Polar Bonds – Supplemental Worksheet

1. True or False:
   a) Electronegativity trends are similar to ionization energy. **TRUE**
   b) As the electronegativity of an element increases the attraction for a shared pair of electrons decreases. **FALSE. The element will have a stronger attraction for the shared pair of electrons. Elements assigned a lower electronegativity value have a relatively lower attraction for the shared pair of electrons than an element with a higher value**
   c) The ΔEN for a covalent bond must have a value > 2.2. **FALSE. A covalent bond has a small difference, large differences in electronegativity are ionic bonds. In general a rule of thumb is that ΔEN < 2.1 is considered covalent.**

2. For the following compounds identify what has partial positive and partial negative charges.
   a) HF
   b) H$_2$O
   c) HCl
   d) SO$_3$

3. Explain the difference between pure covalent bonds and polar covalent bonds.

   A pure covalent bond is an equal sharing of shared electron pairs in a bond; typically bonds are between 2 elements with identical electronegativities. A polar covalent bond is an unequal sharing of electron pairs in a bond that have different electronegativities but not large enough to be ionic bonds.
4. Label the bond in each of the following compounds

a) F$_2$  
   Pure (Nonpolar) Covalent. $\Delta EN$ equals 0.

b) HF  
   Polar covalent. $\Delta EN$ equals 1.9

c) KCl  
   Ionic. $\Delta EN$ equals 2.2

d) CuS  
   Polar covalent. $\Delta EN$ equals 0.6

5. Which of the following compounds have dipole moments? For those that are not, explain why.

a) HCl  
   Polar bond, dipole moment due to orientation.

b) Br$_2$  
   Pure covalent. No dipole moment because no bond polarity occurs.

c) H$_2$Se  
   Polar bond, dipole moment because of bent shape, forces do not cancel out.

d) CCl$_4$  
   Polar bond, but no dipole moment because tetrahedral shape causes forces to cancel out.

6. True or False:

a) Large dipole moments are non-polar, small dipole moments are polar.  
   **FALSE. Large dipole moments are polar, and small dipole moments are non-polar.**

b) Hydrogen’s electronegativity acts similar to phosphorus because they have the same electronegativity.  
   **FALSE. Hydrogen’s electronegativity acts nearly identical to carbon.**

c) $\delta^+$ means that the electron spends more time with the element labeled $\delta^-$.  
   **TRUE.**