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(July)

BIOTECHNOLOGY

(Honours)

(Biological Chemistry)

Marks : 56

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer Question No. **1** which is compulsory and *any* **four** from the rest

1. *(a)* Write the structure and single letter codes of the three standard -amino acids that have aromatic *R* groups. 3

(b) Calculate the pH of a mixture of 0·2 *M* acetic acid and 0·5 *M* sodium acetate. Given that the pK_a of acetic acid is 4·76. 3

(c) Why are polypeptide bonds rigid? 2

(d) Hydrocarbon chains are constituents of fats. How do their length and extent of saturation affect the properties of fats? 4

2. *(a)* Does dihydroxyacetone have stereo-isomers? Give reasons for your answer. 2

(b) How many stereoisomers will a aldohexone have? 2

(c) Distinguish among enantiomers, diastereoisomers and epimers with suitable examples. 7

3. *(a)* Describe the steps in the pentose phosphate pathway that generates NADPH. 3

(b) Why is the activity of the pentose phosphate pathway very high in adipose tissue? 2

(c) Explain why gluconeogenesis is not the reversal of glycolysis. 6

4. *(a)* What is photorespiration? 3

(b) How do C_4 plants minimize photo-respiration? 6

(c) How do CAM plants differ from C_4 plants? 2

5. How is the proton gradient created across the inner mitochondrial membrane? How is this gradient utilized in the biosynthesis of ATP from ADP and Pi? 5+6=11

6. Derive the Lineweaver-Burk plot and explain its utility in estimating the values of V_{max} and K_m. What do these values signify? 8+3=11

7. *(a)* Write briefly about the levels of protein structure. 8

(b) Describe the steps in glycolysis where substrate-level phosphorylation occurs. 3

8. *(a)* Derive the ion-product of water and explain how the concept of pH is based on it. 9

(b) An aqueous solution has a pH of 9. What are the concentrations of H and OH ions in that solution? 2

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