**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Molecular Models Lab**

Guiding Question: What factors or properties determine the shapes of various covalently bonded compounds?

Pre-Lab Questions:

1. What is the main difference between an atom and a molecule?
2. How many electrons are shared in a single bond? \_\_\_\_\_ A double bond? \_\_\_\_\_\_ A triple bond? \_\_\_\_\_
3. Based on valence electrons, how many times can carbon bond?\_\_\_\_\_ Nitrogen?\_\_\_\_\_ Oxygen?\_\_\_\_\_\_
4. **Prediction**: Will all compounds that contain three atoms have the same shape?

**Reasoning:**

Procedure:

1. Obtain a molecular models building set. Identify the different types of atoms based on the number of holes they have. Complete the chart below; indicating which colors can be used for different elements.
2. Fill in the second chart, which includes places to record Lewis dot structures of the molecules listed below, as well as their shape, a diagram of the model you will construct, and their molecular polarity. You should use the springs when constructing multiple covalent bonds.

| **Color** | **Atom** | **Color** | **Atom** |
| --- | --- | --- | --- |
| Green (1 hole) |  | Red (2 holes) |  |
| Orange (1 hole) |  | Blue (4 holes) |  |
| Yellow (1 hole) |  | Black (4 holes) |  |
| Purple (1 hole) |  |  |  |

**Data**

| **Molecule** | **Lewis Diagram** | **Drawing**  **(In color)** | **Shape**  **(Linear, Bent, Pyramidal, Tetrahedral?)** | **Polarity**  **(P or NP?)** |
| --- | --- | --- | --- | --- |
| Hydrogen  (H2) |  |  |  |  |
| Water  (H2O) |  |  |  |  |
| Methane (CH4) |  |  |  |  |
| Chlorine  (Cl2) |  |  |  |  |
| Ammonia (NH3) |  |  |  |  |
| Hydrofluoric Acid (HF) |  |  |  |  |
| Ethylene (C2H2) |  |  |  |  |
| Nitrogen  (N2) |  |  |  |  |
| Carbon Dioxide  (CO2) |  |  |  |  |
| Oxygen  (O2) |  |  |  |  |
| Hydrogen Sulfide  (H2S) |  |  |  |  |
| Dibromo methane  CH2Br2 |  |  |  |  |
| Carbon tetrachloride  (CCl4) |  |  |  |  |

Analysis Questions:

1. How many unshared pairs are present in a molecule of O2?
2. How many shared pairs are present in a molecule of C2H2?
3. Are all linear molecules polar? Give an example to support your answer.
4. Are all tetrahedral molecules nonpolar? Give an example to support your answer.
5. Construct a **claim** that supports or contradicts the prediction made in the pre-lab questions.
6. Provide **evidence** that supports your claim. Use your **reasoning** skills to explain why your evidence is relevant.