

- (c) Explain the following :
- (i) Mechanism involved in the reaction of metal carbonyls with PMe_3 in the presence of NMe_3 and *m*-CPBA.
- (ii) Product formed when $[\text{Mn}(\text{CO})_5(\eta^1\text{-C}_3\text{H}_5)]$ irradiated with sunlight. **4**

Unit IV

7. (a) What are Carboranes ? How are their structures related with isoelectronic boranes ? Give two methods for the preparations of nido-carboranes. **6**
- (b) What is isolobal analogy ? How can this concept be utilized for the synthesis of metallocarboranes. **4**
- (c) Draw and explain the structure of $\text{Ta}_6\text{Cl}_{12}^{2+}$. **2**
8. (a) What are high nuclearity carbonyl clusters ? Draw and discuss the structure of $\text{Fe}_3(\text{CO})_{12}$ and $\text{Co}_2(\text{CO})_8$. **4**
- (b) Discuss the structure of $\text{Re}_2\text{Cl}_8^{2-}$ on the basis of valence bond theory. **4**
- (c) Give the methods of preparation of decaborane. Draw the structure of decaborane and also give some chemical properties of it. **4**

Roll No.

Total Pages : 04

LMDE/M-24

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INORGANIC CHEMISTRY-II

Paper : CHEM-201

Time : Three Hours]

[Maximum Marks : 60

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Give the criteria for calculation of the number of micro states in various electronic arrangements. Show which of the following electronic configuration from p^1 to p^6 have minimum and maximum number of microstates. **5**
- (b) Nitrogen has $1s^2 2s^2 2p^3$ configuration. Calculate and write down all the possible electronic arrangements and also assign term symbols to them and also arrange them in the order of increasing energy. **5**
- (c) What is spin orbital coupling ? Explain by citing suitable example. **2**

2. (a) Calculate the various spectroscopic terms arising from d^7 electronic configuration and arrange them in order of their decreasing energy. **6**
- (b) On the basis of Hund's rules, determine the term symbols for Cr^{3+} and Co^{2+} . **3**
- (c) How does 3F term split due to spin orbital coupling? Show the difference in their energy levels in terms of 10 Dq. **3**

Unit II

3. (a) Sketch the Orgel diagram for d^3 and d^7 system in octahedral and tetrahedral fields? List all the transitions. **5**
- (b) Write notes on the following :
- Magnetic exchange coupling
 - Spin cross over
 - Cotton effect. **3,2,2**
4. (a) The charge transfer spectra of $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ shows three absorption bands at 12300, 18500 and 27900 cm^{-1} . Assign these bands and calculate the values of Dq and β parameters for the complex. **6**

- (b) Draw and explain the Tanabe Sugano Diagram of $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$. **4**
- (c) $[\text{FeF}_6]^{3-}$ is colorless. Explain. **2**

Unit III

5. (a) Explain the covalent model of bonding in linear and bent transition metal nitrosyl complexes with help of specific example. **4**
- (b) Explain by giving suitable examples, in the reactions of metal carbonyls with sigma donor ligands, Cis/Facial isomers are the major products formed? **4**
- (c) Draw the well labelled molecular orbital diagram of CO and explain coordination behavior as well as stability of metal carbonyl complexes on the basis of diagram. **4**
6. (a) Compare the coordinating ability of NO and N_2 and also explain the stability of complexes of these ligands on the basis of molecular orbital theory. **4**
- (b) How the cone angle in case of Tertiary phosphine affect the steric and electronic characteristics of phosphine ligands. Explain by giving suitable examples. **4**