2025

M.Sc.

4ᵗʰSemester Examination

CHEMISTRY

PAPER – CEM-403 (*Advanced Inorganic Chemistry-IV*)

Full Marks: 50

Time: 2 Hours

Group A

Answer any *four* bits: **2×4 = 8**

1. What is substitution reaction?
2. Write down the Fick's law.
3. Write down the differences between Electrolytic cell and Electrochemical cell.
4. How does CV differ from Coulometry analysis?
5. What is the two-term rate law of square planar complex?
6. What factors affect the nucleophilicity of ligands?

Group B

Answer any *four* questions: **4×4 = 16**

7. Prove that $E_{1/2} = E^0 + \dfrac{0.0591}{n} \log[\dfrac{D_{red}}{D_{ox}}]^{1/2}$

8. Draw the potential energy diagram for the self-exchange reaction of $[Co(NH_3)_6]^{2+/3+}$. Point out $\Delta G^{\#}, \Delta G^0$ and λ in the diagram.

9. Write down the advantages and disadvantages of DME?

10. Draw the TGA plot for the decomposition of the calcium-oxalate mono-hydrate along with magnesium-oxalate with proper explanations

11. $[Co(NH_3)_5(OH)]^{2+} + [Cr(bipy)_3]^{2+}\rightarrow$ products. For this above reaction what will be the electron transfer mechanism; outer sphere or inner sphere? Explain.

12. Write a short note on "Outer sphere mechanism"

Group C

Answer any *two* questions: **2×8 = 16**

13. Write down the Illkovic equation with terms associated with it. Explain the Significance of this equation.   (4+4)

14. (i) Write down the application of Cyclic Voltammetry (CV). (ii) Why Ferrocene is used as standard in CV? (iii) Distinguish between reversible and irreversible redox process in Cyclic Voltammetry.
                                                                   (3+2+3)

15. (i) What is cyclic voltammetry? (ii) Draw a cyclic voltammogram and indicate different region in it. (iii) What is Randless-Sevick equation?
    (1+5+2)

16. (i) Substitution reaction of $[Cr(CO)_6]$ are very slow, consistent with low spin d^6 complex but the isoelectronic complex $[V(CO)_5(NO)]$ is very reactive.-Explain. (ii) What do you mean by the term 'Lability' and Inertness'?   (6+2)

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Internal Assessment-10

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