 01	1.262E 02	3.836E 02	1.169E 03
1650	7.455E-02	2.286E-01	6.781E-01	1.935E 00	5.421E 00	1.533E 01	4.441E 01	1.320E 02	3.998E 02	1.217E 03
1700	7.714E-02	2.381E-01	7.139E-01	2.058E 00	5.782E 00	1.627E 01	4.680E 01	1.382E 02	4.165E 02	1.264E 03
1750	7.966E-02	2.471E-01	7.476E-01	2.178E 00	6.149E 00	1.726E 01	4.931E 01	1.446E 02	4.334E 02	1.316E 03
1800	8.215E-02	2.557E-01	7.794E-01	2.294E 00	6.518E 00	1.828E 01	5.194E 01	1.513E 02	4.514E 02	1.364E 03
1850	8.463E-02	2.640E-01	8.096E-01	2.405E 00	6.885E 00	1.933E 01	5.468E 01	1.583E 02	4.697E 02	1.417E 03
1900	8.711E-02	2.721E-01	8.385E-01	2.512E 00	7.248E 00	2.040E 01	5.752E 01	1.654E 02	4.884E 02	1.469E 03
1950	8.963E-02	2.801E-01	8.664E-01	2.614E 00	7.603E 00	2.148E 01	6.045E 01	1.731E 02	5.081E 02	1.521E 03
2000	9.223E-02	2.881E-01	8.934E-01	2.712E 00	7.950E 00	2.257E 01	6.345E 01	1.809E 02	5.283E 02	1.575E 03
2200	1.042E-01	3.214E-01	9.979E-01	3.073E 00	9.238E 00	2.683E 01	7.591E 01	2.142E 02	6.148E 02	1.802E 03
2400	1.211E-01	3.618E-01	1.107E 00	3.412E 00	1.040E 01	3.083E 01	8.853E 01	2.499E 02	7.089E 02	2.046E 03
2600	1.436E-01	4.164E-01	1.2238E 00	3.766E 00	1.150E 01	3.455E 01	1.008E 02	2.866E 02	8.084E 02	2.305E 03
2800	1.683E-01	4.852E-01	1.406E 00	4.177E 00	1.264E 01	3.813E 01	1.126E 02	3.233E 02	9.110E 02	2.578E 03
3000	1.916E-01	5.606E-01	1.612E 00	4.679E 00	1.390E 01	4.174E 01	1.241E 02	3.596E 02	1.015E 03	2.854E 03
3200	2.120E-01	6.336E-01	1.839E 00	5.280E 00	1.530E 01	4.563E 01	1.356E 02	3.955E 02	1.120E 03	3.141E 03
3400	2.304E-01	7.000E-01	2.066E 00	5.949E 00	1.710E 01	4.994E 01	1.475E 02	4.316E 02	1.225E 03	3.433E 03
3600	2.484E-01	7.604E-01	2.281E 00	6.643E 00	1.902E 01	5.484E 01	1.603E 02	4.685E 02	1.332E 03	3.728E 03
3800	2.660E-01	8.184E-01	2.481E 00	7.325E 00	2.107E 01	6.028E 01	1.743E 02	5.068E 02	1.441E 03	4.030E 03
4000	2.910E-01	8.789E-01	2.670E 00	7.975E 00	2.316E 01	6.614E 01	1.895E 02	5.471E 02	1.553E 03	4.338E 03
4200	3.179E-01	9.464E-01	2.859E 00	8.596E 00	2.522E 01	7.228E 01	2.060E 02	5.900E 02	1.669E 03	4.651E 03
4400	3.477E-01	1.024E 00	3.040E 00	9.202E 00	2.723E 01	7.852E 01	2.234E 02	6.358E 02	1.791E 03	4.978E 03
4600	3.789E-01	1.111E 00	3.228E 00	9.818E 00	2.918E 01	8.476E 01	2.415E 02	6.841E 02	1.919E 03	5.316E 03
4800	4.066E-01	1.203E 00	3.529E 00	1.047E 01	3.112E 01	9.093E 01	2.599E 02	7.348E 02	2.053E 03	5.667E 03
5000	4.372E-01	1.298E 00	3.798E 00	1.117E 01	3.309E 01	9.705E 01	2.786E 02	7.872E 02	2.193E 03	6.032E 03
6000	5.794E-01	1.741E 00	5.222E 00	1.538E 01	4.461E 01	1.292E 02	3.735E 02	1.065E 03	2.965E 03	8.068E 04
7000	7.604E-01	2.258E 00	6.672E 00	1.978E 01	5.812E 01	1.679E 02	4.800E 02	1.364E 03	3.819E 03	1.040E 04
8000	9.420E-01	2.826E 00	8.597E 00	2.465E 01	7.213E 01	2.098E 02	6.012E 02	1.701E 03	4.754E 03	1.296E 04

20000 2.861E 00 9.026E 00 2.840E 01 8.897E 01 2.761E 02 6.437E 02 2.523E 03 7.394E 03 2.088E 04 5.773E 04
 300000 4.306E 00 1.359E 01 4.285E 01 1.349E 02 4.236E 02 1.322E 03 4.081E 03 1.238E 04 3.661E 04 1.050E 05
 400000 6.293E 00 1.925E 01 5.896E 01 1.827E 02 5.708E 02 1.785E 03 5.558E 03 1.713E 04 5.185E 04 1.530E 05

500000 8.752E 00 2.662E 01 8.135E 01 2.493E 02 7.595E 02 2.314E 03 7.106E 03 2.189E 04 6.687E 04 2.004E 05
 600000 1.114E 01 3.468E 01 1.069E 02 3.250E 02 9.853E 02 2.995E 03 9.065E 03 2.737E 04 8.279E 04 2.492E 05
 800000 1.520E 01 4.797E 01 1.510E 02 4.726E 02 1.469E 03 4.517E 03 1.369E 04 4.104E 04 1.225E 05 3.629E 05
 1000000 1.901E 01 6.010E 01 1.899E 02 5.992E 02 1.886E 03 5.903E 03 1.830E 04 5.594E 04 1.681E 05 4.977E 05
 1500000 2.853E 01 9.019E 01 2.851E 02 9.011E 02 2.846E 03 8.981E 03 2.828E 04 8.870E 04 2.760E 05 8.465E 05
 2000000 3.804E 01 1.203E 02 3.803E 02 1.202E 03 3.798E 03 1.200E 04 3.785E 04 1.192E 05 3.738E 05 1.164E 06
 3000000 5.712E 01 1.806E 02 5.709E 02 1.804E 03 5.703E 03 1.802E 04 5.691E 04 1.796E 05 5.655E 05 1.775E 06
 4000000 7.617E 01 2.409E 02 7.616E 02 2.408E 03 7.613E 03 2.404E 04 7.600E 04 2.399E 05 7.566E 05 2.381E 06
 5000000 9.522E 01 3.011E 02 9.521E 02 3.010E 03 9.518E 03 3.009E 04 9.509E 04 3.004E 05 9.479E 05 2.987E 06
 6000000 1.143E 02 3.613E 02 1.143E 03 3.613E 03 1.142E 04 3.611E 04 1.142E 05 3.607E 05 1.139E 06 3.592E 06
 8000000 1.524E 02 4.818E 02 1.523E 03 4.817E 03 1.523E 04 4.816E 04 1.523E 05 4.812E 05 1.520E 06 4.800E 06
 10000000 1.904E 02 6.022E 02 1.904E 03 6.022E 03 1.904E 04 6.021E 04 1.904E 05 6.017E 05 1.902E 06 6.006E 06

NO

TABLE 104. LOG OF PRESSURE (ATM) OF EQUILIBRIUM AIR

TEMP. (DEC K)	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
10000	-6.836E 00	-6.336E 00	-5.837E 00	-5.337E 00	-4.839E 00	-4.345E 00	-3.860E 00	-3.391E 00	-2.940E 00	-2.495E 00	-2.042E 00
10500	-6.815E 00	-6.315E 00	-5.815E 00	-5.316E 00	-4.816E 00	-4.319E 00	-3.825E 00	-3.345E 00	-2.882E 00	-2.433E 00	-1.987E 00
11000	-6.795E 00	-6.295E 00	-5.795E 00	-5.295E 00	-4.796E 00	-4.297E 00	-3.800E 00	-3.311E 00	-2.835E 00	-2.377E 00	-1.931E 00
11500	-6.774E 00	-6.275E 00	-5.776E 00	-5.276E 00	-4.776E 00	-4.277E 00	-3.778E 00	-3.284E 00	-2.798E 00	-2.330E 00	-1.878E 00
12000	-6.752E 00	-6.256E 00	-5.757E 00	-5.257E 00	-4.757E 00	-4.258E 00	-3.759E 00	-3.262E 00	-2.770E 00	-2.291E 00	-1.830E 00
12500	-6.728E 00	-6.235E 00	-5.730E 00	-5.239E 00	-4.739E 00	-4.240E 00	-3.740E 00	-3.242E 00	-2.747E 00	-2.261E 00	-1.790E 00
13000	-6.699E 00	-6.209E 00	-5.718E 00	-5.221E 00	-4.722E 00	-4.222E 00	-3.723E 00	-3.224E 00	-2.727E 00	-2.236E 00	-1.757E 00
13500	-6.666E 00	-6.176E 00	-5.694E 00	-5.202E 00	-4.705E 00	-4.206E 00	-3.706E 00	-3.207E 00	-2.709E 00	-2.215E 00	-1.729E 00
14000	-6.600E 00	-6.136E 00	-5.665E 00	-5.180E 00	-4.687E 00	-4.189E 00	-3.690E 00	-3.191E 00	-2.692E 00	-2.196E 00	-1.704E 00
14500	-6.539E 00	-6.092E 00	-5.628E 00	-5.154E 00	-4.667E 00	-4.172E 00	-3.674E 00	-3.175E 00	-2.676E 00	-2.179E 00	-1.686E 00
15000	-6.525E 00	-6.052E 00	-5.588E 00	-5.122E 00	-4.644E 00	-4.154E 00	-3.658E 00	-3.140E 00	-2.641E 00	-2.163E 00	-1.668E 00
15500	-6.497E 00	-6.018E 00	-5.548E 00	-5.085E 00	-4.616E 00	-4.134E 00	-3.642E 00	-3.145E 00	-2.646E 00	-2.148E 00	-1.652E 00
16000	-6.472E 00	-5.989E 00	-5.513E 00	-5.047E 00	-4.588E 00	-4.110E 00	-3.624E 00	-3.130E 00	-2.632E 00	-2.134E 00	-1.637E 00
16500	-6.452E 00	-5.964E 00	-5.483E 00	-5.012E 00	-4.549E 00	-4.082E 00	-3.604E 00	-3.114E 00	-2.618E 00	-2.120E 00	-1.622E 00
17000	-6.435E 00	-5.942E 00	-5.457E 00	-4.981E 00	-4.514E 00	-4.052E 00	-3.580E 00	-3.096E 00	-2.603E 00	-2.104E 00	-1.608E 00
17500	-6.420E 00	-5.924E 00	-5.435E 00	-4.954E 00	-4.482E 00	-4.019E 00	-3.554E 00	-3.077E 00	-2.588E 00	-2.092E 00	-1.595E 00
18000	-6.406E 00	-5.909E 00	-5.416E 00	-4.930E 00	-4.454E 00	-3.987E 00	-3.525E 00	-3.055E 00	-2.571E 00	-2.078E 00	-1.582E 00
18500	-6.393E 00	-5.895E 00	-5.400E 00	-4.910E 00	-4.429E 00	-3.958E 00	-3.495E 00	-3.030E 00	-2.553E 00	-2.064E 00	-1.569E 00
19000	-6.381E 00	-5.882E 00	-5.385E 00	-4.892E 00	-4.407E 00	-3.931E 00	-3.468E 00	-3.004E 00	-2.533E 00	-2.048E 00	-1.556E 00
19500	-6.369E 00	-5.870E 00	-5.372E 00	-4.873E 00	-4.387E 00	-3.907E 00	-3.438E 00	-2.974E 00	-2.510E 00	-2.032E 00	-1.542E 00
20000	-6.356E 00	-5.858E 00	-5.360E 00	-4.863E 00	-4.371E 00	-3.886E 00	-3.413E 00	-2.949E 00	-2.486E 00	-2.014E 00	-1.528E 00
22000	-6.290E 00	-5.806E 00	-5.314E 00	-4.817E 00	-4.319E 00	-3.824E 00	-3.335E 00	-2.856E 00	-2.388E 00	-1.928E 00	-1.461E 00
24000	-6.200E 00	-5.727E 00	-5.253E 00	-4.769E 00	-4.274E 00	-3.780E 00	-3.284E 00	-2.793E 00	-2.311E 00	-1.841E 00	-1.380E 00
26000	-6.134E 00	-5.650E 00	-5.173E 00	-4.702E 00	-4.225E 00	-3.738E 00	-3.244E 00	-2.746E 00	-2.256E 00	-1.773E 00	-1.303E 00
28000	-6.091E 00	-5.596E 00	-5.108E 00	-4.629E 00	-4.157E 00	-3.684E 00	-3.201E 00	-2.710E 00	-2.216E 00	-1.725E 00	-1.243E 00
30000	-6.056E 00	-5.559E 00	-5.064E 00	-4.574E 00	-4.092E 00	-3.619E 00	-3.147E 00	-2.668E 00	-2.179E 00	-1.687E 00	-1.197E 00
32000	-6.018E 00	-5.524E 00	-5.030E 00	-4.534E 00	-4.043E 00	-3.561E 00	-3.087E 00	-2.616E 00	-2.139E 00	-1.651E 00	-1.160E 00
34000	-5.985E 00	-5.485E 00	-4.997E 00	-4.503E 00	-4.003E 00	-3.516E 00	-3.034E 00	-2.541E 00	-2.090E 00	-1.613E 00	-1.126E 00
36000	-5.911E 00	-5.433E 00	-4.935E 00	-4.469E 00	-3.977E 00	-3.483E 00	-2.993E 00	-2.511E 00	-2.039E 00	-1.569E 00	-1.091E 00
38000	-5.869E 00	-5.384E 00	-4.905E 00	-4.428E 00	-3.944E 00	-3.453E 00	-2.960E 00	-2.472E 00	-1.992E 00	-1.522E 00	-1.051E 00
40000	-5.838E 00	-5.344E 00	-4.860E 00	-4.391E 00	-3.904E 00	-3.421E 00	-2.931E 00	-2.440E 00	-1.953E 00	-1.477E 00	-1.008E 00
42000	-5.807E 00	-5.319E 00	-4.825E 00	-4.359E 00	-3.861E 00	-3.384E 00	-2.901E 00	-2.412E 00	-1.922E 00	-1.439E 00	-0.961E-01
44000	-5.772E 00	-5.286E 00	-4.796E 00	-4.303E 00	-3.821E 00	-3.344E 00	-2.867E 00	-2.383E 00	-1.894E 00	-1.407E 00	-0.928E-01
46000	-5.735E 00	-5.253E 00	-4.767E 00	-4.277E 00	-3.788E 00	-3.306E 00	-2.829E 00	-2.352E 00	-1.867E 00	-1.379E 00	-0.895E-01
48000	-5.701E 00	-5.217E 00	-4.736E 00	-4.250E 00	-3.760E 00	-3.273E 00	-2.793E 00	-2.317E 00	-1.838E 00	-1.353E 00	-0.871E-01
50000	-5.673E 00	-5.185E 00	-4.702E 00	-4.220E 00	-3.734E 00	-3.246E 00	-2.761E 00	-2.283E 00	-1.807E 00	-1.327E 00	-0.841E-01
60000	-5.578E 00	-5.080E 00	-4.583E 00	-4.080E 00	-3.114E 00	-2.634E 00	-2.263E 00	-1.866E 00	-1.466E 00	-1.078E 00	-0.710E-01
70000	-5.499E 00	-5.001E 00	-4.505E 00	-4.009E 00	-3.513E 00	-3.017E 00	-2.524E 00	-2.037E 00	-1.557E 00	-1.078E 00	-0.5976E-01
80000	-5.440E 00	-4.940E 00	-4.441E 00	-3.942E 00	-3.445E 00	-2.949E 00	-2.454E 00	-1.959E 00	-1.467E 00	-0.9813E-01	-0.5027E-01

90000	-5.389E 00	-4.889E 00	-4.389E 00	-3.889E 00	-3.390E 00	-2.891E 00	-2.394E 00	-1.898E 00	-1.404E 00	-9.105E-01	-4.221E-01
100000	-5.343E 00	-4.843E 00	-4.343E 00	-3.843E 00	-3.343E 00	-2.844E 00	-2.344E 00	-1.848E 00	-1.354E 00	-8.552E-01	-3.627E-01
150000	-5.167E 00	-4.667E 00	-4.167E 00	-3.667E 00	-3.167E 00	-2.667E 00	-2.167E 00	-1.671E 00	-1.177E 00	-6.678E-01	-1.605E-01
200000	-5.040E 00	-4.540E 00	-4.042E 00	-3.542E 00	-3.042E 00	-2.542E 00	-2.042E 00	-1.542E 00	-1.042E 00	-5.426E-01	-4.288E-02
300000	-4.705E 00	-4.277E 00	-3.792E 00	-3.304E 00	-2.812E 00	-2.318E 00	-1.827E 00	-1.340E 00	-8.533E-01	-3.611E-01	1.356E-01
400000	-4.619E 00	-4.121E 00	-3.623E 00	-3.127E 00	-2.630E 00	-2.133E 00	-1.639E 00	-1.152E 00	-6.641E-01	-1.801E-01	3.098E-01
500000	-4.522E 00	-4.022E 00	-3.522E 00	-3.022E 00	-2.522E 00	-2.023E 00	-1.524E 00	-1.028E 00	-5.317E-01	-3.641E-02	4.558E-01
600000	-4.443E 00	-3.943E 00	-3.443E 00	-2.943E 00	-2.443E 00	-1.943E 00	-1.443E 00	-9.424E-01	-4.635E-01	5.486E-02	5.516E-01
800000	-4.318E 00	-3.818E 00	-3.318E 00	-2.818E 00	-2.318E 00	-1.818E 00	-1.318E 00	-8.177E-01	-3.177E-01	1.822E-01	6.821E-01
1000000	-4.221E 00	-3.721E 00	-3.221E 00	-2.721E 00	-2.221E 00	-1.721E 00	-1.221E 00	-7.208E-01	-2.208E-01	2.792E-01	7.792E-01
1500000	-4.045E 00	-3.545E 00	-3.045E 00	-2.545E 00	-2.045E 00	-1.545E 00	-1.045E 00	-5.444E-01	-4.444E-02	4.533E-01	9.533E-01
2000000	-3.919E 00	-3.419E 00	-2.919E 00	-2.419E 00	-1.919E 00	-1.419E 00	-9.195E-01	-4.196E-01	8.035E-02	5.803E-01	1.803E 00
3000000	-3.743E 00	-3.243E 00	-2.743E 00	-2.243E 00	-1.743E 00	-1.243E 00	-7.431E-01	-2.431E-01	2.544E-01	7.544E-01	1.257E 00
4000000	-3.618E 00	-3.118E 00	-2.618E 00	-2.118E 00	-1.618E 00	-1.118E 00	-6.182E-01	-1.182E-01	3.818E-01	8.818E-01	1.382E 00
5000000	-3.521E 00	-3.021E 00	-2.521E 00	-2.021E 00	-1.521E 00	-1.021E 00	-5.213E-01	-2.127E-02	4.787E-01	9.787E-01	1.478E 00
6000000	-3.442E 00	-2.942E 00	-2.442E 00	-1.942E 00	-1.442E 00	-9.421E-01	-4.421E-01	5.791E-02	5.379E-01	1.038E 00	1.791E 00
8000000	-3.317E 00	-2.817E 00	-2.317E 00	-1.817E 00	-1.317E 00	-8.171E-01	-3.171E-01	1.829E-01	4.829E-01	1.182E 00	1.482E 00
10000000	-3.220E 00	-2.720E 00	-2.220E 00	-1.720E 00	-1.220E 00	-7.202E-01	-2.202E-01	2.798E-01	7.798E-01	1.298E 00	1.798E 00

TABLE 104 (CONT) LOG OF PRESSURE (ATM) OF EQUILIBRIUM AIR

TEMP. (DEG K)	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
1000	-1.570E 00	-1.102E 00	-6.169E-01	-1.264E-01	3.663E-01	9.571E-01	1.340E 00	1.808E 00	2.267E 00	2.725E 00
1050	-1.532E 00	-1.064E 00	-5.912E-01	-9.843E-02	3.924E-01	9.841E-01	1.371E 00	1.847E 00	2.309E 00	2.766E 00
1100	-1.492E 00	-1.025E 00	-5.517E-01	-7.007E-02	4.181E-01	9.093E-01	1.399E 00	1.880E 00	2.347E 00	2.805E 00
1150	-1.432E 00	-9.800E-01	-5.140E-01	-4.033E-02	4.441E-01	9.335E-01	1.424E 00	1.909E 00	2.381E 00	2.842E 00
1200	-1.383E 00	-9.332E-01	-4.785E-01	-9.232E-03	4.706E-01	9.574E-01	1.447E 00	1.934E 00	2.412E 00	2.876E 00
1250	-1.337E 00	-8.906E-01	-4.395E-01	-2.323E-02	4.978E-01	9.813E-01	1.470E 00	1.958E 00	2.439E 00	2.908E 00
1300	-1.295E 00	-8.473E-01	-3.999E-01	-5.687E-02	5.240E-01	1.006E 00	1.492E 00	1.980E 00	2.464E 00	2.936E 00
1350	-1.240E 00	-8.048E-01	-3.606E-01	-9.132E-02	5.549E-01	1.030E 00	1.514E 00	2.001E 00	2.487E 00	2.963E 00
1400	-1.229E 00	-7.698E-01	-3.223E-01	-1.261E-01	5.846E-01	1.055E 00	1.536E 00	2.022E 00	2.508E 00	2.987E 00
1450	-1.203E 00	-7.368E-01	-2.861E-01	-1.607E-01	6.147E-01	1.081E 00	1.558E 00	2.042E 00	2.528E 00	3.009E 00
1500	-1.181E 00	-7.079E-01	-2.523E-01	-1.945E-01	6.451E-01	1.107E 00	1.580E 00	2.062E 00	2.547E 00	3.030E 00
1550	-1.161E 00	-6.826E-01	-2.215E-01	-2.279E-01	6.753E-01	1.133E 00	1.602E 00	2.081E 00	2.566E 00	3.049E 00
1600	-1.144E 00	-6.605E-01	-1.937E-01	-2.579E-01	7.051E-01	1.159E 00	1.625E 00	2.101E 00	2.584E 00	3.068E 00
1650	-1.128E 00	-6.408E-01	-1.687E-01	-2.868E-01	7.341E-01	1.185E 00	1.647E 00	2.121E 00	2.602E 00	3.085E 00
1700	-1.113E 00	-6.232E-01	-1.464E-01	-3.135E-01	7.621E-01	1.211E 00	1.670E 00	2.140E 00	2.620E 00	3.103E 00
1750	-1.099E 00	-6.072E-01	-1.263E-01	-3.381E-01	7.888E-01	1.237E 00	1.693E 00	2.160E 00	2.637E 00	3.119E 00
1800	-1.085E 00	-5.923E-01	-1.082E-01	-3.604E-01	8.141E-01	1.262E 00	1.715E 00	2.180E 00	2.655E 00	3.135E 00
1850	-1.072E 00	-5.784E-01	-9.170E-02	-3.812E-01	8.379E-01	1.286E 00	1.738E 00	2.199E 00	2.672E 00	3.151E 00
1900	-1.060E 00	-5.653E-01	-7.648E-02	-4.000E-01	8.602E-01	1.310E 00	1.760E 00	2.219E 00	2.689E 00	3.167E 00
1950	-1.048E 00	-5.524E-01	-6.229E-02	-4.173E-01	8.810E-01	1.332E 00	1.781E 00	2.238E 00	2.706E 00	3.182E 00
2000	-1.035E 00	-5.404E-01	-4.895E-02	-4.335E-01	9.003E-01	1.353E 00	1.802E 00	2.257E 00	2.723E 00	3.172E 00
2050	-9.821E-01	-4.930E-01	-9.161E-04	-4.879E-01	9.056E-01	1.429E 00	1.880E 00	2.331E 00	2.789E 00	3.254E 00
2100	-9.167E-01	-4.415E-01	4.418E-02	-5.330E-01	1.017E 00	1.469E 00	1.947E 00	2.398E 00	2.851E 00	3.311E 00
2150	-8.427E-01	-3.805E-01	9.273E-02	-5.759E-01	1.061E 00	1.538E 00	2.003E 00	2.457E 00	2.908E 00	3.363E 00
2200	-7.730E-01	-3.141E-01	1.480E-01	-6.208E-01	1.102E 00	1.581E 00	2.051E 00	2.510E 00	2.960E 00	3.411E 00
2250	-7.176E-01	-2.514E-01	2.073E-01	-6.702E-01	1.143E 00	1.621E 00	2.094E 00	2.556E 00	3.004E 00	3.454E 00
2300	-6.736E-01	-1.982E-01	2.645E-01	-7.228E-01	1.187E 00	1.659E 00	2.132E 00	2.597E 00	3.049E 00	3.497E 00
2350	-6.376E-01	-1.549E-01	3.152E-01	-7.744E-01	1.233E 00	1.699E 00	2.169E 00	2.635E 00	3.088E 00	3.536E 00
2400	-6.049E-01	-1.190E-01	3.582E-01	-8.224E-01	1.279E 00	1.739E 00	2.205E 00	2.671E 00	3.124E 00	3.572E 00
2450	-5.719E-01	-8.701E-02	3.946E-01	-8.648E-01	1.324E 00	1.780E 00	2.241E 00	2.705E 00	3.159E 00	3.605E 00
2500	-5.361E-01	-5.605E-02	4.265E-01	-9.019E-01	1.365E 00	1.820E 00	2.278E 00	2.738E 00	3.191E 00	3.637E 00
2550	-4.977E-01	-2.391E-02	4.563E-01	-9.345E-01	1.402E 00	1.859E 00	2.314E 00	2.771E 00	3.222E 00	3.668E 00
2600	-4.587E-01	-1.022E-02	4.858E-01	-9.639E-01	1.435E 00	1.895E 00	2.349E 00	2.803E 00	3.253E 00	3.697E 00
2650	-4.219E-01	4.555E-02	5.162E-01	-9.920E-01	1.465E 00	1.928E 00	2.383E 00	2.835E 00	3.283E 00	3.726E 00
2700	-3.887E-01	8.044E-02	5.476E-01	-1.020E 00	1.493E 00	1.958E 00	2.415E 00	2.866E 00	3.312E 00	3.753E 00
2750	-3.593E-01	1.133E-01	5.796E-01	-1.049E 00	1.520E 00	1.987E 00	2.445E 00	2.896E 00	3.341E 00	3.780E 00
2800	-2.349E-01	3.409E-01	7.179E-01	-1.187E 00	1.649E 00	2.111E 00	2.572E 00	3.027E 00	3.472E 00	3.907E 00
2850	-1.190E-01	3.537E-01	8.243E-01	-1.298E 00	1.764E 00	2.225E 00	2.681E 00	3.135E 00	3.582E 00	4.017E 00
2900	-2.594E-02	4.512E-01	9.241E-01	-1.392E 00	1.858E 00	2.322E 00	2.779E 00	3.231E 00	3.677E 00	4.113E 00

96CC0	9-842E-02	9-335E-01	1-008E 00	1-478E 00	1-944E 00	2-405E 00	2-043E 00	3-314E 00	3-762E 00	4-197E 00
10CC00	1-262E-01	6-073E-01	1-081E 00	1-552E 00	2-020E 00	2-491E 00	2-938E 00	3-391E 00	3-830E 00	4-273E 00
150C00	3-300E-01	8-267E-01	1-320E 00	1-608E 00	2-289E 00	2-761E 00	3-233E 00	3-677E 00	4-125E 00	4-562E 00
200C00	4-546E-01	9-555E-01	1-453E 00	1-949E 00	2-441E 00	2-926E 00	3-402E 00	3-867E 00	4-320E 00	4-761E 00
300C00	6-341E-01	1-133E 00	1-632E 00	2-130E 00	2-627E 00	3-121E 00	3-611E 00	4-093E 00	4-564E 00	5-021E 00
400C00	7-989E-01	1-284E 00	1-771E 00	2-262E 00	2-756E 00	3-252E 00	3-745E 00	4-234E 00	4-715E 00	5-185E 00
500C00	9-421E-01	1-425E 00	1-910E 00	2-397E 00	2-881E 00	3-364E 00	3-852E 00	4-340E 00	4-825E 00	5-302E 00
600C00	1-047E 00	1-540E 00	2-024E 00	2-512E 00	2-994E 00	3-476E 00	3-957E 00	4-437E 00	4-918E 00	5-398E 00
800C00	1-102E 00	1-681E 00	2-179E 00	2-675E 00	3-167E 00	3-655E 00	4-136E 00	4-613E 00	5-088E 00	5-568E 00
1000C00	1-279E 00	1-779E 00	2-270E 00	2-770E 00	3-276E 00	3-771E 00	4-262E 00	4-748E 00	5-226E 00	5-697E 00
1300C00	1-459E 00	1-959E 00	2-459E 00	2-959E 00	3-454E 00	3-953E 00	4-451E 00	4-948E 00	5-441E 00	5-928E 00
2000C00	1-580E 00	2-080E 00	2-580E 00	3-080E 00	3-580E 00	4-079E 00	4-578E 00	5-076E 00	5-573E 00	6-068E 00
3000C00	1-757E 00	2-257E 00	2-757E 00	3-256E 00	3-754E 00	4-254E 00	4-753E 00	5-254E 00	5-752E 00	6-249E 00
4000C00	1-882E 00	2-382E 00	2-882E 00	3-382E 00	3-882E 00	4-381E 00	4-881E 00	5-380E 00	5-879E 00	6-377E 00
5000C00	1-979E 00	2-479E 00	2-979E 00	3-479E 00	3-979E 00	4-478E 00	4-978E 00	5-478E 00	5-977E 00	6-475E 00
6000000	2-058E 00	2-558E 00	3-058E 00	3-558E 00	4-058E 00	4-558E 00	5-057E 00	5-557E 00	6-056E 00	6-555E 00
8000C00	2-183E 00	2-683E 00	3-183E 00	3-683E 00	4-183E 00	4-683E 00	5-183E 00	5-682E 00	6-182E 00	6-681E 00
10000000	2-280E 00	2-780E 00	3-280E 00	3-780E 00	4-280E 00	4-780E 00	5-280E 00	5-779E 00	6-279E 00	6-779E 00

