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According to the CBSE Syllabus 2023-24, this chapter has been removed from NCERT Class 8 Science textbook. Understanding what non-metals and metals are and how to distinguish them is crucial as everything around us falls into these two categories. This chapter discusses the physical and chemical properties of metals and non-metals, with a focus on helping students comprehend these concepts. To provide a better understanding, here are some key points about metal and non-metal properties. Metals are elements that readily lose valence electrons to form positive ions (cations), making up around 90% of the total 118 elements. Examples include Aluminium, copper, iron, tin, and gold. Notably, alkali metals (Na, K, Li) can be cut using a knife, whereas mercury is a liquid metal. Non-metals occur as solids, liquids, or gases at room temperature, being brittle, non-malleable, non-ductile, and non-sonorous. They are also poor conductors of heat and electricity, with exceptions such as iodine, which has lustre, and graphite, which conducts electricity. In contrast, metals have a range of physical properties, including being hard with high tensile strength, solids at room temperature (except mercury), sonorous, good conductors of heat and electricity, malleable, ductile, and having high melting and boiling points. Some exceptions include cesium (Cs) and gallium (Ga). Non-metals are elements that do not exhibit the properties of metals, with examples such as carbon and boron. Chemically, metals can react vigorously with water and oxygen or air, while some metals like copper, silver, platinum, and gold do not react with water or dilute acids. Additionally, displacement reactions occur when a more reactive element displaces a less reactive element from its compound or solution. ****Basic Properties of Metals**** Some metals react with air and water to form oxides and alkalis. For example: * Sodium oxide (Na₂O) reacts with water to form sodium hydroxide (NaOH) * Potassium oxide (K₂O) also forms potassium hydroxide (KOH) ****Amphoteric Oxides**** Amphoteric oxides, such as aluminum oxide (Al₂O₃), react with both acids and bases. For example: * Al₂O₃ reacts with hydrochloric acid to form aluminum chloride * Al₂O₃ also reacts with sodium hydroxide to form sodium aluminate ****Reactivity Series**** The following table shows the reactivity of metals from highest to lowest: | Metal | Reactivity | | -- | -- | | Potassium (K) | Highly active | | Barium (Ba), Calcium (Ca), Sodium (Na), Magnesium (Mg), Aluminum (Al) | Moderately active | | Zinc (Zn), Iron (Fe), Nickel (Ni), Tin (Sn), Lead (Pb) | Less reactive | ****Reaction with Water/Steam**** Metals react with water and steam to form hydroxides or oxides, releasing hydrogen gas. For example: * Sodium reacts with water to form sodium hydroxide and hydrogen * Calcium reacts with steam to form calcium hydroxide and hydrogen ****Reaction with Acids**** Metals that are more reactive than hydrogen can displace hydrogen from its dilute acids, producing a metal salt and hydrogen gas. For example: * Sodium reacts with hydrochloric acid to form sodium chloride and hydrogen * Potassium also displaces hydrogen from sulfuric acid. ****Reaction with Bases**** Bases react with metals to form salts and hydrogen gas. For example: * Zinc reacts with sodium hydroxide to form zincate and hydrogen ****Electronic Configuration**** The distribution of electrons in an atom or molecule is known as electronic configuration. Group 1 elements (alkali metals) have one electron in their outermost shell, while group 2 elements (alkaline earth metals) have two electrons. * Lithium has an electronic configuration of 2,1 * Sodium has an electronic configuration of 2,8,1 ****How Metals and Non-metals React**** Metals lose valence electrons to form cations, while non-metals gain electrons in their valence shell to form anions. The cation and anion are attracted to each other through electrostatic force, forming an ionic bond. For example: * Calcium chloride is formed by the attraction between calcium (Ca²⁺) and chloride ions (Cl⁻). Ionic Compounds: Properties, Structure, and Applications Ions combine to form compounds with strong electrostatic forces, known as ionic bonds. These bonds hold oppositely charged ions together. Ionic compounds are crystalline solids that typically have high melting and boiling points due to the strong attraction between positive and negative ions. Physical Characteristics of Ionic Compounds Ionic compounds are usually hard to break and brittle because of their rigid structure. They generally shatter when pressure is applied, but they can be melted or dissolved in water to conduct electricity. The lattice structure of ionic solids consists of regular arrangements of particles, which are atoms or ions. Conductivity and Melting Points When molten or dissolved in water, ionic compounds become electrically conductive due to the movement of free