How to draw Lewis structures

1. Determine the number of valence electrons that each atom has to contribute. Add them together. This is the total number of electrons that must be present in the final Lewis structure (bonds + lone pairs of electrons). If you are working with an ion, add (for negative ions) or subtract (for positive ions) the appropriate number of electrons.
2. Arrange the atoms so that the *least* electronegative atom is in the center.
3. Connect atoms through bonds. A bond counts for two electrons.
4. Add electrons to the outer atoms so that they have a complete octet. (If the atom is an H, don’t add any electrons as it already has a complete shell.) Remember that the electrons in the bond are shared, so they contribute two electrons to each atom.
5. Place any remaining electrons on the center atom.
6. Check to see if center atom has a complete octet. If it has fewer than 8 electrons\*,

take a lone pair away from an outer atom and use it to create a double bond with the central atom. Repeat this process if necessary to make a complete octet.

Some patterns you will see in correct Lewis structures:

Halogens usually have 1 bond.

Oxygen usually has 2 bonds.

Nitrogen usually has 3 bonds.

Carbon usually has 4 bonds

Hydrogen can only have one bond!

Oxyacids (acids that contain oxygen (like H2SO4)) always have a hydrogen attached to one or more oxygen atoms.

**The Exceptions (Not really exceptions if you work in Inorganic chemistry)**

Odd number of electrons: Common in very reactive compounds (NO, NO2)

Less than the octet of valance electrons: Typical for boron, only 6 electrons in shared for these compound.

Expanded octet (more than the octet of valance electrons): There are specific exceptions to the octet rule. This occurs in elements in the 3rd period (row) of the periodic table and beyond due to the empty d orbital available for bonding. Ex: Phosphorus in is the 3rd period and has and available 3s, 3p, and 3d orbital; whereas Carbon in the 2nd period only has a 2s and 2p available for bonding.

The validity of Lewis structures is determined by finding the structure(s) that has (have) the least separation of formal charge.

**Formal charge:** *Formal charge is not the same as oxidation state!*

Formal charge is the difference between the number of valence electrons on the free atom and the number of valence electrons assigned to the atom in a molecule. In assigning electron to an atom in a molecule, the following rules are followed:

1. Electrons in lone pairs on an atom belong to the atom.
2. Shared electrons are divided equally between the two sharing atoms.

Formal charge patterns: An oxygen with only one bond will have a -1 formal charge.

A nitrogen with 4 bonds will have a +1 formal charge.