

M.Sc. (Chemistry) (NEP Pattern) Semester-II
02MSCCH01 - Paper-VI : Inorganic Chemistry-II

P. Pages : 2

Time : Three Hours



GUG/W/24/15350

Max. Marks : 80

- Notes : 1. Attempt all questions.
2. All questions carry equal marks.

1. a) Discuss the Orgel energy level diagram for d^2 and d^8 octahedral complexes and give its characteristics. 8
- b) Explain the followings. 8
- i) Abnormal magnetic properties of octahedral complexes.
- ii) High spin-low spin crossover.
- OR**
- c) Describe Tanabe Sugano diagram of octahedral complexes with d^8 configuration. 4
- d) Explain spin-orbit (L-S) coupling scheme with suitable example. 4
- e) Explain how the magnetic and spectral data can be used for determination of structure of tetrahedral-cobalt (II) complexes. 4
- f) Explain the charge transfer spectra. 4
2. a) What is trans effect? Discuss the π -bonding and polarization theories of trans effect. 8
- b) Explain the followings. 8
- i) Complementary and non-complementary e-transfer reactions.
- ii) Marcus-Hush theory for cross reactions.
- OR**
- c) Discuss the mechanism of substitution reaction in Pt (II) square planar complexes. 4
- d) Discuss the bridge activated complex mechanism for electron transfer reaction. 4
- e) Describe the outer sphere electron transfer reaction with suitable example. 4
- f) Explain the effect of following factors in substitution reactions in square planar complexes. 4
- i) Solvent effect. ii) Effect of nucleophile
3. a) What are metal carbonyl clusters? Explain in details. 8
- b) i) Explain vibrational spectra of metal carbonyls. 8
- ii) Calculate EAN of metal and state whether EAN is obeyed or not in the following.
- 1) $Ni(CO)_4$ 2) $V(CO)_6$
- 3) $Fe_2(CO)_9$ 4) $Co_2(CO)_8$

OR

- c) Explain the classification of metal carbonyls with examples. 4
- d) Give an account of four important chemical reactions of metal carbonyls. 4
- e) Draw the structure of following polynuclear metal carbonyls. 4
- i) $\text{Ir}_4(\text{CO})_{12}$ ii) $\text{Os}_4(\text{CO})_{16}$
- iii) $\text{Co}_4(\text{CO})_{12}$ iv) $\text{Os}_4(\text{CO})_{15}$
- f) Explain Synergic bonding in metal carbonyls. 4
4. a) Discuss the structure and bonding in metal dinitrogen and dioxygen complex. 8
- b) i) What are metal nitrosyls? Give any three important reactions of transition metal complexes. 8
- ii) Explain x-ray diffraction studies of transition metal nitrosyls.

OR

- c) Explain Wilkinson's catalyst in detail. 4
- d) Discuss the nitrosylating agent for the synthesis of metal nitrosyls. 4
- e) Explain how vibrational spectra is use in the study of structure and bonding in metal nitrosyls. 4
- f) Write a note on brown ring test. 4
5. a) Write a note on spin selection rule. 2
- b) Write a short note on quenching of orbital angular momentum. 2
- c) Give any two synthetic application of trans effect. 2
- d) Explain Tunneling effect in short. 2
- e) How many metal-metal bonds are included to obey the EAN rule in the following metal carbonyls. 2
- i) $\text{Mn}_2(\text{CO})_{10}$ ii) $\text{Os}_4(\text{CO})_{14}$
- f) Explain π -acid ligands with suitable examples. 2
- g) Write a note on Vaska's compound. 2
- h) How are nitrosyl complexes useful in differentiating sulphide, sulphite and sulphate? 2
