# Molecular Polarity Vs. Bond Polarity Lab – Part A

Name _____ Period/Block _____ Date _____

The polarity of a bond and the polarity of a molecule are two different but related topics. A nonpolar covalent bond is a bond in which the electronegativity difference between the bonded atoms is less than 0.5. A polar covalent bond is a bond in which the electronegativity difference between the bonded atoms is 0.5-1.8. The polarity of the bond **and** the shape of the molecule determine the polarity of the molecule. Shapes that have lone pairs on the central atom are always polar molecules.

NOTE:

- If a molecule has **only** nonpolar bonds in it, it will be a nonpolar molecule.
- If a molecule has polar bonds in it, it can be a polar **or** a nonpolar molecule.
    - If the molecule is symmetrical (all atoms bonded to the central atom are the same) it will be nonpolar.

Complete the chart below. You may use the model sets.

| Bond | Electronegativity Difference (SHOW WORK) | Polar or Nonpolar Bond? | Molecule | Lewis Structure | Shape Name | Polar or Nonpolar Molecule? |
|---|---|---|---|---|---|---|
| Nitrogen bonded to nitrogen | | | $N_2$ | | | |
| Nitrogen bonded to fluorine | | | Nitrogen trifluoride | | | |
| Hydrogen bonded to chlorine | | | HCl | | | |
| Carbon bonded to sulfur | | | Carbon Disulfide | | | |
| Carbon bonded to bromine | | | $CBr_4$ | | | |

# Molecular Polarity Vs. Bond Polarity Lab – Part B

**Purpose:** to understand the shapes of molecules and how those shapes affect the properties

**Procedure:**

1. Draw the Lewis Structure for each molecule.
2. Use the model set to build the molecules.
    a. Balls represent atoms, and springs/sticks represent bonds.
    b. Colors: carbon is black, oxygen is red, hydrogen is white (or yellow), halogens are green
3. Sketch the molecule that you built.
4. Determine the shape(s) present in the molecules. Look at **each** central atom to help you do this.
5. Determine the polarity of each molecule. <u>(For small molecules like those listed below. if the molecule has a polar and a nonpolar shape in it, the molecule is polar molecule.)</u>

| Molecule | Lewis Structure | Drawing | Shape Name(s) | Polar Molecule? |
|---|---|---|---|---|
| $O_2$ | | | | |
| $H_2O$ | | | | |
| $H_2O_2$ | | | | |
| $CH_3OH$ | | | | |
| $C_2H_6$ | | | | |

**Questions.** Answer the following on a **<u>separate</u>** paper. **Provide complete answers.**

1. Is oxygen a solid, liquid, or gas at room temperature? Does it have a very high melting (and boiling point) or a very low melting (and boiling point)? Why? Provide a full explanation.
2. Would you expect methanol, $CH_3OH$ to be soluble in water? Why?/Why not? Provide a full explanation.
3. $H_2O_2$ and $C_2H_6$ have similar molar masses. One is a liquid at room temperature is a gas at room temperature. Which is which? Provide a full explanation.
4. Vaseline is a nonpolar compound that is a soft solid at room temperature. What can you ascertain about its molar mass?
5. Label the following as ionic compound, polar molecule, or nonpolar molecule. Explain why.
   a.) Sugar b.) oil c.) brick d.) plastic