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CBSE CLASS 12th CHEMISTRY CHAPTER 9 NOTES Coordination compounds are chemical entities that feature coordinate bonds between a central metal atom and multiple atoms or groups. These bonds form when a metal ion donates its valence electrons to a ligand, which is an atom or group capable of donating one or more pairs of electrons. Valence bonds are a fundamental concept in understanding the bonding between two atoms. In coordination compounds, the central metal atom may be surrounded by different types of ligands, such as unidentate, bidentate, ambidentate, and chelating ligands. Unidentate ligands can only form one coordinate bond with the metal atom, while bidentate and ambidentate ligands can form two or more bonds. The stability of a coordination compound in solution is crucial for its overall properties. Factors influencing the stability of complexes include the type of metal ion, the number and type of ligands, and the presence of counter ions. Werner's postulates provide a framework for understanding the bonding in coordination compounds, highlighting the importance of valence bond theory. Coordination compounds can exhibit various types of isomerism, including geometrical and optical isomerism. Chelate effect refers to the increased stability of complexes when multiple donor atoms on the ligand are involved in coordinate bonds with the metal atom. A coordination entity is a complex ion that consists of a central metal atom or ion surrounded by ligands. The number of geometrical isomers possible for Co(NH3)3Cl3, for instance, can be calculated using geometric and stereochemical considerations. This chapter on coordination compounds covers various aspects, including the definition, types of complexes, and factors influencing their stability. It also delves into isomerism, chelate effect, and the importance of coordination compounds in chemistry. Here's a rewritten version of the text: Understanding coordination compounds is essential in chemistry, and Chapter 9 explores this topic in-depth. By mastering the concepts, students can easily tackle any type of exam question. Although the learning methods may seem complex initially, persistent practice will help students grasp the material and achieve high scores. It's crucial to practice a wide range of questions to become proficient in handling easy and difficult types. The important topics covered in this chapter include Werner's Theory, classification of ligands, homoleptic and heteroleptic complexes, nomenclature of coordination compounds, geometrical isomerism, geometry of complexes, magnetic nature of potassium ferricyanide, and more. These concepts are crucial for understanding the properties and applications of coordination compounds. **Important Links:** A few key questions to consider: * What are coordination compounds, and how do they differ from other types of compounds? * How does valence bonding relate to coordination compounds? * What is the difference between unidentate, bidentate, and ambidentate ligands? **Practice Questions:** 1. Explain the stability of a coordination compound in solution and the factors that govern its stability. 2. Describe Werner's postulates for the bonding in coordination compounds. 3. Discuss the different types of isomerism possible for coordination compounds. Class 12 Chemistry Notes on Coordination Compounds for Quick Exam Prep. Get the latest chapter-wise notes for CBSE board exams and school-based annual examinations. You can also download Class 12 Chemistry notes Chapter 9 Coordination Compounds from the CBSE Guide website in PDF format for free. These revision notes, prepared by expert teachers, will help you score high in exams. They are designed to help you revise the whole chapter in minutes. A coordination compound consists of a central metal atom or ion surrounded by oppositely charged ions or neutral molecules bonded by a coordinate bond. For instance, they don't dissociate into simple ions when dissolved in water. Double salts, on the other hand, are formed when two salts in stoichiometric ratio are crystallized together from their saturated solution and dissociate into simple ions when dissolved in water. A coordination entity is made up of a central metal atom or ion bonded to a fixed number of ions or molecules. The central atom or ion is the one to which a fixed number of ions/groups are bound in a definite geometrical arrangement around it. A ligand is a molecule, ion, or group that is bonded to the metal atom or ion by a coordinate bond and can be neutral, positively, or negatively charged. The coordination number of a metal ion in a complex can be defined as the number of ligand donor atoms to which the metal is directly bonded. The central atom/ion and the ligands attached to it are enclosed in square