Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2022

Course: Proteomics and protein engineering **Semester : 3rd**

Program: B.Tech. Biotechnology **Duration : 3 Hours**

Course Code: HSBT2002 **Max. Marks: 100**

Instructions: All questions are compulsory

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	Which of the following is correct about free energy change? A. In an exergonic reaction, ΔG is positive B. In an endergonic reaction, there is loss of free energy C. If a reaction is essentially irreversible, it has a high positive ΔG D. If ΔG is negative, the reaction proceeds spontaneously with a loss of free energy	**1.5**	**CO1**
Q2	Energy can neither be created nor be destroyed is A. 1st law of thermodynamics B. 2nd law of thermodynamics C. 3rd law of thermodynamics D. Zeroth law of thermodynamics	**1.5**	**CO1**
Q3	Folding of protein's secondary structure is associated with A. Increase in entropy B. Decrease in entropy C. No change in entropy D. None of the above	**1.5**	**CO1**
Q4	Beer Lambert's law gives the relation between which of the following? A. reflection radiation and concentration B. Scattered radiation and concentration C. Energy absorption and concentration D. Energy absorption and reflected radiation	**1.5**	**CO1**
Q5	Phosphorescence mainly results from A. Internal conversion	**1.5**	**CO2**

	B. Vibrational relaxation C. Intersystem crossing D. All of the above		
Q6	Fluorescence quenching is A. Conversion of fluorescence to phosphorescence B. Enhancement of fluorescence C. Absence of fluorescence D. Repression of fluorescence	**1.5**	**CO2**
Q7	A and B are two enentiomeroc helical peptides. Their chirality can be determined by recording their A. Circular dichroism spectroscopy B. UV spectroscopy C. Fluorescence spectroscopy D. Edman sequencing	**1.5**	**CO2**
Q8	when the absorption intensity of a compound is decreased it is called A. Redshift B. Blueshift C. Hypochromic shift D. Hyper chromic shift	**1.5**	**CO2**
Q9	Select one of the following that is not correct A. Enzyme lower activation energy of a reaction B. The presence of an enzyme has no effect on $\Delta G°$ C. Covalent catalysis is employed by some enzymes to provide an alternative reaction pathway D. Enzyme often lower the activation energy by destabilizing transition state intermediates	**1.5**	**CO3**
Q10	Which of the following is true about Michaelis-Menten kinetics? A. K_m, the Michaelis constant, is defined as that concentration of substrate at which enzyme is working at maximum velocity B. It describes single substrate enzymes C. K_m, the Michaelis constant is defined as the dissociation constant of the enzyme-substrate complex D. It assumes covalent binding occurs between enzyme and substrate	**1.5**	**CO3**
Q11	Trypsin hydrolyze a peptide bond in which amino group is contributed by A. Serine B. Glycine C. Lysine	**1.5**	**CO3**

	D. Glutamate		
Q12	In SDS-PAGE, separation is based on A. Molecular weight B. Shape C. Charge D. All of the above	**1.5**	**CO3**
Q13	When performing a western blot, what is the purpose of adding a secondary antibody? A. Separate the sample from other proteins B. Allow for detection of the protein sample C. Ensure that the primary antibody binds properly to the sample D. Block any interfering noise coming from the membrane	**1.5**	**CO4**
Q14	To determine the isoelectric point of a protein, first determine that the gel: A. Contains a denaturing detergent that can distribute uniform negative charge over the protein surface B. Exhibits a stable pH gradient when ampholytes become distributed in an electric field. C. is washed with an antibody specific to the protein of interest D. None of above	**1.5**	**CO4**
Q15	For size exclusion chromatography, which of the following is true? A. Large or elongated proteins enter the pores in the beads. B. Small proteins enter the pores in the beads and are eluted later C. Large or elongated proteins elute from the bottom of the column later. D. Small proteins elute from the bottom of the column first.	**1.5**	**CO4**
Q16	Protein phosphorylation occur on which of the following amino acid residues? A. Serine B. Lysine C. Tyrosine D. Tryptophan	**1.5**	**CO4**
Q17	Which of the following enzymes do not mediate post-translational modifications? A. Kinases B. Ligases C. Phosphatases D. Helicases	**1.5**	**CO5**

Q18	In O-linked glycosylation, monosaccharides bind to the hydroxyl group of which of the following amino acids? A. Histidine or glycine B. Alanine or tryptophan C. Aspartic acid or glutamic acid D. Serine or threonine	**1.5**	**CO5**
Q19	Roughly how many amino acids are there in one turn of an α helix? A. 1.2 B. 2.4 C. 3.6 D. 4.8	**1.5**	**CO5**
Q20	Which of the following method is a powerful method for single cell analysis and is also used in protein engineering studies? A. Western blotting B. PCR C. ELISA D. Flow cytometry	**1.5**	**CO5**
	Section B **(4Qx5M=20 Marks)**		
Q1	Briefly describe the principal forces associated with protein folding.	**5**	**CO1**
Q2	Why is 2D-Gel electrophoresis required?	**5**	**CO2**
Q3	What is Anfinsen hypothesis of protein folding?	**5**	**CO1**
Q4	**A.** What are glycoproteins? (2 marks) **B.** Briefly mention the chemistry behind maillard reaction. (3 marks)	**5**	**CO3**
	Section C **(2Qx15M=30 Marks)**		
Q1	**A.** What is Far- and Near-UV CD? (3 marks) **B.** Using Morse diagram describe the physical basis for fluorescence and UV-Vis spectroscopy. (5 marks) **C.** Write the working principle of mass spectrometry. (3 marks) **D.** Write any two applications of fluorescence spectroscopy. (4 marks)	**15**	**CO1**
Q2	**A.** Describe separation of proteins using size exclusion chromatography. (4 marks) **B.** Explain the factors that affect column efficiency. (5 marks) **C.** Define isoelectric focusing? (2 marks)	**15**	**CO2**

	D. Write the differences between native PAGE and SDS-PAGE. (4 marks)		
Section D **(2Qx10M=20 Marks)**			
Q1	Describe the following post-translational modifications: **A.** S-nitrosylation. (3 marks) **B.** Ubiquitination (4 marks) **C.** Acetylation (3 marks)	**10**	**CO3**
Q2	**A.** What strategies one must adopt to design novel proteins? (5 marks) **B.** How do one uses computer to model proteins? (5 marks)	**10**	**CO4**