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THERMODYNAMIC PROPERTIES OF GASEOUS NITROGEN

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SUMMARY

The tables of thermal properties of molecular nitrogen that have been prepared in an NBS-NACA series have been grouped together herein for convenient use. They include the thermodynamic functions for the gas, both real and ideal, the transport properties for the gas, and the vapor pressure of the liquid and the solid. A table of the ideal-gas properties is presented, including the specific heat at constant pressure, enthalpy, entropy, and the free-energy function; and a table giving these same properties for atomic nitrogen is also included. The tables of the real-gas thermodynamic properties include density, compressibility factor, entropy, enthalpy, specific heat at constant pressure, ratio of specific heats, and velocity of sound at very low frequency.

For the tables of real-gas thermodynamic properties the entries are for pressures of 0.01, 0.1, 0.4, 0.7, 1, 4, 7, 10, 40, 70, and 100 atmospheres. The temperatures cover the range from 100° K, or slightly above, up to 3,000° K. The method of correlation of the pressure-volume-temperature data permits the calculation of tables far beyond the range of the experimental points. This is accomplished, with some sacrifice of fit in certain regions, by the assumption of a reasonable representation of the forces within clusters of molecules.

Tables are also included for the viscosity, thermal conductivity, and Prandtl number. The viscosity is tabulated as a function of pressure, the low-pressure values having been computed on the basis of the force constants $\epsilon/k = 91.46^\circ$ K and $r_0 = 3.681$ A for the Lennard-Jones 6-12 model (where ϵ is the maximum energy of binding between molecules, k is Boltzmann's constant, and r_0 is the classical distance of closest intermolecular approach). The thermal conductivity was fitted to a purely empirical equation, and the Prandtl number was computed in a straightforward manner from these and the specific-heat values.

The vapor pressure for nitrogen is given in a table with values at every 2° from 52° to 126° K for ready reference and with the values of $\log_{10} P$ tabulated against uniformly spaced values of $1/T$ to allow accurate interpolation (where P is pressure and T is absolute temperature). The latent heat of vaporization is also given for the temperature range 62° to 78° K.

INTRODUCTION

Advances in methods of propulsion and the high speeds attained thereby have focused attention on the need for accurate thermodynamic data on a wide class of substances over wide ranges of pressure and temperature. The substances include air and its constituent gases, actual and potential fuel systems and their oxidizers, and the products of combustion. This is one of a series of reports on the thermodynamic and transport properties of technically important gases compiled and calculated at the National Bureau of Standards at the suggestion and with the financial assistance of the National Advisory Committee for Aeronautics. The work conducted by members of the Thermodynamics Section, Heat and Power Division, under the supervision of Mr. Joseph Hilsenrath, has been described in part previously (refs. 1 to 5). This report is concerned with the properties of gaseous nitrogen. Tables are included for the thermodynamic functions for the gas, both ideal (tables 1 and 2) and real (tables 3 to 9), the transport properties for the gas (tables 10 to 12), and the vapor pressure of the liquid and the solid (table 13).

The computation of a set of mutually consistent tables of thermodynamic properties of nitrogen has been accomplished through the representation of the data of state by a virial equation whose coefficients were then used to calculate the derived thermodynamic properties. Since the experimental PVT data are abundant, cover a wide range of temperatures and pressures, and are usually very precise, the equation of state is an effective and efficient starting point for the calculation of the other thermodynamic quantities.

In the representation of the PVT data for the NBS-NACA tables, the objective was to cover adequately the range of pressure from zero to a maximum of 100 atmospheres and of temperature from a minimum of 100° K upward through the atmospheric and experimental range with a suitable extrapolation to high temperatures but omitting the effect of dissociation. The maximum temperatures were thus limited to approximately 3,000° K. As the resulting tables were to be tabulated in terms of pressure for convenient use, the correlation was made directly in terms of pressure. For most of the range of pressure and temperature desired, the simple equation

$$Z = PV/RT = 1 + B_1P + C_1P^2 + D_1P^3 \tag{1}$$

appeared to be adequate. The coefficients B_1, C_1, and D_1 are functions of temperature and are related to the virial coefficients in the analogous equation in powers of reciprocal specific volume. The coefficients B_1,

C_1, and D_1 are given in table 14 for the generation of compressibility values at the higher pressures where interpolation in the table proves inadequate. The derivative functions of these coefficients are given in table 15.

The pressure corrections to various thermodynamic properties were determined theoretically from the correlation of the data of state and were combined with the values of the properties for the ideal gas to obtain the complete real-gas properties apart from dissociation. In this way tables 6, 7, and 9 were obtained. The methods used are based on the thermodynamic relationships between the properties and the data of state and are discussed by Woolley (ref. 2). Many details concerning the actual computations will be found in succeeding sections of this report and in the discussions of the tables.

Graphical representation of the estimated dissociation effects for entropy and enthalpy are included. A higher dissociation energy of approximately 9.764 electron volts as recommended by Gaydon (refs. 6 and 7) has been used. A number of lines of experimental evidence (refs. 7, 8, 9, and 10) are now in agreement in pointing toward this value in preference to Herzberg's earlier estimate of 7.373 electron volts (ref. 11). A more extended discussion of the effects of dissociation for diatomic elements is given in an earlier report (ref. 12). If nitrogen is present as one of several components in a gas mixture, the compressibility depends on interactions between the distinct constituents and is not calculated from the properties of pure constituents alone. The dissociation effects in such a case may be obtained by methods given by Huff, Gordon, and Morrell (ref. 13) and by Damköhler (ref. 14).

The fundamental physical constants employed in the correlation are those contained in the National Bureau of Standards tabulation of selected values of chemical thermodynamic properties (ref. 15).

The tables are given in dimensionless form and conversion factors to some frequently used units are given. The pressure intervals were chosen to facilitate Lagrangian interpolation of the tables. When linear interpolation in pressure is strictly valid, values for intermediate pressures have in some cases been omitted. Deviation plots or tables indicating the agreement or discordance of the experimental data have been included. These plots also show graphically the range and the abundance or paucity of the experimental data for nitrogen.

The tables of thermal properties were originally prepared in loose-leaf form to permit their prompt distribution to research workers. They were arranged in close proximity to conversion factors, text material, and deviation plots. This desirable feature could not readily be retained in this report. The discussion of the tables, including their reliability, has been assembled in a separate section. The reader is urged to consult this section prior to the use of the tables. Values of the gas constant R are listed in table 16. Conversion factors are listed separately in tables 17 and 18. A temperature interconversion table is also presented (table 19).

The tables in this collection were computed over an extended period with the assistance of a number of persons. Valuable assistance has been rendered by Mrs. Lilla Fano who supervised the computations, some of which were performed by Mr. F. Donald Queen and Miss Mary M. Dunlap. Part of the calculations were performed by the Computation Laboratory of the Applied Mathematics Division under the supervision of Miss Irene Stegun. Thanks are also due to Prof. Y. S. Touloukian, Dr. R. L. Nuttall, and Mr. J. Hilsenrath for the tables of transport properties and to Dr. H. J. Hoge and Mr. G. J. King for the vapor-pressure tables.

SYMBOLS

a sound velocity at low frequency, m sec^{-1} or ft sec^{-1}

a_0 sound velocity at standard conditions, 336.96 m sec^{-1} or 1,105.5 ft sec^{-1}

B second virial coefficient in $1/V$ series, a function of temperature, cm^3 $mole^{-1}$

$B^{(0)}(\tau)$ second virial coefficient function, B/b_0

B_1 coefficient of P in pressure series for PV/RT, atm^{-1}

$B_1' = T\,dB_1/dT$, atm^{-1}

$B_1'' = T^2\,d^2B_1/dT^2$, atm^{-1}

b_0 characteristic parameter of Lennard-Jones interaction potential, cm^3 $mole^{-1}$

b_2 b_0 for pairs alone as distinct from pairs in larger clusters, 63 cm^3 $mole^{-1}$

b_3 b_0 for pairs within a cluster of three, 61.7 cm^3 $mole^{-1}$

C	third virial coefficient in $1/V$ series, a function of temperature, $\left(\mathrm{cm}^3\ \mathrm{mole}^{-1}\right)^2$
$C^{(0)}(\tau)$	third virial coefficient function, $C/b_o{}^2$ in simple theory
C_1	coefficient of P^2 in pressure series for PV/RT, atm^{-2}

$C_1{}' = T\ dC_1/dT$, atm^{-2}

$C_1{}'' = T^2\ d^2C_1/dT^2$, atm^{-2}

C_p	heat capacity at constant pressure, various units
$C_p{}^o$	heat capacity at constant pressure for ideal gas, various units
C_v	heat capacity at constant volume, various units
D	fourth virial coefficient in $1/V$ series, a function of temperature, $\left(\mathrm{cm}^3\ \mathrm{mole}^{-1}\right)^3$
D_1	coefficient of P^3 in pressure series for PV/RT, atm^{-3}

$D_1{}' = T\ dD_1/dT$, atm^{-3}

$D_1{}'' = T^2\ dD_1/dT^2$, atm^{-3}

$E_0{}^o$	internal energy for 1 mole of gas in ideal-gas state at 0^o K; equal to $H_0{}^o$, enthalpy for same conditions, various units
F^o	free energy per mole in standard state (ideal gas at 1 atmosphere for gaseous substances), various units
H	enthalpy per mole, various units
H^o	enthalpy per mole in standard state (ideal gas at 1 atmosphere for gaseous substances), various units
$H_0{}^o$	enthalpy per mole in standard state at 0^o K, same as $E_0{}^o$

K_3	equilibrium constant for a chemical reaction, atm^n
k	thermal conductivity, cal cm^{-1} sec^{-1} $^oC^{-1}$; also Boltzmann constant for proportionality of energy to temperature, 1.38048×10^{-16} erg $^oK^{-1}$
k_0	thermal conductivity at 273.16° K and 1-atmosphere pressure, 5.77×10^{-5} cal cm^{-1} sec^{-1} $^oC^{-1}$
M	molecular weight (chemical scale), 28.016 g $mole^{-1}$
m	moles of vapor expelled from container during vaporization
N_{Pr}	Prandtl number, $\eta C_p/k$
P	pressure, atm or dynes cm^{-2}
P_0	atmospheric pressure, 1 atm or 1,013,250 dynes cm^{-2}
Q	energy used for vaporization of an amount of liquid
R	gas constant per mole, 82.0567 cm^3 atm $(^oK)^{-1}$ $mole^{-1}$, 1.98719 cal deg^{-1} $mole^{-1}$, or 8.31439 abs. j deg^{-1} $mole^{-1}$ (for values of R in other dimensions, see table 16)
r	distance between two molecules
r_o	classical distance of closest intermolecular approach at zero energy according to Lennard-Jones potential, 3.68 A
S	entropy for 1 mole, various units
S^o	entropy for 1 mole in standard state (ideal gas at 1 atmosphere for gaseous substances), various units
T	absolute temperature, ^oK or ^oR
T_0	temperature at standard conditions, 273.16° K
U	potential energy of interaction of two molecules
V	volume per mole, cm^3 $mole^{-1}$
V_f	function in theory of viscosity

W function in theory of viscosity

Z compressibility factor

Z_0 compressibility factor at standard temperature and pressure, 0.99955

α isentropic expansion coefficient, $\frac{-V}{P}\left(\frac{dP}{dV}\right)_S = \frac{-V}{P}\left(\frac{dP}{dV}\right)_T \gamma$

γ ratio of specific heats, C_p/C_v

ϵ maximum energy of binding between molecules with a Lennard-Jones potential, ergs

ϵ/k characteristic parameter of Lennard-Jones interaction potential, $^{\circ}K$

ϵ_2/k ϵ/k for pairs alone, 95.42° K

ϵ_3/k ϵ/k for pairs within a cluster of three, 97.7° K

η viscosity, poise or g sec^{-1} cm^{-1}

η_0 viscosity at 273.16° K and 1 atmosphere, $1{,}662.5 \times 10^{-7}$ poise

μ Joule-Thomson coefficient, $\left(\frac{dT}{dP}\right)_H$, deg atm^{-1}

ρ density, mole cm^{-3}, Amagat units, and so forth

ρ_0 density at 273.16° K and 1 atmosphere, 4.46338×10^{-5} mole cm^{-3} or 1.25046×10^{-3} g cm^{-3}

τ a reduced temperature, kT/ϵ

EXPERIMENTAL DATA OF STATE FOR NITROGEN

The experimental PVT data for nitrogen extending to elevated pressure are indicated in figure 1. Here the direct experimental values of Z are represented by $V(Z - 1)$ plotted as a function of density, with values for temperatures in $^{\circ}$K adjoining the plotted points. The deviations of the correlation adopted for the present tables are indicated by the comparison between the solid curves and the plotted experimental points.

The procedure used in the present correlation in representing the second and third virial coefficients B and C, related to B_1 and C_1 in equation (1), has been outlined previously (ref. 2). The method is so arranged that it is possible to make use of experimental data on the pressure dependence of internal energy, enthalpy, specific heat, and sound velocity for the second virial coefficient and to use Joule-Thomson data and PVT data for both second and third coefficients. In determining the parameters for B and C the PVT data of Michels and coworkers (refs. 16 and 17) have been weighted heavily using values consistent with the recent summary of Michels, Lunbeck, and Wolkers (ref. 18). Their data are in the range 0° to 150° C.

The isotherm data of Holborn and Otto (ref. 19) have been corrected for the effect of stretching of the container at elevated pressure and for individual pressures and temperatures occurring in their evaluation of the amount of substance present for individual measurements. The need for correction of their results has been discussed by Cragoe (ref. 20). As a result of the corrections applied, the points as plotted are not identical with the figures given in their original publications. Also, the data of Michels have been adjusted slightly for the highest temperatures for the vapor pressure of the mercury confining the gas.

It was not possible to obtain an exact fit of the second virial coefficient to all the good data using an unmodified 6-12 Lennard-Jones function. Nevertheless, such a function was used even though it departed considerably from the data (refs. 21 to 23) at the lower temperatures, because the tables herein are intended primarily for moderate and elevated temperatures. The parameters to obtain C and the function for D were so chosen as to compensate partially for the failure to fit B for the actual PVT data at moderately low temperatures.

In terms of the virial coefficients for 6-12 Lennard-Jones potentials as tabulated in the dimensionless form $B^{(0)}(\tau)$ and $C^{(0)}(\tau)$ by Hirschfelder (refs. 24 and 25), the coefficients B_1 and C_1 are represented by

$$B_1 = b_2 B^{(0)}\left(\tau_2\right) \Big/ RT$$

and

$$C_1 = b_3{}^2 \left\{C^{(0)}\left(\tau_3\right) - 4\left[B^{(0)}\left(\tau_3\right)\right]^2\right\} \Big/ (RT)^2 + 3B_1{}^2$$

where

$$\tau_2 = kT/\epsilon_2$$

and

$$\tau_3 = kT/\epsilon_3$$

with

$$\epsilon_2/k = 95.42^\circ \text{ K}$$

$$b_2 = 63 \text{ cm}^3 \text{ mole}^{-1}$$

and

$$\epsilon_3/k = 97.7^\circ \text{ K}$$

$$b_3 = 61.7 \text{ cm}^3 \text{ mole}^{-1}$$

The coefficient D_1 is represented empirically as

$$D_1 = 0.091442T^{-3} - 297.40T^{-4} + 111{,}984T^{-5} - 6.9819 \times 10^6 T^{-6} - 2.4526 \times 10^{-5} T^{-3} e^{1{,}600/T}$$

After the calculation of the derived tables based on the present PVT correlation was completed, values of virial coefficients representing new PVT data of Friedman, White, and Johnston were received (private communication). At the lower temperatures their values indicate a need for a different extrapolation; at intermediate and elevated temperatures they favor the trend of Holborn and Otto (ref. 19). A complete correlation of PVT data including the region near the critical point cannot be performed properly when one represents the compressibility factor as a power series in the pressure, because the critical point is a point of singularity for such a representation. The extension of the correlation to this region of temperature and pressure is possible, however, if one uses a series in density or $1/V$ for which no such singularity occurs. Examination of figure 1 shows that the isotherms in this representation deviate only slightly from linearity or complete representation in terms of B and C alone. Representations of the data in the low-temperature region with a density series using only B and C have been given with considerable success by Claitor and Crawford (ref. 26) and by Hall and Ibele (ref. 27).

COMPARISON OF DERIVED QUANTITIES WITH EXPERIMENTAL DATA

Experimental data on heat capacity, entropy, enthalpy, sound velocity, and so forth are too sparse to provide directly a tabulation of these properties over an appreciable temperature and pressure range. Fortunately, it is possible to calculate these quantities when sufficient data of state are available. Thermodynamic properties thus calculated from good PVT data are usually in very satisfactory agreement with the experimental data. This section is devoted to a comparison of the derived thermodynamic quantities with the existing experimental data.

The specific heat at constant pressure was measured by Henry (ref. 28) for pressures near 1 atmosphere. His method involved the determination of a temperature difference due to lack of symmetry of the temperature distribution along a uniformly heated flow tube, together with a comparison of the effect with the similar effect for helium. He reduced his values to specific heat at constant volume. For the present comparison, his results have been reduced back to the observed specific heats at constant pressure, using his graphically presented experimental points. His tabulated final results are presented as a dashed curve near the experimental points in figure 2, showing percent departures from table 5. His claimed accuracy was only about 1 percent, and his values at his higher temperature of 350° C deviate from the computed values by about this amount. At room temperature, for which he suggested 1/2 percent as the accuracy, the agreement is correspondingly better.

Measurements have been made by Brinkworth (ref. 29) on the cooling of a gas during an isentropic expansion, according to the method of Lummer and Pringsheim. Brinkworth's results were based on measurements near atmospheric pressure only, so that no clear indication of equation-of-state effects can be inferred directly from his results. His computed values for γ for the ideal-gas state, which he obtained by applying corrections based on Berthelot or Callender equations of state to his measured values, are shifted oppositely to the adjustments that would properly be made on the basis of the present PVT correlation. However, the actual shift required to give agreement with γ^{o}, as computed from C_p^{o}/R based on spectroscopic values for zero pressure, is several times as great as that given in the present PVT correlation, although it agrees in sign.

It is to be noted that, while the adiabatic expansion for an ideal gas follows a rule that PV^{γ} is a constant or $PT^{\gamma/(1-\gamma)}$ is a constant, the behavior of a real gas, during an adiabatic expansion, is given in first approximation over a limited range assuming that PV^{α} is a constant, where

$$\alpha = -\frac{V}{P}\left(\frac{dP}{dV}\right)_S = -\frac{V}{P}\left(\frac{dP}{dV}\right)_T \gamma = \gamma Z \Bigg/ \left[Z - P\left(\frac{dZ}{dP}\right)_T\right]$$

To express the temperature change with change of pressure, other relations are required; so that, if $PT^{\left[\gamma_a/(1-\gamma_a)\right]} = \text{Constant}$ is to be used, then

$$\frac{\gamma_a - 1}{\gamma_a} = \frac{P}{T}\left(\frac{dT}{dP}\right)_S = P\left(\frac{dV}{dT}\right)_p \Bigg/ C_p = \left[Z + T\left(\frac{\partial Z}{\partial T}\right)_p\right] R \Bigg/ C_p$$

As can be seen, γ_a is naturally different from both γ and α.

The final values of γ_a reported by Brinkworth for the real gas were obtained as an extrapolation to infinite volume of an experimental container, as he found a marked dependence on volume. Values of γ_a computed from theory are within the range of his extrapolations.

The results of Brinkworth have been converted to provide values of C_p for about 1.03 atmospheres, using the present PVT correlation to give $Z + T\left(\frac{\partial Z}{\partial T}\right)_p$ in

$$C_p = R\left[Z + T\left(\frac{\partial Z}{\partial T}\right)_p\right]\left(\frac{d \log_e P}{d \log_e T}\right)_S$$

The results are shown in figure 2 as percent departure from table 5.

Values for the specific heat of gaseous nitrogen were reported by Eucken and Von Lüde (ref. 30) based on a similar use of the method of Lummer and Pringsheim involving the cooling during an isentropic expansion. They used the PVT data of Holborn and Otto in the evaluation. Their results are also shown in figure 2.

Values of the specific heat at constant pressure for nitrogen are at times quoted from the measurements of the velocity of sound by Shilling and Partington (ref. 31). Their results deviate markedly from the computed values at elevated temperatures. Similar results were obtained by Dixon, Campbell, and Parker (ref. 32), who also measured the velocity of sound. These measurements are considered further in the discussion of sound velocity.

The specific heat at constant pressure was measured over an extended range of pressures by Workman (ref. 33) for temperatures of 26° C and 60° C. His data, shown in figure 3, have here been expressed as the ratio of C_p to $C_p^{\,o}$, the value at zero pressure, instead of his reported ratio to the value at 1 atmosphere in order to make distinct the contribution of the departure from ideality. The independent variable is here shown in atmospheres instead of the original pressure units. The curves in the figure are the predictions from theory using the present PVT correlation. The agreement is considered fairly satisfactory for the pressure range of chief interest in this correlation, that is, below 100 atmospheres.

The data of Clark and Katz (ref. 34) for the ratio of specific heats of nitrogen have been recomputed using an improved theory for the effective mass of the gas to be added to the mass of the moving piston in their resonating system. The correction involves the recognition that the participation of the mass in each end of the cylinder is not linear with distance as if it were approximately proportional to the velocity but varies according to the kinetic energy or as the square of the velocity. The integration for quadratic dependence on distance, which is approximately valid, supplies a factor of 1/3 rather than 1/2 as used by Clark and Katz. A detailed derivation of the corrections for the effective mass of the gas in a resonating-piston experiment is to be found in a note by Woolley (ref. 3).

In figure 4 the open circles show the values reported by Clark and Katz, while the recomputed values are shown as filled circles. The curves show the theoretically computed values based on the present PVT correlation with $C_p^{\,o}/R$ taken from table 1. The different curves are for distinct computations carried to the powers of pressure corresponding to the virial coefficients B_1, C_1, and D_1 as indicated. A more direct comparison of the experimentally observed quantities may be made by computing values of α; but such a comparison is not shown here, as the quality of agreement remains essentially the same as is shown for γ.

A graphical indication of values of γ for nitrogen from 0 to 100 atmospheres at 27° C was given by Hubbard and Hodge (ref. 35) based on measurements of the velocity of sound. Values read from their graph are shown in figure 5 as a dashed curve.

Other measurements of the velocity of sound in nitrogen as a function of pressure up to 1 atmosphere have been made by Keesom and Van Lammeren (ref. 36), by Van Itterbeek and Mariëns (ref. 37), and by Van Itterbeek and Van Doninck (ref. 38). These are all at temperatures below the region covered in the present tables, which are primarily fitted to the PVT data immediately above and below ordinary atmospheric temperatures. The comparison with these data is accordingly omitted. A limited portion of the data of Keesom and Van Lammeren gives the temperature dependence of the velocity of sound near atmospheric pressure between 145° K and about 165° K. The results are shown in figure 6 with a curve interpolated from table 9 shown also for comparison.

Values for the velocity of sound in nitrogen were reported by Shilling and Partington (ref. 31) based on measurements with a Kundt's tube. Their results for sound velocity are shown in figure 6 as measured. Although the values reported deviate so far from the theoretical as to give heat-capacity values that are not satisfactory, the ratio of sound velocity in nitrogen to that in air is seen to be considerably more accurate.

Measurements on the velocity of sound in nitrogen in tubes by Dixon, Campbell, and Parker (ref. 32) gave values surprisingly near those of Shilling and Partington. The former authors also made a number of similar determinations on the velocity of sound in air. As in the case with the results of Shilling and Partington, values of sound velocity in nitrogen obtained indirectly by accepting their ratios of sound velocity for nitrogen versus air, together with the velocity in air, depart relatively little from table 9.

A determination of the third-law entropy of nitrogen was presented in 1933 by Giauque and Clayton (ref. 39) at the boiling point with good agreement with the statistically calculated value for the entropy. As the computation involved the use of their measured specific heats for the solid and the liquid together with latent heats of transition in the solid, fusion, and vaporization, the agreement can be taken as indicating a satisfactory condition for the data for this entire low-temperature region insofar as consistency is concerned.

In table 20 revisions in the boiling point and in the latent heat of vaporization are examined. The value used by Giauque and Clayton for the boiling point, 77.32° K, may be compared with that given by Friedman and White, 77.34° K (ref. 40), and with that given by Hoge and King for table 13, 77.395° K. Similarly, the value for the latent heat of vaporization, 1,332.9 cal/mole, was revised to 1,320 cal/mole by Friedman and White. An interpolation of newer data of Furukawa and McCoskey (ref. 41) indicates 1,336.6 cal/mole. At the boiling temperature credited to Hoge and King in table 20, an entropy of vaporization has been obtained from the data of Friedman and White on the basis of the observation that in this region the pressures given by Hoge and King are about 0.3 percent higher than those of Friedman and White.

Furukawa and McCoskey (ref. 41) have recently reported values for the heat of vaporization of liquid nitrogen and for the heat of sublimation of solid nitrogen. These values are of some interest in regard to PVT data, because it is possible in principle to obtain values of PV/RT for the vapor from such data if in addition sufficiently accurate vapor-pressure data are known. Their results for vaporization of the liquid are 5,899.0 j $mole^{-1}$ at 68° K, 5,735.2 j $mole^{-1}$ at 73.10° K, and 5,571.8 j $mole^{-1}$ at 78° K. For the sublimation of solid nitrogen their result is 6,775.0 j $mole^{-1}$ at 62° K. The comparison of their results with previous work is shown in figure 7.

The reduction of the heat-of-vaporization data involves a correction for the finite volume of the liquid. The same correction enters with reversed sign in using the Clapeyron equation to obtain the compressibility of the vapor, which is

$$PV/RT = \frac{QP}{m}\Big/ RT^2 \frac{dP}{dT}$$

These relationships provide a check of the consistency among the latent heats, vapor pressures, and data of state. It is possible by means of a slight change in the vapor-pressure values to bring them into close agreement with newer latent heats and data of state at low temperatures.

Measurements of the Joule-Thomson effect have been made by Roebuck and Osterberg (ref. 42) over the range 93° K to 573° K and up to 200 atmospheres. When the constant correction factor for pressure in their measurements is applied, the agreement with the present PVT correlation is quite good from the ice point upward, which is the region of most of the PVT data. The two sets of values differ considerably at lower temperatures, the reported experimental value being 50 percent greater than the theoretically calculated PVT value at the lowest temperature in the measurements.

The Joule-Thomson coefficient of cooling in an isenthalpic expansion has not been tabulated here. It can be readily obtained, however, from the relationship

$$\mu = \left(\frac{dT}{dP}\right)_H$$

$$= \frac{RT^2}{C_pP} \times \left(\frac{dZ}{dT}\right)_p$$

$$= \frac{RT}{C_p}\left(T\,\frac{dB_1}{dT} + TP\,\frac{dC_1}{dT} + TP^2\,\frac{dD_1}{dT}\right)$$

where C_p is the specific heat given in table 5 and the derivatives in the parentheses are given in table 15. Cooling in an isentropic expansion can be similarly computed from the tabulated values through the relationship

$$\frac{P}{T}\left(\frac{dT}{dP}\right)_S = \frac{R}{C_p}\left[Z + T\left(\frac{\partial Z}{\partial T}\right)_p\right]$$

CALCULATION OF TABLES

The thermodynamic quantities tabulated in this report were computed numerically from the coefficients of the equation of state. The following formulas were used:

$$\frac{S}{R} = \frac{S^o}{R} - \log_e P - \left(B_1 + B_1'\right)P - \frac{\left(C_1 + C_1'\right)P^2}{2} - \frac{\left(D_1 + D_1'\right)P^3}{3}$$

$$\frac{H - E_0^o}{RT_0} = \frac{H^o - E_0^o}{RT_0} - \frac{T}{T_0}\,B_1'P - \frac{T}{T_0}\,\frac{C_1'P^2}{2} - \frac{T}{T_0}\,\frac{D_1'P^3}{3}$$

$$\frac{C_p}{R} = \frac{C_p{}^o}{R} - \left(2B_1' + B_1''\right)P - \frac{\left(2C_1' + C_1''\right)P^2}{2} - \frac{\left(2D_1' + D_1''\right)P^3}{3}$$

$$\frac{C_p - C_v}{R} = \frac{\left[Z + T\left(\frac{\partial Z}{\partial T}\right)_p\right]^2}{Z - P\left(\frac{\partial Z}{\partial P}\right)_T}$$

$$= \frac{\left[1 + \left(B_1 + B_1'\right)P + \left(C_1 + C_1'\right)P^2 + \left(D_1 + D_1'\right)P^3\right]^2}{1 - C_1P^2 - 2D_1P^3}$$

The velocity of sound is given by

$$a = \sqrt{RT\alpha Z/M} = Z\sqrt{\frac{RT\gamma}{M\left[Z - P(\partial Z/\partial P)_T\right]}}$$

DISCUSSION AND RELIABILITY OF TABLES

The uncertainty of the tabulated density and compressibility and also of the various derived properties is discussed below. In general, the uncertainty is smallest in the region from about 0° C to 150° C where the most accurate experimental determinations were made. Since a semi-theoretical representation was closely fitted to the data in this region, the uncertainty here does not exceed 0.1 percent in PV/RT or about 10 percent of the difference between the real and ideal values of the compressibility. The uncertainty increases both at higher and lower temperatures. This is due in part to the limitations of the theory and of the fitting process and also to limitations in the ranges and reliability of the various experiments. The derived pressure corrections to thermodynamic properties are, in general, less accurate, because errors are increased in differentiation. The corresponding experimental determinations, such as Joule-Thomson coefficients, are frequently inaccurate, particularly at the lower temperatures. The knowledge of the properties of nitrogen can undoubtedly be improved by refinement of experimental techniques, extension of the experimental range, and by improvement of theory and the methods of correlation.

It is sometimes convenient to indicate the uncertainty of the ideal-gas values separately from that of the pressure corrections. Thus, under properties of the real gas the reader may find the statement to the effect that the uncertainty in the difference between the real and the ideal entropy for nitrogen may be as great as 10 percent at the highest pressures. An examination of the entries for the entropy of nitrogen at 1,000°, for example, shows the value for the ideal gas to be 27.4261 dimensionless units at 1 atmosphere (table 1), giving $27.4261 - \log_e (100\ \text{atm}/1\ \text{atm}) = 27.4261 - 4.6052 = 22.8209$ dimensionless units for the ideal gas at 100 atmospheres. The corresponding real-gas value at 100 atmospheres as tabulated is 22.8094 (table 7). The indicated uncertainty of 10 percent of the difference is thus 0.0012 (about 0.005 percent of the total entry).

Table 1.- The thermodynamic properties of undissociated molecular nitrogen in the ideal-gas state are given in dimensionless form in table 1. The values from 60° to 2,800° K are based largely on the calculations of Goff and Gratch (ref. 43) but are for the normal isotopic mixture. These values have been extended to the greater temperature range of the present table at the National Bureau of Standards, using the same fundamental spectroscopic data.

The uncertainty of the N_2 table up to 2,800° K has been indicated by Goff and Gratch (ref. 43). On the basis of that analysis, the functions C_p^o/R and S^o/R appear accurate to the next to the last place tabulated in the present table up to about 2,000° K, while at considerably higher temperatures their uncertainties may amount to several units in the next to the last digit included. It would be indicated similarly that the uncertainty in $\left(H^o - E_0^o\right)/RT_0$ may be as great as 0.0001 at 500° K, 0.001 at 1,000° K, and several times as great at the higher temperatures.

The free-energy values are considered to be very reliable, being uncertain by less than 1 unit in the third decimal place up to the highest temperatures.

Table 2.- The ideal-gas thermal functions for atomic nitrogen have been converted from those given in reference 44 and subtabulated in table 2. A slight upward shift of about 0.0001 in S^o/R has occurred in the lower temperature part of the table in the process of fitting closely the values at higher temperatures within the constant-specific-heat range.

The values in this table are considered to be very reliable, namely, to within 0.0001, as tabulated, except for the free energy which is reliable to 2 or 3 units in the last place.

Table 3.- The tabulated values of the compressibility factor $Z = PV/RT$ (table 3) are those which would exist if there were no

dissociation within the range covered. The values were computed from the virial equation

$$Z = 1 + B_1P + C_1P^2 + D_1P^3$$

The coefficients B_1 and C_1 were calculated from the Lennard-Jones potential using intermolecular force constants as parameters.

The parameter values for the second virial coefficients B_1 were obtained by a graphical method which permits the simultaneous fit of data on the Joule-Thomson coefficient and on the pressure dependence of PV/RT (refs. 16 through 19, 27, and 45 through 52), internal energy, specific heat, and velocity of sound. The experimental third virials C_1 were fitted using the second-virial-coefficient parameters only for a cluster of two and graphically determined values of the parameters for the cluster of three, since the equilibrium constant for the formation of a cluster of three is $K_3 = \left(2B_1{}^2 - C_1/2\right)/(RT)^2$. The modification of the usual Lennard-Jones treatment (ref. 2) was undertaken to provide a more applicable model for nitrogen than is afforded by the unmodified theory.

The tabulated values are reliable to approximately 1 unit in the next to the last tabulated place at temperatures below 300° K and within 2 or 3 units in the last place at higher temperatures. These tables are in essential agreement with a recent correlation of Hall and Ibele (ref. 27) and Michels, Lunbeck, and Wolkers (ref. 18).

The compressibility factor is dimensionless. Values of the gas constant R are listed in table 16 for frequently used units in order to facilitate the use of this table in calculating, by means of the equation $Z = PV/RT$, the pressure P, the specific volume V (or the density $1/V$), or the temperature T when any two of these are known. The values given are based on a molecular weight of 28.016.

Table 4.- The tabulated densities for molecular nitrogen (table 4) were computed from the equation

$$\rho/\rho_0 = \frac{T_0Z_0P}{P_0TZ}$$

from the compressibility factors given in table 3, and $T_0Z_0/P_0 = 273.037°$ K atm^{-1}. The values are derived from the values of compressibility in table 3 and have identical errors. On the basis of the estimated errors of table 3, this table has entries that may be in error by 5 in the next to the last place, but many entries are more precise. At low pressures and high temperatures the values are less reliable because of neglect of dissociation effects.

Table 5.- The specific-heat values (table 5) were obtained by combining the ideal-gas specific-heat values from table 1 with differences between real and ideal based on thermodynamic formulas and the virial coefficients in table 3. The effect of dissociation is not included in this table, but its magnitude may be estimated with the formulas discussed in reference 29.

The accuracy of the tabulated values varies with temperature and pressure. The error in $C_p - C_p^o$ may approach 5 percent in the range of moderate pressure but may approach 10 percent for the high-pressure entries. Comparisons with the experimental data are shown in figures 2 and 3.

Tables 6 and 7.- The enthalpy and entropy of nitrogen tabulated in tables 6 and 7 do not include the effect of dissociation. Its magnitude may be estimated and found to be small at moderate temperatures and pressures using formulas discussed and evaluated in reference 12. The exact magnitude in the case of nitrogen has been unknown because of the large uncertainty in the dissociation energy. The graphs shown in figures 8 and 9 show the effect of the dissociation on the basis of the now-accepted dissociation energy of about 9.764 electron volts. If other constituents containing nitrogen are present, the effects are more complicated, as is indicated in reference 12.

The accuracy of the tabulated values varies with temperature and pressure. If the small neglected effect of dissociation at the most elevated temperatures is disregarded, the uncertainty in the difference between real and ideal properties is thought to be somewhat less than 5 percent in the range of moderate pressure but may be as great as 10 percent at the highest pressure.

Table 8.- On the basis of the reliabilities estimated for specific heats and compressibilities, tables 5 and 3, the values of γ (table 8) are considered to be reliable to within 5 percent of their departures from values for the ideal gas at pressures below 40 atmospheres and possibly only to within 10 percent of this difference at the highest pressure of 100 atmospheres. Comparisons with direct and indirect experimental determinations of γ are shown in figures 4 and 5.

Table 9.- The sound velocities tabulated for nitrogen (table 9) are for equilibrium conditions as far as internal molecular energies, intermolecular energies, and kinetic energies are concerned and thus do not apply at very high frequencies. The effect of dissociation has not been included, so that the values are not strictly for zero frequency as would correspond to full equilibrium conditions at the highest temperatures.

The accuracy of the values tabulated varies with temperature and pressure. Numerically, the reliability is roughly that indicated for the values of γ in terms of departures from ideal-gas values. At 200° K the values are believed reliable within about 0.002 at 10 atmospheres, 0.01 at 40 atmospheres, 0.03 at 70 atmospheres, and 0.07 at 100 atmospheres. At 400° K these limits might be reduced by factors between 5 and 10. At higher temperatures, the values for 100 atmospheres are probably within 0.005.

The effect of dissociation is probably quite small except for the low pressures at the highest temperatures covered. Below the very high temperatures at which dissociation is appreciable, the table is more precise with increasing temperatures, because the gas becomes more ideal. Figure 6 shows the departures of experimental values for the velocity of sound from the indications of this table.

Table 10.- The viscosity at low pressure (table 10) was calculated using the Lennard-Jones potential, as applied by Hirschfelder, Bird, and Spotz (ref. 53). In this case the potential energy of interaction between the two molecules at a separation r is given by

$$U(r) = 4\epsilon\left[\left(\frac{r_0}{r}\right)^{12} - \left(\frac{r_0}{r}\right)^{6}\right]$$

where ϵ is the maximum energy of attraction and r_o is the distance at which the attractive and repulsive energies are equal. The coefficient of viscosity for a single gas is given by

$$\eta \times 10^7 = \frac{266.93V_f}{r_o^2W^{(2)}(2)}\sqrt{MT}$$

where M is the molecular weight, T is the Kelvin temperature, and V_f and $W^{(2)}(2)$ are functions of kT/ϵ tabulated by Hirschfelder, Bird, and Spotz (ref. 53) from solutions of the collision integrals. The tables were calculated by Hilsenrath and Touloukian (ref. 4) using the parameters $\epsilon/k = 91.46^\circ$ K and $r_o = 3.681$ A, chosen to fit the more accurate viscosity data in the lower temperature region. They also computed the viscosity at elevated pressure on the basis of the Enskog equation

$$\eta/\eta' = 1 + 0.175b\rho + 0.8651b^2\rho^2$$

where η' is the low-pressure viscosity at T° K in poises; ρ is the density in grams per cubic centimeter; and b, the viscosity covolume in cubic centimeters per gram, is

$$b = 1.783\left(10^{-7}\right)M^{-1/4}\left(\sqrt{T}/\eta'\right)^{3/2}$$

The viscosity of nitrogen at very low pressures has recently been measured by Johnston, Mattox, and Powers (ref. 54). Their report lists viscosities of nitrogen at 306° and 273° K at pressures from 500 to 0.00017 millimeter of mercury and at 194° K and 79° K at pressures down to 0.353 millimeter of mercury. Their values extrapolated to atmospheric pressure show a mean deviation of 0.17 percent from data obtained earlier by Johnston and McCloskey (ref. 55).

The values of viscosity are reliable within 5 percent. A graphical comparison of the tabulated values with the experimental results is shown in figures 10 and 11. The decided trend (see fig. 10) of the low-pressure experimental data at high temperature would suggest that a modification of the force constants ϵ/k and r_o is in order. If the constants are chosen as 3.8 A and 80° K, respectively, the deviations for the low-pressure data can be reduced to within 2 percent. While this choice improves the fit at the higher temperatures, it introduces larger departures in the lower region where the experimental data are probably more precise. Numerical adjustments may be made to the tables on the basis of the deviations shown in figure 10 which would bring the values within a few tenths percent of the experimental data (refs. 56 to 67).

The departures of the high-pressure viscosity data of Boyd (ref. 68), Michels and Gibson (ref. 69), and Sibbitt, Hawkins, and Solberg (ref. 70) from the tabulated values are shown in figure 11. The recent data of Kestin and Pilarczyk (ref. 71) at room temperature are in agreement with the correlation within 0.2 percent up to 40 atmospheres. Above this pressure the departures increase gradually to 1 percent at 70 atmospheres.

Table 11.- The tabulated values (table 11) of thermal conductivity up to 300° K were obtained through the equation given by Keyes (ref. 72),

$$k = \frac{0.604\sqrt{T}}{1 + \frac{224}{T} \times 10^{-12/T}} \times 10^{-5}\ \mathrm{cal\ cm^{-1}\ sec^{-1}\ {}^{\circ}K^{-1}}$$

where T is the Kelvin temperature.

Above 300° K the values were obtained by the relation given by Stops (ref. 73),

$$k = k_0\left(1 + 3.13 \times 10^{-3}t - 1.33 \times 10^{-6}t^2 + 2.63 \times 10^{-10}t^3\right)$$

where t is the Celsius temperature. The two equations, both empirical relations, yield values of the thermal conductivity which are in very close agreement between 300° and 700° K. Stops' data cover the range from 0° C to 1,000° C, while Keyes' data extend from -200° C to 400° C. The overlap region is represented satisfactorily by both equations. The value k_0, the thermal conductivity at 0° C, was taken as 5.77×10^{-5} cal cm^{-1} sec^{-1} °K^{-1} according to Stops' representation. While the Keyes relation yields 5.73×10^{-5} cal cm^{-1} sec^{-1} °K^{-1} for k_0, this discrepancy is not serious since the estimated accuracy of the tabulated k/k_0 is of the order of 5 percent.

Table 12.- The Prandtl number $N_{Pr} = \eta C_p/k$ and some of its fractional powers are listed for molecular nitrogen at 1 atmosphere in table 12. The table was computed from values of specific heat C_p/R, viscosity η, and thermal conductivity k/k_0 given, respectively, in tables 5, 10, and 11.

The uncertainty in this table results from the uncertainties of the values of thermal conductivity and viscosity. Above 600° K the values of viscosity in table 10 may be somewhat too high (see fig. 10), which may account for the sharp rise of the Prandtl number at high temperatures. Below this temperature the tabulated Prandtl numbers should be reliable to about 5 percent. The uncertainties in the fractional powers are correspondingly lower. Other fractional powers may be computed with the aid of figure 12.

Table 13.- The vapor pressures (table 13) were computed by Dr. H. J. Hoge and Mr. G. J. King. The tables are based on an analysis of the data in references 74 to 76, 39, and 77 to 85, which are listed here roughly in the order of the weight given to the data taken from them. The accepted vapor-pressure - temperature relation for solid nitrogen is given by the equation for which constants are given in table 13(c), while that for liquid nitrogen is given by table 13(a). Deviations of the experimental data from the accepted relations are shown in figure 13. A substantial improvement in consistency was effected by adjusting the temperatures of some of the reported data. A recent study (ref. 85) showed differences in reported vapor pressures of oxygen that were attributed to differences in temperature scales. Many laboratories have published data on both oxygen and nitrogen, and for references 39, 74, 76, 81,

and 82 the nitrogen temperatures were adjusted by amounts that, if similarly applied to the oxygen data, would have brought the oxygen data into agreement with those reported in reference 85, which are on the NBS provisional temperature scale below 90° K and on the International Temperature Scale above that point. In other cases there was inadequate information to warrant an adjustment. Where an adjustment was made, figure 13 shows the adjusted rather than the unadjusted values.

