JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2025
MSc-III Semester (BT)

Course Code (Credits): 20MS1BT312 (2) Max. Marks: 25
Course Name: Emerging Technology
Course Instructors: Dr. Abhishek Chaudhary Max. Time: 1.5 Hour

Note: (a)All questions are compulsory. Calculator use is permitted
(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

Q.No	Question	Marks
Q1	The emission intensity of chromophore in presence and absence of quenching agent is 5 and 15 respectively. Calculate the concentration of quenching agent if bimolecular quenching rate constant for this reaction is 8 and life time of molecule in excited state is 2ns	4
Q2	You are performing a Fluorescence Resonance Energy Transfer process. For the same, you Join two molecules where the emission spectrum of Donor (D) overlaps very well with the absorption spectrum of acceptor (A). The efficiency (FRET efficiency) of the process is to be measure 50%. If R0 = 60nm, calculate the actual distance between D and A?	4
Q3	Fluorescence is a fundamental process in molecular spectroscopy because it provides highly sensitive and selective measurements of molecular structure, dynamics, and interactions by analyzing the light emitted after a molecule absorbs excitation photons. If the fluorescence of a fluorophore molecule is quenched by 10% in the presence of 10 mM of a quencher a. Calculate stern volmer constant Ksv in M-1 b. Also calculate bimolecular constant kq if life time of molecule is 5ns	4
Q4	Fluorescence recovery after photobleaching (FRET) is technique by which fluorescent label on particular protein molecules in an area of cell are permanently bleached with a laser beam. During the subsequent recovery phase, non-bleached fluorescent protein moved into the photo bleached area. What are the two reasons for why there might be no recovery? Explain in detail.	3
Q5	Fluorescence Recovery After Photobleaching (FRAP) can be used to assess a particular protein's mobility in a cellular membrane. You are studying the behaviour of a protein in plasma membrane to understand the transport mechanism of drug molecule across the membrane. Sketch the fluorescence recovery curve for this membrane protein with detail explanation of FRAP mechanism	2+3
Q6	Take into consideration the ground and excited state electron spin possibilities. In your opinion, do the energies of these spin states differ? Which do you anticipate having less energy? If the spin state is defined as (2S + 1) where S represents the total electronic spin for the system, calculate the spin multiplicity of ground, singlet and triplet excited state. Also explain why is phosphorescence emission weak in most substances?	5