

Organic Chemistry Web Review IV

Bond Polarity and Formal Charge



Some Additional Information That Can Be Derived From Lewis Structures

Bond Polarity and Formal Charge



What Is a Polar Covalent Bond?

A Covalent Bond Between Two
Atoms of Significantly Different
Electronegativity in Which Electrons
Are Not Evenly Shared



Formal Charge

A Calculated Number That Allows
Us to Visualize Where Charge Exists
Within a Covalent Molecule or Ion



How Do We Calculate Formal Charge?

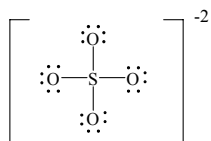
Draw the Lewis Structure then:

F.C. = # of Valence electrons on the atom
minus

All unshared electrons and $\frac{1}{2}$ of all shared
electrons



What is the Formal Charge On All Atoms of the Sulfate Ion?



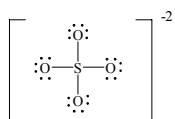
$$\text{Sulfur} = 6 - (0 + \frac{1}{2} 8) = +2$$

$$\text{Oxygen} = 6 - (6 + \frac{1}{2} 2) = -1$$

All 4 oxygens the same



The Sum of the Formal Charges Must Equal the Charge of the Ion or Zero for a Molecule



$$\text{Total F.C.} = +2 + 4 \times -1 = -2$$

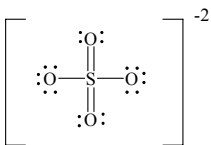


It Is Generally Not a Favorable Situation to Have Many Atoms With a Non-zero Formal Charge

The “Best” Lewis Structure Is the
One That Has the Fewest Number of
Atoms With a Non-zero Formal
Charge



The “Best” Lewis Structure for Sulfate Is:



$$\text{F.C. on S} = 6 - (0 + 1/2 \times 12) = 0$$

$$\text{F.C. on } =\text{O} = 6 - (4 + 1/2 \times 4) = 0$$

$$\text{F.C. on } -\text{O} = 6 - (6 + 1/2 \times 2) = -1 \text{ each}$$

This Ion Has Resonance and the Multiple
Bonds Are Distributed Around the Structure



End Review IV

