25BTP102/22BTP102N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch – **BIOTECHNOLOGY**

STRUCTURAL BIOLOGY AND CHEMISTRY OF PROTEINS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Ramachandran plot represents: a) Bond lengths in proteins b) Sterically allowed regions of φ and ψ angles c) Protein folding energy d) Van der Waals interaction	K1	CO1
	2	The oxygen-binding site in both hemoglobin and myoglobin is given by____. a) Cysteine b) Tyrosine c) Histidine residues coordinating with heme d) Serine	K2	CO1
2	3	The leucine zipper motif functions primarily in _____. a) Protein–protein dimerization b) Protein phosphorylation c) Enzyme catalysis d) Ligand binding	K1	CO2
	4	The strongest covalent interaction stabilizing protein tertiary structure is_____. a) Hydrogen bond b) Disulfide bond c) Ionic interaction d) van der Waals force	K2	CO2
3	5	Differential centrifugation separates cell components based on_____. a) Density b) Charge c) Size and mass d) Affinity	K1	CO3
	6	High-Performance Lquid Chromatography (HPLC) provides: a) Rapid and high-resolution separation b) Low resolution separation c) Only size-based separation d) Only charge-based separation	K2	CO3
4	7	Insulin is an example of _____. a) Antimicrobial peptide b) Peptide Hormonal c) Growth factor d) Antibiotic peptide	K1	CO3
	8	DNA polymerase is considered multifunctional because it_____. a) Only synthesizes DNA b) Performs DNA synthesis and proofreading (exonuclease activity) c) Only repairs damaged DNA d) Only unwinds DNA	K2	CO4
5	9	Changing asparagine residues in proteins is often done to_____. a) Reduce glycosylation sites b) Increase folding errors c) Promote aggregation d) Reduce pH sensitivity	K1	CO5
	10	Which method allows rapid screening of enzyme variants? a) Combinatorial enzyme engineering b) Western blotting c) X-ray crystallography d) SDS-PAGE	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Describe the properties of the peptide bond.	K3	CO1
		(OR)		
	11.b.	Explain the quaternary structure of hemoglobin and its functional significance.		
2	12.a.	Describe the structural features of the classic zinc finger motif and explain its role in DNA binding.	K3	CO2
		(OR)		
	12.b.	Briefly describe how metal ions contribute to protein architecture with an example.		
3	13.a.	Explain the principle of ion exchange chromatography and its application for protein analysis.	K3	CO3
		(OR)		
	13.b.	Briefly describe the role of MALDI-TOF and ESI-MS in protein identification.		
4	14.a.	Explain the structural and functional classification of proteins with examples.	K4	CO4
		(OR)		
	14.b.	Compare the catalytic mechanism of chymotrypsin and subtilisin as serine proteases.		
5	15.a.	Write short notes on adding disulfide bonds as a protein engineering strategy.	K5	CO5
		(OR)		
	15.b.	Write short notes on adding disulfide bonds as a protein engineering strategy.		

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Describe the different types of super-secondary structures with neat diagrams.	K1	CO1
2	17	Describe the structure and function of molecular chaperones and chaperonins, explaining their role in protein folding and misfolding diseases.	K2	CO2
3	18	Explain the role of AI in mass spectrometry data analysis for protein identification and its significance in modern proteomics.	K3	CO3
4	19	Explain the collagen triple helix structure in detail and discuss its importance in connective tissue function.	K4	CO4
5	20	Discuss the engineering of cryostable enzymes and their relevance in food, detergent, and pharmaceutical industries.	K5	CO5

Z-Z-Z END