**A guide to Lewis dot structures, polarity & formal charge**

**Steps for writing Lewis dot structures:**

Use a periodic table to determine the number of valence electrons in each atom.

1. Using the molecule’s formula, sum all valence electrons for all atoms in the structure, including charge.

* Add an electron for each negative charge and subtract one for each positive charge.

2. Write atomic symbols and connect each with one line.

* When there are not multiple copies of atoms, write them left to right as shown in the formula.
* When there are multiple copies of atoms, place the single atom in the center and surround them, symmetrically, with the repeated atoms.
* When the molecule that contains carbon, carbon should be at the center of the molecule.
* Remember that each bond (or line) is two valence electrons.

3. Use the remaining valence electrons to complete the octets of peripheral atoms (those connected to the central atom).

* Add these valance electrons in pairs represented as two dots.

4. Place any leftover valence electrons on the central atom.

5. If there are not enough valence electrons to complete the central octet, move some of the free electron pairs on peripheral atoms to create multiple bonds from that peripheral atom to the central atom.

Lewis dot structure examples:

 

**Determining the polarity of bonds:**

Bond polarity is determined by comparing the electronegativity values of each pair of bonded atoms.

1. Chose a pair of bonded atoms.

2. Find their electronegativity values using a table of electronegativity values.

3. Draw a polarity arrow toward the more electronegative atom; the positive end of the arrow is next to the less electronegative atom.

4. Calculate the absolute difference between their electronegativity values; sign is not important.

5. Classify the type of bond using the difference in electronegativities:

 Ionic bonds < 0.5

 Polar covalent bonds 0.5 – 2.0

 Nonpolar covalent bonds > 2.0

 Polarity example:



**Determination of formal charge:**

For uncharged molecules, the formal charges of all atoms must sum to zero. But for charged ions, all atomic formal charges must sum to the overall charge of the ion.

The formal charge of each atom in a structure is determined using this simple formula:

 Formal charge = #valence electrons – (dots + sticks)

Formal charge example:

