[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7001 **K**

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 :

(i) $[Ni(NH_3)_2Cl_2]$

(ii) $Ba[BrF_4]_2$

(iii) $[Co(NH_3)_5CL]SO_4$

(iv) $Na_3[OsCl_5N]$

(v) $[Co(en)_3]Cl_3$

(vi) $Li[AlH_4]$

P.T.O.

(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) potassiumtrisoxalatoferrate(III)

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

(i) $[Cr(CN)_6][Cr(NH_3)_6]$ and $[Cr(CN)_2(NH_3)_4][Cr(CN)_4(NH_3)_2]$

(ii) $[Co(NH_3)_5(SCN)]Cl_2$ and $[Co(NH_3)_5(NCS)]Cl_2$ (5,5,5)

2. (a) Explain the structure of $K_3[Fe(Cl)_6]$ on the basis of Valance 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 :

$[Ag(NH_3)_2]^+$ and $[Co(CN)_4]^{4-}$

(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) $[Fe_3(CO)_{12}]$

(ii) $[Mn(CO)_5]^-$

(iii) $[Ti(CO)_6]^{2-}$

(iv) $[Fe(CO)_4]^{2-}$

(v) $[Mn_2(CO)_{10}]$

(c) Arrange the following in decreasing order of υ-o(stretching frequency) :

(i) $[Fe(CO)_4]^{2-}$, $[Ni(CO)_4]$, $[Co(CO)_4]^-$

(ii) $[Ti(CO)_6]^{2-}$, $[Mn(CO)_6]^{2+}$, $[V(CO)_6]^-$, $[Cr(CO)_6]$ (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)