

### Rules for Writing Lewis Structures

- (1) Add up all the valence electrons from all the atoms.

**Note:** when adding up the valence electrons for a polyatomic ion, add an electron for each negative charge, subtract an electron for each positive charge

- (2) Draw a skeleton structure using a line to represent a single covalent bond between each pair of bonded atoms. To draw the skeleton structure apply the following rules:

- (i) the least electronegative atom usually goes in the center
- (ii) hydrogen can only form one bond (i.e., only needs 2 electrons to attain the noble gas electron configuration), thus make sure that all hydrogens are on the "outside"
- (iii) fluorine, like hydrogen, is usually located on the "outside"

**Note:** for each single bond in the skeleton structure, subtract 2 from the total number of valence electrons

- (3) Use the remaining valence electrons to satisfy the octet rule for each terminal atom, then to the extent possible, for each central atom.

**Octet rule:** an atom, other than hydrogen, tends to form bonds until it is surrounded by 8 valence electrons (i.e., bond pair or lone pair electrons)

- (4) If some atoms remain which do not satisfy the octet rule, redistribute electrons by converting lone pair electrons into bond pairs to form double or triple bonds as required.

### Hints to Determine the Correct Lewis Structures

- (i) carbon usually forms 4 bonds
- (ii) oxygen usually forms 2 bonds, but can form 1 or 3 bonds
- (iii) nitrogen usually forms 3 bonds, but can form 2 or 4 bonds
- (iv) halogens usually form 1 bond unless they are the central atom

### Practice Exercises

Write Lewis structures for the following molecules or polyatomic ions:

$\text{NCl}_3$ ,  $\text{CCl}_4$ ,  $\text{SiF}_4$ ,  $\text{PCl}_3$ ,  $\text{CH}_2\text{O}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{C}_2\text{H}_2$ ,  $\text{C}_2\text{H}_4$ ,  $\text{PO}_4^{3-}$ ,  $\text{CO}_3^{2-}$ ,  $\text{CH}_3\text{CO}_2\text{H}$