(vi) Chirality of an amino acid is due to the presence of
(a) no net charge on the molecule
(b) asymmetric carbon atom
(c) symmetry element
(d) positive charge on the molecule.

(vii) Lenght of the pitch of Z-DNA is
(a) 11 bp (b) 12 bp (c) 10.5 bp (d) 10 bp.

(viii) Peptide bonds are
(a) fully flexible single bonds
(b) fully rigid double bonds
(c) single bonds with partial flexibility
(d) fully rigid triple bonds.

(ix) The genome of a virus has a composition of 25% G, 25% C, 30% A and 20% U. The genome is a
(a) ss DNA (b) dsDNA (c) dsRNA (d) ssRNA.

(x) The fibrous protein fibroin has its polypeptide chain arranged as
(a) beta-pleated sheet
(b) alpha-helical fibre
(c) beta-pleated sheet and alpha-helical randomly
(d) beta-pleated sheet and alpha-helical alternatively.

Group - B

2. (a) Explain the following terms: (i) dipole-dipole interaction, (ii) hydrophobic interaction.

(b) What is the hydrogen ion concentration in a solution at pH 5.3? Calculate the pH of a mixture of 0.25 M acetic acid and 0.1 M sodium acetate. The pKa of acetic acid is 4.76.

(3 + 3) + (2 + 4) = 12

3. (a) State the difference between configuration and conformation.

(b) State the stereochemical relation between (i) D glucose and D mannose, (ii) D glucose and D galactose, (iii) D glucose and L glucose, (iv) alpha glucose and beta glucose.

(c) What happens when
(i) Glucose reacts with Benedict's reagent
(ii) Starch is treated with iodine solution

2 + (1 + 1 + 1 + 1) + (3 + 3) = 12

Group - C

4. (a) What is wax? What is the chemical difference between natural wax and paraffin wax?

(b) Draw the structure of cholesterol. Discuss the importance of cholesterol and other steroids in biological systems.

(3 + 2) + (2 +5) = 12

5. What happens when
(i) Cholesterol is treated with glacial acetic acid
(ii) Triacyl-glycerol is treated with sodium hydroxide
(iii) Fats and oils are kept in open container under moist condition for a long time
(iv) Oleic acid is treated with iodine

(3 × 4) = 12

Group - D

6. (a) Discuss a method by which amino acids can be separated in a laboratory.

(b) Which amino acid residues are present in a beta pleated sheet? Name a protein that contains entirely a beta-pleated sheet structure. Discuss the structure of myoglobin.

3 + (3 + 1 + 5) = 12

7. (a) Draw the structure of dGDP.

(b) Calculate weight in grams of a double-helical DNA molecule stretching from the earth to the moon (~ 320,000 km). The DNA double helix weighs about 1×10^{-18} g per 1,000 nucleotide pairs. Give logic for your answer.

(c) What is T_m of a DNA molecule? On what factors the T_m of DNA molecules depends?

(d) Derive the equation for renaturation kinetics of an ssDNA molecule into dsDNA.

2 + 2 + (2 + 2) + 4 = 12

Group - E

8. (a) Define bathochromic, hypochromic, hypsochromic and hyperchromic shits.

(b) Explain the principle of NMR spectroscopy.

(c) How protein folding can be studied with CD spectroscopy?

4 + 4 + 4 = 12

9. (a) Describe the method of structure determination of biomolecules by X-ray crystallography.

(b) Define flourophore, with an appropriate example, existing as biomolecules.

(c) Monochromatic light is passed through a cell having path length of 1 mm and containing 0.006 moles/L solution. The light intensity reduced to 18% of its value. Calculate molar extinction coefficient of the sample. What will be the transmittance if the cell path length is 2mm?

4 + 2 + 6 = 12

CHEMISTRY OF BIOMOLECULES
(BIOT 2101)

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) Which of the following molecules would you expect to form micelles?
(a) Sodium chloride (b) Acetic acid
(c) Ammonium acetate (d) Sodium palmitate.

(ii) Which of the following amino acids is a modified amino acid?
(a) Proline (b) Methionine
(c) Cysteine (d) Methyl lysine.

(iii) Which of the following compounds is different from others?
(a) GMP
(b) deoxy- guanosine-monophosphate
(c) gulanylic acid,
(d) guanosine-5'- monophosphate.

(iv) The X-ray crystallography studies of Rosalind Franklin and Murice Wilkins showed that
(a) DNA contains only four kinds of nucleotides,
(b) DNA has helix major regularity of 0. 34 nm,
(c) the amount of adenine found in DNA is equal to the amount of thymine,
(d) the same base pairing rules apply to all species.

(v) $O.D_{260}$ of DNA sample (50 µg/ml) is maximum if it is
(a) Double stranded DNA (b) Single stranded DNA
(c) Free deoxynucleotide (d) none of these.