

Ms. Randall

Regents Chemistry (adapted from Evan Silberstein)

Lab Activity: Three Dimensional Models of Covalent Molecules

**Background:**

When learning how to draw structural formulas it is difficult to visualize the actual geometry or shape of the molecule when it is drawn on paper. When you draw a molecule on paper, you are only seeing a 2 dimensional representation of it. Molecular model kits allow you the opportunity to gain a more accurate perception of a molecule's actual geometry in three dimensions.

**Objective:**

- To use Lewis diagrams to predict the molecular formulas of covalent compounds
- To build a structural model for given covalent compounds (molecules).
- To describe the molecular shape and polarity for given molecules.

**Equipment and Materials**

Pencil

Molecular model kit

**Model Kit color codes**

Black = Carbon

Yellow = Hydrogen

Green = Halogens (Cl, F, Br)

Blue = Nitrogen

Red = Oxygen/Sulfur

wooden stick = single bond

use springs for double and triple bonds

**Procedure:**


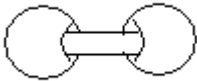
*Carefully reading ALL directions will help you to avoid making common mistakes. \*\*\*\*Note: Use pencil for the drawings!!!!\*\*\*\**

1. Draw the Electron Dot Diagram and structural formulas for each molecule. Draw it in a table in your lab notebook.

H<sub>2</sub>S, CH<sub>4</sub>, F<sub>2</sub>, NH<sub>3</sub>, HBr, N<sub>2</sub>, O<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, CO<sub>2</sub>, H<sub>2</sub>O<sub>2</sub>

2. Use the colored "atoms" and wooden connectors to "build" each molecule on the following table. Use the wooden connectors for single bonds and use the spring connectors for double and triple bonds.
3. Sketch the model and describe the shape and polarity of each molecule.

**Data:**

	Formula	Electron Dot Diagram representing molecular formula	Structural formula	3D sketch of molecule Molecular Shape Molecule polarity
1	H <sub>2</sub>		H—H	 Linear Non polar

**Analysis:**

1. How is the formation of a covalent bond different from ionic bonds?
2. What is a double bond and what is a triple bond?
3. What is the octet rule and how does it related to bonding?
4. List the compounds from this lab that contained double and triple bonds.

Bond Type	Compounds
Double bond(s)	
Triple Bond(s)	

5. What is an obvious way to know a molecule is non-polar? List 4 examples of non-polar molecules from this lab.

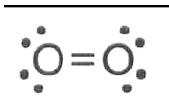
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Lab Conclusion: Three Dimensional Models of Covalent Molecules

1. Write a paragraph summarizing what you have learned about the scientific concept of the lab from doing the lab. Back up your statement with details from your lab experience

2. Given a formula for oxygen:



What is the total number of electrons shared between the atoms represented in this formula?

- A) 1                                      B) 2                                      C) 8                                      D) 4
3. Which type of bonding is found in all molecular substances?
- A) Covalent bonding                                      B) hydrogen bonding  
C) Ionic bonding    D) metallic bonding
4. Why is a molecule of CO<sub>2</sub> nonpolar even though the bonds between the carbon atom and the oxygen atoms are polar?
- A) The shape of the CO<sub>2</sub> molecule is symmetrical.  
B) The shape of the CO<sub>2</sub> molecule is asymmetrical.  
C) The CO<sub>2</sub> molecule has a deficiency of electrons.  
D) The CO<sub>2</sub> molecule has an excess of electrons.

5. Which structural formula represents a polar molecule?

