Roll Number:

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

B.Tech-II Semester (BT/BI)

COURSE CODE (CREDITS): 25B11PH212 (04) MAX MARKS: 25

COURSE NAME: Biophysical Techniques

COURSE INSTRUCTOR: Dr. Ragini Raj Singh MAX. TIME: 1 Hour 30 Min

*Note: (a) All questions are compulsory.*

*(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

*(c) Use of calculator is allowed*



| Q.No | Question | CO | Marks |
|---|---|---|---|
| Q1 | **a.** What can be studied using Scanning Electron Microscopy (SEM). Why do we need vacuum in SEM. Discuss the influence of accelerating voltage, working distance, and surface topography on image resolution and contrast. | 1 | 2 |
| | **b.** When a magnetic field strength of 0.3 Tesla is applied on an electromagnetic lens perpendicular to the electron beam direction with an applied voltage of 30 kV, what would be the radius of the electron beam? (mass of electron=$9.109 \times 10^{-31}$ Kg, charge of electron= $1.602 \times 10^{-19}$ Coulomb) | | 2 |
| Q2 | **a.** Explain:<br>1. Absorption and emission pathways with diagram<br>2. Why routine UV spectra collected from 200 nm. | 2 | 2 |
| | **b.** (i)A solution shows absorbance of 0.75 at 280 nm in a 1 cm cuvette. The molar absorptivity is $1.5 \times 10^4$ L $mol^{-1}cm^{-1}$. Find the concentration. | | 1 |
| | (ii) If absorbance of a solution is 0.3 in a 0.5 cm cuvette, what will be the absorbance in a 1.5 cm cuvette (same concentration)? | | 1 |
| Q3 | **a.** Discuss the substituent effects in UV-visible spectroscopy with diagram. Also discuss the case of auxochrome? | 2 | 2 |
| | **b.** A mixture contains compounds X and Y. Path length = 1 cm. Find concentrations of X and Y.<br>At 250 nm: A=0.8<br>At 300 nm: A=0.6<br>**Compound** **ε250** **ε300**<br>X 1000 200<br>Y 400 800 | | 2 |

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|---|---|---|---|
| Q4 | **a.** What is the primary use of CD spectroscopy. What kind of spectra do we get in case of Alpha helix, beta sheet and random coil? Compare ORD, CD and UV Spectroscopy with graphs.<br><br>**b.** Observed ellipticity at 208 nm is –20 mdeg. Path length = 0.1 cm Mean residue molar ellipticity for α-helix at this wavelength is: $[\theta]=-33{,}000$ deg cm$^2$ dmol$^{-1}$. Find the protein concentration. | 3 | 3<br><br>2 |
| Q5 | **a.** Discuss the instrumentation of circular dichroism spectrophotometer with detailed explanation of its parts and their functions.<br><br>**b.** Observed ellipticity = –15 mdeg; Concentration = $2 \times 10^{-4}$ mol/L Molar ellipticity: $[\theta]=-25000$. Find path length. | 3 | 2.5<br><br>2 |
| Q6 | **a.** Explain with one detailed example the reflection of environment on protein folding; Also discuss one other use of CD spectroscopy.<br><br>**b.** Observed molar ellipticity at 222 nm $[\theta]_{obs}=-20000$. Pure α-helix value $[\theta]_{helix}=-33000$ . Find α-helix percentage. | 4 | 2.5<br><br>1 |