TABLE 105. DIMENSIONLESS INTERNAL ENERGY, E/RT, OF EQUILIBRIUM AIR

TEMP. (DEG K)	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
1000	4.954E 01	4.952E 01	4.949E 01	4.939E 01	4.908E 01	4.818E 01	4.583E 01	4.109E 01	3.444E 01	2.781E 01	2.262E 01
10500	4.752E 01	4.750E 01	4.749E 01	4.744E 01	4.731E 01	4.692E 01	4.580E 01	4.303E 01	3.792E 01	3.139E 01	2.534E 01
11000	4.576E 01	4.569E 01	4.566E 01	4.563E 01	4.557E 01	4.539E 01	4.486E 01	4.339E 01	4.003E 01	3.453E 01	2.827E 01
11500	4.436E 01	4.409E 01	4.401E 01	4.397E 01	4.393E 01	4.385E 01	4.358E 01	4.282E 01	4.083E 01	3.678E 01	3.102E 01
12000	4.372E 01	4.286E 01	4.256E 01	4.247E 01	4.242E 01	4.237E 01	4.223E 01	4.183E 01	4.069E 01	3.799E 01	3.327E 01
12500	4.466E 01	4.230E 01	4.144E 01	4.114E 01	4.104E 01	4.099E 01	4.091E 01	4.069E 01	4.004E 01	3.834E 01	3.481E 01
13000	4.818E 01	4.308E 01	4.090E 01	4.010E 01	3.982E 01	3.972E 01	3.945E 01	3.952E 01	3.914E 01	3.810E 01	3.562E 01
13500	5.431E 01	4.599E 01	4.143E 01	3.952E 01	3.882E 01	3.859E 01	3.844E 01	3.839E 01	3.816E 01	3.752E 01	3.585E 01
14000	6.131E 01	5.108E 01	4.363E 01	3.977E 01	3.819E 01	3.763E 01	3.743E 01	3.732E 01	3.717E 01	3.676E 01	3.566E 01
14500	6.711E 01	5.724E 01	4.769E 01	4.128E 01	3.816E 01	3.696E 01	3.651E 01	3.634E 01	3.621E 01	3.594E 01	3.520E 01
15000	7.103E 01	6.281E 01	5.293E 01	4.431E 01	3.904E 01	3.649E 01	3.578E 01	3.546E 01	3.530E 01	3.510E 01	3.460E 01
15500	7.356E 01	6.595E 01	5.518E 01	4.356E 01	4.113E 01	3.704E 01	3.534E 01	3.471E 01	3.447E 01	3.428E 01	3.393E 01
16000	7.502E 01	6.974E 01	6.246E 01	5.326E 01	4.435E 01	3.831E 01	3.533E 01	3.416E 01	3.373E 01	3.351E 01	3.324E 01
16500	7.539E 01	7.151E 01	6.557E 01	5.755E 01	4.828E 01	4.052E 01	3.593E 01	3.389E 01	3.311E 01	3.280E 01	3.255E 01
17000	7.484E 01	7.231E 01	6.768E 01	6.096E 01	5.230E 01	4.359E 01	3.725E 01	3.400E 01	3.268E 01	3.217E 01	3.190E 01
17500	7.374E 01	7.222E 01	6.892E 01	6.345E 01	5.586E 01	4.697E 01	3.930E 01	3.462E 01	3.248E 01	3.165E 01	3.129E 01
18000	7.239E 01	7.148E 01	6.934E 01	6.513E 01	5.871E 01	5.040E 01	4.194E 01	3.591E 01	3.260E 01	3.127E 01	3.074E 01
18500	7.099E 01	7.039E 01	6.906E 01	6.606E 01	6.083E 01	5.344E 01	4.488E 01	3.758E 01	3.312E 01	3.109E 01	3.028E 01
19000	6.967E 01	6.917E 01	6.831E 01	6.631E 01	6.227E 01	5.594E 01	4.781E 01	3.977E 01	3.408E 01	3.115E 01	2.993E 01
19500	6.852E 01	6.793E 01	6.731E 01	6.600E 01	6.306E 01	5.784E 01	5.048E 01	4.223E 01	3.547E 01	3.150E 01	2.973E 01
20000	6.769E 01	6.680E 01	6.623E 01	6.533E 01	6.329E 01	5.917E 01	5.275E 01	4.474E 01	3.722E 01	3.219E 01	2.970E 01
22000	7.199E 01	6.956E 01	6.788E 01	6.173E 01	6.099E 01	5.980E 01	5.719E 01	5.230E 01	4.533E 01	3.778E 01	3.187E 01
24000	8.721E 01	7.625E 01	6.658E 01	6.089E 01	5.837E 01	5.723E 01	5.622E 01	5.429E 01	5.040E 01	4.427E 01	3.712E 01
26000	9.450E 01	8.789E 01	7.852E 01	6.811E 01	6.016E 01	5.598E 01	5.414E 01	5.259E 01	5.127E 01	4.784E 01	4.223E 01
28000	9.354E 01	9.110E 01	8.620E 01	7.836E 01	6.848E 01	5.958E 01	5.609E 01	5.153E 01	5.011E 01	4.835E 01	4.501E 01
30000	9.035E 01	8.899E 01	8.712E 01	8.330E 01	7.658E 01	6.743E 01	6.355E 01	5.223E 01	4.917E 01	4.748E 01	4.533E 01
32000	9.117E 01	8.693E 01	8.497E 01	8.310E 01	7.988E 01	7.384E 01	6.525E 01	5.639E 01	5.015E 01	4.689E 01	4.499E 01
34000	1.008E 02	9.010E 01	8.617E 01	8.143E 01	7.946E 01	7.630E 01	7.053E 01	6.227E 01	5.378E 01	4.781E 01	4.461E 01
36000	1.119E 02	9.998E 01	8.870E 01	8.163E 01	7.820E 01	7.599E 01	7.266E 01	6.684E 01	5.873E 01	5.073E 01	4.529E 01
38000	1.168E 02	1.086E 02	9.775E 01	8.653E 01	7.998E 01	7.513E 01	7.257E 01	6.895E 01	6.284E 01	5.481E 01	4.746E 01
40000	1.172E 02	1.129E 02	1.050E 02	9.446E 01	8.358E 01	7.600E 01	7.207E 01	6.921E 01	6.310E 01	5.854E 01	5.069E 01
42000	1.274E 02	1.126E 02	1.080E 02	1.004E 02	9.039E 01	7.289E 01	6.877E 01	6.099E 01	6.577E 01	6.099E 01	5.399E 01
44000	1.227E 02	1.139E 02	1.085E 02	1.034E 02	9.586E 01	8.574E 01	7.601E 01	6.954E 01	6.579E 01	6.211E 01	5.654E 01
46000	1.299E 02	1.181E 02	1.096E 02	1.042E 02	9.871E 01	9.080E 01	8.079E 01	7.183E 01	6.817E 01	6.244E 01	5.812E 01
48000	1.350E 02	1.246E 02	1.134E 02	1.052E 02	9.972E 01	9.379E 01	8.338E 01	7.559E 01	6.746E 01	6.276E 01	5.887E 01
50000	1.371E 02	1.293E 02	1.186E 02	1.081E 02	1.006E 02	9.512E 01	8.556E 01	7.967E 01	7.040E 01	6.365E 01	5.927E 01
60000	1.274E 02	1.259E 02	1.238E 02	1.201E 02	1.067E 02	1.067E 02	1.067E 02	1.067E 02	1.067E 02	1.067E 02	1.067E 02
70000	1.194E 02	1.181E 02	1.134E 02	1.127E 02	1.104E 02	1.083E 02	1.047E 02	1.044E 01	1.044E 01	1.044E 01	1.044E 01
80000	1.074E 02	1.074E 02	1.071E 02	1.069E 02	1.049E 02	1.023E 02	1.023E 02	1.023E 02	1.023E 02	1.023E 02	1.023E 02

TABLE 10(SICONT) DIMENSIONLESS INTERNAL ENERGY, E/RT, OF EQUILIBRIUM AIR

TEMP. (DEG K)	LEG DENSITY RATIO									
	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	C.0	0.5	1.0
1000	1.911E 01	1.692E 01	1.561E 01	1.481E 01	1.426E 01	1.368E 01	1.273E 01	1.119E 01	9.333E 00	7.658E 00
1050	2.082E 01	1.785E 01	1.599E 01	1.480E 01	1.418E 01	1.362E 01	1.290E 01	1.168E 01	9.978E 00	8.34E 00
1100	2.290E 01	1.908E 01	1.661E 01	1.510E 01	1.418E 01	1.356E 01	1.294E 01	1.198E 01	1.051E 01	8.787E 00
1150	2.521E 01	2.061E 01	1.747E 01	1.550E 01	1.430E 01	1.353E 01	1.292E 01	1.215E 01	1.091E 01	9.289E 00
1200	2.752E 01	2.235E 01	1.856E 01	1.607E 01	1.452E 01	1.357E 01	1.290E 01	1.222E 01	1.119E 01	9.721E 00
1250	2.960E 01	2.419E 01	1.982E 01	1.679E 01	1.487E 01	1.368E 01	1.290E 01	1.224E 01	1.137E 01	1.007E 01
1300	3.128E 01	2.598E 01	2.120E 01	1.765E 01	1.532E 01	1.386E 01	1.294E 01	1.225E 01	1.148E 01	1.035E 01
1350	3.246E 01	2.760E 01	2.262E 01	1.864E 01	1.589E 01	1.413E 01	1.303E 01	1.227E 01	1.155E 01	1.055E 01
1400	3.314E 01	2.893E 01	2.401E 01	1.969E 01	1.653E 01	1.447E 01	1.317E 01	1.231E 01	1.159E 01	1.076E 01
1450	3.339E 01	2.992E 01	2.529E 01	2.078E 01	1.728E 01	1.489E 01	1.336E 01	1.238E 01	1.163E 01	1.090E 01
1500	3.331E 01	3.057E 01	2.638E 01	2.185E 01	1.808E 01	1.536E 01	1.360E 01	1.248E 01	1.168E 01	1.090E 01
1550	3.301E 01	3.090E 01	2.726E 01	2.285E 01	1.887E 01	1.589E 01	1.389E 01	1.251E 01	1.174E 01	1.097E 01
1600	3.257E 01	3.097E 01	2.791E 01	2.376E 01	1.968E 01	1.645E 01	1.423E 01	1.278E 01	1.181E 01	1.104E 01
1650	3.206E 01	3.085E 01	2.833E 01	2.454E 01	2.046E 01	1.704E 01	1.459E 01	1.297E 01	1.191E 01	1.110E 01
1700	3.151E 01	3.058E 01	2.855E 01	2.517E 01	2.119E 01	1.764E 01	1.499E 01	1.320E 01	1.202E 01	1.118E 01
1750	3.095E 01	3.023E 01	2.860E 01	2.565E 01	2.185E 01	1.823E 01	1.540E 01	1.345E 01	1.216E 01	1.126E 01
1800	3.040E 01	2.982E 01	2.852E 01	2.599E 01	2.246E 01	1.879E 01	1.583E 01	1.372E 01	1.231E 01	1.135E 01
1850	2.988E 01	2.939E 01	2.833E 01	2.615E 01	2.293E 01	1.931E 01	1.626E 01	1.401E 01	1.248E 01	1.145E 01
1900	2.940E 01	2.895E 01	2.808E 01	2.628E 01	2.332E 01	1.983E 01	1.668E 01	1.430E 01	1.267E 01	1.157E 01
1950	2.895E 01	2.852E 01	2.779E 01	2.626E 01	2.362E 01	2.027E 01	1.709E 01	1.460E 01	1.286E 01	1.171E 01
2000	2.865E 01	2.811E 01	2.746E 01	2.618E 01	2.383E 01	2.066E 01	1.749E 01	1.491E 01	1.307E 01	1.185E 01
2050	2.851E 01	2.698E 01	2.620E 01	2.539E 01	2.398E 01	2.105E 01	1.878E 01	1.604E 01	1.392E 01	1.250E 01
2100	3.106E 01	2.733E 01	2.550E 01	2.451E 01	2.349E 01	2.187E 01	1.954E 01	1.697E 01	1.474E 01	1.318E 01
2150	3.549E 01	2.966E 01	2.597E 01	2.407E 01	2.291E 01	2.165E 01	1.982E 01	1.757E 01	1.539E 01	1.372E 01
2200	3.960E 01	3.324E 01	2.785E 01	2.447E 01	2.263E 01	2.132E 01	1.981E 01	1.788E 01	1.584E 01	1.415E 01
2250	4.201E 01	3.662E 01	3.044E 01	2.585E 01	2.290E 01	2.116E 01	1.970E 01	1.801E 01	1.612E 01	1.445E 01
2300	4.273E 01	3.886E 01	3.342E 01	2.792E 01	2.383E 01	2.132E 01	1.964E 01	1.805E 01	1.628E 01	1.465E 01
2350	4.253E 01	3.983E 01	3.553E 01	3.016E 01	2.529E 01	2.191E 01	1.977E 01	1.810E 01	1.638E 01	1.478E 01
2400	4.230E 01	3.999E 01	3.675E 01	3.208E 01	2.699E 01	2.287E 01	2.013E 01	1.823E 01	1.647E 01	1.487E 01
2450	4.271E 01	3.992E 01	3.726E 01	3.344E 01	2.862E 01	2.409E 01	2.075E 01	1.849E 01	1.660E 01	1.497E 01
2500	4.417E 01	4.015E 01	3.742E 01	3.425E 01	2.998E 01	2.536E 01	2.156E 01	1.885E 01	1.680E 01	1.508E 01
2550	4.655E 01	4.102E 01	3.759E 01	3.468E 01	3.097E 01	2.655E 01	2.248E 01	1.942E 01	1.708E 01	1.523E 01
2600	4.931E 01	4.262E 01	3.808E 01	3.495E 01	3.164E 01	2.756E 01	2.342E 01	2.005E 01	1.743E 01	1.543E 01
2650	5.182E 01	4.471E 01	3.904E 01	3.528E 01	3.208E 01	2.836E 01	2.430E 01	2.072E 01	1.785E 01	1.567E 01
2700	5.369E 01	4.691E 01	4.046E 01	3.583E 01	3.244E 01	2.896E 01	2.507E 01	2.139E 01	1.831E 01	1.595E 01
2750	5.487E 01	4.886E 01	4.215E 01	3.669E 01	3.284E 01	2.943E 01	2.573E 01	2.204E 01	1.880E 01	1.626E 01
2800	5.918E 01	5.338E 01	4.851E 01	4.292E 01	3.696E 01	3.192E 01	2.797E 01	2.445E 01	2.104E 01	1.797E 01
2850	6.736E 01	5.968E 01	5.237E 01	4.656E 01	4.129E 01	3.578E 01	3.065E 01	2.641E 01	2.281E 01	1.956E 01
2900	7.173E 01	6.488E 01	5.792E 01	5.065E 01	4.426E 01	3.878E 01	3.354E 01	2.870E 01	2.460E 01	2.109E 01

150000	7.442E 01	9.071E 01	9.083E 01	4.416E 01	3.801E 01	3.208E 01	2.002E 01	2.396E 01
150000	6.552E 01	6.328E 01	5.701E 01	5.192E 01	4.584E 01	3.972E 01	3.407E 01	2.912E 01
200000	5.403E 01	5.367E 01	5.200E 01	4.986E 01	4.649E 01	4.260E 01	3.844E 01	3.172E 01
300000	4.275E 01	4.241E 01	4.199E 01	4.115E 01	4.015E 01	3.839E 01	3.562E 01	3.113E 01
400000	5.763E 01	4.988E 01	3.882E 01	3.607E 01	3.529E 01	3.429E 01	3.261E 01	3.016E 01
500000	7.545E 01	6.541E 01	5.130E 01	3.833E 01	3.447E 01	3.279E 01	3.060E 01	2.862E 01
600000	8.853E 01	7.675E 01	6.254E 01	4.742E 01	4.099E 01	3.521E 01	3.112E 01	2.827E 01
700000	7.149E 01	7.114E 01	6.830E 01	6.048E 01	5.388E 01	4.690E 01	3.978E 01	3.374E 01
800000	6.224E 01	6.212E 01	6.189E 01	5.992E 01	5.726E 01	5.304E 01	4.719E 01	4.052E 01
900000	4.972E 01	4.909E 01	4.968E 01	4.947E 01	4.922E 01	4.866E 01	4.748E 01	4.517E 01
1000000	4.346E 01	4.344E 01	4.342E 01	4.332E 01	4.320E 01	4.297E 01	4.254E 01	4.170E 01
1100000	3.749E 01	3.734E 01	3.728E 01	3.714E 01	3.700E 01	3.689E 01	3.675E 01	3.639E 01
1200000	3.431E 01	3.430E 01	3.429E 01	3.420E 01	3.411E 01	3.398E 01	3.381E 01	3.337E 01
1300000	3.239E 01	3.238E 01	3.238E 01	3.235E 01	3.231E 01	3.224E 01	3.211E 01	3.191E 01
1400000	3.110E 01	3.110E 01	3.109E 01	3.107E 01	3.105E 01	3.101E 01	3.093E 01	3.079E 01
1500000	2.949E 01	2.949E 01	2.949E 01	2.948E 01	2.946E 01	2.944E 01	2.940E 01	2.932E 01
1600000	2.853E 01	2.853E 01	2.853E 01	2.852E 01	2.851E 01	2.849E 01	2.846E 01	2.841E 01

TABLE 106. INTERNAL ENERGY (ERG/GM) OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO										
	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
10000	1.422E 12	1.421E 12	1.421E 12	1.418E 12	1.439E 12	1.383E 12	1.315E 12	1.18CE 12	9.885E 11	7.981E 11	6.493E 11
10500	1.432E 12	1.432E 12	1.431E 12	1.430E 12	1.426E 12	1.414E 12	1.380E 12	1.297E 12	1.143E 12	9.461E 11	7.638E 11
11000	1.445E 12	1.442E 12	1.442E 12	1.441E 12	1.439E 12	1.433E 12	1.416E 12	1.370E 12	1.264E 12	1.090E 12	8.924E 11
11500	1.464E 12	1.455E 12	1.453E 12	1.451E 12	1.450E 12	1.447E 12	1.439E 12	1.413E 12	1.340E 12	1.214E 12	1.024E 12
12000	1.506E 12	1.476E 12	1.466E 12	1.463E 12	1.461E 12	1.459E 12	1.455E 12	1.441E 12	1.402E 12	1.309E 12	1.146E 12
12500	1.602E 12	1.518E 12	1.487E 12	1.476E 12	1.473E 12	1.471E 12	1.468E 12	1.460E 12	1.437E 12	1.376E 12	1.249E 12
13000	1.798E 12	1.608E 12	1.526E 12	1.496E 12	1.486E 12	1.482E 12	1.480E 12	1.475E 12	1.461E 12	1.422E 12	1.329E 12
13500	2.104E 12	1.782E 12	1.606E 12	1.531E 12	1.504E 12	1.495E 12	1.491E 12	1.488E 12	1.479E 12	1.454E 12	1.389E 12
14000	2.464E 12	2.053E 12	1.753E 12	1.598E 12	1.533E 12	1.512E 12	1.504E 12	1.500E 12	1.494E 12	1.477E 12	1.433E 12
14500	2.793E 12	2.382E 12	1.985E 12	1.718E 12	1.588E 12	1.537E 12	1.519E 12	1.512E 12	1.507E 12	1.496E 12	1.465E 12
15000	3.058E 12	2.705E 12	2.279E 12	1.908E 12	1.681E 12	1.579E 12	1.540E 12	1.527E 12	1.520E 12	1.511E 12	1.490E 12
15500	3.272E 12	2.979E 12	2.588E 12	2.161E 12	1.850E 12	1.649E 12	1.572E 12	1.544E 12	1.533E 12	1.523E 12	1.510E 12
16000	3.445E 12	3.203E 12	2.869E 12	2.446E 12	2.037E 12	1.759E 12	1.623E 12	1.569E 12	1.549E 12	1.539E 12	1.526E 12
16500	3.570E 12	3.387E 12	3.105E 12	2.725E 12	2.287E 12	1.919E 12	1.702E 12	1.605E 12	1.568E 12	1.553E 12	1.542E 12
17000	3.652E 12	3.528E 12	3.303E 12	2.974E 12	2.552E 12	2.124E 12	1.817E 12	1.659E 12	1.594E 12	1.570E 12	1.556E 12
17500	3.704E 12	3.627E 12	3.462E 12	3.187E 12	2.806E 12	2.359E 12	1.974E 12	1.739E 12	1.631E 12	1.590E 12	1.572E 12
18000	3.740E 12	3.693E 12	3.562E 12	3.365E 12	3.033E 12	2.604E 12	2.167E 12	1.850E 12	1.684E 12	1.616E 12	1.588E 12
18500	3.770E 12	3.738E 12	3.667E 12	3.508E 12	3.230E 12	2.838E 12	2.383E 12	1.995E 12	1.759E 12	1.651E 12	1.608E 12
19000	3.799E 12	3.772E 12	3.725E 12	3.616E 12	3.396E 12	3.051E 12	2.608E 12	2.169E 12	1.858E 12	1.699E 12	1.632E 12
19500	3.835E 12	3.802E 12	3.768E 12	3.694E 12	3.530E 12	3.237E 12	2.828E 12	2.364E 12	1.985E 12	1.763E 12	1.644E 12
20000	3.866E 12	3.835E 12	3.802E 12	3.750E 12	3.633E 12	3.397E 12	3.028E 12	2.588E 12	2.137E 12	1.848E 12	1.705E 12
20500	3.896E 12	3.864E 12	3.831E 12	3.898E 12	3.851E 12	3.776E 12	3.611E 12	3.303E 12	2.862E 12	2.384E 12	2.013E 12
21000	6.007E 12	5.253E 12	4.587E 12	4.194E 12	4.021E 12	3.943E 12	3.873E 12	3.740E 12	3.472E 12	3.050E 12	2.557E 12
21500	7.052E 12	6.559E 12	5.860E 12	5.083E 12	4.489E 12	4.178E 12	4.040E 12	3.954E 12	3.826E 12	3.570E 12	3.151E 12
22000	8.086E 12	7.422E 12	6.927E 12	6.297E 12	5.504E 12	4.786E 12	4.347E 12	4.141E 12	4.027E 12	3.886E 12	3.617E 12
22500	8.374E 12	7.663E 12	7.502E 12	7.173E 12	6.594E 12	5.806E 12	5.025E 12	4.497E 12	4.234E 12	4.089E 12	3.920E 12
23000	8.374E 12	7.984E 12	7.804E 12	7.640E 12	7.337E 12	6.782E 12	5.993E 12	5.379E 12	4.604E 12	4.307E 12	4.133E 12
23500	9.836E 12	8.793E 12	8.214E 12	7.946E 12	7.754E 12	7.446E 12	6.883E 12	6.077E 12	5.249E 12	4.866E 12	4.354E 12
24000	1.156E 13	1.033E 13	9.165E 12	8.435E 12	8.081E 12	7.508E 12	6.907E 12	6.007E 12	5.269E 12	4.846E 12	4.480E 12
24500	1.274E 13	1.187E 13	1.066E 13	9.438E 12	8.614E 12	8.194E 12	7.915E 12	7.521E 12	6.854E 12	6.391E 12	5.176E 12
25000	1.345E 13	1.291E 13	1.205E 13	1.084E 13	9.596E 12	8.732E 12	8.274E 12	7.946E 12	7.474E 12	7.021E 12	5.820E 12
25500	1.421E 13	1.366E 13	1.302E 13	1.213E 13	1.096E 13	9.645E 12	8.787E 12	8.314E 12	7.929E 12	7.552E 12	6.509E 12
26000	1.549E 13	1.438E 13	1.371E 13	1.306E 13	1.211E 13	1.083E 13	9.600E 12	8.785E 12	8.308E 12	7.845E 12	7.143E 12
26500	1.715E 13	1.562E 13	1.446E 13	1.366E 13	1.303E 13	1.199E 13	9.844E 12	9.044E 12	8.736E 12	8.246E 12	7.673E 12
27000	1.860E 13	1.716E 13	1.562E 13	1.449E 13	1.374E 13	1.292E 13	1.176E 13	1.061E 13	9.322E 12	8.644E 12	8.110E 12
27500	1.968E 13	1.856E 13	1.705E 13	1.552E 13	1.444E 13	1.365E 13	1.271E 13	1.143E 13	1.010E 13	9.134E 12	8.506E 12
28000	2.194E 13	2.161E 13	2.132E 13	2.08E 13	1.984E 13	1.837E 13	1.667E 13	1.524E 13	1.415E 13	1.298E 13	1.155E 13
28500	2.399E 13	2.373E 13	2.324E 13	2.265E 13	2.219E 13	2.116E 13	2.105E 13	1.978E 13	1.803E 13	1.628E 13	1.489E 13
29000	2.667E 13	2.465E 13	2.460E 13	2.445E 13	2.408E 13	2.350E 13	2.290E 13	2.236E 13	2.157E 13	2.019E 13	1.831E 13

100000 2.575E 13 2.575E 13 2.574E 13 2.573E 13 2.570E 13 2.567E 13 2.564E 13 2.561E 13 2.558E 13 2.555E 13
150000 2.042E 13 2.042E 13 2.041E 13 2.040E 13 2.038E 13 2.036E 13 2.034E 13 2.032E 13 2.030E 13 2.028E 13
200000 3.244E 13 3.244E 13 3.243E 13 3.242E 13 3.240E 13 3.238E 13 3.236E 13 3.234E 13 3.232E 13 3.230E 13
300000 1.049E 14 1.049E 14 1.048E 14 1.047E 14 1.045E 14 1.043E 14 1.041E 14 1.039E 14 1.037E 14 1.035E 14
400000 1.354E 14 1.354E 14 1.353E 14 1.352E 14 1.350E 14 1.348E 14 1.346E 14 1.344E 14 1.342E 14 1.340E 14

500000 1.634E 14 1.634E 14 1.633E 14 1.632E 14 1.630E 14 1.628E 14 1.626E 14 1.624E 14 1.622E 14 1.620E 14
600000 1.504E 14 1.504E 14 1.503E 14 1.502E 14 1.500E 14 1.498E 14 1.496E 14 1.494E 14 1.492E 14 1.490E 14
800000 1.646E 14 1.646E 14 1.645E 14 1.644E 14 1.642E 14 1.640E 14 1.638E 14 1.636E 14 1.634E 14 1.632E 14
1000000 1.707E 14 1.707E 14 1.706E 14 1.705E 14 1.703E 14 1.701E 14 1.699E 14 1.697E 14 1.695E 14 1.693E 14

1500000 2.147E 14 2.147E 14 2.146E 14 2.145E 14 2.143E 14 2.141E 14 2.139E 14 2.137E 14 2.135E 14 2.133E 14
2000000 2.523E 14 2.523E 14 2.522E 14 2.521E 14 2.519E 14 2.517E 14 2.515E 14 2.513E 14 2.511E 14 2.509E 14
3000000 3.231E 14 3.231E 14 3.230E 14 3.229E 14 3.227E 14 3.225E 14 3.223E 14 3.221E 14 3.219E 14 3.217E 14
4000000 3.940E 14 3.940E 14 3.939E 14 3.938E 14 3.936E 14 3.934E 14 3.932E 14 3.930E 14 3.928E 14 3.926E 14
5000000 4.648E 14 4.648E 14 4.647E 14 4.646E 14 4.644E 14 4.642E 14 4.640E 14 4.638E 14 4.636E 14 4.634E 14

6000000 5.356E 14 5.356E 14 5.355E 14 5.354E 14 5.352E 14 5.350E 14 5.348E 14 5.346E 14 5.344E 14 5.342E 14
8000000 6.773E 14 6.773E 14 6.772E 14 6.771E 14 6.769E 14 6.767E 14 6.765E 14 6.763E 14 6.761E 14 6.759E 14
10000000 8.189E 14 8.189E 14 8.188E 14 8.187E 14 8.185E 14 8.183E 14 8.181E 14 8.179E 14 8.177E 14 8.175E 14

TABLE 16(1CONT): INTERNAL ENERGY (ERG/CM) OF EQUILIBRIUM AIR

TEMP. (066 K)	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
10000	3.406E 11	4.857E 11	4.479E 11	4.250E 11	4.092E 11	3.925E 11	3.653E 11	3.212E 11	2.679E 11	2.100E 11
10500	6.273E 11	5.374E 11	4.810E 11	4.483E 11	4.272E 11	4.105E 11	3.807E 11	3.525E 11	3.007E 11	2.481E 11
11000	7.231E 11	6.023E 11	5.245E 11	4.769E 11	4.479E 11	4.281E 11	4.005E 11	3.784E 11	3.318E 11	2.773E 11
11500	8.320E 11	6.803E 11	5.748E 11	5.116E 11	4.719E 11	4.467E 11	4.264E 11	4.009E 11	3.461E 11	3.044E 11
12000	9.477E 11	7.700E 11	6.392E 11	5.534E 11	5.002E 11	4.673E 11	4.444E 11	4.208E 11	3.654E 11	3.240E 11
12500	1.042E 12	8.679E 11	7.111E 11	6.025E 11	5.394E 11	4.907E 11	4.629E 11	4.393E 11	3.800E 11	3.414E 11
13000	1.167E 12	9.695E 11	7.916E 11	6.590E 11	5.710E 11	5.173E 11	4.829E 11	4.572E 11	4.204E 11	3.861E 11
13500	1.258E 12	1.069E 12	8.766E 11	7.223E 11	6.157E 11	5.476E 11	5.049E 11	4.759E 11	4.475E 11	4.082E 11
14000	1.332E 12	1.163E 12	9.649E 11	7.914E 11	6.649E 11	5.817E 11	5.292E 11	4.947E 11	4.659E 11	4.302E 11
14500	1.389E 12	1.245E 12	1.052E 12	8.648E 11	7.190E 11	6.197E 11	5.561E 11	5.152E 11	4.842E 11	4.501E 11
15000	1.434E 12	1.316E 12	1.136E 12	9.406E 11	7.775E 11	6.615E 11	5.857E 11	5.372E 11	5.029E 11	4.693E 11
15500	1.469E 12	1.375E 12	1.213E 12	1.017E 12	8.394E 11	7.049E 11	6.182E 11	5.611E 11	5.222E 11	4.881E 11
16000	1.496E 12	1.422E 12	1.282E 12	1.091E 12	9.076E 11	7.556E 11	6.533E 11	5.868E 11	5.425E 11	5.068E 11
16500	1.518E 12	1.461E 12	1.342E 12	1.162E 12	9.680E 11	8.070E 11	6.911E 11	6.195E 11	5.640E 11	5.258E 11
17000	1.537E 12	1.492E 12	1.393E 12	1.228E 12	1.034E 12	8.605E 11	7.313E 11	6.441E 11	5.847E 11	5.453E 11
17500	1.554E 12	1.518E 12	1.437E 12	1.289E 12	1.098E 12	9.154E 11	7.735E 11	6.756E 11	6.100E 11	5.654E 11
18000	1.570E 12	1.541E 12	1.473E 12	1.343E 12	1.159E 12	9.710E 11	8.177E 11	7.086E 11	6.361E 11	5.863E 11
18500	1.587E 12	1.561E 12	1.505E 12	1.391E 12	1.217E 12	1.027E 12	8.632E 11	7.437E 11	6.628E 11	6.082E 11
19000	1.603E 12	1.579E 12	1.532E 12	1.433E 12	1.272E 12	1.081E 12	9.097E 11	7.800E 11	6.900E 11	6.311E 11
19500	1.622E 12	1.596E 12	1.555E 12	1.470E 12	1.322E 12	1.134E 12	9.567E 11	8.174E 11	7.199E 11	6.553E 11
20000	1.645E 12	1.614E 12	1.577E 12	1.503E 12	1.368E 12	1.186E 12	1.004E 12	8.558E 11	7.501E 11	6.804E 11
20500	1.661E 12	1.704E 12	1.654E 12	1.604E 12	1.514E 12	1.267E 12	1.186E 12	1.014E 12	8.768E 11	7.891E 11
21000	2.139E 12	1.882E 12	1.757E 12	1.688E 12	1.610E 12	1.366E 12	1.344E 12	1.169E 12	1.015E 12	9.059E 11
26000	2.649E 12	2.213E 12	1.938E 12	1.796E 12	1.710E 12	1.615E 12	1.479E 12	1.311E 12	1.148E 12	1.024E 12
28000	3.183E 12	2.671E 12	2.239E 12	1.967E 12	1.819E 12	1.714E 12	1.592E 12	1.437E 12	1.273E 12	1.137E 12
30000	3.610E 12	3.153E 12	2.638E 12	2.226E 12	1.972E 12	1.822E 12	1.696E 12	1.551E 12	1.388E 12	1.245E 12
32000	3.924E 12	3.569E 12	3.070E 12	2.565E 12	2.189E 12	1.958E 12	1.804E 12	1.658E 12	1.495E 12	1.340E 12
34000	4.150E 12	3.687E 12	3.488E 12	2.843E 12	2.448E 12	2.138E 12	1.929E 12	1.766E 12	1.558E 12	1.462E 12
36000	4.370E 12	4.132E 12	3.758E 12	3.314E 12	2.789E 12	2.364E 12	2.080E 12	1.894E 12	1.702E 12	1.537E 12
38000	4.659E 12	4.354E 12	4.044E 12	3.644E 12	3.122E 12	2.627E 12	2.263E 12	2.017E 12	1.811E 12	1.632E 12
40000	5.071E 12	4.610E 12	4.296E 12	3.933E 12	3.442E 12	2.912E 12	2.475E 12	2.169E 12	1.929E 12	1.732E 12
42000	5.612E 12	4.946E 12	4.532E 12	4.181E 12	3.734E 12	3.201E 12	2.710E 12	2.341E 12	2.059E 12	1.837E 12
44000	6.228E 12	5.303E 12	4.810E 12	4.414E 12	3.996E 12	3.481E 12	2.958E 12	2.522E 12	2.201E 12	1.949E 12
46000	6.841E 12	5.704E 12	5.155E 12	4.658E 12	4.236E 12	3.744E 12	3.208E 12	2.735E 12	2.357E 12	2.069E 12
48000	7.396E 12	6.463E 12	5.574E 12	4.937E 12	4.470E 12	3.990E 12	3.454E 12	2.947E 12	2.523E 12	2.198E 12
50000	7.874E 12	7.012E 12	6.049E 12	5.265E 12	4.713E 12	4.223E 12	3.692E 12	3.162E 12	2.698E 12	2.334E 12
60000	1.019E 13	9.193E 12	8.354E 12	7.392E 12	6.365E 12	5.497E 12	4.816E 12	4.210E 12	3.623E 12	3.095E 12
70000	1.353E 13	1.199E 13	1.052E 13	9.355E 12	8.295E 12	7.188E 12	6.158E 12	5.307E 12	4.583E 12	3.931E 12
80000	1.647E 13	1.490E 13	1.330E 13	1.163E 13	1.016E 13	8.904E 12	7.700E 12	6.590E 12	5.649E 12	4.842E 12

