

Class 12 - Chemistry

Chemistry - I

Coordination Compounds

CBSE NOTES

Coordination Compounds - Practice Worksheet

Strengthen your foundation with key concepts and basic applications.



Personal AI Tutor for CBSE Classes 6-12 & NCERT Help

edzy is a personal AI tutor for CBSE and State Board students, with curriculum-aligned guidance, practice, revision, and study plans that adapt to each learner.

Solve the following questions. Write your answers in the space provided.

1. Define coordination compounds and discuss their significance in biological systems with examples.

Hint: Think about the roles of hemoglobin and chlorophyll in living organisms.

2. What is Werner's theory of coordination compounds? Explain its importance.

Hint: Refer to the definitions of primary and secondary valences.



Solve the following questions. Write your answers in the space provided.

3. Explain the different types of ligands with examples.

Hint: Consider the binding sites of ligands when classifying them.

4. What is the coordination number of a metal ion and how is it determined?

Hint: Examine how ligands arrange around a central atom.



Solve the following questions. Write your answers in the space provided.

5. Describe the different types of isomerism in coordination compounds.

Hint: Think about how the arrangement of ligands affects isomerism.

6. Discuss the Valence Bond Theory and its application in coordination compounds.

Hint: Link hybridization types to molecular geometry.



Solve the following questions. Write your answers in the space provided.

7. Explain the role of coordination compounds in industrial applications.

Hint: Identify specific processes where these compounds are used.

8. What are homoleptic and heteroleptic coordination compounds? Provide examples.

Hint: Consider the composition of the ligands when identifying the type.



Solve the following questions. Write your answers in the space provided.

9. Discuss the applications of coordination compounds in medicinal chemistry.

Hint: Search for examples of metals used in therapeutics.

10. Illustrate the concept of coordination polyhedra and explain their geometries.

Hint: Visualize how ligands are positioned around the metal.



Check your answers with the solutions below.

1. Define coordination compounds and discuss their significance in biological systems with examples.

Solution: Coordination compounds are complex molecules formed when a central metal atom is bonded to surrounding ligands (molecules or ions). They play a crucial role in biological systems; for example, hemoglobin, which contains iron, is a coordination compound that transports oxygen in blood. Similarly, chlorophyll, a magnesium-based coordination complex, is vital for photosynthesis. These compounds contribute to various biochemical reactions, acting as catalysts and facilitating essential physiological processes.

2. What is Werner's theory of coordination compounds? Explain its importance.

Solution: Werner's theory postulates that every metal shows both primary and secondary valences. The primary valence is ionizable and linked to negative ions, while secondary valence indicates the number of groups directly attached to the metal, termed coordination number. This theory is essential as it provided a foundation for understanding coordination compounds' structure and behavior, leading to advances in inorganic chemistry.

3. Explain the different types of ligands with examples.

Solution: Ligands can be classified into monodentate and polydentate. Monodentate ligands bind to the metal at one site, such as chloride (Cl^-) and ammonia (NH_3). Polydentate ligands, like ethylenediamine (en) and oxalate ($\text{C}_2\text{O}_4^{2-}$), can attach to the metal at multiple points. This ability affects the stability and geometry of complexes formed, influencing their reactivity and applications in various fields.

4. What is the coordination number of a metal ion and how is it determined?

Solution: The coordination number is the number of ligand donor atoms bonded to the central metal atom in a coordination compound. It is determined by the spatial arrangement of ligands around the metal. For instance, in octahedral complexes, the coordination number is typically six, while it is four in tetrahedral complexes. Understanding coordination numbers helps predict the geometry and chemical properties of coordination compounds.



Download Edzy App

Check your answers with the solutions below.

5. Describe the different types of isomerism in coordination compounds.

Solution: Coordination compounds can exhibit structural and stereoisomerism. Structural isomerism includes types such as linkage isomers (where different ligands bond through different atoms) and coordination isomers (where the distribution of ligands changes). Stereoisomerism involves geometric (cis/trans) and optical isomers, depending on spatial arrangements. These isomeric forms can have distinct physical and chemical properties, crucial for their application.

6. Discuss the Valence Bond Theory and its application in coordination compounds.

Solution: Valence Bond Theory explains the bonding in coordination compounds through hybridization of atomic orbitals. When ligands approach the metal ion, its d-orbitals can hybridize with s and p-orbitals, forming new hybrid orbitals that facilitate bond formation. For instance, in octahedral complexes, d^2sp^3 hybridization occurs, allowing six ligand bonds. This theory helps understand bond angles and shapes of complexes, contextualizing their behavior in reactions.

7. Explain the role of coordination compounds in industrial applications.

Solution: Coordination compounds serve various industrial applications including in catalysts for chemical reactions, dyeing processes in textiles, and in electroplating. For instance, nickel salts are used for electroplating, enhancing metal surfaces' durability. In catalysis, transition metal complexes speed up reactions without undergoing permanent changes. Their properties enable efficient processes in multiple sectors, showcasing their versatility.

8. What are homoleptic and heteroleptic coordination compounds? Provide examples.

Solution: Homoleptic coordination compounds have ligands of the same type bound to a central metal atom, such as $[\text{Co}(\text{NH}_3)_6]^{3+}$. Conversely, heteroleptic compounds have different types of ligands, like $[\text{CoCl}(\text{NH}_3)_5]^{2+}$. Understanding these concepts is crucial as the type of ligands can greatly influence the properties and reactivities of the compounds formed.



Download Edzy App

Check your answers with the solutions below.

9. Discuss the applications of coordination compounds in medicinal chemistry.

Solution: Coordination compounds play a pivotal role in medicinal chemistry, notably in drug design and delivery. Complexes like cisplatin, used in cancer therapy, function by binding to DNA and disrupting cell division. Furthermore, coordination compounds can be designed for targeted therapy, allowing for the delivery of drugs directly to diseased tissues, minimizing side effects. This innovation highlights their significance in advancing medical science.

10. Illustrate the concept of coordination polyhedra and explain their geometries.

Solution: Coordination polyhedra refer to the spatial arrangement of ligands around the central metal ion. Common geometries include octahedral (six ligands, e.g., $[\text{Co}(\text{NH}_3)_6]^{3+}$), tetrahedral (four ligands, e.g., $[\text{Ni}(\text{CO})_4]$), and square planar (four ligands arranged in a plane, e.g., $[\text{PtCl}_4]^{2-}$). The geometry affects the compound's properties, reactivity, and isomerism, thus playing a crucial role in coordination chemistry.



Study smart, not hard - with Edzy!

For Students

- Practice past papers to get exam-ready
- Study with a timer to stay focused
- Revise regularly to build long-term memory

For Teachers

- Use Edzy to share quizzes instantly with students
- Save time with ready-made teaching aids
- Simplify test prep with structured resources

Before You Sleep:

Quickly review important notes - it helps memory consolidation.

Download Edzy App

Discover why we're called India's largest learning platform.



Personal AI Tutor for CBSE Classes 6-12 & NCERT Help

edzy is a personal AI tutor for CBSE and State Board students, with curriculum-aligned guidance, practice, revision, and study plans that adapt to each learner.