D 122469 **(Pages : 2)** **Name.....**

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2025

(CBCSS)

Chemistry

CHE2C06—CO-ORDINATION CHEMISTRY

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer any **eight** *questions.*

Each question carries a weightage of 1.

1. Generally, the stepwise stability constants gradually decrease ; why ?
2. Comment on the thermodynamic aspect of chelate effect.
3. Arrange the following metal complexes in the increasing order their hydration energy :

   $[Mn(H_2O)_6]^{2+}$ $[V(H_2O)_6]^{2+}$, $[Ni(H_2O_6)^{2+}$ $[Ti(H_2O)_6]^{2+}$.

   Substantiate your answer.
4. Draw the crystal field splitting diagram for $[CoCl_4]^{2-}$ and calculate CFSE.
5. Derive the term symbols for Ti^{3+} and Co^{2+}.
6. The complex $[Co(H_2O)_6]^{2+}$ is light pink, whereas $[CoCl_4]^{2-}$ is blue. Explain.
7. Compare the intensities of M – O, M – N and M – Cl stretching vibrations in metal complexes.
8. When the yellow complex $[Ni(en)_2]Br_2$ is dissolved in pyridine, a blue coloured solution is obtained ; Why ?
9. What is cis effect ?
10. What are prompt and delayed photochemical reactions ? Explain with suitable examples.

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any **six** *questions.*

Each question carries a weightage of 2.

11. Describe the spectrophotometric method for determination of stability constant of metal complexes.

12. What is the effect of π-donor and π-acceptor ligands on Δ_0 ? Explain on the basis of ligand field theory.

13. Discuss the principle and experimental setup involved in Gouy method for the determination of magnetic moment values of metal complexes.

14. How ESR spectroscopy is useful in the study of copper (II) complexes ?

15. Explain the theories of *trans* effect.

16. What are prompt and delayed phtochemical reactions ? Explain with suitable examples.

17. Write a note on photolysis of water.

18. Differentiate between thermodynamic stability and kinetic stability of metal complexes.

(6 × 2 = 12 weightage)

Section C

Answer any **two** *questions.*

Each question carries a weightage of 5.

19. Construct the molecular orbital diagram of octahedral nickel (II) complex with σ-bonding only and discuss its salient features.

20. Outline the principle and experimental setup involved in Mössbauer spectroscopy. Discuss the application of this technique in the structural investigation of diamagnetic metal complexes.

21. Briefly discuss the various types of magnetic properties exhibited by solids.

22. Discuss A, D and I mechanisms of substitution reactions of octahedral metal complexes.

(2 × 5 = 10 weightage)