BIOCHEMISTRY
(BIOT 2103)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) The regulation of glycolytic pathway involves
(a) Allosteric stimulation by ADP (b) Allosteric inhibition by ATP
(c) Feed back inhibition by ATP (d) All of these

(ii) The cofactors of pyruvate dehydrogenase complex are
(a) Folate and TPP (b) FAD and NAD+
(c) NADH and Nicotinic acid (d) all of these.

(ii) Which of the following signal molecules does not interact with cell surface receptors?
(a) Insulin (b) Gastrin (c) Glucagon (d) Testosterone.

(iii) The no. of ATP molecules produced by complete oxidation of 1 molecule of glucose are
(a) 2 (b) 4 (c) 38 (d) 32.

(v) To regenerate cytoplasmic NAD^+, eukaryotes have the following systems:
(a) Malate-Aspartate shuttle (b) Glycero-phosphate shuttle
(c) Both (d) None.

(vi) The coenzyme involved in transfer of acetyl group
(a) NADH (b) Coenzyme A
(c) S-adenosyl methionine (d) Biotin

(vii) Which one is an example of a ketone body?
(a) Acetoacetate (b) Acetone (c) Pyruvate (d) Both (a) and (b)

(viii) Rubisco binds to
(a) CO_2 (b) O_2 (c) both CO_2 and O_2 (d) none

(ix) Example of a second messenger is
(a) cAMP (b) ATP (c) GTP (d) Wnt

(x) Which of the following form of lipids are referred to as neutral lipids?
(a) TGL (b) Steroids (c) Phospholipids (d) Wax.

Fill in the blanks with the correct word

(xi) The dehydrogease enzyme belongs to_____ class.

(xii) Blood clotting is the result of disease _____ .

(xiii) Scurvy is caused by the deficiency of vitamin_____.

(xiv) Example of a cell surface receptor is _____.

(xv) Lactose intolerance is the result of deficiency of _____ enzyme.

Group - B

2. (a) Show by a schematic diagram the flow of electron in oxidative electron transport chain.
Explain the theory proposed for ATP production.
Show how ATP is produced by ATP synthase. *[(CO3)(Understand/HOCQ)]*

(b) Explain how the lactic acid produced in muscle of heavy mammals during heavy excercise are metabolised. *[(CO3)(Memorize /IOCQ)]*

(4 + 2 + 3) + 3 = 12

3. (a) How the 3 phases of PPP operates? What is the significance of this pathway? *[(CO3)(Understand/HOCQ)]*

(b) What is neoglucogenesis? What are the 3 bypasses here? *[(CO3)(Memorize/IOCQ)]*

(4 + 4) + (1 + 3) = 12

Group - C

4. (a) Describe with the help of a flow chart how ketone bodies are synthesized? *[(CO5)(Understand/LOCQ)]*

(b) Lipid dysregulation causes atherosclerosis. Justify this statement. *[(CO5)(Evaluate/HOCQ)]*

(c) Deduce the β-oxidation pathway for oleic acid. *[(CO5)(Apply/IOCQ)]*

4 + 4 + 4 = 12

5. (a) Why does activation of fatty acids require two ATP equivalents? *[(CO5)(Analyse/IOCQ)]*

(b) Give a detailed comparison of fatty acid degradation and its biosynthesis. *[(CO5)(Remember/LOCQ)]*

(c) Analyse the antagonizing effects of insulin and glucagon. *[(CO5)(Analyse/IOCQ)]*

4 + 4 + 4 = 12

Group - D

6. (a) Explain how transamination results finally into deamination of all amino acid? *[(CO4)(Explain/IOCQ)]*

(b) Write a short note on Urea Cycle. Why it is also known as Kreb's bicycle? *[(CO4)(Evaluate/IOCQ)]*

6 + (4 + 2) = 12

7. (a) Describe the salvage pathway for purine biosynthesis. *[(CO3)(Understand/LOCQ)]*

(b) Mention the cause of Lesch-Nyhan syndrome. *[(CO4)(Explain/IOCQ)]*

(c) What is glutathione? *[(CO4)(Analyze/IOCQ)]*

4 + 4 + 4 = 12

Group - E

8. (a) Describe the cell signalling termination process using arrestin as an example. *[(CO3)(Understand/LOCQ)]*

(b) Analyze about the different unique properties of cell signaling. *[(CO3)(Analy/IOCQ)]*

(c) Describe the various process of termination of cell signalling with respect to G proteins. *[(CO3)(Evaluate/HOCQ)]*

4 + 4 + 4 = 12

9. (a) Discuss about the structure and function of calmodulin. *[(CO3)(Understand/LOCQ)]*

(b) How can β – adrenergic receptor be activated and desentisized? *[(CO4) (Apply/IOCQ)]*

(c) Analyse the JAK-STAT pathway. *[(CO2)(Analyse/IOCQ)]*

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	20.83	53.13	26.04

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.*