

Study Guide: Test – Chapter 8 DNA and RNA

Know the following topics from chapter 8. Use your book, notes, and homework to take good detailed notes on each topic. Use diagrams to help review structures and processes.

Vocabulary: Nucleotide, nitrogen base, double helix, DNA polymerase, replication, semi-conservative, codon, anti-codon, triplet code, amino acid, ribosome, protein, peptide bond

Things to know:

Chapter 8.1-8.3

- Contributions of Avery, Franklin, Watson and Crick in determining DNA as hereditary material and the structure (X-ray evidence, modeling)
- Structure of DNA – shape, nucleotides, bonding
- Chargaff's rule and the base pairing rule (why do the nucleotides pair up they way they do?). Match DNA strand with complementary base pairs.
- DNA replication – process, specific steps, proteins and enzymes involved (how they work), why it occurs quickly, points of origin, importance of replication.
- Semi-conservative replication

Chapter 8.4

- Central dogma of molecular biology (including 3 processes involved)
- Compare and contrast DNA and RNA (nucleotides, sugars,
- Process of transcription – where it occurs, molecules involved, specific steps, proteins and enzymes involved, reason for transcription (importance), end result
- 3 types of RNA, their structures, and their functions

Chapter 8.5

- Similarities and differences between replication and transcription.
- Process of translation – where it occurs, molecules involved, purpose and importance, specific steps
- How to read and translate the code (start and stop codons, using the codon table)
- How do amino acids become proteins, roles of small and large ribosomal units

Review Questions:

1. Explain semi-conservative replication
2. The DNA double helix model used today was discovered based on x-ray radiograph technology methods developed by which scientists
3. In humans, where does DNA replication take place?
4. Which scientists figured out the three-dimensional structure of DNA by using a model of metal and wood?
5. As a result of the Hershey and Chase experiments, what did scientists learn?
6. Base pairs in the DNA molecule are held together by what kind of bond?
7. Why does replication occur quickly in eukaryotic cells
8. A nucleotide consists of what components
9. Which bases are purines and which are pyrimidines?
10. Suppose you can read the sequence of bases on only one strand of the double helix. What law would you use to figure out the sequences of the other strand?
11. Which RNA molecules carry amino acids to the ribosome?
12. If a molecule of DNA has one strand with the sequence TTCCGAGATCA what is the sequence of the complementary strand of DNA?
13. Restriction enzymes are naturally occurring enzymes found in bacteria. Scientists use restriction enzymes to cut genetic material into smaller pieces during genetic engineering. Based on this information, what molecules do restriction enzymes cut?

14. Suppose a researcher wants to produce RNA from a DNA template. The research puts DNA into a test tube. Which free-floating nucleotides should be added to the test tube to produce RNA?
15. A scientist wants to produce a protein in a test tube. Which combination of components would need to be put into the test tube?
16. What is the polypeptide chain encoded by the mRNA sequence **UGU AUC GUC UAG**
17. During replication, what are the functions of DNA polymerase?
18. During transcription, what does messenger RNA do?
19. The central dogma states what?
20. How many amino acids are coded for by the strand of mRNA show below? Assume the reading frame begins with the first nucleotide. **CGC UUA UCG**
21. What is the main difference between the four nucleotides that make up DNA?
22. A polypeptide consists of the following chain of amino acids Try-Cys-Arg-Leu. Which mRNA sequence could code for this polypeptide?
23. What is the term for a three-nucleotide sequence on mRNA that codes for an amino acid?
24. What is the main function of tRNA?
25. What characteristic of transcription explains how lots of mRNA can be made at once?
26. Proteins are made up of what monomer
27. Below is a single strand of DNA. Choose the first three nucleotides of the complementary **RNA** strand.
A-A-C-G-T-T-C-A-A-G
28. Describe translation.
29. Below is a single strand of DNA. Choose the first three nucleotides of the complementary **DNA** strand.
A-C-T-G-A-T-T-G-C-A-A
30. How do genes influence traits?
31. What events occur directly after RNA polymerase recognizes the transcription start site of a gene on a segment of DNA
32. Where does translation occur?
33. How many amino acids are used to make up all proteins in the human body?
34. A tRNA codon that carries the amino acid methionine (met) pairs up with which type of codon?
35. What are the differences between transcription and replication?