



## BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – M.Sc.(BT)-2022/M.Sc.(BT)-2023

Course Name – Biochemistry

Course Code - MBTC101

( Semester I )

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

### Group-A

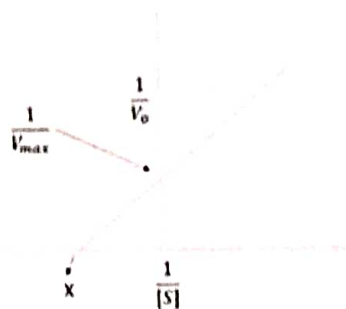
(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) In the TCA cycle, what is the fate of the carbons from acetyl-CoA that enter the cycle?
  - a) They are completely oxidized to CO<sub>2</sub>
  - b) They are used to synthesize fatty acids
  - c) They are converted into glycogen
  - d) They are excreted as urea
- (ii) Van der Waals interactions include which of the following forces?
  - a) Ionic forces
  - b) London dispersion forces
  - c) Covalent forces
  - d) Electrostatic forces
- (iii) Choose which of the following is not a factor that can influence enzyme activity?
  - a) Temperature
  - b) pH
  - c) Substrate concentration
  - d) Color of the enzyme
- (iv) Identify which of the following glycosidic linkage found in maltose?
  - a) Glucose ( $\alpha$ -1 – 2 $\beta$ ) Fructose
  - b) Glucose ( $\alpha$ 1 – 4) Glucose
  - c) Galactose ( $\beta$ 1 – 4) Glucose
  - d) Glucose ( $\beta$ 1 – 4) Glucose
- (v) When the temperature of an enzyme-catalyzed reaction increases, predict what typically happens to the reaction rate?
  - a) It decreases
  - b) It remains constant
  - c) It depends on the enzyme
  - d) It increases
- (vi) Select which of the amino acid participate in 'O' glycosylation
  - a) Serine
  - b) Glycine
  - c) Alanine
  - d) All of these
- (vii) Identify which one of these involved in primary structure of protein
  - a) Right hand twisted rotation
  - b) Peptide bond formation
  - c) beta sheet formation
  - d) metal ion involvement

(viii) In the following plot, what does X represent?



- a)  $V_{max}$
  - b)  $K_m/V_{max}$
  - c)  $-1/K_m$
  - d)  $S_{max}$
- (ix) Determine the reason for the sensitivity of enzymes towards pH changes
- a) They can only function at a neutral pH
  - b) pH affects the charge of amino acid side chains in the active site
  - c) pH does not have any impact on enzyme activity
  - d) They produce acids as byproducts of catalysis
- (x) When the reaction reaches its plateau state, which type of kinetics is seen?
- a) Zero order kinetics
  - b) First order kinetics
  - c) Second order kinetics
  - d) Pseudo zero order kinetics
- (xi) Choose the correct option for an allosteric inhibitor of an enzyme
- a) binds to the active site.
  - b) participates in feedback regulation.
  - c) denatures the enzyme
  - d) is a hydrophobic compound
- (xii) Compute the rate of denaturation  $k_d$ , if the half-life of an enzyme catalyzed reaction is 15.6 mins?
- a)  $4.4 \times 10^{-2}/\text{sec}$
  - b)  $0.4 \times 10^2/\text{min}$
  - c)  $4.4 \times 10^{-2}/\text{min}$
  - d)  $0.4 \times 10^2/\text{sec}$
- (xiii) Select what are the three things that structural variation in DNA reflects
- a) DNA bending, stretching, and melting
  - b) Different types of bonds, steric constraints, and rotational freedom
  - c) Syn and anti conformations, sugar interference, and carbonyl oxygen
  - d) Covalent bonds, hydrogen bonds, and van der Waals forces
- (xiv) Select the step in glycolysis, results in the production of ATP?
- a) Conversion of glucose to glucose-6-phosphate
  - b) Conversion of fructose-6-phosphate to fructose-1,6-bisphosphate
  - c) Conversion of 1,3-bisphosphoglycerate to 3-phosphoglycerate
  - d) Conversion of phosphoenolpyruvate (PEP) to pyruvate
- (xv) Calculate the net production of NADH molecules from one turn of the TCA cycle
- a) 1 NADH
  - b) 2 NADH
  - c) 3 NADH
  - d) 4 NADH

### Group-B

(Short Answer Type Questions)

$$3 \times 5 = 15$$

2. How does a buffer system contribute to maintaining the pH of blood in the human body? (3)
3. Examine the statement that base stacking determine the stability of DNA double helical structure as compared to H-bonding. (3)
4. "Even though Tryptophan is less hydrophobic than phenylalanine but overall nature is hydrophobic". Explain why? (3)
5. The first step in the catabolism of most L-amino acids is the removal of alpha-amino group. Identify the reaction and explain the mechanism. (3)

6. You have discovered and sequenced an enzyme, and found that this enzyme is rich in Lysine (3) and Arginine residues. Mention whether this enzyme will exist as cation or anion under physiological pH. Justify your answer with suitable reasons.

OR

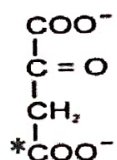
Assess how do temperature and enzyme denaturation relate to each other, and what are the (3) consequences of enzyme denaturation?

**Group-C**

(Long Answer Type Questions)

5 x 6=30

7. Explain the oxidative decarboxylation of pyruvate to acetyl-CoA by the PDH complex. (5)  
8. Describe the concept of activation energy in enzymatic reactions. How do enzymes lower the activation energy of reactions? (5)  
9. What is anaplerotic reaction. Give four suitable examples (5)  
10. Validate the concept of enzyme cooperativity. How does cooperativity influence the sigmoidal kinetics observed in some enzyme-substrate binding curves? (5)  
11. Differentiate between inhibitors and uncouplers of electron transport chain with suitable examples (5)  
12. (5)



\* Indicates radiolabeled C-atom. Identify this molecule and speculate the fate of this radiolabeled carbon during the course of TCA cycle by marking the radiolabeled 'C' in all the intermediates.

OR

Justify: Phosphoryl groups affect the structure and catalytic activity of proteins

(5)

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