190000 2.821E 13 2.790E 13 2.725E 13 2.614E 13 2.432E 13 2.222E 13 2.077E 13 1.915E 13 1.721E 13
 200000 3.101E 13 3.095E 13 3.081E 13 3.031E 13 2.985E 13 2.862E 13 2.762E 13 2.642E 13 2.511E 13
 300000 3.601E 13 3.652E 13 3.634E 13 3.610E 13 3.590E 13 3.543E 13 3.457E 13 3.305E 13 3.067E 13
 400000 6.616E 13 5.727E 13 4.923E 13 4.457E 13 4.247E 13 4.141E 13 4.032E 13 3.932E 13 3.744E 13

500000 1.083E 14 9.419E 13 8.287E 13 7.343E 13 6.383E 13 5.501E 13 4.947E 13 4.635E 13 4.392E 13
 600000 1.387E 14 1.322E 14 1.271E 14 1.077E 14 9.340E 13 8.167E 13 7.060E 13 6.044E 13 5.360E 13
 800000 1.642E 14 1.634E 14 1.613E 14 1.568E 14 1.496E 14 1.389E 14 1.237E 14 1.068E 14 9.134E 13
 1000000 1.787E 14 1.786E 14 1.783E 14 1.777E 14 1.760E 14 1.720E 14 1.643E 14 1.522E 14 1.354E 14
 1500000 2.141E 14 2.140E 14 2.139E 14 2.138E 14 2.135E 14 2.130E 14 2.119E 14 2.095E 14 2.044E 14
 2000000 2.495E 14 2.494E 14 2.494E 14 2.492E 14 2.490E 14 2.487E 14 2.480E 14 2.467E 14 2.442E 14
 3000000 3.228E 14 3.223E 14 3.217E 14 3.210E 14 3.204E 14 3.198E 14 3.191E 14 3.181E 14 3.164E 14
 4000000 3.939E 14 3.939E 14 3.938E 14 3.937E 14 3.933E 14 3.927E 14 3.916E 14 3.902E 14 3.882E 14
 5000000 4.648E 14 4.648E 14 4.647E 14 4.646E 14 4.645E 14 4.642E 14 4.637E 14 4.627E 14 4.609E 14
 6000000 5.356E 14 5.356E 14 5.355E 14 5.355E 14 5.354E 14 5.352E 14 5.348E 14 5.341E 14 5.327E 14
 8000000 6.773E 14 6.772E 14 6.772E 14 6.772E 14 6.771E 14 6.769E 14 6.768E 14 6.760E 14 6.750E 14
 10000000 8.189E 14 8.189E 14 8.189E 14 8.189E 14 8.187E 14 8.186E 14 8.183E 14 8.178E 14 8.169E 14

TABLE 107. INTERNAL ENERGY DENSITY (ERG/CM³) OF EQUILIBRIUM AIR

TEMP. (DEG K)	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
1000	1.837E 00	5.809E 00	1.836E 01	5.793E 01	1.821E 02	5.651E 02	1.700E 03	6.820E 03	1.277E 04	3.262E 04	8.391E 04
1050	1.851E 00	5.851E 00	1.849E 01	5.843E 01	1.843E 02	5.779E 02	1.784E 03	5.300E 03	1.477E 04	3.846E 04	9.971E 04
1100	1.867E 00	5.895E 00	1.863E 01	5.888E 01	1.859E 02	5.857E 02	1.830E 03	5.598E 03	1.634E 04	4.455E 04	1.153E 05
1150	1.892E 00	5.948E 00	1.877E 01	5.931E 01	1.874E 02	5.915E 02	1.839E 03	5.776E 03	1.742E 04	4.961E 04	1.323E 05
1200	1.946E 00	6.032E 00	1.895E 01	5.977E 01	1.883E 02	5.964E 02	1.880E 03	5.887E 03	1.811E 04	5.348E 04	1.481E 05
1250	2.071E 00	6.203E 00	1.921E 01	6.033E 01	1.903E 02	6.010E 02	1.897E 03	5.965E 03	1.856E 04	5.622E 04	1.614E 05
1300	2.323E 00	6.571E 00	1.972E 01	6.114E 01	1.920E 02	6.057E 02	1.912E 03	6.026E 03	1.888E 04	5.810E 04	1.718E 05
1350	2.720E 00	7.282E 00	2.075E 01	6.258E 01	1.944E 02	6.110E 02	1.927E 03	6.079E 03	1.911E 04	5.941E 04	1.795E 05
1400	3.184E 00	8.389E 00	2.266E 01	6.530E 01	1.983E 02	6.179E 02	1.944E 03	6.129E 03	1.930E 04	6.037E 04	1.852E 05
1450	3.610E 00	9.736E 00	2.565E 01	7.021E 01	2.052E 02	6.283E 02	1.963E 03	6.181E 03	1.947E 04	6.112E 04	1.893E 05
1500	2.952E 01	1.105E 01	2.945E 01	7.796E 01	2.173E 02	6.453E 02	1.991E 03	6.238E 03	1.964E 04	6.176E 04	1.925E 05
1550	4.229E 00	1.217E 01	3.345E 01	8.829E 01	2.365E 02	6.738E 02	2.032E 03	6.311E 03	1.982E 04	6.233E 04	1.951E 05
1600	4.452E 00	1.309E 01	3.707E 01	9.995E 01	2.632E 02	7.190E 02	2.097E 03	6.411E 03	2.002E 04	6.289E 04	1.973E 05
1650	4.614E 00	1.384E 01	4.013E 01	1.114E 02	2.935E 02	7.842E 02	2.199E 03	6.558E 03	2.027E 04	6.348E 04	1.992E 05
1700	4.719E 00	1.442E 01	4.268E 01	1.216E 02	3.238E 02	8.680E 02	2.349E 03	6.780E 03	2.060E 04	6.415E 04	2.011E 05
1750	4.787E 00	1.485E 01	4.474E 01	1.302E 02	3.626E 02	9.642E 02	2.551E 03	7.106E 03	2.108E 04	6.497E 04	2.031E 05
1800	4.833E 00	1.509E 01	4.629E 01	1.375E 02	3.920E 02	1.064E 03	2.800E 03	7.561E 03	2.177E 04	6.603E 04	2.053E 05
1850	4.871E 00	1.529E 01	4.739E 01	1.434E 02	4.174E 02	1.160E 03	3.080E 03	8.151E 03	2.273E 04	6.746E 04	2.078E 05
1900	4.910E 00	1.541E 01	4.814E 01	1.478E 02	4.388E 02	1.247E 03	3.370E 03	8.863E 03	2.402E 04	6.942E 04	2.110E 05
1950	4.956E 00	1.544E 01	4.865E 01	1.510E 02	4.562E 02	1.323E 03	3.652E 03	9.659E 03	2.565E 04	7.206E 04	2.150E 05
2000	5.022E 00	1.567E 01	4.913E 01	1.533E 02	4.695E 02	1.388E 03	3.913E 03	1.050E 04	2.762E 04	7.555E 04	2.203E 05
2200	5.875E 00	1.695E 01	5.131E 01	1.593E 02	4.977E 02	1.543E 03	4.666E 03	1.350E 04	3.699E 04	9.750E 04	2.601E 05
2400	7.763E 00	2.147E 01	5.928E 01	1.710E 02	5.197E 02	1.611E 03	5.005E 03	1.528E 04	4.687E 04	1.246E 05	3.304E 05
2600	9.114E 00	2.680E 01	7.573E 01	2.077E 02	5.802E 02	1.707E 03	5.222E 03	1.616E 04	4.945E 04	1.459E 05	4.073E 05
2800	9.715E 00	2.992E 01	8.952E 01	2.574E 02	7.113E 02	1.956E 03	5.618E 03	1.692E 04	5.204E 04	1.588E 05	4.675E 05
3000	1.005E 01	3.132E 01	9.695E 01	2.931E 02	8.522E 02	2.373E 03	6.493E 03	1.838E 04	5.472E 04	1.671E 05	5.066E 05
3200	1.082E 01	3.263E 01	1.009E 02	3.122E 02	9.482E 02	2.772E 03	7.745E 03	2.117E 04	5.952E 04	1.760E 05	5.341E 05
3400	1.271E 01	3.593E 01	1.061E 02	3.247E 02	1.002E 03	3.043E 03	8.895E 03	2.484E 04	6.783E 04	1.907E 05	5.626E 05
3600	1.494E 01	4.222E 01	1.184E 02	3.447E 02	1.044E 03	3.207E 03	9.703E 03	2.823E 04	7.643E 04	2.142E 05	6.048E 05
3800	1.646E 01	4.851E 01	1.378E 02	3.857E 02	1.113E 03	3.349E 03	1.023E 04	3.073E 04	8.858E 04	2.443E 05	6.690E 05
4000	1.739E 01	5.276E 01	1.558E 02	4.432E 02	1.240E 03	3.569E 03	1.069E 04	3.247E 04	9.658E 04	2.747E 05	7.521E 05
4200	1.837E 01	5.559E 01	1.682E 02	4.957E 02	1.408E 03	3.941E 03	1.136E 04	3.398E 04	1.025E 05	3.005E 05	8.412E 05
4400	2.002E 01	5.878E 01	1.771E 02	5.337E 02	1.565E 03	4.427E 03	1.241E 04	3.590E 04	1.074E 05	3.206E 05	9.231E 05
4600	2.216E 01	6.382E 01	1.871E 02	5.621E 02	1.684E 03	4.899E 03	1.378E 04	3.876E 04	1.129E 05	3.370E 05	9.916E 05
4800	2.403E 01	7.013E 01	2.018E 02	5.923E 02	1.776E 03	5.281E 03	1.520E 04	4.256E 04	1.205E 05	3.533E 05	1.048E 06
5000	2.543E 01	7.584E 01	2.203E 02	6.343E 02	1.866E 03	5.579E 03	1.643E 04	4.673E 04	1.306E 05	3.733E 05	1.099E 06
6000	2.835E 01	8.832E 01	2.755E 02	8.499E 02	2.563E 03	7.509E 03	2.154E 04	6.228E 04	1.829E 05	5.306E 05	1.493E 06
7000	3.101E 01	9.699E 01	3.003E 02	9.255E 02	2.867E 03	8.892E 03	2.720E 04	8.083E 04	2.320E 05	6.855E 05	1.924E 06
8000	3.188E 01	1.007E 02	3.179E 02	9.990E 02	3.112E 03	9.603E 03	2.959E 04	9.136E 04	2.787E 05	8.252E 05	2.367E 06

90C00	3-258E 01	1-030E 02	3-257E 02	1-029E 03	3-248E 03	1-021E 04	3-101E 04	9-812E 04	3-017E 05	9-249E 05	2-782E 06
100C00	3-327E 01	1-052E 02	3-327E 02	1-052E 03	3-325E 03	1-050E 04	3-311E 04	1-030E 05	3-221E 05	9-897E 05	3-029E 06
150C00	3-673E 01	1-161E 02	3-672E 02	1-161E 03	3-672E 03	1-161E 04	3-671E 04	1-161E 05	3-670E 05	1-160E 06	3-661E 06
200C00	4-192E 01	1-294E 02	4-054E 02	1-277E 03	4-031E 03	1-273E 04	4-020E 04	1-270E 05	4-010E 05	1-269E 06	4-012E 06
300C00	1-381E 02	3-965E 02	1-097E 03	3-068E 03	0-970E 03	2-669E 04	7-703E 04	2-698E 05	5-644E 05	1-607E 06	4-843E 06
400C00	1-750E 02	5-476E 02	1-694E 03	5-197E 03	1-600E 04	4-930E 04	1-489E 05	4-298E 05	1-188E 06	3-303E 06	9-478E 06
500C00	1-853E 02	5-859E 02	1-852E 03	5-854E 03	1-847E 04	5-810E 04	1-812E 05	5-802E 05	1-787E 06	5-200E 06	1-554E 07
600C00	1-944E 02	6-148E 02	1-944E 03	6-148E 03	1-944E 04	6-147E 04	1-943E 05	6-133E 05	1-930E 06	6-031E 06	1-860E 07
800C00	2-127E 02	6-720E 02	2-127E 03	6-726E 03	2-127E 04	6-724E 04	2-127E 05	6-724E 05	2-127E 06	6-724E 06	2-125E 07
1000C00	2-310E 02	7-305E 02	2-310E 03	7-305E 03	2-310E 04	7-305E 04	2-310E 05	7-304E 05	2-310E 06	7-304E 06	2-309E 07
1500C00	2-774E 02	8-760E 02	2-768E 03	8-751E 03	2-767E 04	8-750E 04	2-767E 05	8-750E 05	2-767E 06	8-750E 06	2-767E 07
2000C00	3-261E 02	1-031E 03	3-259E 03	1-030E 04	3-252E 04	1-026E 05	3-239E 05	1-022E 06	3-220E 06	1-020E 07	3-224E 07
3000C00	4-176E 02	1-321E 03	4-176E 03	1-321E 04	4-176E 04	1-321E 05	4-176E 05	1-321E 06	4-176E 06	1-320E 07	4-174E 07
4000C00	5-091E 02	1-610E 03	5-091E 03	1-610E 04	5-091E 04	1-610E 05	5-091E 05	1-610E 06	5-091E 06	1-610E 07	5-091E 07
5000C00	6-007E 02	1-899E 03	6-007E 03	1-899E 04	6-007E 04	1-899E 05	6-007E 05	1-899E 06	6-007E 06	1-899E 07	6-007E 07
6000C00	6-922E 02	2-189E 03	6-922E 03	2-189E 04	6-922E 04	2-189E 05	6-922E 05	2-189E 06	6-922E 06	2-189E 07	6-922E 07
8000C00	8-753E 02	2-768E 03	8-753E 03	2-768E 04	8-753E 04	2-768E 05	8-753E 05	2-768E 06	8-753E 06	2-768E 07	8-753E 07
10000C00	1-058E 03	3-347E 03	1-058E 04	3-347E 04	1-058E 05	3-347E 05	1-058E 06	3-347E 06	1-058E 07	3-347E 07	1-058E 08

TABLE 107(CUNT) INTERNAL ENERGY DENSITY (ERG/CM3) OF EQUILIBRIUM AIR

TEMP. (DEG K)	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
1000	2.242E 05	6.277E 05	1.832E 06	5.493E 06	1.672E 07	5.073E 07	1.493E 08	4.153E 08	1.095E 09	2.840E 09
10500	2.564E 05	6.945E 05	2.196E 06	5.794E 06	1.746E 07	5.305E 07	1.588E 08	4.549E 08	1.229E 09	3.207E 09
11000	2.955E 05	7.783E 05	2.149E 06	6.163E 06	1.830E 07	5.532E 07	1.669E 08	4.890E 08	1.356E 09	3.585E 09
11500	3.400E 05	8.792E 05	2.357E 06	6.612E 06	1.928E 07	5.773E 07	1.743E 08	5.181E 08	1.472E 09	3.963E 09
12000	3.873E 05	9.950E 05	2.612E 06	7.151E 06	2.044E 07	6.040E 07	1.816E 08	5.438E 08	1.575E 09	4.327E 09
12500	4.341E 05	1.122E 06	2.906E 06	7.786E 06	2.180E 07	6.342E 07	1.892E 08	5.677E 08	1.667E 09	4.671E 09
13000	4.771E 05	1.253E 06	3.233E 06	8.516E 06	2.337E 07	6.686E 07	1.974E 08	5.909E 08	1.751E 09	4.990E 09
13500	5.141E 05	1.382E 06	3.583E 06	9.344E 06	2.516E 07	7.076E 07	2.063E 08	6.146E 08	1.829E 09	5.285E 09
14000	5.442E 05	1.502E 06	3.943E 06	1.023E 07	2.717E 07	7.517E 07	2.163E 08	6.393E 08	1.904E 09	5.559E 09
14500	5.678E 05	1.610E 06	4.301E 06	1.118E 07	2.939E 07	8.008E 07	2.273E 08	6.658E 08	1.979E 09	5.817E 09
15000	5.861E 05	1.701E 06	4.642E 06	1.216E 07	3.177E 07	8.549E 07	2.394E 08	6.943E 08	2.053E 09	6.065E 09
15500	6.002E 05	1.777E 06	4.957E 06	1.314E 07	3.430E 07	9.136E 07	2.526E 08	7.251E 08	2.134E 09	6.308E 09
16000	6.114E 05	1.838E 06	5.238E 06	1.410E 07	3.693E 07	9.765E 07	2.670E 08	7.583E 08	2.217E 09	6.550E 09
16500	6.205E 05	1.888E 06	5.483E 06	1.502E 07	3.959E 07	1.043E 08	2.824E 08	7.941E 08	2.303E 09	6.795E 09
17000	6.283E 05	1.929E 06	5.693E 06	1.587E 07	4.226E 07	1.112E 08	2.989E 08	8.324E 08	2.398E 09	7.047E 09
17500	6.352E 05	1.962E 06	5.871E 06	1.665E 07	4.486E 07	1.183E 08	3.162E 08	8.731E 08	2.496E 09	7.307E 09
18000	6.418E 05	1.991E 06	6.021E 06	1.735E 07	4.737E 07	1.255E 08	3.342E 08	9.160E 08	2.600E 09	7.577E 09
18500	6.484E 05	2.017E 06	6.149E 06	1.797E 07	4.975E 07	1.327E 08	3.528E 08	9.611E 08	2.709E 09	7.858E 09
19000	6.553E 05	2.040E 06	6.259E 06	1.852E 07	5.197E 07	1.397E 08	3.718E 08	1.008E 09	2.823E 09	8.156E 09
19500	6.630E 05	2.063E 06	6.356E 06	1.900E 07	5.403E 07	1.466E 08	3.910E 08	1.056E 09	2.942E 09	8.468E 09
20000	6.721E 05	2.085E 06	6.443E 06	1.942E 07	5.591E 07	1.533E 08	4.102E 08	1.106E 09	3.065E 09	8.793E 09
22000	7.358E 05	2.202E 06	6.761E 06	2.072E 07	6.187E 07	1.767E 08	4.846E 08	1.311E 09	3.591E 09	1.020E 10
24000	8.743E 05	2.433E 06	7.179E 06	2.182E 07	6.613E 07	1.947E 08	5.500E 08	1.511E 09	4.149E 09	1.171E 10
26000	1.082E 06	2.861E 06	7.421E 06	2.321E 07	6.988E 07	2.088E 08	6.046E 08	1.694E 09	4.693E 09	1.323E 10
28000	1.301E 06	3.452E 06	9.148E 06	2.541E 07	7.432E 07	2.215E 08	6.507E 08	1.857E 09	5.203E 09	1.470E 10
30000	1.478E 06	4.075E 06	1.078E 07	2.876E 07	8.058E 07	2.354E 08	6.932E 08	2.004E 09	5.672E 09	1.608E 10
32000	1.604E 06	4.612E 06	1.255E 07	3.314E 07	8.944E 07	2.531E 08	7.373E 08	2.142E 09	6.110E 09	1.739E 10
34000	1.696E 06	5.024E 06	1.417E 07	3.803E 07	1.008E 08	2.763E 08	7.883E 08	2.283E 09	6.531E 09	1.864E 10
36000	1.788E 06	5.340E 06	1.552E 07	4.283E 07	1.144E 08	3.054E 08	8.501E 08	2.435E 09	6.955E 09	1.986E 10
38000	1.904E 06	5.627E 06	1.661E 07	4.714E 07	1.276E 08	3.395E 08	9.248E 08	2.607E 09	7.400E 09	2.110E 10
40000	2.072E 06	5.957E 06	1.756E 07	5.082E 07	1.406E 08	3.763E 08	1.012E 09	2.803E 09	7.882E 09	2.238E 10
42000	2.293E 06	6.391E 06	1.852E 07	5.403E 07	1.526E 08	4.137E 08	1.108E 09	3.026E 09	8.415E 09	2.373E 10
44000	2.545E 06	6.956E 06	1.966E 07	5.704E 07	1.633E 08	4.498E 08	1.209E 09	3.272E 09	8.996E 09	2.518E 10
46000	2.796E 06	7.630E 06	2.107E 07	6.020E 07	1.731E 08	4.838E 08	1.311E 09	3.535E 09	9.632E 09	2.674E 10
48000	3.023E 06	8.353E 06	2.278E 07	6.386E 07	1.827E 08	5.156E 08	1.412E 09	3.809E 09	1.031E 10	2.840E 10
50000	3.218E 06	9.062E 06	2.472E 07	6.805E 07	1.926E 08	5.458E 08	1.509E 09	4.087E 09	1.103E 10	3.016E 10
60000	4.165E 06	1.188E 07	3.414E 07	9.533E 07	2.631E 08	7.103E 08	1.968E 09	5.441E 09	1.481E 10	4.000E 10
70000	5.531E 06	1.550E 07	4.300E 07	1.209E 08	3.390E 08	9.290E 08	2.516E 09	6.858E 09	1.873E 10	5.280E 10
80000	6.731E 06	1.925E 07	5.435E 07	1.503E 08	4.153E 08	1.151E 09	3.147E 09	8.517E 09	2.308E 10	6.258E 10

TABLE 108. ENTHALPY (ERG/GM) OF EQUILIBRIUM AIR

TEMP. (DEG K)	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
10500	1.536E 12	1.536E 12	1.535E 12	1.532E 12	1.522E 12	1.495E 12	1.424E 12	1.280E 12	1.076E 12	8.775E 11	7.204E 11
10500	1.552E 12	1.552E 12	1.550E 12	1.546E 12	1.546E 12	1.533E 12	1.497E 12	1.409E 12	1.246E 12	1.030E 12	8.447E 11
11000	1.570E 12	1.568E 12	1.567E 12	1.566E 12	1.564E 12	1.550E 12	1.541E 12	1.491E 12	1.379E 12	1.194E 12	9.844E 11
11500	1.596E 12	1.587E 12	1.584E 12	1.583E 12	1.582E 12	1.570E 12	1.569E 12	1.542E 12	1.472E 12	1.330E 12	1.128E 12
12000	1.644E 12	1.614E 12	1.603E 12	1.600E 12	1.598E 12	1.596E 12	1.591E 12	1.574E 12	1.535E 12	1.435E 12	1.262E 12
12500	1.750E 12	1.662E 12	1.670E 12	1.670E 12	1.670E 12	1.631E 12	1.610E 12	1.602E 12	1.577E 12	1.512E 12	1.376E 12
13000	1.958E 12	1.761E 12	1.676E 12	1.645E 12	1.635E 12	1.631E 12	1.628E 12	1.623E 12	1.608E 12	1.564E 12	1.447E 12
13500	2.282E 12	1.947E 12	1.764E 12	1.687E 12	1.659E 12	1.650E 12	1.644E 12	1.641E 12	1.632E 12	1.605E 12	1.535E 12
14000	2.661E 12	2.234E 12	1.923E 12	1.762E 12	1.656E 12	1.672E 12	1.664E 12	1.660E 12	1.653E 12	1.635E 12	1.587E 12
14500	3.010E 12	2.583E 12	2.149E 12	1.892E 12	1.757E 12	1.704E 12	1.685E 12	1.678E 12	1.672E 12	1.660E 12	1.627E 12
15000	3.292E 12	2.925E 12	2.482E 12	2.095E 12	1.859E 12	1.753E 12	1.713E 12	1.698E 12	1.691E 12	1.681E 12	1.658E 12
15500	3.522E 12	3.217E 12	2.810E 12	2.364E 12	2.020E 12	1.831E 12	1.751E 12	1.722E 12	1.710E 12	1.702E 12	1.684E 12
16000	3.709E 12	3.457E 12	3.109E 12	2.648E 12	2.241E 12	1.952E 12	1.809E 12	1.753E 12	1.732E 12	1.721E 12	1.707E 12
16500	3.847E 12	3.656E 12	3.363E 12	2.966E 12	2.508E 12	2.124E 12	1.897E 12	1.796E 12	1.757E 12	1.742E 12	1.729E 12
17000	3.940E 12	3.811E 12	3.574E 12	3.233E 12	2.792E 12	2.344E 12	2.023E 12	1.858E 12	1.790E 12	1.764E 12	1.750E 12
17500	4.002E 12	3.923E 12	3.750E 12	3.463E 12	3.044E 12	2.597E 12	2.193E 12	1.947E 12	1.834E 12	1.790E 12	1.771E 12
18000	4.048E 12	3.999E 12	3.883E 12	3.656E 12	3.309E 12	2.859E 12	2.401E 12	2.069E 12	1.895E 12	1.823E 12	1.794E 12
18500	4.084E 12	4.054E 12	3.979E 12	3.813E 12	3.522E 12	3.111E 12	2.634E 12	2.224E 12	1.978E 12	1.845E 12	1.820E 12
19000	4.125E 12	4.097E 12	4.048E 12	3.934E 12	3.703E 12	3.341E 12	2.874E 12	2.415E 12	2.088E 12	1.920E 12	1.850E 12
19500	4.171E 12	4.137E 12	4.100E 12	4.023E 12	3.851E 12	3.544E 12	3.112E 12	2.624E 12	2.277E 12	1.994E 12	1.869E 12
20000	4.231E 12	4.178E 12	4.144E 12	4.090E 12	3.967E 12	3.719E 12	3.331E 12	2.847E 12	2.392E 12	2.088E 12	1.937E 12
22000	4.948E 12	4.534E 12	4.351E 12	4.274E 12	4.227E 12	4.148E 12	3.973E 12	3.648E 12	3.183E 12	2.674E 12	2.284E 12
24000	6.502E 12	5.717E 12	5.025E 12	4.616E 12	4.434E 12	4.354E 12	4.280E 12	4.140E 12	3.855E 12	3.407E 12	2.884E 12
26000	7.628E 12	7.114E 12	6.386E 12	5.576E 12	4.937E 12	4.631E 12	4.488E 12	4.397E 12	4.241E 12	3.980E 12	3.541E 12
28000	8.154E 12	7.950E 12	7.338E 12	6.880E 12	6.050E 12	5.300E 12	4.850E 12	4.625E 12	4.504E 12	4.353E 12	4.064E 12
30000	8.469E 12	8.347E 12	8.179E 12	7.834E 12	7.229E 12	6.503E 12	5.931E 12	5.030E 12	4.753E 12	4.599E 12	4.418E 12
32000	9.126E 12	8.723E 12	8.536E 12	8.364E 12	8.047E 12	7.464E 12	6.835E 12	5.779E 12	5.176E 12	4.861E 12	4.675E 12
34000	1.069E 13	9.604E 12	9.004E 12	8.726E 12	8.525E 12	8.201E 12	7.609E 12	6.759E 12	5.895E 12	5.270E 12	4.940E 12
36000	1.253E 13	1.125E 13	1.003E 13	9.276E 12	8.908E 12	8.664E 12	8.366E 12	7.671E 12	6.766E 12	5.911E 12	5.315E 12
38000	1.390E 13	1.290E 13	1.144E 13	1.026E 13	9.505E 12	9.047E 12	8.775E 12	8.358E 12	7.452E 12	6.725E 12	5.874E 12
40000	1.459E 13	1.403E 13	1.313E 13	1.186E 13	1.037E 13	9.672E 12	9.193E 12	8.847E 12	8.366E 12	7.548E 12	6.564E 12
42000	1.544E 13	1.480E 13	1.410E 13	1.326E 13	1.067E 13	1.067E 13	9.771E 12	9.275E 12	8.868E 12	8.255E 12	7.357E 12
44000	1.622E 13	1.567E 13	1.494E 13	1.429E 13	1.349E 13	1.196E 13	1.067E 13	9.811E 12	9.309E 12	8.816E 12	8.068E 12
46000	1.860E 13	1.700E 13	1.592E 13	1.506E 13	1.431E 13	1.321E 13	1.183E 13	1.059E 13	9.801E 12	9.282E 12	8.671E 12
48000	2.014E 13	1.866E 13	1.704E 13	1.589E 13	1.510E 13	1.424E 13	1.303E 13	1.161E 13	1.046E 13	9.746E 12	9.175E 12
50000	2.134E 13	2.018E 13	1.860E 13	1.701E 13	1.588E 13	1.506E 13	1.407E 13	1.273E 13	1.133E 13	1.030E 13	9.636E 12
60000	2.401E 13	2.367E 13	2.202E 13	2.101E 13	2.101E 13	2.028E 13	1.849E 13	1.699E 13	1.504E 13	1.460E 13	1.308E 13
70000	2.648E 13	2.621E 13	2.549E 13	2.507E 13	2.459E 13	2.414E 13	2.339E 13	2.205E 13	2.020E 13	1.835E 13	1.687E 13
80000	2.752E 13	2.750E 13	2.744E 13	2.728E 13	2.690E 13	2.629E 13	2.566E 13	2.502E 13	2.424E 13	2.278E 13	2.078E 13

