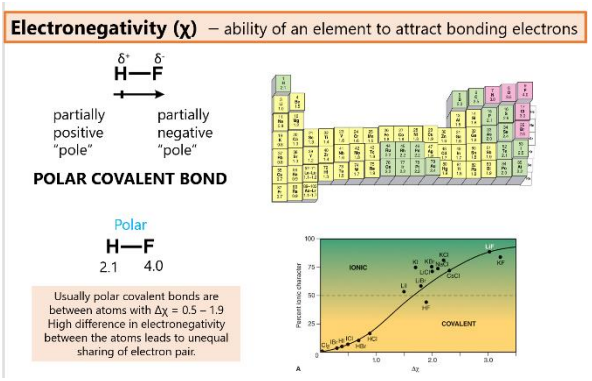
# Electronegativity and Lewis Structure Practice

## ELECTRONEGATIVITY




## LEWIS STRUCTURE:

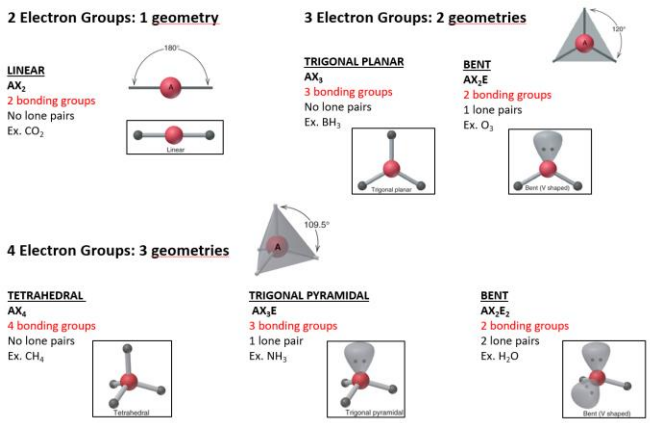
1.Determine total number of valence electrons
2. Any charges? YES – add (-ve charge)/subtract (+ve charge)
3. Build skeleton structure (incomplete Lewis Structure)
4. Group 14,15,16 atoms usually "central"
5. Hydrogen and Group 17 atoms "terminal"
6. Make multiple bonds only when necessary
7. Check - Noble gas electronic configuration at each atom?

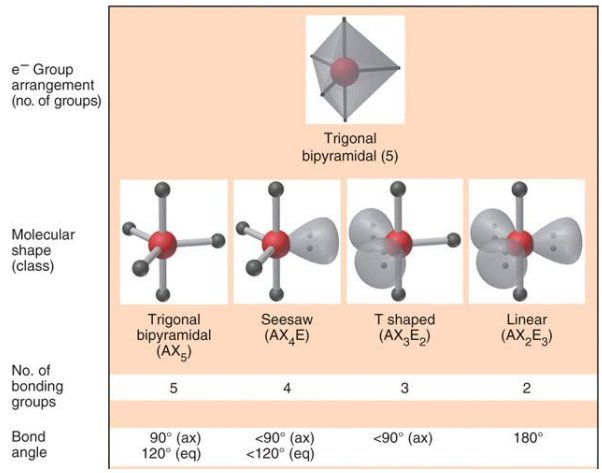
## CALCULATING FORMAL CHARGE:

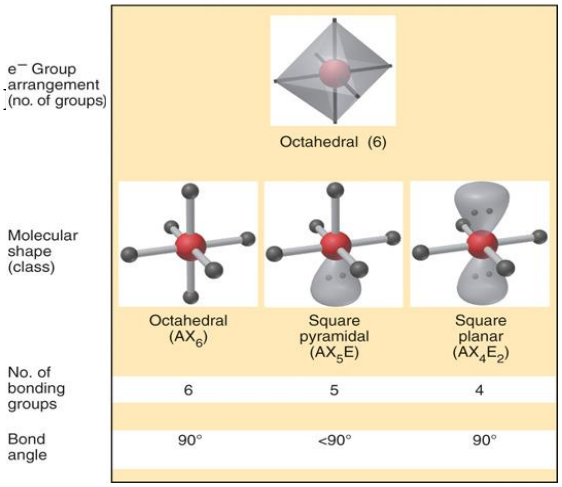
1) Draw Lewis Structure
2) Determine neutral valence of each atom (number of valence electrons)
3) Assign each atom half of bonding electrons + lone pairs
4) FC = Neutral Valence – Assigned electrons

## Shape of Molecules (Only electron groups 2, 3, and 4)

### VSEPR (Valence Shell Electron Pair Repulsion) Theory



**Review**

**Question 1**

A. Draw the Lewis Structure and identify the formal charge on carbon in the bicarbonate ion ($HCO_3$)$^-$. Show calculation for the formal charge.

B. Draw the Lewis structure for HCN, $CH_2NH$, and $CH_3NH_2$. (Note: All contain a Carbon-Nitrogen bond)

Which molecule to you expect to have the shortest nitrogen-to-carbon bond? Why?

**Question 2**

**Arrange the following (Explain your answer – show Lewis structures and geometry where applicable)**

1. From lowest to highest bond angle

   $PH_3$, $ClO_4^-$, $SCl_2$

2. From lowest to highest formal charge on the atom that is bolded (consider the most stable Lewis structure only)

   Cl**O**$^-$, **O**$_3$ (central oxygen atom), **Cl**$O_4^-$

**Question 3**

**a)** Draw the Lewis structure(s) for [$CH_2CHCH_2CN$]. The molecule has a C-C-C-C-N skeleton. Include lone pairs in your answer.

**b)** Calculate formal charge for N in the structure(s) drawn.

**c)** Indicate electron groups and the molecular geometry around each carbon.

from left to right:

**Question 4**

**a)** Draw the Lewis structure(s) for $H_2SO_3$ and $SO_3^{2-}$. Include lone pairs in your answer. Indicate all **non zero** formal charge on the atoms.

**b)** Which of the two ($H_2SO_3$ or $SO_3^{2-}$) has equivalent resonance structures? Show all equivalent resonance structures for that molecule

**Question 5**

a. Draw all possible resonance structures for $CH_3NCO$.

b. Give the formal charge on each atom with a non-zero formal charge.

c. Which of the resonance structures is most contributing? Explain why?

**Question 6**

$C_2H_4 + HBr \rightarrow C_2H_5Br$

In the above reaction, determine the shape of the molecule (around either of the carbons atom) in the reactant and compare that to the shape of the product.

**Question 7**

For each of the following compare the electron geometry (total electron groups) and molecular geometry (shape of the molecule) around:

a. Central oxygen atom for : $H_3O^+$ ; $OH^-$; $H_2O$

b. Central carbon atom for: $CH_3^+$ ; $CH_4$; $CH_3^-$