2024

M.Sc.

3rd Semester Examination

CHEMISTRY

PAPER – CEM-301

Full Marks:50

Time: 2 Hours

(CEM 301-Advanced Spectroscopy-I)

1. Answer any ***four*** questions 2×4 = 8

(a) Identify the nos of EPR lines for NH_2 radical.
(b) Explain the term 'chelation enhanced fluorescence (CHEF)'.
(c) How the photo-sensing related to the life time of fluorophore?
(d) What standard is used to calibrate the ESR spectra? What type of frequencies is used in EPR?
(e)State photosensitization reaction with example.
(f) How does the solvent influences the emission of pyrene?

2. Answer any ***four*** questions 4×4 = 16

(a) Draw and explain the possible transitions for fluorescence and phosphorescence in Jablonski diagram. 4

(b) (i) What do you mean by 'Kramer's degeneracy? Write with diagram. (ii) Calculate the EPR lines with intensity ratio for $[Cu(H_2O)_4(NH_3)_2]^{2+}$. (2+2)

(c)What is Excimer? What is the difference of it with Exciplex? (2+2)

(d) How do the solvents affect the fluorescence intensity? What do you meant by the fluorophor? (3+1)

(e) (i) Explain the "Drago's rule" with example. (ii)Explain Pascalian triangle on NH_3 radical. (2+2)

(f) (i)How many lines are observed in the ESR spectrum of napthathyl radical? Mention the intensity ratios of the ESR signals observed in this radical.

(ii)How do you differentiate EPR from NMR spectra though bothare resonance spectra? (2+2)

3. Answer any ***two*** questions 2×8 = 16

(a) (i) What method is used to record the EPR spectra? (ii) Find out the EPR lines with their relative intensity ratio for the following cases (A) 1,3-butadiene (B) one e^- spin interacts with two equivalent N nuclei (I=1) (C) CH_2OH radical. (2+2+2+2)

(b) (i) Justify the term 'Resonance' in EPR. (ii) How the energy state is splitted in presence of applied magnetic field in EPR. Explain with equation.(iii) Write down the uses of ESR spectra. (2+4+2)

(c)(i)How are thepH effects on probe's fluorescence? (ii) Write the possible photo-deactivation process. (iii)What do you mean by Delayed fluorescence? Draw the Jablonski diagram with explanation. (2+3+3)

(d)(i) What do you meant by fluorescence quenching? (ii) Explain the Benesi-Hildebrand plot to determine the binding constant. (iii) Calculate the quantum yield from the interpretation of lifetime experiment. (2+2+ 4)

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Internal Assessment-10