## 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.

- (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<sub>4</sub>, FeC<sub>2</sub>O<sub>4</sub>, K<sub>4</sub>Fe(CN)<sub>6</sub> and Na<sub>2</sub>Fe(CN)<sub>5</sub>NO 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.

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### Section-A

- (a) Discuss the normal modes of vibrations of trigonal bipyramid AB<sub>5</sub> type molecules.
  - (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.
  - (b) What are the advantages of RR spectroscopy over simple one? Explain the difference between normal and Resonance Raman Spectrum by suitable example.

#### Section-B

- 4. Explain the hyperfine splitting in ESR spectra of
  - (a) Iso-Propyl radical

 $4 \times 4 = 16$ 

- (b) H, radical
- (c) CH<sub>3</sub> radical
- (d) NH<sub>3</sub> radical
- 5. (a) What do you mean by Kramer's degeneracy? How this help in predicting the number of EPR peaks in manganese complexes?
  - (b) Discuss the use of ESR for study of electron exchange reaction.

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# 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. 3
  - (b) Discuss the applications of Mossbauer spectroscopy for elucidation of the structures of Fe(II) compounds.
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### Section-D

- (a) Discuss the 19F NMR spectrum of fluoroacetone, dimethyl phosphorus trifluoride and 31p spectrum of HPF<sub>2</sub>.
  - (b) Write short note on Nuclear Quadrupole moment.
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- (a) Describe the various energy levels of a given Quadrupolar nucleus in Non-symmetrical molecules.
  - (b) Write short notes on:  $4 \times 2 = 8$ 
    - (i) Wide line NMR
    - (ii) Lanthanide shift reagents

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