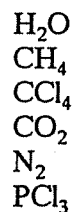


## Model Building of Covalent Compounds

Using ball and stick model kits, build models of the following molecules, and show the shape of each molecule.



Use the hints below to help build the models.

Determine the color ball to use for each atom by the number of electron pairs needed around that atom. (For example carbon often has 4 pairs of electrons so use a ball with 4 holes.)

Single bonds and **lone pairs** are represented by sticks. (The lone pairs must be shown to understand the shape of the molecule.)

Double and triple bonds are represented by 2 or 3 springs.



**Questions:**

1. Compare the molecule of  $\text{CH}_4$  to  $\text{CF}_4$ . What shape is each molecule? Do the lone pairs on the atoms **other** than the central atom (the carbon atom) change the shape of the molecule?
2. What is the shape of the carbon dioxide molecule? \_\_\_\_\_  
How do double and triple bonds seem to function in terms of shape?
3. Which of the six molecules have polar bonds? (Use electronegativity difference.) What is the direction of polarity (the negative pole.)
4.  $\text{PCl}_3$  has properties of a polar compound. Would you expect that? \_\_\_\_\_  
 $\text{CO}_2$  has properties of a nonpolar. Would you expect that? \_\_\_\_\_  
  
Look at the shape of the molecules and direction of polarity. Why do you think  $\text{CO}_2$  might be nonpolar as a molecule?
5. Based on shape, do you think any other molecules that you built have polar bonds, but a non-polar molecule? (have non-polar properties) Explain.
6. Some of these molecules conduct when dissolved in water? Which ones are they and why?

## Model building: Part II

Just because a compound has polar bonds doesn't mean that the molecule behaves as a polar molecule. (Benzoic Acid has polar bonds, but was not soluble in water; a nonpolar characteristic.) Look at [http://www.mpcfacyty.net/mark\\_bishop/molecular\\_polarity.htm](http://www.mpcfacyty.net/mark_bishop/molecular_polarity.htm)

Draw an electron dot structure for each substance listed below. Then build a model of the molecule and describe its shape and how that affects the polarity.

Compound	Electron Dot Diagram	Drawing of Model	Shape of Molecule	Polarity of Molecule
$\text{SiBr}_4$				
$\text{SO}_3$				
$\text{AsCl}_3$				
$\text{CCl}_2\text{O}$				
$\text{SeH}_2$				

How does shape effect the polarity of molecules (not individual bonds, but the molecule overall)?

## Model building: Part III

Often the way a formula is written gives clues to the arrangement of atoms in the molecule. For example, the formula  $C_2H_6O$  can be written:

	$CH_3CH_2OH$	$CH_3-O-CH_3$
Electron Dot Diagram		
Drawing Of Model		

1. These two compounds are called **isomers**. Look at the formulas and the models.

What is the same about the two compounds? \_\_\_\_\_

What is different about the two compounds? \_\_\_\_\_

2. Only one of these compounds is polar. Which one and why?
3. Build a model and sketch hexane ( $CH_3CH_2CH_2CH_2CH_2CH_3$ ).
4. Is hexane polar? Explain.
5. Make an isomer of hexane and sketch the model.