Table 13(b) gives P at temperature intervals of 2° K (3.6° R) from 52° to 126° K. This table is for ready reference when values at these particular temperatures are adequate. When accurate values at other temperatures are required, they should be found from the equation, if for the solid, and from table 13(a), if for the liquid. Table 13(a) gives $\log_{10} P$ at uniform intervals of $1/T$, the argument being $40/T$ at first, then changing to $100/T$ at higher pressures to give a closer spacing of entries. Values of T are also given, but these are only for convenience in locating the part of the table to be used. Interpolations must be made in terms of $40/T$ or $100/T$ ($72/T$ or $180/T$ on the Rankine scale) rather than in terms of T for greatest convenience and accuracy. When this is done, linear interpolation will introduce no significant error except possibly in the 5° immediately below the critical point.

The accuracy of the equation and the tables may be estimated from figure 13. The spread of the data is somewhat less than ±0.10° below 90° K and approximately ±0.15° at higher temperatures. These temperature spreads correspond to pressure spreads of ±0.2 millimeter of mercury at 53° K, ±1 millimeter of mercury at 60° K, ±7 millimeters of mercury at 75° K, ±60 millimeters of mercury at 100° K, and ±175 millimeters of mercury near the critical point. The probable error of the accepted values is perhaps half of the spreads just quoted. The equation for the solid may be used for order-of-magnitude calculations below the range of the experimental data but not below the transition at 35.6° K.

Tables 14 and 15.- Tables 14 and 15 give the virial coefficients and their first derivatives on which the thermodynamic properties are based. The conversion factors given in tables 17 and 18(a) to 18(j) were taken from NBS Circular 461 (ref. 86). The conversion factors for viscosity (table 18(k)) were taken from reference 87.

National Bureau of Standards,
Washington, D. C., January 3, 1955.

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TABLE 1.- SPECIFIC HEAT, ENTHALPY, ENTROPY, AND FREE ENERGY OF MOLECULAR NITROGEN IN IDEAL-GAS STATE

°K	$\frac{C_p^o}{R}$		$\frac{H^o - E_0^o}{RT_0}$		$\frac{S^o}{R}$		$\frac{-(F^o - E_0^o)}{RT}$		°R
10	3.5019	- 13	.1246	1281	11.1440	24267	7.740	2379	18
20	3.5006	- 2	.2527	1282	13.5707	14196	10.119	1403	36
30	3.5004	- 1	.3809	1281	14.9903	10067	11.522	999	54
40	3.5003		.5090	1282	15.9970	7811	12.521	776	72
50	3.5003		.6372	1281	16.7781	6382	13.297	635	90
60	3.5003		.7653	1281	17.4163	5396	13.932	538	108
70	3.5003	1	.8934	1282	17.9559	4674	14.470	465	126
80	3.5004		1.0216	1281	18.4233	4122	14.935	411	144
90	3.5004		1.1497	1282	18.8355	3688	15.346	368	162
100	3.5004	1	1.2779	1281	19.2043	3337	15.714	333	180
110	3.5005		1.4060	1282	19.5380	3046	16.047	303	198
120	3.5005		1.5342	1281	19.8426	2801	16.350	280	216
130	3.5005	1	1.6623	1282	20.1227	2595	16.630	259	234
140	3.5006		1.7905	1281	20.3822	2415	16.889	241	252
150	3.5006	1	1.9186	1282	20.6237	2259	17.130	225	270
160	3.5007		2.0468	1281	20.8496	2123	17.355	212	288
170	3.5007		2.1749	1282	21.0619	2000	17.567	200	306
180	3.5007	1	2.3031	1281	21.2619	1893	17.767	189	324
190	3.5008		2.4312	1282	21.4512	1796	17.956	179	342
200	3.5008	1	2.5594	1282	21.6308	1708	18.135	171	360
210	3.5009	1	2.6876	1281	21.8016	1629	18.306	162	378
220	3.5010		2.8157	1282	21.9645	1556	18.468	156	396
230	3.5010	2	2.9439	1282	22.1201	1490	18.624	149	414
240	3.5012	1	3.0721	1281	22.2691	1429	18.773	142	432
250	3.5013	2	3.2002	1282	22.4120	1373	18.915	137	450
260	3.5015	2	3.3284	1282	22.5493	1322	19.052	132	468
270	3.5017	4	3.4566	1282	22.6815	1273	19.184	128	486
280	3.5021	4	3.5848	1282	22.8088	1229	19.312	122	504
290	3.5025	5	3.7130	1282	22.9317	1188	19.434	119	522
300	3.5030	6	3.8412	1283	23.0505	1149	19.553	115	540
310	3.5036	8	3.9695	1283	23.1654	1112	19.668	111	558
320	3.5044	10	4.0978	1283	23.2766	1079	19.779	107	576
330	3.5054	11	4.2261	1283	23.3845	1046	19.886	105	594
340	3.5065	13	4.3544	1284	23.4891	1017	19.991	101	612
350	3.5078	16	4.4828	1285	23.5908	988	20.092	99	630
360	3.5094	17	4.6113	1285	23.6896	962	20.191	96	648
370	3.5111	20	4.7398	1285	23.7858	937	20.287	93	666
380	3.5131	23	4.8683	1287	23.8795	912	20.380	91	684
390	3.5154	25	4.9970	1287	23.9707	891	20.471	89	702
400	3.5179	27	5.1257	1289	24.0598	869	20.560	86	720
410	3.5206	31	5.2546	1289	24.1467	849	20.646	84	738
420	3.5237	33	5.3835	1291	24.2316	829	20.730	83	756
430	3.5270	36	5.5126	1291	24.3145	811	20.813	80	774
440	3.5306	38	5.6417	1294	24.3956	794	20.893	79	792
450	3.5344	42	5.7711	1294	24.4750	777	20.972	77	810
460	3.5386	44	5.9005	1296	24.5527	762	21.049	75	828
470	3.5430	46	6.0301	1298	24.6289	746	21.124	74	846
480	3.5476	50	6.1599	1300	24.7035	732	21.198	72	864
490	3.5526	52	6.2899	1301	24.7767	719	21.270	71	882
500	3.5578	54	6.4200	1304	24.8486	705	21.341	70	900
510	3.5632	56	6.5504	1305	24.9191	692	21.411	68	918
520	3.5688	59	6.6809	1308	24.9883	680	21.479	67	936
530	3.5747	61	6.8117	1310	25.0563	669	21.546	65	954
540	3.5808	63	6.9427	1312	25.1232	658	21.611	65	972
550	3.5871	65	7.0739	1314	25.1890	647	21.676	63	990
560	3.5936	67	7.2053	1317	25.2537	636	21.739	62	1008
570	3.6003	69	7.3370	1319	25.3173	627	21.801	61	1026
580	3.6072	70	7.4689	1322	25.3800	617	21.862	61	1044
590	3.6142	72	7.6011	1324	25.4417	608	21.923	59	1062
600	3.6214		7.7335		25.5025		21.982		1080

TABLE 1.- SPECIFIC HEAT, ENTHALPY, ENTROPY, AND FREE ENERGY

OF MOLECULAR NITROGEN IN IDEAL-GAS STATE - Continued

°K	$\frac{C_p^\circ}{R}$		$\frac{H^\circ - E_0^\circ}{RT_0}$		$\frac{S^\circ}{R}$		$\frac{-(F^\circ - E_0^\circ)}{RT}$		°R
600	3.6214	73	7.7335	1327	25.5025	600	21.982	58	1080
610	3.6287	75	7.8662	1330	25.5625	590	22.040	57	1098
620	3.6362	75	7.9992	1333	25.6215	583	22.097	57	1116
630	3.6437	77	8.1325	1335	25.6798	574	22.154	55	1134
640	3.6514	77	8.2660	1338	25.7372	567	22.209	55	1152
650	3.6591	79	8.3998	1341	25.7939	559	22.264	54	1170
660	3.6670	79	8.5339	1344	25.8498	552	22.318	53	1188
670	3.6749	80	8.6683	1347	25.9050	545	22.371	52	1206
680	3.6829	80	8.8030	1349	25.9595	538	22.423	52	1224
690	3.6909	81	8.9379	1353	26.0133	532	22.475	51	1242
700	3.6990	81	9.0732	1356	26.0665	525	22.526	50	1260
710	3.7071	81	9.2088	1358	26.1190	519	22.576	50	1278
720	3.7152	82	9.3446	1362	26.1709	513	22.626	49	1296
730	3.7234	82	9.4808	1364	26.2222	507	22.675	48	1314
740	3.7316	82	9.6172	1368	26.2729	502	22.723	48	1332
750	3.7398	82	9.7540	1370	26.3231	496	22.771	47	1350
760	3.7480	82	9.8910	1374	26.3727	490	22.818	46	1368
770	3.7562	81	10.0284	1376	26.4217	485	22.864	46	1386
780	3.7643	82	10.1660	1380	26.4702	481	22.910	46	1404
790	3.7725	81	10.3040	1383	26.5183	475	22.956	44	1422
800	3.7806	401	10.4423	6957	26.5658	2304	23.000	217	1440
850	3.8207	389	11.1380	7029	26.7962	2194	23.217	205	1530
900	3.8596	374	11.8409	7099	27.0156	2097	23.422	195	1620
950	3.8970	356	12.5508	7166	27.2253	2008	23.617	185	1710
1000	3.9326	338	13.2674	7230	27.4261	1927	23.802	177	1800
1050	3.9664	318	13.9904	7289	27.6188	1852	23.979	170	1890
1100	3.9982	299	14.7193	7346	27.8040	1784	24.149	163	1980
1150	4.0281	281	15.4539	7400	27.9824	1720	24.312	156	2070
1200	4.0562	263	16.1939	7449	28.1544	1662	24.468	151	2160
1250	4.0825	247	16.9388	7495	28.3206	1606	24.619	146	2250
1300	4.1072	231	17.6883	7539	28.4812	1554	24.765	140	2340
1350	4.1303	215	18.4422	7580	28.6366	1506	24.905	136	2430
1400	4.1518	202	19.2002	7619	28.7872	1461	25.041	132	2520
1450	4.1720	189	19.9621	7654	28.9333	1418	25.173	128	2610
1500	4.1909	177	20.7275	7688	29.0751	1377	25.301	124	2700
1550	4.2086	166	21.4963	7719	29.2128	1339	25.425	120	2790
1600	4.2252	156	22.2682	7748	29.3467	1302	25.545	117	2880
1650	4.2408	146	23.0430	7776	29.4769	1268	25.662	114	2970
1700	4.2554	138	23.8206	7802	29.6037	1236	25.776	111	3060
1750	4.2692	129	24.6008	7826	29.7273	1204	25.887	109	3150
1800	4.2821	122	25.3834	7850	29.8477	1175	25.996	105	3240
1850	4.2943	114	26.1684	7870	29.9652	1147	26.101	104	3330
1900	4.3057	109	26.9554	7892	30.0799	1120	26.205	100	3420
1950	4.3166	102	27.7446	7910	30.1919	1094	26.305	99	3510
2000	4.3268	97	28.5356	7929	30.3013	1070	26.404	96	3600
2050	4.3365	92	29.3285	7947	30.4083	1046	26.500	95	3690
2100	4.3457	87	30.1232	7962	30.5129	1023	26.595	92	3780
2150	4.3544	83	30.9194	7978	30.6152	1002	26.687	90	3870
2200	4.3627	78	31.7172	7993	30.7154	981	26.777	89	3960
2250	4.3705	75	32.5165	8007	30.8135	962	26.866	87	4050
2300	4.3780	72	33.3172	8020	30.9097	942	26.953	85	4140
2350	4.3852	68	34.1192	8033	31.0039	924	27.038	84	4230
2400	4.3920	65	34.9225	8045	31.0963	906	27.122	82	4320
2450	4.3985	62	35.7270	8057	31.1869	890	27.204	80	4410
2500	4.4047	59	36.5327	8068	31.2759	872	27.284	79	4500
2550	4.4106	57	37.3395	8078	31.3631	857	27.363	78	4590
2600	4.4163	55	38.1473	8089	31.4488	842	27.441	76	4680
2650	4.4218	52	38.9562	8099	31.5330	827	27.517	76	4770
2700	4.4270	50	39.7661	8108	31.6157	813	27.593	74	4860
2750	4.4320	49	40.5769	8117	31.6970	799	27.667	72	4950
2800	4.4369		41.3886		31.7769		27.739		5040

TABLE 1.- SPECIFIC HEAT, ENTHALPY, ENTROPY, AND FREE ENERGY

OF MOLECULAR NITROGEN IN IDEAL-GAS STATE - Concluded

$^{\circ}K$	$\frac{C_p^{\circ}}{R}$		$\frac{H^{\circ} - E_0^{\circ}}{RT_0}$		$\frac{S^{\circ}}{R}$		$\frac{-(F^{\circ} - E_0^{\circ})}{RT}$		$^{\circ}R$
2800	4.4369	46	41.3886	8125	31.7769	785	27.739	72	5040
2850	4.4415	45	42.2011	8134	31.8554	773	27.811	70	5130
2900	4.4460	43	43.0145	8142	31.9327	761	27.881	69	5220
2950	4.4503	42	43.8287	8150	32.0088	748	27.950	69	5310
3000	4.4545	40	44.6437	8158	32.0836	737	28.019	67	5400
3050	4.4585	39	45.4595	8164	32.1573	725	28.086	66	5490
3100	4.4624	39	46.2759	8172	32.2298	715	28.152	66	5580
3150	4.4663	36	47.0931	8178	32.3013	703	28.218	64	5670
3200	4.4699	36	47.9109	8186	32.3716	693	28.282	63	5760
3250	4.4735	35	48.7295	8191	32.4409	684	28.345	63	5850
3300	4.4770	34	49.5486	8198	32.5093	673	28.408	62	5940
3350	4.4804	32	50.3684	8204	32.5766	664	28.470	60	6030
3400	4.4836	32	51.1888	8210	32.6430	655	28.530	61	6120
3450	4.4868	32	52.0098	8216	32.7085	646	28.591	59	6210
3500	4.4900	30	52.8314	8221	32.7731	637	28.650	58	6300
3550	4.4930	30	53.6535	8227	32.8368	628	28.708	58	6390
3600	4.4960	28	54.4762	8232	32.8996	621	28.766	57	6480
3650	4.4988	28	55.2994	8238	32.9617	612	28.823	57	6570
3700	4.5016	28	56.1232	8242	33.0229	605	28.880	55	6660
3750	4.5044	27	56.9474	8248	33.0834	597	28.935	55	6750
3800	4.5071	26	57.7722	8252	33.1431	589	28.990	55	6840
3850	4.5097	26	58.5974	8257	33.2020	582	29.045	53	6930
3900	4.5123	25	59.4231	8262	33.2602	575	29.098	53	7020
3950	4.5148	25	60.2493	8266	33.3177	568	29.151	53	7110
4000	4.5173	24	61.0759	8271	33.3745	561	29.204	52	7200
4050	4.5197	24	61.9030	8276	33.4306	555	29.256	51	7290
4100	4.5221	24	62.7306	8279	33.4861	548	29.307	50	7380
4150	4.5245	23	63.5585	8283	33.5409	542	29.357	51	7470
4200	4.5268	22	64.3868	8288	33.5951	536	29.408	49	7560
4250	4.5290	22	65.2156	8292	33.6487	530	29.457	49	7650
4300	4.5312	22	66.0448	8297	33.7017	524	29.506	49	7740
4350	4.5334	22	66.8745	8300	33.7541	518	29.555	48	7830
4400	4.5356	21	67.7045	8304	33.8059	513	29.603	47	7920
4450	4.5377	21	68.5349	8308	33.8572	507	29.650	47	8010
4500	4.5398	21	69.3657	8311	33.9079	502	29.697	47	8100
4550	4.5419	21	70.1968	8316	33.9581	496	29.744	46	8190
4600	4.5440	20	71.0284	8319	34.0077	492	29.790	46	8280
4650	4.5460	20	71.8603	8324	34.0569	486	29.836	45	8370
4700	4.5480	20	72.6927	8326	34.1055	481	29.881	44	8460
4750	4.5500	20	73.5253	8330	34.1536	477	29.925	45	8550
4800	4.5520	20	74.3583	8334	34.2013	471	29.970	44	8640
4850	4.5540	19	75.1917	8338	34.2484	468	30.014	43	8730
4900	4.5559	20	76.0255	8342	34.2952	463	30.057	43	8820
4950	4.5579	19	76.8597	8344	34.3415	458	30.100	43	8910
5000	4.5598		77.6941		34.3873		30.143		9000

TABLE 2.- SPECIFIC HEAT, ENTHALPY, ENTROPY, AND FREE ENERGY

OF ATOMIC NITROGEN IN IDEAL-GAS STATE

$^{\circ}K$	$\frac{C_p^{\circ}}{R}$	$\frac{H^{\circ} - E_0^{\circ}}{RT_0}$		$\frac{S^{\circ}}{R}$		$\frac{-(F^{\circ} - E_0^{\circ})}{RT}$		$^{\circ}R$
10	2.5000	.0915	915	9.9377	17328	7.4377	17328	18
20		.1830	916	11.6705	10137	9.1705	10137	36
30		.2746	915	12.6842	7192	10.1842	7192	54
40		.3661	915	13.4034	5579	10.9034	5579	72
50		.4576	915	13.9613	4558	11.4613	4558	90
60		.5491	916	14.4171	3853	11.9171	3853	108
70		.6407	915	14.8024	3339	12.3024	3339	126
80		.7322	915	15.1363	2944	12.6363	2944	144
90		.8237	915	15.4307	2634	12.9307	2634	162
100		.9152	915	15.6941	2383	13.1941	2383	180
110		1.0067	916	15.9324	2175	13.4324	2175	198
120		1.0983	915	16.1499	2001	13.6499	2001	216
130		1.1898	915	16.3500	1853	13.8500	1853	234
140		1.2813	915	16.5353	1725	14.0353	1725	252
150		1.3728	915	16.7078	1613	14.2078	1613	270
160		1.4643	916	16.8691	1516	14.3691	1516	288
170		1.5559	915	17.0207	1429	14.5207	1429	306
180		1.6474	915	17.1636	1352	14.6636	1352	324
190		1.7389	915	17.2988	1282	14.7988	1282	342
200		1.8304	916	17.4270	1220	14.9270	1220	360
210		1.9220	915	17.5490	1163	15.0490	1163	378
220		2.0135	915	17.6653	1111	15.1653	1111	396
230		2.1050	915	17.7764	1064	15.2764	1064	414
240		2.1965	915	17.8828	1020	15.3828	1020	432
250		2.2880	916	17.9848	981	15.4848	981	450
260		2.3796	915	18.0829	944	15.5829	944	468
270		2.4711	915	18.1773	909	15.6773	909	486
280		2.5626	915	18.2682	877	15.7682	877	504
290		2.6541	915	18.3559	848	15.8559	848	522
300		2.7456	916	18.4407	819	15.9407	819	540
310		2.8372	915	18.5226	794	16.0226	794	558
320		2.9287	915	18.6020	769	16.1020	769	576
330		3.0202	915	18.6789	747	16.1789	747	594
340		3.1117	916	18.7536	724	16.2536	724	612
350		3.2033	915	18.8260	705	16.3260	705	630
360		3.2948	915	18.8965	685	16.3965	685	648
370		3.3863	915	18.9650	666	16.4650	666	666
380		3.4778	915	19.0316	650	16.5316	650	684
390		3.5693	916	19.0966	633	16.5966	633	702
400		3.6609	915	19.1599	617	16.6599	617	720
410		3.7524	915	19.2216	602	16.7216	602	738
420		3.8439	915	19.2818	589	16.7818	589	756
430		3.9354	915	19.3407	574	16.8407	574	774
440		4.0269	916	19.3981	562	16.8981	562	792
450		4.1185	915	19.4543	550	16.9543	550	810
460		4.2100	915	19.5093	537	17.0093	537	828
470		4.3015	915	19.5630	527	17.0630	527	846
480		4.3930	916	19.6157	515	17.1157	515	864
490		4.4846	915	19.6672	505	17.1672	505	882
500		4.5761	915	19.7177	495	17.2177	495	900
510		4.6676	915	19.7672	486	17.2672	486	918
520		4.7591	915	19.8158	476	17.3158	476	936
530		4.8506	916	19.8634	467	17.3634	467	954
540		4.9422	915	19.9101	459	17.4101	459	972
550		5.0337	915	19.9560	450	17.4560	450	990
560		5.1252	915	20.0010	443	17.5010	443	1008
570		5.2167	915	20.0453	435	17.5453	435	1026
580		5.3082	916	20.0888	427	17.5888	427	1044
590		5.3998	915	20.1315	420	17.6315	420	1062
600		5.4913		20.1735		17.6735		1080

TABLE 2.- SPECIFIC HEAT, ENTHALPY, ENTROPY, AND FREE ENERGY

OF ATOMIC NITROGEN IN IDEAL-GAS STATE - Continued

$^{\circ}K$	$\frac{C_p^{\circ}}{R}$		$\frac{H^{\circ} - E_0^{\circ}}{RT_0}$		$\frac{S^{\circ}}{R}$		$\frac{-(F^{\circ} - E_0^{\circ})}{RT}$		$^{\circ}R$
600	2.5000		5.4913	915	20.1735	413	17.6735	413	1080
610			5.5828	915	20.2148	407	17.7148	407	1098
620			5.6743	916	20.2555	400	17.7555	400	1116
630			5.7659	915	20.2955	394	17.7955	394	1134
640			5.8574	915	20.3349	387	17.8349	387	1152
650			5.9489	915	20.3736	382	17.8736	382	1170
660			6.0404	915	20.4118	376	17.9118	376	1188
670			6.1319	916	20.4494	370	17.9494	370	1206
680			6.2235	915	20.4864	365	17.9864	365	1224
690			6.3150	915	20.5229	360	18.0229	360	1242
700			6.4065	915	20.5589	355	18.0589	355	1260
710			6.4980	915	20.5944	349	18.0944	349	1278
720			6.5895	916	20.6293	345	18.1293	345	1296
730			6.6811	915	20.6638	340	18.1638	340	1314
740			6.7726	915	20.6978	336	18.1978	336	1332
750			6.8641	915	20.7314	331	18.2314	331	1350
760			6.9556	916	20.7645	327	18.2645	327	1368
770			7.0472	915	20.7972	322	18.2972	322	1386
780			7.1387	915	20.8294	319	18.3294	319	1404
790			7.2302	915	20.8613	314	18.3613	314	1422
800			7.3217	4576	20.8927	1516	18.3927	1516	1440
850			7.7793	4576	21.0443	1429	18.5443	1429	1530
900			8.2369	4576	21.1872	1352	18.6872	1352	1620
950			8.6945	4576	21.3224	1282	18.8224	1282	1710
1000			9.1521	4577	21.4506	1220	18.9506	1220	1800
1050			9.6098	4576	21.5726	1163	19.0726	1163	1890
1100			10.0674	4576	21.6889	1111	19.1889	1111	1980
1150			10.5250	4576	21.8000	1064	19.3000	1064	2070
1200			10.9826	4576	21.9064	1020	19.4064	1020	2160
1250			11.4402	4576	22.0084	981	19.5084	981	2250
1300			11.8978	4576	22.1065	943	19.6065	943	2340
1350			12.3554	4576	22.2008	910	19.7008	910	2430
1400			12.8130	4576	22.2918	877	19.7918	877	2520
1450			13.2706	4575	22.3795	847	19.8795	847	2610
1500			13.7281	4577	22.4642	820	19.9642	820	2700
1550	2.5000		14.1858	4577	22.5462	795	20.0462	795	2790
1600	2.5000		14.6435	4576	22.6257	769	20.1257	769	2880
1650	2.5000	1	15.1011	4576	22.7026	746	20.2026	746	2970
1700	2.5001		15.5587	4576	22.7772	725	20.2772	725	3060
1750	2.5001	1	16.0163	4576	22.8497	705	20.3497	704	3150
1800	2.5002		16.4739	4576	22.9202	685	20.4201	685	3240
1850	2.5002	1	16.9315	4577	22.9887	666	20.4886	667	3330
1900	2.5003	1	17.3892	4577	23.0553	650	20.5553	649	3420
1950	2.5004	1	17.8469	4578	23.1203	633	20.6202	633	3510
2000	2.5005	2	18.3047	4577	23.1836	618	20.6835	617	3600
2050	2.5007	2	18.7624	4576	23.2454	602	20.7452	603	3690
2100	2.5009	2	19.2200	4577	23.3056	588	20.8055	588	3780
2150	2.5011	3	19.6777	4579	23.3644	575	20.8643	575	3870
2200	2.5014	4	20.1356	4580	23.4219	563	20.9218	562	3960
2250	2.5018	4	20.5936	4581	23.4782	550	20.9780	550	4050
2300	2.5022	5	21.0517	4580	23.5332	538	21.0330	537	4140
2350	2.5027	6	21.5097	4581	23.5870	527	21.0867	526	4230
2400	2.5033	7	21.9678	4583	23.6397	516	21.1393	516	4320
2450	2.5040	9	22.4261	4586	23.6913	506	21.1909	507	4410
2500	2.5049	9	22.8847	4586	23.7419	496	21.2416	495	4500
2550	2.5058	11	23.3433	4588	23.7915	487	21.2911	486	4590
2600	2.5069	13	23.8021	4590	23.8402	477	21.3397	476	4680
2650	2.5082	13	24.2611	4592	23.8879	469	21.3873	467	4770
2700	2.5095	16	24.7203	4595	23.9348	461	21.4340	459	4860
2750	2.5111	17	25.1798	4597	23.9809	453	21.4799	450	4950
2800	2.5128		25.6395		24.0262		21.5249		5040

TABLE 2.- SPECIFIC HEAT, ENTHALPY, ENTROPY, AND FREE ENERGY

OF ATOMIC NITROGEN IN IDEAL-GAS STATE - Concluded

°K	$\frac{C_p^\circ}{R}$		$\frac{H^\circ - E_0^\circ}{RT_0}$		$\frac{S^\circ}{R}$		$\frac{-(F^\circ - E_0^\circ)}{RT}$		°R
2800	2.5128	19	25.6395	4601	24.0262	445	21.5249	443	5040
2850	2.5147	21	26.0996	4604	24.0707	437	21.5692	435	5130
2900	2.5168	23	26.5600	4608	24.1144	430	21.6127	428	5220
2950	2.5191	25	27.0208	4612	24.1574	424	21.6555	420	5310
3000	2.5216	27	27.4820	4618	24.1998	417	21.6975	413	5400
3050	2.5243	29	27.9438	4623	24.2415	411	21.7388	407	5490
3100	2.5272	32	28.4061	4629	24.2826	404	21.7795	400	5580
3150	2.5304	35	28.8690	4635	24.3230	399	21.8195	395	5670
3200	2.5339	37	29.3325	4642	24.3629	393	21.8590	388	5760
3250	2.5376	39	29.7967	4649	24.4022	388	21.8978	383	5850
3300	2.5415	41	30.2616	4656	24.4410	382	21.9361	378	5940
3350	2.5456	45	30.7272	4663	24.4792	378	21.9739	372	6030
3400	2.5501	47	31.1935	4672	24.5170	372	22.0111	367	6120
3450	2.5548	49	31.6607	4681	24.5542	368	22.0478	362	6210
3500	2.5597	52	32.1288	4689	24.5910	363	22.0840	356	6300
3550	2.5649	55	32.5977	4700	24.6273	359	22.1196	350	6390
3600	2.5704	57	33.0677	4709	24.6632	355	22.1546	346	6480
3650	2.5761	60	33.5386	4720	24.6987	351	22.1892	340	6570
3700	2.5821	63	34.0106	4731	24.7338	347	22.2232	336	6660
3750	2.5884	66	34.4837	4744	24.7685	343	22.2568	332	6750
3800	2.5950	68	34.9581	4757	24.8028	340	22.2900	328	6840
3850	2.6018	71	35.4338	4770	24.8368	336	22.3228	324	6930
3900	2.6089	74	35.9108	4784	24.8704	333	22.3552	320	7020
3950	2.6163	77	36.3892	4797	24.9037	330	22.3872	317	7110
4000	2.6240	79	36.8689	4811	24.9367	326	22.4189	313	7200
4050	2.6319	81	37.3500	4824	24.9693	324	22.4502	309	7290
4100	2.6400	84	37.8324	4840	25.0017	320	22.4811	305	7380
4150	2.6484	86	38.3164	4855	25.0337	318	22.5116	302	7470
4200	2.6570	89	38.8019	4871	25.0655	315	22.5418	299	7560
4250	2.6659	91	39.2890	4888	25.0970	312	22.5717	296	7650
4300	2.6750	94	39.7778	4904	25.1282	310	22.6013	292	7740
4350	2.6844	96	40.2682	4922	25.1592	307	22.6305	289	7830
4400	2.6940	97	40.7604	4940	25.1899	305	22.6594	287	7920
4450	2.7037	100	41.2544	4958	25.2204	303	22.6881	283	8010
4500	2.7137	102	41.7502	4977	25.2507	300	22.7164	280	8100
4550	2.7239	104	42.2479	4996	25.2807	299	22.7444	278	8190
4600	2.7343	106	42.7475	5015	25.3106	296	22.7722	274	8280
4650	2.7449	107	43.2490	5034	25.3402	294	22.7996	272	8370
4700	2.7556	110	43.7524	5055	25.3696	292	22.8268	269	8460
4750	2.7666	111	44.2579	5075	25.3988	290	22.8537	267	8550
4800	2.7777	112	44.7654	5094	25.4278	289	22.8804	264	8640
4850	2.7889	114	45.2748	5116	25.4567	287	22.9068	261	8730
4900	2.8003	116	45.7864	5136	25.4854	285	22.9329	260	8820
4950	2.8119	116	46.3000	5156	25.5139	283	22.9589	257	8910
5000	2.8235		46.8156		25.5422		22.9846		9000

TABLE 3.- COMPRESSIBILITY FACTOR Z = PV/RT FOR MOLECULAR NITROGEN

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
100	.99982	4	.99820	42	.9927	17	.987	3	180
110	.99986	3	.99862	30	.9944	13	.990	2	198
120	.99989	2	.99892	22	.9957	9	.992	2	216
130	.99991	2	.99914	17	.9966	6	.994	1	234
140	.99993	1	.99931	13	.9972	6	.995	1	252
150	.99994	1	.99944	10	.99776	41	.9961	7	270
160	.99995	1	.99954	8	.99817	33	.9968	6	288
170	.99996	1	.99962	7	.99850	26	.9974	4	306
180	.99997		.99969	5	.99876	21	.9978	4	324
190	.99997	1	.99974	5	.99897	18	.9982	3	342
200	.99998		.99979	3	.99915	15	.99851	26	360
210	.99998	1	.99982	3	.99930	12	.99877	21	378
220	.99999		.99985	3	.99942	10	.99898	18	396
230	.99999		.99988	2	.99952	9	.99916	16	414
240	.99999		.99990	2	.99961	7	.99932	13	432
250	.99999		.99992	2	.99968	7	.99945	11	450
260	.99999	1	.99994	1	.99975	5	.99956	10	468
270	1.00000		.99995	1	.99980	5	.99966	8	486
280	1.00000		.99996	1	.99985	4	.99974	7	504
290	1.00000		.99997	1	.99989	4	.99981	6	522
300	1.00000		.99998	1	.99993	3	.99987	6	540
310	1.00000		.99999	1	.99996	3	.99993	4	558
320	1.00000		1.00000		.99999	2	.99997	5	576
330	1.00000		1.00000	1	1.00001	2	1.00002	3	594
340	1.00000		1.00001		1.00003	2	1.00005	3	612
350	1.00000		1.00001	1	1.00005	1	1.00008	3	630
360	1.00000		1.00002		1.00006	2	1.00011	3	648
370	1.00000		1.00002		1.00008	1	1.00014	2	666
380	1.00000		1.00002	1	1.00009	1	1.00016	2	684
390	1.00000		1.00003		1.00010	1	1.00018	2	702
400	1.00000		1.00003		1.00011	1	1.00020	1	720
410	1.00000		1.00003		1.00012	1	1.00021	1	738
420	1.00000		1.00003		1.00013		1.00022	2	756
430	1.00000		1.00003	1	1.00013	1	1.00024	1	774
440	1.00000		1.00004		1.00014	1	1.00025		792
450	1.00000		1.00004		1.00015		1.00025	1	810
460	1.00000		1.00004		1.00015		1.00026	1	828
470	1.00000		1.00004		1.00015	1	1.00027	1	846
480	1.00000		1.00004		1.00016		1.00028		864
490	1.00000		1.00004		1.00016		1.00028	1	882
500	1.00000		1.00004		1.00016	1	1.00029		900
510	1.00000		1.00004		1.00017		1.00029		918
520	1.00000		1.00004		1.00017		1.00029	1	936
530	1.00000		1.00004		1.00017		1.00030		954
540	1.00000		1.00004		1.00017		1.00030		972
550	1.00000		1.00004		1.00017		1.00030		990
560	1.00000		1.00004		1.00017		1.00030		1008
570	1.00000		1.00004		1.00017		1.00030		1026
580	1.00000		1.00004		1.00017		1.00030		1044
590	1.00000		1.00004		1.00017		1.00030		1062
600	1.00000		1.00004		1.00017		1.00030	1	1080
610	1.00000		1.00004		1.00017		1.00031		1098
620	1.00000		1.00004		1.00017		1.00031	-1	1116
630	1.00000		1.00004		1.00017		1.00030		1134
640	1.00000		1.00004		1.00017		1.00030		1152
650	1.00000		1.00004		1.00017		1.00030		1170
660	1.00000		1.00004		1.00017		1.00030		1188
670	1.00000		1.00004		1.00017		1.00030		1206
680	1.00000		1.00004		1.00017		1.00030		1224
690	1.00000		1.00004		1.00017		1.00030		1242

TABLE 3.- COMPRESSIBILITY FACTOR $Z = PV/RT$ FOR MOLECULAR NITROGEN - Continued

°K	0.01 atm	0.1 atm		0.4 atm		0.7 atm		°R
700	1.00000	1.00004		1.00017		1.00030		1260
710	1.00000	1.00004		1.00017		1.00030		1278
720	1.00000	1.00004		1.00017		1.00030		1296
730	1.00000	1.00004		1.00017		1.00030	- 1	1314
740	1.00000	1.00004		1.00017		1.00029		1332
750	1.00000	1.00004		1.00017		1.00029		1350
760	1.00000	1.00004		1.00017		1.00029		1368
770	1.00000	1.00004		1.00017	- 1	1.00029		1386
780	1.00000	1.00004		1.00016		1.00029		1404
790	1.00000	1.00004		1.00016		1.00029		1422
800	1.00000	1.00004		1.00016		1.00029	- 1	1440
850	1.00000	1.00004		1.00016	- 1	1.00028	- 1	1530
900	1.00000	1.00004		1.00015		1.00027	- 1	1620
950	1.00000	1.00004		1.00015	- 1	1.00026	- 1	1710
1000	1.00000	1.00004	- 1	1.00014		1.00025	- 1	1800
1050	1.00000	1.00003		1.00014	- 1	1.00024		1890
1100	1.00000	1.00003		1.00013		1.00024	- 1	1980
1150	1.00000	1.00003		1.00013		1.00023	- 1	2070
1200	1.00000	1.00003		1.00013	- 1	1.00022	- 1	2160
1250	1.00000	1.00003		1.00012		1.00021		2250
1300	1.00000	1.00003		1.00012		1.00021	- 1	2340
1350	1.00000	1.00003		1.00012	- 1	1.00020		2430
1400	1.00000	1.00003		1.00011		1.00020	- 1	2520
1450	1.00000	1.00003		1.00011		1.00019	- 1	2610
1500	1.00000	1.00003		1.00011	- 1	1.00018		2700
1550	1.00000	1.00003	- 1	1.00010		1.00018	- 1	2790
1600	1.00000	1.00002		1.00010		1.00017		2880
1650	1.00000	1.00002		1.00010	- 1	1.00017	- 1	2970
1700	1.00000	1.00002		1.00009		1.00016		3060
1750	1.00000	1.00002		1.00009		1.00016		3150
1800	1.00000	1.00002		1.00009		1.00016	- 1	3240
1850	1.00000	1.00002		1.00009	- 1	1.00015		3330
1900	1.00000	1.00002		1.00008		1.00015	- 1	3420
1950	1.00000	1.00002		1.00008		1.00014		3510
2000	1.00000	1.00002		1.00008		1.00014		3600
2050	1.00000	1.00002		1.00008		1.00014		3690
2100	1.00000	1.00002		1.00008		1.00014	- 1	3780
2150	1.00000	1.00002		1.00008	- 1	1.00013		3870
2200	1.00000	1.00002		1.00007		1.00013		3960
2250	1.00000	1.00002		1.00007		1.00013	- 1	4050
2300	1.00000	1.00002		1.00007		1.00012		4140
2350	1.00000	1.00002		1.00007		1.00012		4230
2400	1.00000	1.00002		1.00007		1.00012		4320
2450	1.00000	1.00002		1.00007	- 1	1.00012	- 1	4410
2500	1.00000	1.00002		1.00006		1.00011		4500
2550	1.00000	1.00002		1.00006		1.00011		4590
2600	1.00000	1.00002		1.00006		1.00011		4680
2650	1.00000	1.00002		1.00006		1.00011		4770
2700	1.00000	1.00002	- 1	1.00006		1.00011	- 1	4860
2750	1.00000	1.00001		1.00006		1.00010		4950
2800	1.00000	1.00001		1.00006		1.00010		5040
2850	1.00000	1.00001		1.00006		1.00010		5130
2900	1.00000	1.00001		1.00006	- 1	1.00010		5220
2950	1.00000	1.00001		1.00005		1.00010	- 1	5310
3000	1.00000	1.00001		1.00005		1.00009		5400

TABLE 3.- COMPRESSIBILITY FACTOR Z = PV/RT FOR MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
100	.981	5	.909	30	.783	98			180
110	.986	3	.939	15	.881	35	.805	68	198
120	.989	2	.954	10	.916	20	.873	33	216
130	.991	2	.964	8	.936	14	.906	21	234
140	.993	1	.972	5	.950	10	.927	15	252
150	.9944	10	.9773	42	.9597	76	.9416	113	270
160	.9954	8	.9815	33	.9673	60	.9529	88	288
170	.9962	7	.9848	27	.9733	48	.9617	68	306
180	.9969	5	.9875	22	.9781	39	.9685	57	324
190	.9974	5	.9897	18	.9820	31	.9742	46	342
200	.99788	36	.99150	148	.98514	261	.9788	37	360
210	.99824	31	.99298	124	.98775	217	.9825	32	378
220	.99855	26	.99422	103	.98992	182	.9857	26	396
230	.99881	21	.99525	88	.99174	154	.9883	22	414
240	.99902	19	.99613	75	.99328	131	.9905	19	432
250	.99921	16	.99688	63	.99459	111	.99235	159	450
260	.99937	14	.99751	56	.99570	96	.99394	137	468
270	.99951	12	.99807	47	.99666	83	.99531	117	486
280	.99963	10	.99854	41	.99749	71	.99648	102	504
290	.99973	9	.99895	35	.99820	62	.99750	88	522
300	.99982	8	.99930	31	.99882	54	.99838	77	540
310	.99990	6	.99961	27	.99936	47	.99915	66	558
320	.99996	6	.99988	24	.99983	41	.99981	59	576
330	1.00002	5	1.00012	20	1.00024	36	1.00040	51	594
340	1.00007	5	1.00032	18	1.00060	32	1.00091	45	612
350	1.00012	4	1.00050	16	1.00092	27	1.00136	39	630
360	1.00016	4	1.00066	15	1.00119	25	1.00175	35	648
370	1.00020	3	1.00081	12	1.00144	21	1.00210	30	666
380	1.00023	3	1.00093	11	1.00165	19	1.00240	27	684
390	1.00026	2	1.00104	9	1.00184	17	1.00267	23	702
400	1.00028	2	1.00113	9	1.00201	15	1.00290	22	720
410	1.00030	2	1.00122	8	1.00216	13	1.00312	18	738
420	1.00032	2	1.00130	6	1.00229	11	1.00330	15	756
430	1.00034	1	1.00136	6	1.00240	11	1.00345	15	774
440	1.00035	1	1.00142	5	1.00251	8	1.00360	12	792
450	1.00036	2	1.00147	4	1.00259	7	1.00372	11	810
460	1.00038	1	1.00151	4	1.00266	7	1.00383	9	828
470	1.00039		1.00155	4	1.00273	6	1.00392	9	846
480	1.00039	1	1.00159	2	1.00279	5	1.00401	7	864
490	1.00040	1	1.00161	3	1.00284	5	1.00408	6	882
500	1.00041		1.00164	3	1.00289	4	1.00414	6	900
510	1.00041	1	1.00167	1	1.00293	2	1.00420	4	918
520	1.00042		1.00168	2	1.00295	3	1.00424	3	936
530	1.00042	1	1.00170	1	1.00298	3	1.00427	4	954
540	1.00043		1.00171	1	1.00301	2	1.00431	3	972
550	1.00043		1.00172	1	1.00303	1	1.00434	1	990
560	1.00043		1.00173	1	1.00304	1	1.00435	2	1008
570	1.00043		1.00174		1.00305	1	1.00437	1	1026
580	1.00043	1	1.00174		1.00306		1.00438	1	1044
590	1.00044		1.00174		1.00306		1.00439		1062
600	1.00044		1.00174		1.00306		1.00439		1080
610	1.00044		1.00174		1.00306	1	1.00439		1098
620	1.00044		1.00174		1.00307		1.00439	- 1	1116
630	1.00044		1.00174		1.00307	- 1	1.00438		1134
640	1.00044	- 1	1.00174		1.00306	- 1	1.00438	- 1	1152
650	1.00043		1.00174	- 1	1.00305	- 1	1.00437	- 1	1170
660	1.00043		1.00173		1.00304		1.00436	- 1	1188
670	1.00043		1.00173	- 1	1.00304	- 1	1.00435	- 2	1206
680	1.00043		1.00172		1.00303	- 2	1.00433	- 2	1224
690	1.00043		1.00172	- 1	1.00301		1.00431	- 1	1242

