

Instructions: All questions in Sections I & II carry equal marks

Illustrate your answers with neat diagrams wherever necessary.

Question 1 Write the following

- (i) Explain the structure and function of the eukaryotic genome. (7 Marks)
- (ii) Discuss the reasons for DNA being the primary genetic material in organisms. (7 Marks)

OR

- (i) What are the key differences between prokaryotic and eukaryotic gene regulation? (7 Marks)
- (ii) Identify and describe the various types of histone proteins associated with chromatin and their roles in genome organisation. (7 Marks)

Question 2 Write the following

- (i) What are the mechanisms behind the termination of transcription, and how do they vary across different organisms? (7 Marks)
- (ii) Outline the key steps involved in initiating DNA replication and explain the regulatory mechanisms that ensure precision during this process. (7 Marks)

OR

- (i) How does the C-terminal domain (CTD) of RNA polymerase influence transcription, and why is it considered essential for gene expression? (7 Marks)
- (ii) Describe the process of amino acid activation for protein translation and provide a detailed explanation of how translation initiation occurs. (7 Marks)

Question 3 Write the following

- (i) What role do restriction enzymes play in DNA manipulation during genetic engineering? Provide a specific example to illustrate your point. (7 Marks)
- (ii) Can you outline the detailed process of PCR, highlighting each step involved? (7 Marks)

OR

- (i) Describe the method used for visualizing DNA in gel electrophoresis. How can you determine the size and quantity of DNA fragments after separation? (7 Marks)

- (ii) What is a genomic DNA library, and what steps are involved in its creation? (7 Marks)
Discuss its uses in research and biotechnology.

Question 4 Write the following

- (i) Write a short note on the importance of proteomics in research. (7 Marks)
(ii) Explain various tunnel theories of protein folding. (7 Marks)

OR

- (i) Write a short note on the isolation and purification of protein. (7 Marks)
(ii) Discuss the protein folding steps. (7 Marks)

Question 5 Attempt any seven out of twelve

(14 Marks)

- (i) In what ways do proteomics and genomics differ from each other?
(ii) How is SDS-PAGE utilized in the analysis of proteins?
(iii) Draw the structure of chromatin.
(iv) What are the drawbacks of using blunt-end ligation in cloning experiments?
(v) What are two key differences in mRNA processing in eukaryotes versus prokaryotes?
(vi) What defines therapeutic proteins, and what are their applications?
(vii) Why is the sigma (σ) factor crucial during transcription initiation?
(viii) What does the term "transcriptome" refer to?
(ix) What methods can be used to eliminate excess salt from purified proteins?
(x) What is the function of a vector in genetic engineering?
(xi) Can you explain the mechanism of affinity chromatography?
(xii) Why is it essential to have a host cell for gene cloning?
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