Chemistry 0310 - Organic Chemistry 1 Chapter 1. Structure & Bonding in Organic Molecules

Important concepts:

- Valence electrons: the electrons in the outer shells of atoms that can participate in bonding. Each element generally forms certain fixed numbers of bonds: Valence.

- Lewis structures: electron dot formulas that show the valence electrons of atoms. Lone-pairs are often omitted.

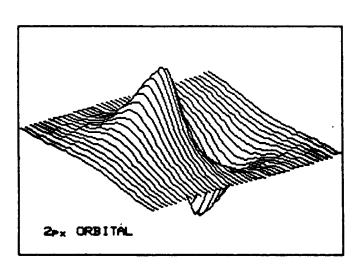
- Octet rule: most 2nd and 3rd row elements prefer an eight (8) electron configuration in bonding (noble gas configuration).

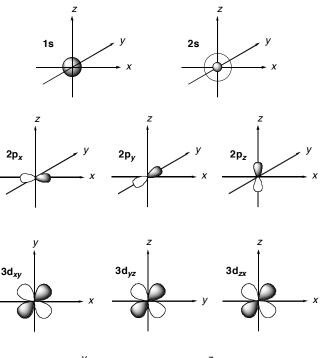
- **Constitutional isomers**: molecules with identical molecular formulae, but different connectivity between the atoms.

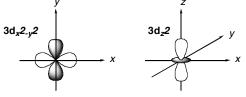
- **Electronegativity**: the ability of an atom to attract electrons. The Pauling scale ranges from 4.0 (strongest, F) to 0.7 (weakest, Cs). The electron distribution within the bond reflects a continuum from covalent to ionic and is a function of the electronegativity of the bonded atoms.

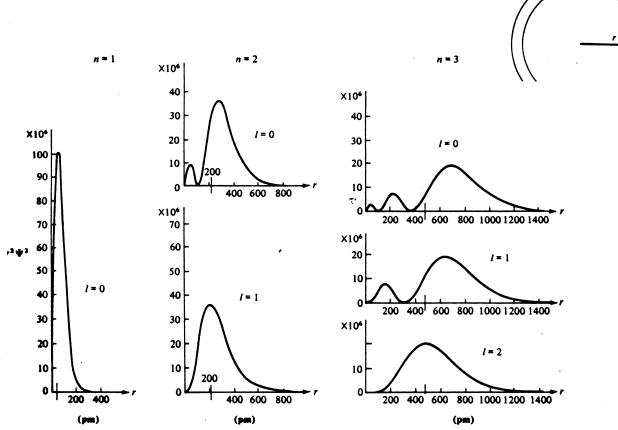
- **Resonance structures**: chemical structures that differ only in the distribution of the (π) bond electrons.

- **Orbitals**: plots of the square of the wave function (ψ^2) that express a high probability of finding an electron within its perimeter.









Radial probability functions for n = 1, 2, 3 for the hydrogen atom. The function gives the probability of finding the electron in a spherical shell of thickness *dr* at a distance *r* from the nucleus.

- **Nodes**: positions in space where ψ =0; the greater the number of nodes the higher the energy of the orbital.

- **Hybridization**: combination of individual wave functions for s and p orbitals to obtain wave functions for new orbitals: sp³, sp², sp (σ and π -bonding).

- **Dipole moment**: a function of charge separation; equals distance times (partial) charge. Polar molecules have a dipole moment, but apolar molecules can also contain polar bonds whose dipole moments cancel each other.

- Representation of structural formulae:

Representation of structural formula: Isobutanol (isobutyl alcohol)

- Molecular formula: C₄H₁₀O

