Name: _____ **Date:** _____

Answer Key: Sticking Together: The 8th Grade Geometry of Atomic Bonds Quiz

Examine polyatomic patterns and lattice energy across 10 challenges focused on predicting molecular behavior and electron arrangement.

---

1. When considering the lattice energy of ionic compounds, which of the following substances would require the most energy to separate its ions, based on the charge and size of the ions involved?

Answer: B) Aluminum nitride (AlN)

Lattice energy increases with the charge of the ions. Aluminum (+3) and Nitride (-3) have much higher charges than the elements in the other options, creating a significantly stronger electrostatic attraction.

2. In a molecule of Nitrogen gas (N_2), the two atoms are held together by a _____ covalent bond to satisfy the octet rule.

Answer: C) Triple

Nitrogen has 5 valence electrons. To reach a stable octet of 8, each nitrogen atom must share three electrons with the other, resulting in a triple bond.

3. A polar covalent bond occurs when electrons are shared equally between two atoms of the same electronegativity.

Answer: B) False

Equal sharing creates a non-polar bond. Polar covalent bonds occur when one atom is more electronegative than the other, pulling the shared electrons closer to itself.

4. Which of the following best explains why metallic bonds allow metals like Silver (Ag) to be hammered into thin sheets without breaking?

Answer: B) The delocalized 'sea of electrons' acts as a flexible glue

In metallic bonding, valence electrons are not bound to any specific atom, allowing the metal cations to slide past one another under pressure while maintained by the electron 'sea'.

5. The _____ of an atom is a measure of its ability to attract shared electrons in a chemical bond.

Answer: D) Electronegativity

Name: _____ **Date:** _____

Electronegativity is the specific chemical property that describes the tendency of an atom to attract a shared pair of electrons towards itself.

6. Polyatomic ions, such as Sulfate (SO_4^{2-}), are groups of atoms held together by covalent bonds that function as a single charged unit.

Answer: A) True

Polyatomic ions consist of non-metals covalently bonded to each other, but the group as a whole has gained or lost electrons, giving it a net charge.

7. Which molecule contains a coordinate covalent bond, where one atom provides both electrons for the shared pair?

Answer: A) Carbon monoxide (CO)

In Carbon Monoxide, the oxygen atom contributes two of its own electrons to form the third bond with carbon to complete both octets, a classic coordinate bond.

8. Sulfur hexafluoride (SF_6) is an example of a molecule that has an _____ octet, because the central atom is surrounded by 12 electrons.

Answer: B) Expanded

Elements in Period 3 or below can sometimes accommodate more than 8 electrons in their valence shell using d-orbitals, known as an expanded octet.

9. If an element from Group 2 reacts with an element from Group 17, what is the most likely chemical formula of the resulting compound?

Answer: C) XY_2

Group 2 elements form +2 ions, while Group 17 elements form -1 ions. Two Group 17 ions are needed to balance the charge of one Group 2 ion.

10. The high boiling point of Ammonia (NH_3) compared to Phosphine (PH_3) is primarily due to the presence of hydrogen bonding.

Answer: A) True

Hydrogen bonding is a strong type of dipole-dipole attraction that occurs when hydrogen is bonded to N, O, or F. This requires more energy (heat) to overcome.