Dipoles and Bond Polarity

Go to www.phet.colorado.edu and search for the “Molecule Polarity” simulation

Use this screen to answer the following questions:

1. Change the electronegativities of both A and B. Which direction does the arrow for the bond dipole point?

2. What do you notice about the length of the arrow for the bond dipole as you change the electronegativities?

3. Click on the box for “Electron Density”. What do you notice about the dispersion of electrons when...
   a. The 2 atoms have the same electronegativity values.
   
   b. The 2 atoms have different electronegativity values.

4. Click on the box for “Partial Charges”. What do you think the “δ” represents?
   
   a. Which side of the molecule ends up being slightly negative?
5. Explain how the bond dipole is different from the molecular dipole.

6. Compare the molecules H₂ and HF.
   a. How are they similar?
   b. Which one has a molecular dipole?
   c. Which molecule is nonpolar?
   d. Which molecule is polar?
   e. What makes them different?
7. Compare the molecules CH$_2$F and CH$_4$.
   a. How are they similar?
   b. Which one has a molecular dipole?
   c. Which molecule is nonpolar?
   d. Which molecule is polar?
   e. What makes them different?

8. Compare the molecules H$_2$O and CO$_2$.
   a. How are they similar?
   b. Which one has a molecular dipole?
   c. Which molecule is nonpolar?
   d. Which molecule is polar?
   e. What makes them different?

9. Compare the molecules BH$_3$ and NH$_3$.
   a. How are they similar?
   b. Which one has a molecular dipole?
   c. Which molecule is nonpolar?
   d. Which molecule is polar?
   e. What makes them different?

10. Examine HCN. Is the molecule polar or nonpolar?
    a. Which atom has the higher density of electrons, N or H?

11. Determine a rule for determining if a molecule is polar or nonpolar.