This question paper contains 3 printed pages. *Your Roll No. .....*

Sl. No. of Ques. Paper : **912** **G**
Unique Paper Code : **249103**
Name of Paper : **Biophysics : BCHT-102**
Name of Course : **B.Sc. (Hons.) Biochemistry**
Semester : **I**
Duration : : **3 hours**
Maximum Marks : **75**

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

Attempt five questions in all. Q. No. 1 is compulsory.

1. (a) Explain the following:

   (i) Ethidium bromide is used to visualize DNA in agarose gels.

   (ii) The brightness of an image increases as the magnification decreases.

   (iii) Cover slips are used in microscopic experiments.

   (iv) The origin of homochirality during chemical evolution.

   (v) Rotor chamber in an ultracentrifuge is evacuated.

   (vi) Emitted light has a longer wavelength than the incident light in fluorescence.

   (b) Define the following terms:

   (i) Quantum Yield

   (ii) Viscosity

   (iii) Resolution

   (iv) Chromophore.

   (c) Water has a high dielectric constant. Justify. 12,4,3

2. (a) Discuss the working of a GM Counter.

   (b) Draw a schematic diagram of an electron microscope. Compare and contrast electron microscopy with light microscopy.

   (c) A sample of wood from the British Museum is sent for carbon dating. In this process the radioactivity emitted from the sample is compared to the count from a new piece of wood. The radioactivity is due to ^{14}C which has a half life of 5600 years.

   (i) Explain the term half life.

P. T. O.

(i) What is the age of the old sample if it showed 5 counts/min/g and the new sample showed 20 counts/min/g? 5,5,4

3. Differentiate between the following:

(a) Fluorescence and phosphorescence

(b) CD and ORD

(c) Osmosis and diffusion

(d) Alpha emission and beta emission. 4,4,3,3

4. (a) Describe the working of a spectrophotometer.

(b) Explain the principle of dark field microscopy. Name one advantage and one disadvantage of dark field microscopy.

(c) How will you distinguish between the following using spectral measurements?

(i) Tryptophan and Isoleucine

(ii) RNA and DNA. 5,5,4

5. (a) What is the role of the following:

(i) Nicol prism in a polarimeter

(ii) Staining dyes in light microscopy?

(b) What is the relationship between absorbance and transmittance? Why is absorbance preferred over transmittance in spectrophotometric measurements?

(c) Write a brief note on density gradient centrifugation. 6,4,4

6. (a) What are the nuclei that can be used to study protein conformation by NMR? Why is it important to label the protein for NMR? Name a few isotopes used for labeling proteins for NMR studies.

(b) X-rays are the "sweetspot" for wavelength when determining atomic resolution structures from the scattering of electromagnetic radiation. Justify the statement giving reasons why ultraviolet radiation and gamma rays are not suitable.

(c) State Fick's first law of diffusion. What are the factors affecting the diffusion coefficient of a molecule? 5,5,4

7. (a) Explain the "RNA world" hypothesis for the origin of life.

(b) What do you understand by the solubility product of a salt? Will a precipitate of AgCl form if 20 ml of 0·01 M $AgNO_3$ and 20 ml of 0·0004 M NaCl are mixed? (Solubility product of AgCl $= 1 \cdot 7 \times 10^{-10}$.)

(c) Define conductance. How is electrolytic conductance different from metallic conductance? 6,4,4

8. (a) Write short notes on any *three*:

(i) Scintillation counter

(ii) Miller and Urey's experiments

(iii) Density gradient centrifugation

(iv) Phase contrast microscopy.

(b) Give an example of intrinsic flour and extrinsic flour. 12,2