

Name _____

Breaking the Bond: Understanding Chemical Bond Breakage

Short Answer Key

1. Covalent bonds involve the sharing of electrons between atoms, while ionic bonds involve the transfer of electrons from one atom to another. In covalent bonds, electrons are shared to achieve a stable electron configuration, while in ionic bonds, one atom loses electrons to become positively charged (cation), and another gains electrons to become negatively charged (anion), resulting in electrostatic attraction between them.
2. The process of breaking a chemical bond involves adding energy to the system, overcoming attractive forces between atoms or ions, and separating the atoms or ions. Energy is applied to disrupt the balance of attractive forces until the bond is entirely broken, allowing the atoms or ions to move apart.
3. Example: Combustion of methane (CH_4). In this reaction, methane combines with oxygen (O_2) to form carbon dioxide (CO_2) and water (H_2O). The covalent bonds in methane and oxygen are broken, and new covalent bonds are formed in carbon dioxide and water, resulting in the creation of new substances with different properties.
4. The release of energy during bond breakage can be harnessed for various practical applications, such as generating electricity in power plants, powering engines in vehicles, or heating water for domestic use. It can also be used in industrial processes to produce heat for chemical reactions.
5. One example is cellular respiration, where glucose molecules are broken down to release energy for cell functions. During this process, covalent bonds within glucose molecules are broken, and new covalent bonds are formed, releasing energy in the form of ATP (adenosine triphosphate). This energy is essential for various biological functions, including muscle contraction and cell division.