TABLE 3.- COMPRESSIBILITY FACTOR $Z = PV/RT$ FOR MOLECULAR NITROGEN - Continued

^{o}K	1 atm		4 atm		7 atm		10 atm		^{o}R
700	1.00043		1.00171	- 1	1.00301	- 2	1.00430	- 2	1260
710	1.00043	- 1	1.00170		1.00299	- 1	1.00428	- 2	1278
720	1.00042		1.00170	- 1	1.00298	- 1	1.00426	- 1	1296
730	1.00042		1.00169	- 1	1.00297	- 1	1.00425	- 2	1314
740	1.00042		1.00168		1.00296	- 2	1.00423	- 2	1332
750	1.00042		1.00168	- 1	1.00294	- 1	1.00421	- 2	1350
760	1.00042	- 1	1.00167	- 1	1.00293	- 2	1.00419	- 3	1368
770	1.00041		1.00166	- 1	1.00291	- 2	1.00416	- 2	1386
780	1.00041		1.00165	- 1	1.00289	- 1	1.00414	- 3	1404
790	1.00041		1.00164	- 1	1.00288	- 2	1.00411	- 2	1422
800	1.00041	- 1	1.00163	- 5	1.00286	- 9	1.00409	- 13	1440
850	1.00040	- 2	1.00158	- 4	1.00277	- 8	1.00396	- 12	1530
900	1.00038	- 1	1.00154	- 5	1.00269	- 9	1.00384	- 12	1620
950	1.00037	- 1	1.00149	- 5	1.00260	- 8	1.00372	- 12	1710
1000	1.00036	- 1	1.00144	- 5	1.00252	- 8	1.00360	- 12	1800
1050	1.00035	- 1	1.00139	- 4	1.00244	- 8	1.00348	- 11	1890
1100	1.00034	- 1	1.00135	- 5	1.00236	- 8	1.00337	- 11	1980
1150	1.00033	- 1	1.00130	- 4	1.00228	- 7	1.00326	- 10	2070
1200	1.00032	- 1	1.00126	- 4	1.00221	- 7	1.00316	- 10	2160
1250	1.00031	- 1	1.00122	- 3	1.00214	- 6	1.00306	- 9	2250
1300	1.00030	- 1	1.00119	- 4	1.00208	- 6	1.00297	- 9	2340
1350	1.00029	- 1	1.00115	- 3	1.00202	- 7	1.00288	- 9	2430
1400	1.00028	- 1	1.00112	- 4	1.00195	- 5	1.00279	- 8	2520
1450	1.00027	- 1	1.00108	- 3	1.00190	- 6	1.00271	- 8	2610
1500	1.00026		1.00105	- 3	1.00184	- 5	1.00263	- 7	2700
1550	1.00026	- 1	1.00102	- 2	1.00179	- 5	1.00256	- 7	2790
1600	1.00025	- 1	1.00100	- 3	1.00174	- 5	1.00249	- 7	2880
1650	1.00024		1.00097	- 3	1.00169	- 4	1.00242	- 7	2970
1700	1.00024	- 1	1.00094	- 2	1.00165	- 5	1.00235	- 6	3060
1750	1.00023	- 1	1.00092	- 3	1.00160	- 4	1.00229	- 6	3150
1800	1.00022		1.00089	- 2	1.00156	- 3	1.00223	- 5	3240
1850	1.00022	- 1	1.00087	- 2	1.00153	- 5	1.00218	- 6	3330
1900	1.00021		1.00085	- 2	1.00148	- 3	1.00212	- 5	3420
1950	1.00021	- 1	1.00083	- 2	1.00145	- 4	1.00207	- 5	3510
2000	1.00020		1.00081	- 2	1.00141	- 3	1.00202	- 5	3600
2050	1.00020	- 1	1.00079	- 2	1.00138	- 3	1.00197	- 4	3690
2100	1.00019		1.00077	- 2	1.00135	- 3	1.00193	- 5	3780
2150	1.00019	- 1	1.00075	- 1	1.00132	- 3	1.00188	- 4	3870
2200	1.00018		1.00074	- 2	1.00129	- 3	1.00184	- 4	3960
2250	1.00018		1.00072	- 2	1.00126	- 3	1.00180	- 4	4050
2300	1.00018	- 1	1.00070	- 1	1.00123	- 2	1.00176	- 3	4140
2350	1.00017		1.00069	- 1	1.00121	- 3	1.00173	- 4	4230
2400	1.00017		1.00068	- 2	1.00118	- 2	1.00169	- 3	4320
2450	1.00017	- 1	1.00066	- 1	1.00116	- 3	1.00166	- 4	4410
2500	1.00016		1.00065	- 1	1.00113	- 2	1.00162	- 3	4500
2550	1.00016		1.00064	- 2	1.00111	- 2	1.00159	- 3	4590
2600	1.00016	- 1	1.00062	- 1	1.00109	- 2	1.00156	- 3	4680
2650	1.00015		1.00061	- 1	1.00107	- 2	1.00153	- 3	4770
2700	1.00015		1.00060	- 1	1.00105	- 2	1.00150	- 3	4860
2750	1.00015		1.00059	- 1	1.00103	- 1	1.00147	- 2	4950
2800	1.00015	- 1	1.00058	- 1	1.00102	- 3	1.00145	- 3	5040
2850	1.00014		1.00057	- 1	1.00099	- 2	1.00142	- 3	5130
2900	1.00014		1.00056	- 1	1.00097	- 1	1.00139	- 2	5220
2950	1.00014		1.00055	- 1	1.00096	- 1	1.00137	- 2	5310
3000	1.00014		1.00054		1.00095		1.00135		5400

TABLE 3.- COMPRESSIBILITY FACTOR Z = PV/RT FOR MOLECULAR NITROGEN - Continued

°K	10 atm		40 atm		70 atm		100 atm		°R
110	.805	68							198
120	.873	33							216
130	.906	21							234
140	.927	15							252
150	.9416	113	.736	63					270
160	.9529	88	.799	44					288
170	.9617	68	.843	30					306
180	.9685	57	.873	26	.787	50			324
190	.9742	46	.899	20	.837	34			342
200	.9788	37	.9185	156	.8705	264	.844	34	360
210	.9825	32	.9341	126	.8969	211	.878	27	378
220	.9857	26	.9467	104	.9180	172	.905	22	396
230	.9883	22	.9571	87	.9352	142	.9268	177	414
240	.9905	19	.9658	73	.9494	119	.9445	148	432
250	.99235	159	.97311	614	.9613	99	.9593	123	450
260	.99394	137	.97925	528	.9712	85	.9716	106	468
270	.99531	117	.98453	447	.9797	71	.9822	89	486
280	.99648	102	.98900	384	.9868	61	.9911	75	504
290	.99750	88	.99284	336	.9929	55	.9986	68	522
300	.99838	77	.99620	288	.9984	45	1.0054	57	540
310	.99915	66	.99908	249	1.0029	41	1.0111	50	558
320	.99981	59	1.00157	216	1.0070	34	1.0161	43	576
330	1.00040	51	1.00373	190	1.0104	30	1.0204	38	594
340	1.00091	45	1.00563	165	1.0134	26	1.0242	32	612
350	1.00136	39	1.00728	144	1.0160	22	1.0274	28	630
360	1.00175	35	1.00872	128	1.0182	20	1.0302	25	648
370	1.00210	30	1.01000	111	1.0202	18	1.0327	22	666
380	1.00240	27	1.01111	98	1.0220	15	1.0349	19	684
390	1.00267	23	1.01209	83	1.0235	13	1.0368	15	702
400	1.00290	22	1.01292	77	1.0248	12	1.0383	15	720
410	1.00312	18	1.01369	66	1.0260	10	1.0398	13	738
420	1.00330	15	1.01435	54	1.0270	8	1.0411	10	756
430	1.00345	15	1.01489	51	1.0278	8	1.0421	9	774
440	1.00360	12	1.01540	44	1.0286	6	1.0430	8	792
450	1.00372	11	1.01584	36	1.0292	6	1.0438	6	810
460	1.00383	9	1.01620	32	1.0298	4	1.0444	5	828
470	1.00392	9	1.01652	30	1.0302	5	1.0449	5	846
480	1.00401	7	1.01682	22	1.0307	3	1.0454	4	864
490	1.00408	6	1.01704	22	1.0310	3	1.0458	3	882
500	1.00414	6	1.01726	18	1.0313	3	1.0461	3	900
510	1.00420	4	1.01744	12	1.0316	1	1.0464	2	918
520	1.00424	3	1.01756	11	1.0317	1	1.0466	1	936
530	1.00427	4	1.01767	11	1.0318	2	1.0467	1	954
540	1.00431	3	1.01778	9	1.0320	1	1.0468	1	972
550	1.00434	1	1.01787	4	1.0321		1.0469		990
560	1.00435	2	1.01791	4	1.0321		1.0469	- 1	1008
570	1.00437	1	1.01795	1	1.0321		1.0468		1026
580	1.00438	1	1.01796	1	1.0321		1.0468	- 1	1044
590	1.00439		1.01797	- 2	1.0321	- 1	1.0467	- 2	1062
600	1.00439		1.01795		1.0320		1.0465	- 1	1080
610	1.00439		1.01795	- 3	1.0320	- 1	1.0464	- 1	1098
620	1.00439	- 1	1.01792	- 5	1.0319	- 1	1.0463	- 2	1116
630	1.00438		1.01787	- 3	1.0318	- 1	1.0461	- 2	1134
640	1.00438	- 1	1.01784	- 6	1.0317	- 1	1.0459	- 2	1152
650	1.00437	- 1	1.01778	- 6	1.0316	- 1	1.0457	- 1	1170
660	1.00436	- 1	1.01772	- 6	1.0315	- 2	1.0456	- 3	1188
670	1.00435	- 2	1.01766	- 6	1.0313	- 1	1.0453	- 2	1206
680	1.00433	- 2	1.01760	- 10	1.0312	- 2	1.0451	- 3	1224
690	1.00431	- 1	1.01750	- 6	1.0310	- 1	1.0448	- 2	1242

TABLE 3.- COMPRESSIBILITY FACTOR Z = PV/RT FOR MOLECULAR NITROGEN - Concluded

°K	10 atm		40 atm		70 atm		100 atm		°R
700	1.00430	- 2	1.01744	- 9	1.0309	- 2	1.0446	- 2	1260
710	1.00428	- 2	1.01735	- 9	1.0307	- 1	1.0444	- 3	1278
720	1.00426	- 1	1.01726	- 6	1.0306	- 2	1.0441	- 2	1296
730	1.00425	- 2	1.01720	- 9	1.0304	- 1	1.0439	- 3	1314
740	1.00423	- 2	1.01711	- 9	1.0303	- 2	1.0436	- 3	1332
750	1.00421	- 2	1.01702	- 9	1.0301	- 2	1.0433	- 2	1350
760	1.00419	- 3	1.01693	- 13	1.0299	- 2	1.0431	- 4	1368
770	1.00416	- 2	1.01680	- 10	1.0297	- 2	1.0427	- 3	1386
780	1.00414	- 3	1.01670	- 8	1.0295	- 2	1.0424	- 1	1404
790	1.00411		1.01662	- 1	1.0293	- 1	1.0423	- 3	1422
800	1.0041	- 1	1.0165	- 5	1.0292	- 10	1.0420	- 15	1440
850	1.0040	- 2	1.0160	- 5	1.0282	- 9	1.0405	- 14	1530
900	1.0038	- 1	1.0155	- 5	1.0273	- 9	1.0391	- 13	1620
950	1.0037	- 1	1.0150	- 5	1.0264	- 9	1.0378	- 13	1710
1000	1.0036	- 1	1.0145	- 5	1.0255	- 8	1.0365	- 13	1800
1050	1.0035	- 1	1.0140	- 5	1.0247	- 9	1.0352	- 11	1890
1100	1.0034	- 1	1.0135	- 4	1.0238	- 8	1.0341	- 11	1980
1150	1.0033	- 1	1.0131	- 4	1.0230	- 7	1.0330	- 11	2070
1200	1.0032	- 1	1.0127	- 4	1.0223	- 7	1.0319	- 10	2160
1250	1.0031	- 1	1.0123	- 4	1.0216	- 7	1.0309	- 10	2250
1300	1.0030	- 1	1.0119	- 3	1.0209	- 6	1.0299	- 9	2340
1350	1.0029	- 1	1.0116	- 4	1.0203	- 7	1.0290	- 10	2430
1400	1.0028	- 1	1.0112	- 3	1.0196	- 6	1.0280	- 9	2520
1450	1.0027	- 1	1.0109	- 4	1.0190	- 5	1.0271	- 7	2610
1500	1.0026		1.0105	- 3	1.0185	- 5	1.0264	- 7	2700
1550	1.0026	- 1	1.0102	- 2	1.0180	- 5	1.0257	- 7	2790
1600	1.0025	- 1	1.0100	- 3	1.0175	- 5	1.0250	- 7	2880
1650	1.0024		1.0097	- 3	1.0170	- 5	1.0243	- 7	2970
1700	1.0024	- 1	1.0094	- 2	1.0165	- 5	1.0236	- 7	3060
1750	1.0023	- 1	1.0092	- 3	1.0160	- 4	1.0229	- 6	3150
1800	1.0022		1.0089	- 2	1.0156	- 3	1.0223	- 5	3240
1850	1.0022	- 1	1.0087	- 2	1.0153	- 5	1.0218	- 6	3330
1900	1.0021		1.0085	- 2	1.0148	- 3	1.0212	- 5	3420
1950	1.0021	- 1	1.0083	- 2	1.0145	- 4	1.0207	- 5	3510
2000	1.0020		1.0081	- 2	1.0141	- 3	1.0202	- 5	3600
2050	1.0020	- 1	1.0079	- 2	1.0138	- 3	1.0197	- 4	3690
2100	1.0019		1.0077	- 2	1.0135	- 3	1.0193	- 5	3780
2150	1.0019	- 1	1.0075	- 1	1.0132	- 3	1.0188	- 4	3870
2200	1.0018		1.0074	- 2	1.0129	- 3	1.0184	- 4	3960
2250	1.0018		1.0072	- 2	1.0126	- 3	1.0180	- 4	4050
2300	1.0018	- 1	1.0070	- 1	1.0123	- 2	1.0176	- 3	4140
2350	1.0017		1.0069	- 1	1.0121	- 3	1.0173	- 4	4230
2400	1.0017		1.0068	- 2	1.0118	- 2	1.0169	- 3	4320
2450	1.0017	- 1	1.0066	- 1	1.0116	- 3	1.0166	- 4	4410
2500	1.0016		1.0065	- 1	1.0113	- 2	1.0162	- 3	4500
2550	1.0016		1.0064	- 2	1.0111	- 2	1.0159	- 3	4590
2600	1.0016	- 1	1.0062	- 1	1.0109	- 2	1.0156	- 3	4680
2650	1.0015		1.0061	- 1	1.0107	- 2	1.0153	- 3	4770
2700	1.0015		1.0060	- 1	1.0105	- 2	1.0150	- 3	4860
2750	1.0015		1.0059	- 1	1.0103	- 1	1.0147	- 2	4950
2800	1.0015	- 1	1.0058	- 1	1.0102	- 3	1.0145	- 3	5040
2850	1.0014		1.0057	- 1	1.0099	- 2	1.0142	- 3	5130
2900	1.0014		1.0056	- 1	1.0097	- 1	1.0139	- 2	5220
2950	1.0014		1.0055	- 1	1.0096	- 1	1.0137	- 2	5310
3000	1.0014		1.0054		1.0095		1.0135		5400

TABLE 4.- DENSITY ρ/ρ_0 OF MOLECULAR NITROGEN

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
100	.02731	-249	.27353	-2497	1.1000	-1015	1.936	-181	180
110	.02482	-206	.24856	-2078	.9985	- 844	1.755	-149	198
120	.02276	-176	.22778	-1757	.9141	- 711	1.606	-127	216
130	.02100	-150	.21021	-1505	.8430	- 607	1.479	-107	234
140	.01950	-130	.19516	-1303	.7823	- 526	1.372	- 93	252
150	.01820	-113	.18213	-1140	.72973	- 4589	1.2792	- 808	270
160	.01707	-101	.17073	-1006	.68384	- 4043	1.1984	- 712	288
170	.01606	- 89	.16067	- 894	.64341	- 3591	1.1272	- 630	306
180	.01517	- 80	.15173	- 799	.60750	- 3209	1.0642	- 565	324
190	.01437	- 72	.14374	- 719	.57541	- 2887	1.0077	- 506	342
200	.01365	- 65	.13655	- 651	.54654	- 2611	.95706	- 4582	360
210	.01300	- 59	.13004	- 591	.52043	- 2371	.91124	- 4160	378
220	.01241	- 54	.12413	- 540	.49672	- 2165	.86964	- 3796	396
230	.01187	- 49	.11873	- 495	.47507	- 1983	.83168	- 3478	414
240	.01138	- 46	.11378	- 456	.45524	- 1824	.79690	- 3198	432
250	.01092	- 42	.10922	- 420	.43700	- 1684	.76492	- 2950	450
260	.01050	- 39	.10502	- 389	.42016	- 1558	.73542	- 2731	468
270	.01011	- 36	.10113	- 361	.40458	- 1447	.70811	- 2534	486
280	.00975	- 34	.09752	- 337	.39011	- 1347	.68277	- 2359	504
290	.00941	- 31	.09415	- 314	.37664	- 1257	.65918	- 2201	522
300	.00910	- 29	.09101	- 293	.36407	- 1175	.63717	- 2059	540
310	.00881	- 28	.08808	- 276	.35232	- 1102	.61658	- 1929	558
320	.00853	- 26	.08532	- 258	.34130	- 1035	.59729	- 1813	576
330	.00827	- 24	.08274	- 244	.33095	- 974	.57916	- 1705	594
340	.00803	- 23	.08030	- 229	.32121	- 918	.56211	- 1608	612
350	.00780	- 22	.07801	- 217	.31203	- 867	.54603	- 1518	630
360	.00758	- 20	.07584	- 205	.30336	- 821	.53085	- 1437	648
370	.00738	- 20	.07379	- 194	.29515	- 777	.51648	- 1360	666
380	.00718	- 18	.07185	- 184	.28738	- 737	.50288	- 1290	684
390	.00700	- 17	.07001	- 175	.28001	- 700	.48998	- 1226	702
400	.00683	- 17	.06826	- 167	.27301	- 666	.47772	- 1166	720
410	.00666	- 16	.06659	- 158	.26635	- 635	.46606	- 1110	738
420	.00650	- 15	.06501	- 151	.26000	- 605	.45496	- 1059	756
430	.00635	- 14	.06350	- 145	.25395	- 577	.44437	- 1010	774
440	.00621	- 14	.06205	- 138	.24818	- 552	.43427	- 965	792
450	.00607	- 13	.06067	- 132	.24266	- 527	.42462	- 924	810
460	.00594	- 13	.05935	- 126	.23739	- 505	.41538	- 884	828
470	.00581	- 12	.05809	- 121	.23234	- 485	.40654	- 847	846
480	.00569	- 12	.05688	- 116	.22749	- 464	.39807	- 813	864
490	.00557	- 11	.05572	- 111	.22285	- 446	.38994	- 780	882
500	.00546	- 11	.05461	- 108	.21839	- 428	.38214	- 749	900
510	.00535	- 10	.05353	- 103	.21411	- 412	.37465	- 721	918
520	.00525	- 10	.05250	- 99	.20999	- 396	.36744	- 693	936
530	.00515	- 9	.05151	- 95	.20603	- 381	.36051	- 668	954
540	.00506	- 10	.05056	- 92	.20222	- 368	.35383	- 643	972
550	.00496	- 8	.04964	- 89	.19854	- 355	.34740	- 621	990
560	.00488	- 9	.04875	- 85	.19499	- 342	.34119	- 598	1008
570	.00479	- 8	.04790	- 83	.19157	- 330	.33521	- 578	1026
580	.00471	- 8	.04707	- 79	.18827	- 319	.32943	- 559	1044
590	.00463	- 8	.04628	- 78	.18508	- 309	.32384	- 539	1062
600	.00455	- 7	.04550	- 74	.18199	- 298	.31845	- 523	1080
610	.00448	- 8	.04476	- 72	.17901	- 289	.31322	- 505	1098
620	.00440	- 7	.04404	- 70	.17612	- 279	.30817	- 489	1116
630	.00433	- 6	.04334	- 68	.17333	- 271	.30328	- 474	1134
640	.00427	- 7	.04266	- 66	.17062	- 263	.29854	- 459	1152
650	.00420	- 6	.04200	- 63	.16799	- 254	.29395	- 445	1170
660	.00414	- 6	.04137	- 62	.16545	- 247	.28950	- 432	1188
670	.00408	- 6	.04075	- 60	.16298	- 240	.28518	- 420	1206
680	.00402	- 6	.04015	- 58	.16058	- 232	.28098	- 407	1224
690	.00396	- 6	.03957	- 57	.15826	- 227	.27691	- 395	1242

TABLE 4.- DENSITY ρ/ρ_0 OF MOLECULAR NITROGEN - Continued

$^{\circ}K$	0.01 atm		0.1 atm		0.4 atm		0.7 atm		$^{\circ}R$
700	.00390	- 5	.03900	- 55	.15599	- 219	.27296	- 385	1260
710	.00385	- 6	.03845	- 53	.15380	- 214	.26911	- 374	1278
720	.00379	- 5	.03792	- 52	.15166	- 208	.26537	- 363	1296
730	.00374	- 5	.03740	- 50	.14958	- 202	.26174	- 354	1314
740	.00369	- 5	.03690	- 50	.14756	- 197	.25820	- 344	1332
750	.00364	- 5	.03640	- 48	.14559	- 191	.25476	- 335	1350
760	.00359	- 4	.03592	- 46	.14368	- 187	.25141	- 327	1368
770	.00355	- 5	.03546	- 46	.14181	- 181	.24814	- 318	1386
780	.00350	- 4	.03500	- 44	.14000	- 178	.24496	- 310	1404
790	.00346	- 5	.03456	- 43	.13822	- 172	.24186	- 302	1422
800	.00341	- 20	.03413	- 201	.13650	- 803	.23884	- 1405	1440
850	.00321	- 18	.03212	- 178	.12847	- 714	.22479	- 1249	1530
900	.00303	- 16	.03034	- 160	.12133	- 638	.21230	- 1117	1620
950	.00287	- 14	.02874	- 144	.11495	- 575	.20113	- 1005	1710
1000	.00273	- 13	.02730	- 130	.10920	- 520	.19108	- 910	1800
1050	.00260	- 12	.02600	- 118	.10400	- 473	.18198	- 827	1890
1100	.00248	- 11	.02482	- 108	.09927	- 431	.17371	- 755	1980
1150	.00237	- 9	.02374	- 99	.09496	- 396	.16616	- 692	2070
1200	.00228	- 10	.02275	- 91	.09100	- 364	.15924	- 637	2160
1250	.00218	- 8	.02184	- 84	.08736	- 336	.15287	- 588	2250
1300	.00210	- 8	.02100	- 78	.08400	- 311	.14699	- 544	2340
1350	.00202	- 7	.02022	- 72	.08089	- 289	.14155	- 506	2430
1400	.00195	- 7	.01950	- 67	.07800	- 269	.13649	- 470	2520
1450	.00188	- 6	.01883	- 63	.07531	- 251	.13179	- 440	2610
1500	.00182	- 6	.01820	- 59	.07280	- 235	.12739	- 411	2700
1550	.00176	- 5	.01761	- 55	.07045	- 220	.12328	- 385	2790
1600	.00171	- 6	.01706	- 51	.06825	- 207	.11943	- 362	2880
1650	.00165	- 4	.01655	- 49	.06618	- 194	.11581	- 340	2970
1700	.00161	- 5	.01606	- 46	.06424	- 184	.11241	- 321	3060
1750	.00156	- 4	.01560	- 43	.06240	- 173	.10920	- 304	3150
1800	.00152	- 4	.01517	- 41	.06067	- 164	.10616	- 286	3240
1850	.00148	- 4	.01476	- 39	.05903	- 155	.10330	- 272	3330
1900	.00144	- 4	.01437	- 37	.05748	- 148	.10058	- 258	3420
1950	.00140	- 3	.01400	- 35	.05600	- 140	.09800	- 245	3510
2000	.00137	- 4	.01365	- 33	.05460	- 133	.09555	- 233	3600
2050	.00133	- 3	.01332	- 32	.05327	- 127	.09322	- 222	3690
2100	.00130	- 3	.01300	- 30	.05200	- 121	.09100	- 212	3780
2150	.00127	- 3	.01270	- 29	.05079	- 115	.08888	- 202	3870
2200	.00124	- 3	.01241	- 28	.04964	- 110	.08686	- 193	3960
2250	.00121	- 2	.01213	- 26	.04854	- 106	.08493	- 184	4050
2300	.00119	- 3	.01187	- 25	.04748	- 101	.08309	- 177	4140
2350	.00116	- 2	.01162	- 24	.04647	- 97	.08132	- 169	4230
2400	.00114	- 3	.01138	- 24	.04550	- 93	.07963	- 163	4320
2450	.00111	- 2	.01114	- 22	.04457	- 89	.07800	- 156	4410
2500	.00109	- 2	.01092	- 21	.04368	- 85	.07644	- 150	4500
2550	.00107	- 2	.01071	- 21	.04283	- 83	.07494	- 144	4590
2600	.00105	- 2	.01050	- 20	.04200	- 79	.07350	- 139	4680
2650	.00103	- 2	.01030	- 19	.04121	- 76	.07211	- 133	4770
2700	.00101	- 2	.01011	- 18	.04045	- 74	.07078	- 129	4860
2750	.00099	- 1	.00993	- 18	.03971	- 71	.06949	- 124	4950
2800	.00098	- 2	.00975	- 17	.03900	- 68	.06825	- 119	5040
2850	.00096	- 2	.00958	- 17	.03832	- 66	.06706	- 116	5130
2900	.00094	- 1	.00941	- 15	.03766	- 64	.06590	- 112	5220
2950	.00093	- 2	.00926	- 16	.03702	- 62	.06478	- 108	5310
3000	.00091		.00910		.03640		.06370		5400

TABLE 4.- DENSITY ρ/ρ_0 OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
100	2.783	-266	12.010	-1440	24.40	-468			180
110	2.517	-216	10.570	-1030	19.72	-234	30.83	-477	198
120	2.301	-182	9.540	- 825	17.38	-168	26.06	-288	216
130	2.119	-155	8.715	- 689	15.70	-133	23.18	-215	234
140	1.964	-133	8.026	- 576	14.37	-109	21.03	-170	252
150	1.8305	-1161	7.4501	- 4955	13.276	- 927	19.331	-1423	270
160	1.7144	-1022	6.9546	- 4310	12.349	- 798	17.908	-1208	288
170	1.6122	- 906	6.5236	- 3793	11.551	- 696	16.700	-1038	306
180	1.5216	- 808	6.1443	- 3363	10.855	- 612	15.662	- 912	324
190	1.4408	- 727	5.8080	- 3004	10.243	- 543	14.750	- 803	342
200	1.36809	- 6562	5.50755	- 27008	9.7004	- 4863	13.947	- 714	360
210	1.30247	- 5959	5.23747	- 24430	9.2141	- 4381	13.233	- 643	378
220	1.24288	- 5435	4.99317	- 22204	8.7760	- 3970	12.590	- 579	396
230	1.18853	- 4976	4.77113	- 20283	8.3790	- 3616	12.011	- 526	414
240	1.13877	- 4576	4.56830	- 18604	8.0174	- 3308	11.485	- 480	432
250	1.09301	- 4221	4.38226	- 17121	7.6866	- 3039	11.005	- 440	450
260	1.05080	- 3906	4.21105	- 15824	7.3827	- 2803	10.565	- 405	468
270	1.01174	- 3625	4.05281	- 14658	7.1024	- 2593	10.160	- 375	486
280	.97549	- 3373	3.90623	- 13624	6.8431	- 2407	9.785	- 347	504
290	.94176	- 3147	3.76999	- 12695	6.6024	- 2241	9.438	- 322	522
300	.91029	- 2944	3.64304	- 11861	6.3783	- 2090	9.1160	- 3009	540
310	.88085	- 2758	3.52443	- 11106	6.1693	- 1956	8.8151	- 2811	558
320	.85327	- 2590	3.41337	- 10423	5.9737	- 1834	8.5340	- 2635	576
330	.82737	- 2438	3.30914	- 9797	5.7903	- 1724	8.2705	- 2473	594
340	.80299	- 2298	3.21117	- 9231	5.6179	- 1622	8.0232	- 2328	612
350	.78001	- 2170	3.11886	- 8712	5.45572	- 15298	7.7904	- 2193	630
360	.75831	- 2052	3.03174	- 8238	5.30274	- 14460	7.5711	- 2072	648
370	.73779	- 1944	2.94936	- 7796	5.15814	- 13680	7.3639	- 1960	666
380	.71835	- 1844	2.87140	- 7393	5.02134	- 12968	7.1679	- 1856	684
390	.69991	- 1751	2.79747	- 7018	4.89166	- 12310	6.9823	- 1762	702
400	.68240	- 1666	2.72729	- 6676	4.76856	- 11700	6.8061	- 1674	720
410	.66574	- 1586	2.66053	- 6355	4.65156	- 11134	6.6387	- 1592	738
420	.64988	- 1513	2.59698	- 6055	4.54022	- 10607	6.4795	- 1517	756
430	.63475	- 1443	2.53643	- 5780	4.43415	- 10126	6.3278	- 1447	774
440	.62032	- 1379	2.47863	- 5520	4.33289	- 9662	6.1831	- 1381	792
450	.60653	- 1320	2.42343	- 5277	4.23627	- 9238	6.0450	- 1321	810
460	.59333	- 1263	2.37066	- 5054	4.14389	- 8845	5.9129	- 1263	828
470	.58070	- 1209	2.32012	- 4842	4.05544	- 8473	5.7866	- 1211	846
480	.56861	- 1161	2.27170	- 4641	3.97071	- 8123	5.6655	- 1160	864
490	.55700	- 1115	2.22529	- 4457	3.88948	- 7798	5.5495	- 1113	882
500	.54585	- 1070	2.18072	- 4282	3.81150	- 7488	5.4382	- 1070	900
510	.53515	- 1030	2.13790	- 4114	3.73662	- 7193	5.3312	- 1027	918
520	.52485	- 990	2.09676	- 3960	3.66469	- 6926	5.2285	- 988	936
530	.51495	- 954	2.05716	- 3812	3.59543	- 6668	5.1297	- 952	954
540	.50541	- 919	2.01904	- 3673	3.52875	- 6423	5.0345	- 917	972
550	.49622	- 886	1.98231	- 3541	3.46452	- 6190	4.9428	- 883	990
560	.48736	- 855	1.94690	- 3418	3.40262	- 5973	4.8545	- 853	1008
570	.47881	- 826	1.91272	- 3298	3.34289	- 5767	4.7692	- 822	1026
580	.47055	- 798	1.87974	- 3186	3.28522	- 5568	4.6870	- 795	1044
590	.46257	- 771	1.84788	- 3080	3.22954	- 5383	4.6075	- 768	1062
600	.45486	- 746	1.81708	- 2978	3.17571	- 5206	4.5307	- 743	1080
610	.44740	- 721	1.78730	- 2883	3.12365	- 5041	4.4564	- 719	1098
620	.44019	- 699	1.75847	- 2791	3.07324	- 4878	4.3845	- 695	1116
630	.43320	- 677	1.73056	- 2704	3.02446	- 4723	4.3150	- 674	1134
640	.42643	- 655	1.70352	- 2621	2.97723	- 4577	4.2476	- 654	1152
650	.41988	- 637	1.67731	- 2540	2.93146	- 4439	4.1822	- 633	1170
660	.41351	- 617	1.65191	- 2465	2.88707	- 4309	4.1189	- 614	1188
670	.40734	- 599	1.62726	- 2392	2.84398	- 4180	4.0575	- 596	1206
680	.40135	- 581	1.60334	- 2323	2.80218	- 4055	3.9979	- 579	1224
690	.39554	- 565	1.58011	- 2256	2.76163	- 3945	3.9400	- 562	1242

TABLE 4.- DENSITY ρ/ρ_0 OF MOLECULAR NITROGEN - Continued

$^{\circ}$K	1 atm		4 atm		7 atm		10 atm		$^{\circ}$R
700	.38989	- 550	1.55755	- 2192	2.72218	- 3829	3.8838	- 546	1260
710	.38439	- 533	1.53563	- 2133	2.68389	- 3725	3.8292	- 532	1278
720	.37906	- 519	1.51430	- 2073	2.64664	- 3623	3.7760	- 516	1296
730	.37387	- 506	1.49357	- 2017	2.61041	- 3525	3.7244	- 503	1314
740	.36881	- 491	1.47340	- 1965	2.57516	- 3428	3.6741	- 489	1332
750	.36390	- 479	1.45375	- 1911	2.54088	- 3341	3.6252	- 476	1350
760	.35911	- 466	1.43464	- 1862	2.50747	- 3252	3.5776	- 464	1368
770	.35445	- 455	1.41602	- 1814	2.47495	- 3168	3.5312	- 452	1386
780	.34990	- 443	1.39788	- 1768	2.44327	- 3090	3.4860	- 440	1404
790	.34547	- 431	1.38020	- 1724	2.41237	- 3011	3.4420	- 430	1422
800	.34116	- 2007	1.36296	- 8011	2.38226	- 13993	3.3990	- 1996	1440
850	.32109	- 1783	1.28285	- 7122	2.24233	- 12441	3.1994	- 1771	1530
900	.30326	- 1596	1.21163	- 6371	2.11792	- 11129	3.0223	- 1588	1620
950	.28730	- 1436	1.14792	- 5734	2.00663	- 10018	2.8635	- 1429	1710
1000	.27294	- 1300	1.09058	- 5188	1.90645	- 9063	2.7206	- 1293	1800
1050	.25994	- 1181	1.03870	- 4718	1.81582	- 8240	2.5913	- 1176	1890
1100	.24813	- 1078	.99152	- 4306	1.73342	- 7524	2.4737	- 1073	1980
1150	.23735	- 989	.94846	- 3948	1.65818	- 6898	2.3664	- 983	2070
1200	.22746	- 910	.90898	- 3633	1.58920	- 6346	2.2681	- 906	2160
1250	.21836	- 839	.87265	- 3353	1.52574	- 5859	2.1775	- 835	2250
1300	.20997	- 778	.83912	- 3105	1.46715	- 5426	2.0940	- 774	2340
1350	.20219	- 722	.80807	- 2884	1.41289	- 5036	2.0166	- 718	2430
1400	.19497	- 672	.77923	- 2684	1.36253	- 4692	1.9448	- 669	2520
1450	.18825	- 627	.75239	- 2506	1.31561	- 4378	1.8779	- 624	2610
1500	.18198	- 587	.72733	- 2344	1.27183	- 4096	1.8155	- 585	2700
1550	.17611	- 550	.70389	- 2198	1.23087	- 3841	1.7570	- 548	2790
1600	.17061	- 517	.68191	- 2064	1.19246	- 3608	1.7022	- 514	2880
1650	.16544	- 487	.66127	- 1943	1.15638	- 3396	1.6508	- 485	2970
1700	.16057	- 458	.64184	- 1833	1.12242	- 3202	1.6023	- 457	3060
1750	.15599	- 434	.62351	- 1730	1.09040	- 3024	1.5566	- 431	3150
1800	.15165	- 410	.60621	- 1637	1.06016	- 2863	1.5135	- 409	3240
1850	.14755	- 388	.58984	- 1551	1.03153	- 2709	1.4726	- 386	3330
1900	.14367	- 368	.57433	- 1472	1.00444	- 2573	1.4340	- 367	3420
1950	.13999	- 350	.55961	- 1398	.97871	- 2443	1.3973	- 348	3510
2000	.13649	- 333	.54563	- 1330	.95428	- 2324	1.3625	- 333	3600
2050	.13316	- 317	.53233	- 1266	.93104	- 2214	1.3292	- 315	3690
2100	.12999	- 302	.51967	- 1207	.90890	- 2111	1.2977	- 302	3780
2150	.12697	- 288	.50760	- 1154	.88779	- 2016	1.2675	- 287	3870
2200	.12409	- 276	.49606	- 1101	.86763	- 1925	1.2388	- 275	3960
2250	.12133	- 264	.48505	- 1054	.84838	- 1842	1.2113	- 263	4050
2300	.11869	- 252	.47451	- 1009	.82996	- 1764	1.1850	- 251	4140
2350	.11617	- 242	.46442	- 967	.81232	- 1690	1.1599	- 242	4230
2400	.11375	- 233	.45475	- 927	.79542	- 1622	1.1357	- 232	4320
2450	.11142	- 222	.44548	- 890	.77920	- 1556	1.1125	- 221	4410
2500	.10920	- 214	.43658	- 856	.76364	- 1496	1.0904	- 214	4500
2550	.10706	- 206	.42802	- 822	.74868	- 1438	1.0690	- 205	4590
2600	.10500	- 198	.41980	- 792	.73430	- 1384	1.0485	- 197	4680
2650	.10302	- 191	.41188	- 762	.72046	- 1333	1.0288	- 191	4770
2700	.10111	- 184	.40426	- 735	.70713	- 1284	1.0097	- 183	4860
2750	.09927	- 177	.39691	- 708	.69429	- 1239	.9914	- 177	4950
2800	.09750	- 171	.38983	- 684	.68190	- 1195	.9737	- 170	5040
2850	.09579	- 165	.38299	- 660	.66995	- 1153	.9567	- 165	5130
2900	.09414	- 160	.37639	- 637	.65842	- 1116	.9402	- 159	5220
2950	.09254	- 154	.37002	- 617	.64726	- 1078	.9243	- 154	5310
3000	.09100		.36385		.63648		.9089		5400

TABLE 4.- DENSITY ρ/ρ_0 OF MOLECULAR NITROGEN - Continued

°K	10 atm		40 atm		70 atm		100 atm		°R
110	30.83	-477							198
120	26.06	-288							216
130	23.18	-215							234
140	21.03	-170							252
150	19.331	-1423	98.9	-135					270
160	17.908	-1208	85.4	-92					288
170	16.700	-1038	76.2	-67					306
180	15.662	-912	69.5	-56	134.9	-148			324
190	14.750	-803	63.9	-44	120.1	-103			342
200	13.947	-714	59.45	-378	109.77	-830	161.7	-137	360
210	13.233	-643	55.67	-324	101.47	-683	148.0	-109	378
220	12.590	-579	52.43	-282	94.635	-5779	137.1	-90	396
230	12.011	-526	49.61	-250	88.856	-4976	128.08	-763	414
240	11.485	-480	47.11	-222	83.880	-4352	120.45	-661	432
250	11.005	-440	44.893	-1998	79.528	-3839	113.84	-576	450
260	10.565	-405	42.895	-1810	75.689	-3435	108.08	-513	468
270	10.160	-375	41.085	-1646	72.254	-3082	102.95	-457	486
280	9.785	-347	39.439	-1508	69.172	-2796	98.38	-410	504
290	9.438	-322	37.931	-1388	66.376	-2566	94.28	-376	522
300	9.1160	-3009	36.543	-1280	63.810	-2335	90.523	-3414	540
310	8.8151	-2811	35.263	-1187	61.475	-2164	87.109	-3137	558
320	8.5340	-2635	34.076	-1104	59.311	-1991	83.972	-2888	576
330	8.2705	-2473	32.972	-1030	57.320	-1850	81.084	-2677	594
340	8.0232	-2328	31.942	-964	55.470	-1723	78.407	-2477	612
350	7.7904	-2193	30.978	-903	53.747	-1606	75.930	-2310	630
360	7.5711	-2072	30.075	-850	52.141	-1509	73.620	-2163	648
370	7.3639	-1960	29.225	-801	50.632	-1419	71.457	-2029	666
380	7.1679	-1856	28.424	-755	49.213	-1332	69.428	-1904	684
390	6.9823	-1762	27.669	-714	47.881	-1256	67.524	-1783	702
400	6.8061	-1674	26.955	-677	46.625	-1191	65.741	-1696	720
410	6.6387	-1592	26.278	-643	45.434	-1125	64.045	-1603	738
420	6.4795	-1517	25.635	-609	44.309	-1064	62.442	-1511	756
430	6.3278	-1447	25.026	-581	43.245	-1016	60.931	-1436	774
440	6.1831	-1381	24.445	-554	42.229	-962	59.495	-1367	792
450	6.0450	-1321	23.891	-528	41.267	-921	58.128	-1296	810
460	5.9129	-1263	23.363	-504	40.346	-873	56.832	-1236	828
470	5.7866	-1211	22.859	-483	39.473	-842	55.596	-1184	846
480	5.6655	-1160	22.376	-461	38.631	-799	54.412	-1131	864
490	5.5495	-1113	21.915	-443	37.832	-767	53.281	-1081	882
500	5.4382	-1070	21.472	-425	37.065	-738	52.200	-1038	900
510	5.3312	-1027	21.047	-407	36.327	-702	51.162	-993	918
520	5.2285	-988	20.640	-392	35.625	-675	50.169	-952	936
530	5.1297	-952	20.248	-377	34.950	-654	49.217	-916	954
540	5.0345	-917	19.871	-363	34.296	-627	48.301	-882	972
550	4.9428	-883	19.508	-349	33.669	-601	47.419	-847	990
560	4.8545	-853	19.159	-337	33.068	-580	46.572	-813	1008
570	4.7692	-822	18.822	-325	32.488	-561	45.759	-789	1026
580	4.6870	-795	18.497	-313	31.927	-541	44.970	-758	1044
590	4.6075	-768	18.184	-303	31.386	-520	44.212	-728	1062
600	4.5307	-743	17.881	-293	30.866	-506	43.484	-709	1080
610	4.4564	-719	17.588	-283	30.360	-487	42.775	-686	1098
620	4.3845	-695	17.305	-274	29.873	-471	42.089	-660	1116
630	4.3150	-674	17.031	-266	29.402	-457	41.429	-640	1134
640	4.2476	-654	16.765	-257	28.945	-442	40.789	-620	1152
650	4.1822	-633	16.508	-249	28.503	-429	40.169	-604	1170
660	4.1189	-614	16.259	-242	28.074	-414	39.565	-580	1188
670	4.0575	-596	16.017	-234	27.660	-404	38.985	-566	1206
680	3.9979	-579	15.783	-227	27.256	-390	38.419	-546	1224
690	3.9400	-562	15.556	-222	26.866	-381	37.873	-534	1242

