CHM 123 Lecture Notes 11/07/05

* Homework #6 is due 11/14/05!
* Quiz #5 is next week!
* Exam #3 11/21/05!

· Substitution in Hydrocarbons
- H atoms may be replaced by functional groups
  e.g. -COOH carboxyl
  -OH hydroxyl
  $-NH_2$ amino

· Multiple Covalent Bonds
- one pair of electrons shared by two atoms = single bond
- two pairs " " " " = double bond
- three pairs " " " " = triple bond

· Multiple Bonds in Hydrocarbons
- alkenes - hydrocarbons that have one or more carbon-carbon double bonds; unsaturated hydrocarbons
- alkynes - hydrocarbons that have one or more carbon-carbon triple bonds.

· Bond Lengths
- sizes of atoms help to determine bond lengths.
  e.g. C-N < C-C < C-P and C=O < C=S

- bond type also affects bond length

e.g.	C–O	C=O	C≡O	Bond
	143pm	122pm	113pm	Bond length

· Bond Enthalpies (Energies)
- bond breaking is endothermic ; energy is required
- bond making (forming) is exothermic ; energy is given off
- greater electron density between two atoms means shorter and stronger bonds.

· Bond Polarity and Electronegativity
- non-polar covalent - equal ~~bonding~~ sharing of bonding electron pair ; eg H_2
- polar covalent bond - unequal sharing of bonding electron pair ; e.g. CO
- electronegativity - ability of an atom in a covalent bond to attract shared electrons to itself.
- ionic bonding - transfer of electron
- The greater the difference in electronegativity values, the more polar the bond.

· Formal Charge (FC)
- charge that the atom would have if its bonding electrons were shared evenly

$$FC = (\#\text{ of valence electrons}) - [(\#\text{ of lone pair electrons}) + (1/2\ \#\text{ of bonding electrons})]$$

- Formal charges lack physical meaning, but they help to pick the most likely structure from several possible Lewis structures.
- smaller formal charges are more favorable than larger ones; negative formal charges should be on the more electronegative atom

Lewis Structures and Resonance

- resonance structures = molecules that have two or more equivalent Lewis structures.

ex. SO_2