**Name:** _____ **Date:** _____

## Bonding Battles: The Molecular Wrestling Federation for 11th Grade

Examine how electronegativity and orbital hybridization dictate the industrial strength of materials and the behavior of complex drugs.

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**1. In a molecule of Gallium Arsenide (GaAs), often used in high-frequency semiconductors, how should the bonding character be categorized based on the Pauling scale of electronegativity (Ga = 1.81, As = 2.18)?**

A. Purely ionic with full electron transfer
B. Predominantly covalent with significant polar character
C. Non-polar covalent due to minimal electronegativity difference
D. Metallic bonding through a delocalized lattice

**2. The extremely high melting point and hardness of Tungsten Carbide (WC), used in industrial cutting tools, is best explained because it forms a _____ lattice involving both covalent and metallic characteristics.**

A. simple molecular
B. giant covalent
C. interstitial alloy
D. van der Waals

**3. According to Valence Shell Electron Pair Repulsion (VSEPR) theory, the presence of lone pairs on the central atom in Sulfur Tetrafluoride (SF4) results in a perfectly symmetrical tetrahedral geometry.**

A. True
B. False

**4. Why does Aluminum Chloride (AlCl3) exhibit a high degree of covalent character despite being composed of a metal and a non-metal?**

A. Low electronegativity of Chlorine
B. Aluminum's high charge density polarizes the Chlorine electron cloud
C. Chlorine atoms undergo sp3 hybridization
D. The formation of a delocalized metallic 'sea' within the salt

**5. In the process of carbon steel production, carbon is added to iron to impede the movement of layers in the metallic lattice. This structural modification results in an _____ alloy.**

A. interstitial
B. substitutional
C. amorphous
D. ionic

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**6. Consider the molecule Boron Trifluoride (BF3). Which statement best describes its bonding status in terms of the octet rule and formal charge?**

A. It is hypervalent with twelve electrons around Boron
B. It is electron-deficient, leaving Boron with only six valence electrons
C. It forms three double bonds to stabilize the central atom
D. The formal charge on Boron is -1 while Fluorine is +1

**7. Diamond and Graphite are both allotropes of carbon, but Diamond is an insulator because its electrons are localized in sp3 hybrid orbitals, while Graphite conducts because of delocalized electrons in p-orbitals.**

A. True
B. False

**8. The strength of a chemical bond can be quantified by its 'bond order.' For the Nitrogen molecule (N2), the bond order is _____, which explains its extreme chemical inertness.**

A. one
B. two
C. three
D. four

**9. Which of the following compounds displays the highest lattice energy, as predicted by Coulomb's law of electrostatic attraction?**

A. LiF (Lithium Fluoride)
B. KCl (Potassium Chloride)
C. ScN (Scandium Nitride)
D. MgO (Magnesium Oxide)

**10. All polar molecules must contain polar bonds, and all molecules with polar bonds are invariably polar molecules.**

A. True
B. False