

Name _____

Bonding Wonders: Everyday Substances and Chemical Bonds

Open-Ended Response Answer Key

1. One real-world example is in the pharmaceutical industry. Understanding the types of chemical bonds in drug molecules is crucial for designing effective medications. Covalent bonds within drug molecules determine their stability and interactions in the body, while hydrogen bonds may influence their solubility and interactions with biological targets.
2. Covalent bonds involve the sharing of electrons and are relatively strong. Example: Water (H_2O). Ionic bonds involve the transfer of electrons and are also strong. Example: Table salt (NaCl). Metallic bonds involve a "sea" of delocalized electrons and are relatively weaker than covalent and ionic bonds. Example: Copper (Cu).
3. Van der Waals forces contribute to the behavior of gases by influencing their boiling and condensation points. An example is the gas methane (CH_4). Despite being non-polar, methane molecules experience temporary fluctuations in electron distribution, leading to Van der Waals forces. These forces are significant in methane's behavior as they influence its transition to the liquid state under certain conditions.
4. Hydrogen bonds play a critical role in maintaining the structures of biological molecules. In DNA, hydrogen bonds hold the complementary base pairs (adenine-thymine and guanine-cytosine) together in the double helix, ensuring accurate replication of genetic information. In proteins, hydrogen bonds contribute to the folding and stability of their three-dimensional structures, influencing their functions as enzymes, receptors, and structural components in living organisms.

