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Roll No. | | | | | | | | | | |

S. No. of Question Paper : **8656**

Unique Paper Code : **249103** **C**

Name of the Paper : **BCHT-102 : Biophysics**

Name of the Course : **B.Sc. (Hons.) Bio-Chemistry Part I**

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. Question No. **1** is compulsory.

Use of scientific calculator/log tables may be allowed.

1. (A) Indicate whether True *or* False with justification : (9×2=18)

(*i*) Fluorescent molecules are generally flexible molecules.

(*ii*) Gamma rays are used for crystallographic diffraction studies.

(*iii*) A tungsten halogen lamp is used in UV-visible spectrophotometry.

(*iv*) The triplet state is lower in energy than singlet state.

(*v*) Increasing magnification improves resolution.

(*vi*) Phase contrast microscopy can be used to study living cells.

(*vii*) Osmosis and diffusion involve the same principles.

(*viii*) ^{1}H NMR spectra of proteins show no change on denaturation.

(*ix*) Treatment of DNA with DNAse results in an initial increase in viscosity.

P.T.O.

(B) Give an example each of the following : (½×2=1)

(*i*) Extrinsic fluor.

(*ii*) Paramagnetic element.

2. Differentiate between the following using relevant example : (7×2=14)

(*i*) Scanning and transmission electron microscopy.

(*ii*) Fluorescence and phosphorescence.

(*iii*) DPM and CPM in radioactivity measurements.

(*iv*) CD and ORD spectorscopy.

(*v*) Differential and gradient centrifugation.

(*vi*) Hyperchromic and hypochromic effects in DNA.

(*vii*) Extrinsic and intrinsic fluors.

3. (A) Schematically represent a spectrophotometer and label the various parts. (5,5,4)

(B) The molar extinction coefficient of benzene is 100 M^{-1} cm^{-1} at 260 nm.

(*i*) What concentration would give an absorbance of 1.0 in a 1 cm cuvette at 260 nm.

(*ii*) What concentration would allow 1% of 260 nm light to be transmitted through a 1 cm cell ? Assume that Lambert Beer's law is obeyed.

(C) Explain why double beam spectrophotometers are more useful than single beam ones.

4. (A) Draw a simple geometric construction to deduce Bragg's law of diffraction. (5,4,5)

(B) What is the purpose of growing protein crystals in the presence of heavy atoms like Cu, Co, for X-ray diffraction strudies ?

(C) How are neutron diffraction studies complementary to X-ray diffraction studies ?

5. Explain the following statements/observations : (7×2=14)

(*i*) Water forms nearly spherical droplets on the surface of a freshly waxed car but no beads are formed on a clean windshield.

(*ii*) In infrared spectroscopy aqueous solutions of samples cannot be used.

(*iii*) Fluorescence emission always has a longer wavelength than incident light.

(*iv*) Dark field microscopy is helpful in examining cells that are difficult to see in bright light.

(*v*) Most polarimeters have two Nicol prisms.

(*vi*) Use of A_{280} for proteins is subject to interference by other biomolecules.

(*vii*) Reverse osmosis is commoly used in the purification of drinking water.

6. Write briefly the principles involved in the following techniques : (2,3,3,3,3)

(*i*) ^1H NMR

(*ii*) β-scintillation counters

(*iii*) Raman spectroscopy

(*iv*) Flow cytometry

(*v*) Confocal microscopy.

7. (A) Indicate which technique would be useful to study the following and why ?

(*i*) Cu^{2+} binding to cytochrome oxidase (a protein).

(*ii*) Brain maps.

(*iii*) Bond structure of various groups in a molecule.

(*iv*) Location of Trp in a protein (internal or external).

(*v*) Chirality of a molecule.

(B) Define the following terms :

(*i*) Diffusion coefficient

(*ii*) Sedimentation coefficient

(*iii*) Molar specific rotation

(*iv*) Quantum yield

(*v*) Specific viscosity.

(C) Describe an experiment to determine the surface tension of a liquid. (5,5,4)

8. Write short notes on : (3,3,4,4)

(*i*) Osmosis in biological systems

(*ii*) Prebiotic earth

(*iii*) Radiation hazards

(*iv*) Carbon dating.