

**Lab #3: Molecular Shapes****Objectives:**

1. To become familiar with the three-dimensional shapes of molecules and polyatomic ions.
2. To draw electron-dot structures for simple molecules and polyatomic ions.
3. To build molecular models from electron-dot structures drawn and applying VSEPR model.
4. To predict the polarity of a molecule from its molecular shape.

**Pre-lab:**

Draw the electron dot structures (Lewis Diagram) for the molecules in the observation table. Show all your work. Indicate the number of effective electron pairs and the number of lone pairs around the central atom.

**Materials:**

Molecular Model Kit

**Procedure:**

1. From the electron dot structures drawn in the pre-lab section and applying VSEPR model, build the three-dimensional structure of the molecules or polyatomic ions using either the Molecular Model Kit.
2. Draw (using —, —, —, and indicate lone pairs) the three-dimensional structures built.
3. Name the three-dimensional structures built.
4. Determine if the molecule is polar or non-polar for each of the molecule.

**Observations:**

	<b>Compounds or Ions</b>	<b>Electron-Dot Structures (Lewis Diagram) (# of eff <math>e^-</math> pair and # of lone pair around central atom)</b>	<b>Sketch of 3-D Model</b>	<b>Name of Shape</b>	<b>Polar or Non-polar</b>
1.	HCl				
2.	SiH <sub>4</sub> (use black ball for Si)				
3.	PH <sub>3</sub> (use blue ball for P)				
4.	O <sub>3</sub> (use black ball for central atom)				

5.	HCN				
6.	CH <sub>3</sub> F				
7.	H <sub>2</sub> O <sub>2</sub>				
8.	CO <sub>3</sub> <sup>2-</sup>				
9.	H <sub>2</sub> S (use red ball for S)				
10.	SO <sub>2</sub> (use a black ball for S)				
11.	CH <sub>2</sub> O				
12.	PCl <sub>5</sub> (use white balls for Cl & brown ball for P)				
13.	SCl <sub>4</sub> (use white balls for Cl & brown ball for S)				
14.	IF <sub>2</sub> <sup>-</sup> (use white balls for F & a brown ball for I)				

15.	SF <sub>6</sub> (use white balls for F & a grey ball for S)				
16.	BrF <sub>5</sub> (use white balls for F and a grey ball for Br)				
17.	XeCl <sub>4</sub> (use white balls for Cl & a grey ball for Xe)				
18.	BrCl <sub>3</sub> (use white balls for Cl & brown ball for Br)				

**Analysis:**

1. Explain the polarity by showing all bond dipoles of each molecule from the observation table.
2. Three of the compounds from the observation table have their boiling points listed below. Account for the differences in these boiling points.

Molecule	Boiling Point
CH <sub>3</sub> F	-78°C (195 K)
H <sub>2</sub> O <sub>2</sub>	150°C (423 K)
SiH <sub>4</sub>	-107°C (166 K)

**Conclusion:**

Summarize what you have learned from this lab.