 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **CHEMISTRY**

THIRD SEMESTER – **APRIL 2012**

# CH 3809 - COORDINATION CHEMISTRY

Date : 24-04-2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**Part-A**

***Answer all questions. Each question carries two marks:***

1. The thermodynamic stability of high-spin complexes of *d0,5,10* metal ions are lower than that of other *dn* metal ions under identical ligand framework. Comment upon this observation.

2. Identify the number of isomers of [Co(en)2(SCN)2]+.

3. It is exceedingly difficult to synthesize low-spin *Td* complexes of first row transition metals. Rationalize.

4. What is nephelauxetic ratio? Mention its significance.

5. Transition metal complexes are invariably colored, while their cabonyls are mostly colorless. Offer a reasonable explanation.

6. Jahn-Teller distortion in 6-coordinate complexes of low-spin *d*4 metal ions escapes experimental detection, while it can be detected in 6-coordinate complexes of high-spin *d*4 metal ions. Explain.

7. Differentiate *trans*-effect and *trans*-influence.

8. Organometallic compounds are formed by transition metal ions in their low oxidation state. Comment.

9. What is halometallation reaction? Cite an example.

10. Mention the biological roles of the enzyme *carboxy peptidase A*.

**Part-B**

***Answer eight questions. Each question carries five marks:***

11. How is nitro- and nitrito complexes differentiated by IR spectroscopy?

12. State Jahn Teller theorem. Explain static dynamic Jahn Teller distortion with an example. How is it studied experimentally?

13. What is molecular recognition? Give an account of recognition of neutral molecules by molecular receptors.

14. Explain photoisomerization and photosubstitution reactions in transition metal complexes with examples.

15. Give an account of the synthesis and structural features of **-complexes of cyclooctatetraene and cycloheptatriene with transition metals.

16. Explain supramolecular assemblies formed by self assembly methods.

17. Give an account of the mechanism of substitution reactions in tetrahedral complexes.

18. What is *trans*-effect? You are provided with K2PtCl4 and ammonia. How do you synthesise*cis*- and *trans*-isomers of [PtCl2(NH3)2]?

19. Explain the synthesis of Ziegler-Natta catalysts and the mechanism of polymerization of olefins by this catalyst.

20. The epr spectrum of [Cu(salen)] consists of four sets of eleven lines each. Interpret the spectrum and substantiate your result with the help of experimental evidences.

21. Write a note on copper proteins.

22. Explain the structural features and biological roles of superoxide dismutase.

**Part-C**

***Answer four questions. Each question carries ten marks***:

23a. Identify the metal orbitals and LGOs suitable for **- and **-bonding in *Oh* complexes of transition metal ions. Construct a qualitative MO energy level diagram for **-bonding. (6)

b. Justify the position of CO in the spectrochemical series with the help of MO theory. (4)

24. Explain the principles of angular overlap model. Show that *t*= 4/9** with the help of this theory.

25a. Explain the electronic spectral features of high-spin *Oh* and *Td* complexes of *d1-9* metal ions. (6)

b. Construct the Orgel diagram for high-spin *d*3 and *d*7*Oh* and *Td* complexes. (4)

26a. Explain the mechanism of palladium chloride-catalyzed production of acetaldehyde. (4)

b. Explain the mechanism of replacement of coordinated water by another ligand in octahedral complexes. (6)

27a. Explain the mechanism of oxygen transport in mammalian systems. (7)

b. Give an account of synthetic oxygen carriers. (3)

28a. What are electron transfer reactions? Differentiate complimentary and non-complimentary electron transfer reactions with examples. (3)

b. Explain the inner- and outer-sphere mechanisms of electron transfer reactions in coordination compounds with examples. Mention the various factors which affect these mechanisms. (7)

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