TABLE 4.- DENSITY ρ/ρ_0 OF MOLECULAR NITROGEN - Concluded

°K	10 atm		40 atm		70 atm		100 atm		°R
700	3.8838	- 546	15.334	- 214	26.485	- 368	37.339	- 518	1260
710	3.8292	- 532	15.120	- 209	26.117	- 360	36.821	- 501	1278
720	3.7760	- 516	14.911	- 204	25.757	- 348	36.320	- 491	1296
730	3.7244	- 503	14.707	- 197	25.409	- 341	35.829	- 474	1314
740	3.6741	- 489	14.510	- 192	25.068	- 330	35.355	- 461	1332
750	3.6252	- 476	14.318	- 187	24.738	- 320	34.894	- 453	1350
760	3.5776	- 464	14.131	- 182	24.418	- 313	34.441	- 434	1368
770	3.5312	- 452	13.949	- 178	24.105	- 304	34.007	- 427	1386
780	3.4860	- 440	13.771	- 173	23.801	- 297	33.580	- 421	1404
790	3.4420	- 430	13.598	- 169	23.504	- 292	33.159	- 405	1422
800	3.3990	- 1996	13.429	- 783	23.212	- 1346	32.754	- 1883	1440
850	3.1994	- 1771	12.646	- 697	21.866	- 1193	30.871	- 1676	1530
900	3.0223	- 1588	11.949	- 623	20.673	- 1070	29.195	- 1502	1620
950	2.8635	- 1429	11.326	- 561	19.603	- 972	27.693	- 1351	1710
1000	2.7206	- 1293	10.765	- 508	18.631	- 868	26.342	- 1223	1800
1050	2.5913	- 1176	10.257	- 461	17.763	- 792	25.119	- 1116	1890
1100	2.4737	- 1073	9.796	- 422	16.971	- 725	24.003	- 1020	1980
1150	2.3664	- 983	9.374	- 387	16.246	- 667	22.983	- 934	2070
1200	2.2681	- 906	8.987	- 356	15.579	- 613	22.049	- 861	2160
1250	2.1775	- 835	8.631	- 329	14.966	- 565	21.188	- 795	2250
1300	2.0940	- 774	8.302	- 305	14.401	- 526	20.393	- 738	2340
1350	2.0166	- 718	7.997	- 283	13.875	- 486	19.655	- 684	2430
1400	1.9448	- 669	7.714	- 264	13.389	- 454	18.971	- 638	2520
1450	1.8779	- 624	7.450	- 245	12.935	- 425	18.333	- 599	2610
1500	1.8155	- 585	7.205	- 230	12.510	- 398	17.734	- 561	2700
1550	1.7570	- 548	6.975	- 217	12.112	- 373	17.173	- 525	2790
1600	1.7022	- 514	6.758	- 203	11.739	- 350	16.648	- 493	2880
1650	1.6508	- 485	6.555	- 191	11.389	- 329	16.155	- 465	2970
1700	1.6023	- 457	6.364	- 180	11.060	- 311	15.690	- 438	3060
1750	1.5566	- 431	6.184	- 170	10.749	- 294	15.252	- 415	3150
1800	1.5135	- 409	6.014	- 162	10.455	- 280	14.837	- 394	3240
1850	1.4726	- 386	5.852	- 153	10.175	- 263	14.443	- 371	3330
1900	1.4340	- 367	5.699	- 145	9.912	- 251	14.072	- 355	3420
1950	1.3973	- 348	5.554	- 138	9.661	- 238	13.717	- 336	3510
2000	1.3625	- 333	5.416	- 131	9.423	- 227	13.381	- 320	3600
2050	1.3292	- 315	5.285	- 124	9.196	- 216	13.061	- 306	3690
2100	1.2977	- 302	5.161	- 120	8.980	- 207	12.755	- 290	3780
2150	1.2675	- 287	5.041	- 114	8.773	- 197	12.465	- 279	3870
2200	1.2388	- 275	4.927	- 108	8.576	- 188	12.186	- 266	3960
2250	1.2113	- 263	4.819	- 104	8.388	- 180	11.920	- 255	4050
2300	1.1850	- 251	4.715	- 100	8.208	- 173	11.665	- 244	4140
2350	1.1599	- 242	4.615	- 96	8.035	- 165	11.421	- 234	4230
2400	1.1357	- 232	4.519	- 91	7.870	- 159	11.187	- 225	4320
2450	1.1125	- 221	4.428	- 88	7.711	- 152	10.962	- 215	4410
2500	1.0904	- 214	4.340	- 85	7.559	- 147	10.747	- 208	4500
2550	1.0690	- 205	4.255	- 81	7.412	- 141	10.539	- 199	4590
2600	1.0485	- 197	4.174	- 78	7.271	- 136	10.340	- 192	4680
2650	1.0288	- 191	4.096	- 76	7.135	- 130	10.148	- 185	4770
2700	1.0097	- 183	4.020	- 72	7.005	- 126	9.963	- 179	4860
2750	.9914	- 177	3.948	- 70	6.879	- 122	9.784	- 173	4950
2800	.9737	- 170	3.878	- 68	6.757	- 117	9.611	- 165	5040
2850	.9567	- 165	3.810	- 65	6.640	- 113	9.446	- 160	5130
2900	.9402	- 159	3.745	- 64	6.527	- 110	9.286	- 156	5220
2950	.9243	- 154	3.681	- 61	6.417	- 107	9.130	- 150	5310
3000	.9089		3.620		6.310		8.980		5400

TABLE 5.- SPECIFIC HEAT C_p/R OF MOLECULAR NITROGEN

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
100	3.5012	- 1	3.5086	- 19	3.5353	- 91	3.5687	-218	180
110	3.5011	- 1	3.5067	- 13	3.5262	- 57	3.5469	-107	198
120	3.5010	- 1	3.5054	- 9	3.5205	- 38	3.5362	- 69	216
130	3.5009		3.5045	- 6	3.5167	- 28	3.5293	- 52	234
140	3.5009		3.5039	- 5	3.5139	- 21	3.5241	- 39	252
150	3.5009		3.5034	- 3	3.5118	- 16	3.5202	- 28	270
160	3.5009		3.5031	- 4	3.5102	- 14	3.5174	- 24	288
170	3.5009		3.5027	- 2	3.5088	- 11	3.5150	- 19	306
180	3.5009	1	3.5025	- 2	3.5077	- 7	3.5131	- 14	324
190	3.5010		3.5023	- 1	3.5070	- 7	3.5117	- 13	342
200	3.5010		3.5022	- 1	3.5063	- 5	3.5104	- 10	360
210	3.5010	1	3.5021		3.5058	- 4	3.5094	- 8	378
220	3.5011		3.5021	- 1	3.5054	- 5	3.5086	- 7	396
230	3.5011	2	3.5020	1	3.5049	- 2	3.5079	- 5	414
240	3.5013	1	3.5021		3.5047	- 2	3.5074	- 5	432
250	3.5014	2	3.5021	1	3.5045	- 1	3.5069	- 2	450
260	3.5016	2	3.5022	2	3.5044		3.5067	- 3	468
270	3.5018	4	3.5024	3	3.5044	2	3.5064		486
280	3.5022	4	3.5027	4	3.5046	2	3.5064	1	504
290	3.5026	5	3.5031	4	3.5048	3	3.5065	2	522
300	3.5031	5	3.5035	6	3.5051	5	3.5067	3	540
310	3.5036	8	3.5041	8	3.5056	6	3.5070	6	558
320	3.5044	10	3.5049	9	3.5062	9	3.5076	8	576
330	3.5054	11	3.5058	11	3.5071	10	3.5084	9	594
340	3.5065	13	3.5069	13	3.5081	12	3.5093	11	612
350	3.5078	16	3.5082	15	3.5093	15	3.5104	14	630
360	3.5094	17	3.5097	17	3.5108	16	3.5118	16	648
370	3.5111	20	3.5114	20	3.5124	19	3.5134	19	666
380	3.5131	23	3.5134	23	3.5143	23	3.5153	21	684
390	3.5154	25	3.5157	25	3.5166	24	3.5174	24	702
400	3.5179	27	3.5182	27	3.5190	26	3.5198	26	720
410	3.5206	31	3.5209	30	3.5216	31	3.5224	30	738
420	3.5237	33	3.5239	33	3.5247	32	3.5254	32	756
430	3.5270	36	3.5272	36	3.5279	36	3.5286	36	774
440	3.5306	38	3.5308	38	3.5315	37	3.5322	37	792
450	3.5344	42	3.5346	42	3.5352	42	3.5359	41	810
460	3.5386	44	3.5388	44	3.5394	44	3.5400	43	828
470	3.5430	46	3.5432	46	3.5438	45	3.5443	46	846
480	3.5476	50	3.5478	50	3.5483	50	3.5489	49	864
490	3.5526	52	3.5528	52	3.5533	52	3.5538	52	882
500	3.5578	54	3.5580	54	3.5585	53	3.5590	53	900
510	3.5632	56	3.5634	56	3.5638	56	3.5643	56	918
520	3.5688	59	3.5690	58	3.5694	59	3.5699	58	936
530	3.5747	61	3.5748	61	3.5753	61	3.5757	61	954
540	3.5808	63	3.5809	63	3.5814	62	3.5818	62	972
550	3.5871	65	3.5872	65	3.5876	65	3.5880	65	990
560	3.5936	67	3.5937	67	3.5941	67	3.5945	67	1008
570	3.6003	69	3.6004	69	3.6008	69	3.6012	68	1026
580	3.6072	70	3.6073	70	3.6077	70	3.6080	70	1044
590	3.6142	72	3.6143	72	3.6147	71	3.6150	72	1062
600	3.6214	73	3.6215	73	3.6218	73	3.6222	72	1080
610	3.6287	75	3.6288	75	3.6291	75	3.6294	75	1098
620	3.6362	75	3.6363	75	3.6366	75	3.6369	75	1116
630	3.6437	77	3.6438	77	3.6441	77	3.6444	77	1134
640	3.6514	77	3.6515	77	3.6518	77	3.6521	76	1152
650	3.6591	79	3.6592	79	3.6595	79	3.6597	79	1170
660	3.6670	79	3.6671	79	3.6674	79	3.6676	79	1188
670	3.6749	80	3.6750	80	3.6753	79	3.6755	80	1206
680	3.6829	80	3.6830	80	3.6832	80	3.6835	80	1224
690	3.6909	81	3.6910	81	3.6912	81	3.6915	80	1242

TABLE 5.- SPECIFIC HEAT C_p/R OF MOLECULAR NITROGEN - Continued

^oK	0.01 atm		0.1 atm		0.4 atm		0.7 atm		^oR
700	3.6990	81	3.6991	81	3.6993	81	3.6995	81	1260
710	3.7071	81	3.7072	81	3.7074	81	3.7076	81	1278
720	3.7152	82	3.7153	82	3.7155	82	3.7157	82	1296
730	3.7234	82	3.7235	82	3.7237	82	3.7239	82	1314
740	3.7316	82	3.7317	82	3.7319	82	3.7321	82	1332
750	3.7398	82	3.7399	82	3.7401	82	3.7403	82	1350
760	3.7480	82	3.7481	82	3.7483	82	3.7485	81	1368
770	3.7562	81	3.7563	81	3.7565	80	3.7566	81	1386
780	3.7643	82	3.7644	82	3.7645	82	3.7647	82	1404
790	3.7725	81	3.7726	81	3.7727	81	3.7729	81	1422
800	3.7806	790	3.7807	789	3.7808	790	3.7810	789	1440
900	3.8596	730	3.8596	730	3.8598	729	3.8599	729	1620
1000	3.9326	656	3.9326	656	3.9327	656	3.9328	656	1800
1100	3.9982	580	3.9982	580	3.9983	580	3.9984	580	1980
1200	4.0562	510	4.0562	510	4.0563	510	4.0564	509	2160
1300	4.1072	446	4.1072	446	4.1073	446	4.1073	446	2340
1400	4.1518	391	4.1518	391	4.1519	391	4.1519	391	2520
1500	4.1909	343	4.1909	343	4.1910	342	4.1910	343	2700
1600	4.2252	302	4.2252	302	4.2252	302	4.2253	302	2880
1700	4.2554	267	4.2554	267	4.2554	267	4.2555	267	3060
1800	4.2821	236	4.2821	236	4.2821	236	4.2822	235	3240
1900	4.3057	211	4.3057	211	4.3057	211	4.3057	211	3420
2000	4.3268	189	4.3268	189	4.3268	189	4.3268	189	3600
2100	4.3457	170	4.3457	170	4.3457	170	4.3457	170	3780
2200	4.3627	153	4.3627	153	4.3627	153	4.3627	153	3960
2300	4.3780	140	4.3780	140	4.3780	140	4.3780	140	4140
2400	4.3920	127	4.3920	127	4.3920	127	4.3920	127	4320
2500	4.4047	116	4.4047	116	4.4047	116	4.4047	116	4500
2600	4.4163	107	4.4163	107	4.4163	107	4.4163	107	4680
2700	4.4270	99	4.4270	99	4.4270	99	4.4270	99	4860
2800	4.4369	91	4.4369	91	4.4369	91	4.4369	91	5040
2900	4.4460	85	4.4460	85	4.4460	85	4.4460	85	5220
3000	4.4545		4.4545		4.4545		4.4545		5400

TABLE 5.- SPECIFIC HEAT C_p/R OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
100	3.613	-43							180
110	3.5697	-172							198
120	3.5525	-104	3.775	-80					216
130	3.5421	-77	3.695	-47	3.917	-131			234
140	3.5344	-56	3.6477	-274	3.786	-62	3.958	-114	252
150	3.5288	-43	3.6203	-195	3.7245	-402	3.844	-68	270
160	3.5245	-33	3.6008	-150	3.6843	-293	3.7764	-469	288
170	3.5212	-27	3.5858	-118	3.6550	-223	3.7295	-342	306
180	3.5185	-21	3.5740	-94	3.6327	-175	3.6953	-273	324
190	3.5164	-18	3.5646	-77	3.6152	-143	3.6680	-214	342
200	3.5146	-14	3.5569	-63	3.6009	-116	3.6466	-173	360
210	3.5132	-12	3.5506	-53	3.5893	-96	3.6293	-143	378
220	3.5120	-12	3.5453	-45	3.5797	-83	3.6150	-122	396
230	3.5108	-7	3.5408	-36	3.5714	-67	3.6028	-101	414
240	3.5101	-7	3.5372	-32	3.5647	-59	3.5927	-86	432
250	3.5094	-5	3.5340	-27	3.5588	-49	3.5841	-74	450
260	3.5089	-5	3.5313	-24	3.5539	-43	3.5767	-63	468
270	3.5084	-1	3.5289	-18	3.5496	-36	3.5704	-53	486
280	3.5083	-1	3.5271	-16	3.5460	-30	3.5651	-46	504
290	3.5082	1	3.5255	-12	3.5430	-26	3.5605	-40	522
300	3.5083	2	3.5243	-9	3.5404	-22	3.5565	-34	540
310	3.5085	5	3.5234	-7	3.5382	-17	3.5531	-27	558
320	3.5090	7	3.5227	-3	3.5365	-12	3.5504	-22	576
330	3.5097	8	3.5224		3.5353	-8	3.5482	-18	594
340	3.5105	10	3.5224	3	3.5345	-6	3.5464	-12	612
350	3.5115	14	3.5227	7	3.5339		3.5452	-8	630
360	3.5129	15	3.5234	9	3.5339	2	3.5444	-4	648
370	3.5144	18	3.5243	12	3.5341	7	3.5440		666
380	3.5162	21	3.5255	16	3.5348	10	3.5440	5	684
390	3.5183	24	3.5271	18	3.5358	14	3.5445	9	702
400	3.5207	25	3.5289	21	3.5372	16	3.5454	12	720
410	3.5232	30	3.5310	26	3.5388	21	3.5466	17	738
420	3.5262	31	3.5336	28	3.5409	24	3.5483	21	756
430	3.5293	35	3.5364	31	3.5433	28	3.5504	24	774
440	3.5328	37	3.5395	34	3.5461	30	3.5528	27	792
450	3.5365	41	3.5429	38	3.5491	35	3.5555	32	810
460	3.5406	43	3.5467	40	3.5526	37	3.5587	34	828
470	3.5449	45	3.5507	42	3.5563	40	3.5621	37	846
480	3.5494	49	3.5549	47	3.5603	44	3.5658	42	864
490	3.5543	52	3.5596	49	3.5647	47	3.5700	44	882
500	3.5595	53	3.5645	51	3.5694	49	3.5744	47	900
510	3.5648	55	3.5696	53	3.5743	51	3.5791	49	918
520	3.5703	59	3.5749	57	3.5794	55	3.5840	53	936
530	3.5762	60	3.5806	58	3.5849	56	3.5893	55	954
540	3.5822	62	3.5864	61	3.5905	59	3.5948	57	972
550	3.5884	65	3.5925	63	3.5964	62	3.6005	60	990
560	3.5949	66	3.5988	65	3.6026	63	3.6065	62	1008
570	3.6015	69	3.6053	67	3.6089	66	3.6127	64	1026
580	3.6084	70	3.6120	68	3.6155	68	3.6191	65	1044
590	3.6154	71	3.6188	70	3.6223	69	3.6256	68	1062
600	3.6225	73	3.6258	72	3.6292	70	3.6324	69	1080
610	3.6298	74	3.6330	73	3.6362	72	3.6393	71	1098
620	3.6372	75	3.6403	74	3.6434	73	3.6464	72	1116
630	3.6447	77	3.6477	75	3.6507	74	3.6536	73	1134
640	3.6524	76	3.6552	76	3.6581	75	3.6609	74	1152
650	3.6600	79	3.6628	78	3.6656	77	3.6683	76	1170
660	3.6679	79	3.6706	78	3.6733	77	3.6759	76	1188
670	3.6758	79	3.6784	78	3.6810	78	3.6835	77	1206
680	3.6837	80	3.6862	79	3.6888	78	3.6912	77	1224
690	3.6917	81	3.6941	80	3.6966	79	3.6989	78	1242

TABLE 5.- SPECIFIC HEAT C_p/R OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
700	3.6998	81	3.7021	80	3.7045	79	3.7067	79	1260
710	3.7079	80	3.7101	80	3.7124	79	3.7146	79	1278
720	3.7159	82	3.7181	81	3.7203	81	3.7225	79	1296
730	3.7241	82	3.7262	82	3.7284	80	3.7304	80	1314
740	3.7323	82	3.7344	81	3.7364	81	3.7384	80	1332
750	3.7405	82	3.7425	81	3.7445	81	3.7464	80	1350
760	3.7487	81	3.7506	81	3.7526	80	3.7544	80	1368
770	3.7568	81	3.7587	81	3.7606	80	3.7624	79	1386
780	3.7649	82	3.7668	81	3.7686	81	3.7703	81	1404
790	3.7731	81	3.7749	80	3.7767	79	3.7784	79	1422
800	3.7812	788	3.7829	785	3.7846	781	3.7863	777	1440
900	3.8600	729	3.8614	726	3.8627	723	3.8640	721	1620
1000	3.9329	656	3.9340	653	3.9350	651	3.9361	649	1800
1100	3.9985	579	3.9993	578	4.0001	577	4.0010	574	1980
1200	4.0564	510	4.0571	508	4.0578	507	4.0584	507	2160
1300	4.1074	446	4.1079	445	4.1085	444	4.1091	442	2340
1400	4.1520	390	4.1524	390	4.1529	389	4.1533	389	2520
1500	4.1910	343	4.1914	342	4.1918	342	4.1922	341	2700
1600	4.2253	302	4.2256	302	4.2260	301	4.2263	300	2880
1700	4.2555	267	4.2558	266	4.2561	266	4.2563	266	3060
1800	4.2822	236	4.2824	236	4.2827	235	4.2829	235	3240
1900	4.3058	211	4.3060	210	4.3062	210	4.3064	210	3420
2000	4.3269	189	4.3270	189	4.3272	189	4.3274	188	3600
2100	4.3458	169	4.3459	170	4.3461	169	4.3462	170	3780
2200	4.3627	153	4.3629	153	4.3630	153	4.3632	152	3960
2300	4.3780	140	4.3782	139	4.3783	139	4.3784	140	4140
2400	4.3920	127	4.3921	127	4.3922	127	4.3924	126	4320
2500	4.4047	116	4.4048	116	4.4049	116	4.4050	116	4500
2600	4.4163	107	4.4164	107	4.4165	107	4.4166	106	4680
2700	4.4270	99	4.4271	99	4.4272	98	4.4272	99	4860
2800	4.4369	91	4.4370	91	4.4370	91	4.4371	91	5040
2900	4.4460	85	4.4461	85	4.4461	85	4.4462	85	5220
3000	4.4545		4.4546		4.4546		4.4547		5400

TABLE 5.- SPECIFIC HEAT C_p/R OF MOLECULAR NITROGEN - Continued

°K	10 atm		40 atm		70 atm		100 atm		°R
140	3.958	-114							252
150	3.844	- 68							270
160	3.7764	- 469							288
170	3.7295	- 342							306
180	3.6953	- 273	4.522	-198					324
190	3.6680	- 214	4.3244	-1379	5.219	-359			342
200	3.6466	- 173	4.1865	-1021	4.860	-243	5.64	- 45	360
210	3.6293	- 143	4.0844	- 786	4.617	-175	5.19	- 30	378
220	3.6150	- 122	4.0058	- 627	4.442	-132	4.89	- 22	396
230	3.6028	- 101	3.9431	- 505	4.310	-103	4.67	- 16	414
240	3.5927	- 86	3.8926	- 421	4.207	- 83	4.51	- 13	432
250	3.5841	- 74	3.8505	- 350	4.124	- 68	4.38	- 10	450
260	3.5767	- 63	3.8155	- 299	4.056	- 56	4.28	- 8	468
270	3.5704	- 53	3.7856	- 253	4.000	- 47	4.20	- 7	486
280	3.5651	- 46	3.7603	- 219	3.953	- 40	4.128	- 58	504
290	3.5605	- 40	3.7384	- 189	3.913	- 35	4.070	- 49	522
300	3.5565	- 34	3.7195	- 164	3.878	- 30	4.021	- 42	540
310	3.5531	- 27	3.7031	- 142	3.848	- 26	3.979	- 36	558
320	3.5504	- 22	3.6889	- 125	3.822	- 23	3.943	- 32	576
330	3.5482	- 18	3.6764	- 108	3.799	- 20	3.911	- 28	594
340	3.5464	- 12	3.6656	- 95	3.779	- 17	3.883	- 25	612
350	3.5452	- 8	3.6561	- 81	3.7619	- 153	3.858	- 21	630
360	3.5444	- 4	3.6480	- 70	3.7466	- 135	3.837	- 20	648
370	3.5440		3.6410	- 59	3.7331	- 116	3.817	- 16	666
380	3.5440	5	3.6351	- 50	3.7215	- 102	3.801	- 15	684
390	3.5445	9	3.6301	- 41	3.7113	- 90	3.786	- 13	702
400	3.5454	12	3.6260	- 33	3.7023	- 75	3.773	- 12	720
410	3.5466	17	3.6227	- 24	3.6948	- 66	3.761	- 10	738
420	3.5483	21	3.6203	- 19	3.6882	- 53	3.7511	- 88	756
430	3.5504	24	3.6184	- 11	3.6829	- 45	3.7423	- 74	774
440	3.5528	27	3.6173	- 5	3.6784	- 38	3.7349	- 65	792
450	3.5555	32	3.6168		3.6746	- 26	3.7284	- 53	810
460	3.5587	34	3.6168	7	3.6720	- 22	3.7231	- 45	828
470	3.5621	37	3.6175	10	3.6698	- 13	3.7186	- 36	846
480	3.5658	42	3.6185	20	3.6685	- 6	3.7150	- 25	864
490	3.5700	44	3.6205	20	3.6679	1	3.7125	- 21	882
500	3.5744	47	3.6225	25	3.6680	5	3.7104	- 13	900
510	3.5791	49	3.6250	29	3.6685	10	3.7091	- 6	918
520	3.5840	53	3.6279	34	3.6695	17	3.7085	1	936
530	3.5893	55	3.6313	38	3.6712	21	3.7086	6	954
540	3.5948	57	3.6351	42	3.6733	26	3.7092	11	972
550	3.6005	60	3.6393	43	3.6759	29	3.7103	17	990
560	3.6065	62	3.6436	48	3.6788	35	3.7120	20	1008
570	3.6127	64	3.6484	50	3.6823	36	3.7140	25	1026
580	3.6191	65	3.6534	53	3.6859	41	3.7165	30	1044
590	3.6256	68	3.6587	55	3.6900	44	3.7195	34	1062
600	3.6324	69	3.6642	58	3.6944	45	3.7229	35	1080
610	3.6393	71	3.6700	59	3.6989	51	3.7264	41	1098
620	3.6464	72	3.6759	62	3.7040	50	3.7305	41	1116
630	3.6536	73	3.6821	63	3.7090	55	3.7346	46	1134
640	3.6609	74	3.6884	64	3.7145	55	3.7392	47	1152
650	3.6683	76	3.6948	67	3.7200	59	3.7439	50	1170
660	3.6759	76	3.7015	68	3.7259	60	3.7489	53	1188
670	3.6835	77	3.7083	69	3.7319	61	3.7542	55	1206
680	3.6912	77	3.7152	69	3.7380	61	3.7597	54	1224
690	3.6989	78	3.7221	72	3.7441	65	3.7651	58	1242

TABLE 5.- SPECIFIC HEAT C_p/R OF MOLECULAR NITROGEN - Concluded

°K	10 atm		40 atm		70 atm		100 atm		°R
700	3.7067	79	3.7293	71	3.7506	65	3.7709	59	1260
710	3.7146	79	3.7364	71	3.7571	65	3.7768	58	1278
720	3.7225	79	3.7435	74	3.7636	67	3.7826	62	1296
730	3.7304	80	3.7509	73	3.7703	69	3.7888	63	1314
740	3.7384	80	3.7582	74	3.7772	68	3.7951	63	1332
750	3.7464	80	3.7656	75	3.7840	69	3.8014	64	1350
760	3.7544	80	3.7731	74	3.7909	70	3.8078	65	1368
770	3.7624	79	3.7805	74	3.7979	69	3.8143	64	1386
780	3.7703	81	3.7879	76	3.8048	71	3.8207	66	1404
790	3.7784	79	3.7955	74	3.8119	69	3.8273	65	1422
800	3.7863	777	3.8029	737	3.8188	700	3.8338	666	1440
900	3.8640	721	3.8766	694	3.8888	668	3.9004	643	1620
1000	3.9361	649	3.9460	629	3.9556	610	3.9647	592	1800
1100	4.0010	574	4.0089	560	4.0166	546	4.0239	533	1980
1200	4.0584	507	4.0649	495	4.0712	485	4.0772	475	2160
1300	4.1091	442	4.1144	434	4.1197	424	4.1247	416	2340
1400	4.1533	389	4.1578	382	4.1621	374	4.1663	368	2520
1500	4.1922	341	4.1960	335	4.1995	331	4.2031	325	2700
1600	4.2263	300	4.2295	296	4.2326	292	4.2356	288	2880
1700	4.2563	266	4.2591	261	4.2618	257	4.2644	252	3060
1800	4.2829	235	4.2852	232	4.2875	228	4.2896	226	3240
1900	4.3064	210	4.3084	208	4.3103	206	4.3122	203	3420
2000	4.3274	188	4.3292	186	4.3309	183	4.3325	182	3600
2100	4.3462	170	4.3478	167	4.3492	166	4.3507	164	3780
2200	4.3632	152	4.3645	151	4.3658	149	4.3671	147	3960
2300	4.3784	140	4.3796	138	4.3807	137	4.3818	135	4140
2400	4.3924	126	4.3934	125	4.3944	124	4.3953	123	4320
2500	4.4050	116	4.4059	115	4.4068	114	4.4076	113	4500
2600	4.4166	106	4.4174	106	4.4182	105	4.4189	104	4680
2700	4.4272	99	4.4280	97	4.4287	97	4.4293	96	4860
2800	4.4371	91	4.4377	90	4.4384	89	4.4389	89	5040
2900	4.4462	85	4.4467	84	4.4473	83	4.4478	83	5220
3000	4.4547		4.4551		4.4556		4.4561		5400

TABLE 6.- ENTHALPY $\left(H - E_0^o\right)/RT_0$ OF MOLECULAR NITROGEN

^oK	0.01 atm		0.1 atm		0.4 atm		0.7 atm		^oR
100	1.2777	1281	1.2761	1283	1.2706	1292	1.2650	1300	180
110	1.4058	1283	1.4044	1284	1.3998	1290	1.3950	1297	198
120	1.5341	1281	1.5328	1283	1.5288	1288	1.5247	1292	216
130	1.6622	1282	1.6611	1283	1.6576	1287	1.6539	1292	234
140	1.7904	1281	1.7894	1283	1.7863	1285	1.7831	1289	252
150	1.9185	1282	1.9177	1283	1.9148	1286	1.9120	1289	270
160	2.0467	1281	2.0460	1281	2.0434	1284	2.0409	1286	288
170	2.1748	1282	2.1741	1283	2.1718	1285	2.1695	1287	306
180	2.3030	1281	2.3024	1282	2.3003	1283	2.2982	1285	324
190	2.4311	1282	2.4306	1282	2.4286	1285	2.4267	1286	342
200	2.5593	1282	2.5588	1283	2.5571	1283	2.5553	1285	360
210	2.6875	1281	2.6871	1281	2.6854	1283	2.6838	1284	378
220	2.8156	1283	2.8152	1282	2.8137	1284	2.8122	1285	396
230	2.9439	1282	2.9434	1283	2.9421	1283	2.9407	1284	414
240	3.0721	1281	3.0717	1281	3.0704	1282	3.0691	1283	432
250	3.2002	1282	3.1998	1282	3.1986	1283	3.1974	1284	450
260	3.3284	1282	3.3280	1283	3.3269	1283	3.3258	1284	468
270	3.4566	1282	3.4563	1282	3.4552	1283	3.4542	1284	486
280	3.5848	1282	3.5845	1282	3.5835	1283	3.5826	1283	504
290	3.7130	1282	3.7127	1282	3.7118	1283	3.7109	1284	522
300	3.8412	1283	3.8409	1283	3.8401	1284	3.8393	1284	540
310	3.9695	1283	3.9692	1284	3.9685	1283	3.9677	1284	558
320	4.0978	1283	4.0976	1283	4.0968	1284	4.0961	1284	576
330	4.2261	1283	4.2259	1283	4.2252	1284	4.2245	1285	594
340	4.3544	1284	4.3542	1284	4.3536	1284	4.3530	1285	612
350	4.4828	1285	4.4826	1285	4.4820	1286	4.4815	1285	630
360	4.6113	1285	4.6111	1285	4.6106	1285	4.6100	1286	648
370	4.7398	1285	4.7396	1285	4.7391	1286	4.7386	1286	666
380	4.8683	1287	4.8681	1288	4.8677	1287	4.8672	1288	684
390	4.9970	1287	4.9969	1287	4.9964	1288	4.9960	1288	702
400	5.1257	1289	5.1256	1289	5.1252	1289	5.1248	1289	720
410	5.2546	1289	5.2545	1289	5.2541	1289	5.2537	1290	738
420	5.3835	1291	5.3834	1291	5.3830	1292	5.3827	1292	756
430	5.5126	1291	5.5125	1291	5.5122	1291	5.5119	1291	774
440	5.6417	1294	5.6416	1294	5.6413	1294	5.6410	1295	792
450	5.7711	1294	5.7710	1294	5.7707	1295	5.7705	1294	810
460	5.9005	1296	5.9004	1296	5.9002	1296	5.8999	1297	828
470	6.0301	1298	6.0300	1298	6.0298	1298	6.0296	1298	846
480	6.1599	1300	6.1598	1300	6.1596	1301	6.1594	1301	864
490	6.2899	1301	6.2898	1301	6.2897	1301	6.2895	1301	882
500	6.4200	1304	6.4199	1304	6.4198	1304	6.4196	1305	900
510	6.5504	1305	6.5503	1306	6.5502	1305	6.5501	1305	918
520	6.6809	1308	6.6809	1308	6.6807	1308	6.6806	1308	936
530	6.8117	1310	6.8117	1310	6.8115	1311	6.8114	1311	954
540	6.9427	1312	6.9427	1312	6.9426	1312	6.9425	1312	972
550	7.0739	1314	7.0739	1314	7.0738	1314	7.0737	1314	990
560	7.2053	1317	7.2053	1317	7.2052	1317	7.2051	1318	1008
570	7.3370	1319	7.3370	1319	7.3369	1319	7.3369	1319	1026
580	7.4689	1322	7.4689	1322	7.4688	1323	7.4688	1322	1044
590	7.6011	1324	7.6011	1324	7.6011	1324	7.6010	1325	1062
600	7.7335	1327	7.7335	1327	7.7335	1327	7.7335	1327	1080
610	7.8662	1330	7.8662	1330	7.8662	1330	7.8662	1330	1098
620	7.9992	1333	7.9992	1333	7.9992	1333	7.9992	1333	1116
630	8.1325	1335	8.1325	1335	8.1325	1335	8.1325	1336	1134
640	8.2660	1338	8.2660	1338	8.2660	1339	8.2661	1338	1152
650	8.3998	1341	8.3998	1341	8.3999	1341	8.3999	1341	1170
660	8.5339	1344	8.5339	1344	8.5340	1344	8.5340	1344	1188
670	8.6683	1347	8.6683	1347	8.6684	1347	8.6684	1348	1206
680	8.8030	1349	8.8030	1349	8.8031	1349	8.8032	1349	1224
690	8.9379	1353	8.9379	1353	8.9380	1353	8.9381	1353	1242

TABLE 6.- ENTHALPY $\left(H - E_0^{\circ}\right)/RT_0$ OF MOLECULAR NITROGEN - Continued

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
700	9.0732	1356	9.0732	1356	9.0733	1356	9.0734	1356	1260
710	9.2088	1358	9.2088	1358	9.2089	1358	9.2090	1358	1278
720	9.3446	1362	9.3446	1362	9.3447	1362	9.3448	1363	1296
730	9.4808	1364	9.4808	1364	9.4809	1365	9.4811	1364	1314
740	9.6172	1368	9.6172	1368	9.6174	1368	9.6175	1368	1332
750	9.7540	1370	9.7540	1370	9.7542	1370	9.7543	1370	1350
760	9.8910	1374	9.8910	1374	9.8912	1374	9.8913	1374	1368
770	10.0284	1376	10.0284	1376	10.0286	1376	10.0287	1376	1386
780	10.1660	1380	10.1660	1380	10.1662	1380	10.1663	1381	1404
790	10.3040	1383	10.3040	1383	10.3042	1383	10.3044	1383	1422
800	10.4423	13986	10.4423	13986	10.4425	13987	10.4427	13987	1440
900	11.8409	14265	11.8409	14265	11.8412	14265	11.8414	14266	1620
1000	13.2674	14519	13.2674	14519	13.2677	14520	13.2680	14520	1800
1100	14.7193	14746	14.7193	14746	14.7197	14746	14.7200	14746	1980
1200	16.1939	14944	16.1939	14944	16.1943	14945	16.1946	14945	2160
1300	17.6883	15119	17.6883	15119	17.6888	15119	17.6891	15119	2340
1400	19.2002	15273	19.2002	15273	19.2007	15273	19.2010	15274	2520
1500	20.7275	15407	20.7275	15407	20.7280	15407	20.7284	15407	2700
1600	22.2682	15524	22.2682	15524	22.2687	15524	22.2691	15524	2880
1700	23.8206	15628	23.8206	15628	23.8211	15628	23.8215	15629	3060
1800	25.3834	15720	25.3834	15720	25.3839	15721	25.3844	15720	3240
1900	26.9554	15802	26.9554	15802	26.9560	15802	26.9564	15802	3420
2000	28.5356	15876	28.5356	15876	28.5362	15876	28.5366	15876	3600
2100	30.1232	15940	30.1232	15940	30.1238	15940	30.1242	15940	3780
2200	31.7172	16000	31.7172	16000	31.7178	16000	31.7182	16000	3960
2300	33.3172	16053	33.3172	16053	33.3178	16053	33.3182	16053	4140
2400	34.9225	16102	34.9225	16102	34.9231	16102	34.9235	16102	4320
2500	36.5327	16146	36.5327	16146	36.5333	16146	36.5337	16147	4500
2600	38.1473	16188	38.1473	16188	38.1479	16188	38.1484	16188	4680
2700	39.7661	16225	39.7661	16225	39.7667	16225	39.7672	16225	4860
2800	41.3886	16259	41.3886	16259	41.3892	16259	41.3897	16259	5040
2900	43.0145	16292	43.0145	16292	43.0151	16292	43.0156	16292	5220
3000	44.6437		44.6437		44.6443		44.6448		5400

TABLE 6.- ENTHALPY $\left(H - E_0{}^{\circ}\right)/RT_0$ OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
100	1.2589	1313							180
110	1.3902	1303	1.3343	1422					198
120	1.5205	1298	1.4765	1363					216
130	1.6503	1296	1.6128	1343	1.5721	1405			234
140	1.7799	1292	1.7471	1330	1.7126	1372	1.6761	1426	252
150	1.9091	1292	1.8801	1322	1.8498	1358	1.8187	1394	270
160	2.0383	1289	2.0123	1314	1.9856	1342	1.9581	1372	288
170	2.1672	1289	2.1437	1311	2.1198	1334	2.0953	1360	306
180	2.2961	1287	2.2748	1306	2.2532	1326	2.2313	1347	324
190	2.4248	1287	2.4054	1304	2.3858	1321	2.3660	1339	342
200	2.5535	1287	2.5358	1301	2.5179	1317	2.4999	1332	360
210	2.6822	1285	2.6659	1298	2.6496	1311	2.6331	1325	378
220	2.8107	1286	2.7957	1298	2.7807	1310	2.7656	1321	396
230	2.9393	1286	2.9255	1296	2.9117	1306	2.8977	1317	414
240	3.0679	1284	3.0551	1293	3.0423	1303	3.0294	1313	432
250	3.1963	1284	3.1844	1294	3.1726	1302	3.1607	1311	450
260	3.3247	1285	3.3138	1292	3.3028	1300	3.2918	1309	468
270	3.4532	1284	3.4430	1292	3.4328	1300	3.4227	1306	486
280	3.5816	1285	3.5722	1290	3.5628	1297	3.5533	1304	504
290	3.7101	1284	3.7012	1290	3.6925	1296	3.6837	1303	522
300	3.8385	1284	3.8302	1291	3.8221	1296	3.8140	1302	540
310	3.9669	1285	3.9593	1290	3.9517	1295	3.9442	1300	558
320	4.0954	1285	4.0883	1289	4.0812	1295	4.0742	1299	576
330	4.2239	1284	4.2172	1289	4.2107	1293	4.2041	1298	594
340	4.3523	1286	4.3461	1290	4.3400	1294	4.3339	1298	612
350	4.4809	1286	4.4751	1290	4.4694	1294	4.4637	1298	630
360	4.6095	1286	4.6041	1290	4.5988	1294	4.5935	1298	648
370	4.7381	1286	4.7331	1290	4.7282	1293	4.7233	1297	666
380	4.8667	1289	4.8621	1291	4.8575	1295	4.8530	1298	684
390	4.9956	1288	4.9912	1291	4.9870	1294	4.9828	1297	702
400	5.1244	1290	5.1203	1293	5.1164	1296	5.1125	1299	720
410	5.2534	1290	5.2496	1293	5.2460	1296	5.2424	1298	738
420	5.3824	1291	5.3789	1295	5.3756	1297	5.3722	1300	756
430	5.5115	1292	5.5084	1294	5.5053	1297	5.5022	1299	774
440	5.6407	1295	5.6378	1297	5.6350	1299	5.6321	1302	792
450	5.7702	1295	5.7675	1297	5.7649	1299	5.7623	1302	810
460	5.8997	1296	5.8972	1299	5.8948	1301	5.8925	1303	828
470	6.0293	1299	6.0271	1301	6.0249	1303	6.0228	1305	846
480	6.1592	1301	6.1572	1302	6.1552	1305	6.1533	1306	864
490	6.2893	1301	6.2874	1304	6.2857	1305	6.2839	1308	882
500	6.4194	1305	6.4178	1306	6.4162	1308	6.4147	1310	900
510	6.5499	1306	6.5484	1308	6.5470	1309	6.5457	1310	918
520	6.6805	1308	6.6792	1310	6.6779	1312	6.6767	1314	936
530	6.8113	1311	6.8102	1312	6.8091	1314	6.8081	1314	954
540	6.9424	1312	6.9414	1314	6.9405	1316	6.9395	1317	972
550	7.0736	1315	7.0728	1316	7.0721	1317	7.0712	1319	990
560	7.2051	1317	7.2044	1319	7.2038	1320	7.2031	1322	1008
570	7.3368	1320	7.3363	1320	7.3358	1322	7.3353	1323	1026
580	7.4688	1322	7.4683	1324	7.4680	1326	7.4676	1326	1044
590	7.6010	1324	7.6007	1326	7.6006	1326	7.6002	1329	1062
600	7.7334	1328	7.7333	1328	7.7332	1330	7.7331	1331	1080
610	7.8662	1330	7.8661	1332	7.8662	1333	7.8662	1333	1098
620	7.9992	1333	7.9993	1334	7.9995	1335	7.9995	1337	1116
630	8.1325	1336	8.1327	1337	8.1330	1338	8.1332	1339	1134
640	8.2661	1338	8.2664	1339	8.2668	1340	8.2671	1341	1152
650	8.3999	1341	8.4003	1343	8.4008	1344	8.4012	1345	1170
660	8.5340	1345	8.5346	1345	8.5352	1346	8.5357	1347	1188
670	8.6685	1347	8.6691	1348	8.6698	1348	8.6704	1349	1206
680	8.8032	1349	8.8039	1350	8.8046	1351	8.8053	1353	1224
690	8.9381	1354	8.9389	1355	8.9397	1355	8.9406	1356	1242

TABLE 6.- ENTHALPY $\left(H - E_0^\circ\right)/RT_0$ OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
700	9.0735	1356	9.0744	1357	9.0752	1358	9.0762	1359	1260
710	9.2091	1358	9.2101	1359	9.2110	1360	9.2121	1360	1278
720	9.3449	1363	9.3460	1363	9.3470	1364	9.3481	1365	1296
730	9.4812	1364	9.4823	1365	9.4834	1366	9.4846	1367	1314
740	9.6176	1368	9.6188	1369	9.6200	1369	9.6213	1370	1332
750	9.7544	1370	9.7557	1371	9.7569	1372	9.7583	1372	1350
760	9.8914	1375	9.8928	1375	9.8941	1376	9.8955	1377	1368
770	10.0289	1376	10.0303	1377	10.0317	1377	10.0332	1378	1386
780	10.1665	1380	10.1680	1381	10.1694	1381	10.1710	1382	1404
790	10.3045	1383	10.3061	1383	10.3075	1385	10.3092	1385	1422
800	10.4428	13988	10.4444	13994	10.4460	13999	10.4477	14005	1440
900	11.8416	14267	11.8438	14270	11.8459	14275	11.8482	14278	1620
1000	13.2683	14520	13.2708	14524	13.2734	14527	13.2760	14530	1800
1100	14.7203	14747	14.7232	14750	14.7261	14753	14.7290	14756	1980
1200	16.1950	14944	16.1982	14947	16.2014	14949	16.2046	14951	2160
1300	17.6894	15120	17.6929	15121	17.6963	15123	17.6997	15125	2340
1400	19.2014	15274	19.2050	15275	19.2086	15277	19.2122	15278	2520
1500	20.7288	15407	20.7325	15409	20.7363	15410	20.7400	15412	2700
1600	22.2695	15524	22.2734	15525	22.2773	15526	22.2812	15528	2880
1700	23.8219	15629	23.8259	15630	23.8299	15631	23.8340	15631	3060
1800	25.3848	15720	25.3889	15721	25.3930	15722	25.3971	15722	3240
1900	26.9568	15802	26.9610	15803	26.9652	15803	26.9693	15805	3420
2000	28.5370	15876	28.5413	15877	28.5455	15878	28.5498	15878	3600
2100	30.1246	15941	30.1290	15940	30.1333	15941	30.1376	15942	3780
2200	31.7187	16000	31.7230	16001	31.7274	16001	31.7318	16001	3960
2300	33.3187	16053	33.3231	16053	33.3275	16054	33.3319	16055	4140
2400	34.9240	16102	34.9284	16103	34.9329	16103	34.9374	16103	4320
2500	36.5342	16146	36.5387	16146	36.5432	16147	36.5477	16147	4500
2600	38.1488	16188	38.1533	16189	38.1579	16188	38.1624	16189	4680
2700	39.7676	16225	39.7722	16225	39.7767	16226	39.7813	16226	4860
2800	41.3901	16259	41.3947	16259	41.3993	16259	41.4039	16259	5040
2900	43.0160	16292	43.0206	16293	43.0252	16293	43.0298	16293	5220
3000	44.6452		44.6499		44.6545		44.6591		5400

