1. Which of the following best describes transcription?
a) The process of converting mRNA into a protein
b) The synthesis of an mRNA strand from a DNA template
c) The duplication of DNA during the cell cycle
d) The folding of a protein into its final shape

2. Where does transcription occur in eukaryotic cells?
a) Cytoplasm
b) Ribosome
c) Nucleus
d) Mitochondria

3. What is the function of mRNA in protein synthesis?
a) It carries amino acids to the ribosome
b) It serves as a template for building proteins
c) It helps fold proteins into their correct shape
d) It binds to DNA to initiate replication

4. Which enzyme is responsible for creating the mRNA strand during transcription?
a) DNA polymerase
b) RNA polymerase
c) Helicase
d) Ligase

5. What is a codon?
a) A sequence of three nucleotides that codes for an amino acid
b) A segment of DNA that codes for a protein
c) A sequence of mRNA that signals the end of transcription
d) A protein that regulates gene expression

6. What is the role of tRNA in translation?
a) It carries genetic information from DNA to the ribosome
b) It provides energy for the ribosome
c) It brings amino acids to the ribosome
d) It forms the peptide bonds between amino acids

7. What is the function of ribosomes in protein synthesis?
a) They break down proteins into amino acids
b) They catalyze the formation of peptide bonds
c) They unwind the DNA double helix
d) They produce ATP for the process

8. Which of the following best describes the relationship between DNA, mRNA, and proteins?
a) DNA is directly used to assemble amino acids into a protein

b) mRNA translates DNA into proteins
c) DNA is transcribed into mRNA, which is then translated into proteins
d) Proteins produce mRNA, which is then transcribed into DNA

9. What is the role of the start codon (AUG) in protein synthesis?
a) It signals RNA polymerase to bind to DNA
b) It starts the process of DNA replication
c) It initiates translation by signaling ribosomes to start assembling the protein
d) It terminates the translation process

10. Which of the following occurs during translation?
a) RNA polymerase synthesizes mRNA
b) mRNA is converted into a sequence of amino acids
c) The DNA double helix unwinds for replication
d) tRNA transcribes DNA into mRNA

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11. Describe the three main steps of transcription.

12. Explain the difference between mRNA, tRNA, and rRNA in protein synthesis.

13. Why is the genetic code considered universal and redundant?

14. What happens to an mRNA strand before it leaves the nucleus in a eukaryotic cell? (Hint: Discuss modifications).

15. Explain the role of ribosomes in protein synthesis and describe their two main subunits.

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16. A scientist mutates a section of DNA, changing one nucleotide.
a) What is this type of mutation called?
b) How could this mutation affect the final protein?
c) Why might the mutation have no effect at all?

17. The following DNA strand is transcribed and translated into a protein:
DNA sequence: TAC GGA TTT GCT ACT
a) Write the corresponding mRNA sequence.
b) Identify the amino acid sequence using the genetic code.
c) What would happen if the first codon (TAC) were mutated to TAA?

18. Certain antibiotics work by binding to bacterial ribosomes and preventing protein synthesis.
a) Why do these antibiotics not affect human cells?
b) How could bacteria develop resistance to these antibiotics?

19. A student claims that a cell can still make proteins even if its DNA is damaged.
a) Is this statement true or false? Explain.
b) What might happen to the cell if a crucial gene for protein synthesis is mutated?

20. Compare and contrast transcription and translation by completing the table:

Feature	Transcription	Translation
Location		
Molecules Involved		
End Product		

A rare genetic mutation prevents the proper attachment of tRNA to its corresponding amino acid.

- Predict how this would affect the process of translation.
- What impact would this have on the final protein product and the cell's function?