

Name: _____ Date: _____

Dissect Molecular Ties: A 9th Grade Bonding Battle

Synthesize data on electronegativity and lattice energy to predict substance behavior in this high-stakes analytical challenge.

1. An unknown crystalline solid is found to be soluble in water, has a high melting point, and conducts electricity only when molten. Which interaction best describes the bonding in this substance?

- A. Non-polar covalent sharing of valence electrons
- B. Electrostatic attraction between a localized cation and an anion
- C. Delocalized sea of electrons surrounding positive kernels
- D. Intermolecular hydrogen bonding between discrete units

2. In a molecule of Nitrogen (N₂), the atoms are held together by a _____ covalent bond, which accounts for its high bond dissociation energy.

- A. Single
- B. Double
- C. Triple
- D. Quadruple

3. The polarity of a bond is determined solely by the total number of electrons shared between two atoms.

- A. True
- B. False

4. Examine the electronegativity values: H (2.1), C (2.5), O (3.5), F (4.0). Which of the following bonds exhibits the highest degree of ionic character?

- A. C-O
- B. H-F
- C. C-H
- D. O-F

5. The property of metals that allows them to be hammered into thin sheets without shattering is known as _____, facilitated by the non-directional nature of metallic bonds.

- A. Ductility
- B. Brittleness
- C. Viscosity
- D. Malleability

6. Which scenario would likely result in the formation of a coordinate covalent bond (dative bond)?

- A. Two chlorine atoms sharing one electron each to form Cl₂.
- B. An ammonium ion (NH₄⁺) forming when H⁺ bonds to the lone pair of NH₃.

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- C. Sodium transferring an electron to Fluorine.
- D. Carbon sharing four electrons with four separate Hydrogen atoms.

7. Lattice energy is the energy required to separate one mole of a solid ionic compound into its gaseous ions; higher lattice energy generally leads to higher melting points.

- A. True
- B. False

8. Why does Silicon Dioxide (SiO₂) have a much higher melting point than Carbon Dioxide (CO₂), despite both being in the same chemical family?

- A. SiO₂ forms a giant covalent network lattice, while CO₂ forms discrete molecules.
- B. Silicon is more electronegative than Carbon.
- C. CO₂ contains ionic bonds that are easily broken by heat.
- D. SiO₂ is held together by weak London dispersion forces.

9. The ____ rule suggests that atoms tend to gain, lose, or share electrons to achieve a stable configuration of eight valence electrons.

- A. Hund's
- B. Octet
- C. Aufbau
- D. Pauli

10. A metallic bond is characterized by a specific, directional attraction between one nucleus and two specific shared electrons.

- A. True
- B. False