QP Code: P25B012

Reg. No : .....
Name : .....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

II SEMESTER (CBCSS-PG) DEGREE EXAMINATION, MARCH 2025
M Sc Chemistry
CHE2C06 : COORDINATION CHEMISTRY
2024 Admission Onwards
(Credits: 3)

Time: 3 Hours **Maximum Weightage: 30**

Section A

Answer **any eight** questions. Weightage **1** for each question. **(8x1 = 8 Weightage)**

1. Define Macrocyclic ligand and template effect. [BTL1]
2. Compare the structure of $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$. [BTL4]
3. Discuss the orgel diagram of d^9 metal ion in the octahedral environment. [BTL2]
4. Examine quenching of orbital angular momentum and what are its consequences on the μ_{eff} of transition metal complexes. [BTL3]
5. Define fluxionality. [BTL1]
6. The C-O stretching frequencies for $[Ni(CO)_4]$, $[Co(CO)_4]^-$ and $[Fe(CO)_4]^{2-}$ are 2060, 1890, and 1790 cm^{-1} respectively. Analyze the result. [BTL4]
7. What is Fuoss-Eigen equation? [BTL1]
8. $[Cr(H_2O)_6]^{3+}$ is inert whereas $[Cr(H_2O)_6]^{2+}$ is labile to ligand substitution reaction. Explain. [BTL3]
9. Discuss the excited states of metal complexes in photochemical reactions. [BTL2]
10. Predict substitution lability using Adamson's rule. [BTL3]

Section B

Answer **any six** questions. Weightage **2** for each question. **(6x2 = 12 Weightage)**

11. Explain electrochemical and spectrochemical method for the determination of stability constant. [BTL2]
12. For (Cd^{2+}/NH_3)system log K values as follows:log K_1 = 2.65, log K_2 = 2.10, log K_3 = 1.44 and log K_4= 0.93 For (Cd^{2+}/CN^-) system log K values as follows: log K_1 = 5.48, log K_2 = 5.12, log K_3 = 4.63 and log K_4= 3.65 Calculate the overall stability constant. Which is more stable. [BTL3]

Turn Over

13. Discuss the MO diagram of tetrahedral complexes. [BTL2]

14. By using orgel diagram of $[Ni(H_2O)_6]^{2+}$, draw absorption spectra of the complex. [BTL3]

15. Compare the ESR spectra of $[Cu(bpy)_3]^{2+}$ and $[Cu(phen)Cl_2]^{2+}$. [BTL4]

16. Discuss the theories of Trans effect. [BTL4]

17. Define inner sphere mechanism with example. [BTL1]

18. Account for the photoreactive excited states of Cr(III) complexes. Giving suitable examples discuss the photoaquation reactions of Cr(III) complexes. [BTL5]

Section C

Answer **any two** questions. Weightage **5** for each question. **(2x5 = 10 Weightage)**

19. Evaluate the energy level splitting diagram and show the occupancy of the d-orbitals by electrons in the following cases [BTL5]
    (a) d^6 octahedral, high spin
    (b) d^7 octahedral, low spin
    (c) d^8 square planar
    (d) d^9 octahedral with tetragonal shortening
    (e) d^9 octahedral with tetragonal distortion
    (f) d^6 tetrahedral.

20. Explain (a) Temperature independent magnetism (b) Gouy method. [BTL2]

21. Discuss the principle involved in Mossbauer spectroscopy. What do you mean by the term isomer shift and hyperfine interaction? How this technique is useful in the study of spin crossover in Fe(II) complexes. [BTL3]

22. Show the substitution reactions in square planar complexes. [BTL3]

****