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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Biotechnology **Duration: 3 hrs.**
Course Code: 19BT3DCBBM **Max Marks: 100**
Course: Basics of Biomolecules **Date: 21.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Illustrate the glycosidic linkage found in the following: **08**
i) Cellulose ii) Glycogen iii) Sucrose iv) Trehalose
Briefly explain their structure and function.

b) Calculate the pH of a mixture of 0.10 M acetic acid and 0.20 M sodium acetate. The pKa of acetic acid is 4.76. Also give any two examples of buffers in blood. **04**

c) (i) Gentiobiose (β-D-glucopyranosyl-(1 → 6)-D-glucopyranose) is a disaccharide found in some plant glycosides. Draw the structure of gentiobiose based on its systematic name. Is it a reducing sugar? Does it undrgo mutarotation? **08**
(ii) Why does the specific rotation of a freshly prepared solution of the α-D-glucose gradually decreases with time? Why do solutions of the α and β forms of D-glucose reach the same specific rotation at equilibrium?
(iii) Calculate the percentage of each of the two formsof D-glucose present at equilibrium.

OR

2 a) Derive Henderson Hasselbach equation and mention its importance. **06**

b) Describe the reducing property, oxidation and mutarotation of Glucose. **06**

c) Explain the structure and importance of structural polysaccharides. **04**

d) Describe R, S system of nomenclature of chiral compounds with examples. **04**

UNIT - II

3 a) Draw the structure of cholesterol and write about its importance. **05**

b) Illustrate and explain the structure and importance of any two glycerophospholipids. **06**

c) Biological cell membranes are composed of several different types of lipids, as well as proteins. One reason why there are multiple types of lipids is to ensure that the membrane remains fluid so that proteins, lipids and small molecules can move through and within the membrane. In particular, there is **06**

always a mixture of saturated and unsaturated phospholipids.
Give an explanation with diagram of why a membrane containing unsaturated phospholipids would be more fluid than a membrane made exclusively of saturated phospholipids?

d) Write a note on poly unsaturated fatty acids and their significance. **03**

UNIT - III

4 a) Explain the functions of any three biologically important peptides. **06**

b) A protein is subjected to end group analysis by Edman degradation. The liberated PTH-amino acids are found to be present with a molar ratio of two parts Val, one part Ala and one part Phe. **08**
(i) What is Edman's reagent? Write its structure.
(ii) What conclusions can be drawn about the nature of the protein?
(iii) What is the most important difference between the Edman degradation and other methods of N-terminal residue identification?

c) Analyze the titration curve of glycine and explain its zwitter ionic behavior. **06**

UNIT - IV

5 a) You are studying a di-peptide with the sequence Asp-Ile. Draw the structure of this di-peptide at pH 7. Indicate which parts of the molecule are planar and explain why. On the drawing, indicate the Φ and ψ angles. **07**

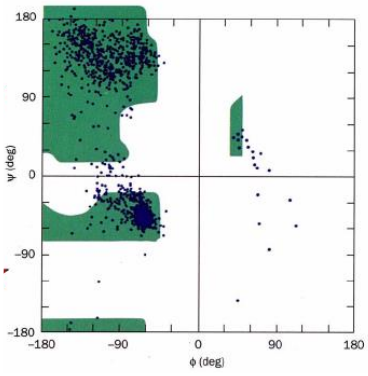
b) Describe in detail the structure of collagen. **05**

c) Discuss the different secondary structures of proteins. Interpret the role of various bonds in the secondary structure of proteins. **08**

OR

6 a) Describe the thermodynamics of protein folding depicted as a free-energy funnel with the help of a suitable diagram. **07**

b) Refer the Ramachandran plot given below to answer the following questions. **08**



(i) What does the Ramachandran plot represent?
(ii) What are the parameters shown on the Ramachandran plot and what do they characterize?
(iii) Why is the lower right quadrant a "forbidden" region in the Ramachandran plot?
(iv) What makes Glycine a special amino acid when itcomes to Ramachandran plots?

c) Protein A has a binding site for ligand X with a K_d of 10^{-6}M. Protein B has a binding site for ligand X with a K_d of 10^{-9}M. Which protein has a higher affinity for ligand X? Explain your reasoning. Convert the K_d to K_a for both proteins. **05**

UNIT - V

7 a) Compare the salient features of A, B, and Z forms of DNA. **06**

b) List the salient features of the tertiary structure of tRNA. **05**

c) Explain hyperchromic effect and the thermodynamics of melting of DNA. **05**

d) What do you mean by linking number? What is Lk0? How is linking number changed? **04**

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