

Unit II

No. of Printed Pages : 06

Roll No.

31116

M. Sc. EXAMINATION, 2025

(Second Semester)

(2020-21 Onwards)

(Re-appear Only)

CHEMISTRY

Inorganic Chemistry-II

4. (a) Discuss the Orgel diagram for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{V}(\text{NH}_3)_6]^{3+}$ metal ions for octahedral complexes. Also assign possible transition in absorbance.
- (b) Give a brief account on the Terms Symbol and Charge Transfer Spectra.
5. (a) Explain the use of Orgel Diagram in interpreting the electronic spectra of complexes.
- (b) State and explain Jahn Teller Theorem. Discuss the consequences of Jahn-Teller Distortion on the electronic spectra of octahedral complex.

Time : 3 Hours]

[Maximum Marks : 80

Before answering the question-paper, candidates must ensure that they have been supplied with correct and complete question-paper. No complaint, in this regard will be entertained after the examination.

Note : There are nine questions in all. Attempt any *Five* questions out of these selecting *one* from each Unit. Question No. **1** is compulsory. Each question carries 16 marks.

1. Answer the following :

- (a) Why do d^8 metal ions form square planer complexes ?
- (b) Write a relation between magnetic susceptibility and magnetic moment.
- (c) Derive the ground state term symbol for d^3 electronic configuration.
- (d) The electronic spectra of $[\text{CoF}_6]^{3-}$ contain two bands at 1150 cm^{-1} and 14500 cm^{-1} . Account for the band.
- (e) How many bands are expected in electronic spectrum of $[\text{V}(\text{H}_2\text{O})_6]^{3+}$?
- (f) Calculate spin magnetic moment of complex $\text{K}_4 [\text{Mn}(\text{CN})_6]$.
- (g) Calculate M – M bond and bonds per metal atom in $[\eta^5 - \text{CpMo}(\text{CO})_2]_2$.
- (h) Write short note on high spin and low spin complexes.

Unit I

- 2. (a) How does M.O. theory ? Explain the formation of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{CN})_6]^{3-}$.
- (b) Write the crystal field splitting of d -orbital of central metal ion in symmetric octahedral, tetrahedral and tetragonal complexes.
- 3. (a) Draw and explain M.O. diagram for octahedral complex $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ showing both σ and π interaction.
- (b) How will you explain the structure of $[\text{Co}(\text{NH}_3)_6]^{3+}$ on the basis of CFT ?

- (b) Explain preparation, bonding, structure and important reactions of transition metal dinitrogen complexes.
9. (a) Give important reactions of transition metal dinitrogen and dioxygen complexes.
- (b) Explain preparation, bonding, structure and important reactions of tertiary phosphine complexes.



Unit III

6. (a) Discuss the Guoy's method for determining the magnetic susceptibility. What are the advantage and disadvantage of this method ?
- (b) Explain the term Wades rule. Draw the structure of para $C_2B_{10}H_{12}$ and $B_{10}H_4$.
7. (a) Discuss the phenomenon of spin state crossover.
- (b) What are Zintl ions ? Explain with examples.

Unit IV

8. (a) Explain preparation, bonding, structure and important reactions of transition metal carbonyl.