98000 2.841E 13 6.874E 12 2.926E 13 2.917E 13 2.893E 13 6.874E 12 3.371E 13 3.345E 13
100000 2.930E 13 2.930E 13 3.375E 13 3.374E 13 3.374E 13 3.375E 13 3.371E 13 3.345E 13
150000 3.374E 13 3.375E 13 3.817E 13 3.820E 13 3.820E 13 3.819E 13 3.817E 13 3.815E 13
200000 3.817E 13 3.819E 13 4.260E 13 4.267E 13 4.267E 13 4.266E 13 4.267E 13 4.261E 13
300000 4.267E 13 4.266E 13 4.703E 13 4.725E 13 4.725E 13 4.725E 13 4.725E 13 4.721E 13
400000 4.725E 13 4.721E 13 5.151E 14 5.189E 14 5.189E 14 5.151E 14 5.151E 14 5.145E 14

500000 5.151E 14 5.189E 14 5.622E 14 5.649E 14 5.649E 14 5.622E 14 5.622E 14 5.617E 14
600000 5.622E 14 5.617E 14 6.077E 14 6.107E 14 6.107E 14 6.077E 14 6.077E 14 6.073E 14
800000 6.077E 14 6.073E 14 6.522E 14 6.552E 14 6.552E 14 6.522E 14 6.522E 14 6.518E 14
1000000 6.522E 14 6.518E 14 6.967E 14 6.997E 14 6.997E 14 6.967E 14 6.967E 14 6.963E 14
1200000 6.967E 14 6.963E 14 7.412E 14 7.442E 14 7.442E 14 7.412E 14 7.412E 14 7.408E 14
1400000 7.412E 14 7.408E 14 7.857E 14 7.887E 14 7.887E 14 7.857E 14 7.857E 14 7.853E 14
1600000 7.857E 14 7.853E 14 8.302E 14 8.332E 14 8.332E 14 8.302E 14 8.302E 14 8.298E 14
1800000 8.302E 14 8.298E 14 8.747E 14 8.777E 14 8.777E 14 8.747E 14 8.747E 14 8.743E 14
2000000 8.747E 14 8.743E 14 9.192E 14 9.222E 14 9.222E 14 9.192E 14 9.192E 14 9.188E 14
2200000 9.192E 14 9.188E 14 9.637E 14 9.667E 14 9.667E 14 9.637E 14 9.637E 14 9.633E 14
2400000 9.637E 14 9.633E 14 10.082E 14 10.112E 14 10.112E 14 10.082E 14 10.082E 14 10.078E 14
2600000 10.082E 14 10.078E 14 10.527E 14 10.557E 14 10.557E 14 10.527E 14 10.527E 14 10.523E 14
2800000 10.527E 14 10.523E 14 10.972E 14 11.002E 14 11.002E 14 10.972E 14 10.972E 14 10.968E 14
3000000 10.972E 14 10.968E 14 11.417E 14 11.447E 14 11.447E 14 11.417E 14 11.417E 14 11.413E 14
3200000 11.417E 14 11.413E 14 11.862E 14 11.892E 14 11.892E 14 11.862E 14 11.862E 14 11.858E 14
3400000 11.862E 14 11.858E 14 12.307E 14 12.337E 14 12.337E 14 12.307E 14 12.307E 14 12.303E 14
3600000 12.307E 14 12.303E 14 12.752E 14 12.782E 14 12.782E 14 12.752E 14 12.752E 14 12.748E 14
3800000 12.752E 14 12.748E 14 13.197E 14 13.227E 14 13.227E 14 13.197E 14 13.197E 14 13.193E 14
4000000 13.197E 14 13.193E 14 13.642E 14 13.672E 14 13.672E 14 13.642E 14 13.642E 14 13.638E 14
4200000 13.642E 14 13.638E 14 14.087E 14 14.117E 14 14.117E 14 14.087E 14 14.087E 14 14.083E 14
4400000 14.087E 14 14.083E 14 14.532E 14 14.562E 14 14.562E 14 14.532E 14 14.532E 14 14.528E 14
4600000 14.532E 14 14.528E 14 14.977E 14 15.007E 14 15.007E 14 14.977E 14 14.977E 14 14.973E 14
4800000 14.977E 14 14.973E 14 15.422E 14 15.452E 14 15.452E 14 15.422E 14 15.422E 14 15.418E 14
5000000 15.422E 14 15.418E 14 15.867E 14 15.897E 14 15.897E 14 15.867E 14 15.867E 14 15.863E 14
5200000 15.867E 14 15.863E 14 16.312E 14 16.342E 14 16.342E 14 16.312E 14 16.312E 14 16.308E 14
5400000 16.312E 14 16.308E 14 16.757E 14 16.787E 14 16.787E 14 16.757E 14 16.757E 14 16.753E 14
5600000 16.757E 14 16.753E 14 17.202E 14 17.232E 14 17.232E 14 17.202E 14 17.202E 14 17.198E 14
5800000 17.202E 14 17.198E 14 17.647E 14 17.677E 14 17.677E 14 17.647E 14 17.647E 14 17.643E 14
6000000 17.647E 14 17.643E 14 18.092E 14 18.122E 14 18.122E 14 18.092E 14 18.092E 14 18.088E 14
6200000 18.092E 14 18.088E 14 18.537E 14 18.567E 14 18.567E 14 18.537E 14 18.537E 14 18.533E 14
6400000 18.537E 14 18.533E 14 18.982E 14 19.012E 14 19.012E 14 18.982E 14 18.982E 14 18.978E 14
6600000 18.982E 14 18.978E 14 19.427E 14 19.457E 14 19.457E 14 19.427E 14 19.427E 14 19.423E 14
6800000 19.427E 14 19.423E 14 19.872E 14 19.902E 14 19.902E 14 19.872E 14 19.872E 14 19.868E 14
7000000 19.872E 14 19.868E 14 20.317E 14 20.347E 14 20.347E 14 20.317E 14 20.317E 14 20.313E 14
7200000 20.317E 14 20.313E 14 20.762E 14 20.792E 14 20.792E 14 20.762E 14 20.762E 14 20.758E 14
7400000 20.762E 14 20.758E 14 21.207E 14 21.237E 14 21.237E 14 21.207E 14 21.207E 14 21.203E 14
7600000 21.207E 14 21.203E 14 21.652E 14 21.682E 14 21.682E 14 21.652E 14 21.652E 14 21.648E 14
7800000 21.652E 14 21.648E 14 22.097E 14 22.127E 14 22.127E 14 22.097E 14 22.097E 14 22.093E 14
8000000 22.097E 14 22.093E 14 22.542E 14 22.572E 14 22.572E 14 22.542E 14 22.542E 14 22.538E 14
8200000 22.542E 14 22.538E 14 22.987E 14 23.017E 14 23.017E 14 22.987E 14 22.987E 14 22.983E 14
8400000 22.987E 14 22.983E 14 23.432E 14 23.462E 14 23.462E 14 23.432E 14 23.432E 14 23.428E 14
8600000 23.432E 14 23.428E 14 23.877E 14 23.907E 14 23.907E 14 23.877E 14 23.877E 14 23.873E 14
8800000 23.877E 14 23.873E 14 24.322E 14 24.352E 14 24.352E 14 24.322E 14 24.322E 14 24.318E 14
9000000 24.322E 14 24.318E 14 24.767E 14 24.797E 14 24.797E 14 24.767E 14 24.767E 14 24.763E 14
9200000 24.767E 14 24.763E 14 25.212E 14 25.242E 14 25.242E 14 25.212E 14 25.212E 14 25.208E 14
9400000 25.212E 14 25.208E 14 25.657E 14 25.687E 14 25.687E 14 25.657E 14 25.657E 14 25.653E 14
9600000 25.657E 14 25.653E 14 26.102E 14 26.132E 14 26.132E 14 26.102E 14 26.102E 14 26.098E 14
9800000 26.102E 14 26.098E 14 26.547E 14 26.577E 14 26.577E 14 26.547E 14 26.547E 14 26.543E 14
10000000 26.547E 14 26.543E 14 26.992E 14 27.022E 14 27.022E 14 26.992E 14 26.992E 14 26.988E 14

TABLE 10B(CONT) ENTHALPY (ERG/CM) OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO									
	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
10500	4.141E 11	5.477E 11	5.078E 11	4.936E 11	4.668E 11	4.409E 11	4.199E 11	3.716E 11	3.137E 11	2.619E 11
10500	7.004E 11	6.031E 11	5.462E 11	5.108E 11	4.889E 11	4.704E 11	4.449E 11	4.071E 11	3.512E 11	2.939E 11
11000	8.049E 11	6.766E 11	5.941E 11	5.266E 11	5.128E 11	4.917E 11	4.706E 11	4.378E 11	3.869E 11	3.279E 11
11500	9.237E 11	7.624E 11	6.524E 11	5.831E 11	5.408E 11	5.140E 11	4.924E 11	4.644E 11	4.190E 11	3.611E 11
12000	1.050E 12	8.610E 11	7.216E 11	6.301E 11	5.739E 11	5.384E 11	5.130E 11	4.882E 11	4.454E 11	3.930E 11
12500	1.176E 12	9.688E 11	8.012E 11	6.952E 11	6.114E 11	5.658E 11	5.360E 11	5.104E 11	4.762E 11	4.248E 11
13000	1.293E 12	1.081E 12	8.897E 11	7.804E 11	6.551E 11	5.967E 11	5.599E 11	5.321E 11	5.006E 11	4.539E 11
13500	1.394E 12	1.192E 12	9.847E 11	8.391E 11	7.047E 11	6.316E 11	5.850E 11	5.542E 11	5.235E 11	4.809E 11
14000	1.478E 12	1.296E 12	1.083E 12	8.962E 11	7.602E 11	6.707E 11	6.143E 11	5.771E 11	5.457E 11	5.062E 11
14500	1.545E 12	1.389E 12	1.181E 12	9.783E 11	8.212E 11	7.141E 11	6.454E 11	6.019E 11	5.676E 11	5.302E 11
15000	1.598E 12	1.478E 12	1.275E 12	1.063E 12	8.870E 11	7.617E 11	6.800E 11	6.276E 11	5.902E 11	5.532E 11
15500	1.640E 12	1.538E 12	1.342E 12	1.149E 12	9.568E 11	8.134E 11	7.174E 11	6.554E 11	6.134E 11	5.754E 11
16000	1.674E 12	1.594E 12	1.440E 12	1.233E 12	1.029E 12	8.687E 11	7.578E 11	6.857E 11	6.376E 11	5.963E 11
16500	1.703E 12	1.640E 12	1.510E 12	1.314E 12	1.103E 12	9.272E 11	8.012E 11	7.168E 11	6.631E 11	6.213E 11
17000	1.729E 12	1.679E 12	1.570E 12	1.390E 12	1.177E 12	9.881E 11	8.473E 11	7.524E 11	6.900E 11	6.444E 11
17500	1.752E 12	1.712E 12	1.622E 12	1.459E 12	1.250E 12	1.051E 12	8.959E 11	7.899E 11	7.193E 11	6.686E 11
18000	1.774E 12	1.741E 12	1.667E 12	1.523E 12	1.321E 12	1.114E 12	9.445E 11	8.275E 11	7.400E 11	6.934E 11
18500	1.796E 12	1.767E 12	1.705E 12	1.579E 12	1.388E 12	1.178E 12	9.988E 11	8.678E 11	7.792E 11	7.191E 11
19000	1.819E 12	1.792E 12	1.739E 12	1.630E 12	1.455E 12	1.241E 12	1.052E 12	9.090E 11	8.119E 11	7.462E 11
19500	1.843E 12	1.816E 12	1.770E 12	1.675E 12	1.511E 12	1.303E 12	1.107E 12	9.531E 11	8.459E 11	7.742E 11
20000	1.873E 12	1.840E 12	1.798E 12	1.715E 12	1.565E 12	1.363E 12	1.161E 12	9.977E 11	8.811E 11	8.039E 11
20500	2.059E 12	1.936E 12	1.902E 12	1.844E 12	1.743E 12	1.578E 12	1.374E 12	1.182E 12	1.031E 12	9.304E 11
21000	2.440E 12	2.166E 12	2.031E 12	1.956E 12	1.876E 12	1.748E 12	1.565E 12	1.365E 12	1.191E 12	1.066E 12
21500	3.005E 12	2.540E 12	2.245E 12	2.091E 12	1.995E 12	1.886E 12	1.729E 12	1.536E 12	1.349E 12	1.204E 12
22000	3.600E 12	3.052E 12	2.587E 12	2.294E 12	2.132E 12	2.013E 12	1.871E 12	1.691E 12	1.499E 12	1.339E 12
22500	4.093E 12	3.593E 12	3.038E 12	2.593E 12	2.316E 12	2.149E 12	2.004E 12	1.833E 12	1.640E 12	1.448E 12
23000	4.450E 12	4.066E 12	3.526E 12	2.979E 12	2.570E 12	2.316E 12	2.140E 12	1.968E 12	1.773E 12	1.592E 12
23500	4.722E 12	4.434E 12	3.980E 12	3.409E 12	2.892E 12	2.530E 12	2.295E 12	2.105E 12	1.902E 12	1.711E 12
24000	4.986E 12	4.728E 12	4.363E 12	3.839E 12	3.260E 12	2.794E 12	2.478E 12	2.251E 12	2.032E 12	1.829E 12
24500	5.323E 12	4.994E 12	4.679E 12	4.222E 12	3.644E 12	3.100E 12	2.695E 12	2.414E 12	2.148E 12	1.948E 12
25000	5.793E 12	5.299E 12	4.951E 12	4.588E 12	4.016E 12	3.431E 12	2.945E 12	2.598E 12	2.314E 12	2.072E 12
25500	6.400E 12	5.688E 12	5.241E 12	4.855E 12	4.359E 12	3.768E 12	3.221E 12	2.804E 12	2.472E 12	2.201E 12
26000	7.090E 12	6.185E 12	5.568E 12	5.133E 12	4.671E 12	4.096E 12	3.512E 12	3.030E 12	2.645E 12	2.339E 12
26500	7.780E 12	6.775E 12	5.969E 12	5.428E 12	4.940E 12	4.400E 12	3.807E 12	3.272E 12	2.833E 12	2.486E 12
27000	8.409E 12	7.407E 12	6.449E 12	5.788E 12	5.241E 12	4.703E 12	4.099E 12	3.523E 12	3.032E 12	2.642E 12
27500	8.958E 12	8.030E 12	6.991E 12	6.141E 12	5.533E 12	4.964E 12	4.383E 12	3.786E 12	3.262E 12	2.807E 12
28000	1.163E 13	1.026E 13	8.649E 12	8.298E 12	7.471E 12	6.510E 12	5.742E 12	5.045E 12	4.350E 12	3.729E 12
28500	1.542E 13	1.376E 13	1.218E 13	1.091E 13	9.736E 12	8.505E 12	7.348E 12	6.376E 12	5.530E 12	4.760E 12
29000	1.881E 13	1.711E 13	1.538E 13	1.356E 13	1.199E 13	1.055E 13	9.191E 12	7.924E 12	6.827E 12	5.850E 12

150000	3.351E 13	3.316E 13	3.243E 13	3.110E 13	2.937E 13	2.808E 13	2.680E 13	2.560E 13	2.430E 13	2.308E 13	2.197E 13	2.092E 13
200000	3.811E 13	3.803E 13	3.709E 13	3.740E 13	3.670E 13	3.524E 13	3.324E 13	3.295E 13	3.295E 13	3.295E 13	3.295E 13	3.295E 13
300000	4.749E 13	4.717E 13	4.690E 13	4.674E 13	4.640E 13	4.560E 13	4.560E 13	4.469E 13	4.469E 13	4.469E 13	4.469E 13	4.469E 13
400000	5.177E 13	7.234E 13	6.389E 13	5.800E 13	5.662E 13	5.541E 13	5.541E 13	5.430E 13	5.430E 13	5.430E 13	5.430E 13	5.430E 13
500000	1.300E 14	1.151E 14	1.030E 14	9.317E 13	8.264E 13	7.316E 13	6.709E 13	6.351E 13	6.351E 13	6.351E 13	6.351E 13	6.351E 13
600000	1.663E 14	1.594E 14	1.484E 14	1.332E 14	1.170E 14	1.052E 14	9.307E 13	8.269E 13	8.269E 13	8.269E 13	8.269E 13	8.269E 13
800000	2.018E 14	2.010E 14	1.907E 14	1.939E 14	1.840E 14	1.743E 14	1.577E 14	1.389E 14	1.389E 14	1.389E 14	1.389E 14	1.389E 14
1000000	2.250E 14	2.257E 14	2.254E 14	2.244E 14	2.227E 14	2.183E 14	2.097E 14	1.961E 14	1.961E 14	1.961E 14	1.961E 14	1.961E 14
1500000	2.848E 14	2.847E 14	2.846E 14	2.845E 14	2.841E 14	2.834E 14	2.820E 14	2.791E 14	2.791E 14	2.791E 14	2.791E 14	2.791E 14
2000000	3.430E 14	3.437E 14	3.434E 14	3.435E 14	3.432E 14	3.427E 14	3.418E 14	3.401E 14	3.401E 14	3.401E 14	3.401E 14	3.401E 14
3000000	4.644E 14	4.639E 14	4.633E 14	4.639E 14	4.610E 14	4.611E 14	4.602E 14	4.589E 14	4.589E 14	4.589E 14	4.589E 14	4.589E 14
4000000	5.820E 14	5.820E 14	5.827E 14	5.829E 14	5.821E 14	5.813E 14	5.800E 14	5.783E 14	5.783E 14	5.783E 14	5.783E 14	5.783E 14
5000000	7.009E 14	7.000E 14	7.000E 14	7.007E 14	7.005E 14	7.001E 14	6.995E 14	6.982E 14	6.982E 14	6.982E 14	6.982E 14	6.982E 14
6000000	8.189E 14	8.189E 14	8.188E 14	8.187E 14	8.186E 14	8.183E 14	8.178E 14	8.169E 14	8.169E 14	8.169E 14	8.169E 14	8.169E 14
8000000	1.055E 15	1.055E 15	1.055E 15	1.055E 15	1.055E 15	1.054E 15	1.054E 15	1.052E 15	1.052E 15	1.052E 15	1.052E 15	1.052E 15
10000000	1.291E 15	1.291E 15	1.291E 15	1.291E 15	1.291E 15	1.291E 15	1.290E 15	1.290E 15	1.290E 15	1.290E 15	1.290E 15	1.290E 15

TABLE 109. EFFECTIVE GAMMA-1 = P/V/E OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO										
	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
1000	0.030E-02	0.039E-02	0.040E-02	0.049E-02	0.040E-02	0.105E-02	0.232E-02	0.539E-02	9.105E-02	9.946E-02	1.051E-01
1050	0.30E-02	0.32E-02	0.30E-02	0.30E-02	0.30E-02	0.41E-02	0.47E-02	0.630E-02	9.41E-02	9.64E-02	1.051E-01
1100	0.709E-02	0.716E-02	0.72E-02	0.72E-02	0.72E-02	0.734E-02	0.744E-02	0.931E-02	9.076E-02	9.54E-02	1.031E-01
1150	0.009E-02	0.039E-02	0.050E-02	0.057E-02	0.057E-02	0.061E-02	0.076E-02	0.121E-02	9.251E-02	9.94E-02	1.015E-01
1200	0.207E-02	0.32E-02	0.36E-02	0.37E-02	0.38E-02	0.38E-02	0.39E-02	0.41E-02	9.491E-02	9.60E-02	1.012E-01
1250	0.201E-02	0.519E-02	0.64E-02	0.69E-02	0.70E-02	0.70E-02	0.71E-02	0.72E-02	9.767E-02	9.80E-02	1.011E-01
1300	0.898E-02	0.524E-02	0.64E-02	0.64E-02	0.64E-02	0.64E-02	0.64E-02	0.64E-02	1.004E-01	1.013E-01	1.033E-01
1350	0.418E-02	0.267E-02	0.076E-02	1.027E-01	1.027E-01	1.033E-01	1.034E-01	1.035E-01	1.034E-01	1.040E-01	1.053E-01
1400	7.999E-02	0.631E-02	0.681E-02	1.023E-01	1.031E-01	1.061E-01	1.064E-01	1.065E-01	1.064E-01	1.069E-01	1.077E-01
1450	7.755E-02	0.412E-02	0.301E-02	1.013E-01	1.03E-01	1.084E-01	1.092E-01	1.095E-01	1.094E-01	1.096E-01	1.103E-01
1500	7.656E-02	0.132E-02	0.809E-02	0.82E-02	1.039E-01	1.100E-01	1.110E-01	1.123E-01	1.126E-01	1.127E-01	1.130E-01
1550	7.637E-02	7.944E-02	0.572E-02	0.43E-02	1.037E-01	1.104E-01	1.137E-01	1.150E-01	1.154E-01	1.156E-01	1.158E-01
1600	7.672E-02	7.940E-02	0.384E-02	0.08E-02	1.004E-01	1.093E-01	1.148E-01	1.172E-01	1.181E-01	1.184E-01	1.184E-01
1650	7.760E-02	7.960E-02	0.299E-02	0.847E-02	0.609E-02	1.069E-01	1.148E-01	1.189E-01	1.204E-01	1.212E-01	1.214E-01
1700	7.894E-02	0.024E-02	0.262E-02	0.710E-02	0.400E-02	1.037E-01	1.134E-01	1.190E-01	1.227E-01	1.237E-01	1.241E-01
1750	0.055E-02	0.13E-02	0.317E-02	0.65E-02	0.20E-02	1.006E-01	1.109E-01	1.195E-01	1.242E-01	1.261E-01	1.268E-01
1800	0.230E-02	0.280E-02	0.400E-02	0.65E-02	0.971E-02	0.802E-02	1.080E-01	1.182E-01	1.250E-01	1.281E-01	1.293E-01
1850	0.409E-02	0.444E-02	0.521E-02	0.69E-02	0.045E-02	0.627E-02	1.052E-01	1.140E-01	1.240E-01	1.296E-01	1.314E-01
1900	0.584E-02	0.617E-02	0.660E-02	0.709E-02	0.031E-02	0.523E-02	1.029E-01	1.134E-01	1.230E-01	1.305E-01	1.330E-01
1950	0.748E-02	0.791E-02	0.831E-02	0.912E-02	0.102E-02	0.478E-02	1.012E-01	1.100E-01	1.220E-01	1.307E-01	1.352E-01
2000	0.888E-02	0.950E-02	0.000E-02	0.059E-02	0.191E-02	0.462E-02	1.001E-01	1.084E-01	1.197E-01	1.300E-01	1.363E-01
2050	0.850E-02	0.344E-02	0.591E-02	0.694E-02	0.751E-02	0.847E-02	1.005E-01	1.047E-01	1.120E-01	1.228E-01	1.347E-01
2100	0.235E-02	0.845E-02	0.547E-02	1.006E-01	1.032E-01	1.043E-01	1.053E-01	1.069E-01	1.105E-01	1.173E-01	1.270E-01
2150	0.168E-02	0.472E-02	0.979E-02	0.694E-02	1.041E-01	1.086E-01	1.107E-01	1.119E-01	1.134E-01	1.170E-01	1.237E-01
2200	0.464E-02	0.579E-02	0.819E-02	0.254E-02	0.933E-02	1.073E-01	1.135E-01	1.167E-01	1.184E-01	1.203E-01	1.240E-01
2250	0.351E-02	0.920E-02	0.025E-02	0.227E-02	0.623E-02	1.028E-01	1.112E-01	1.184E-01	1.224E-01	1.248E-01	1.270E-01
2300	0.982E-02	0.250E-02	0.376E-02	0.481E-02	0.671E-02	1.005E-01	1.071E-01	1.150E-01	1.237E-01	1.285E-01	1.312E-01
2350	0.637E-02	0.226E-02	0.615E-02	0.809E-02	0.937E-02	1.014E-01	1.054E-01	1.122E-01	1.213E-01	1.296E-01	1.346E-01
2400	0.324E-02	0.857E-02	0.491E-02	0.973E-02	1.023E-01	1.039E-01	1.042E-01	1.106E-01	1.181E-01	1.277E-01	1.359E-01
2450	0.316E-02	0.631E-02	0.150E-02	0.80E-02	1.035E-01	1.066E-01	1.066E-01	1.113E-01	1.164E-01	1.248E-01	1.347E-01
2500	0.471E-02	0.659E-02	0.978E-02	0.504E-02	1.018E-01	1.076E-01	1.110E-01	1.134E-01	1.164E-01	1.229E-01	1.323E-01
2550	0.594E-02	0.810E-02	0.019E-02	0.359E-02	0.913E-02	1.061E-01	1.105E-01	1.154E-01	1.210E-01	1.277E-01	1.362E-01
2600	0.545E-02	0.914E-02	0.159E-02	0.397E-02	0.775E-02	1.030E-01	1.110E-01	1.168E-01	1.205E-01	1.239E-01	1.295E-01
2650	0.422E-02	0.868E-02	0.256E-02	0.523E-02	0.977E-02	1.023E-01	1.090E-01	1.164E-01	1.219E-01	1.256E-01	1.300E-01
2700	0.391E-02	0.760E-02	0.226E-02	0.622E-02	0.908E-02	1.023E-01	1.074E-01	1.147E-01	1.220E-01	1.272E-01	1.313E-01
2750	0.459E-02	0.77E-02	0.132E-02	0.615E-02	1.001E-01	1.032E-01	1.071E-01	1.131E-01	1.210E-01	1.279E-01	1.320E-01
2800	0.451E-02	0.537E-02	0.610E-02	0.735E-02	0.97E-02	1.038E-01	1.093E-01	1.147E-01	1.193E-01	1.245E-01	1.321E-01
2850	1.035E-01	1.042E-01	1.055E-01	1.071E-01	1.084E-01	1.094E-01	1.114E-01	1.150E-01	1.204E-01	1.271E-01	1.330E-01
2900	1.153E-01	1.154E-01	1.155E-01	1.159E-01	1.170E-01	1.187E-01	1.204E-01	1.220E-01	1.242E-01	1.262E-01	1.345E-01

TABLE 109(CONT) EFFECTIVE GAMMA-1 = PV/E OF EQUILIBRIUM AIR

TEMP. (DEG K)	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
1000	1.194E-01	1.277E-01	1.337E-01	1.379E-01	1.402E-01	1.437E-01	1.464E-01	1.570E-01	1.711E-01	1.895E-01
1050	1.162E-01	1.259E-01	1.337E-01	1.394E-01	1.432E-01	1.463E-01	1.499E-01	1.564E-01	1.678E-01	1.863E-01
1100	1.129E-01	1.234E-01	1.327E-01	1.399E-01	1.450E-01	1.484E-01	1.521E-01	1.571E-01	1.681E-01	1.863E-01
1150	1.102E-01	1.207E-01	1.310E-01	1.375E-01	1.416E-01	1.504E-01	1.542E-01	1.584E-01	1.694E-01	1.776E-01
1200	1.084E-01	1.182E-01	1.289E-01	1.387E-01	1.445E-01	1.521E-01	1.562E-01	1.602E-01	1.714E-01	1.760E-01
1250	1.075E-01	1.162E-01	1.267E-01	1.373E-01	1.443E-01	1.530E-01	1.579E-01	1.620E-01	1.735E-01	1.754E-01
1300	1.074E-01	1.149E-01	1.248E-01	1.356E-01	1.436E-01	1.533E-01	1.593E-01	1.638E-01	1.764E-01	1.754E-01
1350	1.084E-01	1.144E-01	1.233E-01	1.339E-01	1.445E-01	1.533E-01	1.602E-01	1.653E-01	1.799E-01	1.764E-01
1400	1.099E-01	1.146E-01	1.223E-01	1.324E-01	1.433E-01	1.531E-01	1.608E-01	1.665E-01	1.713E-01	1.768E-01
1450	1.118E-01	1.154E-01	1.219E-01	1.313E-01	1.422E-01	1.524E-01	1.610E-01	1.675E-01	1.726E-01	1.778E-01
1500	1.141E-01	1.167E-01	1.221E-01	1.304E-01	1.408E-01	1.515E-01	1.600E-01	1.671E-01	1.737E-01	1.789E-01
1550	1.165E-01	1.184E-01	1.227E-01	1.301E-01	1.399E-01	1.506E-01	1.605E-01	1.685E-01	1.746E-01	1.799E-01
1600	1.191E-01	1.205E-01	1.238E-01	1.301E-01	1.391E-01	1.497E-01	1.599E-01	1.686E-01	1.753E-01	1.808E-01
1650	1.217E-01	1.227E-01	1.253E-01	1.306E-01	1.387E-01	1.489E-01	1.593E-01	1.683E-01	1.758E-01	1.815E-01
1700	1.244E-01	1.251E-01	1.271E-01	1.314E-01	1.386E-01	1.483E-01	1.587E-01	1.682E-01	1.760E-01	1.821E-01
1750	1.271E-01	1.274E-01	1.290E-01	1.335E-01	1.389E-01	1.478E-01	1.580E-01	1.678E-01	1.760E-01	1.824E-01
1800	1.297E-01	1.301E-01	1.312E-01	1.339E-01	1.394E-01	1.476E-01	1.575E-01	1.674E-01	1.759E-01	1.824E-01
1850	1.322E-01	1.326E-01	1.334E-01	1.354E-01	1.402E-01	1.476E-01	1.570E-01	1.669E-01	1.757E-01	1.827E-01
1900	1.347E-01	1.351E-01	1.357E-01	1.374E-01	1.413E-01	1.479E-01	1.588E-01	1.688E-01	1.764E-01	1.824E-01
1950	1.370E-01	1.376E-01	1.381E-01	1.394E-01	1.426E-01	1.484E-01	1.564E-01	1.662E-01	1.750E-01	1.820E-01
2000	1.385E-01	1.400E-01	1.405E-01	1.415E-01	1.441E-01	1.491E-01	1.567E-01	1.657E-01	1.746E-01	1.815E-01
2200	1.455E-01	1.479E-01	1.495E-01	1.502E-01	1.513E-01	1.538E-01	1.587E-01	1.658E-01	1.734E-01	1.790E-01
2400	1.604E-01	1.507E-01	1.563E-01	1.584E-01	1.593E-01	1.605E-01	1.631E-01	1.676E-01	1.732E-01	1.771E-01
2600	1.345E-01	1.475E-01	1.584E-01	1.644E-01	1.668E-01	1.677E-01	1.689E-01	1.714E-01	1.745E-01	1.764E-01
2800	1.311E-01	1.424E-01	1.557E-01	1.665E-01	1.723E-01	1.744E-01	1.753E-01	1.764E-01	1.774E-01	1.774E-01
3000	1.313E-01	1.394E-01	1.515E-01	1.648E-01	1.748E-01	1.797E-01	1.813E-01	1.818E-01	1.813E-01	1.799E-01
3200	1.340E-01	1.392E-01	1.485E-01	1.614E-01	1.742E-01	1.827E-01	1.863E-01	1.876E-01	1.857E-01	1.830E-01
3400	1.376E-01	1.412E-01	1.477E-01	1.585E-01	1.718E-01	1.832E-01	1.896E-01	1.916E-01	1.901E-01	1.864E-01
3600	1.409E-01	1.443E-01	1.489E-01	1.571E-01	1.691E-01	1.819E-01	1.911E-01	1.950E-01	1.940E-01	1.902E-01
3800	1.426E-01	1.474E-01	1.513E-01	1.574E-01	1.674E-01	1.799E-01	1.909E-01	1.970E-01	1.973E-01	1.935E-01
4000	1.423E-01	1.495E-01	1.541E-01	1.590E-01	1.669E-01	1.781E-01	1.898E-01	1.978E-01	1.994E-01	1.944E-01
4200	1.405E-01	1.500E-01	1.564E-01	1.612E-01	1.675E-01	1.776E-01	1.884E-01	1.974E-01	2.010E-01	1.964E-01
4400	1.384E-01	1.491E-01	1.578E-01	1.635E-01	1.698E-01	1.795E-01	1.891E-01	1.969E-01	2.017E-01	2.003E-01
4600	1.372E-01	1.475E-01	1.579E-01	1.653E-01	1.708E-01	1.775E-01	1.866E-01	1.961E-01	2.019E-01	2.034E-01
4800	1.370E-01	1.465E-01	1.570E-01	1.662E-01	1.726E-01	1.787E-01	1.866E-01	1.955E-01	2.017E-01	2.022E-01
5000	1.452E-01	1.452E-01	1.557E-01	1.663E-01	1.741E-01	1.802E-01	1.871E-01	1.952E-01	2.015E-01	2.024E-01
6000	1.410E-01	1.485E-01	1.550E-01	1.631E-01	1.738E-01	1.843E-01	1.923E-01	1.983E-01	2.029E-01	2.044E-01
7000	1.393E-01	1.476E-01	1.572E-01	1.671E-01	1.797E-01	1.891E-01	1.933E-01	2.016E-01	2.066E-01	2.074E-01
8000	1.418E-01	1.487E-01	1.566E-01	1.662E-01	1.760E-01	1.867E-01	1.936E-01	2.023E-01	2.087E-01	2.098E-01

