

M.Sc. Sem.-3 Examination

504

Biochemistry

(Adv. Mole. Bio.)

Time : 2-30 Hours]

November-2025

[Max. Marks : 70

Instructions: Illustrate your answers with neat diagrams wherever necessary.

Question 1 Write the following

- (i) Discuss the various techniques used for separation and characterization of (7 Marks) nucleic acids. Include the principles of electrophoresis and explain in detail.
- (ii) What is a cot curve? Describe the principle, construction, and interpretation (7 Marks) of cot analysis in understanding genome complexity.

OR

- (i) Explain in detail the physical and chemical properties of DNA and RNA. (7 Marks) How do these properties contribute to their biological functions?
- (ii) Compare and contrast the genome organization of prokaryotes and (7 Marks) eukaryotes with suitable examples.

Question 2 Write the following

- (i) "Preparation of post-transcriptional modification is initiated at the time of (7 Marks) initiation of transcription."- Justify it and write the importance of CTD of RNA polymerase.
- (ii) List the proteins involved specifically in the initiation of DNA replication, (7 Marks) along with their functions. Also, explain how replication is regulated at the initiation stage

OR

- (i) Explain each phase of translation in prokaryotes with a proper diagram. (7 Marks)
- (ii) What are the fundamental rules that are followed by DNA replication? (7 Marks) Discuss in detail.

Question 3 Write the following

- (i) What is a c-DNA library? How to prepare it? Write the merits and demerits (7 Marks) of the c-DNA library.
- (ii) Write the mode of action of the following enzymes, which are used in cloning (7 Marks)
(a) DNA Polymerase, (b) T4 DNA Ligase, (c) Restriction endonuclease

OR

- (i) Write the types of restriction enzymes and how restriction enzymes are (7 Marks) beneficial in molecular biology.
- (ii) Write the steps of molecular cloning in a flowchart. If a researcher wants to (7 Marks) clone the "X" gene from a plant, what are the steps for it?

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Question 4 Write the following

- (i) Explain the process of protein folding. Describe the role of chaperones and (7 Marks) discuss how misfolding leads to diseases with suitable examples.
- (ii) Discuss the purification and characterization techniques of monoclonal (7 Marks) antibodies and highlight their applications in diagnostics and therapeutics.

OR

- (i) Describe the methods used for isolation and purification of proteins from (7 Marks) biological samples. Explain the principles behind chromatography techniques.
- (ii) Explain the various methods used for protein characterization. Discuss how (7 Marks) SDS-PAGE, 2D gel electrophoresis, and mass spectrometry are applied in proteomic studies.

Question 5 Attempt any seven out of twelve

(14 Marks)

- (i) Write any two differences between DNA and RNA.
- (ii) What is the principle of agarose gel electrophoresis?
- (iii) Define chromatin. Name its two types.
- (iv) Define exon and intron with one example each.
- (v) Write any two differences between eukaryotic mRNA and prokaryotic mRNA processing.
- (vi) Which proteins are involved in the termination of DNA replication? How does it work?
- (vii) Draw any bacterial expression vector diagram with a label.
- (viii) What is the difference between an endonuclease and an exonuclease?
- (ix) What is the Klenow fragment?
- (x) What is the principle of SDS-PAGE?
- (xi) Give two examples of therapeutic proteins.
- (xii) Name two purification techniques used for monoclonal antibodies.

