Roll No: _____

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M.Sc. Biochemistry Semester II Examination, May 2024

Paper Title: Protein & Proteomics
Paper Code: MBC 202

Time: 2½ h

Max Marks: 60

Note: *This paper has 3 Sections, A, B, and C. Attempt all three sections. Section A: Answer all the questions; Section B: Answer any two; Section C: Answer all the questions, each question in this section has an internal choice.*

Abbreviations Used: *CLO- Course Learning Outcome, PLO- Program Learning Outcome, BTL- Bloom Taxonomy Level; BT level 1- Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create.*

Section A: Attempt all questions. **(1x12=12 Marks)**

Q No.1	Questions (Fill in the blanks/True and False/short answers)	BTL	CLO	PLO
i.	Proteins are synthesized from _____ templates.	1	1	3
ii.	The folding of a protein into its functional shape is guided by its _____ structure.	1	3	3
iii.	X-ray crystallography technique is used to determine the _____ structure of proteins.	3	4	2
iv.	_____ proposed a hypothesis that states that a protein's native structure is determined solely by its amino acid sequence.	4	2	3
v.	The function of peptidal prolyl isomerase is _____.	2	1	2
vi.	_____ refers to the specific three-dimensional arrangement of amino acids in a protein molecule.	5	5	3
vii.	Protein denaturation disrupts the _____ interactions that maintain a protein's native structure.	2	2	3
viii.	Mass spectrometry is a technique used to analyze the _____ of proteins.	3	3	3
ix.	The presence of alpha-helices, beta-sheets, and loops in a protein constitutes its tertiary structure. **(True/False)**	4	1	3
x.	The secondary structure of a protein is determined by the sequence of amino acids. **(True/False)**	1	2	3
xi.	Name one amino acid with sulfhydryl group.	3	3	2
xii.	Define protein sequencing.	2	1	3

Section B: LONG ANSWER QUESTIONS
Attempt any TWO out of four questions (2x12=24 Marks)

Q No. 2	Questions	BTL	CLO	PLO
a)	Explain the significance of protein sequencing in understanding protein structure and function. Discuss any two techniques used for protein sequencing and their advantages and limitations.	1	1	
b)	Describe the structure and function of proteins, highlighting the relationship between protein structure and its biological activity. Include examples of different protein classes and their roles in cellular processes.	2	3	2
c)	Compare and contrast different techniques used in proteomics research, such as mass spectrometry, two-dimensional gel electrophoresis, and protein microarrays. Discuss the strengths, limitations, and applications of each technique.	3	2	3
d)	Explain how protein misfolding can lead to the formation of amyloid fibrils and the development of neurodegenerative diseases.	4	4	2

Section C: SHORT ANSWER QUESTIONS
Attempt ALL questions, each question has an internal choice (6x4=24 Marks)

Q. No 3	Questions	BTL	CLO	PLO
a)	Explain the concept of protein denaturation and describe the various factors that can induce protein denaturation. **OR** Discuss the role of molecular chaperones in protein folding and quality control.	4	3	2
b)	What are the advantages of using 2D-PAGE in proteomics research? **OR** Describe the steps involved in protein purification and characterization.	1	1	3
c)	Discuss the structural features of the peptide bond and its implications for protein conformation. **OR** Explain how the linear sequence of amino acids dictates the folding pathway and conformational stability of a protein.	4	5	2
d)	Name and write the principle of the technique used to identify proteins and protein expression pattern in biological samples. **OR** Compare and Contrast the structure of hemoglobin with myoglobin.	3	2	3
e)	Define secondary structure in proteins and describe the common elements of secondary structure, such as alpha helices and beta sheets. **OR** Discuss the structural motifs found in secondary structures and their role in stabilizing protein conformation.	5	2	3
f)	Discuss the structural features of globular proteins and fibrous proteins, highlighting their differences in secondary and tertiary structures, as well as their biological functions and properties. **OR** Discuss the technique of MALDI TOF MS indicating its applications. How is this technique different from APIMS or ESI MS?	3	2	2

END OF THE QUESTION PAPER