

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT  
TEST -1 EXAMINATIONS-2022  
M.Sc-III Semester (Biotechnology)

Course Code (Credits): 20MS1BT312(2)

Max. Marks: 15

Course Name: Emerging Technology

Course Instructors: Dr. Abhishek

Max. Time: 1 Hour

*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

- Q.1 For a  $3.7 \times 10^{-3}$  M solution of naphthalene in hexane the peak of the first absorption band is at 301 nm. The intensity of light at this wavelength is reduced to 0.1 of its original value (1) on passing through 1 cm of this solution. Obtain the molar absorption coefficient. [3]
- Q.2 Number of emitted photon and number of absorbed photon by a molecule are  $2.24 \times 10^{18}$  and  $2.24 \times 10^{22}$  respectively. If the radiative decay rate constant of the molecules are  $2 \times 10^2$   $S^{-1}$ , what would be the value of non-radiative decay rate constant. [3]
- Q3. When strong light of  $19636 \text{ cm}^{-1}$  is scattered by a material consisting of molecules containing carbonyl group (R-CO-R), its spectrum exhibits two lines one at  $17786 \text{ cm}^{-1}$ . What would be the frequency of other other line (Antistokes line). [2]
- Q3. If the spin state is define as  $(2S+1)$  where S represent the total electronic spin for the system, try to come up with the name for the ground and possible excited state for the system that are based on their spin state. Also draw an energy level diagram for a typical organic molecule in polar environment with sufficient viscosity. (Solvent relaxation time of the molecule is equal or greater than the life time of molecule  $\tau_{SR} > \tau$ ). [4]
- Q4. A student tried to observe the slide of binary fission in Amobea under microscopea using illumination source of 800 nm. After focusing on the slide, he was not able to get a clear view even after adjusting the diapharm. After suggestion from supervisor, student change the source of illumination and start working with 400 nm illumination sources. This time student observed the perfectly focused image explain why? And also write down the resolving powder of microscope in above two cases. If the magnifying power of the eyepiece and objective lenses used in the above microscope are 2X and 15X, then what would be the magnifying power of microscope? [3]