Tutorial 9: Lewis Structures, Electron Pair Geometry, and Molecular Geometry

Goals:

- ✓ To be able to draw 2-D representations of molecular compounds (Lewis structures).
- ✓ Understand the 3-D shape (molecular geometry) of molecular compounds.

Drawing Lewis Structures

1. Add up all of the valence electrons for the atoms involved in bonding

2. Write the symbols for the elements and show connectivity with single bonds (remember that a single bond had 2 electrons being shared).
   a. The central atom is typically the one there is only one of or the fewest of.
   b. If there is one of several atoms, they will usually be written in order.
   c. H is ALWAYS terminal

3. Complete the octet for the atoms bonded to the central atom (NOT FOR HYDROGEN).

4. Place the leftover electrons on the central atom.

5. If octet is not satisfied on the central atom then form double or triple bonds as needed.

NOTE: There are many exceptions to the octet rule, but that is a more advanced topic and will not be considered here.

Molecular Shape (Geometry)

VSEPR Theory: The repulsions between electrons will result in the placement of electron pairs (bonding or lone pairs) as far apart as possible in 3-D space. This causes molecules to take on very predictable shapes.

Number of bonds	***Number of lone pair electrons***	***Electron pair geometry***	***Molecular geometry***
2	*0*	*linear*	*linear*
3	*0*	*trigonal planar*	*trigonal planar*
2	*1*	*trigonal planar*	*bent*
4	*0*	*tetrahedral*	*tetrahedral*
3	*1*	*tetrahedral*	*pyramidal*
2	*2*	*tetrahedral*	*bent*