

Worksheet: Understanding Transcription

Part A: Multiple Choice Questions

1. What is the primary purpose of transcription?
 - A. To convert DNA into a protein
 - B. To create an mRNA copy of a gene
 - C. To replicate the DNA strand
 - D. To assemble amino acids into a protein

2. Where does transcription occur in eukaryotic cells?
 - A. Ribosome
 - B. Nucleus
 - C. Cytoplasm
 - D. Mitochondria

3. Which enzyme is responsible for synthesizing mRNA during transcription?
 - A. DNA polymerase
 - B. Helicase
 - C. RNA polymerase
 - D. Ligase

4. What is the complementary RNA base for adenine (A) in DNA?
 - A. Thymine (T)
 - B. Uracil (U)
 - C. Cytosine (C)
 - D. Guanine (G)

5. What signals the start of transcription?

- A. Terminator sequence
- B. Start codon
- C. Promoter region
- D. Ribosomal binding site

Part B: Fill in the Blanks

1. The process of copying a gene from DNA into mRNA is called _____.
2. The enzyme _____ unwinds the DNA double helix and synthesizes mRNA.
3. In RNA, the base _____ pairs with adenine instead of thymine.
4. The region of DNA where RNA polymerase binds to initiate transcription is called the _____.
5. The newly synthesized mRNA detaches from the DNA when the _____ sequence is reached.

Part C: Short Answer Questions

1. Explain the role of RNA polymerase during transcription.
2. What happens to the mRNA molecule after transcription in eukaryotic cells?
3. How is transcription different from replication?

Part D: Diagram Labeling

Below is a diagram of transcription. Label the following components:

- DNA template strand
- mRNA strand
- RNA polymerase
- Promoter region
- Terminator region

Part E: True/False

1. Transcription occurs in the cytoplasm of eukaryotic cells.
2. RNA polymerase synthesizes DNA during transcription.

3. The mRNA sequence is complementary to the DNA template strand.
4. Uracil (U) in RNA replaces thymine (T) in DNA.
5. The mRNA molecule leaves the nucleus to be translated into a protein.

Part F: Application

Scenario: A DNA strand has the following sequence:

3' - TAC GGA TCC TGA - 5'

1. Write the mRNA sequence transcribed from this DNA strand.
2. Identify the start codon in the mRNA sequence.

Answer Key

Part A:

1. B 2. B 3. C 4. B 5. C

Part B:

1. Transcription
2. RNA polymerase
3. Uracil
4. Promoter
5. Terminator

Part C:

1. RNA polymerase unwinds DNA and synthesizes mRNA by adding complementary RNA bases.
2. The mRNA undergoes modifications (capping, tailing, splicing) and exits the nucleus to the cytoplasm.
3. Transcription creates RNA from DNA, while replication copies the entire DNA molecule.

Part E:

1. False 2. False 3. True 4. True 5. True

Part F:

1. mRNA sequence: 5' - AUG CCU AGG ACU - 3'
2. Start codon: AUG