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Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – M.Sc.(MB)-2024

Course Name – Microbial Biochemistry

Course Code - MMB10103

(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) What is the maximum wavelength that Tryptophan and tyrosine absorb?

- a) 250nm
- b) 260nm
- c) 280nm
- d) 290nm

(ii) Choose one aromatic amino acid

- a) Tyrosine
- b) Alanine
- c) Lysine
- d) Arginine

(iii) Cis Unsaturated fatty acids have

- a) Hydrogen atoms attached to the carbon double bond are on the same side
- b) Hydrogen atoms attached to the carbon double bond are on the opposite side
- c) Both are correct
- d) None of these

(iv) 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

(v) Complete the sentence "The catalytic efficiency of two distinct enzymes can be compared based on _____"

- a) K_m
- b) availability of the substrate
- c) pH of the reaction
- d) temperature of the reaction

(vi) Assume that the reaction catalyzed by an enzyme follows Michaelis-Menten kinetics.

The substrate concentration (K_m , Michaelis constant) needed to reach 50% of the maximum reaction velocity (V_{max}) is 25 μM . What substrate concentration is required to obtain at least 95% of the maximum reaction velocity?

- a) 25 μM
- b) 50 μM
- c) 475 μM
- d) 250 μM

(vii) By Kiliani fischer synthesis, Erythrose will generate

- a) Ribose
- b) Arabinose

- c) both A and B
 (viii) Choose which one of the following interactions plays a major role in stabilizing B-DNA
 a) Hydrogen bond
 b) Hydrophobic interactions
 c) Ionic interactions
 d) Vander waals interactions
 (ix) Determine why might chaperone proteins be particularly important in maintaining protein integrity within a crowded cellular environment?
 a) They catalyze protein folding reactions
 b) They break disulfide bonds in misfolded proteins
 c) They prevent protein aggregation and misfolding
 d) They degrade misfolded proteins
 (x) 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
 (xi) Analyze how does the removal of negative charges from DNA affect its susceptibility to hydrolysis?
 a) It makes DNA more resistant to hydrolysis
 b) It has no effect on DNA's susceptibility to hydrolysis
 c) It makes DNA more prone to hydrolysis
 d) It converts DNA into RNA
 (xii) Choose the reason behind the more accessibility of the major groove of dsDNA to proteins.
 a) The major groove contains fewer hydrogen bonds
 b) The major groove is wider due to the arrangement of glycosidic bonds
 c) The minor groove contains hydrophobic regions
 d) Proteins prefer the minor groove for binding
 (xiii) Choose what accounts for the structural variations observed in cellular DNA, as discussed in the text?
 a) Complementarity of base pairs
 b) Antiparallel strands
 c) Deoxyribose conformations, backbone bond rotations, and glycosyl bond rotation
 d) DNA melting and bending
 (xiv) Why are pyrimidines generally restricted to the anti conformation in DNA?
 a) To maximize hydrogen bonding
 b) To maintain strand complementarity
 c) Because of steric interference with the sugar and carbonyl oxygen
 d) To increase structural stability
 (xv) What is the most noticeable characteristic of Z-DNA's helical rotation compared to B-DNA?
 a) Z-DNA has a wider helical rotation
 b) Z-DNA has a left-handed helical rotation
 c) Z-DNA has a deeper major groove
 d) Z-DNA has a shallower minor groove

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Group-B

(Short Answer Type Questions)

3 x 5=15

2. Explain the process of monosaccharide ring formation and the types of cyclic structures formed. (3)
3. Distinguish between the Michaelis-Menten equation and the Lineweaver-Burk plot as methods to analyze enzyme kinetics, and select one to explain its advantages in enzyme studies (3)
4. Explain Cot curve, and how does it provide insights into the complexity and abundance of nucleic acid sequences in a given sample? (3)
5. An enzyme hydrolyzed a substrate concentration of 0.03 mmol/L, the initial velocity was 1.5×10^{-3} mmol/L.min⁻¹ and the maximum velocity was 4.5×10^{-3} mmol/L.min⁻¹. Estimate the K_m value. (3)
6. Explain the reason behind tryptophan being less hydrophobic than phenylalanine. (3)

OR

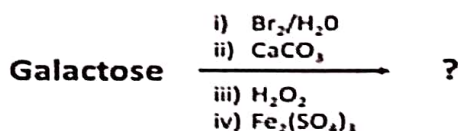
Compare acidity of cysteine with serine based on electronegativity and atomic size of -SH and -OH group. (3)

Group-C

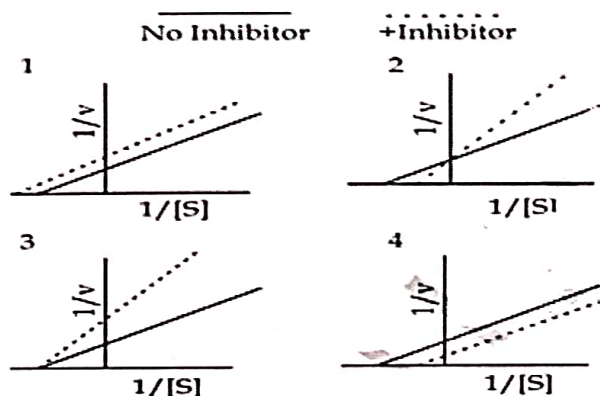
(Long Answer Type Questions)

5 x 6=30

7. Complete reaction mechanism for the below mentioned equation. (5)



8. Name the two heterocyclic rings attached histidine and tryptophan. Draw and structure of three basic amino acids and arrange them in the order of increasing basicity. (5)
9. For a competitive inhibition of an enzyme choose the plot that you would use to determine K_m and interpret your selection. (5)



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10. Explain five different kinds of constraints affect the stability of an alpha-helix. (5)
11. Explain the significance of sugar puckering in nucleic acid (5)
12. Considering that covalent modifications such as phosphorylation can activate or inhibit enzymes, how does the specificity of kinases and phosphatases ensure precise regulation of metabolic processes, and what could happen if this specificity is compromised? (5)

OR

Illustrate how do changes in temperature and pH influence the kinetic parameters (K_m and V_{max}) of enzymes, and how can these changes be visualized through Lineweaver-Burk or Eadie-Hofstee plots? (5)
