

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?