

2/H-77 (ii) (Syllabus-2015)

2 0 1 9

(April)

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 down the reaction catalyzed by succinyl CoA synthetase in TCA cycle and explain how GTP is generated in this step. 2+2=4
- (b) Give one example for each of the following with chemical structure : 2×3=6
- (i) Amino acid with non-polar R group
 - (ii) Aldopentose
 - (iii) C_{18} cis- Δ^9 fatty acid
- (c) What role(s) do prosthetic groups such as heme and iron-sulfur clusters play in oxidative phosphorylation? 2

(2)

(3)

2. (a) What are the sources of intracellular osmolarity? What mechanisms does an animal cell employ to regulate its osmolarity? 3+5=8
- (b) Do the mechanisms that you described above influence the membrane potential? Substantiate your answer. 3
3. What is the proton motive force (pmf) in mitochondria? How is pmf related to ATP? 6+5=11
4. (a) Derive the Henderson-Hasselbalch equation and state its significance. 5+3=8
- (b) The pK_a1 , pK_a2 and pK_aR values of aspartic acid are 2.09, 9.82 and 3.86 respectively. Calculate its isoelectric point (pI). 3
5. Derive the Michaelis-Menten equation and illustrate how the affinity of an enzyme for its substrate can be measured by the equation. 8+3=11
6. Trace the steps of β -oxidation of fatty acids and explain how the complete oxidation of palmitate yields 129 ATP molecules. 6+5=11

7. How is NADPH generated in plant chloroplasts? What is its role in CO_2 fixation? 8+3=11
8. (a) Why do allosteric enzymes show deviations from Michaelis-Menten kinetics? 5
- (b) Name the allosteric modulators of phosphofructokinase and explain their key roles in regulation of glycolysis. 6
