JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2023
M.Sc-III Semester (BT)

Course Code (Credits): 20MS1BT312 (2)   Max. Marks: 25
Course Name: Emerging Technology
Course Instructors: Dr. Abhishek   Max. Time: 1 Hour 30 Minutes

Note: (a)All questions are compulsory.
(b)Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

1. Fluorescence microscopy provides a simple method to quantify cells and study their morphology on surfaces. For similar studies a scholar used acridine orange (AO) which is a selective cationic stain for nucleic acids. It interacts with DNA and RNA by *intercalation* and electrostatic attraction, respectively. The absorption band of AO lies between 440 and 480 nm (blue light) and the emission occurs between 520 nm (green fluorescence for DNA) and 650 nm (orange fluorescence for RNA). What would be the stoke shift, scholar will observed in angstrom, also draw a ray diagram for DNA and RNA using above information's. [5]

2. Answer the following question with detail explanations:
    a. In a spectrophotometric cell of 2.0 cm pathlength, the solution of substance shows the absorbance value of 1.0. if the molar absorptivity of the compound is 2×10^4 L Mol^{-1} cm^{-1}. what would be the concentration of the substance in the solution. [2.5]
    b. A solution of chemical "A" having its 0.14 mol/L concentration has an absorbance of 0.42. Another solution of "A" under the same condition has an absorbance of 0.36. What is the concentration of "A" in this solution? [2.5]
    c. How does the percent transmittance of a solution vary with (a) increasing concentration and (b) increasing path length? [2]

3. What do you mean by excited state lifetime of a fluorophore? Differentiate between internal and external fluorescence quenching with example. Illustrate the various processes occur in excited and ground state (Detail explanation with neat and clean ray diagram) [5]

4. Photoluminescence (PL) is the process in which a photogenerated excited state relaxes *via* emission of a photon. All PL is classified as either fluorescence or phosphorescence based on whether emission occurs by radiative decay from an excited state with spin multiplicity that is the same as or higher than the ground state, respectively. Which type of emission you will observe when photon transit from singlet excited and triplet excited state to ground state respectively? Also calculate the spin multiplicity of singlet excited and triplet excited state. How do spin states differ in ground singlet state versus excite singlet state and triplet excited state? [6]

5. The quantum yield for the decomposition of HI is 0.2. In an experiment 0.01 moles are decomposed. Calculate the numbers of photons absorbed in the above decomposition reaction [2]