96C00	1.434E-01	1.509E-01	1.588E-01	1.649E-01	1.764E-01	1.864E-01	1.959E-01	2.037E-01	2.101E-01	2.114E-01
100C00	1.482E-01	1.534E-01	1.610E-01	1.693E-01	1.779E-01	1.874E-01	1.972E-01	2.058E-01	2.121E-01	2.136E-01
150C00	1.679E-01	1.805E-01	1.901E-01	1.928E-01	1.947E-01	2.023E-01	2.099E-01	2.182E-01	2.252E-01	2.279E-01
200C00	2.257E-01	2.286E-01	2.287E-01	2.287E-01	2.293E-01	2.311E-01	2.344E-01	2.391E-01	2.440E-01	2.485E-01
300C00	2.901E-01	2.917E-01	2.924E-01	2.926E-01	2.926E-01	2.925E-01	2.927E-01	2.936E-01	2.959E-01	2.993E-01
400C00	2.358E-01	2.635E-01	2.969E-01	3.214E-01	3.332E-01	3.380E-01	3.401E-01	3.415E-01	3.433E-01	3.465E-01
500C00	2.004E-01	2.216E-01	2.434E-01	2.655E-01	2.950E-01	3.298E-01	3.562E-01	3.783E-01	3.775E-01	3.829E-01
600C00	1.991E-01	2.057E-01	2.170E-01	2.346E-01	2.615E-01	2.875E-01	3.184E-01	3.539E-01	3.830E-01	4.012E-01
800C00	2.295E-01	2.302E-01	2.321E-01	2.343E-01	2.435E-01	2.550E-01	2.743E-01	3.014E-01	3.325E-01	3.673E-01
1000C00	2.639E-01	2.639E-01	2.640E-01	2.644E-01	2.657E-01	2.691E-01	2.760E-01	2.881E-01	3.076E-01	3.352E-01
1500C00	3.304E-01	3.304E-01	3.304E-01	3.304E-01	3.305E-01	3.304E-01	3.309E-01	3.319E-01	3.347E-01	3.413E-01
2000C00	3.761E-01	3.761E-01	3.781E-01	3.781E-01	3.782E-01	3.782E-01	3.784E-01	3.787E-01	3.795E-01	3.813E-01
3000C00	4.388E-01	4.393E-01	4.460E-01	4.460E-01	4.414E-01	4.418E-01	4.421E-01	4.425E-01	4.431E-01	4.441E-01
4000C00	4.794E-01	4.794E-01	4.795E-01	4.796E-01	4.798E-01	4.804E-01	4.812E-01	4.822E-01	4.832E-01	4.844E-01
5000C00	5.079E-01	5.079E-01	5.080E-01	5.080E-01	5.081E-01	5.082E-01	5.084E-01	5.090E-01	5.100E-01	5.114E-01
6000C00	5.289E-01	5.289E-01	5.289E-01	5.290E-01	5.290E-01	5.291E-01	5.292E-01	5.295E-01	5.301E-01	5.311E-01
8000C00	5.577E-01	5.577E-01	5.577E-01	5.578E-01	5.578E-01	5.579E-01	5.580E-01	5.581E-01	5.585E-01	5.590E-01
10000C00	5.766E-01	5.766E-01	5.766E-01	5.766E-01	5.766E-01	5.767E-01	5.768E-01	5.769E-01	5.772E-01	5.776E-01

TABLE 110. DIMENSIONLESS ENTROPY, S/R, OF EQUILIBRIUM AIR

TEMP. (DEG K)	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
10500	1.453E 02	1.397E 02	1.351E 02	1.304E 02	1.258E 02	1.201E 02	1.134E 02	1.045E 02	9.417E 01	8.427E 01	7.618E 01
10500	1.456E 02	1.400E 02	1.354E 02	1.306E 02	1.259E 02	1.212E 02	1.156E 02	1.085E 02	9.932E 01	8.921E 01	8.000E 01
11000	1.450E 02	1.404E 02	1.358E 02	1.312E 02	1.265E 02	1.218E 02	1.167E 02	1.108E 02	1.032E 02	9.300E 01	8.409E 01
11500	1.456E 02	1.408E 02	1.361E 02	1.315E 02	1.269E 02	1.222E 02	1.174E 02	1.121E 02	1.037E 02	9.355E 01	8.808E 01
12000	1.459E 02	1.414E 02	1.365E 02	1.318E 02	1.272E 02	1.226E 02	1.179E 02	1.129E 02	1.039E 02	9.303E 02	9.162E 01
12500	1.456E 02	1.426E 02	1.371E 02	1.322E 02	1.275E 02	1.229E 02	1.182E 02	1.134E 02	1.039E 02	1.022E 02	9.499E 01
13000	1.548E 02	1.450E 02	1.362E 02	1.327E 02	1.279E 02	1.232E 02	1.185E 02	1.138E 02	1.039E 02	1.034E 02	9.664E 01
13500	1.628E 02	1.495E 02	1.402E 02	1.337E 02	1.284E 02	1.235E 02	1.189E 02	1.142E 02	1.034E 02	1.042E 02	9.819E 01
14000	1.718E 02	1.563E 02	1.439E 02	1.353E 02	1.291E 02	1.240E 02	1.192E 02	1.145E 02	1.030E 02	1.040E 02	9.927E 01
14500	1.797E 02	1.642E 02	1.495E 02	1.382E 02	1.304E 02	1.246E 02	1.196E 02	1.148E 02	1.031E 02	1.053E 02	1.000E 02
15000	1.859E 02	1.718E 02	1.563E 02	1.426E 02	1.326E 02	1.256E 02	1.200E 02	1.151E 02	1.034E 02	1.056E 02	1.006E 02
15500	1.908E 02	1.779E 02	1.633E 02	1.463E 02	1.359E 02	1.271E 02	1.208E 02	1.155E 02	1.037E 02	1.060E 02	1.011E 02
16000	1.945E 02	1.828E 02	1.694E 02	1.546E 02	1.404E 02	1.295E 02	1.219E 02	1.161E 02	1.100E 02	1.063E 02	1.014E 02
16500	1.972E 02	1.867E 02	1.744E 02	1.605E 02	1.437E 02	1.329E 02	1.235E 02	1.168E 02	1.115E 02	1.066E 02	1.018E 02
17000	1.989E 02	1.894E 02	1.785E 02	1.656E 02	1.472E 02	1.371E 02	1.259E 02	1.179E 02	1.120E 02	1.069E 02	1.021E 02
17500	1.999E 02	1.916E 02	1.817E 02	1.698E 02	1.502E 02	1.416E 02	1.290E 02	1.195E 02	1.127E 02	1.073E 02	1.024E 02
18000	2.006E 02	1.929E 02	1.840E 02	1.733E 02	1.526E 02	1.445E 02	1.327E 02	1.217E 02	1.130E 02	1.078E 02	1.027E 02
18500	2.012E 02	1.937E 02	1.856E 02	1.759E 02	1.543E 02	1.469E 02	1.348E 02	1.244E 02	1.152E 02	1.085E 02	1.031E 02
19000	2.017E 02	1.944E 02	1.867E 02	1.779E 02	1.573E 02	1.498E 02	1.409E 02	1.276E 02	1.170E 02	1.099E 02	1.035E 02
19500	2.024E 02	1.949E 02	1.874E 02	1.793E 02	1.597E 02	1.501E 02	1.448E 02	1.310E 02	1.192E 02	1.105E 02	1.041E 02
20000	2.032E 02	1.955E 02	1.880E 02	1.803E 02	1.715E 02	1.609E 02	1.493E 02	1.346E 02	1.219E 02	1.120E 02	1.048E 02
22000	2.140E 02	2.005E 02	1.968E 02	1.827E 02	1.751E 02	1.671E 02	1.579E 02	1.466E 02	1.337E 02	1.207E 02	1.098E 02
24000	2.258E 02	2.170E 02	1.999E 02	1.871E 02	1.777E 02	1.694E 02	1.618E 02	1.532E 02	1.428E 02	1.304E 02	1.179E 02
26000	2.503E 02	2.350E 02	2.174E 02	1.993E 02	1.841E 02	1.729E 02	1.641E 02	1.561E 02	1.477E 02	1.377E 02	1.260E 02
28000	2.562E 02	2.448E 02	2.310E 02	2.148E 02	1.969E 02	1.806E 02	1.680E 02	1.585E 02	1.502E 02	1.417E 02	1.319E 02
30000	2.593E 02	2.488E 02	2.379E 02	2.252E 02	2.039E 02	1.826E 02	1.660E 02	1.627E 02	1.527E 02	1.441E 02	1.335E 02
32000	2.659E 02	2.524E 02	2.412E 02	2.304E 02	2.181E 02	2.034E 02	1.867E 02	1.702E 02	1.568E 02	1.465E 02	1.378E 02
34000	2.811E 02	2.608E 02	2.455E 02	2.336E 02	2.225E 02	2.104E 02	1.960E 02	1.795E 02	1.634E 02	1.503E 02	1.401E 02
36000	2.981E 02	2.759E 02	2.548E 02	2.384E 02	2.237E 02	2.143E 02	2.021E 02	1.877E 02	1.719E 02	1.559E 02	1.433E 02
38000	3.051E 02	2.902E 02	2.687E 02	2.477E 02	2.306E 02	2.175E 02	2.059E 02	1.934E 02	1.787E 02	1.627E 02	1.479E 02
40000	3.144E 02	2.994E 02	2.810E 02	2.600E 02	2.393E 02	2.223E 02	2.090E 02	1.971E 02	1.842E 02	1.692E 02	1.535E 02
42000	3.218E 02	3.052E 02	2.891E 02	2.708E 02	2.502E 02	2.299E 02	2.133E 02	2.002E 02	1.890E 02	1.745E 02	1.593E 02
44000	3.320E 02	3.115E 02	2.946E 02	2.783E 02	2.599E 02	2.394E 02	2.198E 02	2.039E 02	1.910E 02	1.784E 02	1.643E 02
46000	3.447E 02	3.209E 02	3.003E 02	2.836E 02	2.669E 02	2.482E 02	2.279E 02	2.093E 02	1.943E 02	1.815E 02	1.684E 02
48000	3.553E 02	3.322E 02	3.089E 02	2.890E 02	2.721E 02	2.550E 02	2.360E 02	2.161E 02	1.985E 02	1.844E 02	1.715E 02
50000	3.629E 02	3.420E 02	3.169E 02	2.962E 02	2.770E 02	2.626E 02	2.426E 02	2.232E 02	2.040E 02	1.878E 02	1.745E 02
60000	3.774E 02	3.617E 02	3.462E 02	3.296E 02	3.108E 02	2.894E 02	2.672E 02	2.295E 02	2.295E 02	2.117E 02	1.931E 02
70000	3.884E 02	3.729E 02	3.564E 02	3.395E 02	3.234E 02	3.076E 02	2.905E 02	2.711E 02	2.498E 02	2.291E 02	2.107E 02
80000	3.916E 02	3.772E 02	3.627E 02	3.478E 02	3.321E 02	3.156E 02	2.981E 02	2.830E 02	2.661E 02	2.470E 02	2.263E 02

9CC00	3-930E 02	3-795E 02	3-612E 02	3-509E 02	3-344E 02	3-216E C1	3-041E 02	2-897E 02	2-739E 02	2-569E 02	2-393E 02
100000	3-957E 02	3-815E 02	3-672E 02	3-529E 02	3-364E 02	3-243E 02	3-097E 02	2-949E 02	2-790E 02	2-627E 02	2-462E 02
150000	4-033E 02	3-890E 02	3-747E 02	3-605E 02	3-442E 02	3-319E 02	3-177E 02	3-034E 02	2-891E 02	2-740E 02	2-609E 02
200000	4-111E 02	3-954E 02	3-806E 02	3-661E 02	3-510E 02	3-394E 02	3-231E 02	3-089E 02	2-945E 02	2-802E 02	2-659E 02
300000	5-133E 02	4-043E 02	4-031E 02	4-022E 02	4-024E 02	3-017E 02	3-952E 02	3-345E 02	3-100E 02	2-913E 02	2-740E 02
400000	5-423E 02	5-222E 02	5-009E 02	4-789E 02	4-579E 02	4-344E 02	4-136E 02	3-871E 02	3-595E 02	3-323E 02	3-097E 02

500000	5-485E 02	5-296E 02	5-106E 02	4-917E 02	4-726E 02	4-531E 02	4-390E 02	4-117E 02	3-901E 02	3-685E 02	3-454E 02
600000	5-530E 02	5-341E 02	5-152E 02	4-963E 02	4-773E 02	4-584E 02	4-394E 02	4-204E 02	4-011E 02	3-812E 02	3-604E 02
800000	5-601E 02	5-412E 02	5-223E 02	5-033E 02	4-844E 02	4-655E 02	4-466E 02	4-277E 02	4-087E 02	3-898E 02	3-709E 02
1000000	5-656E 02	5-467E 02	5-278E 02	5-089E 02	4-899E 02	4-710E 02	4-521E 02	4-332E 02	4-143E 02	3-953E 02	3-764E 02
1500000	5-757E 02	5-567E 02	5-378E 02	5-189E 02	4-999E 02	4-810E 02	4-621E 02	4-432E 02	4-242E 02	4-053E 02	3-864E 02
2000000	5-833E 02	5-643E 02	5-454E 02	5-264E 02	5-074E 02	4-884E 02	4-694E 02	4-504E 02	4-314E 02	4-124E 02	3-934E 02
3000000	5-933E 02	5-744E 02	5-554E 02	5-365E 02	5-175E 02	4-986E 02	4-797E 02	4-607E 02	4-418E 02	4-228E 02	4-039E 02
4000000	6-004E 02	5-815E 02	5-625E 02	5-436E 02	5-246E 02	5-057E 02	4-868E 02	4-679E 02	4-490E 02	4-299E 02	4-110E 02
5000000	6-059E 02	5-870E 02	5-680E 02	5-491E 02	5-301E 02	5-112E 02	4-923E 02	4-733E 02	4-544E 02	4-354E 02	4-165E 02
6000000	6-104E 02	5-915E 02	5-725E 02	5-534E 02	5-344E 02	5-157E 02	4-968E 02	4-778E 02	4-589E 02	4-399E 02	4-210E 02
8000000	6-175E 02	5-986E 02	5-796E 02	5-607E 02	5-417E 02	5-228E 02	5-039E 02	4-849E 02	4-660E 02	4-470E 02	4-281E 02
10000000	6-230E 02	6-041E 02	5-851E 02	5-662E 02	5-472E 02	5-283E 02	5-094E 02	4-904E 02	4-715E 02	4-525E 02	4-336E 02

TABLE 110(CONT) DIMENSIONLESS ENTROPY, S/R, OF EQUILIBRIUM AIR

TEMP. (DEG K)	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
1000	7.001E 01	6.531E 01	6.157E 01	5.842E 01	5.554E 01	5.288E 01	4.951E 01	4.587E 01	4.200E 01	3.804E 01
1050	7.264E 01	6.703E 01	6.271E 01	5.920E 01	5.615E 01	5.328E 01	5.030E 01	4.692E 01	4.320E 01	3.942E 01
1100	7.569E 01	6.910E 01	6.407E 01	6.011E 01	5.681E 01	5.365E 01	5.044E 01	4.777E 01	4.420E 01	4.037E 01
1150	7.898E 01	7.147E 01	6.566E 01	6.117E 01	5.754E 01	5.442E 01	5.150E 01	4.847E 01	4.500E 01	4.147E 01
1200	8.234E 01	7.407E 01	6.747E 01	6.238E 01	5.837E 01	5.502E 01	5.202E 01	4.905E 01	4.583E 01	4.231E 01
1250	8.553E 01	7.680E 01	6.975E 01	6.375E 01	5.929E 01	5.568E 01	5.254E 01	4.957E 01	4.647E 01	4.304E 01
1300	8.834E 01	7.951E 01	7.161E 01	6.524E 01	6.033E 01	5.639E 01	5.308E 01	5.004E 01	4.703E 01	4.373E 01
1350	9.067E 01	8.208E 01	7.381E 01	6.689E 01	6.144E 01	5.717E 01	5.365E 01	5.034E 01	4.752E 01	4.433E 01
1400	9.250E 01	8.439E 01	7.599E 01	6.860E 01	6.268E 01	5.802E 01	5.426E 01	5.102E 01	4.799E 01	4.487E 01
1450	9.388E 01	8.637E 01	7.808E 01	7.036E 01	6.397E 01	5.893E 01	5.490E 01	5.131E 01	4.843E 01	4.535E 01
1500	9.492E 01	8.800E 01	8.001E 01	7.210E 01	6.532E 01	5.990E 01	5.559E 01	5.202E 01	4.886E 01	4.580E 01
1550	9.569E 01	8.930E 01	8.173E 01	7.380E 01	6.670E 01	6.091E 01	5.631E 01	5.254E 01	4.930E 01	4.622E 01
1600	9.628E 01	9.033E 01	8.321E 01	7.541E 01	6.808E 01	6.196E 01	5.707E 01	5.312E 01	4.974E 01	4.663E 01
1650	9.676E 01	9.114E 01	8.447E 01	7.689E 01	6.945E 01	6.304E 01	5.787E 01	5.370E 01	5.019E 01	4.703E 01
1700	9.715E 01	9.178E 01	8.551E 01	7.823E 01	7.077E 01	6.412E 01	5.868E 01	5.430E 01	5.066E 01	4.743E 01
1750	9.749E 01	9.230E 01	8.636E 01	7.942E 01	7.202E 01	6.520E 01	5.951E 01	5.492E 01	5.113E 01	4.783E 01
1800	9.780E 01	9.273E 01	8.707E 01	8.045E 01	7.319E 01	6.627E 01	6.036E 01	5.555E 01	5.142E 01	4.823E 01
1850	9.810E 01	9.310E 01	8.765E 01	8.134E 01	7.428E 01	6.730E 01	6.120E 01	5.620E 01	5.211E 01	4.863E 01
1900	9.842E 01	9.344E 01	8.814E 01	8.211E 01	7.524E 01	6.829E 01	6.204E 01	5.686E 01	5.262E 01	4.905E 01
1950	9.875E 01	9.375E 01	8.857E 01	8.276E 01	7.614E 01	6.923E 01	6.287E 01	5.752E 01	5.313E 01	4.948E 01
2000	9.914E 01	9.405E 01	8.894E 01	8.327E 01	7.693E 01	7.011E 01	6.368E 01	5.817E 01	5.365E 01	4.991E 01
2200	1.017E 02	9.553E 01	9.021E 01	8.487E 01	7.930E 01	7.303E 01	6.641E 01	6.072E 01	5.571E 01	5.167E 01
2400	1.067E 02	9.818E 01	9.173E 01	8.644E 01	8.085E 01	7.508E 01	6.896E 01	6.298E 01	5.771E 01	5.339E 01
2600	1.136E 02	1.027E 02	9.421E 01	8.771E 01	8.210E 01	7.657E 01	7.077E 01	6.489E 01	5.951E 01	5.498E 01
2800	1.204E 02	1.085E 02	9.801E 01	8.987E 01	8.348E 01	7.781E 01	7.218E 01	6.646E 01	6.107E 01	5.640E 01
3000	1.255E 02	1.141E 02	1.027E 02	9.292E 01	8.529E 01	7.909E 01	7.340E 01	6.778E 01	6.240E 01	5.765E 01
3200	1.289E 02	1.187E 02	1.074E 02	9.644E 01	8.767E 01	8.059E 01	7.459E 01	6.894E 01	6.357E 01	5.875E 01
3400	1.313E 02	1.220E 02	1.116E 02	1.005E 02	9.055E 01	8.245E 01	7.588E 01	7.005E 01	6.462E 01	5.974E 01
3600	1.334E 02	1.244E 02	1.148E 02	1.042E 02	9.367E 01	8.465E 01	7.735E 01	7.119E 01	6.563E 01	6.066E 01
3800	1.361E 02	1.265E 02	1.172E 02	1.072E 02	9.674E 01	8.707E 01	7.903E 01	7.241E 01	6.662E 01	6.153E 01
4000	1.397E 02	1.287E 02	1.193E 02	1.097E 02	9.953E 01	8.956E 01	8.089E 01	7.374E 01	6.765E 01	6.239E 01
4200	1.447E 02	1.315E 02	1.212E 02	1.118E 02	1.019E 02	9.196E 01	8.284E 01	7.517E 01	6.873E 01	6.326E 01
4400	1.491E 02	1.350E 02	1.234E 02	1.136E 02	1.040E 02	9.417E 01	8.479E 01	7.688E 01	6.985E 01	6.414E 01
4600	1.537E 02	1.389E 02	1.261E 02	1.155E 02	1.058E 02	9.616E 01	8.668E 01	7.822E 01	7.102E 01	6.504E 01
4800	1.578E 02	1.430E 02	1.291E 02	1.175E 02	1.075E 02	9.794E 01	8.846E 01	7.975E 01	7.222E 01	6.594E 01
5000	1.611E 02	1.468E 02	1.324E 02	1.198E 02	1.092E 02	9.951E 01	9.011E 01	8.124E 01	7.343E 01	6.690E 01
6000	1.755E 02	1.604E 02	1.468E 02	1.330E 02	1.194E 02	1.074E 02	9.710E 01	8.774E 01	7.912E 01	7.153E 01
7000	1.931E 02	1.751E 02	1.582E 02	1.433E 02	1.296E 02	1.163E 02	1.041E 02	9.348E 01	8.412E 01	7.581E 01
8000	2.065E 02	1.884E 02	1.708E 02	1.536E 02	1.381E 02	1.241E 02	1.112E 02	9.932E 01	8.893E 01	7.989E 01

100000	2.291E 02	1.908E 02	1.057E 02	1.468E 02	1.313E 02	1.174E 02	1.048E 02	9.361E 01	8.360E 01
120000	2.389E 02	2.104E 02	1.722E 02	1.549E 02	1.384E 02	1.233E 02	1.099E 02	9.798E 01	8.750E 01
150000	2.440E 02	2.225E 02	1.872E 02	1.685E 02	1.508E 02	1.344E 02	1.193E 02	1.039E 02	9.422E 01
200000	2.516E 02	2.312E 02	1.995E 02	1.827E 02	1.652E 02	1.477E 02	1.312E 02	1.142E 02	1.029E 02
250000	2.559E 02	2.373E 02	2.083E 02	1.933E 02	1.777E 02	1.615E 02	1.450E 02	1.289E 02	1.140E 02
300000	2.597E 02	2.415E 02	2.128E 02	1.983E 02	1.836E 02	1.689E 02	1.528E 02	1.370E 02	1.216E 02
350000	2.688E 02	2.451E 02	2.163E 02	2.019E 02	1.874E 02	1.727E 02	1.577E 02	1.423E 02	1.270E 02
400000	2.877E 02	2.504E 02	2.194E 02	2.050E 02	1.905E 02	1.759E 02	1.611E 02	1.461E 02	1.309E 02
450000	3.020E 02	2.647E 02	2.245E 02	2.084E 02	1.934E 02	1.787E 02	1.639E 02	1.491E 02	1.341E 02
500000	3.194E 02	2.793E 02	2.348E 02	2.145E 02	1.971E 02	1.815E 02	1.663E 02	1.517E 02	1.367E 02
550000	3.389E 02	2.929E 02	2.465E 02	2.244E 02	2.036E 02	1.894E 02	1.673E 02	1.541E 02	1.391E 02
600000	3.477E 02	3.168E 02	2.676E 02	2.428E 02	2.201E 02	1.985E 02	1.782E 02	1.641E 02	1.439E 02
700000	3.510E 02	3.273E 02	2.839E 02	2.604E 02	2.356E 02	2.110E 02	1.898E 02	1.691E 02	1.501E 02
800000	3.549E 02	3.326E 02	2.924E 02	2.708E 02	2.483E 02	2.249E 02	2.007E 02	1.789E 02	1.578E 02
900000	3.575E 02	3.359E 02	2.973E 02	2.772E 02	2.560E 02	2.339E 02	2.106E 02	1.873E 02	1.634E 02
1000000	3.620E 02	3.389E 02	3.052E 02	2.811E 02	2.611E 02	2.401E 02	2.181E 02	1.932E 02	1.723E 02
1200000	3.679E 02	3.446E 02	3.107E 02	2.842E 02	2.670E 02	2.475E 02	2.273E 02	2.041E 02	1.841E 02
1500000	3.748E 02	3.557E 02	3.178E 02	2.909E 02	2.728E 02	2.537E 02	2.343E 02	2.149E 02	1.944E 02
2000000	3.802E 02	3.612E 02	3.233E 02	3.044E 02	2.855E 02	2.643E 02	2.420E 02	2.229E 02	2.036E 02
2500000	3.849E 02	3.659E 02	3.279E 02	3.090E 02	2.900E 02	2.710E 02	2.521E 02	2.331E 02	2.140E 02
3000000	3.888E 02	3.698E 02	3.319E 02	3.129E 02	2.939E 02	2.749E 02	2.559E 02	2.349E 02	2.179E 02
4000000	3.921E 02	3.731E 02	3.352E 02	3.163E 02	2.973E 02	2.783E 02	2.593E 02	2.403E 02	2.212E 02
4500000	3.950E 02	3.760E 02	3.381E 02	3.192E 02	3.002E 02	2.813E 02	2.623E 02	2.432E 02	2.242E 02
5000000	3.976E 02	3.786E 02	3.407E 02	3.218E 02	3.028E 02	2.839E 02	2.649E 02	2.459E 02	2.269E 02
6000000	4.021E 02	3.831E 02	3.452E 02	3.263E 02	3.074E 02	2.884E 02	2.694E 02	2.504E 02	2.315E 02
7000000	4.059E 02	3.869E 02	3.490E 02	3.301E 02	3.112E 02	2.922E 02	2.732E 02	2.543E 02	2.353E 02
8000000	4.092E 02	3.902E 02	3.523E 02	3.334E 02	3.145E 02	2.955E 02	2.766E 02	2.576E 02	2.386E 02
9000000	4.121E 02	3.931E 02	3.552E 02	3.363E 02	3.174E 02	2.984E 02	2.795E 02	2.605E 02	2.414E 02
10000000	4.147E 02	3.951E 02	3.578E 02	3.389E 02	3.200E 02	3.010E 02	2.821E 02	2.631E 02	2.442E 02

