



COORDINATION COMPOUNDS

Class 12 - Chemistry

Time Allowed: 1 hour and 29 minutes

Maximum Marks: 45

- Why is geometrical isomerism not possible in tetrahedral complexes having two different types of unidentate ligands coordinated with the central metal ion? [1]
- Write the coordination number and oxidation state of Platinum in the complex: $[\text{Pt}(\text{en})_2\text{Cl}_2]$. [1]
- Which of the following species cannot act as a ligand? Give reason. [1]
 OH^- , NH_4^+ , CH_3NH_2 , H_2O
 - The complex $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$ is red in colour. Give IUPAC name of its linkage isomer.
- Using IUPAC norms, write the formulae for the following complexes: [1]
 - Tetraamminediaquacobalt(III) chloride
 - Dibromidobis(ethane-1,2-diamine)platinum(IV) nitrate
- Arrange following complex ions in increasing order of crystal field splitting energy (Δ_0): [1]
 $[\text{Cr}(\text{Cl})_6]^{3-}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Cr}(\text{NH}_3)_6]^{3+}$.
- What is ambidentate ligand? Give an example. [1]
- What are complex compounds? [1]
- Write IUPAC names of the following coordination entities: [1]
 - $[\text{Cr}(\text{NH}_3)_3(\text{H}_2\text{O})_3]\text{Cl}_3$
 - $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$
- Why is $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ coloured? [1]
 - Write IUPAC name of the given complex:
 $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$
- Out of $\text{Cis-}[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$ and $\text{Trans-}[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$, which one is optically active? [1]
- 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. [3]
- Mention applications of coordination compounds in following areas giving an example of each: [3]
 - Analytical chemistry.
 - Extraction of metals.
 - Formation of complex is exothermic or endothermic process. Explain why. What is the effect of temperature on stability of complex compounds?
- Draw the structures and write the hybridized state of the central atom of each of the species. [3]
 - $\text{Fe}(\text{CO})_5$
 - trans - $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$

14. Give the electronic configuration of the following complexes on the basis of the Crystal Field Splitting theory. [3]
[CoF₆]³⁻, [Fe(CN)₆]⁴⁻, and [Cu(NH₃)₆]²⁺.
15. Aqueous copper sulphate solution (blue in colour) gives: [3]
i. A green precipitate with aqueous potassium fluoride.
ii. A bright green solution with aqueous potassium chloride. Explain these experimental results.
16. a. Amongst the following, the most stable complex is: [5]
i. [Fe(H₂O)₆]³⁺
ii. [Fe(NH₃)₆]³⁺
iii. [Fe(C₂O₄)₃]³⁻
iv. [FeCl₆]³⁺
b. What will be the correct order for the wavelength of absorption in the visible region for the following:
[Ni(NO₂)₆]⁴⁻, [Ni(NH₃)₆]²⁺, [Ni(H₂O)₆]²⁺
17. Explain with two examples each of the following: Coordination entity, ligand coordination number, coordination polyhedron, homoleptic and heteroleptic. [5]
18. Explain the violet colour of the complex [Ti(H₂O)₆]³⁺ on the basis of crystal field theory. [5]
19. Explain with two examples each of the following: coordination entity, ligand, coordination number, coordination polyhedron, homoleptic and heteroleptic. [5]