



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**B.Sc. DEGREE EXAMINATION – CHEMISTRY**

**SIXTH SEMESTER – NOVEMBER 2022**

**UCH 6501 – COORDINATION CHEMISTRY**

Date: 29-11-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

**Part –A**

**Answer ALL questions.**

**(10 x 2 = 20)**

1. Give an example with the formula for polydentate ligand.
2. Give the IUPAC nomenclature of
  - (i)  $[\text{CoCl}_2(\text{H}_2\text{O})_2(\text{NH}_3)_2]\text{NO}_3$
  - (ii)  $\text{Na}_4[\text{Fe}(\text{CN})_6]$
3. Mention any four factors affecting crystal field splitting parameters
4. Give an example for  $\pi$ -donor and  $\pi$ -acceptor ligands.
5. Derive the term symbol for  $d^2$  metal ion.
6. What is Wilkinson's catalyst? Mention its applications.
7. What is Monsanto acetic acid process?
8. Cite an example for  $\text{S}_\text{N}^1\text{CB}$  mechanism.
9. What is chelate therapy? Cite any two examples.
10. Write any two points to differentiate myoglobin from hemoglobin.

**Part –B**

**Answer any EIGHT questions**

**(8 x 5 = 40)**

11. Write a brief note on the structural isomerism exhibited by coordination compounds.
12. Compute EAN for (i)  $\text{K}_3[\text{Fe}(\text{CN})_6]$  (ii)  $[\text{PtCl}_4]^{2-}$
13. Calculate CFSE for high and low spin complexes of  $d^7$  metal ions.
14. How does crystal field theory explain the splitting up of d-orbitals in octahedral complexes?
15. (a) What is spectrochemical series?  
(b) Explain primary and secondary valencies of the central metal ion in  $\text{K}_3[\text{Fe}(\text{CN})_6]$  based on Werner's theory.
16. Discuss the associative and dissociative mechanisms of substitution reactions in metal complexes.
17. What is template synthesis? How is phthalocyanine synthesized by this method?
18. Explain the variations in the stretching frequency of the isoelectronic species,  $[\text{Cr}(\text{CO})_6]$ ,  $[\text{V}(\text{CO})_6^-]$  and  $[\text{Mn}(\text{CO})_6^+]$ .
19. What is trans effect? How does trans effect help in synthesizing isomers of metal complexes?
20. Explain the synergic effect of metal–ligand bonding in metal carbonyls using MO theory.
21. Briefly explain the significances of metal complexes in *in vivo* and *in vitro* nitrogen fixation.
22. Write a brief note on contrast agents used in MRI

**Part-C**

**Answer any FOUR questions.**

**(4 x 10 = 40)**

23. How does VB theory explain the structure of paramagnetic complex of  $[\text{FeCl}_6]^{4-}$  and diamagnetic complex of  $[\text{Fe}(\text{CN})_6]^{4-}$ .
24. Explain the optical isomers exhibited by 4 and 6 coordinated complex.
25. How does MOT explain the formation of metal complexes with sigma ( $\sigma$ ) and pi ( $\pi$ ) bond forming ligands?
26. Define Jahn-Teller Theorem and indicate the types of distortion in  $d^{1-10}$  high spin octahedral complexes with energy level diagram.
27. Write short notes on the role of metal complexes in
  - (a) hydroformylation reaction
  - (b) polymerization of alkene
28. Explain the biological role of the enzymes, (i) carboxy peptidase (ii) peroxidases.

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