

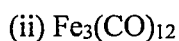
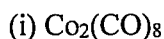
SL No of QP 13598

Unique Paper Code : 2174001203
Name of the Paper : GE - Coordination and Organometallic Chemistry
Name of the Course : B.Sc.(H)
Semester : VII
Duration : 2 hours
Maximum Marks : 60

Attempt any four questions. All questions carry equal marks.

Q.1 (a) With the help of orbital picture, predict the hybridisation and shape of $[\text{CoF}_6]^{3-}$. Is it an outer orbital or inner orbital complex?

(b) Find whether the following obey the EAN rule

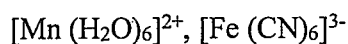


(c) List some disadvantages of VBT

(d) What are ambidentate ligands? Give examples

(5,4,4,2)

Q.2 (a) Explain which of the following is a high spin and which is low spin complex



(b) Calculate the CFSE value of d^5 in octahedral system

(c) Using VBT, derive the structure of $\text{Ni}(\text{CO})_4$

(d) Why does $\text{Mn}(\text{CO})_5$ dimerise but $\text{V}(\text{CO})_6$ doesn't?

(5,4,4,2)

Q.3 (a) Explain why Mn-F bond lengths are all equal in MnF_2 whereas two Cr-F bonds are shorter than remaining four in CrF_2 in octahedral environment.

(b) Compare the bonding of Ziese's salt with metal carbonyls.

(c) Write a short note on (any one):

(i) Synergism

(ii) Factors affecting the magnitude of crystal field splitting

(d) What are homoleptic carbonyls? Which 3d series metal carbonyls obey the EAN rule?

(5,4,4,2)

Q.4 (a) Discuss the structure of $\text{Li}(\text{CH}_3)_4$

(b) With the help of illustrations, represent the splitting of the d-orbitals for the following geometries:

Octahedral, Tetragonal elongation and square planar

(c) Write the structures of $\text{Ru}_3(\text{CO})_{12}$ and $\text{Fe}_3(\text{CO})_{12}$. Why does $\text{Ru}_3(\text{CO})_{12}$ form only terminal carbonyls?

(d) Discuss the physical properties of ferrocene.

(5,4,4,2)

Q.5 (a) Give the IUPAC names of the following complexes:

(i) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)(\text{CN})\text{Cl}]$

(ii) $\text{Na}[\text{Mn}(\text{CO})_5]$

(iii) $\text{K}_4[\text{Fe}(\text{CN})_6]$

(iv) $[(\text{NH}_3)_5\text{Cr}-\text{OH}-\text{Cr}(\text{NH}_3)_5]\text{Cl}_5$

(v) $[\text{Fe}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$

(b) Write chemical formulae for the following compounds:

(i) Potassium hexanitrito -o- cobaltate (III)

(ii) Tetraammine platinum (II) tetrachloridoplatinate (II)

(iii) Aquapentaammine cobalt (III) nitrate

(iv) Sodium hexacyanoferrate (II)

(c) Using the 18- electron rule, indicate the probable number of 'n':

(i) $[\text{V}(\text{NO})(\text{CO})_n]$

(ii) $[\text{Fe}(\text{NO})_2(\text{CO})_n]$

(iii) $[\text{Fe}_2(\text{CO})_n]$

(d) Metal cyanide complexes are not organometallic complexes although they have a Metal-Carbon bond. Give reason.

(5,4,4,2)

Q.6 (a) With the help of MO diagram of carbonyl, explain the bonding in metal carbonyls.

(b) Give the structure of ferrocene in solid and gaseous state.

(c) For $\text{Mn}(\text{H}_2\text{O})^{3+}$, Pairing Energy $P = 336 \text{ KJ mol}^{-1}$ and CFSE is 250 KJ mol^{-1} . Will it exist in HS or LS configuration?

(d) Predict whether $\text{H Mn}(\text{CO})_5$ follows EAN rule

(5,4,4,2)