TABLE 111. ENTROPY (ERG/CM-DEG K) OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO										
	-9.0	-8.5	-8.0	-7.5	-7.0	-6.5	-6.0	-5.5	-5.0	-4.5	-4.0
1000	4.141E 08	4.009E 08	3.877E 08	3.743E 08	3.603E 08	3.448E 08	3.294E 08	3.000E 08	2.703E 08	2.419E 08	2.187E 08
1050	4.152E 08	4.019E 08	3.887E 08	3.753E 08	3.613E 08	3.458E 08	3.304E 08	3.113E 08	2.816E 08	2.532E 08	2.299E 08
1100	4.163E 08	4.030E 08	3.897E 08	3.763E 08	3.623E 08	3.468E 08	3.314E 08	3.100E 08	2.803E 08	2.519E 08	2.286E 08
11500	4.180E 08	4.041E 08	3.907E 08	3.773E 08	3.633E 08	3.478E 08	3.324E 08	3.210E 08	3.035E 08	2.800E 08	2.526E 08
1200	4.215E 08	4.030E 08	3.910E 08	3.780E 08	3.641E 08	3.510E 08	3.303E 08	3.241E 08	3.000E 08	2.879E 08	2.630E 08
12500	4.293E 08	4.092E 08	3.935E 08	3.795E 08	3.660E 08	3.527E 08	3.352E 08	3.256E 08	3.100E 08	2.933E 08	2.712E 08
1300	4.444E 08	4.162E 08	3.965E 08	3.810E 08	3.671E 08	3.536E 08	3.403E 08	3.268E 08	3.120E 08	2.968E 08	2.774E 08
1350	4.673E 08	4.291E 08	4.025E 08	3.830E 08	3.684E 08	3.548E 08	3.412E 08	3.277E 08	3.140E 08	2.992E 08	2.818E 08
1400	4.931E 08	4.480E 08	4.131E 08	3.880E 08	3.708E 08	3.558E 08	3.421E 08	3.286E 08	3.131E 08	3.009E 08	2.849E 08
14500	5.159E 08	4.714E 08	4.291E 08	3.967E 08	3.743E 08	3.574E 08	3.431E 08	3.295E 08	3.140E 08	3.022E 08	2.872E 08
1500	5.336E 08	4.930E 08	4.480E 08	4.094E 08	3.806E 08	3.604E 08	3.444E 08	3.305E 08	3.189E 08	3.032E 08	2.880E 08
15500	5.475E 08	5.107E 08	4.667E 08	4.250E 08	3.902E 08	3.649E 08	3.466E 08	3.316E 08	3.170E 08	3.041E 08	2.901E 08
1600	5.584E 08	5.247E 08	4.863E 08	4.434E 08	4.031E 08	3.710E 08	3.498E 08	3.332E 08	3.187E 08	3.050E 08	2.911E 08
16500	5.660E 08	5.359E 08	5.007E 08	4.608E 08	4.183E 08	3.815E 08	3.544E 08	3.353E 08	3.199E 08	3.059E 08	2.921E 08
1700	5.708E 08	5.433E 08	5.123E 08	4.752E 08	4.339E 08	3.935E 08	3.614E 08	3.385E 08	3.219E 08	3.040E 08	2.930E 08
17500	5.738E 08	5.499E 08	5.214E 08	4.874E 08	4.404E 08	4.070E 08	3.703E 08	3.431E 08	3.236E 08	3.080E 08	2.930E 08
18000	5.758E 08	5.536E 08	5.281E 08	4.973E 08	4.480E 08	4.203E 08	3.810E 08	3.493E 08	3.285E 08	3.094E 08	2.940E 08
18500	5.774E 08	5.560E 08	5.327E 08	5.050E 08	4.516E 08	4.331E 08	3.927E 08	3.571E 08	3.305E 08	3.113E 08	2.950E 08
19000	5.790E 08	5.582E 08	5.358E 08	5.107E 08	4.583E 08	4.443E 08	4.044E 08	3.662E 08	3.338E 08	3.139E 08	2.971E 08
19500	5.808E 08	5.594E 08	5.380E 08	5.147E 08	4.672E 08	4.539E 08	4.154E 08	3.761E 08	3.422E 08	3.172E 08	2.987E 08
2000	5.834E 08	5.610E 08	5.397E 08	5.173E 08	4.723E 08	4.618E 08	4.237E 08	3.863E 08	3.490E 08	3.214E 08	3.008E 08
2200	6.141E 08	5.736E 08	5.476E 08	5.245E 08	4.810E 08	4.797E 08	4.331E 08	4.208E 08	3.837E 08	3.465E 08	3.151E 08
2400	6.768E 08	6.220E 08	5.738E 08	5.371E 08	5.100E 08	4.869E 08	4.644E 08	4.394E 08	4.098E 08	3.748E 08	3.363E 08
2600	7.183E 08	6.745E 08	6.240E 08	5.720E 08	5.283E 08	4.962E 08	4.710E 08	4.481E 08	4.238E 08	3.953E 08	3.616E 08
2800	7.334E 08	7.025E 08	6.631E 08	6.164E 08	5.653E 08	5.183E 08	4.822E 08	4.549E 08	4.312E 08	4.040E 08	3.764E 08
3000	7.444E 08	7.142E 08	6.828E 08	6.463E 08	6.025E 08	5.529E 08	5.051E 08	4.670E 08	4.382E 08	4.137E 08	3.880E 08
3200	7.633E 08	7.244E 08	6.925E 08	6.617E 08	6.129E 08	5.599E 08	5.099E 08	4.886E 08	4.500E 08	4.206E 08	3.954E 08
3400	8.069E 08	7.486E 08	7.047E 08	6.704E 08	6.384E 08	6.038E 08	5.625E 08	5.153E 08	4.691E 08	4.313E 08	4.022E 08
3600	8.557E 08	7.919E 08	7.315E 08	6.841E 08	6.478E 08	6.152E 08	5.801E 08	5.387E 08	4.921E 08	4.475E 08	4.113E 08
3800	8.872E 08	8.331E 08	7.714E 08	7.103E 08	6.620E 08	6.244E 08	5.909E 08	5.550E 08	5.130E 08	4.670E 08	4.245E 08
4000	9.054E 08	8.594E 08	8.066E 08	7.464E 08	6.930E 08	6.380E 08	6.000E 08	5.658E 08	5.286E 08	4.857E 08	4.407E 08
4200	9.237E 08	8.761E 08	8.299E 08	7.774E 08	7.181E 08	6.599E 08	6.129E 08	5.746E 08	5.396E 08	5.008E 08	4.572E 08
4400	9.530E 08	8.941E 08	8.457E 08	7.987E 08	7.459E 08	6.871E 08	6.309E 08	5.854E 08	5.483E 08	5.121E 08	4.716E 08
4600	9.894E 08	9.211E 08	8.626E 08	8.140E 08	7.661E 08	7.174E 08	6.543E 08	6.007E 08	5.576E 08	5.209E 08	4.832E 08
4800	1.020E 09	9.535E 08	8.865E 08	8.295E 08	7.810E 08	7.320E 08	6.772E 08	6.201E 08	5.699E 08	5.292E 08	4.924E 08
5000	1.042E 09	9.817E 08	9.153E 08	8.501E 08	7.951E 08	7.467E 08	6.963E 08	6.406E 08	5.856E 08	5.390E 08	5.003E 08
6000	1.083E 09	1.038E 09	9.938E 08	9.462E 08	8.919E 08	8.307E 08	7.669E 08	7.093E 08	6.506E 08	6.077E 08	5.542E 08
7000	1.115E 09	1.070E 09	1.023E 09	9.745E 08	9.283E 08	8.620E 08	8.339E 08	7.781E 08	7.170E 08	6.577E 08	6.049E 08
8000	1.124E 09	1.083E 09	1.041E 09	9.984E 08	9.533E 08	9.057E 08	8.585E 08	8.123E 08	7.637E 08	7.090E 08	6.496E 08

100000	1.129E 09	1.072E 07	1.074E 07	9.719E 08	9.307E 08	8.890E 08	8.461E 08	8.009E 08	7.539E 08	7.067E 08
120000	1.146E 09	1.103E 09	1.064E 09	9.810E 08	9.408E 08	8.998E 08	8.587E 08	8.174E 08	7.753E 08	7.314E 08
150000	1.158E 09	1.117E 09	1.074E 09	9.937E 08	9.527E 08	9.118E 08	8.708E 08	8.298E 08	7.888E 08	7.476E 08
200000	1.180E 09	1.135E 09	1.092E 09	1.010E 09	9.684E 08	9.273E 08	8.862E 08	8.452E 08	8.042E 08	7.632E 08
250000	1.324E 09	1.264E 09	1.201E 09	1.052E 09	9.926E 08	9.439E 08	8.951E 08	8.561E 08	8.166E 08	7.754E 08
300000	1.473E 09	1.390E 09	1.301E 09	1.155E 09	1.095E 09	1.031E 09	9.608E 08	8.921E 08	8.340E 08	7.808E 08
350000	1.523E 09	1.462E 09	1.403E 09	1.265E 09	1.181E 09	1.099E 09	1.029E 09	9.674E 08	9.033E 08	8.349E 08
400000	1.557E 09	1.499E 09	1.438E 09	1.313E 09	1.253E 09	1.187E 09	1.111E 09	1.029E 09	9.538E 08	8.888E 08
450000	1.567E 09	1.512E 09	1.451E 09	1.343E 09	1.281E 09	1.219E 09	1.158E 09	1.093E 09	1.020E 09	9.405E 08
500000	1.574E 09	1.520E 09	1.464E 09	1.354E 09	1.301E 09	1.243E 09	1.182E 09	1.120E 09	1.058E 09	9.915E 08
600000	1.587E 09	1.533E 09	1.479E 09	1.370E 09	1.316E 09	1.261E 09	1.207E 09	1.151E 09	1.094E 09	1.034E 09
700000	1.598E 09	1.544E 09	1.490E 09	1.381E 09	1.327E 09	1.272E 09	1.218E 09	1.164E 09	1.109E 09	1.054E 09
800000	1.608E 09	1.553E 09	1.499E 09	1.390E 09	1.334E 09	1.282E 09	1.228E 09	1.173E 09	1.119E 09	1.064E 09
900000	1.616E 09	1.562E 09	1.507E 09	1.399E 09	1.344E 09	1.290E 09	1.236E 09	1.182E 09	1.127E 09	1.073E 09
1000000	1.623E 09	1.569E 09	1.515E 09	1.408E 09	1.352E 09	1.298E 09	1.243E 09	1.189E 09	1.135E 09	1.080E 09
1200000	1.636E 09	1.582E 09	1.528E 09	1.419E 09	1.365E 09	1.311E 09	1.256E 09	1.202E 09	1.148E 09	1.093E 09
1500000	1.652E 09	1.598E 09	1.544E 09	1.434E 09	1.381E 09	1.326E 09	1.272E 09	1.218E 09	1.163E 09	1.109E 09
2000000	1.674E 09	1.620E 09	1.565E 09	1.456E 09	1.402E 09	1.347E 09	1.293E 09	1.238E 09	1.184E 09	1.129E 09
2500000	1.690E 09	1.636E 09	1.581E 09	1.473E 09	1.418E 09	1.364E 09	1.309E 09	1.255E 09	1.200E 09	1.146E 09
3000000	1.703E 09	1.649E 09	1.594E 09	1.485E 09	1.431E 09	1.377E 09	1.322E 09	1.268E 09	1.214E 09	1.159E 09
3500000	1.714E 09	1.659E 09	1.605E 09	1.494E 09	1.442E 09	1.388E 09	1.333E 09	1.279E 09	1.225E 09	1.170E 09
4000000	1.723E 09	1.669E 09	1.615E 09	1.504E 09	1.451E 09	1.397E 09	1.343E 09	1.288E 09	1.234E 09	1.180E 09
4500000	1.732E 09	1.677E 09	1.623E 09	1.514E 09	1.460E 09	1.405E 09	1.351E 09	1.297E 09	1.242E 09	1.188E 09
5000000	1.739E 09	1.685E 09	1.630E 09	1.522E 09	1.467E 09	1.413E 09	1.359E 09	1.304E 09	1.250E 09	1.195E 09
6000000	1.752E 09	1.698E 09	1.643E 09	1.535E 09	1.480E 09	1.426E 09	1.371E 09	1.317E 09	1.263E 09	1.208E 09
7000000	1.763E 09	1.709E 09	1.654E 09	1.545E 09	1.491E 09	1.437E 09	1.382E 09	1.328E 09	1.274E 09	1.219E 09
8000000	1.772E 09	1.718E 09	1.664E 09	1.555E 09	1.501E 09	1.446E 09	1.392E 09	1.337E 09	1.283E 09	1.229E 09
9000000	1.781E 09	1.726E 09	1.672E 09	1.563E 09	1.509E 09	1.455E 09	1.400E 09	1.346E 09	1.291E 09	1.237E 09
10000000	1.788E 09	1.734E 09	1.679E 09	1.571E 09	1.516E 09	1.462E 09	1.408E 09	1.353E 09	1.299E 09	1.245E 09

TABLE 111(CONT) ENTROPY (ERG/CM-DEG K) OF EQUILIBRIUM AIR

TEMP. (DEG K)	LOG DENSITY RATIO									
	-3.3	-3.0	-2.3	-2.0	-1.0	-0.5	0.0	0.5	1.0	
10000	2.009E 08	1.074E 08	1.767E 08	1.631E 08	1.512E 08	1.421E 08	1.317E 08	1.208E 08	1.110E 08	
10500	2.029E 08	1.924E 08	1.800E 08	1.652E 08	1.529E 08	1.444E 08	1.347E 08	1.240E 08	1.137E 08	
11000	2.172E 08	1.983E 08	1.839E 08	1.719E 08	1.544E 08	1.462E 08	1.371E 08	1.269E 08	1.164E 08	
11500	2.267E 08	2.031E 08	1.885E 08	1.756E 08	1.562E 08	1.478E 08	1.391E 08	1.294E 08	1.190E 08	
12000	2.363E 08	2.120E 08	1.917E 08	1.790E 08	1.675E 08	1.593E 08	1.408E 08	1.315E 08	1.214E 08	
12500	2.439E 08	2.204E 08	1.994E 08	1.830E 08	1.762E 08	1.508E 08	1.423E 08	1.334E 08	1.236E 08	
13000	2.534E 08	2.282E 08	2.059E 08	1.873E 08	1.731E 08	1.524E 08	1.437E 08	1.350E 08	1.255E 08	
13500	2.639E 08	2.356E 08	2.119E 08	1.920E 08	1.764E 08	1.540E 08	1.451E 08	1.364E 08	1.272E 08	
14000	2.639E 08	2.422E 08	2.181E 08	1.969E 08	1.799E 08	1.557E 08	1.464E 08	1.377E 08	1.288E 08	
14500	2.695E 08	2.479E 08	2.241E 08	2.019E 08	1.834E 08	1.576E 08	1.479E 08	1.390E 08	1.302E 08	
15000	2.724E 08	2.526E 08	2.294E 08	2.070E 08	1.875E 08	1.596E 08	1.493E 08	1.403E 08	1.315E 08	
15500	2.747E 08	2.563E 08	2.344E 08	2.110E 08	1.914E 08	1.616E 08	1.509E 08	1.415E 08	1.327E 08	
16000	2.764E 08	2.593E 08	2.386E 08	2.144E 08	1.954E 08	1.638E 08	1.525E 08	1.428E 08	1.339E 08	
16500	2.777E 08	2.616E 08	2.424E 08	2.207E 08	1.993E 08	1.661E 08	1.541E 08	1.441E 08	1.350E 08	
17000	2.788E 08	2.634E 08	2.454E 08	2.245E 08	2.031E 08	1.684E 08	1.558E 08	1.454E 08	1.361E 08	
17500	2.798E 08	2.649E 08	2.479E 08	2.279E 08	2.067E 08	1.708E 08	1.576E 08	1.468E 08	1.373E 08	
18000	2.807E 08	2.662E 08	2.499E 08	2.309E 08	2.101E 08	1.732E 08	1.595E 08	1.482E 08	1.384E 08	
18500	2.814E 08	2.672E 08	2.516E 08	2.335E 08	2.132E 08	1.757E 08	1.613E 08	1.496E 08	1.396E 08	
19000	2.825E 08	2.682E 08	2.530E 08	2.357E 08	2.160E 08	1.781E 08	1.632E 08	1.510E 08	1.408E 08	
19500	2.835E 08	2.691E 08	2.542E 08	2.375E 08	2.184E 08	1.805E 08	1.651E 08	1.525E 08	1.420E 08	
20000	2.844E 08	2.700E 08	2.553E 08	2.392E 08	2.208E 08	1.828E 08	1.670E 08	1.540E 08	1.433E 08	
22000	2.918E 08	2.742E 08	2.599E 08	2.439E 08	2.274E 08	1.912E 08	1.743E 08	1.599E 08	1.483E 08	
24000	3.042E 08	2.818E 08	2.633E 08	2.475E 08	2.320E 08	1.979E 08	1.808E 08	1.654E 08	1.532E 08	
26000	3.262E 08	2.948E 08	2.704E 08	2.518E 08	2.357E 08	2.031E 08	1.863E 08	1.708E 08	1.578E 08	
28000	3.454E 08	3.113E 08	2.813E 08	2.579E 08	2.394E 08	2.072E 08	1.908E 08	1.753E 08	1.619E 08	
30000	3.633E 08	3.276E 08	2.948E 08	2.667E 08	2.440E 08	2.107E 08	1.945E 08	1.791E 08	1.655E 08	
32000	3.790E 08	3.407E 08	3.094E 08	2.744E 08	2.514E 08	2.141E 08	1.975E 08	1.825E 08	1.684E 08	
34000	3.797E 08	3.502E 08	3.202E 08	2.884E 08	2.593E 08	2.178E 08	2.011E 08	1.855E 08	1.715E 08	
36000	3.639E 08	3.571E 08	3.294E 08	2.989E 08	2.689E 08	2.220E 08	2.043E 08	1.884E 08	1.741E 08	
38000	3.904E 08	3.630E 08	3.345E 08	3.077E 08	2.777E 08	2.248E 08	2.078E 08	1.912E 08	1.764E 08	
40000	4.018E 08	3.694E 08	3.423E 08	3.149E 08	2.857E 08	2.322E 08	2.117E 08	1.942E 08	1.791E 08	
42000	4.139E 08	3.774E 08	3.479E 08	3.208E 08	2.926E 08	2.378E 08	2.159E 08	1.973E 08	1.816E 08	
44000	4.279E 08	3.874E 08	3.543E 08	3.261E 08	2.984E 08	2.434E 08	2.201E 08	2.005E 08	1.841E 08	
46000	4.413E 08	3.987E 08	3.618E 08	3.315E 08	3.038E 08	2.488E 08	2.245E 08	2.039E 08	1.867E 08	
48000	4.529E 08	4.104E 08	3.705E 08	3.373E 08	3.087E 08	2.539E 08	2.289E 08	2.073E 08	1.893E 08	
50000	4.624E 08	4.214E 08	3.800E 08	3.438E 08	3.135E 08	2.586E 08	2.332E 08	2.108E 08	1.920E 08	
52000	5.036E 08	4.605E 08	4.213E 08	3.810E 08	3.094E 08	2.787E 08	2.510E 08	2.271E 08	2.053E 08	
70000	5.542E 08	5.024E 08	4.540E 08	4.113E 08	3.720E 08	2.989E 08	2.683E 08	2.414E 08	2.174E 08	
80000	5.926E 08	5.407E 08	4.902E 08	4.410E 08	3.964E 08	3.190E 08	2.851E 08	2.533E 08	2.293E 08	

120000	6.877E 08	6.385E 08	5.894E 08	5.377E 08	4.837E 08	4.377E 08	3.857E 08	3.424E 08	3.042E 08	2.711E 08
150000	7.060E 08	6.625E 08	6.191E 08	5.727E 08	5.244E 08	4.743E 08	4.242E 08	3.764E 08	3.335E 08	2.704E 08
200000	7.222E 08	6.811E 08	6.398E 08	5.977E 08	5.549E 08	5.101E 08	4.635E 08	4.162E 08	3.700E 08	2.954E 08
250000	7.343E 08	6.932E 08	6.521E 08	6.108E 08	5.695E 08	5.270E 08	4.834E 08	4.387E 08	3.933E 08	3.491E 08
300000	7.459E 08	7.036E 08	6.622E 08	6.209E 08	5.795E 08	5.379E 08	4.957E 08	4.520E 08	4.085E 08	3.644E 08
350000	7.571E 08	7.138E 08	6.730E 08	6.302E 08	5.883E 08	5.467E 08	5.049E 08	4.623E 08	4.194E 08	3.758E 08
400000	8.257E 08	7.597E 08	7.073E 08	6.463E 08	5.981E 08	5.550E 08	5.128E 08	4.704E 08	4.279E 08	3.849E 08
450000	8.647E 08	8.016E 08	7.380E 08	6.739E 08	6.157E 08	5.658E 08	5.210E 08	4.780E 08	4.353E 08	3.924E 08
500000	9.173E 08	8.406E 08	7.712E 08	7.074E 08	6.441E 08	5.843E 08	5.323E 08	4.841E 08	4.423E 08	3.992E 08
600000	9.726E 08	9.094E 08	8.414E 08	7.681E 08	6.949E 08	6.319E 08	5.698E 08	5.114E 08	4.594E 08	4.129E 08
700000	9.979E 08	9.393E 08	8.781E 08	8.148E 08	7.473E 08	6.743E 08	6.080E 08	5.447E 08	4.852E 08	4.309E 08
800000	1.010E 09	9.547E 08	8.922E 08	8.391E 08	7.774E 08	7.126E 08	6.443E 08	5.761E 08	5.123E 08	4.529E 08
900000	1.019E 09	9.641E 08	9.092E 08	8.534E 08	7.959E 08	7.348E 08	6.712E 08	6.044E 08	5.377E 08	4.747E 08
1000000	1.026E 09	9.717E 08	9.172E 08	8.624E 08	8.048E 08	7.494E 08	6.891E 08	6.259E 08	5.603E 08	4.952E 08
1200000	1.039E 09	9.847E 08	9.303E 08	8.759E 08	8.214E 08	7.644E 08	7.104E 08	6.524E 08	5.914E 08	5.285E 08
1500000	1.053E 09	1.000E 09	9.462E 08	8.918E 08	8.374E 08	7.830E 08	7.283E 08	6.731E 08	6.168E 08	5.585E 08
2000000	1.075E 09	1.021E 09	9.665E 08	9.122E 08	8.579E 08	8.035E 08	7.491E 08	6.945E 08	6.397E 08	5.843E 08
2500000	1.091E 09	1.037E 09	9.824E 08	9.260E 08	8.737E 08	8.193E 08	7.650E 08	7.103E 08	6.559E 08	6.011E 08
3000000	1.105E 09	1.050E 09	9.958E 08	9.413E 08	8.848E 08	8.323E 08	7.779E 08	7.235E 08	6.690E 08	6.143E 08
3500000	1.116E 09	1.061E 09	1.007E 09	9.526E 08	8.981E 08	8.453E 08	7.900E 08	7.345E 08	6.800E 08	6.254E 08
4000000	1.125E 09	1.071E 09	1.017E 09	9.622E 08	9.074E 08	8.533E 08	7.988E 08	7.442E 08	6.894E 08	6.350E 08
4500000	1.134E 09	1.079E 09	1.025E 09	9.705E 08	9.162E 08	8.619E 08	8.073E 08	7.528E 08	6.982E 08	6.434E 08
5000000	1.141E 09	1.087E 09	1.032E 09	9.780E 08	9.236E 08	8.693E 08	8.148E 08	7.604E 08	7.058E 08	6.512E 08
6000000	1.154E 09	1.100E 09	1.045E 09	9.909E 08	9.366E 08	8.827E 08	8.278E 08	7.734E 08	7.189E 08	6.644E 08
7000000	1.165E 09	1.111E 09	1.056E 09	1.002E 09	9.475E 08	8.931E 08	8.387E 08	7.843E 08	7.299E 08	6.755E 08
8000000	1.174E 09	1.120E 09	1.064E 09	1.011E 09	9.569E 08	9.026E 08	8.482E 08	7.938E 08	7.394E 08	6.850E 08
9000000	1.183E 09	1.128E 09	1.074E 09	1.020E 09	9.653E 08	9.109E 08	8.565E 08	8.022E 08	7.478E 08	6.938E 08
10000000	1.190E 09	1.134E 09	1.081E 09	1.027E 09	9.728E 08	9.184E 08	8.640E 08	8.094E 08	7.552E 08	7.008E 08

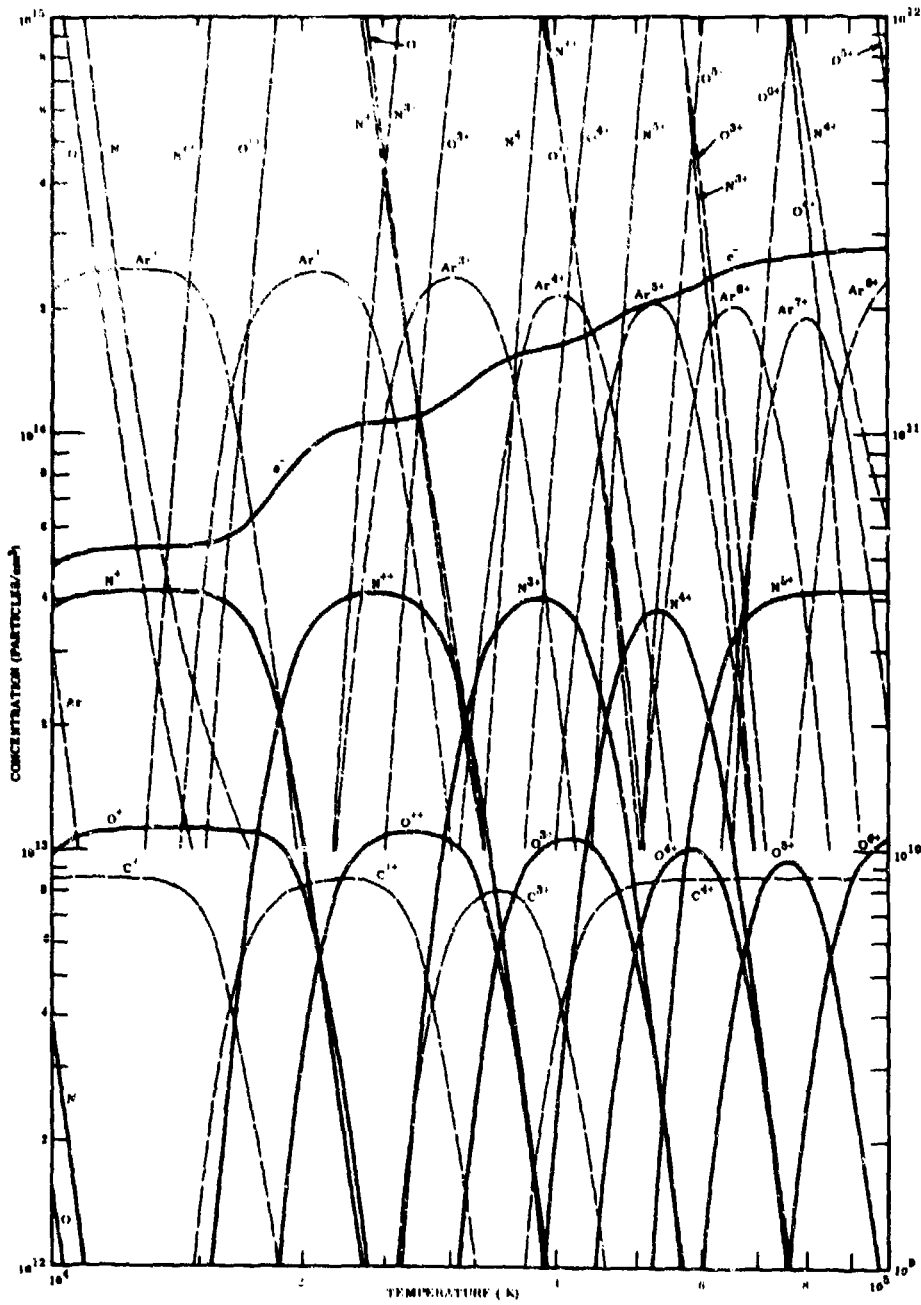


FIG. 2-1 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 10^{-6}$
 SOLID CURVES: USE LEFT-HAND SCALE,
 BROKEN CURVES: USE RIGHT-HAND SCALE

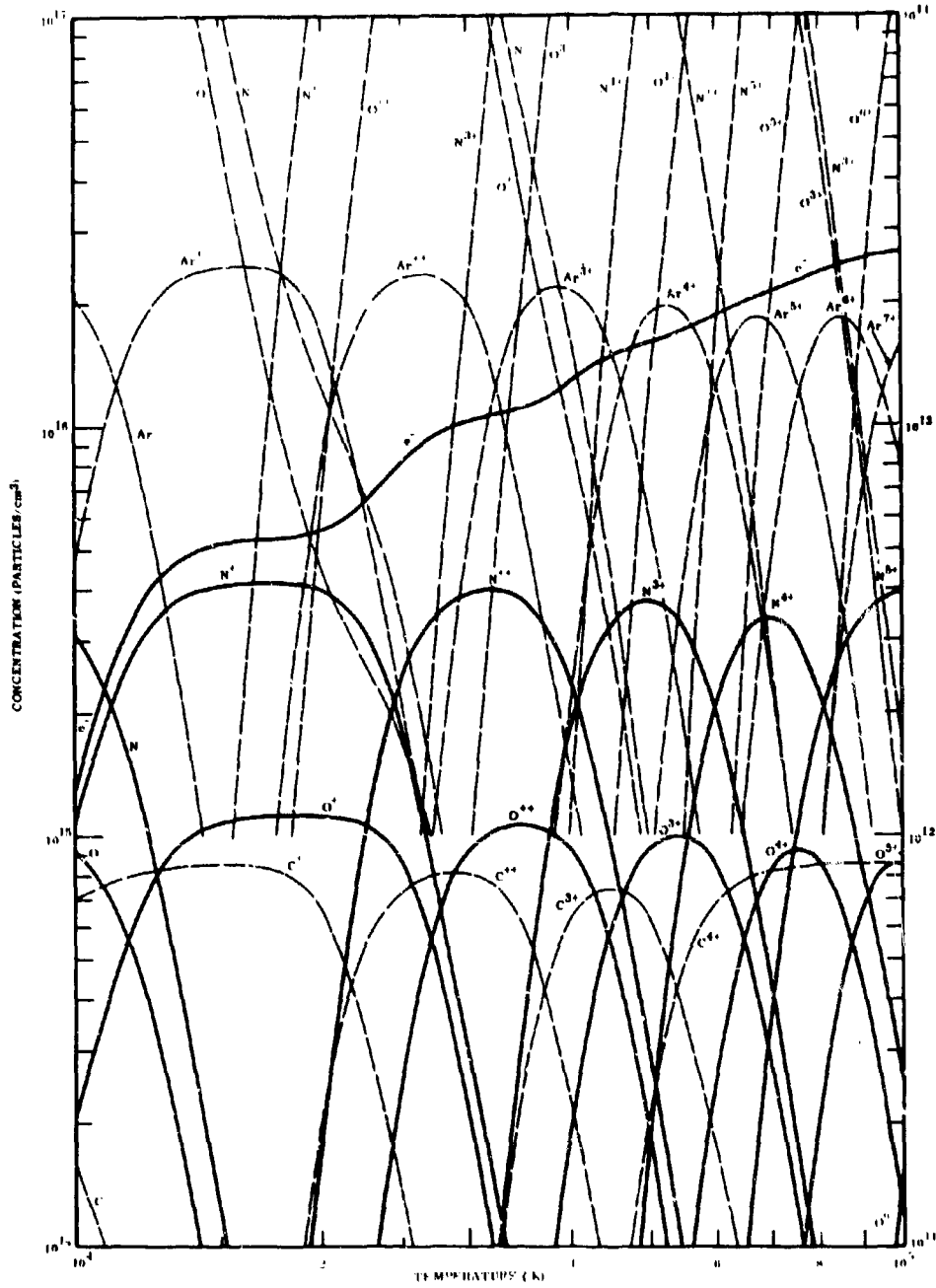


FIG. 2-2 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 10^{-4}$
 SOLID CURVES: USE LEFT-HAND SCALE,
 BROKEN CURVES: USE RIGHT-HAND SCALE

