[This question paper contains 4 printed pages.]

Sr. No. of Question Paper: 6363 D Your Roll No......

Unique Paper Code : 249103

Name of the Course : B.Sc. (Hons.) / Bio-Chemistry

Name of the Paper : Biophysics (BCHT 102)

Semester : I

Duration: 3 Hours Maximum Marks: 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

- 2. Attempt five questions in all.
- 3. Question No. 1 is compulsory.
- 4. Use of scientific calculator/log tables may be allowed.
- 1. State whether the following statements are True or False with justification:
 - (i) Water has a low dielectric constant.
 - (ii) Photosensitive detector in a spectrofluorimeter is at right angles to the incident light.
 - (iii) Diatomic molecules are IR inactive.
 - (iv) pH affects the absorption properties of a ionic chromophore.
 - (v) Alveoli have surfactants which prevent their collapse during expiration.
 - (vi) Mg²⁺ is detectable by ESR spectroscopy.
 - (vii) Molecular structures can be determined by NMR spectroscopy.
 - (viii) Viscosity of DNA increases with denaturation.
 - (ix) Rigid ring structures like fluorescein show fluorescence. (2×9)

- (x) Cover slips are used before viewing slides in light microscopy. (1)
- 2. (i) What were the results and conclusions of Miller and Urey's experiments?
 - (ii) Why do you think only L-amino acids and D-sugars have been selected by nature?
 - (iii) With the help of an energy level diagram show how internal conversion results in fluorescence and intersystem crossing results in phosphorescence?
 - (iv) A solution of L-leucine (3.0 g/50 ml 6N HCI) had an observed rotation of 1.81° in a 20 cm polarimeter tube. Calculate (a) the specific rotation a and (b) the molar rotation [α]_m of the leucine solution. (4,2,4,4)
- 3. (i) The solubility product of AgCI in water is 1.5×10^{-10} . Calculate its solubility in 0.01M NaCI solution.
 - (ii) The molar ionic conductances at infinite dilution of Mg²⁺ and Cl⁻ are 106.1 and 76.3 ohm⁻¹ cm² mol⁻¹ respectively. Find out the molar conductance of the solution of MgCl₂ at infinite dilution.
 - (iii) Which property of water is attributed to the following: (a) water is a good solvent (b) water plays a role in regulating body temperature?
 - (iv) Why does a high dietary intake of phosphate increase the possibility of forming calcium stones?
 - (v) Differentiate between isoosmotic and isotonic solutions.
 - (vi) Explain why atomic emission spectrum relates to only an individual element? (3,3,2,2,2,2)
- 4. (i) Give a schematic representation of a spectrophotometer.

- (ii) Write a note on three types of monochromators used in spectrophotometry.
- (iii) A solution containing 10⁻⁵ M ATP has a transmission of 70.2% at 260 nm using a 1cm path length cuvette. Calculate (a) transmittance in a 3 cm path length cuvette (b) Absorbance in a 1cm cuvette. (4,6,4)
- 5. (i) Write the principle of ¹H NMR spectroscopy and give its use in structure determination using ethyl alcohol as an example.
 - (ii) Write the Bragg's equation as used in X-ray crystallography and briefly explain its use in determining molecular structures. (2×7)
- 6. Differentiate between the following:
 - (i) Intrinsic and extrinsic fluors
 - (ii) Paramagnetic and diamagnetic elements
 - (iii) Alpha and beta radioactive radiations
 - (iv) CD and ORD spectra
 - (v) Relative and specific viscosity
 - (vi) Dark field and light field microscopy
 - (vii) Salting in and salting out

 $.(2\times7)$

- 7. (i) Write the equation used to determine molecular weight of a macromolecule using its determined sedimentation coefficient. What are the various factors that affect the sedimentation coefficient?
 - (ii) Represent schematically an ultracentrifuge.
 - (iii) Differentiate a clinical centrifuge from a high speed one in terms of design and applications. (5,5,4)

- 8. Write short notes on:
 - (i) The three phases of evolution
 - (ii) Biological effects of radiation
 - (iii) Geiger-Muller counters

(5,5,4)