Name: _____ **Date:** _____

Answer Key: Your Mission to the Octet: A Junior Chemist's Bonding Quest

Valence shell identification, electron transfer, and lattice stability — recall the fundamental forces that keep our physical world from falling apart.

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1. In the crystal lattice of Potassium Bromide (KBr), what force is primarily responsible for holding the structure together?

Answer: B) Electrostatic attraction between ions

Ionic bonds, like those in KBr, are formed by the strong electrostatic attraction between oppositely charged cations (K+) and anions (Br-).

2. An atom that loses an electron and takes on a positive charge is known as a(n) _____.

Answer: C) Cation

Cations are positively charged ions formed when a neutral atom loses one or more electrons, typically occurring with metals.

3. Noble gases like Neon rarely form chemical bonds because they already possess a stable octet of valence electrons.

Answer: A) True

Noble gases have full valence shells, making them chemically inert and unlikely to gain, lose, or share electrons under standard conditions.

4. Which of these substances would you expect to exhibit high electrical conductivity in its solid state due to a 'sea of electrons'?

Answer: A) Solid Silver (Ag)

Metallic bonding in silver involves delocalized electrons that are free to move throughout the lattice, allowing for high conductivity.

5. When two Nitrogen atoms combine to form N2, they share three pairs of electrons, creating a _____ bond.

Answer: C) Triple covalent

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A triple covalent bond involves the sharing of six electrons (three pairs) to satisfy the octet rule for both atoms.

6. Brittle materials that shatter when struck, such as Lithium Fluoride crystals, are typically held together by covalent bonds.

Answer: B) False

Brittleness is a hallmark of ionic compounds; when struck, like-charged ions align and repel each other, causing the crystal to shatter.

7. In a molecule of Hydrogen Chloride (HCl), the electrons are shared unequally. This type of bond is specifically called:

Answer: C) Polar covalent

A polar covalent bond occurs when there is an electronegativity difference between atoms, causing electrons to spend more time near one nucleus.

8. The tendency of atoms to prefer a valence shell with eight electrons is known as the _____ Rule.

Answer: B) Octet

The Octet Rule states that atoms lose, gain, or share electrons to achieve a full outer shell of eight electrons, resembling the electron configuration of a noble gas.

9. Which of the following elements is most likely to form an ionic bond with Sulfur?

Answer: C) Barium (Metal)

Ionic bonds typically form between a metal (which loses electrons) and a nonmetal (which gains electrons). Barium is the only metal in the list.

10. Double bonds represent the sharing of four total electrons between two atoms.

Answer: A) True

A double covalent bond consists of two shared pairs of electrons, totaling four electrons shared between the two bonding atoms.