

NCERT EXERCISES

- 9.1 Explain the bonding in coordination compounds in terms of Werner's postulates.
- 9.2 FeSO_4 solution mixed with $(\text{NH}_4)_2\text{SO}_4$ solution in 1:1 molar ratio gives the test of Fe^{2+} ion but CuSO_4 solution mixed with aqueous ammonia in 1:4 molar ratio does not give the test of Cu^{2+} ion. Explain why?
- 9.3 Explain with two examples each of the following: coordination entity, ligand, coordination number, coordination polyhedron, homoleptic and heteroleptic.
- 9.4 What is meant by unidentate, didentate and ambidentate ligands? Give two examples for each.
- 9.5 Specify the oxidation numbers of the metals in the following coordination entities:
 (i) $[\text{Co}(\text{H}_2\text{O})(\text{CN})(\text{en})_2]^{2+}$ (iii) $[\text{PtCl}_4]^{2-}$ (v) $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$
 (ii) $[\text{CoBr}_2(\text{en})_2]^+$ (iv) $\text{K}_3[\text{Fe}(\text{CN})_6]$
- 9.6 Using IUPAC norms write the formulas for the following:
 * (i) Tetrahydroxozincate(II) (vi) Hexaamminecobalt(III) sulphate
 (ii) Potassium tetrachloridopalladate(II) (vii) Potassium tri(oxalato)chromate(III)
 (iii) Diamminedichloridoplatinum(II) (viii) Hexaammineplatinum(IV)
 (iv) Potassium tetracyanonickelate(II) (ix) Tetrabromidocuprate(II)
 (v) Pentaamminenitrito-O-cobalt(III) (x) Pentaamminenitrito-N-cobalt(III)
- 9.7 Using IUPAC norms write the systematic names of the following:
 (i) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ (iv) $[\text{Co}(\text{NH}_3)_4\text{Cl}(\text{NO}_2)]\text{Cl}$ (vii) $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$
 (ii) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NH}_2\text{CH}_3)]\text{Cl}$ (v) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ (viii) $[\text{Co}(\text{en})_3]^{3+}$
 (iii) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ (vi) $[\text{NiCl}_4]^{2-}$ (ix) $[\text{Ni}(\text{CO})_4]$
- 9.8 List various types of isomerism possible for coordination compounds, giving an example of each.
- 9.9 How many geometrical isomers are possible in the following coordination entities?
 * (i) $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$ (ii) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
- 9.10 Draw the structures of optical isomers of:
 * (i) $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$ * (ii) $[\text{PtCl}_2(\text{en})_2]^{2+}$ * (iii) $[\text{Cr}(\text{NH}_3)_2\text{Cl}_2(\text{en})]^+$
- 9.11 Draw all the isomers (geometrical and optical) of:
 * (i) $[\text{CoCl}_2(\text{en})_2]^+$ (ii) $[\text{Co}(\text{NH}_3)\text{Cl}(\text{en})_2]^{2+}$ (iii) $[\text{Co}(\text{NH}_3)_2\text{Cl}_2(\text{en})]^+$
- 9.12 * Write all the geometrical isomers of $[\text{Pt}(\text{NH}_3)(\text{Br})(\text{Cl})(\text{py})]$ and how many of these will exhibit optical isomers?
- 9.13 Aqueous copper sulphate solution (blue in colour) gives:
 * (i) a green precipitate with aqueous potassium fluoride and
 (ii) a bright green solution with aqueous potassium chloride. Explain these experimental results.
- 9.14 What is the coordination entity formed when excess of aqueous KCN is added to an aqueous solution of copper sulphate? Why is it that no precipitate of copper sulphide is obtained when $\text{H}_2\text{S}(\text{g})$ is passed through this solution?
- 9.15 Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory:
 (i) $[\text{Fe}(\text{CN})_6]^{4-}$ (ii) $[\text{FeF}_6]^{3-}$ * (iii) $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$ * (iv) $[\text{CoF}_6]^{3-}$
- 9.16 * Draw figure to show the splitting of d orbitals in an octahedral crystal field.
- 9.17 * What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand.
- 9.18 What is crystal field splitting energy? How does the magnitude of Δ_o decide the actual configuration of d orbitals in a coordination entity?
- 9.19 * $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is paramagnetic while $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic. Explain why?
- 9.20 * * A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green but a solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless. Explain.
- 9.21 * * $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ are of different colours in dilute solutions. Why?
- 9.22 Discuss the nature of bonding in metal carbonyls.
- 9.23 Give the oxidation state, d orbital occupation and coordination number of the central metal ion in the following complexes:
 (i) $\text{K}_3[\text{Co}(\text{C}_2\text{O}_4)_3]$ (iii) $(\text{NH}_4)_2[\text{CoF}_4]$
 * (ii) etc $[\text{Cr}(\text{en})_3\text{Cl}_2]\text{Cl}$ (iv) $[\text{Mn}(\text{H}_2\text{O})_6]\text{SO}_4$

- 9.24 Write down the IUPAC name for each of the following complexes and indicate the oxidation state, electronic configuration and coordination number. Also give stereochemistry and magnetic moment of the complex:
- * (i) $K[Cr(H_2O)_2(C_2O_4)_2] \cdot 3H_2O$ * (iii) $CrCl_3(py)_3$ (v) $K_4[Mn(CN)_6]$
 * (ii) $[Co(NH_3)_5Cl]Cl_2$ (iv) $Cs[FeCl_4]$
- 9.25 What is meant by stability of a coordination compound in solution? State the factors which govern stability of complexes.
- 9.26 * What is meant by the *chelate effect*? Give an example.
- 9.27 * Discuss briefly giving an example in each case the role of coordination compounds in:
- (i) biological systems (iii) analytical chemistry
 (ii) medicinal chemistry and (iv) extraction/metallurgy of metals.
- 9.28 How many ions are produced from the complex $Co(NH_3)_6Cl_2$ in solution?
 (i) 6 (ii) 4 (iii) 3 (iv) 2
- 9.29 * Amongst the following ions which one has the highest magnetic moment value?
 (i) $[Cr(H_2O)_6]^{3+}$ (ii) $[Fe(H_2O)_6]^{2+}$ (iii) $[Zn(H_2O)_6]^{2+}$
- 9.30 The oxidation number of cobalt in $K[Co(CO)_4]$ is
 (i) +1 (ii) +3 (iii) -1 (iv) -3
- 9.31 * Amongst the following, the most stable complex is
 (i) $[Fe(H_2O)_6]^{3+}$ (ii) $[Fe(NH_3)_6]^{3+}$ (iii) $[Fe(C_2O_4)_3]^{3-}$ (iv) $[FeCl_6]^{3-}$
- 9.32 * What will be the correct order for the wavelengths of absorption in the visible region for the following:
 $[Ni(NO_2)_6]^{4-}$, $[Ni(NH_3)_6]^{2+}$, $[Ni(H_2O)_6]^{2+}$?

GPLUS EDUCATION