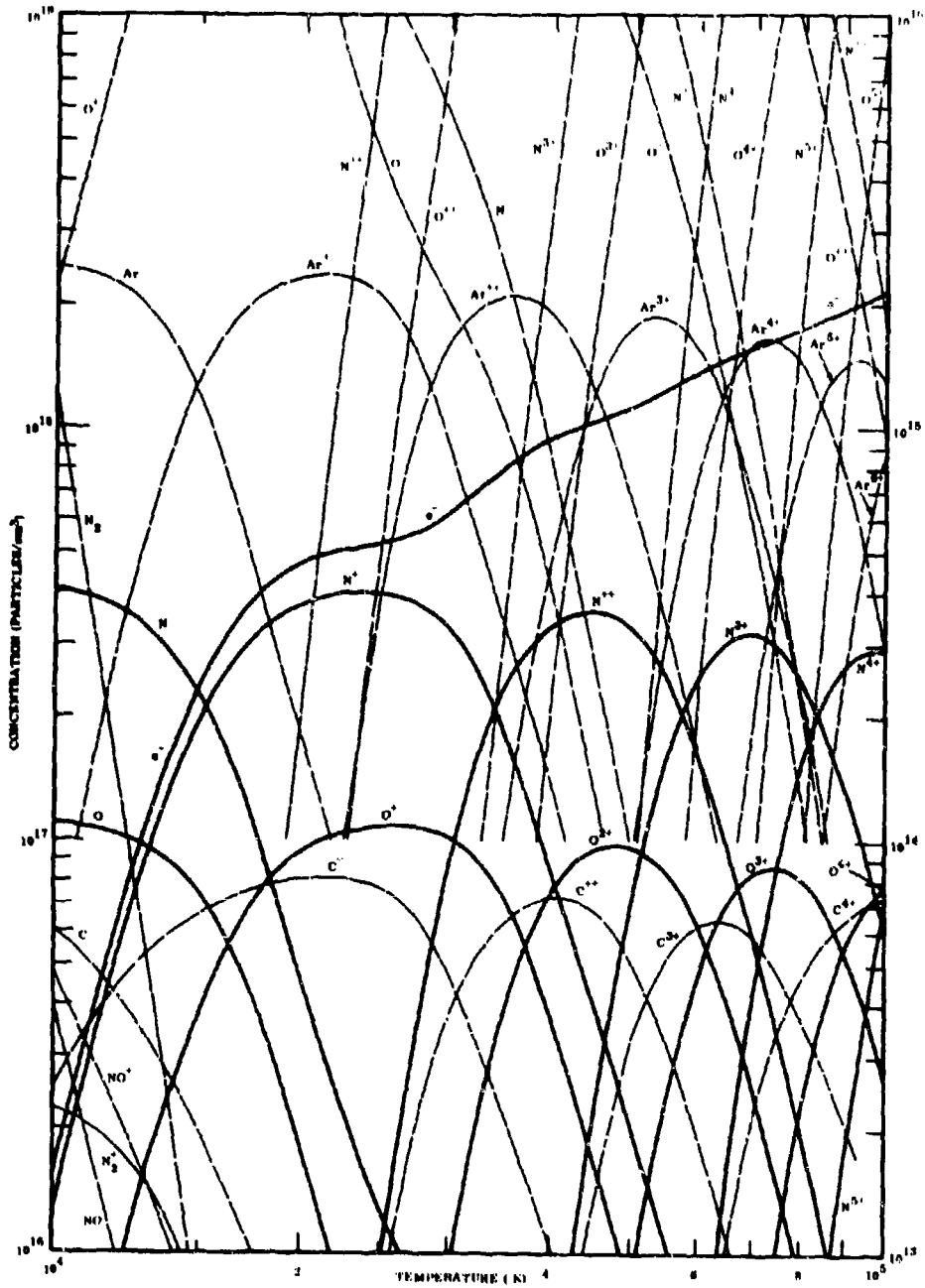


FIG. 2-3 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 10^{-2}$
 SOLID CURVES: USE LEFT-HAND SCALE,
 BROKEN CURVES: USE RIGHT-HAND SCALE

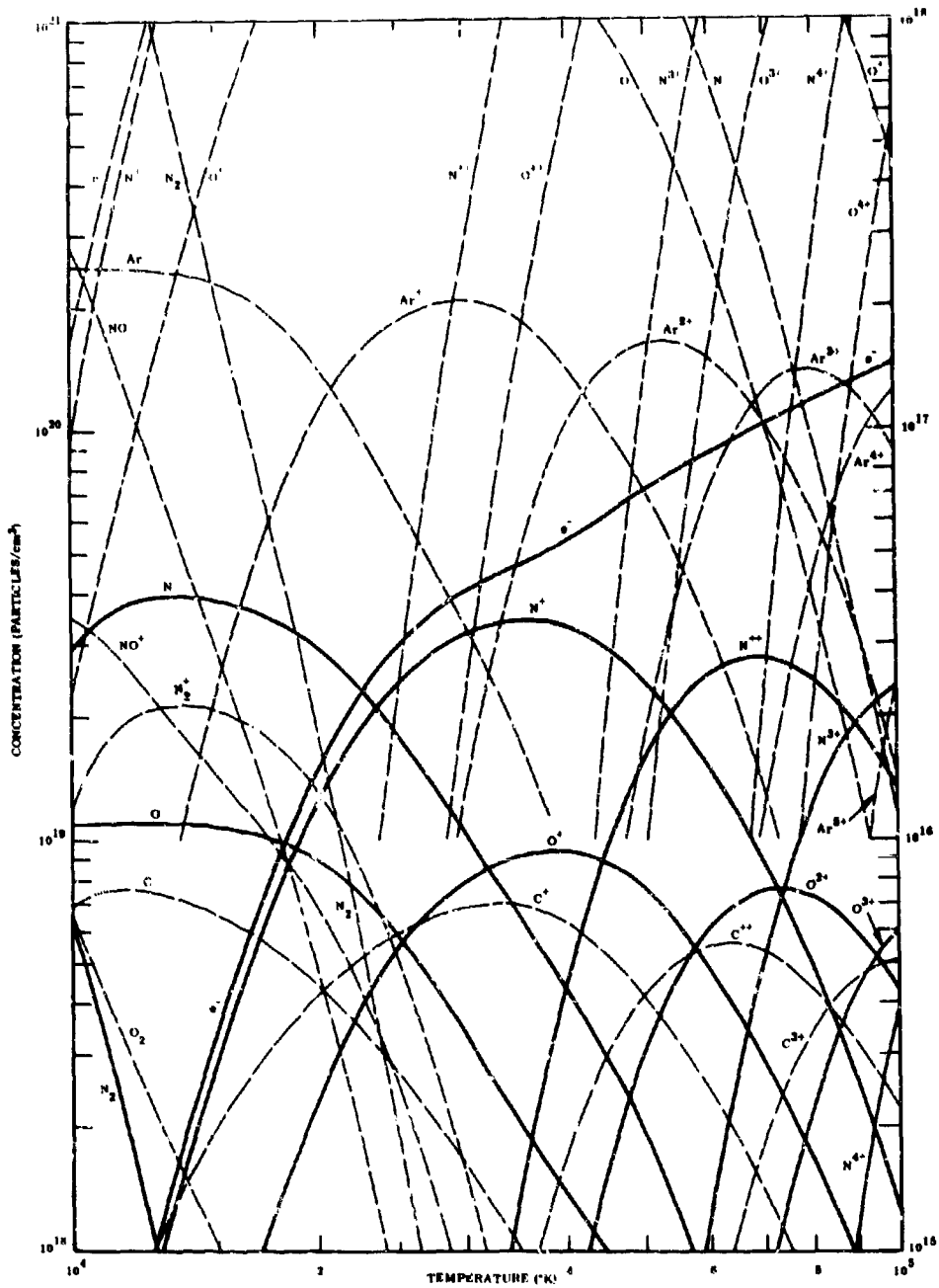


FIG. 2-4 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 1$
 SOLID CURVES: USE LEFT-HAND SCALE,
 BROKEN CURVES: USE RIGHT-HAND SCALE

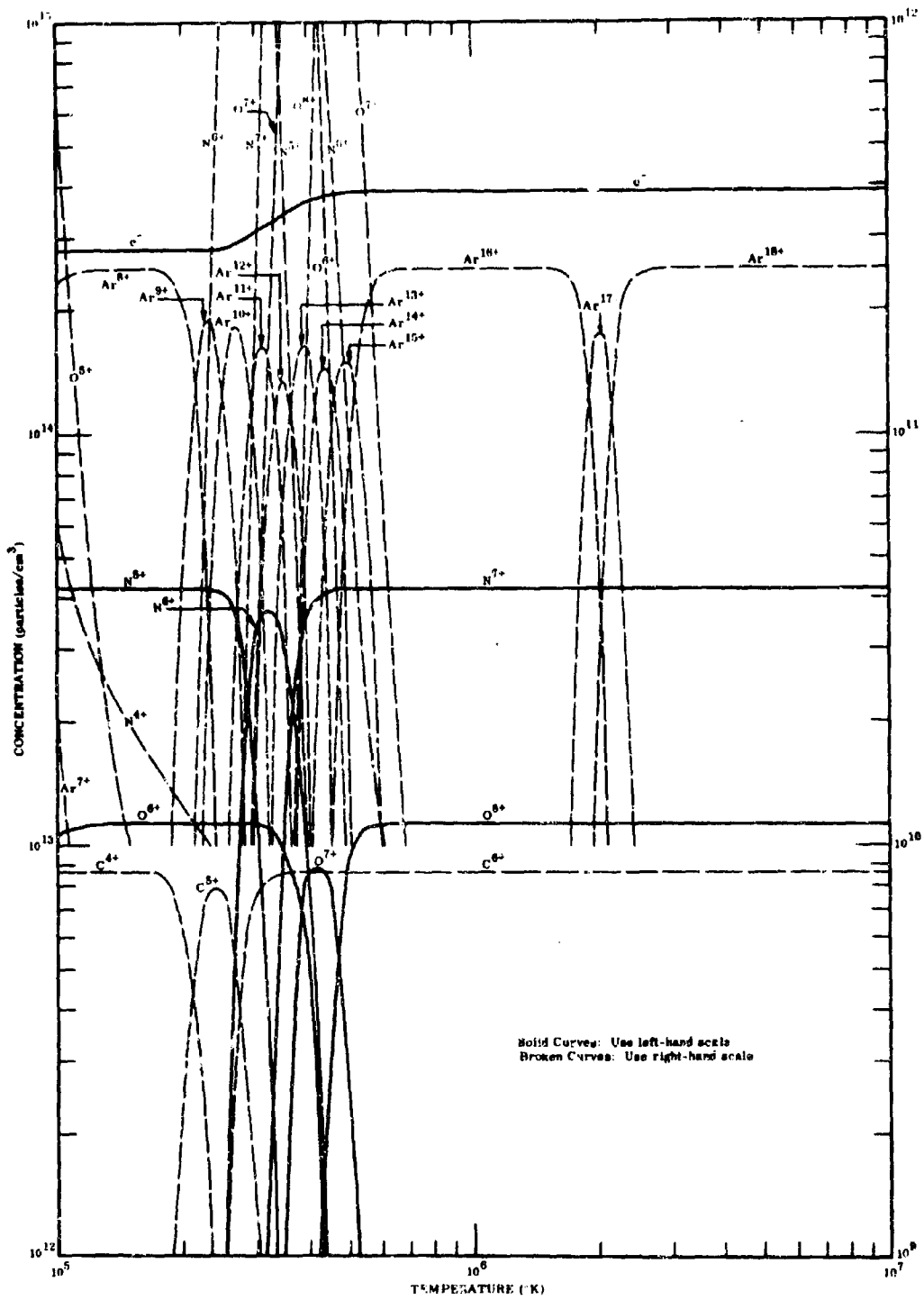


FIG. 2-5 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 10^{-6}$

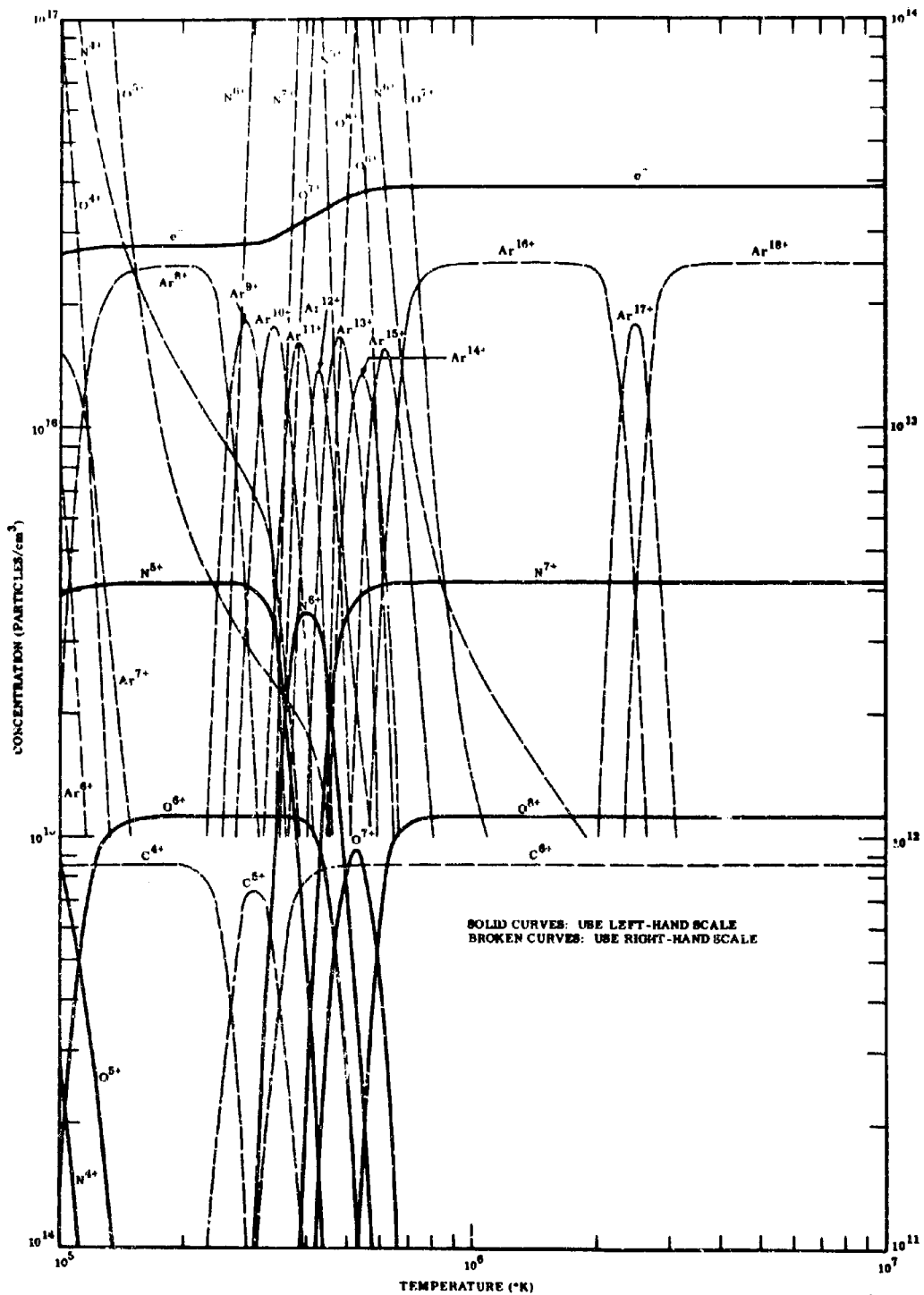


FIG. 2-6 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 10^{-4}$

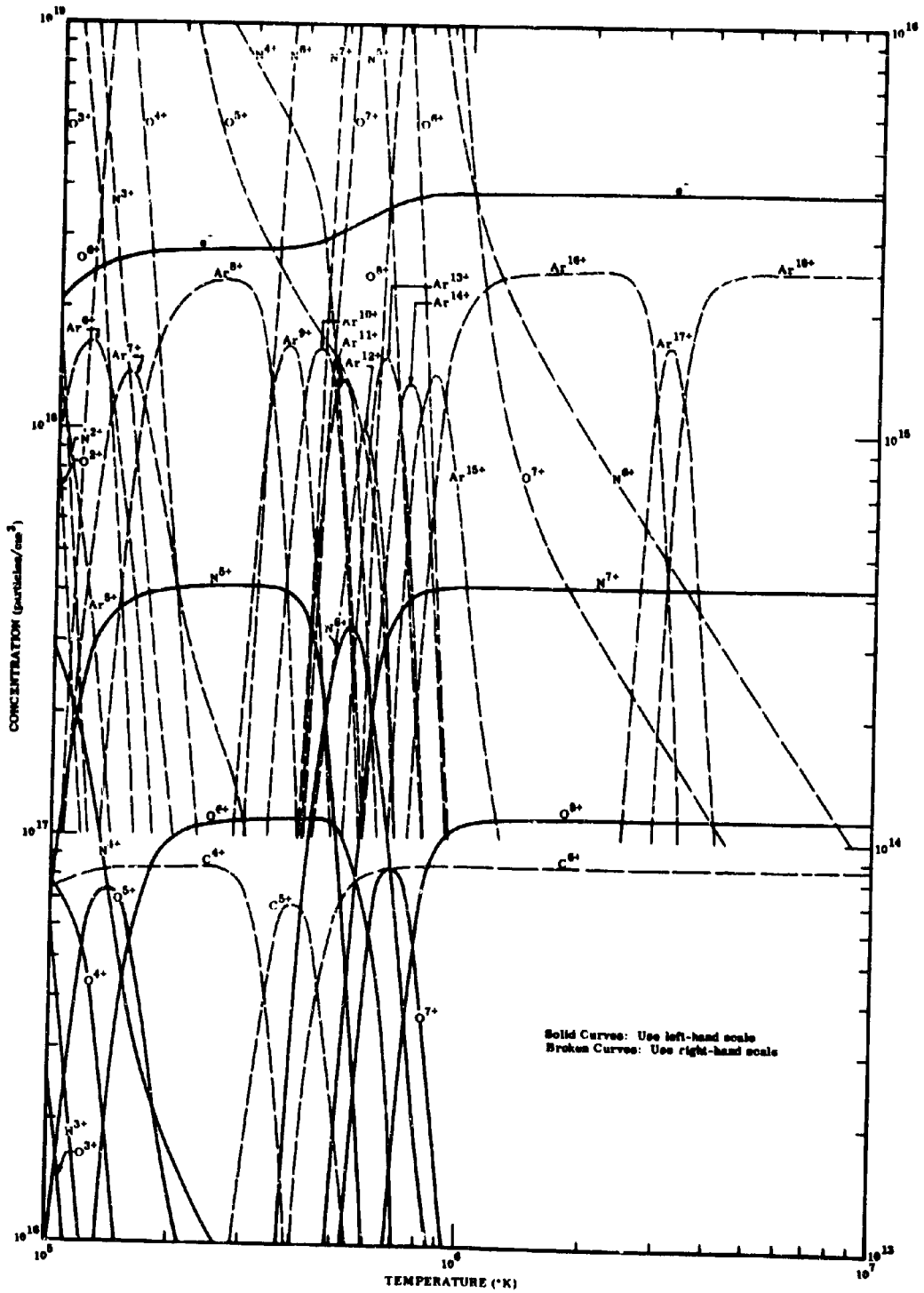


FIG. 2-7 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 10^{-2}$

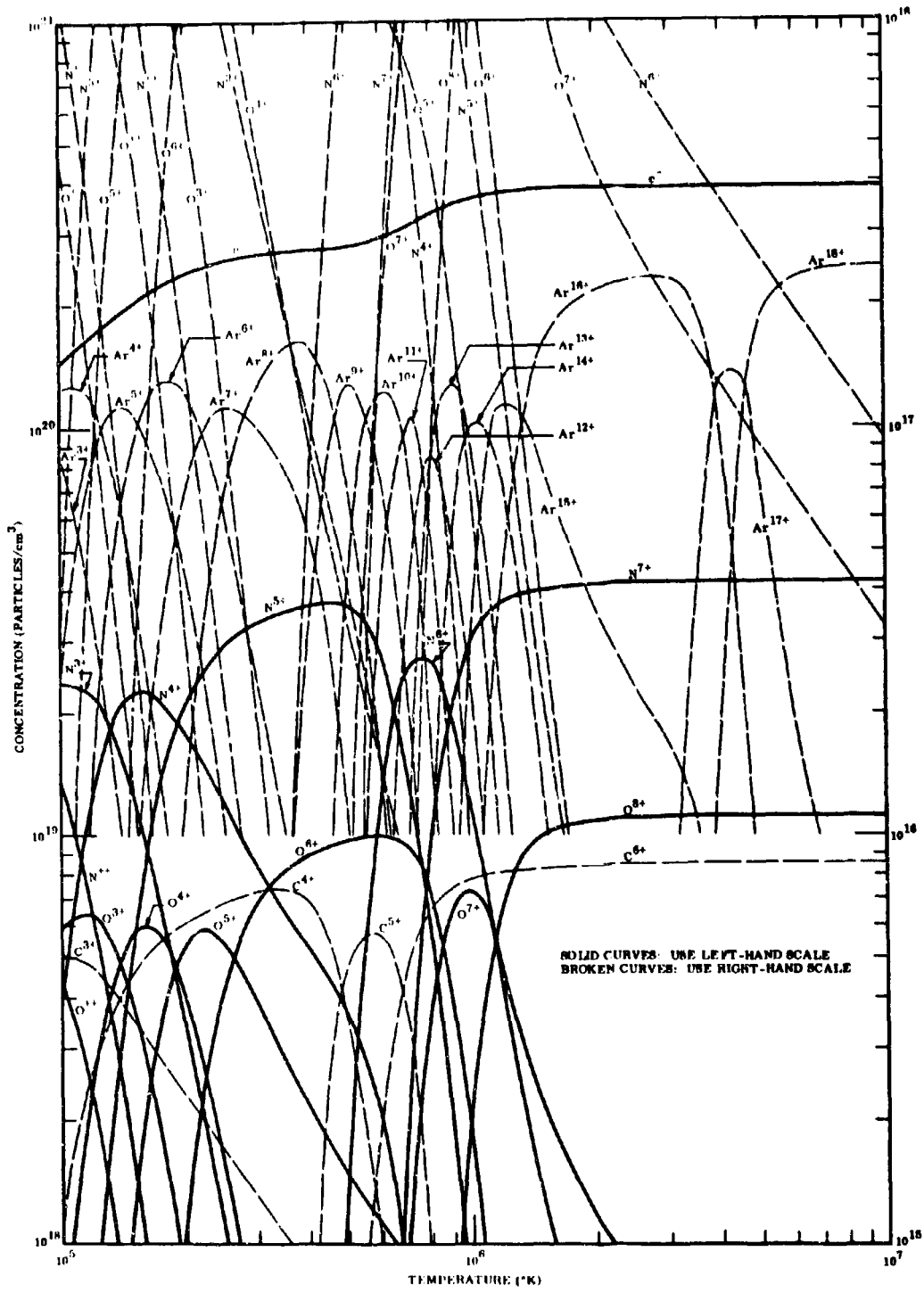


FIG. 2-8 EQUILIBRIUM COMPOSITION OF AIR AT $\rho/\rho_0 = 1$

Appendix A. Composition and Properties of the Atmosphere*
(written by A. D. Anderson)

In this Appendix the main characteristics of the atmosphere are reviewed. The principal regions of the earth's atmosphere are given in Table A-1. Inasmuch as the dominant process in the atmosphere is mixing up to at least 90 km, the proportions of the major constituents are constant up to this altitude. Hence, the mean molecular weight (mass) remains the same from 0 to 90 km and the region is called the "homosphere". Above 90 km, the molecular weight decreases as the composition changes with altitude, because of molecular dissociation and diffusion. This region is called the "heterosphere".

Aside from the compositions of the homosphere and heterosphere, we have also summarized the physics of the upper atmosphere with particular attention to variation of properties and composition with the solar cycle, a subject which has received much recent study.

Composition of the homosphere (lower atmosphere). The composition of dry air near sea level is presented in Table A-2 (U.S. Standard Atmosphere, 1962). Table A-3 gives property values for the homosphere as taken from the U.S. Standard Atmosphere, 1962 (1962). The molecular weight from 0 to 90 km is 28.964. The U.S. Standard Atmosphere, 1962, is a middle-latitude (approximately 45°) year-round mean over the range of solar activity between sunspot minima and sunspot maxima. Seasonal and latitudinal variations of the lower atmosphere properties can be taken into account, if desired, by using values from supplemental atmospheres derived by Cole and Kantor (1963).

* Some of this material has appeared in Space Materials Handbook, Ch. 4, published by Addison-Wesley Pub. Co., 1965, edited by C.G. Goetzl, J.B. Rittenhouse and J.B. Singletary.

TABLE A-1. Principal regions of the earth's atmosphere

Atmospheric region	Sub-region	Approximate altitude range (km)	Characteristic features
Homosphere	Troposphere	0-12	Mean molecular weight constant; heat transfer by convection
	Stratosphere	12-50	Constant molecular weight; increasing temperature, region strongly heated by both earth infrared and solar ultraviolet radiation
	Mesosphere	50-90	Constant molecular weight; decreasing temperature. Mixing processes dominant throughout homosphere
Heterosphere	Thermosphere	90-550	Frequent particle collisions; diffusion process dominant
	Exosphere	550-60,000	Collisions rare; temperature constant with altitude to about 8500 km; diffusion process dominant; heat transfer by conduction.

TABLE A-2. Normal composition of clean, dry atmospheric air
near sea level from U. S. Standard Atmosphere, 1962.

Constituent gas	Content (per cent by volume)	Molecular weight (C ¹² = 12.0000)
Molecular nitrogen	78.084	28.0134
Molecular oxygen	20.9476	31.9988
Argon	0.934	39.948
Carbon dioxide	0.0314	44.00995
Neon	0.001818	20.183
Helium	0.000524	4.026
Krypton	0.000114	83.80
Xenon	0.0000087	131.30
Molecular hydrogen	0.00005	2.01594
Methane	0.0002	16.04303
Nitrous oxide	0.00005	44.0128
Sulfur dioxide	0 to 0.0001	64.0628
Ozone	Summer: 0 to 0.000007 Winter: 0 to 0.000002	47.9982
Nitrogen dioxide	0 to 0.000002	46.0055
Ammonia	0 to trace	17.03061
Carbon monoxide	0 to trace	28.01055
Iodine	0 to 0.000001	253.8088

TABLE A-3. Lower atmosphere neutral properties versus altitude (U.S. Standard Atmosphere, 1962).

Altitude h (km)	Temperature T (°K)	Scale Height (km)	Concentration n (cm ⁻³)	Pressure (dynes cm ⁻²)	Density (gm cm ⁻³)
0	288	8.4	2.54(29)*	1.01(6)	1.22(-3)
5	256	7.5	1.53(19)	5.46(5)	7.36(-4)
10	223	6.6	8.60(16)	2.65(5)	4.24(-4)
15	217	6.4	4.05(18)	1.21(5)	1.95(-4)
20	217	6.4	1.85(16)	5.53(4)	8.89(-5)
25	222	6.5	8.33(17)	2.55(4)	4.00(-5)
30	226	6.7	3.82(17)	1.20(4)	1.84(-5)
35	236	7.0	1.76(17)	5.75(3)	8.46(-6)
40	250	7.4	8.31(16)	2.87(3)	4.00(-6)
45	264	7.8	4.09(16)	1.49(3)	1.97(-6)
50	271	8.0	2.14(16)	7.98(2)	1.09(-6)
60	256	7.6	6.36(15)	2.25(2)	3.06(-7)
70	220	6.6	1.82(15)	5.52(1)	8.75(-6)
80	181	5.4	4.16(14)	1.04(1)	2.00(-6)
90	181	5.4	6.60(13)	1.64	3.17(-9)

*Denotes $n = 2.54 \times 10^{19}$ particles cm⁻³

Minor constituents in the homosphere. Despite the general constancy of the proportions of the major constituents in the homosphere, photochemical and collision mechanisms result in major changes with altitude in the concentrations of the minor constituents. In spite of their small concentrations, some of these minor constituents can be very important. For example, although water vapor usually comprises less than 3 per cent of the gases even with moist conditions at sea level, it absorbs nearly six times as much solar radiant energy as do all the other gases combined. Furthermore, it accounts for nearly all the gaseous absorption of the terrestrial infrared radiation.

Atomic oxygen is present as a minor constituent of the mesosphere, as a result of photodissociation. Detection of the sodium D lines in the night airglow and twilight flash demonstrates the presence of sodium in the mesosphere. Carbon dioxide and the oxides of nitrogen have also been detected in the mesosphere by mass spectrometers of rocket flights. The presence of water vapor in the stratosphere and mesosphere is inferred from the detection of the hydroxyl radical in the night airglow.

Carbon dioxide is also an important absorber of infrared radiation. Many measurements have been made to determine the CO_2 content of the atmosphere. Bray (1959) has weighted the various measurements and gives a median value of 320 ppm. Most of the carbon dioxide measurements have been taken at sea level. Glueckauf (1944) reports values that vary from 250 ppm to 300 ppm for a series of balloon flights over England. He indicates that samples taken in the stratosphere were not different from those taken at ground level. Measurements indicate that the minimum concentrations of CO_2 are approximately 150 ppm and are found in polar air; however, the polar air values vary widely. The maximum concentrations have been measured off the west coast of Africa and may rise to 700 ppm locally. The CO_2 concentration is greater in urban than in rural areas, continental air masses show higher concentrations than air masses over the oceans, and night air usually contains more CO_2 than daytime air.

Water vapor is the most variable constituent in the atmosphere and is perhaps the most difficult to measure at small concentrations and at low temperatures. Measurements indicate that the mixing ratio of water vapor in the atmosphere decreases rapidly from ground level to the tropopause. In the stratosphere, the vapor content changes more slowly and usually decreases with altitude. Since the maximum concentration of water vapor is temperature dependent, its normal altitude profile is in accord with the temperature profile in the atmosphere. Gutnick (1962) has derived a water vapor profile for temperate latitudes, based on the best water vapor measurements to date. The general features of this model are that the mixing ratio decreases from about 6,150 ppm (mg/kg) at the surface to 9 ppm at 16 km, then increases slightly with altitude. However, the water vapor increase above 16 km is now considered dubious. Bandeen et al. (1969) infer the relative planetary distribution of atmospheric moisture from measurements within the 6.3 micron band of water vapor made from Tiros meteorological satellites.

Ozone, produced by the action of solar ultraviolet radiation on molecular oxygen, is found between 15 and 40 km, with peak values between 22 and 35 km. The total amount of ozone in temperate latitudes is about 2.7 mm on the average for the whole year; that is, if the total amount of ozone in the atmosphere could be concentrated at the surface it would make a layer of this height at STP. There are considerable changes in the amount of ozone from day to day which are correlated with weather changes. In particular the relation to pressure changes is well indicated. Ozone also appears to have a slight seasonal and latitudinal variation. Figure A-1 shows the measurements for various latitudes reported by Miller (1960). The ozone distributions shown in the figure can be considered as representative of the atmosphere over the Tropical, Temperate, and Arctic regions of the earth. Atmospheric absorption by ozone is most important in the ultraviolet region of the spectrum and near 9.6 microns in the infrared; a minor absorption band also occurs near 4.8 microns. A good review article on ozone has been presented by Götz (1951).

