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205BS002

Ph.D./M.S. (Engg.) by Research Degree Examination, Aug./Sep. 2023
Fluorescence Spectroscopy and measurement Technologies

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. What is fluorescence? Which material has fluorescence, characteristics and explain with principle Jablonski diagram. **(08 Marks)**

b. What is fluorescence life time? How do you determine the life time of fluorescence. **(07 Marks)**

c. Explain fluorescence resonance energy transfer and mention the factors that affect. **(05 Marks)**

OR

2 a. What is fluorescence anisotropy? How is fluorescence anisotropy measured and what is the significance. **(08 Marks)**

b. Explain stokes shift, how to calculate stokes shift of a molecule. **(07 Marks)**

c. What is time-resolved fluorescence spectroscopy? List the advantage of time – resolved fluorescence spectroscopy. **(05 Marks)**

Module-2

3 a. What is fluorescence quenching? Why quenching is done in fluorescence, mention different types of fluorescence quenching. **(08 Marks)**

b. Derive stern – volmer equation in fluorescence quenching. **(07 Marks)**

c. Explain the theory of static quenching. **(05 Marks)**

OR

4 a. Describe the theory of colloidal quenching. **(08 Marks)**

b. Distinguish between static and dynamic quenching with examples. **(07 Marks)**

c. What is quenching efficiency? How do you calculate quenching efficiency? **(05 Marks)**

Module-3

5 a. What is the theory of energy transfer? Explain the three theories of energy transfer. **(08 Marks)**

b. Explain the sensing mechanism and detection of low concentration acetone using Chitosan – based sensors. **(07 Marks)**

c. Distinguish between analog sensors and digital sensors. **(05 Marks)**

OR

6 a. What is sensor? Explain touch sensor circuit. **(08 Marks)**

b. Explain the difference between forster and dexter energy transfer. **(07 Marks)**

c. Describe Glucose sensing mechanism by energy transfer. **(05 Marks)**

Module-4

7 a. What is Lippert equation? How to calculate excited dipole moment using Lippert equation. **(08 Marks)**

b. What is intra molecular proton transfer? Explain excited state interamolecular proton transfer from principal of photophysics to the development of new chromophores. **(07 Marks)**

c. What is viscosity? Mention the factors viscosity of liquid depends. **(05 Marks)**

OR

8 a. Derive Lippert – Mataga equation. **(08 Marks)**

b. What is probe-probe interaction? Explain the role of probe-probe interaction on the hybridization of double stranded DNA targets on to DNA – modified magnetic micro particles. **(07 Marks)**

c. What is Lippert-Mataga plot? Show that Stokes shift as a function of solvent orientation polarizability. **(05 Marks)**

Module-5

9 a. What is decay time? How do you calculate growth and decay rate? **(08 Marks)**

b. What is time-correlated single photon counting (TCSPC)? How is life time fluorescence measured? **(07 Marks)**

c. List the difference between Flash Lamp and Arc Lamp. **(05 Marks)**

OR

10 a. What is Light-Emitting Diode (LED)? Describe the principle and working of LED. **(08 Marks)**

b. What is semiconductor diode Laser? Describe principle, construction and working of semiconductor diode laser. **(07 Marks)**

c. Explain the principle and data analysis of time-correlated single photon counting (TCSPC). **(05 Marks)**

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