

2024 Bi H2 Q5

Section: DNA and the Genome

Topic: Gene Expression

Question Summary

This question offers a choice between describing the transcription stage of gene expression (A) or explaining chromosome mutations (B). The solution below covers option A - the process of transcription and how mRNA is produced from DNA.

Worked Solution

- (A) Transcription is the first stage of gene expression, where a complementary copy of the gene sequence is made as mRNA.
- It occurs in the nucleus of the cell.
- The enzyme RNA polymerase binds to the DNA at the promoter region of the gene.
- The DNA strands unwind and separate; one strand acts as the template for mRNA synthesis.
- RNA polymerase moves along the template strand, joining RNA nucleotides by complementary base pairing: A pairs with U, and C pairs with G.
- The growing mRNA molecule detaches when the polymerase reaches a stop signal.
- The primary mRNA transcript produced includes introns (non-coding regions) and exons (coding regions). Introns are later removed during RNA splicing to form the mature transcript that

leaves the nucleus for translation.

- (B) If attempted instead, the chromosome mutation question would expect definitions and examples of duplication, deletion, inversion, and translocation, and their potential effects on the organism.

Final Answer

-> Transcription occurs in the nucleus.

-> RNA polymerase forms a complementary mRNA strand from the DNA template.

-> Introns are removed and exons joined to make the mature mRNA transcript.

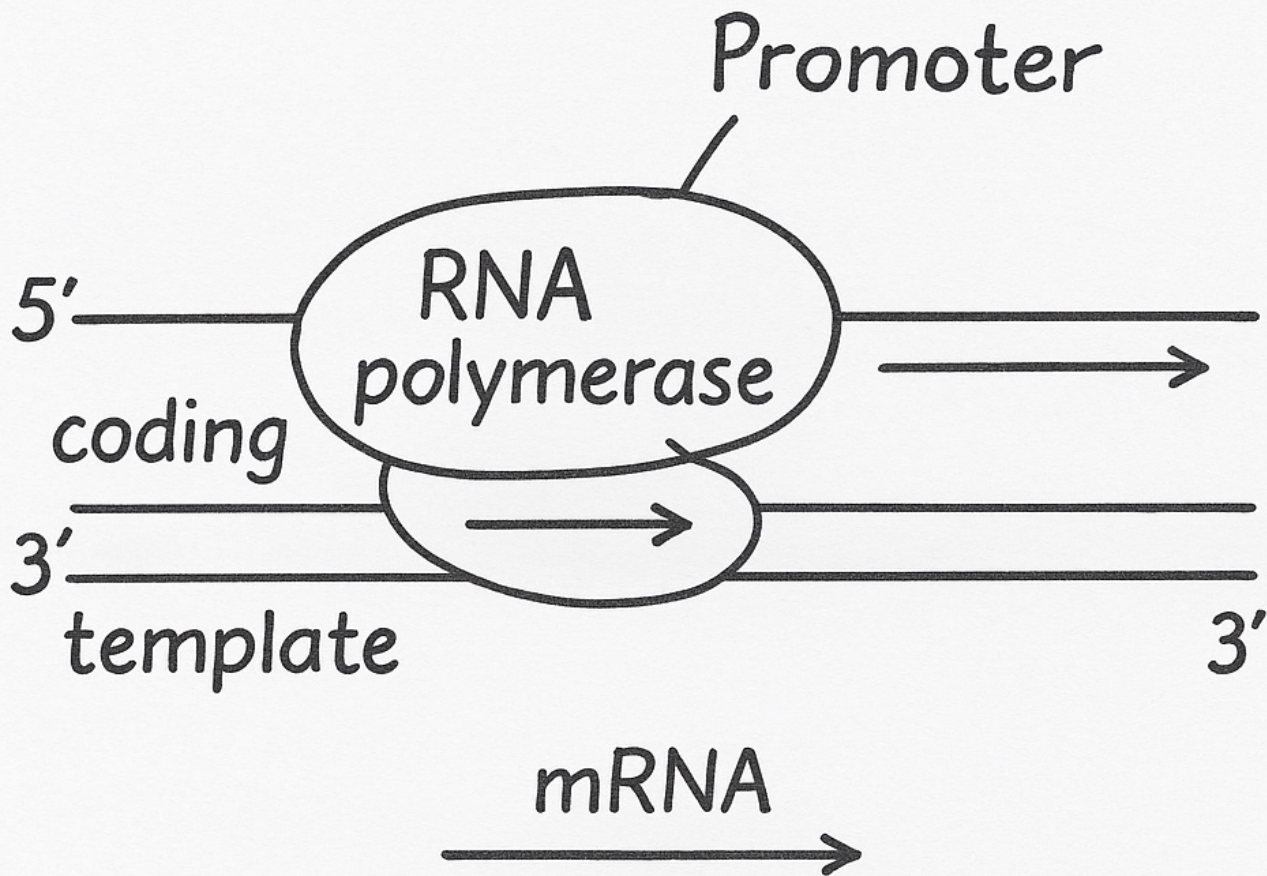
Revision Tips

- Remember: DNA -> mRNA -> protein (transcription then translation).

- In transcription, the base pairing rule uses U (uracil) instead of T.

- RNA polymerase reads the DNA template strand 3' -> 5', producing mRNA 5' -> 3'.

- Chromosome mutations affect chromosome structure, not just individual bases.



Transcription stage