Name:

Enrolment No:

UPES

End Semester Examination, May 2024

Course: Biophysics

Semester : 4th

Program: B.Tech Biomedical Engineering

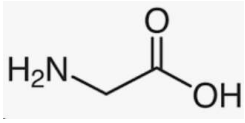
Duration : 3 Hours

Course Code: PHYS 2030 **Max. Marks: 100**

Instructions: Attempt all the questions

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	UV-Vis spectroscopy involves electronic transitions. Is this statement true or false?	1.5	CO4
Q2	The denaturation of protein is irreversible. Is this statement true or false?	1.5	CO4
Q3	Which is the widely accepted model of biological membranes?	1.5	CO2
Q4	Which of the following structures the β-pleated sheet corresponds to? (a) primary structure (b)secondary structure (c) both a and b (d) none of the above	1.5	CO3
Q5	The pitch of protein α-helix is: (a) 3.4 nm (b) 3.4 Å (c) 5.4 Å (d) 5.4 nm	1.5	CO3

Q6	The uncertainty principle suggests that electrons cannot exist inside the nucleus. Is this statement true or false?	**1.5**	**CO1**
Q7	Ionic bonds are formed between metals and non-metals. Is this statement true or false?	**1.5**	**CO1**
Q8	What is the importance of chaperones?	**1.5**	**CO3**
Q9	Which of the following is not a stabilizing force in protein folding? (a) Disulphide bridge (b) Hydrophobic interaction (c) Hydrogen bond (d) Metallic bond	**1.5**	**CO3**
Q10	Fluorescence spectroscopy involves the electronic relaxation from triplet excited states. Is this statement true or false?	**1.5**	**CO4**
Q11	The purpose of satisfying the octet for an atom is to achieve the stable configuration of its nearest noble gas. Is this statement true or false?	**1.5**	**CO1**
Q12	The biological membrane consists of one cholesterol molecule per phospholipid molecule. Is this statement true or false?	**1.5**	**CO2**
Q13	Give the mathematical relationship between osmotic pressure and molar concentration of metabolites.	**1.5**	**CO2**
Q14	Oxygen undergoes simple diffusion across cell membranes. Is this statement true or false?	**1.5**	**CO2**
Q15	Active transport does not require the ATP energy. Is this statement true or false?	**1.5**	**CO2**
Q16	Anfinsen's experiment involves the usage of 3M HCl for protein denaturation. Is this statement true or false?	**1.5**	**CO3**
Q17	Protein folding satisfies the 2^{nd} law of thermodynamics. Is this statement true or false?	**1.5**	**CO3**
Q18	Which of the following is true for molecularity and order of a reaction? a. molecularity and order of a reaction can be fractional values	**1.5**	**CO1**

	b. molecularity and order of a reaction are both related to collisions among molecules c. molecularity and order of a reaction can both be zero d. molecularity and order of a reaction can both have a value of one		
Q19	What is the thickness of phospholipid bilayer in cell membranes?	**1.5**	**CO2**
Q20	Biochemical reactions can be accurately described by the transition state theory. Is this statement true or false?	**1.5**	**CO1**
	Section B **(4Qx5M=20 Marks)**		
Q 1	a. Derive the relation for the velocity of an electron in the first orbit around the nucleus. b. Suppose the velocity of an electron in an atom is known to have an accuracy of $2x10^3$ m/s. What is the electron's minimum uncertainty in position, and how does this compare with the approximate 0.1 nm size of atom?	**5**	**CO1**
Q2	The chemical structure of glycine is shown below in Fig. 1.  Fig. 1 Estimate and explain the formation of a glycine dipeptide.	**5**	**CO3**
Q3	Explain the process of sodium-glucose symport across biological cell membrane with the help of a suitable diagram.	**5**	**CO2**
Q4	For the reaction $2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$, calculate the following: 1. Express the rate of reaction in terms of the reactants and product. 2. At a particular instant if [NO] is decreasing at 0.5 mol/L/s, what is the rate of formation of NO_2 at that instant?	**5**	**CO1**
	Section C		

(2Qx15M=30 Marks)			
Q 1	Describe the process of protein folding and illustrate the mathematical relationship between renaturation kinetics & associated free energy change.	**15**	**CO3**
Q2	(i) Discuss the various allowed as well as forbidden transitions in UV-VIS spectroscopy. (ii) A solution of tryptophan exhibits peak absorbance of 0.54 at 280 nm in a 0.5 cm length cuvette. Estimate the concentration of the solution if absorbance coefficient is 6.4 x 10^3 L/Mol/cm?	**15**	**CO4**
Section D **(2Qx10M=20 Marks)**			
Q 1	Discuss the various types of passive transport involved in biological membranes. Describe the governing mechanism of passive transport.	**10**	**CO2**
Q2	Describe in detail about Anfinsen's experiment and Levinthal's paradox.	**10**	**CO3**