

CBSE Class 11 Chemistry Notes Chapter 9 Hydrogen: In Class 11 Chemistry Notes Chapter 9, "Hydrogen," you'll learn all about the element hydrogen, which is really important in science. It's a very light and flammable gas that can combine with lots of other elements to make different compounds.

You'll find out about different forms of hydrogen, like protium, deuterium, and tritium, and what they're used for. We'll also talk about how hydrogen is made and why it's so useful in things like making fuel and chemicals. By studying this chapter, you'll understand why hydrogen is such an important part of our world and how it's used in many different ways.

CBSE Class 11 Chemistry Notes Chapter 9 Hydrogen PDF

Hydrogen is the lightest and most abundant element in the universe, commonly found in water and organic compounds, and used in various industrial processes and energy application is known as hydrogen.

Here we have provided CBSE Class 11 Chemistry Notes Chapter 9 PDF for the ease of the students.

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Hydrogen Definition

Hydrogen, the lightest atom on Earth with a single electron, was first discovered by Henry Cavendish in 1766. It comprises three stable isotopes: protium, deuterium, and tritium, the latter being radioactive. Despite its resemblance to halogens and alkali metals, hydrogen possesses distinct properties, earning it a unique position in the periodic table.

Water-Gas Shift Reaction

The water-gas shift reaction is a chemical process in which carbon monoxide (CO) reacts with water vapor (H₂O) to produce carbon dioxide (CO₂) and hydrogen gas (H₂). This reaction is often used in industrial settings, particularly in processes such as ammonia production and hydrogen generation for fuel cells.

The reaction is catalyzed by transition metal oxides or other catalysts, and it plays a crucial role in converting harmful carbon monoxide into less harmful carbon dioxide while simultaneously producing hydrogen, which has various industrial applications.

Bond Dissociation Enthalpy

Bond dissociation enthalpy (BDE), also known as bond energy, is the energy required to break a chemical bond in a molecule homolytically, meaning that each atom retains one of the electrons from the broken bond. It is usually expressed in units of kilojoules per mole (kJ/mol) or in kilocalories per mole (kcal/mol).

Bond dissociation enthalpy is an important concept in chemistry as it provides insight into the strength of chemical bonds within molecules. It helps predict the reactivity and stability of compounds, as stronger bonds typically require more energy to break.

Experimentally, bond dissociation enthalpies are determined by measuring the energy required to break specific bonds in molecules using techniques such as calorimetry or spectroscopy. These values can vary depending on factors such as the nature of the atoms involved, the molecular structure, and the presence of neighboring functional groups.

Hydrides

Due to its high negative dissociation enthalpy, dihydrogen remains inactive at room temperature. However, under suitable conditions, dihydrogen can combine with various elements to form hydrides. These hydrides can be categorized into three types:

Saline or Ionic Hydrides: These hydrides serve as good reagents to produce additional hydride compounds.

Molecular or Covalent Hydrides: These hydrides are essential in daily life. For example, water (H₂O) is a molecular hydride.

Non-stoichiometric or Metallic Hydrides: These hydrides are utilized for the ultra-purification of dihydrogen.

Heavy Water and Hydrogen Economy

Heavy water, also known as deuterium oxide (D₂O), is a form of water where the hydrogen atoms are replaced with deuterium, an isotope of hydrogen containing one proton and one neutron in its nucleus. This substitution results in heavier water molecules.

Heavy water finds various applications, one of the most prominent being in nuclear reactors as a neutron moderator. Due to its ability to slow down neutrons without absorbing them, heavy water helps control nuclear reactions and sustain a chain reaction in reactors.

In the context of a hydrogen economy, heavy water is significant for its role in facilitating the production of deuterium, a valuable isotope used in fusion reactions and potentially as a fuel for future energy systems. Additionally, heavy water reactors can potentially produce tritium, another isotope of hydrogen used in fusion reactions.

The concept of a hydrogen economy envisions using hydrogen as a clean and sustainable energy carrier, with applications in fuel cells, transportation, and energy storage. Heavy water

could play a role in this economy by enabling the production and utilization of deuterium, contributing to the advancement of hydrogen-based technologies and energy systems.

Benefits of CBSE Class 11 Chemistry Notes Chapter 9 Hydrogen

Comprehensive Coverage: The notes provide a thorough overview of the fundamental concepts related to hydrogen, including its isotopes, preparation methods, properties, and applications.

Simplified Content: The content is presented in a concise and simplified manner, making it easier for students to grasp complex concepts and retain essential information.

Practice Questions: The notes often include practice questions and examples that enable students to test their understanding and reinforce their learning.

Accessible Resource: Students can access these notes anytime, anywhere, making them a convenient resource for self-study and reference purposes.