QP Code : P24A015

Reg. No : .....

Name : .....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

I SEMESTER M.Sc. (CBCSS-PG) DEGREE EXAMINATION, November 2024

MSc Biotechnology

GBT1C02 : Biomolecules

2024 Admission Onwards

Time : 3 Hours **Maximum Weightage : 30**

Part A

*Short answer type questions: Answer **any four** questions. Weightage **2** for each question*

1. Explain the physical and chemical properties of water that make it essential for biological systems. [BTL2]
2. Define monosaccharides and classify them with examples. [BTL1]
3. Given a sequence of DNA (5'-ATCGGCTA-3'), predict the structural features and stability differences if it were to exist as A-DNA, B-DNA, or Z-DNA. [BTL3]
4. Given the following symptoms in a patient: Fatigue, Muscle weakness, Glossitis (inflammation of the tongue), Cracks at the corners of the mouth, and Difficulty walking. Identify the possible vitamin deficiency and propose a treatment plan that includes dietary recommendations and supplementation. [BTL4]
5. Discuss the basis for classifying proteins and provide examples of each classification type. [BTL2]
6. Apply the concept of mutarotation to explain how the equilibrium between α and β anomers of glucose is established in an aqueous solution. [BTL3]
7. Differentiate between saturated and unsaturated fatty acids with examples and explain their significance in biological membranes. [BTL4]

(4x2 = 8 Weightage)

Part B

*Short essay-type questions: Answer **any four** questions. Weightage **3** for each question*

8. How do covalent and non-covalent bonds contribute to the stability and function of biomolecules? Provide examples of each type of bond and explain their roles in biological systems. [BTL3]
9. Compare and contrast the structures and functions of maltose and lactose, and describe the biological roles of disaccharides in living organisms. [BTL2]

Turn Over

10. What are hormones? List and briefly describe the physiological functions of insulin, thyroxin, and somatotrophin. [BTL1]

11. Explain the differences between the secondary, tertiary, and quaternary structures of proteins, and describe the importance of each structural level in protein function. [BTL2]

12. How would you design an experiment using SDS-PAGE to analyze the purity of a protein sample? Outline the steps and explain the principles behind the technique. [BTL3]

13. How can the concept of Gibbs free energy be applied to determine whether a biochemical reaction will occur spontaneously? Provide an example of a reaction and explain the factors influencing spontaneity. [BTL3]

14. Define lipids. Classify them into simple lipids, compound lipids, and derived lipids, providing examples for each category. [BTL1]

(4x3 = 12 Weightage)

Part C

*Essay-type questions: Answer **any two** questions. Weightage **5** for each question*

15. Analyze the functional differences between mRNA, tRNA, and rRNA in the context of protein synthesis. Discuss how alterations or mutations in these RNA types can affect gene expression and lead to diseases. [BTL4]

16. Describe the basic principles of thermodynamics, including enthalpy, entropy, and free energy. Explain how these principles are used to understand the spontaneity of biochemical reactions. [BTL1]

17. Describe the process of SDS-PAGE electrophoresis and its use in protein analysis. Explain how SDS-PAGE separates proteins based on their molecular weight and discuss how the results can be interpreted to determine the purity and size of proteins. [BTL2]

18. Using the concept of isoelectric point (pI) and amphoteric properties of amino acids, analyze how these factors influence protein solubility and interaction with other molecules. Provide examples of how pI values are used in protein purification techniques. [BTL3]

(2x5 = 10 Weightage)

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