ions. However, when solidified, they no longer conduct electricity because their ions are strongly held together by electrostatic forces. The melting points and boiling points of ionic compounds are typically high due to the strong energy required to break these forces. Solubility and Applications Ionic compounds tend to be highly soluble in polar solvents like water but less so in non-polar solvents. They find applications in various fields, such as protecting metals from rusting (zinc), making jewelry (gold and silver), or serving as essential elements for plants and animals (oxygen and nitrogen). CaCO₃ transforms into CaO and CO₂ when heated. For a deeper understanding of Roasting and Calcination, click here. Lower reactivity metals like gold, silver, platinum, and copper are often found in their free state due to being less reactive. These metals can also be found as sulphide or oxide ores combined with other elements. Their sulphide ores usually undergo roasting. Metals such as zinc, iron, lead, etc., exhibit moderate reactivity and are commonly found in their oxide, sulphide, or carbonate forms. The extraction process for these metals involves calcination for carbonates and roasting for sulphides, followed by a reduction step to produce the metal oxides. Metals like sodium, calcium, magnesium, aluminium, etc., cannot be reduced with carbon due to their high affinity for oxygen. Instead, these metals are obtained through electrolytic reduction or electrolysis of their oxides, hydroxides, or chlorides in a molten state. Enrichment refers to the removal of impurities or gangue from ores using various physical and chemical processes. The method employed for a specific ore depends on its properties differing significantly from those of the gangue. Refining involves removing impurities or gangue from crude metal, marking the final stage in metallurgy. This process relies on distinguishing between the properties of the metal and the gangue. Electrolytic refining purifies impure metals by passing electric current through them, resulting in the production of pure metal. Metals like copper, zinc, nickel, silver, tin, gold, etc., undergo electrolytic refining. This process includes an anode (impure or crude metal), a cathode (thin strip of pure metal), and an electrolyte (aqueous solution of a metal salt). During this process, metal ions are released from the anode into the solution through oxidation, while an equivalent amount of metal is deposited at the cathode through reduction. Impurities settle at the bottom of the anode. To learn more about Electrolytic Refining, visit here. Visit BYJU'S for more information on metals and non-metals and other related topics, including NCERT class 8 Science notes. Also Read: Materials Metals and Non-metals Class 8 Science Chapter 4 Extra Questions with Answers can be found here, prepared based on the latest NCERT Class 8 Science Book. CBSE Class 8 Science Chapter 4 Materials Metals and Non-metals Extra Questions will help you grasp specific concepts of the chapter. Property of malleability in metals is shown by this. Atoms are the smallest units of elements. There are no more than 92 naturally occurring elements. Metals are sonorous because they produce ringing sounds. Non-metals are not ductile, so they cannot be drawn into wires. Zinc can be beaten into thin sheets. Generally, metals are ductile. Copper sulphate reacts with zinc to form zinc sulphate and copper. Oxygen is a non-metal essential for life, inhaled during breathing. A metallic box produces ringing sound because metals are sonorous. Hammering metal A flattens it, whereas hammering metal B breaks it; hence, metal A is malleable. Soft metals like sodium and potassium can be cut with a knife. Non-metals include sulphur, carbon, oxygen, phosphorus, etc. Metals such as iron, copper, aluminium, calcium, magnesium, etc., are examples of metals. Malleability is the property of metals that allows them to be beaten into thin sheets. The oxide formed by sulphur is acidic in nature. Ductility refers to a metal's ability to be drawn into wires. Sulphur reacts with oxygen to form sulphur dioxide gas. Metalloids are elements that possess characteristics of both metals and non-metals. Metals combine with oxygen to produce basic metal oxides when burned. The metal mercury is found in liquid state at room temperature. Rust is acidic in nature and iron oxide (Fe₂O₃) is its chemical composition. Metallic oxides generally tend to be basic in nature. Non-metals react with oxygen, producing non-metallic oxides that are acidic in nature. Aluminium foils are used for wrapping food items because aluminium is malleable, allowing it to be beaten into thin sheets. Metals have various uses such as making machinery, automobiles, aeroplanes, trains, satellites, industrial gadgets, cooking utensils, water boilers, etc. Some metals react with water, producing metal hydroxides and hydrogen gas. Generally, non-metals do not react with water. Displacement reactions involve a more reactive metal replacing a less reactive one but the reverse does not occur. Metals are typically hard, lustrous, malleable, ductile, sonorous, good conductors of heat and electricity. Sodium and potassium are stored in kerosene as they react vigorously with oxygen and water. Screwdrivers often have wooden or plastic handles due to their poor electrical conductivity. Bells are made from metals because they produce a clear ringing sound when struck. 