Name _____ Period _____ Date _____

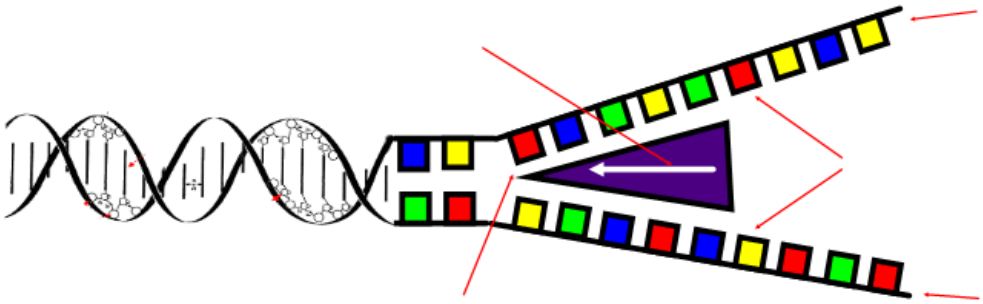
Topic 2.7 DNA Replication, Transcription, and Translation Part I

Review questions

1. State during which phase of the cell cycle DNA replication occurs.
2. State the function of DNA replication.
3. Which of the following is the end product of DNA replication in a human somatic cell?
   a. 23 chromosomes
   b. 46 chromosomes
   c. 23 pairs of chromosomes
   d. 23 pairs of sister chromatids

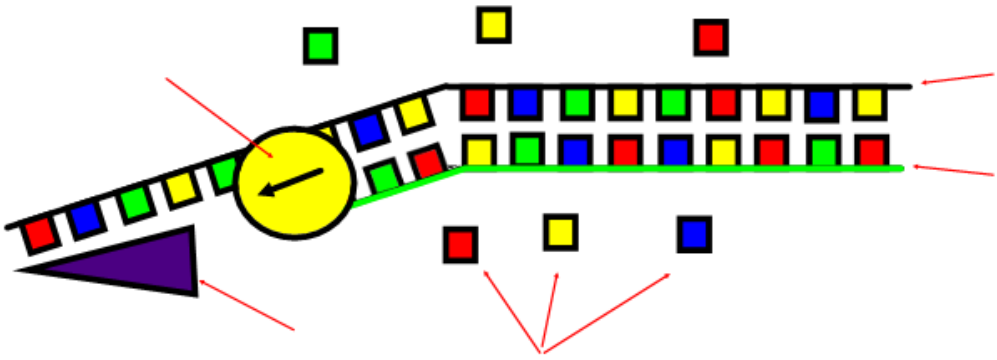
2.7.U2 Helicase unwinds the double helix and separates the two strands by breaking hydrogen bonds.

4. Outline the molecular structure of Helicase.
5. Label and annotate the diagram below to describe the function of helicase.



2.7.U3 DNA polymerase links nucleotides together to form a new strand, using the pre-existing strand as a template.

6. State the groups that DNA polymerase joins the bond formed.
7. Label and annotate the diagram below to describe the function of DNA Polymerase.



8. Explain why the free nucleotides used in DNA replication are deoxynucleoside triphosphates not deoxynucleoside (mono) phosphates.
9. State the direction in which DNA polymerase catalyses the formation of the new strand.

2.7.U1 The replication of DNA is semi-conservative and depends on complementary base pairing.

10. Explain the importance of complementary base pairing in conserving the base-sequence during DNA Replication.
11. Explain why DNA replication of this kind of referred to as being semi-conservative.

Topic 7.1 DNA Structure and Replication Part II

7.1.U3 DNA polymerases can only add nucleotides to the 3' end of a primer.

1. Outline what a primer is and the role it has in DNA Replication.
2. In which direction does DNA polymerase move along the template strand? What implication does this have for the addition of bases on the growing strand?

7.1.U4 DNA replication is continuous on the leading strand and discontinuous on the lagging strand.

7.1.U5 DNA replication is carried out by a complex system of enzymes.

3. Explain the process of DNA Replication (focusing on prokaryotes):
   a. Distinguish between the lead strand and the lagging strand.
   b. Explain the process of DNA replication on the lagging strand, with reference to DNA primase, RNA primers, DNA gyrase, single strand binding proteins, DNA polymerase III, Okazaki fragments, DNA polymerase I and DNA ligase.
   c. Summarize the roles of the enzymes of DNA Replication:
      i. DNA Gyrase (*topoisomerase)*
      ii. DNA Helicase
      iii. DNA Polymerase III
      iv. RNA Primase
      v. DNA Polymerase I
      vi. DNA Ligase

4. Some biochemists are making a mixture of enzymes for DNA replication in the lab. In each of these cases, something was missing from the mixture. For each situation, deduce which one enzyme was missing, with a reason:
   a. The DNA produced came out as lots of short sections of DNA, a few hundred base-pairs long, rather than one continuous strand.
   b. Only the lead strand was replicated.
   c. No DNA was replicated. The original DNA remained untouched.

7.1.U6 Some regions of DNA do not code for proteins but have other important functions.

5. Distinguish between coding and non-coding regions of DNA.
6. Outline how non-coding regions can be involved in gene expression.
7. Most of the eukaryotic genome is non-coding. There are two types of repetitive sequences: moderately repetitive sequences and highly repetitive sequences otherwise known as satellite DNA. Give an example of a region of DNA that contains highly repetitive sequences and outline the function of that region.

7.1.A2 Use of nucleotides containing dideoxyribonucleic acid to stop DNA replication in preparation of samples for base sequencing.

8. State how dideoxyribonucleic acid affect DNA replication.
9. State what is attached to dideoxyribonucleic acid during base sequencing.
10. Outline how do the answers to the above two questions enable scientists to identify the base sequence of DNA.

7.1.A3 Tandem repeats are used in DNA profiling.

11. State the two different sources of DNA used in paternal and maternal profiling.
12. Suggest a reason why non-coding regions are more useful than coding regions in DNA profiling.
13. Describe what is meant by the term tandem repeat sequence.
14. Describe why tandem repeats are useful in DNA profiling.
15. Explain how tandem repeats are used in DNA profiling.