


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2023			
Course: Proteomics and Protein engineering		Semester : III	
Program: B. Tech. Biotechnology		Duration : 3 Hours	
Course Code: HSBT2002		Max. Marks: 100	
Instructions: Carefully read and attempt all questions			
S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	Define exergonic reaction.	1.5	CO1
Q 2	Energy can neither be created nor be destroyed is a) Ist Law of thermodynamics b) IInd Law of thermodynamics c) III Law of thermodynamics d) Pauli's Law	1.5	CO1
Q 3	Draw the structure of any basic amino acid.	1.5	CO1
Q 4	Mention the name of reducing agent which breaks down disulfide bond used in SDS-PAGE.	1.5	CO1
Q 5	State the functions of urea in 2-D gel electrophoresis	1.5	CO1
Q 6	Your protein sample has a lot of phosphorylated proteins. In this light, which dye you prefer to use for the detection of phosphorylated proteins specifically.	1.5	CO1
Q 7	Define ampholytes.	1.5	CO1
Q 8	Define isoelectric point (pI).	1.5	CO1
Q 9	Recall the name of tracking dye used in SDS-Gel electrophoresis.	1.5	CO1
Q 10	Define zwitter ions.	1.5	CO1
Q 11	Proteomics is the study of a) Set of proteins b) Set of proteins in a specific region of the cell c) Entire set of expressed proteins in a cell d) None of these	1.5	CO2
Q 12	Ramachandran plot can be used to predict which of the following structure? a) Quaternary structure b) Tertiary structure c) Primary structure d) Secondary structure	1.5	CO2

Q 13	In 2-DE, write component of the gel which maintains the pH gradient.	1.5	CO2
Q 14	Write down the name of software which is commonly used in 2-D gel image analyses.	1.5	CO2
Q 15	Trypsin cleaves the peptide bond at a) C-terminal side of the amino acid residues lysine and arginine. b) C-terminus of amino acid residues serine and tyrosine. c) N-terminus of amino acid residues methionine and alanine. d) N-terminus of amino acid residues tyrosine and tryptophan.	1.5	CO2
Q 16	In 2-D gel electrophoresis, separation is based on a) charge b) mass c) pI and mass d) pI	1.5	CO2
Q 17	Which of the following techniques helps to predict the 3D structures of proteins in liquid state? a) NMR b) X-ray c) MALDI ToF d) MS-MS	1.5	CO2
Q 18	Write the name of staining dye used for proteins in SDS PAGE.	1.5	CO2
Q 19	To increase thermal stability of enzymes which of the following covalent bonds have to be introduced? a) S-S bonds b) Van Der Waals Bonds c) Hydrogen bonds d) Ionic bonds	1.5	CO2
Q 20	Explain the term molecular ion.	1.5	CO2
Section B (4Qx5M=20 Marks)			
Q 1	Define Ramachandran plot. The below given figure is Ramachandran plot. In below given diagram, label A, B, and C.	5	CO1

	<p style="text-align: center;">The Ramachandran Plot.</p>		
<p>Q 2</p>	<p>Discuss the Anfinsen experiment on Ribonuclease A for determination of 3-D folding of proteins.</p>	<p>5</p>	<p>CO1</p>
<p>Q 3</p>	<p>Describe molten globule state model of protein folding.</p>	<p>2+3</p>	<p>CO2</p>
<p>Q 4</p>	<p>During the analyses Arushi experienced problems of gel-to-gel variation that makes it difficult to pairwise compare spots between the patient- and control gels. Describe an alternative method in which two proteomes can be separated and independently visualized within the same gel.</p>	<p>5</p>	<p>CO2</p>
<p>Section C (2Qx15M=30 Marks)</p>			
<p>Q 1</p>	<p>a) Discuss in detail about various kinds of weak interactions involved in maintaining structure of proteins. b) Discuss chemical ionization method in mass spectrometry. c) Describe site directed mutagenesis. How the function of protein can be altered by using this technique?</p>	<p>5+5+5</p>	<p>CO3</p>
<p>Q 2</p>	<p>a) You have isolated plasma cells from both myeloma patients as well as healthy controls, you want to compare the respective proteomes by running 2-dimensional polyacrylamide gel electrophoresis (2D-PAGE). Describe the underlying principles for protein separation and visualization by 2D-PAGE. b) In a gel there are two proteins with the same isoelectric point (pI=4) but they differ in their molecular weight 20kD and 80kD. What will be the position of these protein spots on the SDS-PAGE, IEF and 2-D gel with respect to each other. Draw the pattern.</p>	<p>5+6+4</p>	<p>CO4</p>

	c) You suspect that a protein is a transcription factor. Describe an <i>in-vitro</i> method that can validate its interaction with DNA.		
Section D (2Qx10M=20 Marks)			
Q 1	Explain primary, secondary, tertiary and quaternary structures of proteins.	10	CO3
Q 2	Describe the principle of mass spectroscopy. Discuss the MALDI-TOF in detail for protein identification.	5+5	CO4