Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Molecular Polarity Lab

<https://goo.gl/zQkLwf>

*Go to the website listed above. Click the play symbol on the simulation.*

**Part 1: Two Atom Investigation**

* Click the keep the box for bond dipole checked and check the boxes to show the partial charges and the bond character
* Keep the electronegativity of A at low and increase and decrease the electronegativity of atom B. Observe the arrow, partial charge and bond character. Fill in the following observation

As the electronegativity of atom B increases the...

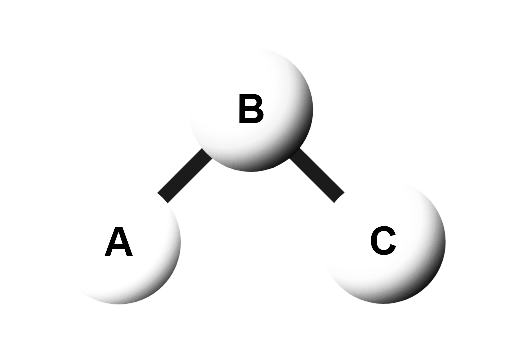
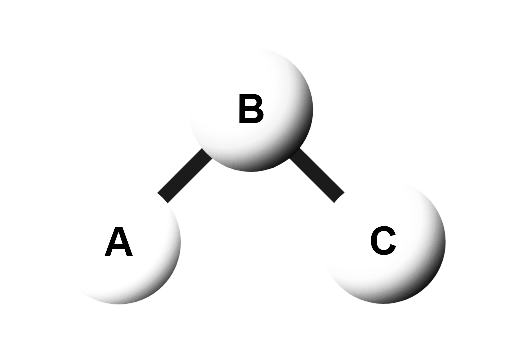
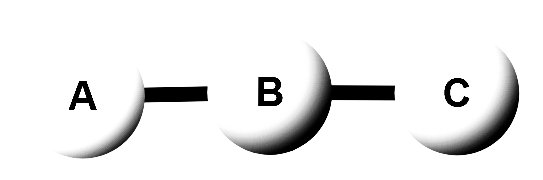
arrow \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
 partial charges \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
 bond character \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

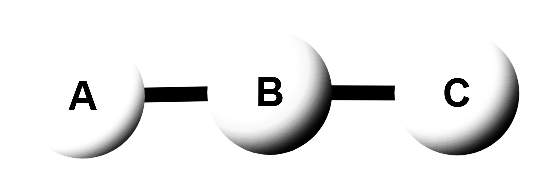
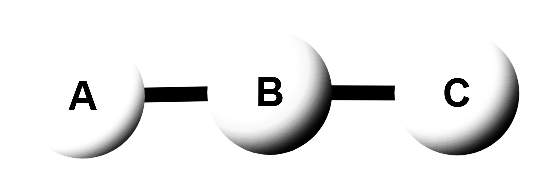
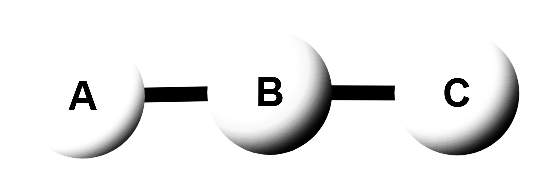
* Now put the electronegativity for A to the middle and vary the electronegativity of B and observe the results.

Fill in the following information.

* The polarity arrow always points to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electronegative atom.
* The partial positive charge is always on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electronegative atom.
* The larger the electronegativity difference the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the bond character.

**Part 2: Three atom Investigation**

* Keep the original “bent” arrangement of atoms and set the electronegativities of A and C to low and B to middle. Click to show the bond dipoles, molecular dipoles and partial charges. 
  + Draw the bond dipoles on the bonds in the diagram
  + In a different color show the overall molecular dipole in the diagram
  + Draw the partial charge symbols in another color in the diagram.
  + Click the electric field on. Describe what happened to the molecule - be very specific.
* Click the reset button.  Keep the “bent” arrangement of atoms and set the electronegativities of A and C to high and B to middle. Click to show the bond dipoles, molecular dipoles and partial charges. 
  + Draw the bond dipoles on the bonds in the diagram
  + In a different color show the overall molecular dipole in the diagram
  + Draw the partial charge symbols in another color in the diagram.
  + Click the electric field on. Describe what happened to the molecule - be very specific.
* Click the reset button.  Change the arrangement of atoms to a “linear” arrangement (see below) and set the electronegativities of A and C to high and keep B to middle. Click to show the bond dipoles, molecular dipoles and partial charges. 
  + Draw the bond dipoles on the bonds in the diagram
  + In a different color show the overall molecular dipole in the diagram
  + Draw the partial charge symbols in another color in the diagram.
  + Click the electric field on. Describe what happened to the molecule - be very specific.

