



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - CHEMISTRY

THIRD SEMESTER – NOVEMBER 2013

CH 3809 - COORDINATION CHEMISTRY

Date : 05/11/2013

Dept. No.

Max. : 100 Marks

Time : 9:00 - 12:00

Part-A

Answer all questions. Each question carries two marks.

1. Why do d^8 metal ions readily form square planar complexes?
2. Is $MnCr_2O_4$ likely to have a normal or inverse spinel structure?
3. What is the ground term of a free ion with $3d^9$ configuration?
4. What are π -acceptor ligands? Give two examples.
5. Explain why the bond order of metal-ligand in mixed phosphine carbonyls varies in the order $(Ph_3P)_3Mo(CO)_3 < (Cl_3P)_3Mo(CO)_3$.
6. What are electron exchange reactions? Cite an example.
7. Why is associative mechanism rare in substitution of octahedral coordination compounds?
8. What are the characteristics of charge transfer bands in the electronic spectrum of a coordination compound?
9. What are excited states and intermediates? Cite one example.
10. What is picket fence porphyrin?

Part-B

Answer eight questions. Each question carries five marks

11. What is tetragonal distortion? Which d^n configurations lead to strong Jahn-Teller distortion in octahedral and tetrahedral complexes?
12. How do you account for the variation of ionic radii of M^{2+} and M^{3+} ions ($M=3d$ series) using crystal field theory?
13. How does MO theory account for the paramagnetism of $[FeF_6]^{4-}$?
14. How many electronic absorption peaks can be expected for the tetrahedral complex of $[NiCl_4]^{2-}$?
15. Which d^n configurations show quenching of orbital angular momentum if it forms octahedral, high and low spin complexes? Give reasons.
16. Discuss the synthesis and uses of *cis*-platin.
17. What is Marcus Hush equation? What is its application?
18. Write a brief notes on Fischer Tropsch process.
19. What are photo isomerization reactions? Cite an example.
20. Explain various types of charge transfer photochemical reactions with an example for each type.
21. Explain the nature of forces operating in supramolecular assemblies?
22. What is carboxypeptidase? What is its application?

Part-C

Answer four questions. Each question carries ten marks

23. (a) Explain why Cl^- acts as a weak ligand whereas CN^- acts as strong ligand in octahedral transition metal complexes with the help of MO theory.
(b) The crystal field splitting parameter (Δ_0) of $[\text{IrCl}_6]^{3-}$ is $27,600 \text{ cm}^{-1}$. Convert this wave number to nanometer. (6+4)
24. Explain Orgel and Tanabe-Sugano diagrams. How are they useful? (3+3+4)
25. (a) Explain how is EPR hyperfine splitting helpful in characterizing bis-(salicylaldimine) copper(II) complex ion.
(b) Explain nuclear quadrupole interactions. (5+5)
26. (a) Discuss various mechanisms observed in the substitution reactions of coordination compounds.
(b) How will you quantify metal-ligand orbital interaction? (6+4)
27. Explain the following. (a) Theoretical basis of trans effect (b) Angular scaling factors (5+5)
28. (a) What are copper proteins? Also explain type I, type II and type III copper systems with specific example.
(b) Explain the chemistry of photosynthesis in chlorophyll. (6+4)