



Date: 27-04-2016

Dept. No. 

Max. : 100 Marks

Time: 09:00-12:00

**Part-A***Answer ALL questions.***(10 × 2 = 20)**

1. The electronic spectrum of  $[\text{CoF}_6]^{3-}$  contains two bands with maxima at 11,500 and 14,500  $\text{cm}^{-1}$ . Account for the bands.
2. What is spin crossover? When does it take place?
3. What is ferromagnetism?
4. What is the origin of the intense color in  $[\text{Cu}(\text{bpy})]$  (bpy = 2,2'-bipyridine)?
5. Arrange the ligands in trans-directing series according to increasing trans-directing tendencies.
6. Provide an example for anation reactions of metal complexes.
7. How would you define the term allosteric effect?
8. Comment on the preorganization of binding sites in a macrocycle.
9. What is haematin?
10. Distinguish essential elements from trace elements.

**Part-B***Answer any EIGHT questions.***(8 × 5 = 40)**

11. How would you apply crystal field theory to explain the nondegeneracy of  $d$ -orbitals in an octahedral complex.
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 square planar geometry.
14. Explain the rules for determining term symbols with an example.
15. Draw the Orgel diagram for  $d^6$  system.
16. Mention the important applications of IR spectroscopy in coordination compounds.
17. Explain outer sphere mechanism with suitable example.
18. Explain the structure and bonding in ferrocene based on molecular orbital theory.
19. Give a brief account of  $\pi$ -interactions in supramolecular assemblies.
20. Compare and contrast the macrocyclic and podand molecular receptors with their structures.
21. Write a short note on cytochromes.
22. Explain the structural features and biological roles of superoxide dismutase.

**Part-C***Answer any FOUR questions.***(4 × 10 = 40)**

23. Explain the principles of angular overlap model and derive the equation of  $\Delta_t = 4/9 \Delta_o$ .
- 24a. Construct a qualitative MO energy level diagram for  $[\text{Co}(\text{NH}_3)_6]^{3+}$ . (5)
- b. Explain trans effect. (5)
- 25a. Explain temperature-dependent paramagnetism. (5)
- b. Based on IR spectrum how are terminal and bridging carbonyls and trans- and cis-carbonyls identified? (5)
- 26a. Explain the following terms: a) hyperfine splitting b) zerofield splitting c) McConnell equation. (6)
- b. Describe Olefin Metathesis. (4)
- 27a. What is molecular recognition? Give an account of recognition of cations by molecular receptors. (5)
- b. Explain supramolecular assemblies formed by self-assembly methods. (5)
- 28a. Explain the electron transport sequence in photosynthesis with Z-scheme. (5)
- b. Describe the biological roles of carboxypeptidase A. (5)

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