* Take off the electric field. Rotate the molecule to keep the “linear” arrangement (see below) and set the electronegativities of A to high, keep B to middle and set C to low. Click to show the bond dipoles, molecular dipoles and partial charges. 
  + Draw the bond dipoles on the bonds in the diagram
  + In a different color show the overall molecular dipole in the diagram
  + Draw the partial charge symbols in another color in the diagram.
  + Click the electric field on. Describe what happened to the molecule - be very specific.
* Take off the electric field. Rotate the molecule to keep the “linear” arrangement (see below) and set the electronegativities of A and C to low and keep B to middle and set C to low. Click to show the bond dipoles, molecular dipoles and partial charges. 
  + Draw the bond dipoles on the bonds in the diagram
  + In a different color show the overall molecular dipole in the diagram
  + Draw the partial charge symbols in another color in the diagram.
  + Click the electric field on. Describe what happened to the molecule - be very specific.
* Take off the electric field. Rotate the molecule to keep the “linear” arrangement (see below) and set the electronegativities of A, Band C to middle. Click to show the bond dipoles, molecular dipoles and partial charges. 
  + Draw the bond dipoles on the bonds in the diagram
  + In a different color show the overall molecular dipole in the diagram
  + Draw the partial charge symbols in another color in the diagram.
  + Click the electric field on. Describe what happened to the molecule - be very specific.

**Summary**

Summarize what you learned by answering the following questions.

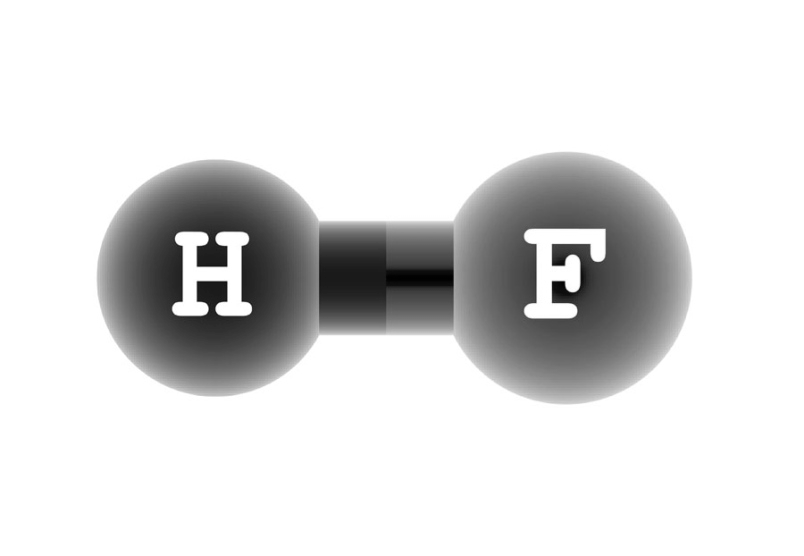
1. Which way do the bond arrows point?
2. Can a molecule have bond dipoles but not have a molecular dipole? Explain.
3. What happens when a molecule with a dipole is put in an electric field? Be specific.

**Part 3: Real Examples**

You will now apply what you learned to real molecules. The real molecules does not work on the simulation so just apply what you know.

HF - The ball and stick structure for HF is shown. Answer the following and do what is asked

* Which atom is more electronegative? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Draw a bond polarity arrow (bond dipole)
* Draw the partial charges on the molecule
* Would you expect this to move in an electric field? Draw it in the field provided.

H2O - The ball and stick structure for H2O is given. Answer the following and do what is asked.

* Which atom is more electronegative? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Draw a bond polarity arrow (bond dipole)
* Place partial charges on the molecule
* In a different color draw a molecular dipole arrow.
* Would you expect this to move in an electric field? Draw it in the field provided.

CO2 - The ball and stick structure for CO2 is given. Answer the following and do what is asked.

* Which atom is more electronegative? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Draw a bond polarity arrow (bond dipole)
* Place partial charges on the molecule
* In a different color draw a molecular dipole arrow.
* Would you expect this to move in an electric field? Draw it in the field provided.

