

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2024

Subject Code:3130403

Date:21-11-2024

Subject Name: Basic Biochemistry and Calculations

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1** (a) What is a buffer? Discuss its role in maintaining pH in biological systems **03**
- (b) Describe the Miller-Urey experiment and its significance in understanding the chemical basis of life. **04**
- (c) Define nucleosides and nucleotides. What is the structural difference between them? **07**

- Q.2** (a) What are glycoconjugates? Discuss their biological importance. **03**
- (b) What are the possible reasons that leads to generation of ketone bodies? Discuss its fate. **04**
- (c) Justify why oxidation of lipids are termed as beta oxidation? Also highlight key steps for oxidation of unsaturated fatty acid chains. **07**

OR

- (c) Explain the process of oxidation of saturated C 16 fatty acid. **07**

- Q.3** (a) Differentiate between monosaccharides, disaccharides, and polysaccharides with examples. **03**
- (b) Describe the mobilization and transport of fats within the body. **04**
- (c) What is the significance of biosynthesizing membrane lipids? Describe the process briefly. **07**

OR

- Q.3** (a) What are the different types of DNA, discuss each with their function. **03**
- (b) What are lipoproteins, and what role do they play in the transport of fats? **04**
- (c) Explain the steps involved in the biosynthesis of purine nucleotides **07**

- Q.4** (a) Explain the concept of isoelectric point (pI) and its importance in amino acid titration **03**
- (b) Draw the general structure of an amino acid and explain the properties of its functional groups **04**
- (c) Describe the process of glycogen metabolism, including both synthesis and breakdown **07**

OR

- Q.4** (a) List and describe the various types of RNA and their functions in the cell. **03**
- (b) Explain the Ramachandran plot and its significance in protein structure analysis **04**
- (c) Describe the metabolic fates of amino groups and the role of the urea cycle **07**
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- Q.5** (a) What is the role of NADPH in the pentose phosphate pathway, and why is it significant for cellular metabolism? **03**
- (b) Calculate the pI of an amino acid with the following pKa values: pKa1 (α -COOH) = 2.1, pKa2 (α -NH₃⁺) = 9.3 **04**
- (c) Explain the role of the carnitine shuttle in fatty acid metabolism. Discuss the steps involved in the transport of long-chain fatty acids into the mitochondria for β -oxidation. **07**

OR

- Q.5** (a) Explain the pentose phosphate pathway and its importance in cellular metabolism. **03**
- (b) Describe the key regulatory steps in gluconeogenesis and how they differ from glycolysis **04**
- (c) Describe the process of glycogen metabolism, including both synthesis and breakdown **07**
