

**Chapter 13: DNA Structure and Function**

1. What three characteristics does genetic material need to have? What reasons were given that DNA was not considered to be the most likely candidate for genetic material early on in the search?
2. Know and understand the three sets of experiments that point to DNA as the transforming factor (Griffith, Avery, and Hershey and Chase).
3. What are Chargaff's rules? Know what they are and be able to apply them.
4. Who were ALL the researchers involved in figuring out the structure of DNA? Who took the X-ray crystallography pictures of DNA? What did that picture reveal about DNA's structure?
5. What is the structure of DNA? (Know the requirements for your 3D model.) How is the 5' and 3' end determined? Which bases are pyrimidines and which are purines?
6. How is DNA replicated?
7. Understand the Meselson and Stahl experiment. Is DNA replication conservative, semiconservative or dispersive? (What do those terms mean?)
8. What are the three enzymes that aid in replication and what jobs do they perform?
9. What is the rate of mistakes in DNA synthesis before and after DNA repair enzymes? (Go with # in text on page 233). What causes mutations?
10. What are *nucleosomes*?

**Chapter 14: Gene Activity: How Genes Work**

1. With which organism did Beadle and Tatum experiment? What was their conclusion and the reasoning behind it?
2. What did Pauling and Itano find in their gel electrophoresis of hemoglobin?
3. Genes encode for what? (Be specific!)
4. Understand the figure on pg. 241 that deals with number of nucleotides and amino acids specified.
5. How are DNA and RNA different?
6. What are mRNA, tRNA, and rRNA? What roles do they play in the manufacture of proteins?
7. Be able to transcribe a sequence of DNA. Be able to translate a sequence of mRNA into amino acids using the genetic code.
8. What changes need to be made to an RNA strand after transcription before it is ready to leave the nucleus? What are introns and exons?
9. Where does protein synthesis occur? Be able to describe the processes of transcription and translation (initiation, elongation, and termination). Understand the difference between codons and anticodons. To what does the term *wobble* refer?
10. What are ribozymes? How are they important to the "chicken or the egg" dilemma of DNA and proteins?
11. Understand the diagrams on pages 246-247.

**1999 Question 4**

Scientists seeking to determine which molecule is responsible for the transmission of characteristics from one generation to the next knew that the molecule must (1) copy itself precisely, (2) be stable but able to be changed, and (3) be complex enough to determine the organism's phenotype.

- a) Explain how DNA meets each of the three criteria stated above.
- b) Select one of the criteria above and describe experimental evidence used to determine that DNA is the hereditary material.

**2003 Form B Question 1**

A difference between prokaryotes and eukaryotes is seen in the organization of their genetic material.

- a) Discuss the organization of the genetic material in prokaryotes and eukaryotes.
- b) Contrast the following activities in prokaryotes and eukaryotes:
  - Replication of DNA
  - Transcription or translation
  - Cell division

**2005 Question 2**

The unit of genetic organization in all living organisms is the chromosome.

- a) Describe the structure and function of the parts of a eukaryotic chromosome. You may wish to include a diagram as part of your description.
- b) Describe the adaptive (evolutionary) significance of organizing genes into chromosomes.
- c) How does the function and structure of the chromosome differ in prokaryotes?

**2005 Form B Question 3**

Protein synthesis is vital for cell growth and metabolism.

- a) Describe transcription and translation.
- b) Identify similarities between transcription and translation.
- c) Identify differences between transcription and translation.
- d) Describe structural changes that can occur to a protein after translation to make it function properly.

**2007 Form B Question 3**

A molecule of messenger RNA (mRNA) has just been synthesized in the nucleus of a human cell.

- a) What types of modifications may occur to this RNA before it leaves the nucleus?
- b) Once in the cytoplasm, how is the mRNA translated to a protein?
- c) If the cell is a secretory cell, how is the protein from part (b) eventually targeted, packaged, and secreted to the exterior of the cell?