

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH, KOLKATA

SEMESTER VII, 2018

ID-4102

Mid-Semester Examination

Maximum Marks – 20

Time: 1 hr.

Date: 22.09.2018

Answer any four questions. Each question carries equal mark.

1. Draw and explain Jablonski diagram. Explain the following: (i) Excited triplet state (T_1) is lower in energy than excited singlet state (S_1). (ii) Excited state lifetime in T_1 is higher than in S_1 . Estimate the magnitude of Stokes shift (in cm^{-1} unit) when the absorption and emission maxima of a molecule in a particular solvent are 400 nm and 500 nm respectively. (2+1+1+1)
2. Explain the following terms mathematically (i) Fluorescence quantum yield, (ii) Phosphorescence quantum yield. Why is the latter generally lower in magnitude than the former? (2+2+1)
3. Explain excimer formation using energy level diagram/potential energy diagram. Why is the excimer not a ground state / excited state dimer? (3+1+1)
4. Explain the principle of operation of TAC and CFD in connection with TCSPC measurement. (2+3)
5. What are the criteria for the observation of Red Edge Effect (REE)? Explain the effect of temperature and solvation on REE? (1+2+2)
6. (a) Explain mathematically and graphically how will you calculate the fractional fluorophore accessibility parameter in connection with fluorescence quenching. What are the units of ground state and excited state quenching constants? Explain τ_0/τ vs. $[Q]$ plot in case of ground state quenching. (2+1+1+1)

(All terms have their usual meaning).