

What Is Transcription?

Worksheet

Transcription is the process where RNA polymerase reads a DNA template strand and synthesizes a complementary mRNA molecule, using base pairing (A-U, T-A, G-C, C-G).

Questions

1. Which enzyme performs transcription?

- A) DNA polymerase
- B) RNA polymerase
- C) Ligase
- D) Helicase

2. In RNA, which base pairs with adenine?

- A) Thymine
- B) Uracil
- C) Guanine
- D) Cytosine

3. What is removed from pre-mRNA during splicing?

- A) Exons
- B) Introns
- C) The poly-A tail
- D) The 5' cap

4. Where does transcription occur in eukaryotic cells?

- A) Cytoplasm
- B) Mitochondria only
- C) Nucleus
- D) Ribosome

5. A gene's pre-mRNA transcript is 1,500 nucleotides long. If introns totaling 500 nucleotides are spliced out, how long is the mature mRNA?

6. The DNA template strand reads 3'-TACGGCTA-5'. What is the mRNA sequence transcribed from it?

7. A mature mRNA is 900 nucleotides long, including a 150-nucleotide untranslated region (UTR). How many nucleotides code for the protein, and roughly how many amino acids can it encode?

8. Define: What enzyme carries out transcription?

9. Define: What is the template strand?

10. Define: What base replaces thymine in RNA?

Answer Key

1. B) RNA polymerase - RNA polymerase synthesizes mRNA from the DNA template strand.
2. B) Uracil - RNA uses uracil instead of thymine to pair with adenine.
3. B) Introns - Introns are non-coding sequences cut out, leaving exons joined together.
4. C) Nucleus - Transcription happens in the nucleus; translation happens later in the cytoplasm.
5. $M = L I = 1500 \ 500 = 1000$ nucleotides
6. RNA polymerase reads 3'5' on the template and synthesizes 5'3' Base pairing: TA, AU, CG, GC, GC, CG, TA, AU mRNA (5'3') = AUGCCGAU
7. Coding length = total mRNA UTR length = $900 \ 150 = 750$ nucleotides $750 \ 3 = 250$ codons So the protein has up to about 250 amino acids
8. RNA polymerase, which synthesizes RNA from a DNA template.
9. The DNA strand read 3'5' by RNA polymerase to produce a complementary RNA strand.
10. Uracil (U) pairs with adenine instead of thymine.

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