TABLE 6.- ENTHALPY $\left(H - E_0^{\,o}\right)/RT_0$ OF MOLECULAR NITROGEN - Continued

^oK	10 atm		40 atm		70 atm		100 atm		^oR
140	1.6761	1426							252
150	1.8187	1394							270
160	1.9581	1372							288
170	2.0953	1360							306
180	2.2313	1347	1.9967	1615					324
190	2.3660	1339	2.1582	1558	1.941	184			342
200	2.4999	1332	2.3140	1513	2.125	173	1.94	20	360
210	2.6331	1325	2.4653	1479	2.298	166	2.14	18	378
220	2.7656	1321	2.6132	1455	2.464	160	2.32	18	396
230	2.8977	1317	2.7587	1435	2.624	156	2.50	17	414
240	3.0294	1313	2.9022	1417	2.780	152	2.67	16	432
250	3.1607	1311	3.0439	1398	2.932	149	2.83	15	450
260	3.2918	1309	3.1837	1395	3.081	148	2.98	16	468
270	3.4227	1306	3.3232	1382	3.229	146	3.14	16	486
280	3.5533	1304	3.4614	1372	3.375	144	3.298	150	504
290	3.6837	1303	3.5986	1365	3.519	143	3.448	148	522
300	3.8140	1302	3.7351	1359	3.662	141	3.596	147	540
310	3.9442	1300	3.8710	1353	3.803	140	3.743	145	558
320	4.0742	1299	4.0063	1347	3.943	140	3.888	144	576
330	4.2041	1298	4.1410	1345	4.083	139	4.032	142	594
340	4.3339	1298	4.2755	1340	4.222	138	4.174	142	612
350	4.4637	1298	4.4095	1337	4.3600	1374	4.316	141	630
360	4.5935	1298	4.5432	1335	4.4974	1369	4.457	140	648
370	4.7233	1297	4.6767	1329	4.6343	1364	4.597	139	666
380	4.8530	1298	4.8096	1331	4.7707	1361	4.736	139	684
390	4.9828	1297	4.9427	1329	4.9068	1358	4.875	138	702
400	5.1125	1299	5.0756	1327	5.0426	1354	5.013	138	720
410	5.2424	1298	5.2083	1325	5.1780	1351	5.151	138	738
420	5.3722	1300	5.3408	1326	5.3131	1351	5.2892	1374	756
430	5.5022	1299	5.4734	1323	5.4482	1345	5.4266	1365	774
440	5.6321	1302	5.6057	1325	5.5827	1348	5.5631	1368	792
450	5.7623	1302	5.7382	1323	5.7175	1343	5.6999	1362	810
460	5.8925	1303	5.8705	1325	5.8518	1344	5.8361	1362	828
470	6.0228	1305	6.0030	1325	5.9862	1342	5.9723	1361	846
480	6.1533	1306	6.1355	1325	6.1204	1344	6.1084	1360	864
490	6.2839	1308	6.2680	1325	6.2548	1343	6.2444	1358	882
500	6.4147	1310	6.4005	1327	6.3891	1343	6.3802	1359	900
510	6.5457	1310	6.5332	1327	6.5234	1342	6.5161	1357	918
520	6.6767	1314	6.6659	1329	6.6576	1344	6.6518	1359	936
530	6.8081	1314	6.7988	1330	6.7920	1345	6.7877	1356	954
540	6.9395	1317	6.9318	1332	6.9265	1345	6.9233	1359	972
550	7.0712	1319	7.0650	1332	7.0610	1346	7.0592	1358	990
560	7.2031	1322	7.1982	1335	7.1956	1348	7.1950	1360	1008
570	7.3353	1323	7.3317	1336	7.3304	1348	7.3310	1359	1026
580	7.4676	1326	7.4653	1339	7.4652	1351	7.4669	1363	1044
590	7.6002	1329	7.5992	1340	7.6003	1351	7.6032	1361	1062
600	7.7331	1331	7.7332	1342	7.7354	1353	7.7393	1363	1080
610	7.8662	1333	7.8674	1346	7.8707	1355	7.8756	1365	1098
620	7.9995	1337	8.0020	1347	8.0062	1358	8.0121	1368	1116
630	8.1332	1339	8.1367	1349	8.1420	1357	8.1489	1368	1134
640	8.2671	1341	8.2716	1351	8.2777	1361	8.2857	1369	1152
650	8.4012	1345	8.4067	1354	8.4138	1364	8.4226	1371	1170
660	8.5357	1347	8.5421	1356	8.5502	1365	8.5597	1374	1188
670	8.6704	1349	8.6777	1359	8.6867	1368	8.6971	1375	1206
680	8.8053	1353	8.8136	1361	8.8235	1368	8.8346	1378	1224
690	8.9406	1356	8.9497	1364	8.9603	1374	8.9724	1379	1242

TABLE 6.- ENTHALPY $\left(H - E_0^{\circ}\right)/RT_0$ OF MOLECULAR NITROGEN - Concluded

$^{\circ}K$	10 atm		40 atm		70 atm		100 atm		$^{\circ}R$
700	9.0762	1359	9.0861	1366	9.0977	1373	9.1103	1381	1260
710	9.2121	1360	9.2227	1369	9.2350	1377	9.2484	1384	1278
720	9.3481	1365	9.3596	1373	9.3727	1379	9.3868	1386	1296
730	9.4846	1367	9.4969	1373	9.5106	1381	9.5254	1388	1314
740	9.6213	1370	9.6342	1378	9.6487	1384	9.6642	1391	1332
750	9.7583	1372	9.7720	1380	9.7871	1386	9.8033	1392	1350
760	9.8955	1377	9.9100	1382	9.9257	1390	9.9425	1395	1368
770	10.0332	1378	10.0482	1385	10.0647	1391	10.0820	1398	1386
780	10.1710	1382	10.1867	1389	10.2038	1394	10.2218	1400	1404
790	10.3092	1385	10.3256	1391	10.3432	1397	10.3618	1402	1422
800	10.4477	14005	10.4647	14058	10.4829	14108	10.5020	14157	1440
900	11.8482	14278	11.8705	14320	11.8937	14359	11.9177	14396	1620
1000	13.2760	14530	13.3025	14563	13.3296	14595	13.3573	14624	1800
1100	14.7290	14756	14.7588	14781	14.7891	14806	14.8197	14832	1980
1200	16.2046	14951	16.2369	14974	16.2697	14994	16.3029	15014	2160
1300	17.6997	15125	17.7343	15143	17.7691	15160	17.8043	15178	2340
1400	19.2122	15278	19.2486	15293	19.2851	15308	19.3221	15321	2520
1500	20.7400	15412	20.7779	15424	20.8159	15438	20.8542	15450	2700
1600	22.2812	15528	22.3203	15539	22.3597	15549	22.3992	15558	2880
1700	23.8340	15631	23.8742	15640	23.9146	15649	23.9550	15659	3060
1800	25.3971	15722	25.4382	15731	25.4795	15738	25.5209	15745	3240
1900	26.9693	15805	27.0113	15811	27.0533	15819	27.0954	15825	3420
2000	28.5498	15878	28.5924	15884	28.6352	15889	28.6779	15895	3600
2100	30.1376	15942	30.1808	15947	30.2241	15952	30.2674	15958	3780
2200	31.7318	16001	31.7755	16006	31.8193	16010	31.8632	16015	3960
2300	33.3319	16055	33.3761	16058	33.4203	16063	33.4647	16065	4140
2400	34.9374	16103	34.9819	16107	35.0266	16111	35.0712	16115	4320
2500	36.5477	16147	36.5926	16150	36.6377	16153	36.6827	16156	4500
2600	38.1624	16189	38.2076	16192	38.2530	16193	38.2983	16196	4680
2700	39.7813	16226	39.8268	16228	39.8723	16231	39.9179	16234	4860
2800	41.4039	16259	41.4496	16262	41.4954	16264	41.5413	16265	5040
2900	43.0298	16293	43.0758	16295	43.1218	16296	43.1678	16298	5220
3000	44.6591		44.7053		44.7514		44.7976		5400

TABLE 7.- ENTROPY S/R OF MOLECULAR NITROGEN

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
100	23.8092	3338	21.5037	3344	20.1079	3364	19.5381	3390	180
110	24.1430	3046	21.8381	3051	20.4443	3066	19.8771	3082	198
120	24.4476	2801	22.1432	2805	20.7509	2816	20.1853	2826	216
130	24.7277	2596	22.4237	2597	21.0325	2605	20.4679	2613	234
140	24.9873	2415	22.6834	2417	21.2930	2424	20.7292	2431	252
150	25.2288	2259	22.9251	2261	21.5354	2265	20.9723	2270	270
160	25.4547	2123	23.1512	2124	21.7619	2197	21.1993	2133	288
170	25.6670	2000	23.3636	2001	21.9816	1936	21.4126	2007	306
180	25.8670	1893	23.5637	1894	22.1752	1897	21.6133	1900	324
190	26.0563	1796	23.7531	1797	22.3649	1798	21.8033	1801	342
200	26.2359	1708	23.9328	1709	22.5447	1711	21.9834	1712	360
210	26.4067	1630	24.1037	1629	22.7158	1631	22.1546	1633	378
220	26.5697	1556	24.2666	1557	22.8789	1558	22.3179	1559	396
230	26.7253	1490	24.4223	1490	23.0347	1492	22.4738	1493	414
240	26.8743	1429	24.5713	1429	23.1839	1430	22.6231	1431	432
250	27.0172	1373	24.7142	1374	23.3269	1374	22.7662	1375	450
260	27.1545	1322	24.8516	1322	23.4643	1323	22.9037	1324	468
270	27.2867	1273	24.9838	1273	23.5966	1274	23.0361	1275	486
280	27.4140	1229	25.1111	1229	23.7240	1230	23.1636	1231	504
290	27.5369	1188	25.2340	1189	23.8470	1189	23.2867	1189	522
300	27.6557	1149	25.3529	1149	23.9659	1149	23.4056	1150	540
310	27.7706	1112	25.4678	1112	24.0808	1113	23.5206	1113	558
320	27.8818	1079	25.5790	1079	24.1921	1080	23.6319	1080	576
330	27.9897	1046	25.6869	1046	24.3001	1046	23.7399	1047	594
340	28.0943	1017	25.7915	1017	24.4047	1018	23.8446	1018	612
350	28.1960	988	25.8932	988	24.5065	988	23.9464	988	630
360	28.2948	962	25.9920	963	24.6053	962	24.0452	963	648
370	28.3910	937	26.0883	937	24.7015	938	24.1415	938	666
380	28.4847	912	26.1820	912	24.7953	912	24.2353	912	684
390	28.5759	891	26.2732	891	24.8865	891	24.3265	892	702
400	28.6650	869	26.3623	869	24.9756	869	24.4157	869	720
410	28.7519	849	26.4492	849	25.0625	850	24.5026	850	738
420	28.8368	829	26.5341	829	25.1475	829	24.5876	829	756
430	28.9197	811	26.6170	812	25.2304	811	24.6705	811	774
440	29.0008	794	26.6982	793	25.3115	794	24.7516	795	792
450	29.0802	777	26.7775	777	25.3909	778	24.8311	777	810
460	29.1579	762	26.8552	762	25.4687	762	24.9088	762	828
470	29.2341	746	26.9314	746	25.5449	746	24.9850	747	846
480	29.3087	732	27.0060	732	25.6195	732	25.0597	732	864
490	29.3819	719	27.0792	719	25.6927	719	25.1329	719	882
500	29.4538	705	27.1511	705	25.7646	705	25.2048	705	900
510	29.5243	692	27.2216	692	25.8351	692	25.2753	692	918
520	29.5935	680	27.2908	680	25.9043	681	25.3445	681	936
530	29.6615	669	27.3588	669	25.9724	669	25.4126	669	954
540	29.7284	658	27.4257	658	26.0393	658	25.4795	658	972
550	29.7942	647	27.4915	647	26.1051	647	25.5453	647	990
560	29.8589	636	27.5562	636	26.1698	636	25.6100	636	1008
570	29.9225	627	27.6198	628	26.2334	627	25.6736	628	1026
580	29.9852	617	27.6826	617	26.2961	617	25.7364	617	1044
590	30.0469	608	27.7443	608	26.3578	608	25.7981	608	1062
600	30.1077	600	27.8051	600	26.4186	600	25.8589	600	1080
610	30.1677	590	27.8651	590	26.4786	590	25.9189	590	1098
620	30.2267	583	27.9241	583	26.5376	583	25.9779	583	1116
630	30.2850	574	27.9824	574	26.5959	574	26.0362	574	1134
640	30.3424	567	28.0398	567	26.6533	567	26.0936	567	1152
650	30.3991	559	28.0965	559	26.7100	560	26.1503	559	1170
660	30.4550	552	28.1524	552	26.7660	552	26.2062	553	1188
670	30.5102	545	28.2076	545	26.8212	545	26.2615	545	1206
680	30.5647	538	28.2621	538	26.8757	538	26.3160	538	1224
690	30.6185	532	28.3159	532	26.9295	532	26.3698	532	1242

TABLE 7.- ENTROPY S/R OF MOLECULAR NITROGEN - Continued

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
700	30.6717	525	28.3691	525	26.9827	525	26.4230	525	1260
710	30.7242	519	28.4216	519	27.0352	519	26.4755	519	1278
720	30.7761	513	28.4735	513	27.0871	513	26.5274	513	1296
730	30.8274	507	28.5248	507	27.1384	507	26.5787	507	1314
740	30.8781	502	28.5755	502	27.1891	502	26.6294	502	1332
750	30.9283	496	28.6257	496	27.2393	496	26.6796	496	1350
760	30.9779	490	28.6753	490	27.2889	490	26.7292	490	1368
770	31.0269	485	28.7243	485	27.3379	485	26.7782	485	1386
780	31.0754	481	28.7728	481	27.3864	481	26.8267	481	1404
790	31.1235	475	28.8209	475	27.4345	475	26.8748	475	1422
800	31.1710	4498	28.8684	4498	27.4820	4498	26.9223	4499	1440
900	31.6208	4105	29.3182	4105	27.9318	4106	27.3722	4105	1620
1000	32.0313	3779	29.7287	3779	28.3424	3779	27.7827	3779	1800
1100	32.4092	3504	30.1066	3504	28.7203	3504	28.1606	3504	1980
1200	32.7596	3268	30.4570	3268	29.0707	3268	28.5110	3269	2160
1300	33.0864	3060	30.7838	3060	29.3975	3060	28.8379	3060	2340
1400	33.3924	2879	31.0898	2879	29.7035	2879	29.1439	2879	2520
1500	33.6803	2716	31.3777	2716	29.9914	2716	29.4318	2716	2700
1600	33.9519	2570	31.6493	2570	30.2630	2570	29.7034	2570	2880
1700	34.2089	2440	31.9063	2440	30.5200	2440	29.9604	2440	3060
1800	34.4529	2322	32.1503	2322	30.7640	2322	30.2044	2322	3240
1900	34.6851	2214	32.3825	2214	30.9962	2214	30.4366	2214	3420
2000	34.9065	2116	32.6039	2116	31.2176	2116	30.6580	2116	3600
2100	35.1181	2025	32.8155	2025	31.4292	2025	30.8696	2025	3780
2200	35.3206	1943	33.0180	1943	31.6317	1943	31.0721	1943	3960
2300	35.5149	1866	33.2123	1866	31.8260	1866	31.2664	1866	4140
2400	35.7015	1796	33.3989	1796	32.0126	1796	31.4530	1796	4320
2500	35.8811	1729	33.5785	1729	32.1922	1729	31.6326	1729	4500
2600	36.0540	1669	33.7514	1669	32.3651	1669	31.8055	1669	4680
2700	36.2209	1612	33.9183	1612	32.5320	1612	31.9724	1612	4860
2800	36.3821	1558	34.0795	1558	32.6932	1558	32.1336	1558	5040
2900	36.5379	1509	34.2353	1509	32.8490	1509	32.2894	1509	5220
3000	36.6888		34.3862		32.9999		32.4403		5400

TABLE 7.- ENTROPY S/R OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
100	19.1705	3420	17.607	424	16.55	77	15.19	153	180
110	19.5125	3099	18.031	338	17.321	406	16.72	55	198
120	19.8224	2837	18.3689	2983	17.727	322	17.266	360	216
130	20.1061	2623	18.6672	2719	18.0491	2844	17.626	301	234
140	20.3684	2436	18.9391	2506	18.3335	2590	17.9274	2688	252
150	20.6120	2276	19.1897	2330	18.5925	2389	18.1962	2458	270
160	20.8396	2137	19.4227	2179	18.8314	2225	18.4420	2273	288
170	21.0533	2011	19.6406	2045	19.0539	2082	18.6693	2122	306
180	21.2544	1902	19.8451	1931	19.2621	1959	18.8815	1991	324
190	21.4446	1803	20.0382	1826	19.4580	1851	19.0806	1876	342
200	21.6249	1714	20.2208	1734	19.6431	1753	19.2682	1775	360
210	21.7963	1635	20.3942	1650	19.8184	1669	19.4457	1686	378
220	21.9598	1560	20.5592	1575	19.9853	1589	19.6143	1602	396
230	22.1158	1494	20.7167	1507	20.1442	1519	19.7745	1531	414
240	22.2652	1433	20.8674	1443	20.2961	1453	19.9276	1465	432
250	22.4085	1376	21.0117	1385	20.4414	1394	20.0741	1404	450
260	22.5461	1325	21.1502	1332	20.5808	1342	20.2145	1350	468
270	22.6786	1275	21.2834	1283	20.7150	1289	20.3495	1296	486
280	22.8061	1231	21.4117	1237	20.8439	1244	20.4791	1250	504
290	22.9292	1190	21.5354	1195	20.9683	1201	20.6041	1207	522
300	23.0482	1151	21.6549	1156	21.0884	1161	20.7248	1166	540
310	23.1633	1113	21.7705	1118	21.2045	1122	20.8414	1128	558
320	23.2746	1080	21.8823	1085	21.3167	1089	20.9542	1092	576
330	23.3826	1048	21.9908	1051	21.4256	1054	21.0634	1058	594
340	23.4874	1018	22.0959	1021	21.5310	1025	21.1692	1029	612
350	23.5892	989	22.1980	992	21.6335	995	21.2721	998	630
360	23.6881	963	22.2972	966	21.7330	969	21.3719	971	648
370	23.7844	938	22.3938	940	21.8299	943	21.4690	946	666
380	23.8782	912	22.4878	915	21.9242	917	21.5636	919	684
390	23.9694	892	22.5793	894	22.0159	896	21.6555	899	702
400	24.0586	870	22.6687	872	22.1055	874	21.7454	875	720
410	24.1456	849	22.7559	851	22.1929	853	21.8329	855	738
420	24.2305	830	22.8410	832	22.2782	833	21.9184	835	756
430	24.3135	811	22.9242	813	22.3615	815	22.0019	816	774
440	24.3946	795	23.0055	796	22.4430	797	22.0835	799	792
450	24.4741	777	23.0851	778	22.5227	781	22.1634	782	810
460	24.5518	763	23.1629	764	22.6008	765	22.2416	766	828
470	24.6281	746	23.2393	748	22.6773	748	22.3182	750	846
480	24.7027	733	23.3141	733	22.7521	735	22.3932	736	864
490	24.7760	719	23.3874	721	22.8256	721	22.4668	722	882
500	24.8479	705	23.4595	706	22.8977	708	22.5390	708	900
510	24.9184	693	23.5301	693	22.9685	694	22.6098	695	918
520	24.9877	680	23.5994	681	23.0379	682	22.6793	683	936
530	25.0557	669	23.6675	670	23.1061	671	22.7476	672	954
540	25.1226	658	23.7345	659	23.1732	659	22.8148	659	972
550	25.1884	648	23.8004	648	23.2391	649	22.8807	650	990
560	25.2532	636	23.8652	637	23.3040	638	22.9457	638	1008
570	25.3168	627	23.9289	628	23.3678	628	23.0095	629	1026
580	25.3795	617	23.9917	618	23.4306	618	23.0724	619	1044
590	25.4412	608	24.0535	609	23.4924	610	23.1343	610	1062
600	25.5020	601	24.1144	600	23.5534	601	23.1953	602	1080
610	25.5621	590	24.1744	591	23.6135	591	23.2555	592	1098
620	25.6211	583	24.2335	584	23.6726	584	23.3147	584	1116
630	25.6794	574	24.2919	574	23.7310	575	23.3731	576	1134
640	25.7368	567	24.3493	568	23.7885	568	23.4307	568	1152
650	25.7935	559	24.4061	559	23.8453	560	23.4875	560	1170
660	25.8494	552	24.4620	553	23.9013	553	23.5435	554	1188
670	25.9046	546	24.5173	545	23.9566	546	23.5989	546	1206
680	25.9592	538	24.5718	539	24.0112	539	23.6535	539	1224
690	26.0130	532	24.6257	533	24.0651	533	23.7074	533	1242

TABLE 7.- ENTROPY S/R OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
700	26.0662	525	24.6790	525	24.1184	526	23.7607	526	1260
710	26.1187	519	24.7315	519	24.1710	519	23.8133	521	1278
720	26.1706	513	24.7834	514	24.2229	514	23.8654	514	1296
730	26.2219	507	24.8348	507	24.2743	508	23.9168	507	1314
740	26.2726	502	24.8855	502	24.3251	502	23.9675	503	1332
750	26.3228	496	24.9357	497	24.3753	497	24.0178	497	1350
760	26.3724	491	24.9854	490	24.4250	491	24.0675	492	1368
770	26.4215	485	25.0344	485	24.4741	485	24.1167	485	1386
780	26.4700	481	25.0829	482	24.5226	482	24.1652	482	1404
790	26.5181	475	25.1311	475	24.5708	475	24.2134	475	1422
800	26.5656	4498	25.1786	4500	24.6183	4502	24.2609	4504	1440
900	27.0154	4106	25.6286	4107	25.0685	4108	24.7113	4110	1620
1000	27.4260	3779	26.0393	3780	25.4793	3781	25.1223	3781	1800
1100	27.8039	3504	26.4173	3505	25.8574	3506	25.5004	3507	1980
1200	28.1543	3268	26.7678	3269	26.2080	3269	25.8511	3269	2160
1300	28.4811	3061	27.0947	3060	26.5349	3061	26.1780	3062	2340
1400	28.7872	2879	27.4007	2880	26.8410	2880	26.4842	2879	2520
1500	29.0751	2716	27.6887	2716	27.1290	2716	26.7721	2717	2700
1600	29.3467	2570	27.9603	2570	27.4006	2571	27.0438	2571	2880
1700	29.6037	2440	28.2173	2440	27.6577	2440	27.3009	2440	3060
1800	29.8477	2322	28.4613	2323	27.9017	2322	27.5449	2323	3240
1900	30.0799	2214	28.6936	2214	28.1339	2214	27.7772	2214	3420
2000	30.3013	2116	28.9150	2116	28.3553	2117	27.9986	2116	3600
2100	30.5129	2025	29.1266	2025	28.5670	2025	28.2102	2026	3780
2200	30.7154	1943	29.3291	1943	28.7695	1943	28.4128	1943	3960
2300	30.9097	1866	29.5234	1866	28.9638	1866	28.6071	1866	4140
2400	31.0963	1796	29.7100	1796	29.1504	1796	28.7937	1796	4320
2500	31.2759	1729	29.8896	1729	29.3300	1729	28.9733	1729	4500
2600	31.4488	1669	30.0625	1669	29.5029	1669	29.1462	1669	4680
2700	31.6157	1612	30.2294	1612	29.6698	1612	29.3131	1612	4860
2800	31.7769	1558	30.3906	1558	29.8310	1558	29.4743	1558	5040
2900	31.9327	1509	30.5464	1509	29.9868	1509	29.6301	1509	5220
3000	32.0836		30.6973		30.1377		29.7810		5400

TABLE 7.- ENTROPY S/R OF MOLECULAR NITROGEN - Continued

°K	10 atm		40 atm		70 atm		100 atm		°R
100	15.19	153							180
110	16.72	55							198
120	17.266	360	12.0	28					216
130	17.626	301	14.76	98					234
140	17.9274	2688	15.74	54	13.5	13	10.0	31	252
150	18.1962	2458	16.279	380	14.84	71	13.09	137	270
160	18.4420	2273	16.659	308	15.551	469	14.46	75	288
170	18.6693	2122	16.9669	2665	16.020	358	15.205	496	306
180	18.8815	1991	17.2334	2389	16.378	296	15.701	375	324
190	19.0806	1876	17.4723	2182	16.674	258	16.076	306	342
200	19.2682	1775	17.6905	2016	16.932	231	16.382	263	360
210	19.4457	1686	17.8921	1882	17.163	211	16.645	234	378
220	19.6143	1602	18.0803	1766	17.374	194	16.879	212	396
230	19.7745	1531	18.2569	1668	17.568	181	17.091	195	414
240	19.9276	1465	18.4237	1579	17.749	170	17.286	182	432
250	20.0741	1404	18.5816	1504	17.919	161	17.468	169	450
260	20.2145	1350	18.7320	1434	18.0795	1519	17.637	160	468
270	20.3495	1296	18.8754	1371	18.2314	1447	17.797	152	486
280	20.4791	1250	19.0125	1315	18.3761	1381	17.949	144	504
290	20.6041	1207	19.1440	1266	18.5142	1319	18.093	137	522
300	20.7248	1166	19.2706	1216	18.6461	1267	18.230	131	540
310	20.8414	1128	19.3922	1173	18.7728	1217	18.3607	1257	558
320	20.9542	1092	19.5095	1134	18.8945	1174	18.4864	1209	576
330	21.0634	1058	19.6229	1096	19.0119	1130	18.6073	1163	594
340	21.1692	1029	19.7325	1060	19.1249	1093	18.7236	1122	612
350	21.2721	998	19.8385	1030	19.2342	1059	18.8358	1084	630
360	21.3719	971	19.9415	998	19.3401	1025	18.9442	1049	648
370	21.4690	946	20.0413	970	19.4426	993	19.0491	1016	666
380	21.5636	919	20.1383	944	19.5419	965	19.1507	984	684
390	21.6555	899	20.2327	919	19.6384	938	19.2491	957	702
400	21.7454	875	20.3246	895	19.7322	914	19.3448	931	720
410	21.8329	855	20.4141	872	19.8236	890	19.4379	904	738
420	21.9184	835	20.5013	851	19.9126	866	19.5283	882	756
430	22.0019	816	20.5864	832	19.9992	847	19.6165	860	774
440	22.0835	799	20.6696	813	20.0839	826	19.7025	838	792
450	22.1634	782	20.7509	795	20.1665	807	19.7863	819	810
460	22.2416	766	20.8304	779	20.2472	790	19.8682	798	828
470	22.3182	750	20.9083	760	20.3262	771	19.9480	783	846
480	22.3932	736	20.9843	747	20.4033	756	20.0263	767	864
490	22.4668	722	21.0590	732	20.4789	743	20.1030	751	882
500	22.5390	708	21.1322	718	20.5532	726	20.1781	734	900
510	22.6098	695	21.2040	704	20.6258	712	20.2515	720	918
520	22.6793	683	21.2744	690	20.6970	699	20.3235	706	936
530	22.7476	672	21.3434	680	20.7669	688	20.3941	694	954
540	22.8148	659	21.4114	668	20.8357	674	20.4635	681	972
550	22.8807	650	21.4782	656	20.9031	663	20.5316	669	990
560	22.9457	638	21.5438	645	20.9694	651	20.5985	657	1008
570	23.0095	629	21.6083	635	21.0345	641	20.6642	646	1026
580	23.0724	619	21.6718	624	21.0986	630	20.7288	635	1044
590	23.1343	610	21.7342	616	21.1616	620	20.7923	625	1062
600	23.1953	602	21.7958	607	21.2236	612	20.8548	617	1080
610	23.2555	592	21.8565	597	21.2848	600	20.9165	605	1098
620	23.3147	584	21.9162	588	21.3448	595	20.9770	598	1116
630	23.3731	576	21.9750	581	21.4043	584	21.0368	588	1134
640	23.4307	568	22.0331	572	21.4627	576	21.0956	580	1152
650	23.4875	560	22.0903	565	21.5203	568	21.1536	572	1170
660	23.5435	554	22.1468	557	21.5771	561	21.2108	564	1188
670	23.5989	546	22.2025	549	21.6332	554	21.2672	557	1206
680	23.6535	539	22.2574	543	21.6886	545	21.3229	548	1224
690	23.7074	533	22.3117	537	21.7431	539	21.3777	542	1242

TABLE 7.- ENTROPY S/R OF MOLECULAR NITROGEN - Concluded

°K	10 atm		40 atm		70 atm		100 atm		°R
700	23.7607	526	22.3654	529	21.7970	532	21.4319	536	1260
710	23.8133	521	22.4183	523	21.8502	527	21.4855	529	1278
720	23.8654	514	22.4706	517	21.9029	519	21.5384	523	1296
730	23.9168	507	22.5223	511	21.9548	513	21.5907	515	1314
740	23.9675	503	22.5734	505	22.0061	508	21.6422	510	1332
750	24.0178	497	22.6239	499	22.0569	502	21.6932	504	1350
760	24.0675	492	22.6738	494	22.1071	495	21.7436	498	1368
770	24.1167	485	22.7232	488	22.1566	491	21.7934	493	1386
780	24.1652	482	22.7720	484	22.2057	486	21.8427	487	1404
790	24.2134	475	22.8204	478	22.2543	479	21.8914	482	1422
800	24.2609	4504	22.8682	4521	22.3022	4539	21.9396	4553	1440
900	24.7113	4110	23.3203	4120	22.7561	4132	22.3949	4145	1620
1000	25.1223	3781	23.7323	3791	23.1693	3798	22.8094	3805	1800
1100	25.5004	3507	24.1114	3513	23.5491	3519	23.1899	3525	1980
1200	25.8511	3269	24.4627	3274	23.9010	3279	23.5424	3283	2160
1300	26.1780	3062	24.7901	3064	24.2289	3068	23.8707	3072	2340
1400	26.4842	2879	25.0965	2883	24.5357	2885	24.1779	2887	2520
1500	26.7721	2717	25.3848	2719	24.8242	2722	24.4666	2724	2700
1600	27.0438	2571	25.6567	2573	25.0964	2573	24.7390	2575	2880
1700	27.3009	2440	25.9140	2442	25.3537	2444	24.9965	2445	3060
1800	27.5449	2323	26.1582	2323	25.5981	2325	25.2410	2326	3240
1900	27.7772	2214	26.3905	2215	25.8306	2216	25.4736	2217	3420
2000	27.9986	2116	26.6120	2118	26.0522	2118	25.6953	2119	3600
2100	28.2102	2026	26.8238	2026	26.2640	2027	25.9072	2028	3780
2200	28.4128	1943	27.0264	1943	26.4667	1944	26.1100	1943	3960
2300	28.6071	1866	27.2207	1867	26.6611	1867	26.3043	1868	4140
2400	28.7937	1796	27.4074	1796	26.8478	1797	26.4911	1797	4320
2500	28.9733	1729	27.5870	1730	27.0275	1729	26.6708	1730	4500
2600	29.1462	1669	27.7600	1669	27.2004	1670	26.8438	1670	4680
2700	29.3131	1612	27.9269	1613	27.3674	1613	27.0108	1613	4860
2800	29.4743	1558	28.0882	1558	27.5287	1559	27.1721	1559	5040
2900	29.6301	1509	28.2440	1509	27.6846	1509	27.3280	1510	5220
3000	29.7810		28.3949		27.8355		27.4790		5400

TABLE 8.- SPECIFIC-HEAT RATIO $\gamma = C_p/C_v$ OF MOLECULAR NITROGEN

°K	0.01 atm		0.1 atm		0.4 atm		0.7 atm		°R
100	1.400		1.402		1.409	- 2	1.416	- 3	180
110	1.400		1.402	- 1	1.407	- 1	1.413	- 3	198
120	1.400		1.401		1.406	- 1	1.410	- 2	216
130	1.400		1.401		1.405	- 1	1.408	- 1	234
140	1.400		1.401		1.404	- 1	1.407	- 1	252
150	1.400		1.401		1.403		1.406	- 1	270
160	1.400		1.401		1.403	- 1	1.405		288
170	1.400		1.401	- 1	1.402		1.405	- 1	306
180	1.400		1.400		1.402		1.404	- 1	324
190	1.400		1.400		1.402		1.403		342
200	1.400		1.400		1.402	- 1	1.403		360
210	1.400		1.400		1.401		1.403	- 1	378
220	1.400		1.400		1.401		1.402		396
230	1.400		1.400		1.401		1.402		414
240	1.400		1.400		1.401		1.402		432
250	1.400		1.400		1.401		1.402	- 1	450
260	1.400		1.400		1.401		1.401		468
270	1.400		1.400		1.401	- 1	1.401		486
280	1.400		1.400		1.400		1.401		504
290	1.400		1.400		1.400		1.401		522
300	1.400	- 1	1.400	- 1	1.400	- 1	1.401		540
320	1.399		1.399		1.399		1.401	- 1	576
340	1.399		1.399		1.399		1.400		612
360	1.399	- 1	1.399	- 1	1.399	- 1	1.400	- 1	648
380	1.398	- 1	1.398	- 1	1.398	- 1	1.399	- 1	684
400	1.397	- 1	1.397	- 1	1.397	- 1	1.398	- 1	720
420	1.396	- 1	1.396	- 1	1.396	- 1	1.397	- 1	756
440	1.395	- 1	1.395	- 1	1.395	- 1	1.396	- 1	792
460	1.394	- 1	1.394	- 1	1.394	- 1	1.395	- 2	828
480	1.393	- 2	1.393	- 2	1.393	- 2	1.393	- 2	864
500	1.391	- 2	1.391	- 2	1.391	- 2	1.391	- 1	900
520	1.389	- 2	1.389	- 1	1.389	- 1	1.390	- 2	936
540	1.387	- 1	1.388	- 2	1.388	- 2	1.388	- 2	972
560	1.386	- 2	1.386	- 2	1.386	- 2	1.386	- 2	1008
580	1.384	- 3	1.384	- 2	1.384	- 2	1.384	- 2	1044
600	1.381	- 2	1.382	- 3	1.382	- 3	1.382	- 2	1080
620	1.379	- 2	1.379	- 2	1.379	- 2	1.380	- 3	1116
640	1.377	- 2	1.377	- 2	1.377	- 2	1.377	- 3	1152
660	1.375	- 2	1.375	- 2	1.375	- 2	1.374	- 2	1188
680	1.373	- 2	1.373	- 2	1.373	- 2	1.372	- 2	1224
700	1.371	- 3	1.371	- 3	1.371	- 3	1.370	- 2	1260
720	1.368	- 2	1.368	- 2	1.368	- 2	1.368	- 2	1296
740	1.366	- 2	1.366	- 2	1.366	- 2	1.366	- 2	1332
760	1.364	- 2	1.364	- 2	1.364	- 2	1.364	- 2	1368
780	1.362	- 2	1.362	- 2	1.362	- 2	1.362	- 2	1404
[a]800	1.360	-10							
900	1.350	- 9							
1000	1.341	- 7							
1100	1.334	- 7							
1200	1.327	- 5							
1300	1.322	- 5							
1400	1.317	- 4							
1500	1.313	- 3							
1600	1.310	- 3							
1700	1.307	- 2							
1800	1.305	- 2							
1900	1.303	- 2							
2000	1.301	- 2							
2100	1.299	- 2							
2200	1.297	- 1							

°K	0.01 atm (Cont.)	
2300	1.296	- 1
2400	1.295	- 1
2500	1.294	- 1
2600	1.293	- 1
2700	1.292	- 1
2800	1.291	- 1
2900	1.290	- 1
3000	1.289	

[a]At higher temperatures in the 0.01-atm pressure range γ is a function only of temperature as given here.

TABLE 8.- SPECIFIC-HEAT RATIO $\gamma = C_p/C_v$ OF MOLECULAR NITROGEN - Continued

°K	1 atm		4 atm		7 atm		10 atm		°R
100	1.424	-5							180
110	1.419	-4							198
120	1.415	-3	1.467	-15					216
130	1.412	-2	1.452	-8	1.500	-18			234
140	1.410	-1	1.444	-7	1.482	-14	1.526	-24	252
150	1.409	-2	1.437	-6	1.468	-11	1.502	-17	270
160	1.407	-1	1.431	-4	1.457	-6	1.485	-13	288
170	1.406		1.427	-4	1.451	-9	1.472	-10	306
180	1.406	-1	1.423	-3	1.442	-6	1.462	-9	324
190	1.405	-1	1.420	-2	1.436	-4	1.453	-6	342
200	1.404		1.418	-2	1.432	-3	1.447	-6	360
210	1.404	-1	1.416	-2	1.429	-4	1.441	-4	378
220	1.403		1.414	-1	1.425	-2	1.437	-4	396
230	1.403		1.413	-1	1.423	-2	1.433	-3	414
240	1.403	-1	1.412	-2	1.421	-2	1.430	-3	432
250	1.402		1.410	-1	1.419	-2	1.427	-3	450
260	1.402		1.409		1.417	-2	1.424	-2	468
270	1.402		1.409	-1	1.415	-1	1.422	-2	486
280	1.402	-1	1.408	-1	1.414	-1	1.420	-1	504
290	1.401		1.407		1.413	-1	1.419	-2	522
300	1.401		1.407	-2	1.412	-2	1.417	-3	540
320	1.401	-1	1.405	-1	1.410	-2	1.414	-2	576
340	1.400		1.404	-1	1.408	-2	1.412	-2	612
360	1.400	-1	1.403	-1	1.406	-1	1.410	-2	648
380	1.399	-1	1.402	-1	1.405	-2	1.408	-2	684
400	1.398	-1	1.401	-2	1.403	-1	1.406	-2	720
420	1.397	-1	1.399	-1	1.402	-2	1.404	-2	756
440	1.396	-1	1.398	-2	1.400	-2	1.402	-2	792
460	1.395	-2	1.396	-1	1.398	-1	1.400	-2	828
480	1.393	-2	1.395	-2	1.397	-2	1.398	-2	864
500	1.391	-1	1.393	-2	1.395	-2	1.396	-2	900
520	1.390	-2	1.391	-2	1.393	-3	1.394	-2	936
540	1.388	-2	1.389	-2	1.390	-2	1.392	-3	972
560	1.386	-2	1.387	-2	1.388	-2	1.389	-2	1008
580	1.384	-2	1.385	-2	1.386	-2	1.387	-2	1044
600	1.382	-2	1.383	-2	1.384	-3	1.385	-3	1080
620	1.380	-3	1.381	-3	1.381	-2	1.382	-2	1116
640	1.377	-3	1.378	-2	1.379	-2	1.380	-3	1152
660	1.374	-2	1.376	-2	1.377	-3	1.377	-2	1188
680	1.372	-2	1.374	-3	1.374	-2	1.375	-2	1224
700	1.370	-2	1.371	-2	1.372	-2	1.373	-3	1260
720	1.368	-2	1.369	-2	1.370	-3	1.370	-2	1296
740	1.366	-2	1.367	-2	1.367	-2	1.368	-2	1332
760	1.364	-2	1.365	-3	1.365	-2	1.366	-3	1368
780	1.362	-2	1.362	-2	1.363	-2	1.363	-2	140[illegible]
[b]800	1.360	-10							
900	1.350	-9							
1000	1.341	-7							
1100	1.334	-7							
1200	1.327	-5							
1300	1.322	-5							
1400	1.317	-4							
1500	1.313	-3							
1600	1.310	-3							
1700	1.307	-2							
1800	1.305	-2							
1900	1.303	-2							
2000	1.301	-2							
2100	1.299	-2							
2200	1.297	-1							

°K	1 atm (Cont.)	
2300	1.296	-1
2400	1.295	-1
2500	1.294	-1
2600	1.293	-1
2700	1.292	-1
2800	1.291	-1
2900	1.290	-1
3000	1.289	

[b]At higher temperatures in the 1-atm pressure range γ is a function only of temperature as given here.

