# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2013**

**CH 3809 - COORDINATION CHEMISTRY**

Date : 04/05/2013 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

## Part – A

*Answer **all** the questions* *(10 x 2 = 20)*

1. Calculate CFSE for metal ion with $d^4$ configuration, in octahedral high and low spin complexes.
2. Why does metal with $d^8$ configuration readily form square planar complexes?
3. Derive the ground term of $d^6$ ion.
4. How does IR spectral analysis help to distinguish terminal and bridged carbonyl group?
5. Why does electronic spectra of $[CoCl_4]^{2-}$ show two absorption bands?
6. Predict whether the complex $[Fe(H_2O)_6]^{2+}$ is labile or inert?
7. Why is $MnO_4^-$ ion, a $d^0$ complex coloured?
8. Explain why is the rate of the reaction slow between $[Co(H_2O)_6]^{3+}$ and $[Co(H_2O)_6]^{2+}$.
9. What is meant by synthetic oxygen carriers? Cite an example.
10. What are the main functions of the enzyme, superoxide dismutase?

## Part – B

*Answer any **eight** questions* *(8 x 5 = 40)*

11. How do you account for the variation of ionic radii of $M^{2+}$ and $M^{3+}$ ions (M=3d series) using Crystal field theory?
12. How does MO theory explain $[Fe(CN)_6]^{4-}$ as diamagnetic complex.
13. Which $d^n$ configurations show quenching of orbital angular momentum if it forms octahedral, high and low spin complexes?
14. How do you account for three bands in the electronic spectrum of $[Cr(NH_3)_6]^{3+}$?
15. Discuss the associative and dissociative mechanisms of substitution reactions in metal complexes.
16. Describe the role of coordination compound as a catalyst for hydroformylation reaction.
17. What is trans effect? Explain why the trans effect of the ligand, CO is stronger than that of pyridine.
18. Construct Orgel diagram for $d^{1-9}$, high spin octahedral and tetrahedral complexes..
19. Explain the types of photosubstitution reactions with examples.
20. What is template synthesis? How is this technique useful in synthesizing macrocyclic complexes?
21. Briefly explain the role of coordination compound in photosynthesis.
22. Describe the role of the enzyme, carboxy peptidase in the hydrolytic breakdown of protein.

## Part – C

*Answer any four questions.* *(4 x 10 = 40)*

23. Discuss the relative positions of halo ligands in spectrochemical series using Molecular orbital theory.
24. What is Jahn-Teller effect? Explain the consequences of Jahn-Teller effect in the geometry of $d^{1-9}$, octahedral complexes.
25. Describe the postulates of Tanabe- Sugano diagram in explaining the electronic transition of low and high spin, $d^2$ metal ion.
26. a) Discuss in detail the mechanism and the various factors affecting the inner sphere electron transfer in metal complexes.
27. a) Explain the synergic effect of metal-ligand bonding in metal carbonyls.
    b) Which complex has higher stretching frequency of C--O ? Why?
    $[(Ph_3P)_3Mo(CO)_3]$ b) $[(Cl_3P)_3Mo(CO)_3]$
28. Discuss the mechanism of oxygen transport and explain the cooperativity bahaviour of haemoglobin.

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