**A–0408**

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# MSCCH-506

## M.SC. (CHEMISTRY) (MSCCH)

**(Inorganic Chemistry-II)**

Examination, June 2025

Time : 2:00 Hrs. Max. Marks : 70

***Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.***

### Section–A

**Long Answer Type Questions** 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. What is the Orgel diagram ? Give the limitation of the Orgel diagram. Draw and explain Orgel diagram of $d^1$ and $d^9$ electronic configurations both tetrahedral and octahedral field.

2. What is magnetic susceptibility ? Describe the Guoy's method for the determination of magnetic susceptibility of complexes.

3. Discuss the any two of the following :

   (a) Base hydrolysis of octahedral complex.

   (b) Discuss the Cross reaction for the electron transfer reaction with suitable example.

   (c) What are labile and inert complexes ? Explain with the suitable Example.

4. What is Crystal Field splitting ? Explain Crystal Field splitting in octahedral complexes.

5. What is the Nucleophile Substitution reaction ? Classify the nucleophilic substitution reaction. Give the mechanism of the nucleophilic substitution reaction of the octahedral complexes.

## Section–B

**Short Answer Type Questions** 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. What is the Crystal field theory ? Give the limitations of crystal field theory.

2. Why some compounds shows paramagnetic behaviour while some show diamagnetic behaviour. Explain.

3. Write short note on the following :

   (a) Spectrochemical series and its applications.

   (b) Microstates.

   (c) Anation reaction.

4. Explain why :

   (a) Why $[Fe(CN)_6]^{-3}$ more stable than $[Co(CN)_6]^{-4}$ while both complexes have same central metal ions.

   (b) $NiCl_4^{2-}$ is thermodynamically stable but kinetically labile.

5. What is the trans effect ? Discuss the Pi bonding theory of the trans effect.

6. Discuss briefly $SN^1CB$ mechanism for the reaction :

$$[Co(en)_2NH_3C1]^{+2} + OH^- \rightarrow [Co(en)_2NH_3(OH)]^{+2} + Cl^-$$

7. Find the ground state term symbol for the ions, $d^1$, $d^2$, $d^7$, $d^6$ and $d^8$ electronic configuration.

8. Write short notes on :

   (a) Laport selection rule.

   (b) Jahn-Teller distortion in $Cu^{2+}$ complexes.

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