



Date: 29-10-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

Part – A

Answer **all** the questions

(10 x 2 = 20)

1. Calculate CFSE for metal ion with d^7 configuration, in high and low spin octahedral complexes.
2. Why does metal with d^8 configuration readily form square planar complexes?
3. Derive the ground term of d^4 ion.
4. How does IR spectroscopy help to distinguish terminal and bridged carbonyl groups?
5. How many absorption peaks are expected for $[\text{CoCl}_4]^{2-}$?
6. Predict whether the complex $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ is labile or inert.
7. Why is MnO_4^- ion, a d^0 complex, coloured?
8. What are metallocenes? Cite an example.
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 $[\text{Fe}(\text{CN})_6]^{4-}$ 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 is absolute configuration of metal complexes determined?
15. Discuss the associative and dissociative mechanisms of substitution reactions in metal complexes.
16. Describe the role of coordination compound as a catalyst for Monsanto acetic acid process.
17. What is trans effect in the substitution reaction of metal complexes? Explain the order of ligands in trans effect series with mechanism.
18. Construct Orgel diagram for d^{1-9} , high and low spin octahedral complexes.
19. Explain the types of photosubstitution reactions with suitable examples.
20. What is template synthesis? How is this technique useful in synthesizing macrocyclic complexes?
21. Briefly explain the role of coordination compounds 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. Explain the d orbital splitting of square planar complexes using crystal field theory.
24. What is Jahn-Teller effect? Explain the consequences of Jahn-Teller effect in the geometry of d^{1-9} , octahedral complexes.
25. What are spinels and inverse spinels? Predict whether the given oxides are spinels and inverse spinels: a) Co_3O_4 b) CuFe_2O_4 c) ZnFe_2O_4
26. Discuss in detail the mechanisms of outer sphere electron transfer in metal complexes.
27. a) Explain the synergic effect of metal-ligand bonding in metal carbonyls.
b) Explain the variations in the stretching frequency of the isoelectronic species, $\text{Cr}(\text{CO})_6$, $\text{V}(\text{CO})_6^-$ and $\text{Mn}(\text{CO})_6^+$.
28. Discuss the essential structure of haemoglobin and explain its cooperativity in its oxygenation.
