

Name: _____ Date: _____

Answer Key: Bonding Forces and Molecular Geometry Quiz for Grade 10

Analyze 10 challenging prompts on electronegativity gradients, crystal lattice structures, and molecular polarity to strengthen chemical reasoning skills.

1. Which of the following substances relies on a 'sea of electrons' to maintain structural integrity while allowing for high thermal conductivity?

Answer: A) Titanium (Ti)

Metallic bonding in elements like Titanium involves delocalized valence electrons that move freely, facilitating the transfer of heat and electricity.

2. In a molecule of Hydrogen Chloride (HCl), the shared pair of electrons is pulled closer to Chlorine due to its higher _____.

Answer: B) Electronegativity

Electronegativity is the measure of an atom's ability to attract shared electrons in a chemical bond, leading to bond polarity.

3. True or False: Polyatomic ions are groups of covalently bonded atoms that carry an overall net electrical charge.

Answer: A) True

Polyatomic ions like Sulfate (SO_4^{2-}) consist of nonmetals bonded covalently, but the group as a whole has gained or lost electrons.

4. What is the primary reason that Ionic compounds like Aluminum Oxide have such high melting points compared to Covalent compounds like Nitrogen Dioxide?

Answer: C) Strong electrostatic attractions within a crystal lattice.

The three-dimensional crystal lattice of ionic compounds is held together by intense electrostatic forces between cations and anions, requiring significant energy to break.

5. A chemical bond formed when one atom provides both electrons for the shared pair is specifically known as a(n) _____ covalent bond.

Answer: C) Coordinate

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In coordinate (dative) covalent bonds, such as in the formation of the Ammonium ion, one atom donates both electrons to the bond.

6. True or False: The Nitrogen molecule (N₂) contains a double covalent bond to satisfy the octet rule for both atoms.

Answer: B) False

Nitrogen atoms have five valence electrons each and require three more to complete an octet, resulting in a triple covalent bond (three shared pairs).

7. Which molecule exhibits a non-polar geometry despite containing polar covalent bonds?

Answer: B) Carbon Tetrachloride (CCl₄)

In Carbon Tetrachloride, the individual C-Cl bond dipoles cancel out due to the symmetrical tetrahedral shape of the molecule.

8. According to VSEPR theory, the _____ of electron pairs around a central atom determines the final 3D shape of a molecule.

Answer: A) Repulsion

Valence Shell Electron Pair Repulsion (VSEPR) theory posits that electron pairs will arrange themselves as far apart as possible to minimize repulsion.

9. True or False: Metals are malleable because the metallic bonds are non-directional, allowing atoms to slide past each other without breaking the bond.

Answer: A) True

Unlike ionic crystals which shatter when shifted, the uniform sea of electrons in metals allows layers of atoms to shift while maintaining the bond.

10. If an atom of Barium (Group 2) reacts with an atom of Sulfur (Group 16), what is the most likely ratio of atoms in the resulting compound?

Answer: C) BaS

Barium forms a +2 ion and Sulfur forms a -2 ion; they combine in a 1:1 ratio to produce an electrically neutral compound.