

- (d) Define organometallic compounds. Is $\text{Ti}(\text{OC}_3\text{H}_7)_4$ an organometallic compound? Give reason.
6. (a) Draw the MO diagram of CO molecule. Explain the HOMO and LUMO in it.
- (b) Write chemical formulae for the following compounds :
- Potassium hexanitrito - k N cobaltate (III)
 - Tetraammine platinum (II) tetrachloridoplatinate (II)
 - Aquapentaammine cobalt (III) nitrate
 - Barium tetrafluoridobromate (III)
- (c) Metal cyanide complexes are not organometallic complexes although they have a Metal-Carbon bond. Give reason.
- (d) Write short notes on (any **one**) :
- Jahn Teller distortion
 - Outer orbital complexes with example
5,4,3,3

[This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **5313** **I**

Unique Paper Code : 2174001203

Name of the Paper : GE : Coordination and Organometallic Compounds

Name of the Course : **All Undergraduate Courses except with Chemistry**

Semester : II/IV/VI

Time : 2 Hours**Maximum Marks : 60****Instructions for Candidates :**

- Write your Roll No. on the top immediately on receipt of this question paper.
 - Attempt any **FOUR** questions.
 - All** questions carry equal marks.
1. (a) For the complex $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, the mean pairing energy $P = 23500 \text{ cm}^{-1}$ and magnitude of $\Delta_0 = 13900 \text{ cm}^{-1}$.
- Calculate CFSE of the complex corresponding to high spin and low spin arrangements.
 - Will it have a regular geometry of distorted octahedral geometry? Justify your answer.

- (iii) Will the complex exist in high or low spin arrangement ?
- (b) What are homoleptic carbonyls ? Which 3d series metal carbonyls obey the EAN rule ?
- (c) Which complex in each of the following pairs will have greater crystal field splitting and why ?
- (i) $[\text{Cr}(\text{CN})_6]^{3-}$ or $[\text{Cr}(\text{NH}_3)_6]^{3+}$
- (ii) $[\text{Fe}(\text{CN})_6]^{3-}$ or $[\text{Ru}(\text{CN})_6]^{3-}$
- (d) Discuss the physical properties of ferrocene.
- 5, 4, 3, 3
2. (a) Give the classification of organometallic compounds in brief.
- (b) Diagrammatically represent the splitting of the d - orbitals for the following geometries. Tetrahedral, Octahedral, Tetragonal elongation and square planar
- (c) Explain synergism in relation to metal carbonyls.
- (d) It is commonly observed that d^3 and d^8 ions prefer octahedral geometry. Comment.
- 5, 4, 3, 3
3. (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) $\text{Fe}[\text{Fe}(\text{CN})_6]$
- (iv) $[(\text{NH}_3)_5\text{Cr}-\text{OH}-\text{Cr}(\text{NH}_3)_5]\text{Cl}_5$
- (v) $[\text{Ru}(\text{NH}_3)_5(\text{N}_2)]\text{Cl}_2$

- (b) Explain the structure of Li methyl.
- (c) What are the limitations of Valence Bond Theory ?
- (d) Why does $\text{Mn}(\text{CO})_5$ dimerise but $\text{V}(\text{CO})_6$ does not ?
- 5, 4, 4, 3

4. (a) What is Ziese's salt ? Explain its bonding and how is its bonding different from metal carbonyls ?
- (b) In the crystal structure of CuF_2 , the Cu^{2+} is six coordinate with four F^- at a distance of 1.93 Å and Two F^- at a distance of 2.27 Å Explain the reason for this observation.
- (c) Give a method to prepare $\text{Na}[\text{Co}(\text{CO})_4]$ from $\text{Co}_2(\text{CO})_8$
- (d) On the basis of VBT, account for the magnetic properties of $[\text{Ni}(\text{NH}_3)_6]^{2+}$ complex.

5, 4, 3, 3

5. (a) Calculate CFSE values for :
- (i) d^5 high spin octahedral system
- (ii) d^7 tetrahedral ion in strong field
- (b) Explain with reference to each Fe, how $\text{Fe}_3(\text{CO})_{12}$ obeys the EAN rule.
- (c) How does inner orbital complex differ from an outer orbital complex ? Explain with an example.