



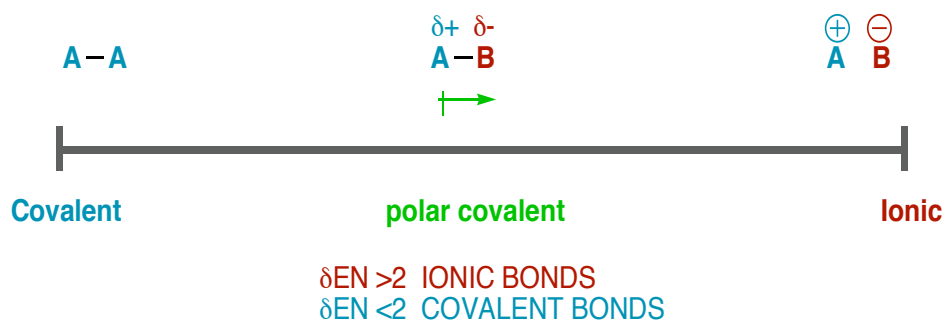
Chem 341 • Organic Chemistry I

Lecture Summary 04 • August 29, 2007

Chapter 2 - Polar Covalent Bonds; Acids and Bases

Polar Covalent Bonds

Molecules are polar and bonds are polarized along a continuum from covalent to ionic depending on the difference in electronegativity. A polar covalent bond has some amount of partial + and - charges at either end.



Electronegativity (EN) - the ability of an atom to attract electrons to itself.

Inductive Effect - the polarization of a bond due to differences in EN

Dipole Moment (μ) - a measure of net polarity for a molecule - the sum of all individual bond polarities in a molecule. Depends on charge and distance.

Formal Charge

When atoms have more or less number of bonds than their valency requires, they must have a charge that is not zero. A formal charge is a way of keeping track of electrons and who owns them in a molecule. $FC = (\# \text{ valence electrons}) - (\# \text{ bonds}) - (\# \text{ nonbonded electrons})$



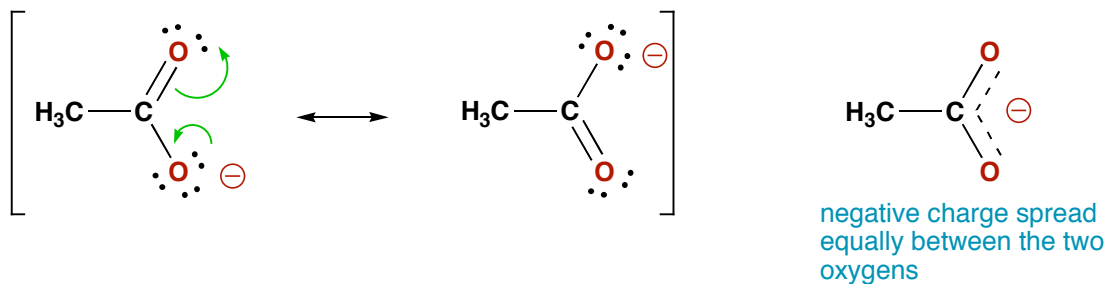
Resonance

Whenever you have a pi-bond adjacent to another pi-bond, lone pair, free radical or empty orbital, the electrons in the system can spread out. It is impossible to indicate this situation precisely using normal Lewis structures. Thus, we draw the Lewis structure extremes of what actually exists somewhere in the middle. These are called Resonance Forms or Resonance Structures.

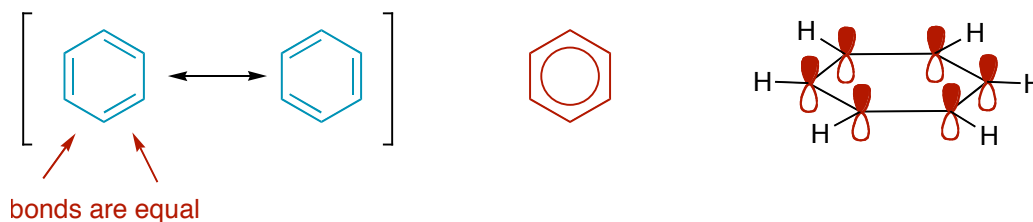
Individual resonance forms **DO NOT EXIST** - they represent the extremes. The actual chemical species is a hybrid of all the resonance forms.

- Resonance forms differ only in the distribution of pi or non-bonding electrons. Atoms do not move.
- Individual resonance forms must obey normal valency rules. You cannot break the octet rule.
- The actual hybrid is more stable than the individual resonance forms and the individual structures do not have to be equal in energy.

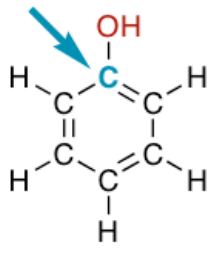
Acetate Ion



Benzene



Quiz of the day

Q: For the following molecule, what is the hybridization of the atom indicated by the arrow? 	<input type="checkbox"/> 1:	sp^3
	<input checked="" type="checkbox"/> 2:	sp^2
	<input type="checkbox"/> 3:	sp
	<input type="checkbox"/> 4:	not hybridized