



Date: 05-04-2019
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART -A

Answer ALL the questions

(10 x 2 =20 marks)

- Write the IUPAC names of following compounds.
(i) $[\text{CoBr}(\text{NH}_3)_5]\text{SO}_4$, (ii) $[\text{Fe}(\text{OH})(\text{H}_2\text{O})_5]^{2+}$
- Calculate CFSE for Mn^{2+} , high spin complex.
- Which amongst the following is paramagnetic?
i. $\text{Ni}(\text{CO})_4$, ii. $[\text{Ni}(\text{CN})_4]^{2-}$
- Apply EAN rule to $[\text{Cr}(\text{NH}_3)_6]^{3+}$.
- Give any two characteristics of nitrogenase enzymes.
- Define outer sphere mechanism with an example.
- Mention the applications of radiopharmaceuticals.
- Give the biological role of haemoglobin.
- What is chelate therapy?
- Define metal template synthesis with a suitable example.

PART-B

Answer any EIGHT questions

(8 x 5 = 40 marks)

- Account for the magnetic property of each of the given complex. Which one of the following has the highest paramagnetism?
(a) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (b) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ (c) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ (d) $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$
- Write a note on photoredox reactions.
- Give the product formed when
i. Reaction of $[\text{PtCl}_4]^{2-}$ with NH_3 followed by $[\text{NO}_2]^-$ ii. $[\text{PtCl}_4]^{2-}$ with $[\text{NO}_2]^-$ followed by NH_3

14. Discuss the structure and function of cytochromes.
15. How does Zeigler-Natta catalyst catalyze the polymerization of ethylene?
16. Explain the Jahn-Teller distortion in $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$.
17. Give the increasing order of Δ_o for the following chromium complexes,
 $[\text{CrCl}_6]^{3-}$, $[\text{Cr}(\text{NH}_3)_6]^{3+}$, $[\text{Cr}(\text{CN})_6]^{3-}$. Explain
18. Determine the configuration (in the form $t_{2g}^m e_g^n$), the number of unpaired electrons, and the ligand field stabilization energy for each of the following complexes using the spectrochemical series to decide, which are strong-field and weak-field.
 (a) $[\text{Co}(\text{NH}_3)_6]^{3+}$; (b) $[\text{Fe}(\text{OH}_2)_6]^{2+}$
19. Explain metal template synthesis of Schiff bases with suitable examples.
20. Discuss the mechanism of outer sphere electron transfer reaction with suitable examples.
21. Describe the structure and bonding in i. Metal alkyls ii. Carbenes.
22. Explain the relative affinity of O_2 for haemoglobin.

PART– C

Answer any FOUR questions

(4 x 10=40 marks)

23. What are π -acceptor ligands? Discuss in detail the nature of bonding involved in $\text{Fe}(\text{CO})_5$ and $\text{Ni}(\text{CO})_4$.
24. Discuss the σ and π metal–ligand bonding in transition metal complexes with reference to octahedral geometry.
25. a) Explain the biological role played by carboxypeptidase A.
 b) Discuss *in vivo* and *in vitro* nitrogen fixation (5+5)
26. a) Apply 18 electron rule to $\text{Ni}(\text{CO})_4$ and $\text{Cr}(\text{CO})_6$.
 b) Discuss the structure and bonding of ferrocene. (5+5)
27. Discuss nucleophilic substitution mechanism reactions for octahedral complexes.
28. a) With a neat diagram explain crystal field splitting of d orbitals when d^6 (high spin) metal ion is placed in an octahedral field
 b) With a suitable example propose the mechanism of hydrogenation of olefins using Wilkinsons catalyst. (5+5)

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