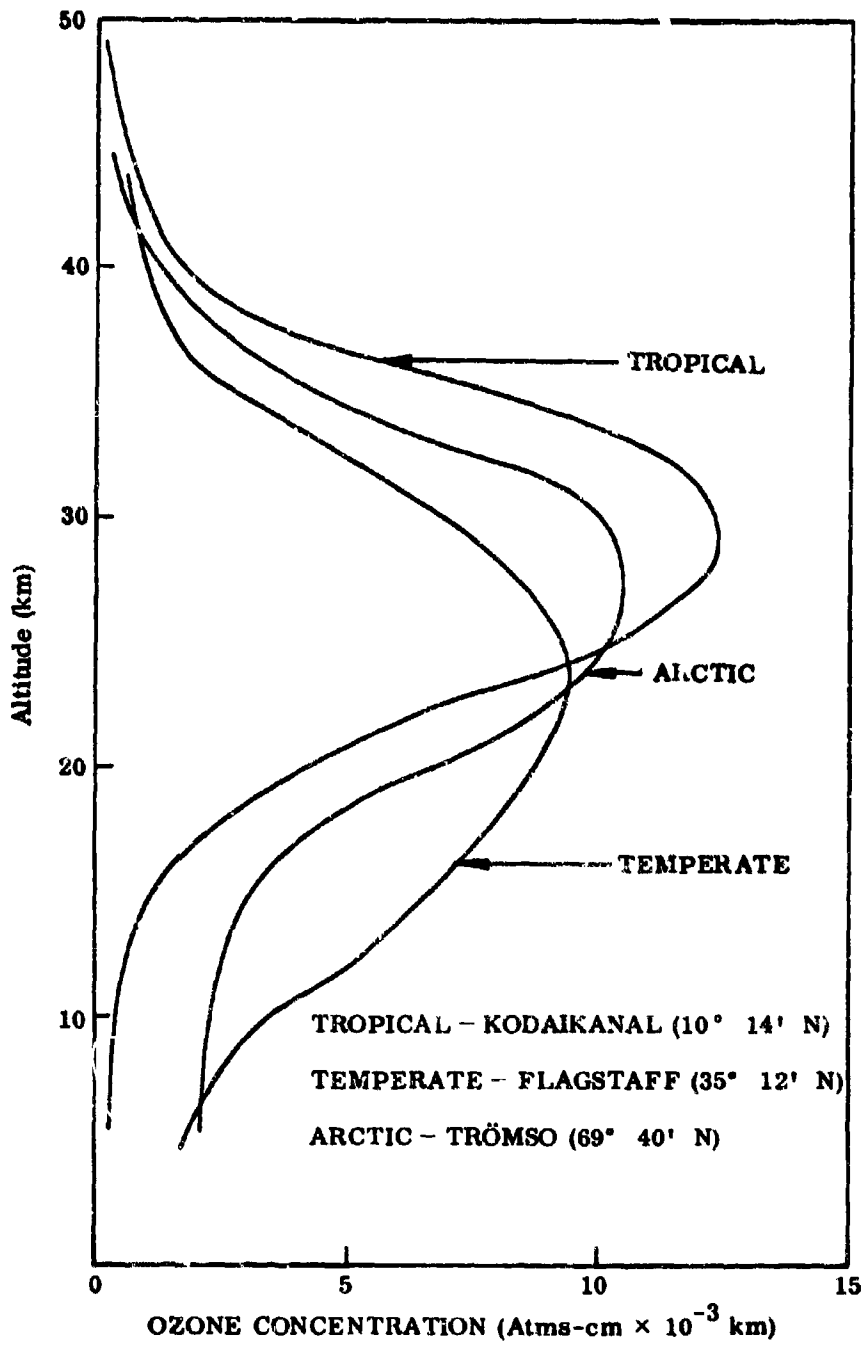


FIG. A-1 OZONE DISTRIBUTION

Composition of the heterosphere (upper atmosphere). The neutral atmosphere above 100 km is composed almost wholly of molecular nitrogen and oxygen and atomic nitrogen, oxygen, helium, and hydrogen; the relative concentrations of these constituents depend strongly on altitude and temperature. The composition of the upper atmosphere can be explained, at least in a qualitative sense, by noting the types of photochemical reactions that can occur and how the reaction products are affected by mixing and diffusion. In the following paragraphs, the reactions leading to the neutral constituents will be discussed first, followed by the ion reactions.

At about 100 km, the absorption of solar radiation with wavelengths shorter than 1850Å down to about 1300Å leads to the dissociation of oxygen molecules into oxygen atoms. For wavelengths shorter than 1026Å, the oxygen molecule can be ionized; this ionization is normally followed by a dissociative recombination producing atomic oxygen. Although the oxygen atoms can recombine into molecules, photochemical equilibrium, where the rates of dissociation and recombination are equal at each altitude, does not prevail. Instead, vertical transport due to both diffusion and mixing plays an important role in determining the atomic and molecular concentrations at various levels near 100 km. More oxygen dissociates than recombines above 100 km, due to the rapid fall-off with altitude of the recombination processes. Below 100 km, collisions occur frequently enough for recombination to prevail, hence more oxygen recombines than dissociates. Consequently, there is a steady flux of molecular oxygen upward and atomic oxygen downward through the 100 km level, due to the effects of diffusion and mixing. Atomic oxygen is the most important constituent in the upper thermosphere.

The most active process leading to the dissociation of molecular nitrogen is ionization followed by dissociative recombination, producing

atomic nitrogen. Atomic nitrogen can react with molecular oxygen to form nitric oxide and atomic oxygen. The nitric oxide in turn reacts with atomic nitrogen to form molecular nitrogen and atomic oxygen. The effectiveness of these reactions, together with the slowness with which molecular nitrogen dissociates, causes atmospheric nitrogen to remain predominantly in molecular form.

Photodissociation of water vapor and methane near 80 km constitute the principal sources of atomic hydrogen. Owing to the small mass of the hydrogen atom compared to other atmospheric constituents, the hydrogen concentration does not decrease with altitude as rapidly as do the other atmospheric constituents in the altitude region where diffusion proceeds rapidly; hence atomic hydrogen becomes an increasingly important atmospheric constituent with increasing altitude. However, atomic hydrogen is such a minor constituent in the thermosphere that it does not become the dominant constituent until 2000 to 5000 km altitude, remaining so until about 20,000 km where the hydrogen ion becomes dominant. The source of atomic hydrogen near 80 km can be expected to remain essentially constant through the sunspot cycle, but the rate of escape, depending on the temperature at the base of the exosphere, varies with the sunspot cycle. The escape will be relatively rapid when the temperature is high, and the concentration of hydrogen will be correspondingly low in the exosphere near sunspot maximum. The escape is relatively slow when the temperature is low, so that the concentration must be comparatively high near sunspot minimum.

Nicolet (1961) showed that helium atoms are an important constituent in the lower exosphere. He explains the high densities derived from the rate of change of the period of the Echo satellite by the presence of helium. Evidently, atomic oxygen, nitrogen or hydrogen cannot explain the slow density decrease between 750 and 1500 km. Atomic oxygen is the most important constituent in the upper thermosphere, but atomic helium

dominates over atomic oxygen somewhere above 800 to 1000 km. Atomic hydrogen dominates over helium somewhere above 2000 to 5000 km. Although the total concentration of the neutral particles is at least an order of magnitude greater than that of the ions up to about 2000 km altitude, the ion concentrations finally become significant at the higher altitudes.

The primary ions formed in the E region (85 to 140 km) of the ionosphere are N_2^+ , O_2^+ , and O^+ . The N_2^+ ions dissociatively recombine very rapidly, and they may also react with oxygen, so that the concentration of N_2^+ is small. Ion-atom exchange reactions of the type



proceed very rapidly, so that the reactions of O^+ with O_2 and N_2 quickly remove the O^+ ions and produce either NO^+ or O_2^+ . The dominant ions in the F_1 region (140 to 200 km) are NO^+ and O_2^+ near the lower altitude boundary, with a gradual transition to O^+ as the principal ion at the upper boundary. O^+ becomes the dominant ion because of the rapid decrease with altitude of the neutral molecular constituents that otherwise would tend to eliminate O^+ by reaction (A1.). In the F_2 region (200 to 800 km), the ions present are O^+ and N^+ , with O^+ greatly predominant. The helium ion starts to become dominant between 800 and 1400 km (Bourdeau and Bauer, 1963), depending on atmospheric temperature. Likewise, protons become the dominant ion between about 1400 to 4000 km. Thus, there are two transition regions (from oxygen to helium ions and from helium to hydrogen ions) in the upper ionosphere rather than a single transition from oxygen to hydrogen as previously believed. The outer portion of the earth's atmosphere (extending from about 20,000 km to at least 60,000 km above the earth's surface) consists

mainly of protons. The protons predominate in the earth's outer atmosphere over the hydrogen atoms because the confining effect of the earth's magnetic field makes their rate of escape to space much less than for the neutral hydrogen atoms. According to Johnson (1960), the solar wind cannot penetrate the geomagnetic field; therefore, the upper boundary of the earth's atmosphere and magnetic field (magnetosphere) are the same.

Even under normal solar wind conditions, the magnetosphere does not present a simple boundary to the earth's atmosphere. On the day side of the earth, a cavity, which is filled with the earth's magnetic field and atmosphere, is formed in the solar wind. At the same time, the geomagnetic field is deformed by the solar wind. A schematic representation of the cavity and deformed geomagnetic field during a moderately strong solar wind is shown in Fig. A-2 (Johnson, 1960). The boundary of the magnetic field in the direction facing the sun is about 10 earth radii from the center of the earth. The widest portion of the magnetic field downwind from the earth is more than 12 earth radii in width and may be over 18. The length of this tail is presently unknown and undoubtedly depends on the intensity and temperature of the particles in the solar wind.

Physics of the atmosphere. Assuming that the earth's atmosphere is a continuous medium consisting of a gas in static equilibrium, the equation connecting the pressure P and density ρ at any altitude h is

$$dP = -g\rho dh, \quad (A2.)$$

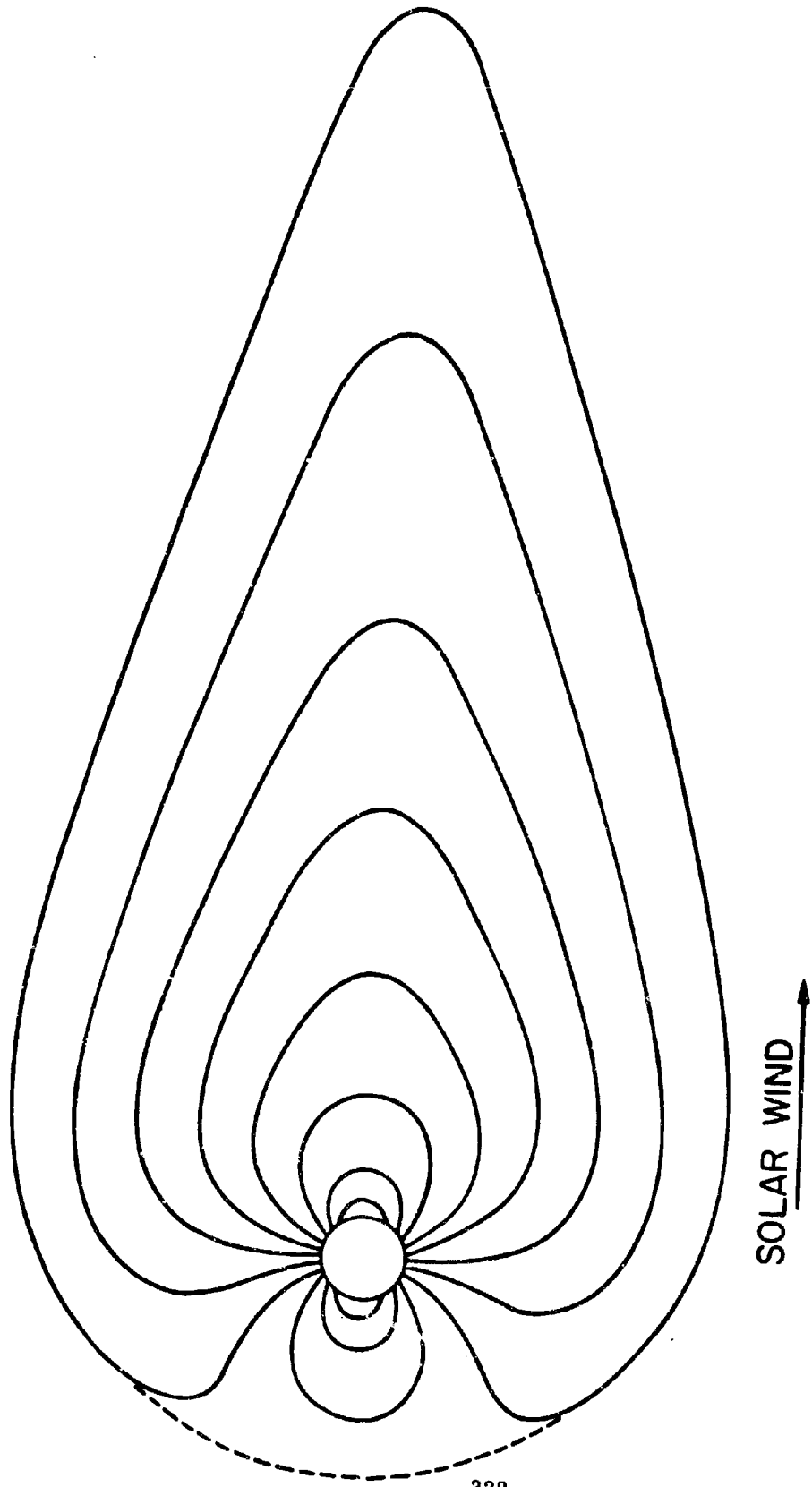


FIG. A-2 THE GEOMAGNETIC FIELD AS DEFORMED BY A MODERATELY STRONG SOLAR WIND BLOWING PERPENDICULARLY TO THE MAGNETIC AXIS, ACCORDING TO JOHNSON (1960)

where g is the gravitational acceleration. The variation in g with altitude can be taken into account by using the relationship

$$g = g_0 R_0^2 / (R_0 + h)^2 \quad , \quad (A3.)$$

where g_0 is the acceleration of gravity at the earth's surface and R_0 is the earth's radius. Eq. (A2.) is the hydrostatic equation in differential form. Further, let m be the mean molecular mass of the gas and n denote the number density or concentration; the density ρ is then

$$\rho = n m \quad . \quad (A4.)$$

Since the terrestrial atmosphere can be approximated by a perfect gas, the pressure is given by the equation of state

$$P = n k T \quad , \quad (A5.)$$

where T is the temperature and k the Boltzmann constant (1.38×10^{-16} erg deg⁻¹).

Multiplying both sides of Eq. (A4.) by g and dividing the result into Eq. (A5.) gives

$$P/\rho \quad g = k T/m \quad g = H \quad , \quad (A6.)$$

where $H = k T/m \quad g$ is known as the pressure scale height, a parameter convenient for atmospheric calculations.

From Eqs. (A2.) to (A4.) one can obtain

$$\frac{dP}{P} = - \frac{m \quad g}{k T} \quad dh \quad . \quad (A7.)$$

Then, integrating Eq.(A7.) gives the barometric law

$$\frac{P}{P_0} = \exp \left[- \int_0^h \frac{m g}{k T} dh \right] . \quad (A)$$

From Eqs.(A5.) and (A8.)we have

$$\frac{n}{n_0} = \frac{T_0}{T} \exp \left[- \int_0^h \frac{m g}{k T} dh \right] , \quad (A)$$

and Eqs.(A4.) and (A9.) yield

$$\frac{\rho}{\rho_0} = \frac{m T_0}{m_0 T} \exp \left[- \int_0^h \frac{m g}{k T} dh \right] . \quad (A)$$

In Eqs.(A8.) to (A10.), P , n , and ρ are the pressure, particle concentration, and density, respectively, at altitude h , and P_0 , n_0 , and ρ_0 are the corresponding values at an arbitrary reference level at which h is assigned the value zero.

Eqs.(A2.) to (A10.) are applicable in the atmosphere where the escape into space of a constituent is not important. The hydrostatic Eq.(A2.) is based on the concept of LTE, i.e., collisions between particles are frequent enough so that there is a complete statistical exchange of particle energy and momentum in the volume under consideration. In the thermosphere the particles collide often enough to insure a Maxwellian velocity distribution and the existence of a meaningful kinetic temperature.

In the exosphere, above about 550 km, collisions are sufficiently reduced so that the existence of a Maxwellian distribution, and consequently, the validity of applying the hydrostatic relationship, must be examined anew. Liouville's theorem can be used to show that the Maxwellian velocity distribution present below the base of the exosphere applies equally well in the exosphere, provided that the escape of particles to space is negligible. The atmosphere is so rarefied in the exosphere that there is little solar radiation absorbed. Also, there are no energy loss mechanisms to disturb the Maxwellian velocity distribution. At the temperatures present, the distribution is disturbed only by the escape of neutral hydrogen from well above the base of the exosphere. It follows that the maximum altitude in the atmosphere where the hydrostatic equation is applicable can be determined by calculating the altitude in the exosphere where the density of the neutral hydrogen starts to be significantly affected by the escape of hydrogen atoms. Consequently, the greatest error involved in using the hydrostatic assumption will occur during the day near sunspot maximum conditions, inasmuch as temperatures are highest then. Calculations (Anderson and Francis, 1964) indicate that the error will start to become significant above about 5000 km altitude. For average sunspot conditions, the altitude is about 8500 km. For sunspot minimum conditions, the error will not be significant below 10,000 km.

Inasmuch as the atmosphere consists of a mixture of gases subject to a force field, the equilibrium distribution of its constituents can be expected to show some degree of diffusive separation. Although turbulent mixing below 100 km does not allow the development of diffusive equilibrium distributions, above this altitude there is experimental evidence that

diffusive equilibrium does exist. In the geopotential field, diffusive equilibrium gives concentration distributions for neutral particles that vary exponentially with the geopotential, with a more rapid decrease in concentration with increasing geopotential for the heavier constituents in the atmosphere than for the lighter. The result is a static distribution of gas constituents under the action of the external force field, which may be expressed by the barometric law Eq. (A8.) that applies for each atmospheric constituent independently of the others.

The concept that the atmosphere extending above 400 km over a given location on the earth's surface is isothermal in the sense that the temperature does not vary with altitude is now well established. In the tenuous gas of the upper thermosphere the thermal conductivity is independent of the pressure while the heat capacity varies linearly with density. Consequently, the conductivity is very large compared to the heat capacity. Above 400 km, the absorption of energy is negligible and the relatively high heat conductivity eliminates temperature differences; hence the kinetic temperature is nearly constant with altitude for many thousands of kilometers. The kinetic temperature can only be determined for a gas with a Maxwellian velocity distribution. As pointed out under the discussion of the accuracy of the hydrostatic assumption, the Maxwellian velocity distribution applies in the exosphere provided that the escape of particles to space is negligible. For hydrogen, the escape of atoms is comparatively rapid so that the velocity distribution in the upper exosphere beyond 10,000 km is not Maxwellian. Therefore, the hydrogen atoms in the upper exosphere have a non-Maxwellian distribution that becomes more pronounced with altitude.

Under these circumstances the concept of kinetic temperature is not entirely applicable, although an effective temperature can be defined by considering the average energy of the hydrogen atoms (Sharp, 1962).

Variation of upper-atmosphere properties and composition with the solar cycle. A principal problem connected with atmospheric structure is to calculate accurate values for all the primary properties in the heterosphere (above 90 km) as a function of time, location, and date by taking into account the relevant processes. The primary atmospheric properties are temperature, pressure, density, and mean molecular mass (or composition). To account for their variations, the following factors must be considered: (a) time (hour, day, sun-rotation period, season, year, sunspot cycle); (b) location (altitude, latitude, longitude); (c) solar characteristics (ultraviolet radiation, solar plasma and associated magnetic storms); and (d) particle processes (conduction, diffusion, mass transport, photoionization, dissociation, recombination, particle escape into space). The problem of describing upper atmospheric behavior is difficult because many of the above elements are interrelated.

The magnitudes of the atmospheric properties in the upper atmosphere are derived from measurements made from satellites, rockets, meteor observations, sky emissions, and the propagation of sound and radio waves. The data are sparse and contain much uncertainty above 200 km. The density (drag) data resulting from tracking satellites are the most precise, and by far, the most numerous. Study of the orbital decay data has clearly established that two major systematic density variations occur: (1) a solar activity effect in which variations in atmospheric heating and density take place above 90 km due to variations in solar

ultraviolet radiation; and (2) a diurnal (time-of-day) effect, in which the solar heating results in the atmosphere bulging toward the sun, producing relatively large density increases at altitudes above 300 km in the sunlit region of the earth. At 800 km, due to effect (1), the density can be 40 times as high during solar maximum conditions than during solar minimum, and due to effect (2), 15 times as high during the day than during the night. The combination of both (1) and (2) can result in densities 500 times as high at 800 km during solar maximum (day) than during solar minimum (night). This extreme variability in density also applies to pressure. Upper atmosphere density variations with latitude and season are much smaller than the two primary effects above. In addition, there is a conspicuous drag effect on satellites associated with major magnetic storms and the resulting heating is such that the relative effect on density increases with altitude. At present, it is not possible to make more than a rough estimate of the effect of magnetic heating on the density; fortunately, major magnetic storms are fairly rare and the associated heating is transient.

Upper-atmosphere measurements are not made on a regular enough basis, either in kind, time or space, to allow them to be used alone, without the aid of a model, to represent atmospheric conditions. The approach followed by most models used to derive atmospheric properties is to assume altitude profiles for some of them in order to calculate the remainder. Almost all the models deal with data referring only to density, pressure and/or temperature. The altitude variation of the mean molecular mass is introduced somewhat arbitrarily and, therefore, a physically

consistent vertical distribution of the composition cannot be obtained. A new method has been devised for computing atmospheric properties (Anderson and Francis, 1964). In this model, no major assumptions are made regarding the property profiles. Instead, the primary properties are calculated by starting with an empirical density profile from a density model as the chief input, assuming diffusive equilibrium conditions above 110 km and isothermal conditions with altitude above 400 km. The density profile, used as starting input for this new property model, is represented in a previous empirical model (Anderson, 1964) as a function of local time and solar activity from 200 to 800 km. This density model can be used to calculate the marked variations in density that occur from day to day by taking corrected values of the 10.7-cm solar flux (called S') as an index of the sun's extreme ultraviolet radiation. The remaining properties are derived by using the hydrostatic equation and equation of state, that relate density, pressure, temperature, and mean molecular mass as a function of altitude (Eqs. (A8.) to (A10.)), together with boundary values based on measurements.

The equations embodying the model are programmed for an IBM-7090 computer. The results of the computations made from the model are given in two tables that present the neutral atmospheric properties and composition vs. altitude from 100 to 10,000 km. Tables A-4 and A-5 exhibit the properties and number densities of the various constituents vs. altitude near sunspot maximum and near sunspot minimum, respectively. The S' value used for Table A-4 ($S' = 250$) is an average value for September, 1959, the month immediately following the Argus high-altitude

nuclear detonation. The S' value used for Table A-5 ($S' = 44$) is an average value for July and August, 1962 ($S' = 42$ for July; $S' = 46$ for August), the two months following the Starfish high-altitude shot. Both tables are for $t = 21$ hr.; the density for this time has been found to closely approximate the diurnally averaged density or the sum of the densities for every hour of the day divided by 24. Calculations of density from the model are based on neutral particles only. The ions do not contribute significantly to the total (ambient) density below 2000 km. Above this altitude, the contribution of H^+ should be taken into account in any calculation of the ambient density. The neutral density is corrected for the departure from a Maxwellian velocity distribution caused by the escape of atomic hydrogen from the earth's exosphere. The temperature used to calculate the total pressure in the exosphere from A-5 is the kinetic temperature that is assumed to be locally isothermal vertically to 10,000 km. Hence, the computed pressure will be somewhat higher than the ambient pressure (a function of the effective temperature) of the neutral constituents above about 5000 km.

TABLE A-4. Upper atmosphere neutral properties versus altitude near sunspot minimum

Altitude h (km)	Temp. T (°K)	Scale height (km)	Mean rel. wt.	Concent. n (cm ⁻³)	Pressure (dynes cm ⁻²)	Density (g cm ⁻³)	Constituent concentrations					
							n(H) (cm ⁻³)	n(O) (cm ⁻³)	n(N ₂) (cm ⁻³)	n(A) (cm ⁻³)		
100	230	7	28.43	1.07(13)*	3.40(-1)	5.05(-10)	4.17(5)	3.78(8)	6.81(11)	7.03(12)	2.88(12)	1.05(11)
120	330	12	27.15	7.28(11)	3.82(-2)	3.28(-11)	3.22(4)	7.05(7)	1.27(11)	3.81(11)	2.14(11)	4.73(9)
140	583	20	25.48	1.34(11)	1.08(-2)	5.66(-12)	2.07(4)	3.80(7)	3.85(10)	6.48(10)	3.00(10)	4.51(8)
160	796	29	24.11	4.33(10)	4.76(-3)	1.73(-12)	1.46(4)	2.44(7)	1.66(10)	1.89(10)	7.65(9)	8.87(7)
170	969	38	22.98	1.86(10)	2.62(-3)	7.48(-13)	1.17(4)	1.81(7)	9.13(9)	7.64(9)	2.81(9)	2.65(7)
200	1080	44	22.02	1.08(10)	1.61(-3)	3.96(-13)	1.03(4)	1.49(7)	5.80(9)	3.75(9)	1.26(9)	1.08(7)
240	1165	52	20.38	4.40(9)	7.07(-4)	1.49(-13)	9.18(3)	1.18(7)	2.83(9)	1.17(9)	3.36(8)	1.96(6)
300	1182	59	18.51	1.48(9)	2.42(-4)	4.56(-14)	8.56(3)	9.33(6)	1.17(9)	2.44(8)	5.65(7)	2.11(5)
340	1183	63	17.62	7.72(8)	1.26(-4)	2.26(-14)	8.25(3)	8.07(6)	6.57(8)	8.87(7)	1.78(7)	4.95(4)
400	1183	68	16.69	3.05(8)	5.05(-5)	8.56(-15)	7.82(3)	6.52(6)	2.80(8)	1.99(7)	3.21(6)	5.86(3)
500	1183	75	15.59	7.61(7)	1.24(-5)	1.97(-15)	7.17(3)	4.63(5)	6.96(7)	1.74(6)	1.95(5)	1.81(2)
600	1183	84	14.26	2.15(7)	3.51(-6)	5.08(-16)	6.53(3)	3.28(6)	1.80(7)	1.64(5)	1.33(4)	6.17
700	1183	102	12.09	7.23(6)	1.81(-6)	1.45(-16)	6.01(3)	2.36(6)	4.84(6)	1.65(4)	9.64(2)	
800	1183	137	9.28	3.03(6)	5.02(-7)	4.74(-17)	5.55(3)	1.72(6)	1.35(6)	1.76(3)	7.51(1)	
900	1183	192	6.82	1.66(6)	2.70(-7)	1.62(-17)	5.13(3)	1.26(6)	3.90(5)	2.01(2)	6.27	
1000	1183	253	5.32	1.05(6)	1.72(-7)	9.30(-18)	4.75(3)	9.32(5)	1.17(5)	2.43(1)		
1400	1183	372	4.01	3.06(5)	4.99(-8)	2.04(-18)	3.57(3)	3.01(5)	1.27(3)			
2000	1183	444	3.90	7.01(4)	1.14(-8)	4.53(-19)	2.44(3)	6.76(4)	3.24			
4000	1182	915	2.91	2.56(3)	4.18(-10)	1.23(-20)	9.33(2)	1.62(3)				
6000	1183	2301	1.64	6.07(2)	9.91(-11)	1.66(-21)	4.77(2)	1.30(2)				
10,000	1183	6122	1.08	1.59(2)	3.25(-11)	3.57(-22)	1.94(2)	5.31				

*Notes n = 1.07 x 10⁻¹³ particles cm⁻³

TABLE A-5. Upper atmosphere neutral properties versus altitude near sunspot minimum

Altitude h (km)	Temp. T (°K)	Scale ht. (km)	Mean mol. wt.	Conc. n (cm ⁻³)	Pressure (dynes cm ⁻²)	Density (gm cm ⁻³)	Constituent concentrations					
							n (N) (cm ⁻³)	n (O) (cm ⁻³)	n (O ₂) (cm ⁻³)	n (A) (cm ⁻³)		
100	206	6	28.22	1.04(13)	2.94(-1)	4.86(-10)	7.46(5)	1.55(6)	4.83(11)	8.00(12)	1.82(12)	6.64(10)
120	287	9	27.22	5.31(11)	2.11(-2)	2.40(-11)	1.12(5)	1.21(7)	5.85(10)	4.04(11)	6.78(10)	1.39(9)
140	418	14	25.72	6.37(10)	3.67(-3)	2.72(-12)	7.21(4)	6.40(6)	1.40(10)	4.40(10)	5.68(9)	6.96(7)
160	595	22	24.28	1.46(10)	1.18(-3)	5.88(-13)	4.92(4)	3.81(6)	4.84(9)	8.79(9)	9.47(8)	7.97(6)
180	740	29	23.03	5.19(9)	5.30(-4)	1.96(-13)	3.76(4)	2.63(6)	2.23(9)	2.70(9)	2.54(6)	1.63(6)
200	876	35	21.95	2.40(9)	2.84(-4)	8.75(-14)	3.16(4)	2.04(6)	1.24(9)	1.07(9)	9.03(7)	4.64(5)
240	969	44	20.18	7.76(8)	1.04(-4)	2.60(-14)	2.66(4)	1.48(6)	5.08(8)	2.48(8)	1.73(7)	6.06(4)
300	1004	51	18.24	2.13(8)	2.96(-5)	6.46(-15)	2.40(4)	1.10(6)	1.72(8)	3.82(7)	2.04(6)	4.24(3)
340	1007	55	17.36	9.99(7)	1.39(-5)	2.88(-15)	2.30(4)	9.28(5)	8.68(7)	1.16(7)	5.24(5)	7.74(2)
400	1008	59	16.47	3.46(7)	4.82(-6)	9.45(-16)	2.16(4)	7.21(5)	3.18(7)	2.00(6)	7.04(4)	6.30(1)
500	1008	65	15.32	6.84(6)	9.51(-7)	1.74(-16)	1.95(4)	4.80(5)	6.32(6)	1.15(5)	2.69(3)	1.06
600	1008	76	13.50	1.62(6)	2.25(-7)	3.53(-17)	1.76(4)	3.23(5)	1.27(6)	7.17(3)	1.13(2)	
700	1008	102	10.36	5.03(5)	7.08(-8)	8.75(-18)	1.60(4)	2.20(5)	2.73(5)	4.83(2)	5.16	
800	1008	154	7.04	2.26(5)	3.15(-8)	2.66(-18)	1.45(4)	1.51(5)	6.10(4)	3.51(1)		
900	1008	223	4.99	1.34(5)	1.84(-8)	1.10(-19)	1.33(4)	1.05(5)	1.42(4)	2.74		
1000	1008	282	4.05	8.91(4)	1.24(-8)	6.00(-19)	1.21(4)	7.36(4)	3.44(3)			
1400	1008	412	3.08	2.82(4)	3.93(-9)	1.44(-19)	8.69(3)	1.95(4)	1.71(1)			
2000	1008	662	2.13	8.98(3)	1.25(-9)	3.18(-20)	5.99(3)	3.39(3)				
4000	1008	2120	1.07	1.88(3)	2.62(-10)	3.34(-21)	1.84(3)	4.26(1)				
6000	1008	3186	1.01	6.56(2)	1.19(-10)	1.43(-21)	8.54(2)	2.20				
10,000	1008	5637	1.00	3.10(2)	4.31(-11)	5.15(-22)	3.10(2)					

* Denotes n = 1.04 x 10¹³ particles cm⁻³

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