TABLE 8.- SPECIFIC-HEAT RATIO $\gamma = C_p/C_v$ OF MOLECULAR NITROGEN - Concluded

°K	10 atm		40 atm		70 atm		100 atm		°R
180	1.462	- 9	1.723	-65					324
190	1.453	- 6	1.658	-36	1.960	-116			342
200	1.447	- 6	1.622	-32	1.844	- 78	2.11	-16	360
210	1.441	- 4	1.590	-25	1.766	- 58	1.95	-10	378
220	1.437	- 4	1.565	-20	1.708	- 43	1.85	- 7	396
230	1.433	- 3	1.545	-17	1.665	- 34	1.78	- 5	414
240	1.430	- 3	1.528	-14	1.631	- 28	1.73	- 5	432
250	1.427	- 3	1.514	-11	1.603	- 22	1.68	- 3	450
260	1.424	- 2	1.503	-10	1.581	- 18	1.65	- 3	468
270	1.422	- 2	1.493	- 9	1.563	- 16	1.62	- 2	486
280	1.420	- 1	1.484	- 7	1.547	- 14	1.602	- 20	504
290	1.419	- 2	1.477	- 6	1.533	- 11	1.582	- 16	522
300	1.417	- 3	1.471	-11	1.522	- 19	1.566	- 26	540
320	1.414	- 2	1.460	- 9	1.503	- 16	1.540	- 20	576
340	1.412	- 2	1.451	- 8	1.487	- 12	1.520	- 17	612
360	1.410	- 2	1.443	- 6	1.475	- 10	1.503	- 14	648
380	1.408	- 2	1.437	- 5	1.465	- 9	1.489	- 9	684
400	1.406	- 2	1.432	- 5	1.456	- 8	1.480	- 13	720
420	1.404	- 2	1.427	- 5	1.448	- 7	1.467	- 8	756
440	1.402	- 2	1.422	- 4	1.441	- 6	1.459	- 8	792
460	1.400	- 2	1.418	- 3	1.435	- 5	1.451	- 7	828
480	1.398	- 2	1.415	- 4	1.430	- 6	1.444	- 7	864
500	1.396	- 2	1.411	- 4	1.424	- 4	1.437	- 6	900
520	1.394	- 2	1.407	- 3	1.420	- 5	1.431	- 6	936
540	1.392	- 3	1.404	- 4	1.415	- 5	1.425	- 5	972
560	1.389	- 2	1.400	- 3	1.410	- 4	1.420	- 5	1008
580	1.387	- 2	1.397	- 3	1.406	- 4	1.415	- 5	1044
600	1.385	- 3	1.394	- 3	1.402	- 4	1.410	- 4	1080
620	1.382	- 2	1.391	- 3	1.398	- 3	1.406	- 5	1116
640	1.380	- 3	1.388	- 3	1.395	- 4	1.401	- 4	1152
660	1.377	- 2	1.385	- 3	1.391	- 3	1.397	- 4	1188
680	1.375	- 2	1.382	- 3	1.388	- 4	1.393	- 3	1224
700	1.373	- 3	1.379	- 3	1.384	- 3	1.390	- 4	1260
720	1.370	- 2	1.376	- 3	1.381	- 3	1.386	- 4	1296
740	1.368	- 2	1.373	- 3	1.378	- 3	1.382	- 3	1332
760	1.366	- 3	1.370	- 2	1.375	- 3	1.379	- 4	1368
780	1.363	- 2	1.368	- 3	1.372	- 3	1.375	- 3	1404
800	1.361	-10	1.365	-11	1.369	- 13	1.372	- 13	1440
900	1.351	- 9	1.354	-10	1.356	- 10	1.359	- 12	1620
1000	1.342	- 8	1.344	- 8	1.346	- 9	1.347	- 9	1800
1100	1.334	- 6	1.336	- 7	1.337	- 7	1.338	- 7	1980
1200	1.328	- 6	1.329	- 6	1.330	- 6	1.331	- 7	2160
1300	1.322	- 5	1.323	- 5	1.324	- 5	1.324	- 5	2340
1400	1.317	- 3	1.318	- 4	1.319	- 5	1.319	- 4	2520
1500	1.314	- 4	1.314	- 4	1.314	- 3	1.315	- 4	2700
1600	1.310	- 3	1.310	- 3	1.311	- 3	1.311	- 3	2880
1700	1.307	- 2	1.307	- 2	1.308	- 3	1.308	- 3	3060
1800	1.305	- 2	1.305	- 2	1.305	- 2	1.305	- 2	3240
1900	1.303	- 2	1.303	- 2	1.303	- 2	1.303	- 2	3420
2000	1.301	- 2	1.301	- 2	1.301	- 2	1.301	- 2	3600
2100	1.299	- 2	1.299	- 2	1.299	- 2	1.299	- 2	3780
2200	1.297	- 1	1.297	- 1	1.297	- 1	1.297	- 1	3960
2300	1.296	- 1	1.296	- 1	1.296	- 1	1.296	- 1	4140
2400	1.295	- 1	1.295	- 1	1.295	- 2	1.295	- 2	4320
2500	1.294	- 1	1.294	- 1	1.293	- 1	1.293	- 1	4500
2600	1.293	- 1	1.293	- 1	1.292		1.292	- 1	4680
2700	1.292	- 1	1.292	- 1	1.292	- 1	1.291	- 1	4860
2800	1.291	- 1	1.291	- 1	1.291	- 1	1.290		5040
2900	1.290	- 1	1.290	- 1	1.290	- 1	1.290	- 1	5220
3000	1.289		1.289		1.289		1.289		5400

TABLE 9.- SOUND VELOCITY a/a_0 IN MOLECULAR NITROGEN

$^{\circ}K$	0.01 atm		0.1 atm		1 atm			$^{\circ}R$
100	.605	29	.604	30	.598	32		180
110	.634	29	.634	28	.630	29		198
120	.663	27	.662	27	.659	27		216
130	.690	26	.689	26	.686	27		234
140	.716	25	.715	26	.713	26		252
150	.741	24	.741	24	.739	24		270
160	.765	24	.765	24	.763	24		288
170	.789	23	.789	22	.787	24		306
180	.812	22	.811	23	.811	22		324
190	.834	21	.834	21	.833	22		342
200	.855	22	.855	21	.855	21		360
210	.877	20	.876	21	.876	21		378
220	.897	20	.897	20	.897	20		396
230	.917	20	.917	20	.917	20		414
240	.937	19	.937	19	.937	19		432
250	.956	19	.956	19	.956	19		450
260	.975	19	.975	19	.975	19		468
270	.994	18	.994	18	.994	19		486
280	1.012	18	1.012	18	1.013	17		504
290	1.030	18	1.030	18	1.030	18		522
300	1.048	34	1.048	34	1.048	34		540
320	1.082	33	1.082	33	1.082	33		576
340	1.115	32	1.115	32	1.115	33		612
360	1.147	31	1.147	32	1.148	31		648
380	1.178	30	1.179	30	1.179	30		684
400	1.208	30	1.209	29	1.209	30		720
420	1.238	29	1.238	29	1.239	28		756
440	1.267	28	1.267	28	1.267	29		792
460	1.295	27	1.295	27	1.296	26		828
480	1.322	26	1.322	26	1.322	27		864
500	1.348	26	1.348	26	1.349	26		900
520	1.374	25	1.374	26	1.375	25		936
540	1.399	25	1.400	24	1.400	25		972
560	1.424	24	1.424	24	1.425	24		1008
580	1.448	24	1.448	24	1.449	24		1044
600	1.472	23	1.472	23	1.473	23		1080
620	1.495	23	1.495	23	1.496	22		1116
640	1.518	22	1.518	22	1.518	22		1152
660	1.540	22	1.540	22	1.540	22		1188
680	1.562	22	1.562	22	1.562	22		1224
700	1.584	20	1.584	20	1.584	21		1260
720	1.604	21	1.604	21	1.605	21		1296
740	1.625	21	1.625	21	1.626	21		1332
760	1.646	20	1.646	20	1.647	20		1368
780	1.666	20	1.666	20	1.667	20		1404
800	1.686	96	1.686	96	1.687	96		1440
900	1.782	90	1.782	90	1.783	90		1620
1000	1.872	86	1.872	86	1.873	86		1800
1100	1.958	82	1.958	82	1.959	82		1980
1200	2.040	79	2.040	79	2.041	79		2160
1300	2.119	76	2.119	76	2.120	76		2340
1400	2.195	74	2.195	74	2.196	73		2520
1500	2.269	72	2.269	72	2.269	72		2700
1600	2.341	69	2.341	69	2.341	69		2880
1700	2.410	68	2.410	68	2.410	68		3060
1800	2.478	66	2.478	66	2.478	65		3240
1900	2.544	64	2.544	64	2.543	65		3420
2000	2.608	62	2.608	62	2.608	63		3600
2100	2.670	61	2.670	61	2.671	60		3780
2200	2.731	60	2.731	60	2.731	61		3960
2300	2.791	59	2.791	59	2.792	59		4140
2400	2.850	58	2.850	58	2.851	57		4320
2500	2.908	56	2.908	56	2.908	57		4500
2600	2.964	55	2.964	55	2.965	55		4680
2700	3.019	55	3.019	55	3.020	54		4860
2800	3.074	53	3.074	53	3.074	53		5040
2900	3.127	52	3.127	52	3.127	53		5220
3000	3.179		3.179		3.180			5400

TABLE 9.- SOUND VELOCITY a/a_0 IN MOLECULAR NITROGEN - Continued

$^{\circ}K$	1 atm		4 atm		7 atm		10 atm		$^{\circ}R$
100	.598	32							180
110	.630	29							198
120	.659	27	.646	31					216
130	.686	27	.677	29	.667	32			234
140	.713	26	.706	27	.699	26			252
150	.739	24	.733	26	.725	30	.722	28	270
160	.763	24	.759	25	.755	26	.750	27	288
170	.787	24	.784	24	.781	25	.777	26	306
180	.811	22	.808	23	.806	23	.803	24	324
190	.833	22	.831	23	.829	23	.827	24	342
200	.855	21	.854	21	.852	23	.851	23	360
210	.876	21	.875	21	.875	21	.874	22	378
220	.897	20	.896	21	.896	21	.896	21	396
230	.917	20	.917	20	.917	21	.917	21	414
240	.937	19	.937	20	.938	20	.938	20	432
250	.956	19	.957	19	.958	19	.958	20	450
260	.975	19	.976	19	.977	19	.978	19	468
270	.994	19	.995	19	.996	19	.997	19	486
280	1.013	17	1.014	18	1.015	18	1.016	19	504
290	1.030	18	1.032	18	1.033	18	1.035	17	522
300	1.048	34	1.050	34	1.051	35	1.052	35	540
320	1.082	33	1.084	33	1.086	33	1.087	34	576
340	1.115	33	1.117	33	1.119	33	1.121	33	612
360	1.148	31	1.150	31	1.152	31	1.154	31	648
380	1.179	30	1.181	31	1.183	31	1.185	31	684
400	1.209	30	1.212	29	1.214	29	1.216	30	720
420	1.239	28	1.241	29	1.243	29	1.246	28	756
440	1.267	29	1.270	27	1.272	28	1.274	28	792
460	1.296	26	1.297	28	1.300	28	1.302	28	828
480	1.322	27	1.325	26	1.328	26	1.330	26	864
500	1.349	26	1.351	26	1.354	26	1.356	26	900
520	1.375	25	1.377	26	1.380	25	1.382	26	936
540	1.400	25	1.403	24	1.405	25	1.408	24	972
560	1.425	24	1.427	24	1.430	24	1.432	24	1008
580	1.449	24	1.451	24	1.454	24	1.456	24	1044
600	1.473	23	1.475	24	1.478	23	1.480	23	1080
620	1.496	22	1.499	22	1.501	22	1.503	23	1116
640	1.518	22	1.521	22	1.523	23	1.526	22	1152
660	1.540	22	1.543	22	1.546	21	1.548	22	1188
680	1.562	22	1.565	21	1.567	22	1.570	22	1224
700	1.584	21	1.586	22	1.589	21	1.592	20	1260
720	1.605	21	1.608	21	1.610	21	1.612	21	1296
740	1.626	21	1.629	20	1.631	20	1.633	21	1332
760	1.647	20	1.649	20	1.651	21	1.654	20	1368
780	1.667	20	1.669	20	1.672	20	1.674	20	1404
800	1.687	96	1.689	96	1.692	95	1.694	95	1440
900	1.783	90	1.785	90	1.787	90	1.789	91	1620
1000	1.873	86	1.875	86	1.877	86	1.880	85	1800
1100	1.959	82	1.961	82	1.963	83	1.965	82	1980
1200	2.041	79	2.043	79	2.046	78	2.047	79	2160
1300	2.120	76	2.122	76	2.124	75	2.126	75	2340
1400	2.196	73	2.198	73	2.199	75	2.201	75	2520
1500	2.269	72	2.271	72	2.274	71	2.276	70	2700
1600	2.341	69	2.343	69	2.345	69	2.346	69	2880
1700	2.410	68	2.412	68	2.414	68	2.415	68	3060
1800	2.478	65	2.480	66	2.482	65	2.483	66	3240
1900	2.543	65	2.546	64	2.547	64	2.549	64	3420
2000	2.608	63	2.610	62	2.611	63	2.613	62	3600
2100	2.671	60	2.672	61	2.674	60	2.675	61	3780
2200	2.731	61	2.733	60	2.734	61	2.736	60	3960
2300	2.792	59	2.793	59	2.795	58	2.796	59	4140
2400	2.851	57	2.852	58	2.853	58	2.855	57	4320
2500	2.908	57	2.910	56	2.911	56	2.912	57	4500
2600	2.965	55	2.966	55	2.967	56	2.969	55	4680
2700	3.020	54	3.021	54	3.023	54	3.024	54	4860
2800	3.074	53	3.075	54	3.077	53	3.078	53	5040
2900	3.127	53	3.129	53	3.130	52	3.131	52	5220
3000	3.180		3.182		3.182		3.183		5400

TABLE 9.- SOUND VELOCITY a/a_0 IN MOLECULAR NITROGEN - Concluded

°K	10 atm		40 atm		70 atm		100 atm		°R
150	.722	28							270
160	.750	27							288
170	.777	26							306
180	.803	24	.787	31					324
190	.827	24	.818	31	.843	29			342
200	.851	23	.849	27	.872	27	.94	2	360
210	.874	22	.876	25	.899	25	.96	2	378
220	.896	21	.901	24	.924	25	.98	2	396
230	.917	21	.925	23	.949	23	1.00	2	414
240	.938	20	.948	22	.972	23	1.02	1	432
250	.958	20	.970	22	.995	21	1.03	2	450
260	.978	19	.992	21	1.016	22	1.05	2	468
270	.997	19	1.013	20	1.038	20	1.07	2	486
280	1.016	19	1.033	20	1.058	20	1.092	18	504
290	1.035	17	1.053	19	1.078	19	1.110	19	522
300	1.052	35	1.072	36	1.097	38	1.129	37	540
320	1.087	34	1.108	35	1.135	35	1.166	34	576
340	1.121	33	1.143	34	1.170	34	1.200	34	612
360	1.154	31	1.177	32	1.204	32	1.234	32	648
380	1.185	31	1.209	31	1.236	31	1.266	32	684
400	1.216	30	1.240	30	1.267	31	1.298	29	720
420	1.246	28	1.270	29	1.298	29	1.327	29	756
440	1.274	28	1.299	29	1.327	28	1.356	28	792
460	1.302	28	1.328	27	1.355	27	1.384	27	828
480	1.330	26	1.355	27	1.382	27	1.411	26	864
500	1.356	26	1.382	26	1.409	26	1.437	25	900
520	1.382	26	1.408	25	1.435	25	1.462	25	936
540	1.408	24	1.433	25	1.460	24	1.487	25	972
560	1.432	24	1.458	24	1.484	24	1.512	23	1008
580	1.456	24	1.482	23	1.508	23	1.535	23	1044
600	1.480	23	1.505	24	1.531	23	1.558	23	1080
620	1.503	23	1.529	22	1.554	23	1.581	22	1116
640	1.526	22	1.551	22	1.577	22	1.603	22	1152
660	1.548	22	1.573	22	1.599	21	1.625	21	1188
680	1.570	22	1.595	21	1.620	21	1.646	21	1224
700	1.592	20	1.616	21	1.641	21	1.667	20	1260
720	1.612	21	1.637	21	1.662	21	1.687	20	1296
740	1.633	21	1.658	20	1.683	20	1.707	20	1332
760	1.654	20	1.678	20	1.703	19	1.727	19	1368
780	1.674	20	1.698	19	1.722	19	1.746	19	1404
800	1.694	95	1.717	95	1.741	94	1.765	93	1440
900	1.789	91	1.812	89	1.835	89	1.858	87	1620
1000	1.880	85	1.901	85	1.924	83	1.945	84	1800
1100	1.965	82	1.986	82	2.007	81	2.029	80	1980
1200	2.047	79	2.068	77	2.088	77	2.109	76	2160
1300	2.126	75	2.145	76	2.165	75	2.185	73	2340
1400	2.201	75	2.221	72	2.240	72	2.258	73	2520
1500	2.276	70	2.293	71	2.312	70	2.331	69	2700
1600	2.346	69	2.364	68	2.382	69	2.400	68	2880
1700	2.415	68	2.432	68	2.451	65	2.468	65	3060
1800	2.483	66	2.500	65	2.516	65	2.533	65	3240
1900	2.549	64	2.565	64	2.581	64	2.598	62	3420
2000	2.613	62	2.629	62	2.645	61	2.660	62	3600
2100	2.675	61	2.691	60	2.706	60	2.722	59	3780
2200	2.736	60	2.751	60	2.766	59	2.781	59	3960
2300	2.796	59	2.811	58	2.825	59	2.840	58	4140
2400	2.855	57	2.869	58	2.884	55	2.898	56	4320
2500	2.912	57	2.927	56	2.939	56	2.954	55	4500
2600	2.969	55	2.983	55	2.995	56	3.009	55	4680
2700	3.024	54	3.038	53	3.051	54	3.064	53	4860
2800	3.078	53	3.091	53	3.105	52	3.117	53	5040
2900	3.131	52	3.144	52	3.157	52	3.170	52	5220
3000	3.183		3.196		3.209		3.222		5400

TABLE 10.- COEFFICIENT OF VISCOSITY η/η_0 OF MOLECULAR NITROGEN

°K	1 atm		10 atm		20 atm		30 atm		°R
100	.413	194							180
150	.607	172							270
200	.779	155							360
250	.934	140							450
300	1.074	129	1.079	129	1.086	128	1.093	128	540
350	1.203	120	1.208	121	1.214	120	1.221	119	630
400	1.323	114	1.329	114	1.334	114	1.340	113	720
450	1.437	109	1.443	109	1.448	109	1.453	108	810
500	1.546	105	1.552	105	1.557	105	1.561	104	900
550	1.651	101	1.657	100	1.662	100	1.665	100	990
600	1.752	92	1.757	92	1.762	91	1.765	91	1080
650	1.844	88	1.849	87	1.853	87	1.856	87	1170
700	1.932	85	1.936	85	1.940	84	1.943	84	1260
750	2.017	82	2.021	81	2.024	81	2.027	81	1350
800	2.099	80	2.102	80	2.105	80	2.108	80	1440
850	2.179	78	2.182	78	2.185	78	2.188	78	1530
900	2.257	76	2.260	75	2.263	75	2.266	75	1620
950	2.333	73	2.335	73	2.338	73	2.341	73	1710
1000	2.406	71	2.408	72	2.411	72	2.414	71	1800
1050	2.477	69	2.480	69	2.483	69	2.485	69	1890
1100	2.546	68	2.549	67	2.552	67	2.554	67	1980
1150	2.614	65	2.616	66	2.619	65	2.621	65	2070
1200	2.679	63	2.682	63	2.684	63	2.686	63	2160
1250	2.742	63	2.745	62	2.747	62	2.749	62	2250
1300	2.805	61	2.807	61	2.809	60	2.811	60	2340
1350	2.866	59	2.868	59	2.869	60	2.871	60	2430
1400	2.925	58	2.927	58	2.929	58	2.931	58	2520
1450	2.983	57	2.985	57	2.987	57	2.989	57	2610
1500	3.040		3.042		3.044		3.046		2700

°K	40 atm		60 atm		80 atm		100 atm		°R
300	1.104	125	1.127	121	1.154	115	1.187	107	540
350	1.229	118	1.248	114	1.269	111	1.294	105	630
400	1.347	112	1.362	110	1.380	107	1.399	104	720
450	1.459	107	1.472	106	1.487	104	1.503	102	810
500	1.566	104	1.578	102	1.591	101	1.605	99	900
550	1.670	99	1.680	98	1.692	97	1.704	96	990
600	1.769	91	1.778	90	1.789	90	1.800	89	1080
650	1.860	87	1.868	87	1.879	86	1.889	85	1170
700	1.947	84	1.955	84	1.965	83	1.974	82	1260
750	2.031	81	2.039	80	2.048	79	2.056	79	1350
800	2.112	79	2.119	78	2.127	78	2.135	78	1440
850	2.191	78	2.197	77	2.205	76	2.213	76	1530
900	2.269	75	2.274	75	2.281	74	2.289	74	1620
950	2.344	73	2.349	73	2.355	74	2.363	73	1710
1000	2.417	71	2.422	72	2.429	71	2.436	71	1800
1050	2.488	69	2.494	69	2.500	69	2.507	68	1890
1100	2.557	66	2.563	66	2.569	66	2.575	65	1980
1150	2.623	65	2.629	64	2.635	64	2.640	64	2070
1200	2.688	63	2.693	63	2.699	63	2.704	62	2160
1250	2.751	62	2.756	62	2.762	60	2.766	63	2250
1300	2.813	60	2.818	60	2.822	60	2.829	60	2340
1350	2.873	60	2.878	60	2.882	59	2.889	58	2430
1400	2.933	58	2.938	58	2.941	58	2.947	57	2520
1450	2.991	57	2.996	56	2.999	57	3.004	57	2610
1500	3.048		3.052		3.056		3.061		2700

TABLE 11.- THERMAL CONDUCTIVITY k/k_0 OF MOLECULAR NITROGEN

°K	k/k_0		°R
100	.390	37	180
110	.427	38	198
120	.465	37	216
130	.502	36	234
140	.538	38	252
150	.576	36	270
160	.612	36	288
170	.648	36	306
180	.684	35	324
190	.719	34	342
200	.753	36	360
210	.789	34	378
220	.823	34	396
230	.857	35	414
240	.892	32	432
250	.924	33	450
260	.957	33	468
270	.990	31	486
280	1.021	30	504
290	1.051	30	522
300	1.081	30	540
310	1.111	30	558
320	1.141	31	576
330	1.172	30	594
340	1.202	30	612
350	1.232	30	630
360	1.262	30	648
370	1.292	29	666
380	1.321	28	684
390	1.349	28	702
400	1.377	28	720
410	1.405	28	738
420	1.433	27	756
430	1.460	27	774
440	1.487	26	792
450	1.513	27	810
460	1.540	26	828
470	1.566	26	846
480	1.592	27	864
490	1.619	26	882

°K	k/k_0		°R
500	1.645	26	900
510	1.671	26	918
520	1.697	25	936
530	1.722	25	954
540	1.747	24	972
550	1.771	24	990
560	1.795	24	1008
570	1.819	24	1026
580	1.843	24	1044
590	1.867	23	1062
600	1.890	23	1080
610	1.913	23	1098
620	1.936	23	1116
630	1.959	23	1134
640	1.982	23	1152
650	2.005	22	1170
660	2.027	21	1188
670	2.048	22	1206
680	2.070	22	1224
690	2.092	22	1242
700	2.114	22	1260
710	2.136	21	1278
720	2.157	21	1296
730	2.178	21	1314
740	2.199	21	1332
750	2.220	20	1350
760	2.240	19	1368
770	2.259	20	1386
780	2.279	20	1404
790	2.299	19	1422
800	2.318	186	1440
900	2.504	169	1620
1000	2.673	155	1800
1100	2.828	140	1980
1200	2.968		2160

TABLE 12.- PRANDTL NUMBER $N_{Pr} = \eta C_p/k$ OF MOLECULAR NITROGEN

AT ATMOSPHERIC PRESSURE

$^{\circ}K$	N_{Pr}		$(N_{Pr})^{2/3}$		$(N_{Pr})^{1/3}$		$(N_{Pr})^{1/2}$		$^{\circ}R$
100	.786	- 8	.851	- 5	.922	- 2	.887	- 5	180
120	.778	- 8	.846	- 6	.920	- 3	.882	- 4	216
140	.770	- 8	.840	- 6	.917	- 4	.878	- 5	252
160	.762	- 8	.834	- 6	.913	- 3	.873	- 5	288
180	.754	- 7	.828	- 5	.910	- 3	.868	- 3	324
200	.747	- 7	.823	- 5	.907	- 2	.865	- 5	360
220	.740	- 7	.818	- 5	.905	- 3	.860	- 4	396
240	.733	- 8	.813	- 6	.902	- 4	.856	- 5	432
260	.725	- 6	.807	- 4	.898	- 2	.851	- 3	468
280	.719	- 6	.803	- 5	.896	- 3	.848	- 4	504
300	.713	- 6	.798	- 4	.893	- 2	.844	- 3	540
320	.707	- 4	.794	- 3	.891	- 2	.841	- 3	576
340	.703	- 4	.791	- 4	.889	- 2	.838	- 2	612
360	.699	- 4	.787	- 3	.887	- 1	.836	- 2	648
380	.695	- 4	.784	- 2	.886	- 2	.834	- 3	684
400	.691	- 2	.782	- 2	.884	- 1	.831	- 1	720
420	.689	- 1	.780		.883		.830		756
440	.688	- 1	.780	- 1	.883		.830	- 1	792
460	.687	- 2	.779	- 2	.883	- 1	.829	- 1	828
480	.685	- 1	.777	- 1	.882	- 1	.828	- 1	864
500	.684	- 1	.776	- 1	.881		.827	- 1	900
520	.683		.775		.881		.826		936
540	.683	1	.775	1	.881		.826	1	972
560	.684	1	.776	1	.881	1	.827	1	1008
580	.685	1	.777	1	.882		.828		1044
600	.686	2	.778	1	.882	1	.828	1	1080
650	.688	3	.779	3	.883	1	.829	2	1170
700	.691	4	.782	3	.884	2	.831	3	1260
750	.695	5	.785	3	.886	2	.834	3	1350
800	.700	11	.788	9	.888	4	.837	6	1440
900	.711	13	.797	9	.892	6	.843	8	1620
1000	.724	12	.806	9	.898	5	.851	7	1800
1100	.736	12	.815	9	.903	5	.858	7	1980
1200	.748		.824		.908		.865		2160

TABLE 13.- VAPOR PRESSURE OF NITROGEN

[Values in parentheses are extrapolated values to facilitate interpolation]

(a) For interpolation

40/T, °K-1	T, °K	$\log_{10}$ P (a) mm Hg	$\log_{10}$ P (a) atm	$\log_{10}$ P (a) psia	Δ	T, °R	72/T, °R-1
0.64	62.50	(1.9206)	(9.0398)	(0.2070)	790	112.50	0.64
.63	63.49	1.9996	9.1188	.2860	788	114.29	.63
.62	64.52	2.0784	9.1976	.3648	786	116.13	.62
.61	65.57	2.1570	9.2762	.4434	784	118.03	.61
.60	66.67	2.2354	9.3546	.5218	783	120.00	.60
.59	67.80	2.3137	9.4329	.6001	782	122.03	.59
.58	68.97	2.3919	9.5111	.6783	781	124.14	.58
.57	70.18	2.4700	9.5892	.7564	780	126.32	.57
.56	71.43	2.5480	9.6672	.8344	778	128.57	.56
.55	72.73	2.6258	9.7450	.9122	775	130.91	.55
.54	74.07	2.7033	9.8225	.9897	770	133.33	.54
.53	75.47	2.7803	9.8995	1.0667	764	135.85	.53
.52	76.92	2.8567	9.9759	1.1431	760	138.46	.52
.51	78.43	2.9327	.0519	1.2191	756	141.18	.51
.50	80.00	3.0083	.1275	1.2947	753	144.00	.50
.49	81.63	3.0836	.2028	1.3700	750	146.94	.49
.48	83.33	3.1586	.2778	1.4450	757	150.00	.48
.47	85.11	3.2343	.3535	1.5207	767	153.19	.47
.46	86.96	3.3110	.4302	1.5974	772	156.52	.46
.45	88.89	3.3882	.5074	1.6746	766	160.00	.45
.44	90.91	3.4648	.5840	1.7512	757	163.64	.44
.43	93.02	3.5405	.6597	1.8269	755	167.44	.43
.42	95.24	3.6160	.7352	1.9024	756	171.43	.42
.41	97.56	3.6916	.8108	1.9780	756	175.61	.41
.40	100.00	3.7672	.8864	2.0536	757	180.00	.40
.39	102.56	3.8429	.9621	2.1293	757	184.62	.39
.38	105.26	3.9186	1.0378	2.2050	758	189.47	.38
.37	108.11	3.9944	1.1136	2.2808	759	194.59	.37
.36	111.11	4.0703	1.1895	2.3567		200.00	.36
100/T							180/T
0.90	111.11	4.0703	1.1895	2.3567	304	200.00	0.90
.89	112.36	4.1007	1.2199	2.3871	305	202.25	.89
.88	113.64	4.1312	1.2504	2.4176	306	204.55	.88
.87	114.94	4.1618	1.2810	2.4482	307	206.90	.87
.86	116.28	4.1925	1.3117	2.4789	309	209.30	.86
.85	117.65	4.2234	1.3426	2.5098	311	211.76	.85
.84	119.05	4.2545	1.3737	2.5409	314	214.29	.84
.83	120.48	4.2859	1.4051	2.5723	316	216.87	.83
.82	121.95	4.3175	1.4367	2.6039	320	219.51	.82
.81	123.46	4.3495	1.4687	2.6359	325	222.22	.81
.80	125.00	4.3820	1.5012	2.6684	331	225.00	.80
.79	126.58	(4.4151)	(1.5343)	(2.7015)	344	227.85	.79
.78	128.21	(4.4495)	(1.5687)	(2.7359)		230.77	.78

[a]Values have been increased by 10 wherever necessary to avoid negative mantissas.

TABLE 13.- VAPOR PRESSURE OF NITROGEN - Concluded

(b) Not for interpolation

Remarks	T, °K	P, mm Hg	P, atm	P, psia	T, °R
Triple point	63.156	94.0	0.1237	1.818	113.681
Boiling point	77.395	760.0	1	14.696	139.311
Critical point	126.1_{35}	254_{52}	33.49	492.2	227.0
Solid nitrogen	52	5.7	0.0075	0.110	93.6
	54	10.2	.0134	.197	97.2
	56	17.6	.0232	.341	100.8
	58	29.4	.0386	.568	104.4
	60	47.2	.0621	.913	108.0
	62	73.6	.0969	1.424	111.6
Liquid nitrogen	64	109.4	.1439	2.115	115.2
	66	154.1	.2028	2.980	118.8
	68	212.6	.2797	4.110	122.4
	70	287.6	.3785	5.56	126.0
	72	382.5	.503	7.40	129.6
	74	500	.658	9.67	133.2
	76	643	.847	12.44	136.8
	78	815	1.073	15.76	140.4
	80	1019	1.341	19.71	144.0
	82	1259	1.657	24.35	147.6
	84	1539	2.026	29.77	151.2
	86	1869	2.460	36.15	154.8
	88	2255	2.967	43.60	158.4
	90	2697	3.548	52.1	162.0
	92	3194	4.203	61.8	165.6
	94	3752	4.937	72.5	169.2
	96	4377	5.76	84.6	172.8
	98	5076	6.68	98.1	176.4
	100	5851	7.70	113.1	180.0
	102	6708	8.83	129.7	183.6
	104	7650	10.07	147.9	187.2
	106	8682	11.42	167.9	190.8
	108	9808	12.91	189.7	194.4
	110	11033	14.52	213.3	198.0
	112	12360	16.26	239.0	201.6
	114	13797	18.15	266.8	205.2
	116	15351	20.20	296.8	208.8
	118	17033	22.41	329.4	212.4
	120	18854	24.81	364.6	216.0
	122	20823	27.40	402.7	219.6
	124	22960	30.21	444.0	223.2
	126	25287	33.27	489.0	226.8

(c) Constants for $\log_{10} P \text{ (solid)} = A - B/T$

Units of P	A	Units of T	B
mm Hg	7.65894	°K	359.093
atm	4.77813	°R	646.367
psia	5.94532		

TABLE 14.- COEFFICIENTS FOR EQUATION $Z = 1 + B_1P + C_1P^2 + D_1P^3$

T, °K	B_1, atm^{-1} (a)	C_1, atm^{-2} (a)	D_1, atm^{-3} (a)	T, °R
100	-0.(1)17951	-0.(3)3487	-0.(3)21663	180
110	-.(1)13778	-.(3)1964	-.(4)37186	198
120	-.(1)10780	-.(3)1145	-.(5)79827	216
130	-.(2)8562	-.(4)6822	-.(5)19016	234
140	-.(2)6883	-.(4)4125	-.(6)40744	252
150	-.(2)5586	-.(4)2490	-.(7)10394	270
160	-.(2)4567	-.(4)1479	.(7)88448	288
170	-.(2)3755	-.(5)8412	.(6)10092	306
180	-.(2)3100	-.(5)4355	.(7)8925	324
190	-.(2)2565	-.(5)1748	.(7)7274	342
200	-.(2)2125	-.(7)801	.(7)5727	360
210	-.(2)1759	.(6)984	.(7)4434	378
220	-.(2)1453	.(5)164	.(7)3402	396
230	-.(2)1195	.(5)204	.(7)2594	414
240	-.(3)977	.(5)225	.(7)1968	432
250	-.(3)790	.(5)235	.(7)1484	450
260	-.(3)631	.(5)236	.(7)1111	468
270	-.(3)493	.(5)233	.(8)823	486
280	-.(3)375	.(5)226	.(8)602	504
290	-.(3)272	.(5)215	.(8)430	522
300	-.(3)183	.(5)208	.(8)298	540
310	-.(3)105	.(5)197	.(8)197	558
320	-.(4)374	.(5)187	.(8)118	576
330	.(4)220	.(5)176	.(9)58	594
340	.(4)742	.(5)166	.(9)12	612
350	.(3)120	.(5)156	-.(9)21	630
360	.(3)160	.(5)147	-.(9)47	648
370	.(3)196	.(5)138	-.(9)67	666
380	.(3)227	.(5)130	-.(9)81	684
390	.(3)255	.(5)122	-.(9)91	702
400	.(3)279	.(5)114	-.(9)97	720
410	.(3)301	.(5)107	-.(8)101	738
420	.(3)320	.(5)101	-.(8)104	756
430	.(3)336	.(6)948	-.(8)104	774
440	.(3)351	.(6)891	-.(8)104	792

[a]Number in parentheses indicates number of zeros immediately to right of decimal point.

TABLE 14.- COEFFICIENTS FOR EQUATION $Z = 1 + B_1P + C_1P^2 + D_1P^3$ - Continued

T, °K	B_1, atm^{-1} (a)	C_1, atm^{-2} (a)	D_1, atm^{-3} (a)	T, °R
450	0.(3)364	0.(6)838	-0.(8)103	810
460	.(3)375	.(6)789	-.(8)101	828
470	.(3)385	.(6)743	-.(9)98	846
480	.(3)394	.(6)700	-.(9)95	864
490	.(3)401	.(6)661	-.(9)92	882
500	.(3)408	.(6)623	-.(9)89	900
510	.(3)414	.(6)589	-.(9)86	918
520	.(3)418	.(6)556	-.(9)82	936
530	.(3)422	.(6)525	-.(9)79	954
540	.(3)426	.(6)497	-.(9)76	972
550	.(3)429	.(6)471	-.(9)73	990
560	.(3)431	.(6)445	-.(9)69	1,008
570	.(3)433	.(6)422	-.(9)66	1,026
580	.(3)434	.(6)400	-.(9)63	1,044
590	.(3)435	.(6)379	-.(9)61	1,062
600	.(3)435	.(6)360	-.(9)58	1,080
610	.(3)436	.(6)342	-.(9)55	1,098
620	.(3)436	.(6)324	-.(9)53	1,116
630	.(3)435	.(6)308	-.(9)50	1,134
640	.(3)435	.(6)293	-.(9)48	1,152
650	.(3)434	.(6)279	-.(9)46	1,170
660	.(3)433	.(6)265	-.(9)44	1,188
670	.(3)432	.(6)253	-.(9)42	1,206
680	.(3)431	.(6)241	-.(9)40	1,224
690	.(3)429	.(6)229	-.(9)38	1,242
700	.(3)428	.(6)219	-.(9)36	1,260
710	.(3)426	.(6)208	-.(9)34	1,278
720	.(3)424	.(6)199	-.(9)33	1,296
730	.(3)423	.(6)190	-.(9)31	1,314
740	.(3)421	.(6)181	-.(9)30	1,332
750	.(3)419	.(6)174	-.(9)29	1,350
760	.(3)417	.(6)166	-.(9)27	1,368
770	.(3)414	.(6)158	-.(9)26	1,386
780	.(3)412	.(6)151	-.(9)25	1,404
790	.(3)410	.(6)145	-.(9)24	1,422

[a]Number in parentheses indicates number of zeros immediately to right of decimal point.

TABLE 14.- COEFFICIENTS FOR EQUATION $Z = 1 + B_1P + C_1P^2 + D_1P^3$ - Concluded

T, °K	B_1, atm^{-1} (a)	C_1, atm^{-2} (a)	D_1, atm^{-3} (a)	T, °R
800	0.(3)408	0.(6)139	-0.(9)23	1,440
850	.(3)396	.(6)112	-.(9)18	1,530
900	.(3)384	.(7)91	-.(9)15	1,620
950	.(3)372	.(7)74	-.(9)12	1,710
1,000	.(3)360	.(7)61	-.(9)10	1,800
1,050	.(3)348	.(7)51		1,890
1,100	.(3)337	.(7)42		1,980
1,150	.(3)326	.(7)35		2,070
1,200	.(3)316	.(7)27		2,160
1,250	.(3)306	.(7)25		2,250
1,300	.(3)297	.(7)20		2,340
1,350	.(3)288	.(7)17		2,430
1,400	.(3)279	.(7)14		2,520
1,450	.(3)271	.(7)12		2,610
1,500	.(3)263	.(7)10		2,700
1,550	.(3)256	.(8)8		2,790
1,600	.(3)249	.(8)9		2,880
1,650	.(3)242	.(8)5		2,970
1,700	.(3)235	.(8)5		3,060
1,750	.(3)229	.(8)4		3,150
1,800	.(3)223			3,240
1,850	.(3)218			3,330
1,900	.(3)212			3,420
1,950	.(3)207			3,510
2,000	.(3)202			3,600
2,050	.(3)197			3,690
2,100	.(3)193			3,780
2,150	.(3)188			3,870
2,200	.(3)184			3,960
2,250	.(3)180			4,050
2,500	.(3)162			4,500
2,750	.(3)147			4,950
3,000	.(3)135			5,400

[a]Number in parentheses indicates number of zeros immediately to right of decimal point.

TABLE 15.- DERIVATIVE FUNCTIONS OF COEFFICIENTS B_1, C_1, AND D_1

T, °K	$T \frac{dB_1}{dT}$, atm^{-1} (a)	$T \frac{dC_1}{dT}$, atm^{-2} (a)	$T \frac{dD_1}{dT}$, atm^{-3} (a)	T, °R
100	0.(1)49505	0.(2)2099	0.(2)4138	180
110	.(1)38528	.(2)1202	.(3)6676	198
120	.(1)30694	.(3)7230	.(3)1402	216
130	.(1)24914	.(3)4509	.(4)3547	234
140	.(1)20541	.(3)2898	.(4)1000	252
150	.(1)17158	.(3)1902	.(5)2834	270
160	.(1)14490	.(3)1270	.(6)6199	288
170	.(1)12353	.(4)856	-.(7)8163	306
180	.(1)10617	.(4)581	-.(6)2829	324
190	.(2)9190	.(4)394	-.(6)3132	342
200	.(2)8004	.(4)265	-.(6)2855	360
210	.(2)7009	.(4)175	-.(6)2429	378
220	.(2)6167	.(4)112	-.(6)2008	396
230	.(2)5450	.(5)67	-.(6)1633	414
240	.(2)4835	.(5)35	-.(6)1318	432
250	.(2)4303	.(5)13	-.(6)1059	450
260	.(2)3841	-.(5)03	-.(7)8493	468
270	.(2)3438	-.(5)14	-.(7)6801	486
280	.(2)3084	-.(5)22	-.(7)5441	504
290	.(2)2772	-.(5)27	-.(7)4348	522
300	.(2)2496	-.(5)31	-.(7)3468	540
310	.(2)2250	-.(5)33	-.(7)2760	558
320	.(2)2032	-.(5)34	-.(7)2189	576
330	.(2)1837	-.(5)34	-.(7)1728	594
340	.(2)1661	-.(5)34	-.(7)1355	612
350	.(2)1504	-.(5)34	-.(7)1052	630
360	.(2)1362	-.(5)33	-.(8)808	648
370	.(2)1234	-.(5)32	-.(8)609	666
380	.(2)1117	-.(5)31	-.(8)448	684
390	.(2)1011	-.(5)30	-.(8)318	702
400	.(3)915	-.(5)29	-.(8)212	720
410	.(3)827	-.(5)27	-.(8)127	738
420	.(3)747	-.(5)26	-.(9)58	756
430	.(3)674	-.(5)25	-.(9)03	774
440	.(3)606	-.(5)24	.(9)41	792

[a]Number in parentheses indicates number of zeros immediately to right of decimal point.

TABLE 15.- DERIVATIVE FUNCTIONS OF COEFFICIENTS B_1, C_1, AND D_1 - Continued

T, °K	$T\frac{dB_1}{dT}$, atm^{-1} (a)	$T\frac{dC_1}{dT}$, atm^{-2} (a)	$T\frac{dD_1}{dT}$, atm^{-3} (a)	T, °R
450	0.(3)544	-0.(5)23	0.(9)76	810
460	.(3)488	-.(5)22	.(8)104	828
470	.(3)436	-.(5)21	.(8)125	846
480	.(3)388	-.(5)20	.(8)142	864
490	.(3)343	-.(5)19	.(8)154	882
500	.(3)302	-.(5)18	.(8)163	900
510	.(3)264	-.(5)17	.(8)169	918
520	.(3)229	-.(5)16	.(8)173	936
530	.(3)196	-.(5)16	.(8)176	954
540	.(3)166	-.(5)15	.(8)176	972
550	.(3)138	-.(5)14	.(8)176	990
560	.(3)112	-.(5)14	.(8)174	1,008
570	.(4)88	-.(5)13	.(8)172	1,026
580	.(4)65	-.(5)12	.(8)169	1,044
590	.(4)44	-.(5)12	.(8)165	1,062
600	.(4)25	-.(5)11	.(8)162	1,080
610	.(4)06	-.(5)11	.(8)158	1,098
620	-.(4)11	-.(5)10	.(8)153	1,116
630	-.(4)27	-.(5)10	.(8)149	1,134
640	-.(4)41	-.(6)9	.(8)145	1,152
650	-.(4)55	-.(6)9	.(8)140	1,170
660	-.(4)68	-.(6)9	.(8)136	1,188
670	-.(4)80	-.(6)8	.(8)131	1,206
680	-.(4)92	-.(6)8	.(8)127	1,224
690	-.(3)103	-.(6)8	.(8)123	1,242
700	-.(3)112	-.(6)7	.(8)118	1,260
710	-.(3)122	-.(6)7	.(8)114	1,278
720	-.(3)130	-.(6)7	.(8)110	1,296
730	-.(3)138	-.(6)6	.(8)106	1,314
740	-.(3)146	-.(6)6	.(8)102	1,332
750	-.(3)153	-.(6)6	.(9)99	1,350
760	-.(3)160	-.(6)6	.(9)95	1,368
770	-.(3)166	-.(6)5	.(9)92	1,386
780	-.(3)172	-.(6)5	.(9)88	1,404
790	-.(3)177	-.(6)5	.(9)85	1,422

[a]Number in parentheses indicates number of zeros immediately to right of decimal point.

TABLE 15.- DERIVATIVE FUNCTIONS OF COEFFICIENTS B_1, C_1, AND D_1 - Concluded

T, °K	$T \frac{dB_1}{dT}$, atm^{-1} (a)	$T \frac{dC_1}{dT}$, atm^{-2} (a)	$T \frac{dD_1}{dT}$, atm^{-3} (a)	T, °R
800	-0.(3)182	-0.(6)5	0.(9)82	1,440
900	-.(3)218	-.(6)3	.(9)57	1,620
1,000	-.(3)235	-.(6)2	.(9)40	1,800
1,100	-.(3)242	-.(6)2	.(9)28	1,980
1,200	-.(3)243	-.(6)1	.(9)20	2,160
1,300	-.(3)240	-.(6)1	.(9)15	2,340
1,400	-.(3)235	-.(6)1	.(9)11	2,520
1,500	-.(3)228	-.(6)1	.(10)8	2,700
1,600	-.(3)222	0	.(10)6	2,880
1,700	-.(3)215		.(10)5	3,060
1,800	-.(3)207		.(10)4	3,240
1,900	-.(3)200		.(10)3	3,420
2,000	-.(3)194		.(10)2	3,600
2,100	-.(3)187		.(10)2	3,780
2,200	-.(3)181		.(10)1	3,960
2,300	-.(3)175		.(10)1	4,140
2,400	-.(3)169		.(10)1	4,320
2,500	-.(3)164		.(10)1	4,500
2,600	-.(3)158		.(10)1	4,680
2,700	-.(3)153		0	4,860
2,800	-.(3)149			5,040
2,900	-.(3)144			5,220
3,000	-.(3)140			5,400

[a]Number in parentheses indicates number of zeros immediately to right of decimal point.

