



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - CHEMISTRY

THIRD SEMESTER – NOVEMBER 2013

CH 3813 - 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. What are the factors that determine $10Dq$ values?
2. Why does metal with d^3 configuration readily form octahedral complexes than tetrahedral complexes?
3. What is Nephelauxetic effect?
4. Calculate the ground term for d^6 metal ion.
5. The magnetic moment of high spin octahedral complex of Co(II) is 4.8-5.2 B.M instead of the expected 3.88 B.M. Why?
6. What are trans-directing ligands? Cite an example.
7. What are complementary electron transfer reactions? Give an example.
8. What are commonly observed chemical reactions of coordination compounds?
9. Mention the differences between an excited and an intermediate states of a reaction.
10. What are the main functions of superoxide dismutase?

Part-B

Answer eight questions. Each question carries five marks.

11. Explain the d-orbital splitting of octahedral and tetrahedral complexes using crystal field theory.
12. What is tetragonal distortion? Which d^n configuration leads to weak and strong Jahn-Teller distortion in octahedral and tetrahedral complexes?
13. How is the variation of ionic size and lattice energy of first row transition elements explained by CFT?
14. Explain the synergic effects present in the metal carbonyls.
15. Explain the variations in the stretching frequency of the isoelectronic species, $\text{Cr}(\text{CO})_6$, $\text{V}(\text{CO})_6^-$ and $\text{Mn}(\text{CO})_6^+$.
16. What are CT and LF photochemical reactions? Cite an example each.
17. Explain $\text{S}_{\text{N}}1\text{CB}$ mechanism with a specific example.
18. Discuss the synthesis and uses of *cis*-platin.
19. Explain photoisomerisation reaction with an example.
20. What is Ziegler-Natta catalyst? Mention its application.
21. What are blue copper proteins? Differentiate it from other copper proteins.
22. The brown ring compound in the nitrate test shows $\mu_{\text{eff}} = 3.8$ B.M. Why?

Part-C

Answer four questions. Each question carries ten marks.

23. a) Explain why F^- acts as a weak ligand whereas CO acts as a strong ligand in octahedral transitionmetal complexes, with the help of MO theory.
b) Discuss the electron transfer reaction in organometallic compound. (6+4)
24. a) Explain the features of Tanabe- Sugano and Orgel diagrams.
b) Construct Orgel diagram for d^3 and d^7 systems for tetrahedral and octahedral complexes. (5+5)
25. a) Explain why is the stretching frequency of ν_{C-N} shifted to higher ν while that of ν_{C-O} is lowered on back donation from metal to ligand?
b) For $[Cr(H_2O)_6]^{2+}$, the mean pairing energy (P) is $23,500 \text{ cm}^{-1}$ and the magnitude of Δ_0 is 13900 cm^{-1} . State whether the given ion is stable in low spin or high spin state. (6+4)
26. a) Discuss inner-sphere mechanism of electron transfer reactions.
b) Explain polarization theory of trans effect. (5+5)
27. Write short notes on
a) Wilkinson catalyst b) Fischer Tropsch process (5+5)
28. a) What is photosynthesis? Explain any one mechanism proposed for this reaction.
b) Explain the term photosynthetic reaction center. (4+4)
