

# Class 12 Chemistry - Coordination Compounds

NEET track | Short Notes + 5 CBSE-based questions + 5 NEET PYQ-based questions with solutions

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## 1. Quick Short Notes

- A coordination compound contains a central metal atom/ion surrounded by ligands.
- Coordination number is the number of donor atoms directly bonded to the central metal ion.
- Ligands may be monodentate, bidentate or polydentate. Some ligands are ambidentate and can bind through two different atoms.
- Oxidation state of metal is found by balancing charges of ligands and complex ion.
- IUPAC naming: name cation first, then anion; ligand names are written alphabetically; oxidation state of metal is shown in Roman numerals.
- Anionic complexes use metal names ending in -ate, e.g. ferrate, cuprate.
- Isomerism includes ionisation, hydrate, linkage, geometrical and optical isomerism.
- Strong-field ligands can cause pairing of electrons; weak-field ligands often give high-spin complexes.
- Magnetic behaviour depends on number of unpaired electrons.
- Board tip: in naming questions, first find oxidation state and coordination number before writing the final name.

## 2. CBSE-based Board Practice

### Q1. Find the oxidation state of iron and coordination number in $K_4[Fe(CN)_6]$ .

Solution: Let oxidation state of Fe = x. Then  $x + 6(-1) = -4$ , so  $x = +2$ . Coordination number = 6 because six  $CN^-$  ligands are directly attached.

### Q2. Write the IUPAC name of $[Cu(NH_3)_4]SO_4$ .

Solution: The cation is  $[Cu(NH_3)_4]^{2+}$ . Therefore the compound is tetraamminecopper(II) sulfate.

### Q3. Differentiate between a double salt and a coordination compound.

Solution: A double salt dissociates completely in water into all constituent ions. A coordination compound retains its complex ion in solution and does not dissociate completely into simple ions.

### Q4. Give one pair of geometrical isomers of $[Pt(NH_3)_2Cl_2]$ .

Solution: The complex shows cis and trans geometrical isomerism.

### Q5. Why is $Ni(CO)_4$ diamagnetic?

Solution: In  $\text{Ni}(\text{CO})_4$ , nickel is in zero oxidation state with electronic configuration  $3d^{10}$ . All electrons are paired, so the complex is diamagnetic.

### 3. NEET PYQ-based Practice

**Q1. A ligand that can coordinate through two different atoms is called:**

Solution: Such a ligand is called an ambidentate ligand.

**Q2. What is the coordination number of  $[\text{Co}(\text{NH}_3)_6]^{3+}$ ?**

Solution: There are six  $\text{NH}_3$  ligands attached to cobalt, so coordination number = 6.

**Q3. What is the colour of the tetraamminecopper(II) complex in solution?**

Solution: The tetraamminecopper(II) complex gives a deep blue colour in solution.

**Q4. Which kind of isomerism is commonly shown by square planar Pt(II) complexes such as  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ ?**

Solution: They commonly show geometrical (cis-trans) isomerism.

**Q5. Is  $[\text{Fe}(\text{CN})_6]^{4-}$  paramagnetic or diamagnetic?**

Solution:  $\text{Fe}^{2+}$  is  $d^6$  and  $\text{CN}^-$  is a strong-field ligand, so electrons pair up. Therefore the complex is diamagnetic.

Practice tip: First revise the short notes, then attempt CBSE board questions in written format, and finally solve the exam-specific section in timed mode.