TABLE 16.- VALUES OF R FOR NITROGEN

For density in -	Value of R			
	For pressure in -			
	atm	kg/cm^2	mm Hg	lb/sq in.
	For temperatures in $^{\circ}$K			
g/cm^3	2.92892	3.02624	2,225.98	43.0436
mole/cm^3	82.0567	84.7832	62,363.1	1,205.91
mole/liter	.0820544	.0847809	62.3613	1.20587
lb/cu ft	.0469168	.0484755	35.6567	.089488
lb mole/cu ft	1.31442	1.35809	998.959	19.3167
	For temperatures in $^{\circ}$R			
g/cm^3	1.62718	1.68124	1,236.65	23.9130
mole/cm^3	45.5870	47.1017	34,646.1	669.947
mole/liter	.0455857	.0471004	34.6451	.669928
lb/cu ft	.0260648	.0269309	19.8092	.383049
lb mole/cu ft	.730231	.754495	554.976	10.7315

TABLE 17.- CONVERSION FACTORS FOR TABLES 1, 2, 4 TO 7, AND 9[a] TO 11

[Molecular weight of nitrogen, 28.016 g $mole^{-1}$]

(a) For tables 1 and 6

To convert tabulated value of	To	Having the dimensions indicated below	Multiply by
$\left(H^{o} - E_{0}^{o}\right)/RT_{0}$	$H^{o} - E_{0}^{o}$	cal $mole^{-1}$	542.821
$\left(H - E_{0}^{o}\right)/RT_{0}$	$H - E_{0}^{o}$	cal g^{-1}	19.3754
		j g^{-1}	81.0669
		Btu $(lb\ mole)^{-1}$	976.437
		Btu lb^{-1}	34.8528

(b) For tables 1, 5, and 7

To convert tabulated value of	To	Having the dimensions indicated below	Multiply by
C_{p}^{o}/R, S^{o}/R	C_{p}^{o}, S^{o}	cal $mole^{-1}$ $^{o}K^{-1}$ (or $^{o}C^{-1}$)	1.98719
C_{p}/R, S/R	C_{p}, S	cal g^{-1} $^{o}K^{-1}$ (or $^{o}C^{-1}$)	.0709305
$-\left(F^{o} - E_{0}^{o}\right)/RT$	$-\left(F^{o} - E_{0}^{o}\right)/T$	j g^{-1} $^{o}K^{-1}$ (or $^{o}C^{-1}$)	.296774
		Btu $(lb\ mole)^{-1}$ $^{o}R^{-1}$ (or $^{o}F^{-1}$)	1.98588
		Btu lb^{-1} $^{o}R^{-1}$ (or $^{o}F^{-1}$)	.0708838

[a]For table 9 a_{0} = 336.96 m/sec = 1,105.5 ft/sec.

TABLE 17.- CONVERSION FACTORS FOR TABLES 1, 2, 4 TO 7,

AND 9 TO 11 - Continued

(c) For table 4

To convert tabulated value of	To	Having the dimensions indicated below	Multiply by
ρ/ρ_0	ρ	g cm^{-3}	1.25046×10^{-3}
		mole cm^{-3}	4.46338×10^{-5}
		g liter^{-1}	1.25050
		lb in.$^{-3}$	4.51760×10^{-5}
		lb ft^{-3}	7.80641×10^{-2}

(d) For table 10

To convert tabulated value of	To	Having the dimensions indicated below	Multiply by
η/η_0	η	poise or g sec^{-1} cm^{-1}	1.6625×10^{-4}
		kg hr^{-1} m^{-1}	5.985×10^{-2}
		slug hr^{-1} ft^{-1}	1.2500×10^{-3}
		lb sec^{-1} ft^{-1}	1.1172×10^{-5}
		lb hr^{-1} ft^{-1}	4.0218×10^{-2}

(e) For table 11

To convert tabulated value of	To	Having the dimensions indicated below	Multiply by
k/k_0	k	cal cm^{-1} sec^{-1} $^{\circ}$K^{-1}	5.77×10^{-5}
		Btu ft^{-1} hr^{-1} $^{\circ}$R^{-1}	1.40×10^{-2}
		w cm^{-1} $^{\circ}$K^{-1}	2.41×10^{-4}

TABLE 17.- CONVERSION FACTORS FOR TABLES 1, 2, 4 TO 7, AND 9 TO 11 - Concluded

(f) For table 2

To convert tabulated value of	To	Having the dimensions indicated below	Multiply by
$\left(H^{\circ} - E_0^{\circ}\right)/RT_0$	$H^{\circ} - E_0^{\circ}$	cal mole^{-1}	542.821
		cal g^{-1}	38.7508
		j g^{-1}	162.134
		Btu (lb mole)$^{-1}$	976.437
		Btu lb^{-1}	69.7057
C_p°/R, S°/R	C_p°, S°	cal mole^{-1} $^{\circ}K^{-1}$ (or $^{\circ}C^{-1}$)	1.98719
		cal g^{-1} $^{\circ}K^{-1}$ (or $^{\circ}C^{-1}$)	.141861
$-\left(F^{\circ} - E_0^{\circ}\right)/RT$	$-\left(F^{\circ} - E_0^{\circ}\right)/T$	j g^{-1} $^{\circ}K^{-1}$ (or $^{\circ}C^{-1}$)	.5935488
		Btu (lb mole)$^{-1}$ $^{\circ}R^{-1}$ (or $^{\circ}F^{-1}$)	1.98588
		Btu lb^{-1} $^{\circ}R^{-1}$ (or $^{\circ}F^{-1}$)	.141768

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS

[The factors in parts (a) to (j) are reproduced from ref. 86; those in part (k) are based on ref. 87]

(a) For units of length

Multiply by appropriate entry ↓ to obtain →	cm	mm	μ	mμ	A
1 cm	1	10	10^{4}	10^{7}	10^{8}
1 mm	10^{-1}	1	10^{3}	10^{6}	10^{7}
1 μ	10^{-4}	10^{-3}	1	10^{3}	10^{4}
1 mμ	10^{-7}	10^{-6}	10^{-3}	1	10
1 A	10^{-8}	10^{-7}	10^{-4}	10^{-1}	1
Multiply by appropriate entry ↓ to obtain →	cm	m	in.	ft	yd
1 cm	1	0.01	0.3937	0.032808333	0.010936111
1 m	100	1	39.37	3.2808333	1.0936111
1 in.	2.5400051	0.025400051	1	0.083333333	0.027777778
1 ft	30.480061	0.30480061	12	1	0.33333333
1 yd	91.440183	0.91440183	36	3	1

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(b) For units of area

Multiply by appropriate entry ↓ to obtain →	cm^2	m^2	sq in.	sq ft	sq yd
1 cm^2	1	10^{-4}	0.15499969	1.0763867×10^{-3}	1.1959853×10^{-4}
1 m^2	10^4	1	1,549.9969	10.763867	1.1959853
1 sq in.	6.4516258	6.4516258×10^{-4}	1	6.9444444×10^{-3}	7.7160494×10^{-4}
1 sq ft	929.03412	0.092903412	144	1	0.11111111
1 sq yd	8,361.3070	0.83613070	1,296	9	1

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(c) For units of volume

Multiply by appropriate entry ↓ to obtain →	ml	liter	gal
1 cm^3	0.9999720	0.9999720×10^{-3}	2.6417047×10^{-4}
1 cu in.	16.38670	1.638670×10^{-2}	4.3290043×10^{-3}
1 cu ft	28,316.22	28.31622	7.4805195
1 ml	1	0.001	2.641779×10^{-4}
1 liter	1,000	1	0.2641779
1 gal	3,785.329	3.785329	1
Multiply by appropriate entry ↓ to obtain →	**cm^3**	**cu in.**	**cu ft**
1 cm^3	1	0.061023378	3.5314455×10^{-5}
1 cu in.	16.387162	1	5.7870370×10^{-4}
1 cu ft	28,317.017	1,728	1
1 ml	1.000028	0.06102509	3.531544×10^{-5}
1 liter	1,000.028	61.02509	0.03531544
1 gal	3,785.4345	231	0.13368056

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(d) For units of mass

Multiply by appropriate entry ↓ to obtain →	g	kg	lb	metric ton	ton
1 g	1	10^{-3}	2.2046223×10^{-3}	10^{-6}	1.1023112×10^{-6}
1 kg	10^{3}	1	2.2046223	10^{-3}	1.1023112×10^{-3}
1 lb	453.59243	0.45359243	1	4.5359243×10^{-4}	0.0005
1 metric ton	10^{6}	10^{3}	2,204.6223	1	1.1023112
1 ton	907,184.86	907.18486	2,000	0.90718486	1

(e) For units of density

Multiply by appropriate entry ↓ to obtain →	g/cm^3	g/ml	lb/cu in.	lb/cu ft	lb/gal
1 g/cm^3	1	1.000028	0.036127504	62.428327	8.3454535
1 g/ml	0.9999720	1	0.03612649	62.42658	8.345220
1 lb/cu in.	27.679742	27.68052	1	1,728	231
1 lb/cu ft	0.016018369	0.01601882	5.7870370×10^{-4}	1	0.13368056
1 lb/gal	0.11982572	0.1198291	4.3290043×10^{-3}	7.4805195	1

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(f) For units of pressure

Multiply by appropriate entry to obtain → ↓	dyne/cm^2	bar	atm	kg(wt.)/cm^2	mm Hg	in. Hg	lb(wt.)/sq in.
1 dyne/cm^2	1	10^{-6}	0.9869233×10^{-6}	1.0197162×10^{-6}	7.500617×10^{-4}	2.952993×10^{-5}	1.4503830×10^{-5}
1 bar	10^6	1	0.9869233	1.0197162	750.0617	29.52993	14.503830
1 atm	1,013,250	1.013250	1	1.0332275	760	29.92120	14.696006
1 kg(wt.)/cm^2	980,665	0.980665	0.9678411	1	735.5592	28.95897	14.223398
1 mm Hg	1,333.2237	1.3332237×10^{-3}	1.3157895×10^{-3}	1.3595098×10^{-3}	1	0.03937	0.019336850
1 in. Hg	33,863.95	0.03386395	0.03342112	0.03453162	25.40005	1	0.4911570
1 lb(wt.)/sq in.	68,947.31	0.06894731	0.06804570	0.07030669	51.71473	2.036009	1

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(g) For units of energy

Multiply by appropriate entry ↓ to obtain →	g mass (energy equiv.)	abs. J	int. J	cal	I. T.[a] cal	Btu	int. kw-hr	hp-hr	ft-lb(wt.)	cu ft - lb(wt.)/sq in.	liter-atm
1 g mass (energy equiv.)	1	8.98656×10^{13}	8.98508×10^{13}	2.14784×10^{13}	2.14644×10^{13}	8.51775×10^{10}	2.49586×10^{7}	3.34754×10^{7}	6.62814×10^{13}	4.60287×10^{11}	8.86880×10^{11}
1 abs. J	1.112772×10^{-14}	1	0.999835	0.239006	0.238849	0.947831×10^{-3}	2.77732×10^{-7}	3.72505×10^{-7}	0.737561	5.12195×10^{-3}	9.86896×10^{-3}
1 int. J	1.112956×10^{-14}	1.000165	1	0.239045	0.238889	0.947988×10^{-3}	2.777778×10^{-7}	3.72567×10^{-7}	0.737682	5.12279×10^{-3}	9.87058×10^{-3}
1 cal	4.65584×10^{-14}	4.1840	4.1833	1	0.999346	3.96573×10^{-3}	1.162030×10^{-6}	1.558562×10^{-6}	3.08595	2.14302×10^{-2}	4.12917×10^{-2}
1 I. T.[a] cal	4.65888×10^{-14}	4.18674	4.18605	1.000654	1	3.96832×10^{-3}	1.162791×10^{-6}	1.559582×10^{-6}	3.08797	2.14443×10^{-2}	4.13187×10^{-2}
1 Btu	1.174019×10^{-11}	1,055.040	1,054.866	252.161	251.996	1	2.93018×10^{-4}	3.93008×10^{-4}	778.156	5.40386	10.41215
1 int. kw-hr	4.00664×10^{-8}	3,600,594	3,600,000	860,563	860,000	3,412.76	1	1.341241	2,655,656	18,442.06	35,534.1
1 hp-hr	2.98727×10^{-8}	2,684,525	2,684,082	641,617	641,197	2,544.48	0.745578	1	1,980,000	13,750	26,493.5
1 ft-lb(wt.)	1.508720×10^{-14}	1.355821	1.355597	0.324049	0.323837	1.285089×10^{-3}	3.76555×10^{-7}	5.05051×10^{-7}	1	6.94444×10^{-3}	1.338054×10^{-2}
1 cu ft - lb(wt.)/sq in.	2.17256×10^{-12}	195.2382	195.2060	46.6630	46.6325	0.1850529	5.42239×10^{-5}	7.27273×10^{-5}	144	1	1.926797
1 liter-atm	1.127548×10^{-12}	101.3278	101.3111	24.2179	24.2021	0.0960417	2.81420×10^{-5}	3.77452×10^{-5}	74.7354	5.18996	1

[a]I. T., International Steam Tables.

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(h) For units of molecular energy

Multiply by appropriate entry to obtain → ↓	erg/molecule	abs. j/mole	int. j/mole	cal/mole	abs. electron-v/molecule	int. electron-v/molecule	wave number (cm^{-1})
1 erg/molecule	1	6.02283×10^{16}	6.02184×10^{16}	1.439491×10^{16}	6.24222×10^{11}	6.24017×10^{11}	5.03581×10^{15}
1 abs. j/mole	1.660349×10^{-17}	1	0.999835	0.239006	1.036427×10^{-5}	1.036086×10^{-5}	8.36121×10^{-2}
1 int. j/mole	1.660623×10^{-17}	1.000165	1	0.239046	1.036599×10^{-5}	1.036257×10^{-5}	8.36259×10^{-2}
1 cal/mole	6.94690×10^{-17}	4.18400	4.1833	1	4.33641×10^{-5}	4.33498×10^{-5}	0.349833
1 abs. electron-v/molecule	1.601992×10^{-12}	96,485.3	96,469.4	23,060.5	1	0.999670	8,067.34
1 int. electron-v/molecule	1.602521×10^{-12}	96,517.1	96,501.2	23,068.1	1.000330	1	8,070.00
1 wave number (cm^{-1})	1.985776×10^{-16}	11.95999	11.95802	2.85851	1.239567×10^{-4}	1.239158×10^{-4}	1

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Continued

(i) For units of specific energy

Multiply by appropriate entry ↓ to obtain →	abs. j/g	int. j/g	cal/g	I. T.[a] cal/g	Btu/lb
1 abs. j/g	1	0.999835	0.239006	0.238849	0.429929
1 int. j/g	1.000165	1	0.239045	0.238889	0.430000
1 cal/g	4.1840	4.1833	1	0.999346	1.798823
1 I. T.[a] cal/g	4.18674	4.18605	1.000654	1	1.8
1 Btu/lb	2.32597	2.32558	0.555919	0.555556	1

[a]I. T., International Steam Tables.

(j) For units of specific energy per degree

Multiply by appropriate entry ↓ to obtain →	abs. j/g °C	int. j/g °C	cal/g °C	I. T.[a] cal/g °C	Btu/lb °F
1 abs. j/g °C	1	0.999835	0.239006	0.238849	0.238849
1 int. j/g °C	1.000165	1	0.239045	0.238889	0.238889
1 cal/g °C	4.1840	4.1833	1	0.999346	0.999346
1 I. T.[a] cal/g °C	4.18674	4.18605	1.000654	1	1
1 Btu/lb °F	4.18674	4.18605	1.000654	1	1

[a]I. T., International Steam Tables.

TABLE 18.- CONVERSION FACTORS TO FREQUENTLY USED UNITS - Concluded

(k) For units of viscosity

Multiply by appropriate entry ↓ to obtain →	Centipoise	Poise	g_F sec cm^{-2}	lb_F sec in.$^{-2}$	lb_F sec ft^{-2}	lb_F hr in.$^{-2}$	lb_F hr ft^{-2}	g_M sec^{-1} cm^{-1}	lb_M sec^{-1} in.$^{-1}$	lb_M hr^{-1} ft^{-1}	slug sec^{-1} in.$^{-1}$	slug hr^{-1} ft^{-1}
Centipoise	1	1×10^{-2}	1.0197×10^{-5}	1.4504×10^{-7}	2.0886×10^{-5}	4.0289×10^{-11}	5.8016×10^{-9}	1×10^{-2}	5.5998×10^{-5}	2.4191	1.7405×10^{-6}	7.5188×10^{-2}
Poise	1×10^{2}	1	1.0197×10^{-3}	1.4504×10^{-5}	2.0886×10^{-3}	4.0289×10^{-9}	5.8016×10^{-7}	1	5.5998×10^{-3}	2.4191×10^{2}	1.7405×10^{-4}	7.5188
g_F sec cm^{-2}	9.8067×10^{4}	9.8067×10^{2}	1	1.4224×10^{-2}	2.0482	3.9510×10^{-6}	5.6895×10^{-4}	9.8067×10^{2}	5.4916	2.3723×10^{5}	1.7068×10^{-1}	7.3733×10^{3}
lb_F sec in.$^{-2}$	6.8947×10^{6}	6.8947×10^{4}	7.0305×10^{1}	1	1.4400×10^{2}	2.7778×10^{-4}	4.0000×10^{-2}	6.8947×10^{4}	3.8609×10^{2}	1.6679×10^{7}	1.2000×10	5.1840×10^{5}
lb_F sec ft^{-2}	4.7880×10^{4}	4.7880×10^{2}	4.8823×10^{-1}	6.9445×10^{-3}	1	1.9290×10^{-6}	2.7778×10^{-4}	4.7880×10^{2}	2.6812	1.1583×10^{5}	8.3335×10^{-2}	3.6000×10^{3}
lb_F hr in.$^{-2}$	2.4821×10^{10}	2.4821×10^{8}	2.5310×10^{5}	3.6000×10^{3}	5.1841×10^{5}	1	1.4400×10^{2}	2.4821×10^{8}	1.3899×10^{6}	6.0044×10^{10}	4.3199×10^{4}	1.8662×10^{9}
lb_F hr ft^{-2}	1.7237×10^{8}	1.7237×10^{6}	1.7577×10^{3}	2.5001×10^{1}	3.6001×10^{3}	6.9446×10^{-3}	1	1.7237×10^{6}	9.6524×10^{3}	4.1698×10^{8}	3.0000×10^{2}	1.2960×10^{7}
g_M sec^{-1} cm^{-1}	1×10^{2}	1	1.0197×10^{-3}	1.4504×10^{-5}	2.0886×10^{-3}	4.0289×10^{-9}	5.8016×10^{-7}	1	5.5998×10^{-3}	2.4191×10^{2}	1.7405×10^{-4}	7.5188
lb_M sec^{-1} in.$^{-1}$	1.7858×10^{4}	1.7858×10^{2}	1.8210×10^{-1}	2.5901×10^{-3}	3.7298×10^{-1}	7.1948×10^{-7}	1.0360×10^{-4}	1.7858×10^{2}	1	4.3200×10^{4}	3.1081×10^{-2}	1.3427×10^{3}
lb_M sec^{-1} ft^{-1}	1.4882×10^{3}	1.4882×10^{1}	1.5175×10^{-2}	2.1585×10^{-4}	3.1083×10^{-2}	5.9958×10^{-8}	8.6339×10^{-6}	1.4882×10	8.3333×10^{-2}	3.6000×10^{3}	2.5902×10^{-3}	1.1189×10^{2}
lb_M hr^{-1} in.$^{-1}$	4.9605	4.9605×10^{-2}	5.0582×10^{-5}	7.1947×10^{-7}	1.0361×10^{-4}	1.9985×10^{-10}	2.8779×10^{-8}	4.9605×10^{-2}	2.7778×10^{-4}	1.2000×10^{1}	8.6337×10^{-6}	3.7297×10^{-1}
lb_M hr^{-1} ft^{-1}	4.1338×10^{-1}	4.1338×10^{-3}	4.2152×10^{-6}	5.9957×10^{-8}	8.6339×10^{-6}	1.6655×10^{-11}	2.3983×10^{-9}	4.1336×10^{-3}	2.3148×10^{-5}	1	7.1946×10^{-7}	3.1081×10^{-2}

TABLE 19.- TEMPERATURE INTERCONVERSION TABLE

°K	°C	°F	°R	°K	°C	°F	°R	°K	°C	°F	°R	°K	°C	°F	°R	°K	°C	°F	°R
0	-273.16	-459.69	0	100	-173.16	-279.69	180	200	-73.16	-99.69	360	300	26.84	80.31	540	400	126.84	260.31	720
3.16	-270	-454.00	5.69	103.16	-170	-274.00	185.69	203.16	-70	-94.00	365.69	303.16	30	86.00	545.69	403.16	130	266.00	725.69
5.38	-267.78	-450	9.69	105.38	-167.78	-270	189.69	205.38	-67.78	-90	369.69	305.38	32.22	90	549.69	405.38	132.22	270	729.69
5.55	-267.61	-449.69	10	105.56	-167.60	-269.69	190	205.56	-67.60	-89.99	370	305.56	32.40	90.31	550	405.56	132.40	270.31	730
10	-263.16	-441.69	18.00	110	-163.16	-261.69	198.00	210	-63.16	-81.69	378.00	310	36.84	98.31	558.00	410	136.84	278.31	738.00
10.94	-262.22	-440	19.69	110.96	-162.20	-260	199.69	210.94	-62.22	-80	379.69	310.94	37.78	100	559.69	410.94	137.78	280	739.69
11.11	-262.05	-439.69	20	111.11	-162.05	-259.69	200	211.11	-62.05	-79.69	380	311.11	37.95	100.31	560	411.11	137.95	280.31	740
13.16	-260	-436.00	23.69	113.16	-160	-256.00	203.69	213.16	-60	-76.00	383.69	313.16	40	104.00	563.69	413.16	140	284.00	743.69
16.49	-256.67	-430	29.69	116.49	-156.67	-250	209.69	216.41	-56.67	-70	389.69	316.41	43.33	110	569.69	416.41	143.33	290	749.69
16.67	-256.49	-429.69	30	116.67	-156.49	-249.69	210	216.67	-56.49	-69.69	390	316.67	43.51	110.31	570	416.67	143.51	290.31	750
20	-253.16	-423.69	36.00	120	-153.16	-243.69	216.00	220	-53.16	-63.69	396.00	320	46.84	116.31	576.00	420	146.84	296.31	756.00
22.05	-251.11	-420	39.69	122.05	-151.11	-240	219.69	222.05	-51.11	-60	399.69	322.05	48.89	120	579.69	422.05	148.89	300	759.69
22.22	-250.94	-419.69	40	122.22	-150.94	-239.69	220	222.22	-50.94	-59.69	400	322.22	49.06	120.31	580	422.22	149.06	300.31	760
23.16	-250	-418.00	41.69	123.16	-150	-238.00	221.69	223.16	-50	-58.00	401.69	323.16	50	122.00	581.69	423.16	150	302.00	761.69
27.60	-245.56	-410	49.69	127.60	-145.56	-230	229.69	227.60	-45.56	-50	409.69	327.60	54.44	130	589.69	427.60	154.44	310	769.69
27.76	-245.38	-409.69	50	127.78	-145.38	-229.69	230	227.78	-45.38	-49.69	410	327.78	54.62	130.31	590	427.78	154.62	310.31	770
30	-243.16	-405.69	54.00	130	-143.16	-225.69	234.00	230	-43.16	-45.69	414.00	330	56.84	134.31	594.00	430	156.84	314.31	774.00
33.16	-240	-400	59.69	133.16	-140	-220	239.69	233.16	-40	-40	419.69	333.16	60	140	599.69	433.16	160	320	779.69
33.33	-239.83	-399.69	60	133.33	-139.83	-219.69	240	233.33	-39.83	-39.69	420	333.33	60.17	140.31	600	433.33	160.17	320.31	780
38.72	-234.44	-390	69.69	138.72	-134.44	-210	249.69	238.72	-34.44	-30	429.69	338.72	65.56	150	609.69	438.72	165.56	330	789.69
38.89	-234.27	-389.69	70	138.89	-134.27	-209.69	250	238.89	-34.27	-29.69	430	338.89	65.73	150.31	610	438.89	165.73	330.31	790
40	-233.16	-387.69	72.00	140	-133.16	-207.69	252.00	240	-33.16	-27.69	432.00	340	66.84	152.31	612.00	440	166.84	332.31	792.00
43.16	-230	-382.00	77.69	143.16	-130	-202.00	257.69	243.16	-30	-22.00	437.69	343.16	70	158.00	617.69	443.16	170	338.00	797.69
44.27	-228.89	-380	79.69	144.27	-128.89	-200	259.69	244.27	-28.89	-20	439.69	344.27	71.11	160	619.69	444.27	171.11	340	799.69
44.44	-228.72	-379.69	80	144.44	-128.62	-199.69	260	244.44	-28.72	-19.69	440	344.44	71.28	160.31	620	444.44	171.28	340.31	800
49.83	-223.33	-370	89.69	149.83	-123.33	-190	269.69	249.83	-23.33	-10	449.69	349.83	76.67	170	629.69	449.83	176.66	350	809.69
50	-223.16	-369.69	90	150	-123.16	-189.69	270	250	-23.16	-9.69	450	350	76.84	170.31	630	450	176.84	350.31	810
53.16	-220	-364.00	95.69	153.16	-120	-184.00	275.69	253.16	-20	-4.00	455.69	353.16	80	176.00	635.69	453.16	180	356.00	815.69
55.38	-217.78	-360	99.69	155.38	-117.78	-180	279.69	255.38	-17.78	0	459.69	355.38	82.22	180	639.69	455.38	182.22	360	819.69
55.56	-217.60	-359.69	100	155.56	-117.60	-179.69	280	255.56	-17.60	.31	460	355.56	82.40	180.31	640	455.56	182.40	360.31	820
60	-213.16	-351.69	108.00	160	-113.16	-171.69	288.00	260	-13.16	8.31	468.00	360	86.84	188.31	648.00	460	186.84	368.31	828.00
60.94	-212.22	-350	109.69	160.94	-112.22	-170	289.69	260.94	-12.22	10	469.69	360.94	87.78	190	649.69	460.94	187.78	370	829.69
61.11	-212.05	-349.69	110	161.11	-112.05	-169.69	290	261.11	-12.05	10.31	470	361.11	87.95	190.31	650	461.11	187.95	370.31	830
63.16	-210	-346.00	113.69	163.16	-110	-166.00	293.69	263.16	-10	14.00	473.69	363.16	90	194.00	653.69	463.16	190	374.00	833.69
66.49	-206.67	-340	119.69	166.49	-106.67	-160	299.69	266.49	-6.67	20	479.69	366.49	93.33	200	659.69	466.49	193.33	380	839.69
66.67	-206.49	-339.69	120	166.67	-106.49	-159.69	300	266.67	-6.49	20.31	480	366.67	93.51	200.31	660	466.67	193.51	380.31	840
70	-203.16	-333.69	126.00	170	-103.16	-153.69	306.00	270	-3.16	26.31	486.00	370	96.84	206.31	666.00	470	196.84	386.31	846.00
72.05	-201.11	-330	129.69	172.05	-101.11	-150	309.69	272.05	-1.11	30	489.69	372.05	98.89	210	669.69	472.05	198.89	390	849.69
72.22	-200.94	-329.69	130	172.22	-100.94	-149.69	310	272.22	-.94	30.31	490	372.22	99.06	210.31	670	472.22	199.06	390.31	850
73.16	-200	-328.00	131.69	173.16	-100	-148.00	311.69	273.16	0	32.00	491.69	373.16	100	212.00	671.69	473.16	200	392.00	851.69
77.60	-195.56	-320	139.69	177.60	-95.56	-140	319.69	277.60	4.44	40	499.69	377.60	104.44	220	679.69	477.60	204.44	400	859.69
77.78	-195.38	-319.69	140	177.78	-95.38	-139.69	320	277.78	4.62	40.31	500	377.78	104.62	220.31	680	477.78	204.62	400.31	860
80	-193.16	-315.69	144.00	180	-93.16	-135.69	324.00	280	6.84	44.31	504.00	380	106.84	224.31	684.00	480	206.84	404.31	864.00
83.16	-190	-310	149.69	183.16	-90	-130	329.69	283.16	10	50	509.69	383.16	110	230	689.69	483.16	210	410	869.69
83.33	-189.83	-309.69	150	183.33	-89.83	-129.69	330	283.33	10.17	50.31	510	383.33	110.17	230.31	690	483.33	210.17	410.31	870
88.72	-184.44	-300	159.69	188.72	-84.44	-120	339.69	288.72	15.56	60	519.69	388.72	115.56	240	699.69	488.72	215.56	420	879.69
88.89	-184.27	-299.69	160	188.89	-84.27	-119.69	340	288.89	15.73	60.31	520	388.89	115.73	240.31	700	488.89	215.73	420.31	880
90	-183.16	-297.69	162.00	190	-83.16	-117.69	342.00	290	16.84	62.31	522.00	390	116.84	242.31	702.00	490	216.84	422.31	882.00
93.16	-180	-292.00	167.69	193.16	-80	-112.00	347.69	293.16	20	68.00	527.69	393.16	120	248.00	707.69	493.16	220	428.00	887.69
94.27	-178.89	-290	169.69	194.27	-78.89	-110	349.69	294.27	21.11	70	529.69	394.27	121.11	250	709.69	494.27	221.11	430	889.69
94.44	-178.72	-289.69	170	194.44	-78.72	-109.69	350	294.44	21.28	70.31	530	394.44	121.28	250.31	710	494.44	221.28	430.31	890
99.83	-173.33	-280	179.69	199.83	-73.33	-100	359.69	299.83	26.67	80	539.69	399.83	126.67	260	719.69	499.83	226.67	440	899.69
100	-173.16	-279.69	180	200	-73.16	-99.69	360	300	26.84	80.31	540	400	126.84	260.31	720	500	226.84	440.31	900

°K	°R
°C	°F
1	1.8
2	3.6
3	5.4
4	7.2
5	9.0
6	10.8
7	12.6
8	14.4
9	16.2
10	18.0

°R	°K
°F	°C
1	0.56
2	1.11
3	1.67
4	2.22
5	2.78
6	3.33
7	3.89
8	4.44
9	5.00
10	5.56
11	6.11
12	6.67
13	7.22
14	7.78
15	8.33
16	8.89
17	9.44
18	10.00

TABLE 19.- TEMPERATURE INTERCONVERSION TABLE - Concluded

°K	°C	°F	°R	°K	°C	°F	°R	°K	°C	°F	°R	°K	°C	°F	°R	°K	°C	°F	°R
500	226.84	440.31	900	600	326.84	620.31	1080	700	426.84	800.31	1260	800	526.84	980.31	1440	900	626.84	1160.31	1620
503.16	230	446.00	905.69	603.16	330	626.00	1085.69	703.16	430	806.00	1265.69	803.16	530	986.00	1445.69	903.16	630	1166.00	1625.69
505.38	232.22	450	909.69	605.38	332.22	630	1089.69	705.38	432.22	810	1269.69	805.38	532.22	990	1449.69	905.38	632.22	1170	1629.69
505.56	232.40	450.31	910	605.56	332.40	630.31	1090	705.56	432.40	810.31	1270	805.56	532.40	990.31	1450	905.56	632.40	1170.31	1630
510	236.84	458.31	918.00	610	336.84	638.31	1098.00	710	436.84	818.31	1278.00	810	536.84	998.31	1458.00	910	636.84	1178.31	1638.00
510.94	237.78	460	919.69	610.94	337.78	640	1099.69	710.94	437.78	820	1279.69	810.94	537.78	1000	1459.69	910.94	637.78	1180	1639.69
511.11	237.95	460.31	920	611.11	337.95	640.31	1100	711.11	437.95	820.31	1280	811.11	537.95	1000.31	1460	911.11	637.95	1180.31	1640
513.16	240	464.00	923.69	613.16	340	644.00	1103.69	713.16	440	824.00	1283.69	813.16	540	1004.00	1463.69	913.16	640	1184.00	1643.69
516.41	243.33	470	929.69	616.41	343.33	650	1109.69	716.41	443.33	830	1289.69	816.41	543.33	1010	1469.69	916.41	643.33	1190	1649.69
516.67	243.51	470.31	930	616.67	343.51	650.31	1110	716.67	443.51	830.31	1290	816.67	543.51	1010.31	1470	916.67	643.51	1190.31	1650
520	246.84	476.31	936.00	620	346.84	656.31	1116.00	720	446.84	836.31	1296.00	820	546.84	1016.31	1476.00	920	646.84	1196.31	1656.00
522.05	248.89	480	939.69	622.05	348.89	660	1119.69	722.05	448.89	840	1299.69	822.05	548.89	1020	1479.69	922.05	648.89	1200	1659.69
522.22	249.06	480.31	940	622.22	349.06	660.31	1120	722.22	449.06	840.31	1300	822.22	549.06	1020.31	1480	922.22	649.06	1200.31	1660
523.16	250	482.00	941.69	623.16	350	662.00	1121.69	723.16	450	842.00	1301.69	823.16	550	1022.00	1481.69	923.16	650	1202.00	1661.69
527.60	254.44	490	949.69	627.60	354.44	670	1129.69	727.60	454.44	850	1309.69	827.60	554.44	1030	1489.69	927.60	654.44	1210	1669.69
527.78	254.62	490.31	950	627.78	354.62	670.31	1130	727.78	454.62	850.31	1310	827.78	554.62	1030.31	1490	927.78	654.62	1210.31	1670
530	256.84	434.31	954.00	630	356.84	674.31	1134.00	730	456.84	854.31	1314.00	830	556.84	1034.31	1494.00	930	656.84	1214.31	1674.00
533.16	260	500	959.69	633.16	360	680	1139.69	733.16	460	860	1319.69	833.16	560	1040	1499.69	933.16	660	1220	1679.69
533.33	260.17	500.31	960	633.33	360.17	680.31	1140	733.33	460.17	860.31	1320	833.33	560.17	1040.31	1500	933.33	660.17	1220.31	1680
538.72	265.56	510	969.69	638.72	365.56	690	1149.69	738.72	465.56	870	1329.69	838.72	565.56	1050	1509.69	938.72	665.56	1230	1689.69
533.89	265.73	510.31	970	638.89	365.73	690.31	1150	738.89	465.73	870.31	1330	838.89	565.73	1050.31	1510	938.89	665.73	1230.31	1690
540	266.84	512.31	972.00	640	366.84	692.31	1152.00	740	466.84	872.31	1332.00	840	566.84	1052.31	1512.00	940	666.84	1232.31	1692.00
543.16	270	518.00	977.69	643.16	370	698.00	1157.69	743.16	470	876.00	1337.69	843.16	570	1058.00	1517.69	943.16	670	1238.00	1697.69
544.27	271.11	520	979.69	644.27	371.11	700	1159.69	744.27	471.11	880	1339.69	844.27	571.11	1060	1519.69	944.27	671.11	1240	1699.69
544.44	271.28	520.31	980	644.44	371.28	700.31	1160	744.44	471.28	880.31	1340	844.44	571.28	1060.31	1520	944.44	671.28	1240.31	1700
549.83	276.66	530	989.69	649.83	376.66	710	1169.69	749.83	476.66	890	1349.69	849.83	576.66	1070	1529.69	949.83	676.66	1250	1709.69
550	276.84	530.31	990	650	376.84	710.31	1170	750	476.84	890.31	1350	850	576.84	1070.31	1530	950	676.84	1250.31	1710
553.16	280	536.00	995.69	653.16	380	716.00	1175.69	753.16	480	896.00	1355.69	853.16	580	1076.00	1535.69	953.16	680	1256.00	1715.69
555.38	282.22	540	999.69	655.38	382.22	720	1179.69	755.38	482.22	900	1359.69	855.38	582.22	1080	1539.69	955.38	682.22	1260	1719.69
555.56	282.40	540.31	1000	655.56	382.40	720.31	1180	755.56	482.40	900.31	1360	855.56	582.40	1080.31	1540	955.56	682.40	1260.31	1720
560	286.84	548.31	1008.00	660	386.84	728.31	1188.00	760	486.84	908.31	1368.00	860	586.84	1088.31	1548.00	960	686.84	1262.31	1722.00
560.94	287.78	550	1009.69	660.94	387.78	730	1189.69	760.94	487.78	910	1369.69	860.94	587.78	1090	1549.69	960.94	687.78	1270	1729.69
561.11	287.95	550.31	1010	661.11	387.95	730.31	1190	761.11	487.95	910.31	1370	861.11	587.95	1090.31	1550	961.11	687.95	1270.31	1730
563.16	290	554.00	1013.69	663.16	390	734.00	1193.69	763.16	490	914.00	1373.69	863.16	590	1094.00	1553.69	963.16	690	1274.00	1733.69
566.49	293.33	560	1019.69	666.49	393.33	740	1199.69	766.49	493.33	920	1379.69	866.49	593.33	1100	1559.69	966.49	693.33	1280	1739.69
566.67	293.51	560.31	1020	666.67	393.51	740.31	1200	766.67	493.51	920.31	1380	866.67	593.51	1100.31	1560	966.67	693.51	1280.31	1740
570	296.84	566.31	1026.00	670	396.84	746.31	1206.00	770	496.84	926.31	1386.00	870	596.84	1106.31	1566.00	970	696.84	1286.31	1746.00
572.05	298.89	570	1029.69	672.05	398.89	750	1209.69	772.05	498.89	930	1389.69	872.05	598.89	1110	1569.69	972.05	698.89	1290	1749.69
527.22	299.06	570.31	1030	672.22	399.06	750.31	1210	772.22	499.06	930.31	1390	872.22	599.06	1110.31	1570	972.22	699.06	1290.31	1750
573.16	300	572.00	1031.69	673.16	400	752.00	1211.69	773.16	500	932.00	1391.69	873.16	600	1112.00	1571.69	973.16	700	1292.00	1751.69
577.60	304.44	580	1039.69	677.60	404.44	760	1219.69	777.60	504.44	940	1399.69	877.60	604.44	1120	1579.69	977.60	704.44	1300	1759.69
577.78	304.62	580.31	1040	677.78	404.62	760.31	1220	777.78	504.62	940.31	1400	877.78	604.62	1120.31	1580	977.78	704.62	1300.31	1760
580	306.84	584.31	1044.30	680	406.84	764.31	1224.00	780	506.84	944.31	1404.00	880	606.84	1124.31	1584.00	980	706.84	1304.31	1764.30
583.16	310	590	1049.69	683.16	410	770	1229.69	783.16	510	950	1409.69	883.16	610	1130	1589.69	983.16	710	1310	1769.69
583.33	310.17	590.31	1050	683.33	410.17	770.31	1230	783.33	510.17	950.31	1410	883.33	610.17	1130.31	1590	983.33	710.17	1310.31	1770
588.72	315.56	600	1059.69	688.72	415.56	780	1239.69	788.72	515.56	960	1419.69	888.72	615.56	1140	1599.69	988.72	715.56	1320	1779.69
588.89	315.73	600.31	1060	688.89	415.73	780.31	1240	788.89	515.73	960.31	1420	888.89	615.73	1140.31	1600	988.89	715.73	1320.31	1780
590	316.84	602.31	1062.00	690	416.84	782.31	1242.00	790	516.84	962.31	1422.00	890	616.84	1142.31	1602.00	990	716.84	1322.31	1782.00
593.16	320	608.00	1067.69	693.16	420	788.00	1.47.69	793.16	520	968.00	1427.69	893.16	620	1148.00	1607.69	993.16	720	1328.00	1787.69
594.27	321.11	610	1069.69	694.27	421.11	790	1249.69	794.87	521.11	970	1429.69	894.27	621.11	1150	1609.69	994.27	721.11	1330	1789.69
594.44	321.28	610.31	1070	694.44	421.28	790.31	1250	794.44	521.28	970.31	1430	894.44	621.28	1150.31	1610	994.44	721.28	1330.31	1790
599.83	326.67	620	1079.69	699.83	426.67	800	1259.67	799.83	526.67	980	1439.69	899.83	626.67	1160	1619.69	999.83	726.67	1340	1799.69
600	326.84	620.31	1080	700	426.84	800.31	1260	800	526.84	980.31	1440	900	626.84	1160.31	1620	1000	726.84	1340.31	1800

°K	°R
°C	°F
1	1.8
2	3.6
3	5.4
4	7.2
5	9.0
6	10.8
7	12.6
8	14.4
9	16.2
10	18.0

°R	°K
°F	°C
1	0.56
2	1.11
3	1.67
4	2.22
5	2.78
6	3.33
7	3.89
8	4.44
9	5.00
10	5.56
11	6.11
12	6.67
13	7.22
14	7.78
15	8.33
16	8.89
17	9.44
18	10.00

TABLE 20.- CALORIMETRIC ENTROPY OF NITROGEN VAPOR AT BOILING POINT

	Boiling point, °K	S or S°, entropy units	Source (a)
Calculation using 77.32° K as boiling point			
S for liquid	77.32	19.074	(1)
$S_{vapor} = \frac{1,332.9 \text{ cal/mole}}{77.32^\circ \text{ K}}$		17.239	(1)
S for vapor	77.32	36.313 ± 0.1	(1)
[b] S° for gas	77.32	36.416	(1)
S° - S		0.103	
[b] S° for gas	77.32	36.373	(2)
S° - S		0.060	
Calculation using 77.34° K as boiling point			
S for liquid	77.32	19.074	(1)
S (77.34° K) - S (77.32° K) for liquid		0.004	(1)
S for liquid	77.34	19.078	(3)
$S_{vapor} = \frac{1,320 \text{ cal/mole}}{77.34^\circ \text{ K}}$		17.067	(3)
S for vapor	77.34	36.145	
[b] S° for gas	77.34	36.375	(2)
S° - S		0.230	
Calculation using 77.395° K as boiling point			
S for liquid	77.32	19.074	(1)
S (77.395° K) - S (77.32° K) for liquid		0.013	(1)
S for liquid	77.395	19.087	(4)
S_{vapor}		17.079	(5)
S for vapor	77.395	36.166	
[b] S° for gas	77.395	36.380	(2)
S° - S		0.214	
S° - S estimated from Berthelot equation		0.22	(1)
S° - S estimated from present correlation		$0.125P + 0.008P^2 + 0.77P^3$	
Calculation using 77.395° K as boiling point with S based on heat of vaporization of Furukawa and McCoskey			
S for liquid	77.395	19.087	(1), (3)
$S_{vapor} = \frac{1,336.6 \text{ cal/mole}}{77.395^\circ \text{ K}}$		17.270	(6)
S for vapor	77.395	36.357	
[b] S° for gas	77.395	36.380	(2)
S° - S		0.023	

[a] (1) Giauque and Clayton (ref. 39).
(2) Table 1.
(3) Friedman and White (ref. 40).
(4) Hoge and King.
(5) Adjusted from value based on reference 40 observing constant factor in pressure.
(6) Furukawa and McCoskey (ref. 41).

[b] Computed from spectra.

