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PG CBCS

M.Sc. Semester-III Examination, 2020

CHEMISTRY

PAPER: CEM 301

(Common paper)

Full Marks: 40 **Time: 2 Hours**

Answer any four questions from following: **10X4=40**

1. (a)What is LASER?

   (b) "Water and alcohol are not suitable solvents for ESR studies"-Explain.

   (c) The benzene radical anion has g=2.0025. At which field should you search resonance in a spectrometer operating at 9.302GHz.

   (d) How many ESR lines can be expected for $^{33}S^{19}F_6$ radical anion and radical cation. I=3/2 for ^{33}S and I= ½ for ^{19}F. 2.5x4

2. (a) $[Mo(CN)_8]^{3-}$ complex shows single line in ESR spectrum but when C- atom is replaced by ^{13}C isotope we get nine lines. Explain.

   (b) How is the fluorescence of pyrene influenced by polarity of the medium?

   (c) Which of the following exhibit excimer emission?

   Pyrene, Naphthalene, Anthracene, 9-methyl anthracene and 9,10-diphenyl anthracene.

   (d) How would you know that a fluorescence quenching process in dynamic and static in nature? 2.5x4

3. (a) Show all the possible transitions predict the intensity distribution in the hyperfine lines of the ESR spectrum of radical $\cdot CD_3$ (I for D= 1).

   (b) The ESR Spectrum of $[(NH_3)_5Co\text{-}O_2\text{-}Co(NH_3)_5]^{5+}$ shows fifteen lines. Derive structural information for this complex ion from this data. 5+5

4. (a) Using energy level diagram explain the ESR spectrum of TEMPOL free radical.
   (b) Explain, Why Mn(II) is EPR active but Cr(III) is EPR inactive.
   (c) Show hyperfine splitting pattern of $\cdot H$.

5. (a) Write down the reaction between excited state life time and the rate constant involving IC, ISC.
   (b) Schematically show the potential energy curves of iodine molecule in its ground and higher energy state. 5+5

P.T.O.

6. (a) Discuss the characteristics of LASER .
   (b)What is population inversion? Write a note on Ruby LASER. 5+5
7. Using energy level diagram predict all possible transition in the hyperfine line of $\cdot CH_3$ radical and draw the spectrum. 10
8. a) Explain the Jablonki diagram and obtain the stern Valmer equation.
   b) Explain the ESR spectrum of $\cdot CH_2OH$ radical. Give /a(CH_2)/=1.738mT and /a(OH)/=0.115mT. 5+5
9. Write a note on photo electric. Describe the principle of XPS Spectroscopy. 10
10. Write note on photo electric effect. Describe its Principle. Write a note on NDYAG –LASER. 10

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