

### Bonding– Supplemental Worksheet

1. What are features of ionic compounds?

- 1) Composed of ions either elemental or polyatomic
- 2) Form large repeating structures of ions.
- 3) Typically a metal and a nonmetal (BUT NOT ALWAYS!!!!)
- 4) Resulting net charge = zero

2. What are the differences between ionic bonding and covalent bonding?

*In ionic bonding, we assume the electron(s) have fully “moved” from one element in a compound to another. In covalent bonding, electrons are “shared” but it is not always equal.*

3. Explain the cations and anions?

*A cation is a positively charged ion because it has “lost” an electron making it more positive. An anion is a negatively charged ion because it has “gain” an electron making it more negative.*

4. What is the net effect for forming an ionic bond? (i.e. sum of all “parts”)

- 1) Energy required to form cation, ionization energy for the element that lost an electron.
- 2) Energy gained by forming anion, electron affinity for the element gaining an electron.
- 3) Energy gained from bring the cation and the anion together, lattice energy.

5. True or False:

- a) Ionization of all elements is negative and therefore must be exothermic.
- b) Electron affinity is exothermic.
- c) Energy of crystallization and lattice energy have equal energies.

- a) FALSE. Ionization is positive and is endothermic.
- b) TRUE.
- c) FALSE. They are equal in magnitudes of energy but have opposite signs.

6. Place the following in order of smallest to largest ion?

- a)  $\text{Se}^{2+}$ ,  $\text{Sr}^{2-}$ ,  $\text{Br}^+$ ,  $\text{Rb}^-$
- b)  $\text{Cl}^-$ ,  $\text{I}^-$ ,  $\text{F}^-$ ,  $\text{Br}^-$

- a) The ion with the smallest nuclear charge is the largest ion.  $\text{Se}^{2+} < \text{Br}^+ < \text{Rb}^- < \text{Sr}^{2-}$
- b) Size increases down a group.  $\text{F}^- < \text{Cl}^- < \text{Br}^- < \text{I}^-$

7. What trend do we associate with bond length and strength?

*A shorter bond is typically stronger, and a longer bond is typically weaker.*

8. Explain electronegativity and describe what trends we find.

*Electronegativity is the ability of an atom in a molecule to attract shared electrons to itself. A higher electronegativity indicates a greater attraction for the element. The trend is similar to ionization energy. Electronegativity decreases from top to bottom and increases left to right.*

9. Predict the order of increasing electronegativity.

- a) S, Se, Cl
- b) Si, Ge, Sn
- c) B, Ga, O

- a)  $Se < S < Cl$
- b)  $Sn < Ge < Si$
- c)  $Ga < B < O$

10. Rank the following bonds in order of increasing ionic character: N-O, Ca-O, C-F, Br-Br, K-F.



11. What is a dipole moment? Explain polar versus nonpolar.

*A dipole moment is the measure of 2 charges separated by a particular distance. Polar molecules have large dipole moments, Nonpolar molecules have small or no dipole moments.*

12. Arrange the following bonds according to decreasing polarity: H-H, O-H, Cl-H, S-H, and F-H.

