

Jaypee University Of Information Technology, Wanknaghat

Test -2 Examinations-2022

M.Sc- III Semester (Biotechnology)

Course Code (Credits): 20MS1BT312 (2)

Max. Marks: 25

Course Name: Emerging Technology

Course Instructors: Dr. Abhishek

Max. Time: 1 Hour And 30 Minutes

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

1. The first electronic absorption band maximum of a polar and relatively rigid aromatic molecule appears at 310 nm but its fluorescence maximum in acetonitrile solution appears with a large Stokes shift at 450 nm. What are the most likely reason for the Stokes shift, justify the your answer. Also calculate the spin multiplicity of singlet excited and triplet excited state.[4]
2. A sample of a fluorescent molecule (concentration of 1.0×10^{-5} M) with no quenching agent has an emission intensity resulting in a 4.6 reading on the detector. An unknown amount of quenching agent is added to the solution and the fluorescence intensity is found to be 2.5 . Use the value of $K_q = 15.0$ liter/mole to determine the concentration of quenching agent. [3]
3. You have been given a report on luminescence measurements for an important molecule in your biochemistry lab. The report describes the fluorescence of the molecule with a peak at 675 nm, absorption peak at 455 nm, and phosphorescence peak at 560 nm. What is wrong with this information? Explain in detail [2.5]
4. You are working on a quenching experiment and have found that the ratio of fluorescence without quenching to fluorescence with quenching increases linearly with the concentration of the quencher. You find that the ratio of lifetime without quenching to lifetime with quenching does not change as you increase the quenching concentration. What type of quenching is occurring? Justify your answer [2.5]
5. The F-actin filament is composed by G-actin monomers. By attaching either a donor (D) or an acceptor (A) chromophore to the G-actin monomer and measuring the energy transfer efficiency to gauge the average distance between G-actin monomers in a F-actin filament (assuming that the monomers are well arranged in DADADADA....sequence), and one finds that the average energy transfer efficiencies is 50%. If the R_0 is 4.5 nm, what is the average distance between monomers in a filament? [5]
6. FRAP offer a chance to study the mobility of macromolecular drug in both pharmaceutical matrices as well as in tissue and cells, explain how? [3]

7. The confocal microscope incorporates the ideas of point-by-point illumination of the specimen and rejection of out-of-focus light but one drawback with imaging a point by point is that there are fewer emitted photons to collect at any given instant and form a noisy image. How will you overcome the above limitation to get the perfect image and also write down the working principle of confocal microscope and draw a ray diagram or basic set up of confocal microscope. [5]

T2 Examinations October 2022