1. Phosphorus is stored in water because it is a highly reactive non-metal that ignites on contact with air, necessitating its containment to prevent accidental ignition. 2. Wooden or plastic handles are used for cooking utensils due to their poor heat conductivity, which shields users from thermal burns during handling hot items. 3. Metal coins produce distinct sounds upon being dropped compared to coal pieces because metals exhibit a sonorous characteristic when struck hard, resulting in audible ringing tones, whereas non-metals fail to create such sound upon impact. 4. The appearance of a 'pop' sound during chemical reactions typically indicates the presence of hydrogen gas as a byproduct of metal reactions with sodium hydroxide. 5. An element is defined as a substance that cannot be decomposed into simpler substances via physical changes like heating, cooling, or electrolysis; examples include sulphur, iron, and carbon. 6. The statement 'the atom of an element remains unaffected by physical changes in the element' holds true for elements such as sulphur, as its atomic structure remains constant whether it exists as a solid, liquid, or gas. 7. Elements are broadly classified into two categories: metals and non-metals, with most elements belonging to the former group and fewer elements falling under the non-metal category; some elements exhibit properties of both metals and non-metals, categorizing them as metalloids. 8. Copper wires are utilized for conducting electricity because they are ductile and possess a high conductivity, allowing for efficient transmission of electrical currents. 9. Copper cannot displace zinc from its salt solution due to the former being less reactive than the latter; when a more reactive element replaces a less reactive one in an aqueous compound, the replacement occurs. 10. Lemon pickle cannot be stored in aluminium utensils because it contains acidic compounds that can catalyze a reaction with aluminium metal, leading to hydrogen gas production and subsequent spoilage of the pickle. Given text here: The following is the list of questions along with their answers from a chemistry chapter. First, we need to determine what happens when oxygen (O₂) and water (H₂O) react together. This chemical reaction forms iron oxide (Fe₂O₃). On the other hand, magnesium (Mg) reacts with oxygen (O₂) to produce magnesium oxide (MgO). Now let's move on to question 25: Explain what happens when sulphur burns in air and what type of oxide is formed. When sulphur burns in air, it combines with oxygen from the air and forms sulphur dioxide, which is an acidic oxide. Let's answer some long questions now. Question one asks whether copper can displace iron from an iron sulphate solution. Since copper lies below iron in the reactivity series, meaning that iron is more reactive than copper, therefore copper cannot displace iron from its salt solutions. In question two, we are asked what happens when iron nails are placed into a copper sulphate solution. Iron being more reactive displaces copper from copper sulphate and there is deposition of copper on the iron nail. Now let's answer another question: why does a greenish deposit appear on copper vessels? The reason for this is that when copper is exposed to moist air, it forms a dull green coating made up of copper hydroxide (Cu(OH)₂) and copper carbonate (CuCO₃). Let's move on to the next question. What happens when dilute sulphuric acid is poured onto a copper plate? Copper does not react with dilute sulphuric acid but it reacts with sulphuric acid when heated. The following are some of the chemical properties of non-metals: Non-metals react with oxygen to form acidic oxides, generally do not react with water and acids. Physical properties and uses of non-metals. Non-metals are brittle, poor conductors of heat and electricity, dull, and not strong. They do not make a sonorous sound. Most solid non-metals are soft. These elements are essential for life and occur naturally in the air we breathe. Non-metals are also used to manufacture fertilizers that enhance plant growth, in water purification processes, as antiseptic solutions, and in food products like crackers. You can find a comprehensive collection of study materials for Class 8 Science Chapter 4 at Study Path, including detailed notes on Metals and Non-metals, along with NCERT solutions, important questions, and multiple-choice questions to help you better understand the topic.

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