

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7001

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Unique Paper Code : 2172513501

Name of the Paper : DSC: Coordination Chemistry and Organometallics

Name of the Course : B.Sc. (Prog.)

Semester : V

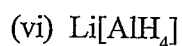
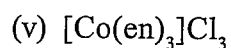
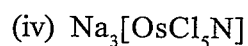
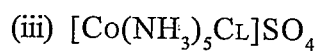
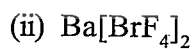
Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **FOUR** questions in all.
3. **All** questions carry equal marks.

1. (a) Name the IUPAC names of any **five** complexes of the following :



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(b) Write the formulae of any **five** complexes of the following :

- (i) sodiumamminebromochloro-k-N-nitroplatinate(II)
- (ii) di- μ -hydroxooctaaquadiiron(II)sulfate
- (iii) pentaamminenitritocobalt(III)chloride
- (iv) potassiumhexacyanoferrate(II)
- (v) pentaammineazidocobalt(III)sulphate
- (vi) potassiumtrioxalatoferrate(III)

(c) Name and explain the type of isomerism exhibited by the following isomers :

- (i) $[\text{Cr}(\text{CN})_6][\text{Cr}(\text{NH}_3)_6]$ and $[\text{Cr}(\text{CN})_2(\text{NH}_3)_4][\text{Cr}(\text{CN})_4(\text{NH}_3)_2]$
- (ii) $[\text{Co}(\text{NH}_3)_5(\text{SCN})]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5(\text{NCS})]\text{Cl}_2$ (5,5,5)

2. (a) Explain the structure of $\text{K}_3[\text{Fe}(\text{Cl})_6]$ on the basis of Valence Bond Theory (VBT).

(b) Discuss the factors affecting Crystal Field Theory (CFT).

(c) Calculate the CFSE values in d^9 octahedral complexes in both weak field and strong field ligand system. (5,5,5)

3. (a) Write a short note on :

- (i) Structure and bonding of methyl lithium
- (ii) Coordination isomerism

- (b) Calculate the number of unpaired electrons and magnetic moment in following ions :
- $[\text{Ag}(\text{NH}_3)_2]^+$ and $[\text{Co}(\text{CN})_4]^{4-}$
- (c) Define organometallic compounds and discuss the types based on nature of Bonding. (5,5,5)
4. (a) What is synergistic interaction? Explain with the help of a suitable example.
- (b) Calculate EAN/18e⁻ of the following complexes :
- (i) $[\text{Fe}_3(\text{CO})_{12}]$
- (ii) $[\text{Mn}(\text{CO})_5]^-$
- (iii) $[\text{Ti}(\text{CO})_6]^{2-}$
- (iv) $[\text{Fe}(\text{CO})_4]^{2-}$
- (v) $[\text{Mn}_2(\text{CO})_{10}]$
- (c) Arrange the following in decreasing order of $\nu\text{-o}$ (stretching frequency) :
- (i) $[\text{Fe}(\text{CO})_4]^{2-}$, $[\text{Ni}(\text{CO})_4]$, $[\text{Co}(\text{CO})_4]^-$
- (ii) $[\text{Ti}(\text{CO})_6]^{2-}$, $[\text{Mn}(\text{CO})_6]^{2+}$, $[\text{V}(\text{CO})_6]^-$, $[\text{Cr}(\text{CO})_6]$ (5,5,5)
5. (a) Explain the structure and bonding of ferrocene.
- (b) What do you mean by hapticity? Explain with examples.
- (c) What are the postulates of Crystal Field Theory (CFT)? (5,5,5)

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6. (a) What do you understand by the π -acidity of a ligand. Explain with the help of Molecular Orbital (MO) diagram of carbon monoxide (CO).
- (b) What is spectrochemical series? Also discuss the nature of weak field and strong field ligands.
- (c) Write a short note of John-Teller distortion. (5,5,5)



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