

Name _____

The Mighty Bond: How Strength Shapes Substance

Open-Ended Response Answer Key

1. One example is in the construction of buildings using concrete. The strength of the chemical bonds in the cement used to make concrete, particularly the formation of strong ionic bonds between calcium and silicate ions, is essential for creating a sturdy and durable building material. The strong bonds contribute to the hardness and strength of concrete, ensuring that structures can withstand various loads and environmental conditions, which is crucial for safety and longevity.
2. A substance with strong ionic bonds, such as table salt (sodium chloride), tends to be hard and brittle due to the strong attraction between oppositely charged ions. It also has a high melting and boiling point. In contrast, a substance with strong covalent bonds, like diamond, is exceptionally hard but can be brittle. The key difference is in the nature of the bonding: ionic bonds involve the transfer of electrons, while covalent bonds involve the sharing of electrons. This difference in bonding accounts for variations in properties.
3. The material with moderate covalent bonds would likely have a balance between flexibility and hardness. It would be somewhat flexible, allowing it to deform under force without shattering completely, similar to plastic. The material with weak covalent bonds would be more flexible, like rubber, as its molecules could easily slide past each other when subjected to force. However, it may lack the hardness and rigidity seen in materials with stronger covalent bonds.
4. The strength of chemical bonds can influence the taste of a substance by affecting how easily its molecules can interact with taste receptors on the tongue. For example, table salt (sodium chloride) has strong ionic bonds, which means it dissociates into ions in the mouth easily, providing a distinct salty taste. In contrast, substances with weaker covalent bonds may not dissociate as readily, resulting in a milder taste or no taste at all. The strength of the bonds determines how effectively the molecules can interact with taste receptors and, thus, the perception of taste.

