Name: Enrolment No:	

UPES

End Semester Examination, May 2025

Course: Principles of Biochemistry **Semester: II**

Program: BSC-CLINICAL RESEARCH/BSC-FN-D/ BSC-MICROBIOLOGY **Time : 03 hrs.**

Course Code: HSCC1027 **Max. Marks: 100**

Instructions: Read the paper carefully before attempting any questions.

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	_____ disaccharide is composed of glucose and galactose. a) Maltose b) Sucrose c) Lactose d) Cellobiose	1.5	CO1
Q2	Which of the following lipids is amphipathic? a) Triglyceride b) Cholesterol c) Phospholipid d) Wax	1.5	CO1
Q3	Anfinsen's experiment demonstrated that_____. a) Protein folding requires cellular machinery. b) Protein structure is determined by amino acid sequence. c) Enzymes are needed for protein folding. d) DNA dictates protein function.	1.5	CO1
Q4	If an enzyme shows a high Km value, it indicates: a) High substrate affinity b) Low substrate affinity c) High Vmax d) No catalytic activity	1.5	CO1
Q5	A child with a defect in the enzyme ornithine transcarbamylase would have problems with which cycle? a) Glycolysis b) Citric acid cycle c) Urea cycle d) Gluconeogenesis	1.5	CO1
Q6	In thermodynamics, the first law states that a) Energy is always conserved. b) Entropy must increase in an isolated system. c) The total energy of a system increases over time.	1.5	CO1

	d) Heat cannot be converted into work.		
Q7	The iodine number of a lipid indicates: a) The degree of unsaturation in the lipid. b) The presence of saturated fats. c) The molecular weight of the lipid. d) The amount of saponifiable fatty acids.	**1.5**	**CO1**
Q8	During glycolysis, one molecule of glucose is broken down to yield: a) 2 ATP molecules. b) 2 NADH molecules. c) 2 molecules of pyruvate. d) All of the above.	**1.5**	**CO1**
Q9	The major difference between an epimer and an enantiomer is that: a) Epimers differ at one carbon atom, enantiomers are mirror images. b) Epimers are non-optical isomers, enantiomers are optical isomers. c) Epimers have different molecular formulas, enantiomers do not. d) Epimers are found in the D-form, enantiomers in the L-form.	**1.5**	**CO1**
Q10	The central concept of quantum theory involves: a) Matter and energy behaving as waves and particles. b) The motion of electrons in the nucleus. c) The interaction between atoms. d) The chemical bonding in molecules.	**1.5**	**CO1**
Q11	The primary function of buffers in biological systems is_____ a) To increase the temperature of reactions. b) To maintain the pH of the system. c) To store energy in the form of ATP. d) To catalyze enzymatic reactions.	**1.5**	**CO1**
Q12	Which of the following enzyme classification involves transferring functional groups between molecules? a) Hydrolases b) Transferases c) Ligases d) Oxidoreductases	**1.5**	**CO1**
Q13	How would you interpret a decrease in Vmax of an enzyme reaction? a) The enzyme is more efficient. b) The enzyme is less efficient at converting substrate to product. c) The enzyme concentration has increased. d) The substrate concentration is high.	**1.5**	**CO1**

Q14	The process of mutarotation involves: a) The conversion of one stereoisomer to another. b) The splitting of a disaccharide into two monosaccharides. c) The formation of an ester bond. d) The conversion of glucose into glycogen.	**1.5**	**CO1**
Q15	Essential fatty acids must be obtained from the diet because a) The body can synthesize them. b) They are required for protein synthesis. c) The body cannot synthesize them. d) They are formed in the mitochondria.	**1.5**	**CO1**
Q16	The saponification number of a fat refers to: a) The number of double bonds in the fat molecules. b) The amount of iodine absorbed by the fat. c) The number of moles of KOH required to hydrolyze a gram of fat. d) The ratio of fatty acids to glycerol in triglycerides.	**1.5**	**CO1**
Q17	Which lipid is most likely to form lipid bilayers in aqueous solutions? a) Triglycerides b) Phospholipids c) Cholesterol d) Sphingolipids	**1.5**	**CO1**
Q18	The following is a key feature of the quantum theory in relation to biophysics. a) The behavior of matter is determined by Newton's laws of motion. b) Energy is quantized in discrete packets. c) Energy is continuously available to all matter. d) The laws of motion apply to both large and small particles.	**1.5**	**CO1**
Q19	It describes the secondary structure of a protein a) The overall 3D shape of the protein. b) The sequence of amino acids. c) Alpha-helices and beta-pleated sheets. d) The way subunits are assembled into a larger structure.	**1.5**	**CO1**
Q20	_____bond is responsible for linking two monosaccharides to form a disaccharide. a) Hydrogen bond b) Glycosidic bond c) Peptide bond d) Ionic bond	**1.5**	**CO1**
Section B (4Qx5M=20 Marks)			
Q 1	Differentiate between essential and non-essential fatty acids with examples.	**5**	**CO2**

Q 2	Write a short note on the formation and biological importance of lipid bilayers.	**5**	**CO2**
Q 3	Describe the structure and function of globular and fibrous proteins.	**5**	**CO2**
Q 4	Explain the laws of thermodynamics and their significance in biological systems.	**5**	**CO2**
	Section C **(2Qx15M=30 Marks)**		
Q 1	A cell is undergoing intense metabolic activity. The cell is primarily relying on glucose metabolism for energy production, and an increase in lactate production is observed. (a) Briefly explain how the processes of glycolysis and citric acid cycle helps in fulfilling the requirements of this intense metabolic activity. Discuss how these pathways contribute to the generation of ATP. (5) (b) In relation to the scenario above discuss the role of gluconeogenesis in maintaining blood glucose levels. (5) (c) Describe the relationship between gluconeogenesis and glycolysis, and identify the key enzymes involved in these opposing pathways. (5)	**15**	**CO3**
Q 2	A biochemist is studying a new class of lipids that have both hydrophobic and hydrophilic properties. The lipids are found to form membranes in cells. a) Classify the different types of lipids, likely to be present in the cell membrane, based on their structure and function. Include examples of each class. (5) b) Discuss the structure and function of the most prominent lipid involved in the formation of biological membranes. (5) c) Based on the biochemist's findings, explain how the lipid in question might contribute to membrane formation. (5)	**15**	**CO4**
	Section D **(2Qx10M=20 Marks)**		
Q 1	Describe the process of glycolysis, its location and overall significance in metabolism. Explain the key steps and enzymes involved in energy investment and payoff phases.	**10 (3+3+4)**	**CO3**
Q 2	Outline the urea cycle and its significance in amino acid metabolism.	**10 (5+5)**	**CO4**