LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **APRIL 2023**

16/17/18UCH5MC01 – COORDINATION CHEMISTRY

Date: 29-04-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

Part –A

Answer ALL questions **(10 x 2 = 20 Marks)**

1. What is a polydentate ligand? Cite an example.
2. Give the IUPAC nomenclature of
   (i) $[FeCl_2(H_2O)_2(NH_3)_2]NO_3$
   (ii) $[Pt(NH_3)_4][PtCl_4]$
3. How does the nature of central metal ion affect the crystal field splitting parameters?
4. Give any two examples for sigma bond forming ligands.
5. What are labile complexes? Cite an example.
6. Differentiate terminal and bridging carbonyl groups in organometallic compounds.
7. What is Ziegler-Natta catalyst? Which type of reaction is activated by that catalyst?
8. Cite an example for S_N^1CB mechanism.
9. What is chelate therapy? Cite any two examples.
10. Write the oxidation state and coordination number of the central metal ion present in haemoglobin.

Part –B

Answer any EIGHT questions **(8 x 5 = 40 Marks)**

11. Write a brief note on the classification of ligands.
12. Highlight the postulates of Sidgwick theory and compute EAN for
    (i) $K_3[Fe(CN)_6]$ (ii) $[PtCl_4]^{2-}$
13. Calculate CFSE for high and low spin, octahedral complexes of d^5 metal ions.
14. Explain Werner's theory.
15. Discuss the structural isomerism exhibited by coordination compounds.
16. Account for the comparative analysis of associative, dissociative and interchange mechanisms of substitution reactions of octahedral metal complexes.
17. Illustrate oxidative addition and reductive elimination reactions of metal complexes.
18. How does VB theory explain the structure of paramagnetic complex, $[FeCl_6]^{4-}$?
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 agents.

Part –C

Answer any FOUR questions **(4 x 10 = 40 Marks)**

23. How does crystal field theory explain the splitting up of d-orbitals in tetrahedral and square planar complexes?
24. Illustrate the various types of electron transfer reactions of metal complexes.
25a. What is spectrochemical series? (3)
   b. How does MOT explain the formation of metal complexes with sigma (σ)-bond forming ligands? (7)
26. Explain the types of Jahn-Teller 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) Mon Santo acetic acid process. (5+5)
28. Explain the biological role of the enzymes, i) carboxy peptidase ii) superoxide dismutase.

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