brackets and are collectively termed as the coordination sphere. Ions present outside the coordination sphere are called counter ions. The spatial arrangement of the ligand atoms directly attached to the central atom/ion defines a coordination polyhedron about the central atom. Common coordination polyhedra include octahedral, square planar, and tetrahedral structures. The charge on the complex ion is equal to the algebraic sum of the charges on all the ligands coordinated to the central metal ion. Denticity refers to the number of ligating atoms present in a ligand. Ligands that bind to metal atoms through a single donor atom are referred to as unidentate ligands. Conversely, polydentate ligands feature multiple donor atoms, such as Ethylenediamine and oxalate ion, which can form bonds with the metal atom. The term ambidentate describes ligands that can coordinate through two distinct atoms, like and . Coordination complexes can also exhibit a phenomenon known as chelation, where a single ligand forms rings around the metal atom. The coordination theory proposed by Werner states that metals display two types of valences: primary and secondary. The former refers to the number of negatively charged ions bound to the metal, while the latter corresponds to the number of neutral or negatively charged ligands coordinated to the metal. Common geometrical shapes in coordination compounds include octahedral, square planar, and tetrahedral. The oxidation state of the central metal atom is defined as its charge if all ligands were removed along with their electron pairs. Homoleptic complexes feature metal ions coordinate-bonded to a single type of donor atoms, whereas heteroleptic complexes involve coordination with multiple types of donors. Isomerism occurs when molecules have the same chemical formula but differ in their atomic arrangements. This can manifest as linkage, solvate, ionisation, or coordination isomerism. Structural isomerism arises from differences in atom bonding orders, while stereoisomerism encompasses geometrical and optical isomerisms, which result from variations in the arrangement of atoms within a molecule. These phenomena are essential for understanding the properties and behavior of coordination compounds. Ligands can be displaced by salt, resulting in the counter ion becoming a ligand. For instance, isomerism occurs when the solvent acts as a ligand. If water is the solvent, it's called hydrate isomerism, exemplified by and . This phenomenon arises in coordination compounds containing ambidentate ligands. In such cases, a ligand can form bonds with metal through different atoms. For example, and exhibit this type of isomerism due to the interchange of ligands between cationic and anionic entities of various metal ions present within the complex. Stereoisomerism arises from different spatial arrangements, while geometrical isomerism occurs in heteroleptic complexes due to diverse possible geometric configurations of ligands. Optical isomers are those that are non-superimposable mirror images. The theory suggests that under the influence of ligands, a metal atom or ion can utilize its (n-1)d, ns, np or ns, np, nd orbitals for hybridization, resulting in a set of equivalent orbitals with definite geometry, such as octahedral, tetrahedral, and square planar. These hybridized orbitals can overlap with ligand orbitals that donate electron pairs for bonding. The coordination number, type of hybridization, and shape of the hybrid orbitals are interrelated (e.g., 4 = Tetrahedral, 5 = Trigonalbipyramidal, 6 = Octahedral). A coordination compound is paramagnetic if it has unpaired electrons and diamagnetic if all its electrons are paired. The magnetic moment is directly proportional to the number of unpaired electrons. Crystal field splitting in octahedral and tetrahedral complexes occurs due to the electrostatic force between ligands and metal atoms or ions, assuming point charges. Metal carbonyls are homoleptic complexes where carbon monoxide acts as a ligand (e.g.,). The M–C bond possesses both s and p character, formed by electron donation from the carbonyl carbon into a vacant orbital of the metal or vice versa. The synergic effect created by metal-ligand bonding strengthens the bond between CO and the metal. Here are the key points for Coordination Compounds class 12 Notes Chemistry: quick revision notes for CBSE students to help with exam preparation. These notes cover important formulas and concepts from the chapter, making it easy to review and study during stressful exam days. To access these notes, as well as sample papers, NCERT solutions, and more, download myCBSEguide app or visit their website. The app offers a range of helpful tools for CBSE students, including test generators and question banks.

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