

BIOCHEMISTRY
(BIOT 2103)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) How many no. of enzymatic steps are bypassed during gluconeogenesis in comparison to reverse glycolysis?
(a) 1 (b) 2 (c) 3 (d) 4
- (ii) The coenzyme involved in transfer of acetyl group
(a) NADH (b) Coenzyme A (c) S-adenosyl methionine (d) Biotin.
- (iii) An essential amino acid in human is
(a) Aspartate (b) Tyrosine (c) Methionine (d) Serine.
- (iv) TCA cycle in eukaryote takes place at
(a) Mitochondria (b) Nucleus (c) Cytoplasm (d) Glyoxysomes.
- (v) What leads to the activation of protein kinase C?
(a) Release of intracellular Ca^{+2} + diacylglycerol
(b) Release of intracellular Mg^{+} + diacylglycerol
(c) Release of intracellular Ca^{+2} + glycerol
(d) Release of intracellular Ca^{+2} + triacylglycerol.
- (vi) Which one is considered as the structural parent of all sphingolipids?
(a) Lecithin (b) Ceramide (c) Sphingosine (d) Sphingomyelin.
- (vii) Glutamine is deaminated to produce
(a) pyruvic acid (b) citric acid (c) oxalic acid (d) α -keto gluteric acid.
- (viii) Phosphorylation of phosphatidylinositol yields _____
(a) Phosphatidylinositol 4, 5-biphosphate
(b) Phosphatidylinositol 3, 5-biphosphate
(c) Phosphatidylinositol 3, 4-biphosphate
(d) Phosphatidylinositol 5, 6-biphosphate.
- (ix) Which of the following is an example for derived lipids?
(a) Steroids (b) Carotenoids (c) Terpenes (d) All of the above.

- (x) The three stages of cell signalling are
(a) transduction, reception and response
(b) reception, transduction and response
(c) response, reception and transduction
(d) none of the above.

Group- B

2. (a) State the characteristics of enzyme action. [(CO1)(Describe/LOCQ)]
(b) Describe the two models for enzyme-substrate binding. [(CO2)(Evaluate/IOCQ)]
(c) Write down the pay-off phase of glycolysis in a flow chart mentioning all enzymes, coenzymes and irreversible steps. Why it is called so? What is the actual oxidation step? [(CO2)(Remember/IOCQ)]
2 + 3 + (4 + 1 + 2) = 12
3. (a) Write schematically the photosynthetic electron transport chain. [(CO2)(Remember/LOCQ)]
(b) What are the different phases in the dark reaction of photosynthesis? [(CO3)(Understand/IOCQ)]
(c) What are C3 and C4 plants? Which of them is advantageous and why? [(CO4)(Analyse/HOCQ)]
4 + 4 + 4 = 12

Group - C

4. (a) What is meant by Omega-oxidation of fatty acids and how is it different from α -oxidation of fatty acids? [(CO5)(Remember/LOCQ)]
(b) By using a suitable example decipher the α -oxidation pathway of fatty acids. [(CO5)(Analyze/IOCQ)]
(c) Draw a flowchart analyzing the role of glucose and glucagon during fed and starvation state. [(CO5)(Analyze/IOCQ)]
4 + 4 + 4 = 12
5. (a) Why are glycerophospholipids considered as derivatives of phosphatic acid. Explain using the structure of phosphatic acid. [(CO5)(Understand/LOCQ)]
(b) Describe the synthesis of lecithin, cephalin and cardiolipin in detail. [(CO5)(Understand/LOCQ)]
(c) What are interconversion reactions and state how plasmalogen synthesis and degradation pathways takes place. [(CO5)(Analyze/HOCQ)]
4 + 4 + 4 = 12

Group - D

6. (a) Phenylketonuria is caused by defect in which pathway? Describe the pathway. [(CO4)(Remember/LOCQ)]
(b) How ammonia is excreted in fish, birds and mammals. [(CO2)(Remember/LOCQ)]

- (c) Describe the entry of two NH₃ molecules in urea cycle. [(CO1)(Analyze/IOCQ)]
(1 + 4) + 3 + 4 = 12

7. (a) How PRPP levels influence purine and pyrimidine nucleotide synthesis? [(CO2)(Remember/LOCQ)]
 (b) What is glutathione? Mention its biosynthesis and role in human. [(CO2)(Remember/LOCQ)]
6 + (3 + 3) = 12

Group - E

8. (a) What are the different properties of cell signalling? [(CO3)(Remember/LOCQ)]
 (b) Explain in detail the function and structure of Calmodulin. [(CO3)(Understand/LOCQ)]
 (c) What are the role of second messengers? Analyse six-different classes of cell signalling. [(CO3)(Analyze/IOCQ)]
4 + 4 + 4 = 12
9. (a) Describe the insulin signalling cascade. [(CO3)(Remember/LOCQ)]
 (b) Decipher the role of insulin in activating glycogen synthase. [(CO3)(Analyze/IOCQ)]
 (c) What is the working principle of Jak-Stat pathway? [(CO3)(Remember/LOCQ)]
4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	56.25	35.41	8.33

Course Outcome (CO):

After the completion of the course students will be able to

1. Explain the basic concepts of enzymes.
2. Understand and apply mathematical knowledge to solve Enzymatic Kinetics particularly related to Michaelis-Menton Equation.
3. Understand and grasp knowledge about main principles behind how various cell signalling works.
4. Explain the basic concepts of how extracellular matrix works.
5. Explain the basis behind lipid synthesis and lipid β oxidation pathways.
6. Understand how Cholesterol synthesis happens.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

