

Series No. 1

Exercise 1: Transcription

The DNA sequence below represents a segment of a gene's coding region. Use it to answer the following questions:

DNA sequence:

5'- ATGCGTAACTAGCCTAGTAA - 3'

1. What is the resulting mRNA sequence after transcription?
2. Which enzyme is responsible for transcribing DNA into mRNA?
3. In which direction does transcription occur?
4. Where does transcription take place in a eukaryotic cell?

Exercise 2: Translation

mRNA sequence:

5'- AUG CGU AAC UAG CCU AGU AA - 3'

1. Identify the codons and indicate the amino acids corresponding to each.
2. What is the first amino acid translated during translation?
3. What occurs when the ribosome reaches a STOP codon during translation?
4. Where does translation occur in a eukaryotic cell?

Exercise 3: Comparison between Transcription and Translation

Indicate whether each statement is True or False

1. Transcription occurs in the cytoplasm of eukaryotic cells.
2. mRNA is translated into proteins by ribosomes.
3. A codon is a sequence of four nucleotides.
4. A STOP codon encodes an amino acid.
5. Ribosomes are composed of RNA and proteins.

Exercise 4: DNA Transcription

You are given the following DNA sequence. **Transcribe it into mRNA:**

DNA sequence:

3'- TAC GGA TCA GTT ACA GGC - 5'

1. What is the mRNA sequence transcribed from this DNA strand?
2. What is the name of the DNA strand used for transcription?
3. What are the structural differences between DNA and RNA?

Exercise 5: Codon Translation

Here is an mRNA sequence. **Translate it into a chain of amino acids:**

mRNA sequence:

5'- GCU AUG CGC UAA GGC UUU CCA - 3'

1. Identify the codons in this mRNA sequence.
2. Determine the amino acids corresponding to each codon using the genetic code table.
3. What is the role of the UAA codon in this sequence?

Exercise 6: Steps of Transcription and Translation

Match the following descriptions to either transcription or translation:

1. This process takes place in the ribosomes.
2. This process produces an mRNA molecule from a DNA strand.
3. This process occurs in the nucleus of eukaryotic cells.
4. This process uses tRNAs to assemble amino acids.
5. This process requires the involvement of RNA polymerase.

Exercise 7: The Genetic Code

Complete the following sentences by choosing the correct answer from the options provided:

1. The genetic code is said to be _____ because several codons can code for the same amino acid.
 - a) ambiguous
 - b) degenerate
 - c) incomplete
2. The initiation codon of translation is always _____.
 - a) UAA
 - b) AUG
 - c) GGA
3. During translation, tRNA carries a _____ corresponding to a codon on the mRNA.
 - a) ribosome
 - b) amino acid
 - c) nucleotide

Exercise 8:

Correct the errors in the following statements:

1. The transcription process produces proteins directly from DNA.
2. The UAA codon codes for the amino acid tyrosine.
3. During translation, RNA polymerase reads the mRNA sequence to synthesize proteins.