Name: _____ **Date:** _____

Answer Key: A Matter of Attraction: 7th Grade Atomic Matchmakers Quiz

Aspiring chemists will investigate how lithium-ion batteries and industrial catalysts rely on specific electron patterns to power our modern world.

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1. When an aluminum atom (Group 13) interacts with oxygen to form aluminum oxide, what primary action occurs to create an ionic bond?

Answer: B) Aluminum transfers three valence electrons to oxygen atoms.

Ionic bonds are defined by the transfer of electrons from a metal (aluminum) to a non-metal (oxygen), resulting in electrostatic attraction between the newly formed ions.

2. In a molecule of Nitrogen gas (N_2), the two atoms are held together by a _____ covalent bond because they must share three pairs of electrons to reach stability.

Answer: C) Triple

Nitrogen has five valence electrons and needs three more to complete its octet; therefore, two nitrogen atoms share six electrons (three pairs) to form a triple bond.

3. True or False: Metallic bonds are characterized by a 'sea of electrons' that allows metals like silver to conduct electricity and be hammered into thin sheets.

Answer: A) True

The delocalized nature of electrons in metallic bonding provides both conductivity (moving charges) and malleability (flexibility of the atomic lattice).

4. Why does Potassium Bromide (KBr) have a much higher melting point than a covalent substance like sugar?

Answer: B) KBr forms a rigid crystal lattice held by strong electrostatic forces.

The repeating 3D lattice structure of ionic compounds requires significant thermal energy to break the strong attractions between the positive and negative ions.

5. When atoms share electrons unequally, such as in a molecule of Hydrogen Chloride (HCl), it results in a _____ covalent bond.

Name: _____ **Date:** _____

Answer: B) Polar

A polar covalent bond occurs when one atom has a stronger pull on the shared electrons than the other, creating partial positive and negative charges.

6. Which of the following best describes the Octet Rule in the context of chemical bonding?

Answer: B) Atoms are most stable when they have eight electrons in their valence shell.

The Octet Rule is a chemical rule of thumb that reflects the observation that main-group elements tend to bond in such a way that each atom has eight electrons in its valence shell, mimicking a noble gas.

7. True or False: In a covalent bond, the atoms involved are typically two non-metals.

Answer: A) True

Covalent bonding usually occurs between non-metal atoms because they have similar electronegativities and 'share' rather than 'transfer' electrons.

8. A mystery substance is found to be brittle, has a high melting point, and conducts electricity only when dissolved in water. This substance most likely contains _____ bonds.

Answer: C) Ionic

Ionic compounds are brittle and non-conductive as solids, but when dissolved (electrolytes), their ions are free to move and carry an electric current.

9. If an atom of Lithium (1 valence electron) bonds with an atom of Fluorine (7 valence electrons), what is the resulting charge of the Lithium ion?

Answer: C) +1

Lithium loses its one negative electron to Fluorine. Losing a negative charge leaves the Lithium atom with a net charge of +1.

10. True or False: A molecule of Oxygen gas (O_2) is considered a polar covalent bond because the electrons are shared equally.

Answer: B) False

This is false; when two identical atoms share electrons (like O_2), the sharing is perfectly equal, making it a non-polar covalent bond.