M.Sc. 3rd Semester CBCS Scheme
Examination, December-2022
CHEMISTRY
Paper- 17CHE23GA1
Inorganic Special-I

Time allowed : 3 hours] *[Maximum marks : 80*

*Note: Attempt five questions in all, selecting at least one question from each section. **Question No. 1 is compulsory.** All questions carry equal marks.*

1. (a) How many no. of vibrational degree of freedom exist in the non-linear complex.

   (b) What is Resonance Raman Spectroscopy?

   (c) Define zero field splitting.

   (d) Which of $FeSO_4$, FeC_2O_4, $K_4Fe(CN)_6$ and $Na_2Fe(CN)_5NO$ will have lowest Isomer shift?

   (e) What are the conditions for a nucleus to be Mossbauer active.

   (f) Define Recoil energy.

   (g) What is the principle of magnetic resonance imaging?

   (h) Define contact shift.

Section-A

2. (a) Discuss the normal modes of vibrations of trigonal bipyramid AB_5 type molecules. 8

   (b) How will you differentiate between nitro and nitrito complexes by vibrational spectra? 8

3. (a) Discuss the spectrum of fluoride complex of sperm whole myoglobin. 10

   (b) What are the advantages of RR spectroscopy over simple one? Explain the difference between normal and Resonance Raman Spectrum by suitable example. 6

Section-B

4. Explain the hyperfine splitting in ESR spectra of

   (a) Iso-Propyl radical 4×4=16

   (b) H_2 radical

   (c) CH_3 radical

   (d) NH_3 radical

5. (a) What do you mean by Kramer's degeneracy? How this help in predicting the number of EPR peaks in manganese complexes? 10

   (b) Discuss the use of ESR for study of electron exchange reaction. 6

Section-C

6. (a) What are finger print application and how the mass spectrum is interpreted? 12

   (b) How the molecular weight of a substance is determined by mass spectrometry? 4

7. (a) What do you mean by quadrupole splitting in MB spectroscopy? Discuss with example. 8

   (b) Discuss the applications of Mossbauer spectroscopy for elucidation of the structures of Fe(II) compounds. 8

Section-D

8. (a) Discuss the 19F NMR spectrum of fluoroacetone, dimethyl phosphorus trifluoride and 31p spectrum of HPF_2. 12

   (b) Write short note on Nuclear Quadrupole moment. 4

9. (a) Describe the various energy levels of a given Quadrupolar nucleus in Non-symmetrical molecules. 8

   (b) Write short notes on: 4×2=8

   (i) Wide line NMR

   (ii) Lanthanide shift reagents