**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Molecular Models Activity and Reporting Sheet**

**Instructions:** Work in pairs with the models everyone although each person will complete their own reporting sheet. **Construct models of each of the following molecules.** Draw Lewis electron dot formulas of each (make sure you include all necessary electrons in the structure!) and then draw their structural formulas, showing the three dimensional geometry. (A line indicates a shared electron pair, 2 dots a lone pair.) The handout from class will help you determine the bond angles and name of the shapes.

1. Lewis structures that obey the octet rule.

Methane (CH4)

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the shape of this molecule? What is the H-C-H angle?

f. Is CH4 polar? Explain.

Ammonia (NH3)

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the shape of this molecule? What is the approximate H-N-H angle?

f. Is NH3 polar? Explain.

Carbon dioxide (CO2)

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the molecular geometry of the molecule? What is the bond angle?

f. Is CO2 polar? Explain.

Formaldehyde (CH2O - carbon is central atom)

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains are around the central atom?
4. How many nonbonding domains?
5. What is the molecular geometry of the molecule?
6. What is the approximate bond angle of H-C-O?
7. Is CH2O polar? Explain.

Chloromethane (CH3Cl)

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains are around the central atom?
4. How many nonbonding domains?
5. What is the geometry of the bonds around the central atom?

f. Is CH3Cl polar? Explain.

Water (H2O)

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the molecular geometry of water?
6. What is the approximate bond angle?

g. Is H2O polar? Explain.

2. Using the molecules of water and ammonia (prepared above), remove one of the **protons** from the water and insert that proton on the unshared electron pair of the ammonia.

a. What two species are produced?

b. Write the equation for the reaction represented.

The rest of the structures include central atoms that do not follow the octet rule; they require expanded octets. **To make 3D models for these, you must use a center atom that has 5 or 6 holes.**

3. Phosphorus can bond with up to five atoms or groups (e.g. PF5). Draw the Lewis dot structure and 3D shape of PF5.

1. Draw the Lewis Dot Structure and 3D Shape (construct the model):
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the molecular geometry of this molecule?

f. What are the two possible F-P-F bond angles?

g. Is PF5 polar? Explain.

4. Sulfur tetrafluoride

1. Draw the Lewis Dot Structure and 3D Shape (construct the model—think carefully about what central atom you should use! — the central atom needs to be able to accommodate all electron domains).
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the molecular geometry of this molecule?

f. Is sulfur tetrafluoride polar? Explain your reasoning.

5. Sulfur Hexafluoride

1. Draw the Lewis Dot Structure and 3D Shape (construct the model—think carefully about what central atom you should use!):
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the molecular geometry of this molecule?

f. Is sulfur hexafluoride polar? Explain your reasoning.

6. Xenon tetrafluoride

1. Draw the Lewis Dot Structure and 3D Shape (construct the model—think carefully about what central atom you should use!)
2. How many electron domains are around the central atom?
3. How many bonding domains?
4. How many nonbonding domains?
5. What is the molecular geometry of this molecule?

f. Is xenon tetrafluoride polar? Explain your reasoning.