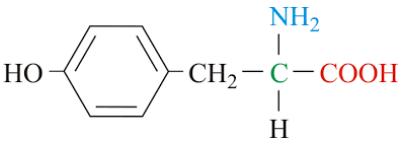
Name:

Enrolment No:

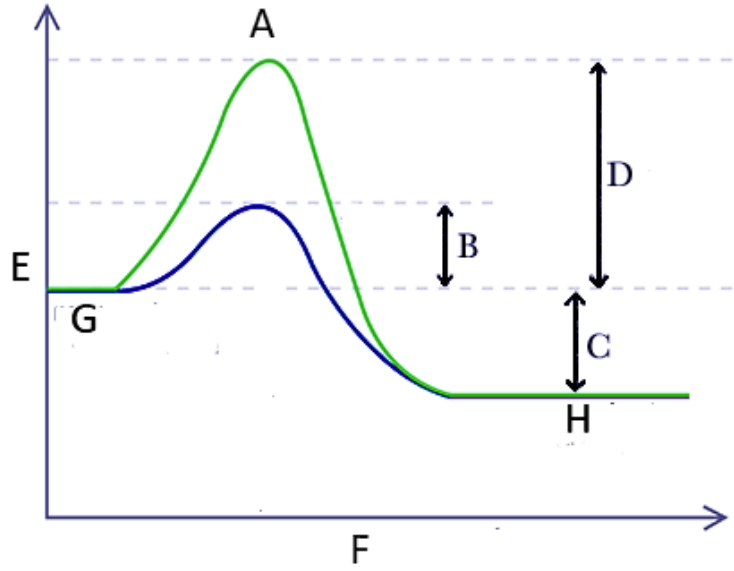
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2025

Course: Biochemistry **Semester : II**
Program: BTech Biotechnology and Food Technology **Duration : 3 Hours**
Course Code: HSCC1032_4 **Max. Marks: 100**

Instructions: Please read all questions carefully, and draw the required structures and chemical reactions wherever applicable.

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	Cos
Q 1	Define chiral carbon.	1.5	CO1
Q 2	In which of the following, glucose residues are linked by β(1-4) glycosidic bonds? A) Starch, B) Cellulose, C) Glycogen, D) Amylose	1.5	CO1
Q 3	Which of the following is a reducing sugar? A) Dihydroxyacetone B) Trehalose C) Sucrose D) Glucose	1.5	CO1
Q 4	Which enzyme catalyzes the conversion of pyruvate to oxaloacetate: A) Pyruvate carboxylase B) Pyruvate dehydrogenase C) Pyruvate kinase D) PFK-1	1.5	CO1
Q 5	In which cellular organelle does the Krebs cycle occur? A) Mitochondria B) Cytoplasm C)Endoplasmic reticulum D) Golgi apparatus	1.5	CO1
Q 6	Identify the given below structure 	1.5	CO1
Q 7	Define peptide bond.	1.5	CO1
Q 8	Write the name of any enzyme with its cofactor	1.5	CO1
Q 9	An apoenzyme with cofactor is called as A) Abzyme B) Ribozyme C) Holoenzyme D) None of the above.	1.5	CO1
Q 10	Define amphipathic molecule.	1.5	CO1
Q 11	Which one is false a) Fatty acids may be saturated or unsaturated. b) Fatty acids are water soluble.	1.5	CO2
Q 12	Which of the following affects the melting point of a fatty acid the most? A) Number of oxygen atoms	1.5	CO2

	B) Type of ester bond C) Length of the carbon chain and degree of unsaturation D) Presence of phosphate group		
Q 13	What does the iodine value of a fat indicate? A) Degree of unsaturation B) Melting point C) Acid content D) Oxidation state	1.5	CO2
Q 14	Draw the structure of lauric acid (12:0).	1.5	CO2
Q 15	How does the presence of double bonds in a hydrocarbon chain affect its melting point? A) Increases melting point by strengthening van der Waals forces B) Decreases melting point by formation of kinks in double bond C) Has no effect on melting point D) Decreases melting point by disrupting packing efficiency	1.5	CO2
Q 16	Define isoelectric point (pI).	1.5	CO2
Q 17	Which list correctly shows bond/interaction strength in decreasing order (strongest to weakest) A) covalent bond > hydrogen bond > ionic bond > van der Waals interaction B) covalent bond > ionic bond > hydrogen bond > van der Waals interaction C) ionic bond > covalent bond > hydrogen bond > van der Waals interaction D) hydrogen bond > ionic bond > van der Waals interaction > covalent bond	1.5	CO2
Q 18	Two successive nucleoside residues link together by…….	1.5	CO2
Q 19	Describe why cold-blooded animals have more unsaturated fatty acid?	1.5	CO2
Q 20	Report two properties that make triglyceride better storage molecule	1.5	CO2
Section B (4Qx5M=20 Marks)			
Q 1	Define Anomers with an example of glucose. **Or** Explain about Transition State Theory.	2+3	CO1
Q 2	Explain about tertiary structures of proteins with an example.	5	CO2
Q 3	Define Chargaff's rule. A DNA sample contains 20% cytosine. Based on Chargaff's Rules, calculate the percentage of: a) Guanine, b) Adenine, c) Thymine	2+3	CO3
Q 4	Estimate the distance covered by 136 amino acids long α-helix. **Or** Estimate the linear length (in nanometers) of a DNA segment consisting of 40 base pairs in the B-form of the DNA double helix.	5	CO5
Section C (2Qx15M=30 Marks)			
Q 1	Discuss what enzyme does in a reaction and how enzymes operate. The below given diagram represents comparison of uncatalyzed with enzyme catalyzed reaction. Label A, B, C, D, E, F, G and H.	3+4+8	CO3

	 **Or** In the liver, alcohol dehydrogenase converts ethanol to acetaldehyde with the help of NAD^+. (i) As per IUBMB classification to which class does alcohol dehydrogenase belong? (ii): What type of reaction is catalyzed here? (iii): Write down the chemical reaction with structures (iv): A methanol poisoning patient is admitted to the hospital. Why is ethanol administered to a patient suffering from methanol poisoning? Explain the underlying biochemical mechanism. (V) Differentiate between Oxidoreductases and Transferases (with examples)	2+2+4+3 +4	
Q 2	A) Illustrate and explain Watson and Crick model of DNA double Helix. B) Differentiate between A, B and Z form of DNA. Or Explain the process of oxidative phosphorylation, including the role of each complex in the electron transport chain (ETC) and how ATP is generated. Illustrate how the proton gradient is established and how ATP synthase uses this gradient to produce ATPs.	7.5+7.5	CO5
	Section D (2Qx10M=20 Marks)		
Q 1	Write three steps (chemical reactions with structure) where NADH and $FADH_2$ are produced in TCA cycle.	10	CO4
Q 2	Define nitrogen balance. Explain the urea cycle, outlining its role in nitrogen metabolism. Support your answer with a labeled diagram (chemical reactions) of the cycle showing key intermediates and enzymes involved. **Or** Define enzymes. Explain why the IUBMB classification of enzymes is required. Discuss each class with reaction type and example.	2+2+6	CO4