



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

FOURTH SEMESTER – APRIL 2015

CH 1054 - ADVANCED COORDINATION CHEMISTRY

Date : 27/04/2015

Dept. No.

Max. : 100 Marks

Time : 09:00-12:00

Part-A

Answer all questions. Each question carries two marks:

(10x2=20)

1. State Kramer's theorem.
2. Orgel diagrams are constructed as a function of the Racah parameter B whereas Tanabe Suganodiagrams are constructed for a particular ratio of the Racah parameters B and C . Comment.
3. What is chelate therapy?
4. What is tetragonal splitting parameter? Mention its significance.
5. The intensities of CT transitions is several orders of magnitude higher than that of crystal field transitions. Explain.
6. How do you differentiate low-spin and high-spin Mn(II) complexes?
7. How is covalent character in transition metal complexes quantified?
8. What is transmetallation? Cite an example.
9. What is oxidative phosphorylation? Mention the primary bioinorganic system involved in this process.
10. Angular orientation of the ligands with respect to the metal ion decides the magnitude of $10Dq$ values in complexes. Rationalize.

Part-B

Answer any eight questions. Each question carries five marks:

(8x5=40)

11. Justify the position of CN^- at the higher end of the spectrochemical series with the help of MO theory.
12. Write a note on photochemistry of Ru(II) polypyridine complexes.
13. Derive Marcus-Hush equation.
14. Explain the working principle of dye-sensitized solar cells.
15. The epr spectrum of bis(salicylaldimine)copper(II) consists of four sets of eleven lines each. Explain the spectral features. Substantiate your interpretation with experimental evidences.
16. How do you differentiate $[\text{Co}(\text{en})_3]^{3+}$ and $[\text{Co}(\text{en})_2(\text{SCN})_2]^+$ by electronic spectroscopy?
17. Mention the biological role of cytochromes. Differentiate cytochrome b and c .
18. Explain the biological role and structural properties of rubredoxins.
19. Explain the synthesis of complexes by *coordination template effect*.
20. Compare the photochemistry of Cr(III) and Co(III) complexes.
21. Write a note on the NMR spectra of paramagnetic complexes.
22. Explain spectroscopic method of studying static-dynamic Jahn-Teller distortion with a specific example.

Part-C

Answer any four questions. Each question carries ten marks:

(4x10=40)

23. Explain the mechanisms of electron transfer reactions with examples.
24. What are compartmental ligands? Explain the synthesis of such ligands and their dinuclear complexes.
- 25a. What is zero field splitting? Mention its causes in transition metal complexes.
b. The epr spectrum of high spin Mn(II) complex doped onto a diamagnetic host consists of five sets of six lines each. Explain the spectrum.
- 26a. A six-coordinate complex of low-spin cobalt(III) with a quadridentate ligand in the equatorial position and two monodentate ligands in the axial sites exhibits three spin allowed electronic transitions at 652, 505, and 425 nm. Assign these transitions and predict the site symmetry of the metal ion.
b. Calculate the field strength of the axial and equatorial ligands. **(7+3)**
- 27a. Explain the application of cyclic voltammetry in the study of coordination compounds.
b. How are the following evaluated from CV: (i) reversibility of a redox couple, (ii) diffusion controlled process, (iii) coupled chemical reaction. **(4+6)**
- 28a. Explain the principle of angular overlap model.
b. Show that $\Delta_t = 4/9\Delta_o$. **(5+5)**
