Chemistry 3A

Introductory General Chemistry

Experiment 6a

Molecular Modeling

Mitch Halloran

Fresno City College

Introduction

- Molecules which include polyatomic ions can be represented with Lewis structures and ball-and-stick models
- A difference between Lewis structures and the ball-and-stick models is that latter can show molecular geometry
- This experiment will
  - Use ball and stick to represent molecules three-dimensionally
  - Use electron dot Lewis structures to represent molecules two-dimensionally

Background

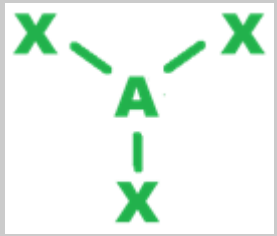
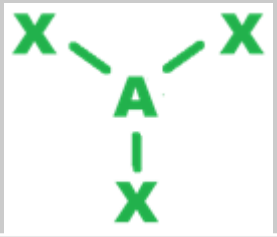
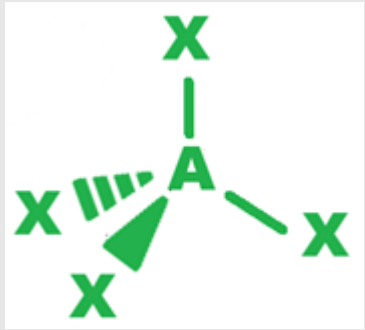
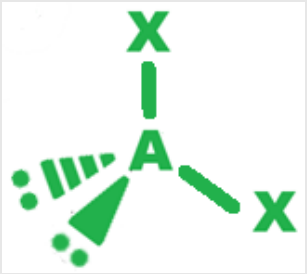
- Model kits will build molecules in 3-D with balls of different colors for different atoms, and gray connectors
  - Single bonds have short, rigid connectors
  - Double & triple bonds have longer flexible connectors

Table 1: Model Kit Composition

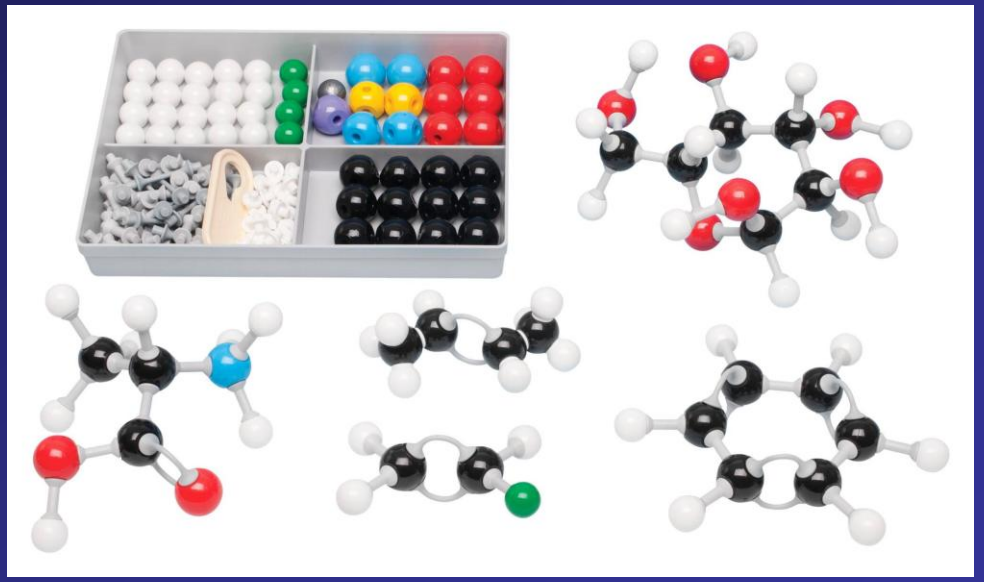
Color	*Element*	*# holes*	*#/kit*
white	hydrogen	1	4
black	carbon	4	3
red	oxygen	2	2
green	chlorine	1	2
orange	bromine	1	2
purple	iodine	1	2
blue	nitrogen *	3	2

Figure 1. Models showing a single bond (left) and a double bond (right)

Shape Summary

# of Electron Groups	Electron Group Symmetry	Ideal Bond Angle	Molecular Geometry		
			0 lone pairs	1 lone pair	2 lone pairs
2	Linear 	180°	Linear 		
3	Trigonal Planar 	120°	Trigonal Planar 	Bent 	
4	Tetrahedral 	109.5°	Tetrahedral 	Trigonal Pyramidal 	Bent 

Equipment You Will Use



Procedure

Drawing Lewis Structures First

1. A table with 10 rows representing 10 different molecules will have the Lewis structure drawn first in the lab report
2. Using the molecular model kit, use the correct colored ball and connectors to construct what Lewis structure shows
3. Use colored pencils to sketch the model and color it in in lab report
4. Count electron groups and indicate the geometry of electron groups and molecule. Use appropriate terms to indicate geometry

Procedure

Constructing Molecular Models First

1. A table with 8 rows representing 8 different molecules requires the construction of molecules using modeling kit
2. Complete the lab report with a sketch of molecule from kit components, indicate valence electrons, draw Lewis dot structure
3. Indicate number of electron groups, the geometry of electron groups, and geometry of molecule

Procedure

Unknown Molecules

1. Models of five molecules will be presented
2. For each, there are entries to be made in the lab report as follows:
   a. Sketch the model with colored pencils
   b. Determine valence electrons
   c. Draw the Lewis structure
   d. Enter the chemical formula in the 1st column

Clean Up

- Return parts to modeling kits
- Organize colored pencils back in storage containers