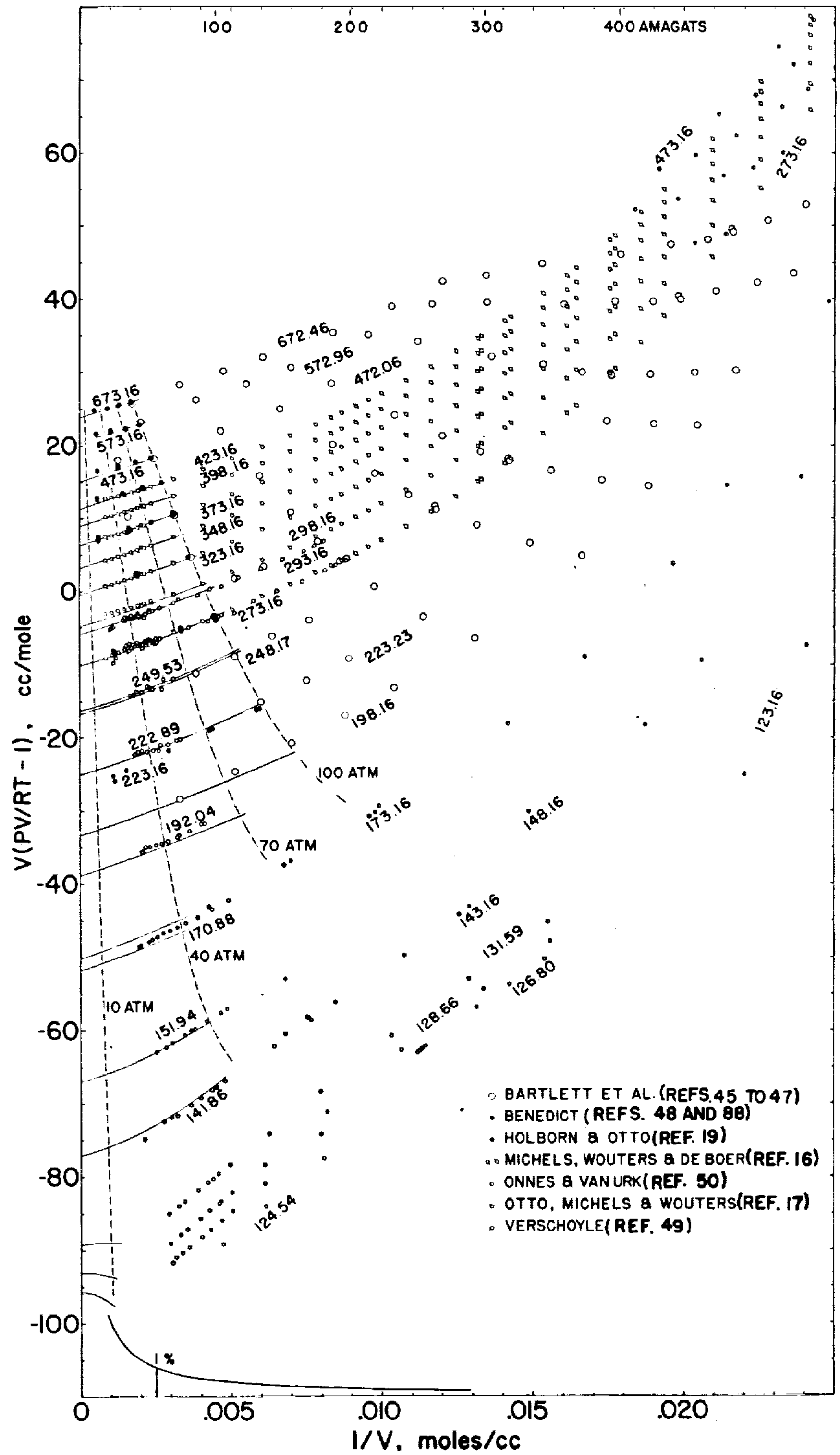

Figure 1.- PVT data for gaseous nitrogen. Values for temperatures in °K. (Hyperbola at bottom of figure shows vertical displacement due to a 1-percent error in PV/RT.)

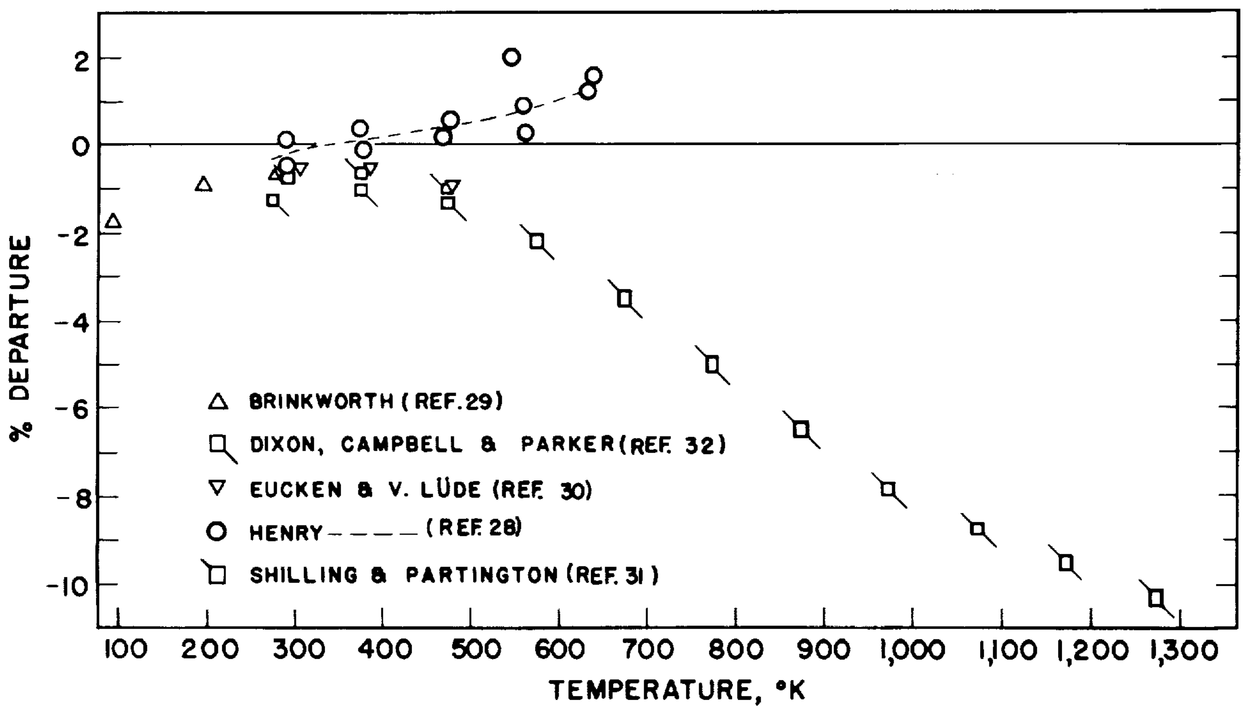

Figure 2.- Departure of experimental specific heat from table 5.

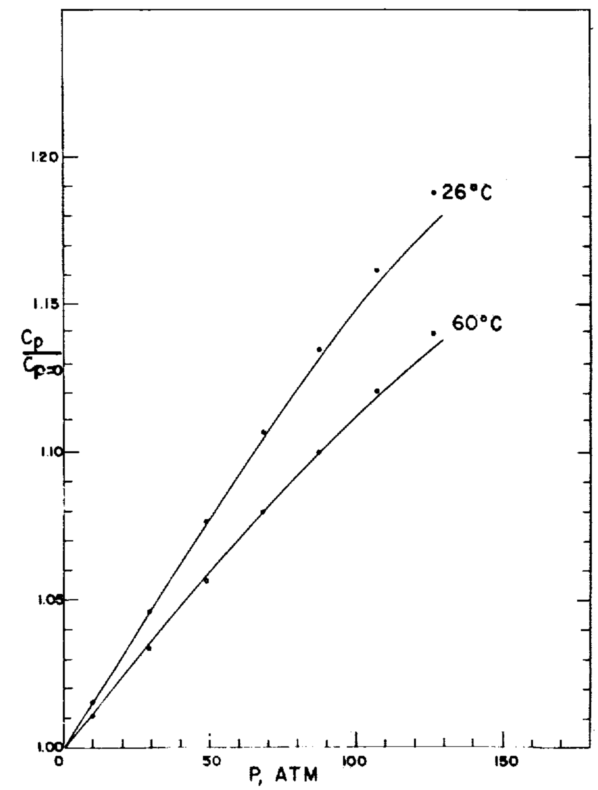

Figure 3.- Dependence of specific heat upon pressure. Data of Workman (ref. 33).

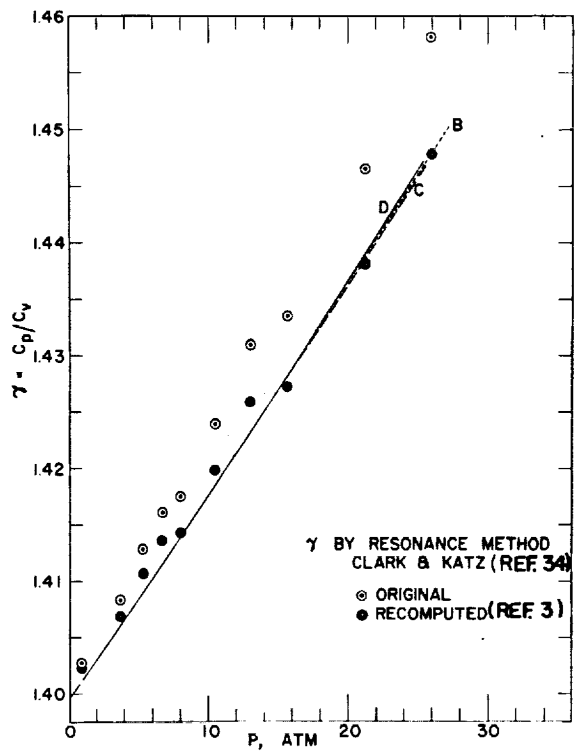

Figure 4.- Ratio of specific heats by resonance method. Temperature, 23° C.

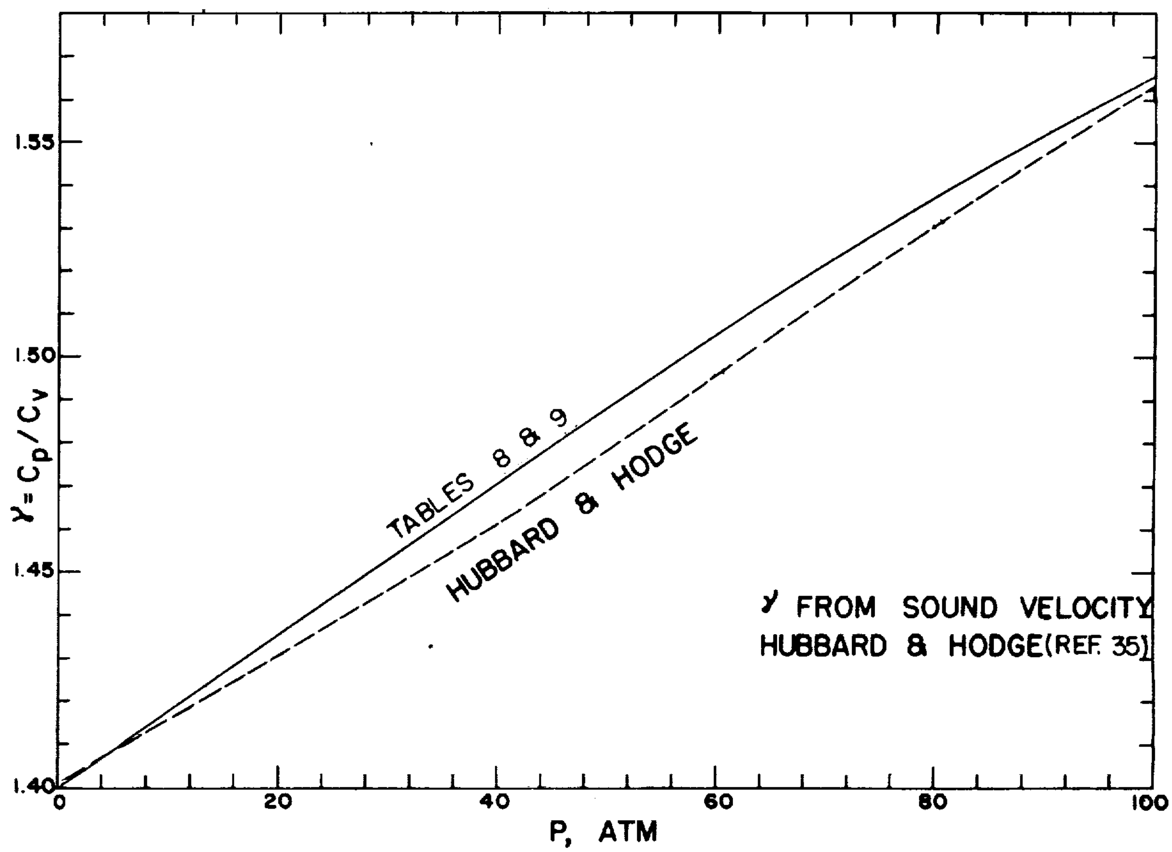

Figure 5.- Ratio of specific heats from velocity of sound.
Temperature, 27° C.

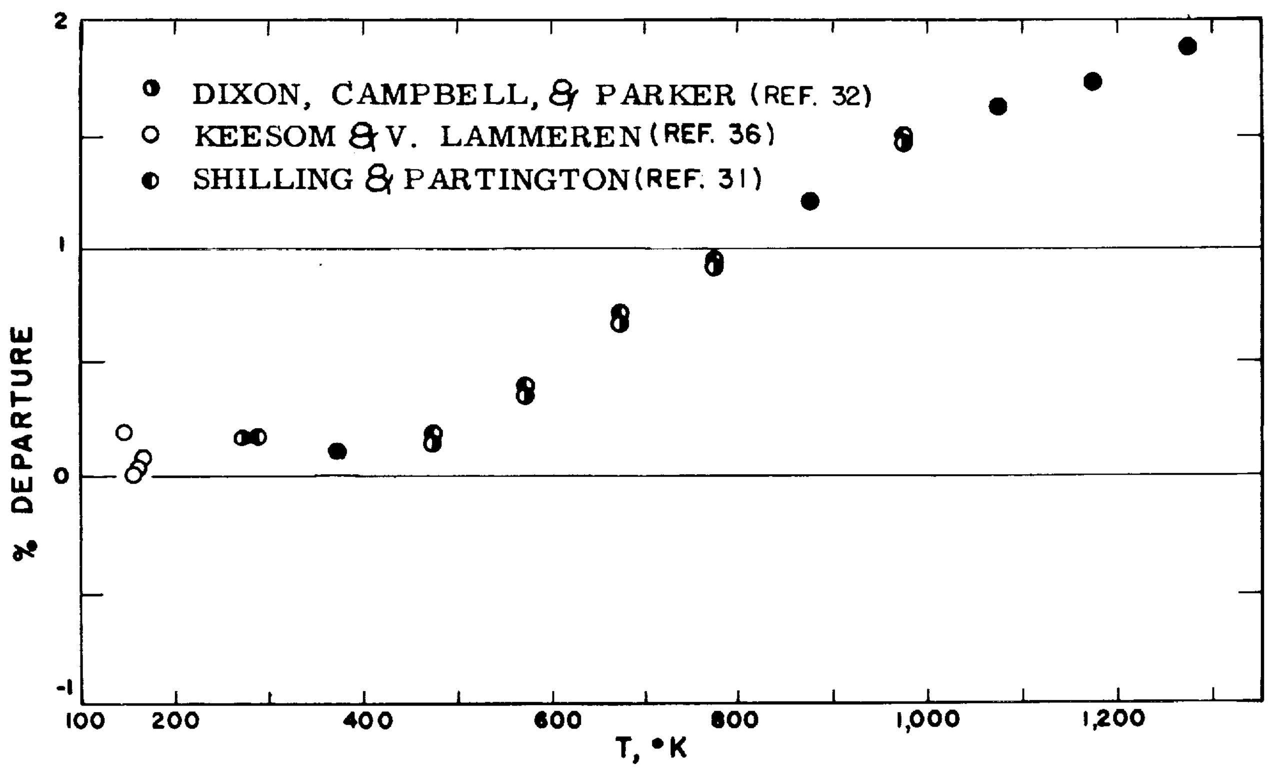

Figure 6.- Departures of experimental velocity of sound from table 9.

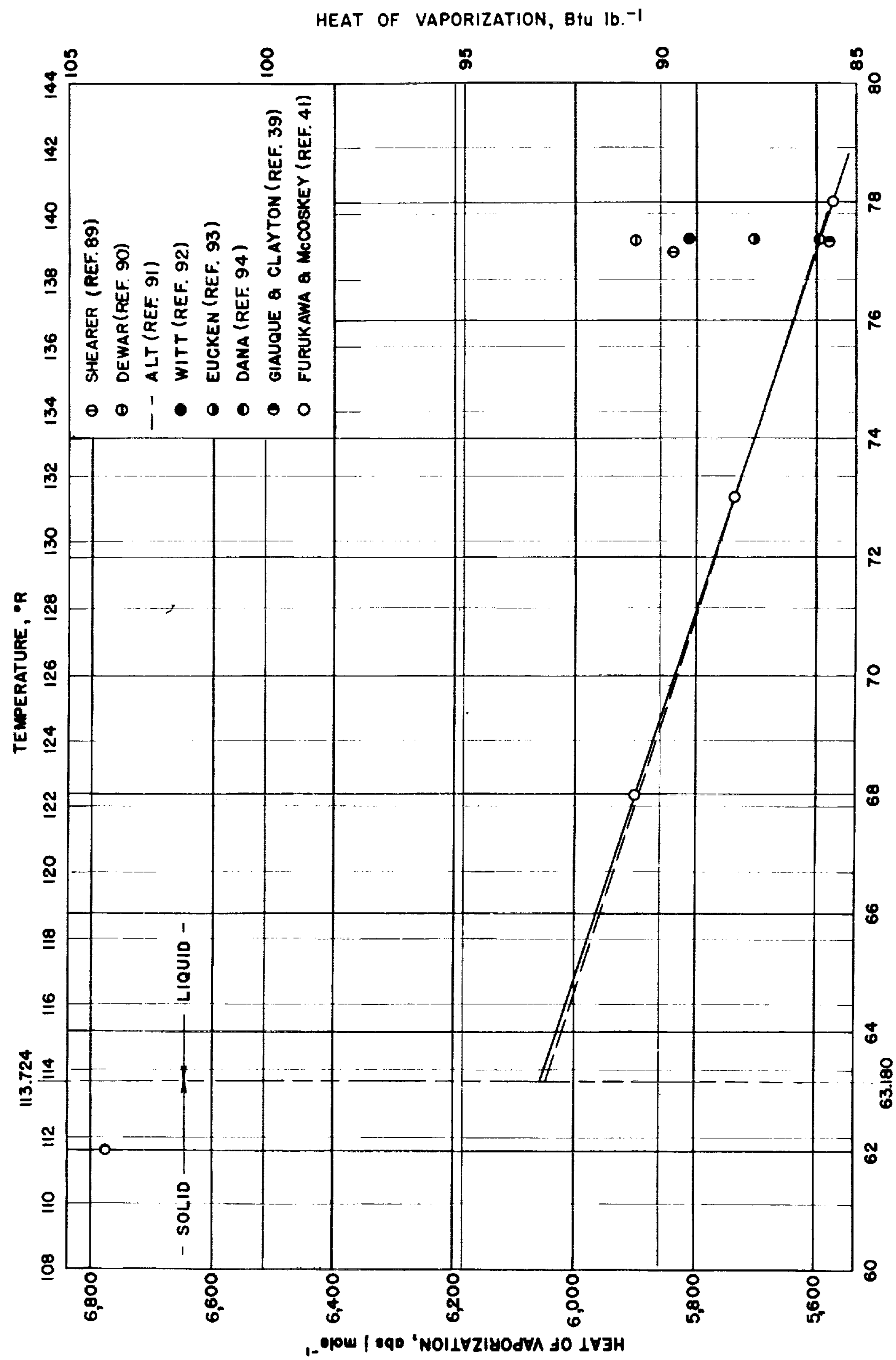

Figure 7.- Heat of vaporization of nitrogen.

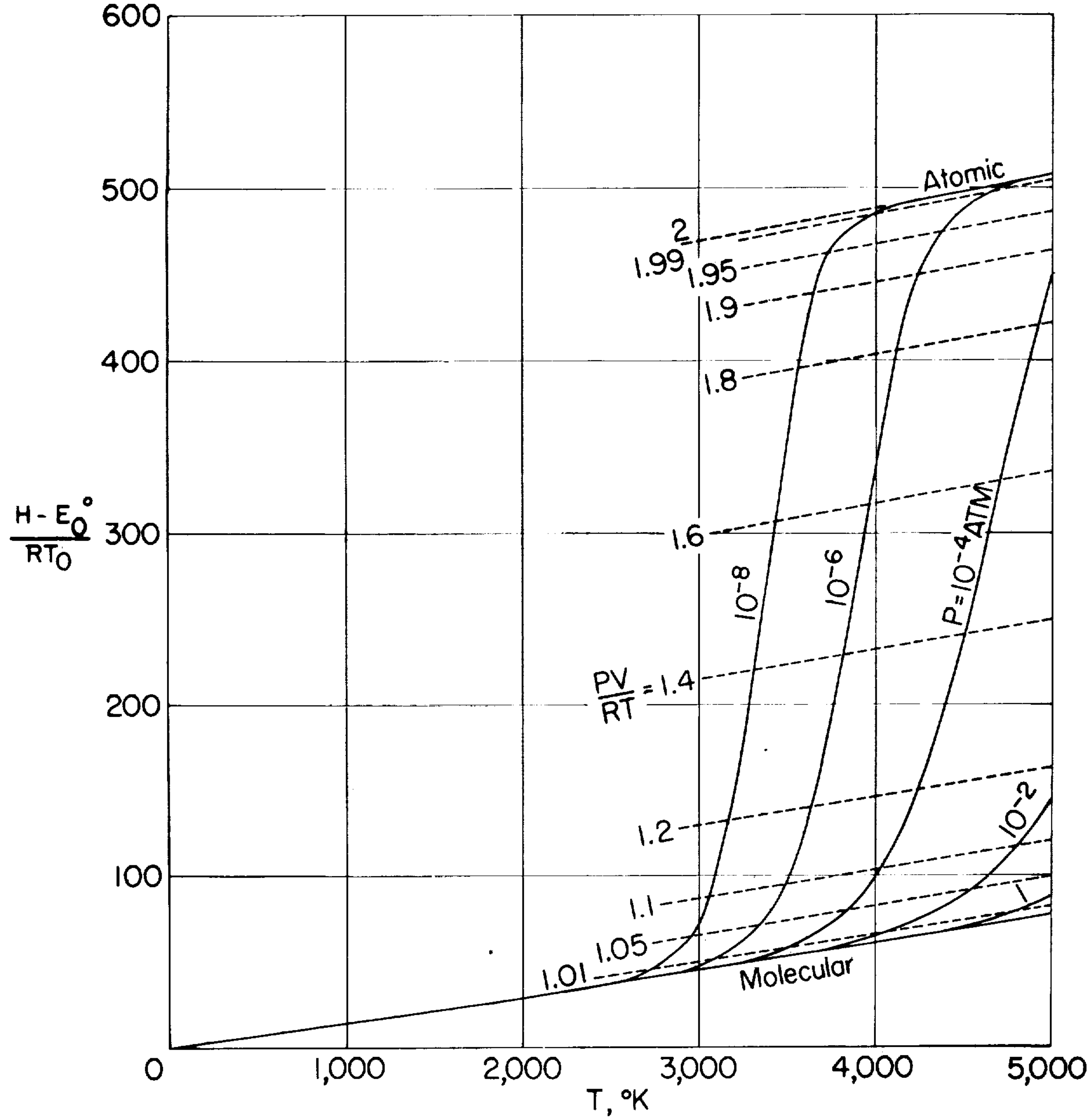

Figure 8.- Effect of dissociation on enthalpy of nitrogen.

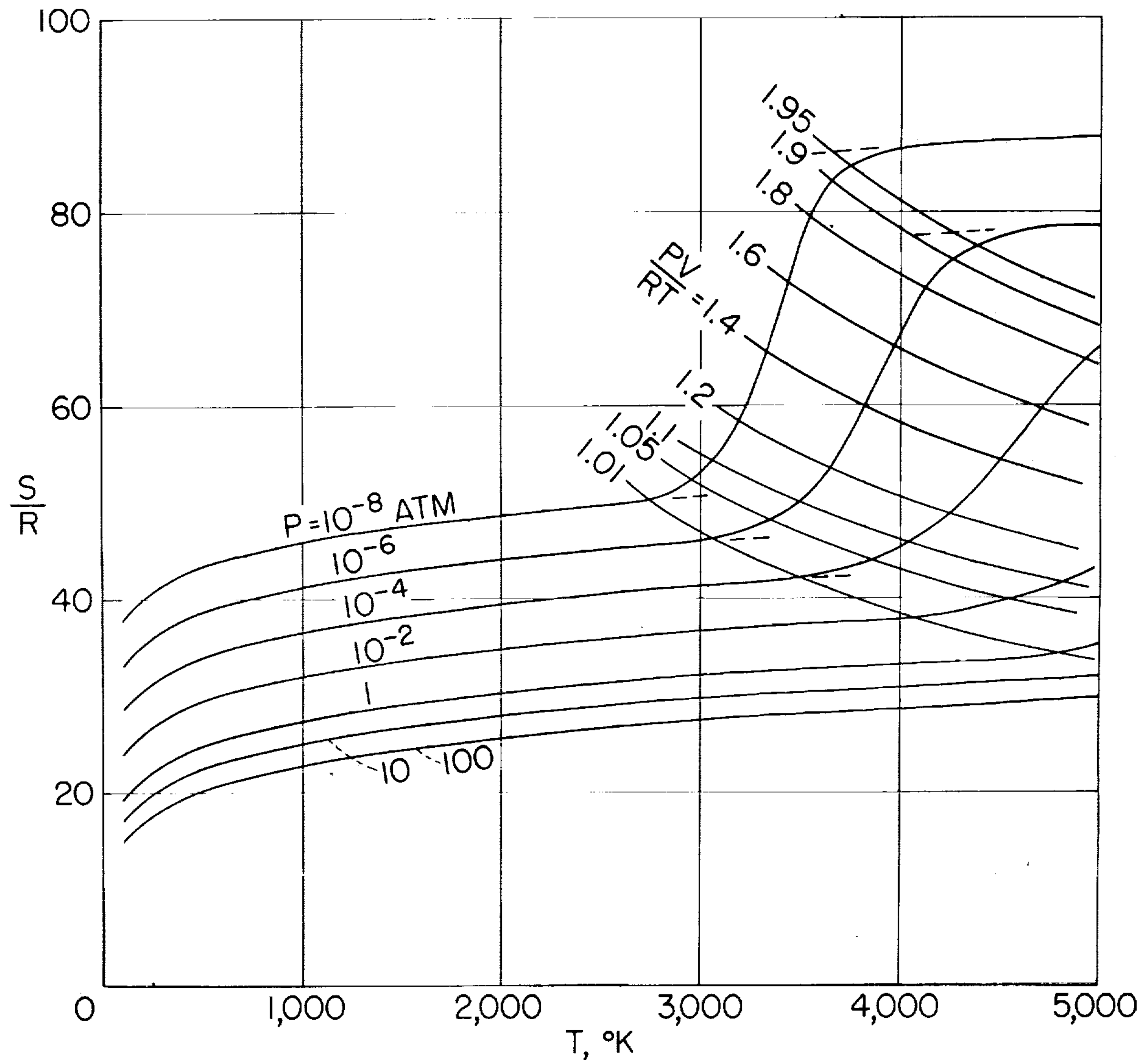

Figure 9.- Effect of dissociation on entropy of nitrogen.

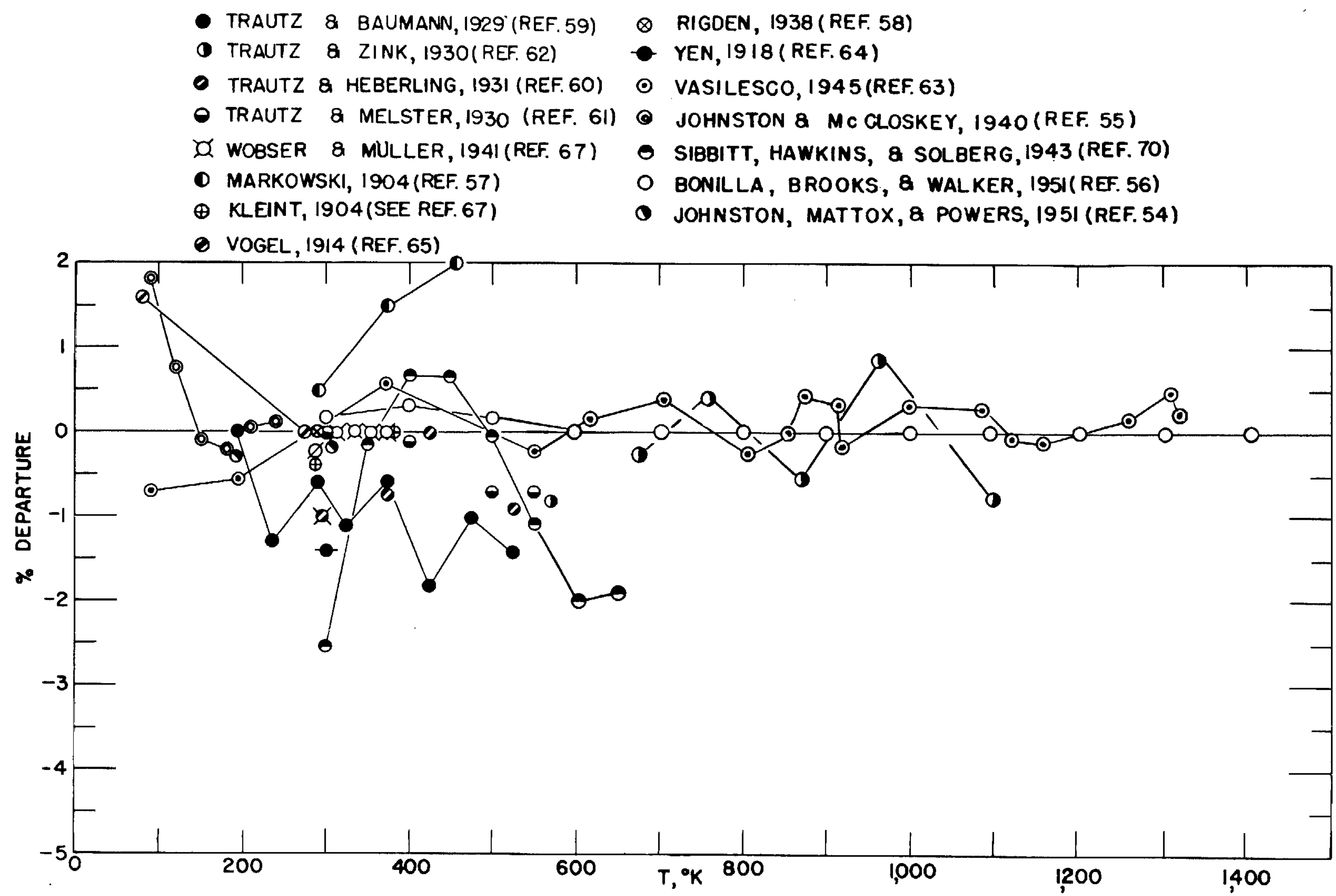

Figure 10.- Departures of experimental viscosities at 1 atmosphere from table 10. Percent departure, $\frac{\eta - \eta_{calc}}{\eta_{calc}} \times 100$.

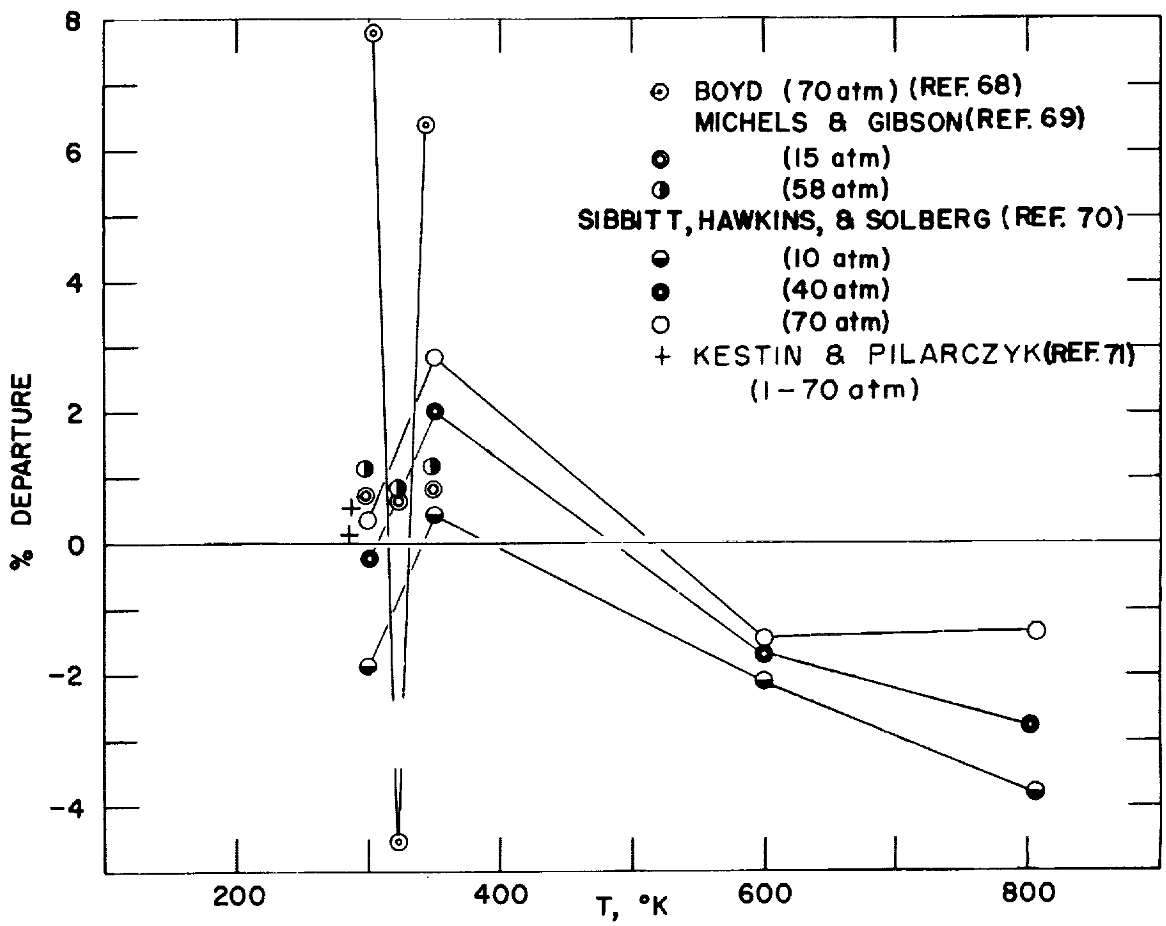

Figure 11.- Departure of high-pressure measurements from table 10.

Percent departure, $\frac{\eta - \eta_{calc}}{\eta_{calc}} \times 100$.

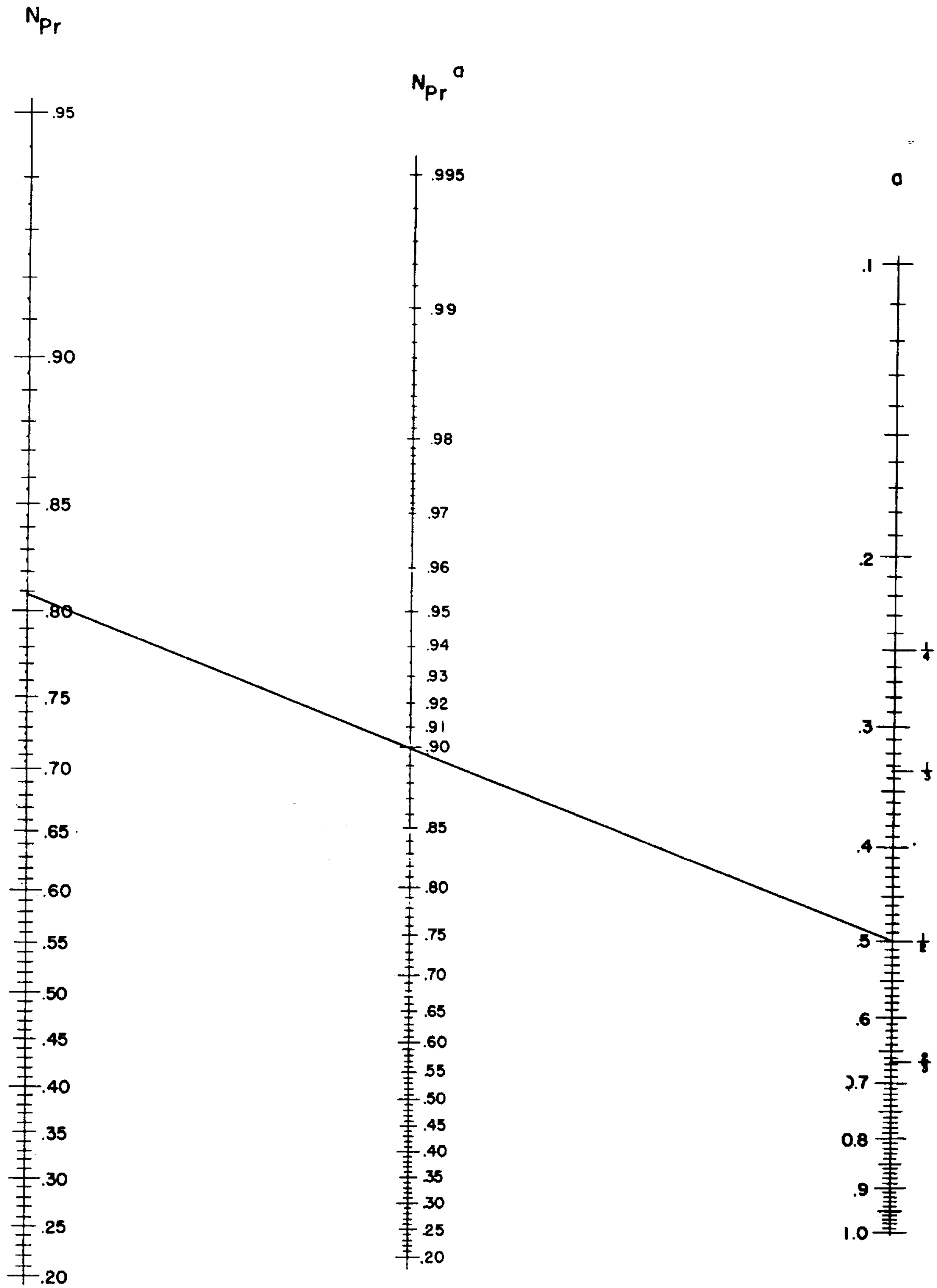

Figure 12.- Nomogram for fractional powers of Prandtl number.

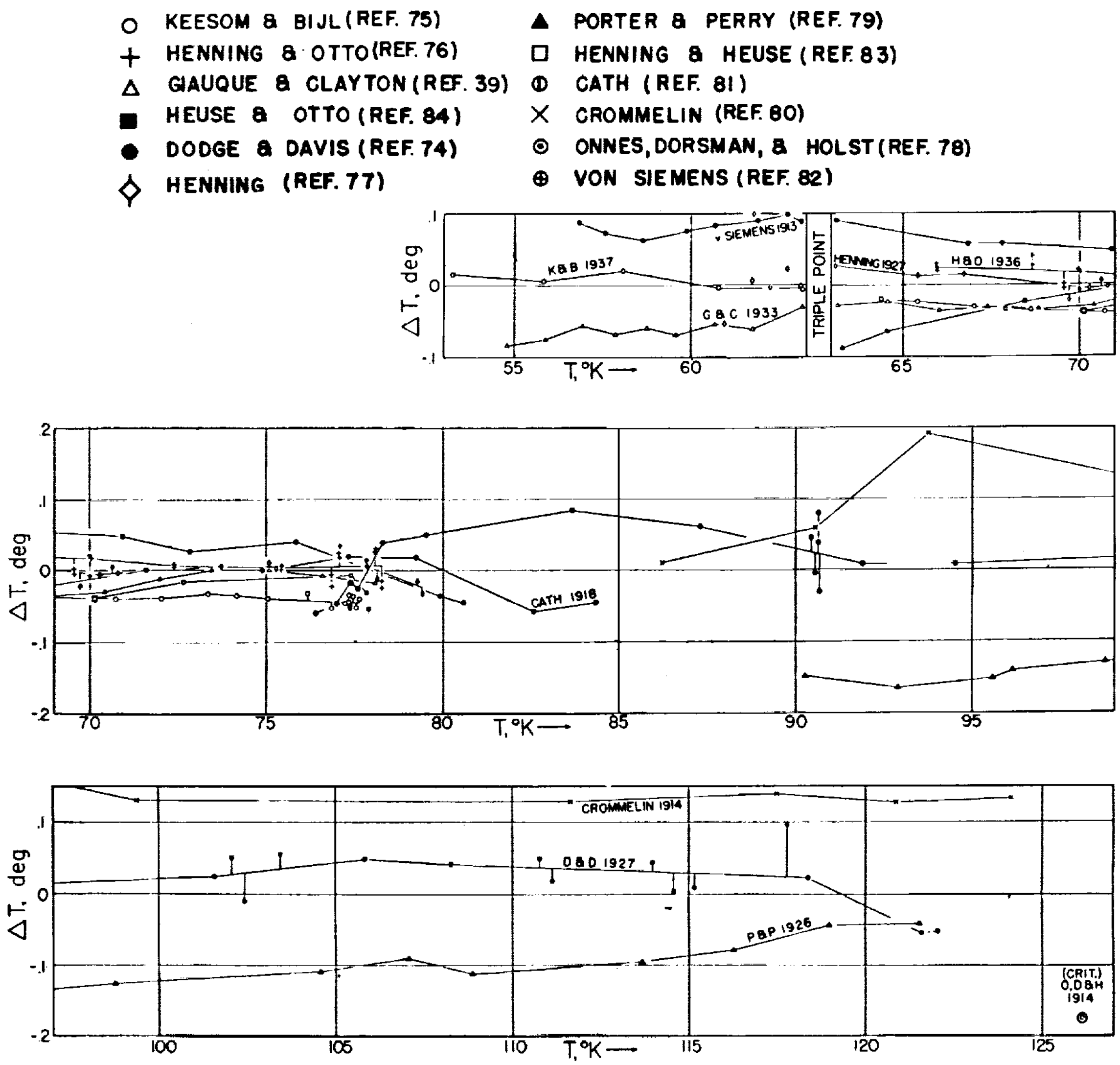

Figure 13.- Deviations (observed minus calculated) of vapor-pressure data for nitrogen.