



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2015

CH 3813 - COORDINATION CHEMISTRY

Date : 03/11/2015
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

Part-A

Answer ALL questions.

(10 × 2 = 20)

1. Justify the positions of OH⁻ and H₂O in spectrochemical series.
2. Why d⁷ low-spin complexes exhibit more distortion than d⁷ high-spin complexes.
3. What is Neil's temperature?
4. What is the origin of the intense colour in K₃[RuCl₆]?
5. How does formation constant () influence the thermodynamic stability of metal complexes?
6. Electron transfer between [Fe(CN)₆]³⁻ and [Fe(CN)₆]⁴⁻ is much faster than between [Co(NH₃)₆]³⁺ and [Co(NH₃)₆]²⁺. Justify.
7. What are directional and non-directional molecular interactions?
8. Comment on the face-to-face *f-f* interactions.
9. Define anoxygenic photosynthesis.
10. What are apoenzymes?

Part-B

Answer any EIGHT questions.

(8 × 5 = 40)

11. Explain the principles of angular overlap model.
12. State Jahn-Teller theorem. Explain static and dynamic Jahn-Teller distortions with an example. How is it studied experimentally?
13. Explain the crystal field splitting in tetragonally distorted octahedral complexes.
14. Describe the selection rules for electronic spectra of complexes.
15. Discuss the salient features of Tanabe-Sugano diagram of metal complexes with an example.
16. Derive the ground state term of high- and low spin octahedral d² and d⁶ ions.
17. Explain the mechanism of the following reaction:
$$[\text{Co}^{\text{III}}(\text{NH}_3)_5\text{Cl}]^{2+} + [\text{Cr}^{\text{II}}(\text{H}_2\text{O})_6]^{2+} \longrightarrow [\text{Co}^{\text{II}}(\text{H}_2\text{O})_6]^{2+} + [\text{Cr}^{\text{III}}(\text{H}_2\text{O})_5\text{Cl}]^{2+}$$
18. Describe Wacker process.
19. Write a short note on template synthesis.
20. Give a brief account of *f*-interactions in supramolecular assemblies.
21. Describe the roles of photosystem-I and II in the electron transport process in photosynthesis.
22. Explain the structural features and biological roles of carboxypeptidase A.

Part-C

Answer any **FOUR** questions.

(4 × 10 = 40)

23. Identify the MOs and LGOs suitable for *s*- and *p*-bonding in O_h complexes of transition metal ions. Construct a qualitative MO energy level diagram for π -bonding.
- 24a. State Curie's Law. Explain temperature dependence of the magnetic susceptibility of ferromagnetic and antiferromagnetic materials. (4)
- b. How are the following metal complexes investigated using ESR experiments?
(i) $[\text{Mo}(\text{CN})_8]^{3-}$ (ii) bis(salicylaldimine)-Cu(II) complex (6)
- 25a. What are the factors influencing the substitution in square planar complexes. (5)
- b. Explain the hydrolysis reaction of octahedral metal complexes. (5)
- 26a. Write a note on *g*-value and hyperfine splitting in ESR spectroscopy. (5)
- b. Describe coordination chemistry of Ziegler-Natta Catalysis. (5)
- 27a. What is molecular recognition? Give an account of the recognition of cations by molecular receptors. (5)
- b. Explain supramolecular assemblies formed by self-assembly methods. (5)
- 28a. Explain the mechanism of oxygen transport in mammalian systems. (7)
- b. What are type-I copper proteins? Comment on the geometry of copper in type-I proteins. (3)
