[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7185 **L**

Unique Paper Code : 2173540024

Name of the Paper : DSE: Coordination Chemistry, Reaction Mechanism and Spectral Properties

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

Semester : VIII

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 **four** questions in all.
3. **All** questions carry equal marks.

1. (i) Why square planar complexes formed by d^8 metal ions are stable and diamagnetic in nature? Explain with the help of molecular orbital energy level diagrams. (5)

   (ii) What is spectrochemical series? CH_3^- and H^- ligands are neither π-donor nor π-acceptor but still they are very high in spectrochemical series. Why? (5)

   (iii) What are salient features of ligand field theory? (5)

2. (i) Why CN^- and CO ligands cause the greater crystal field splitting? Explain with a molecular orbital energy level diagram. (5)

   (ii) How does the oxidation state of metal affect the magnitude of crystal field splitting? (5)

   (iii) What are the symmetries corresponding to metal orbitals for sigma bonding in octahedral complexes? Why do bonding molecular orbitals have primarily the character of ligand orbitals?

3. (i) Discuss briefly different types of charge transfer transitions with example. (5)

P.T.O.

(ii) Discuss Spin and Laporte's Selection rules for d-d electronic transitions. (5)

(iii) Discuss Nephelauxetic series. (5)

4. (i) Discuss Tanabe – Sugano diagram of d^2 system in octahedral Ligand Field. (5)

(ii) Discuss Orgel diagram of d^1 system in tetrahedral Ligand Field. (5)

(iii) Discuss why Jahn Teller distortion splits spectral transitions in the complex ion $[Cu(H_2O)_6]^{2+}$. (5)

5. (i) Explain reasons for increase in the rate of reaction for the following pairs : (5)

$[Fe(CN)_6]^{4-} + [*Fe(CN)_6]^{3-}$	7.4×10^2 L mol^{-1} s^{-1}
$[Fe(phen)_3]^{2+} + [*Fe(phen)_3]^{3+}$	3×10^7 L mol^{-1} s^{-1}

Or

$[Ru(NH_3)_6]^{2+} + [*Ru(NH_3)_6]^{3+}$	8×10^2 L mol^{-1} s^{-1}
$[Ru(phen)_3]^{2+} + [*Ru(phen)_3]^{3+}$	10^7 L mol^{-1} s^{-1}

(ii) Discuss any one of the following : (5)

(a) Role of spin orbit coupling.

(b) Life time of Excited state.

(c) Trans effect.

(iii) Discuss rate of Water exchange reactions. (5)

6. (i) Discuss the rate of Associative(A) mechanism and Dissociative(D) mechanisms. (5)

(ii) Discuss the rate of base hydrolysis of $[Co(NH_3)_5Cl]^{2+}$ Complex. (5)

(iii) Discuss energy profile of Interchange (I_d and I_a) reactions. (5)