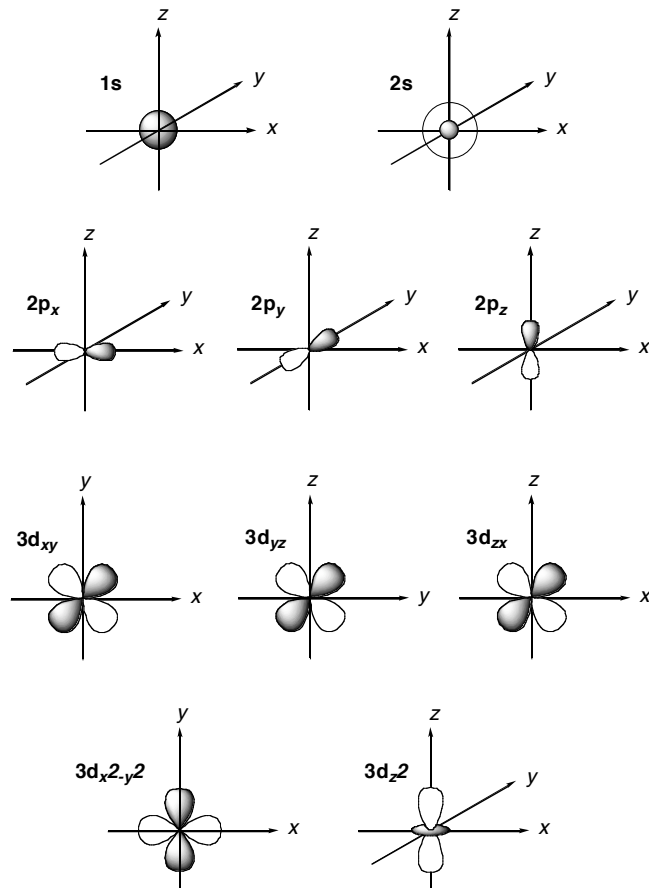
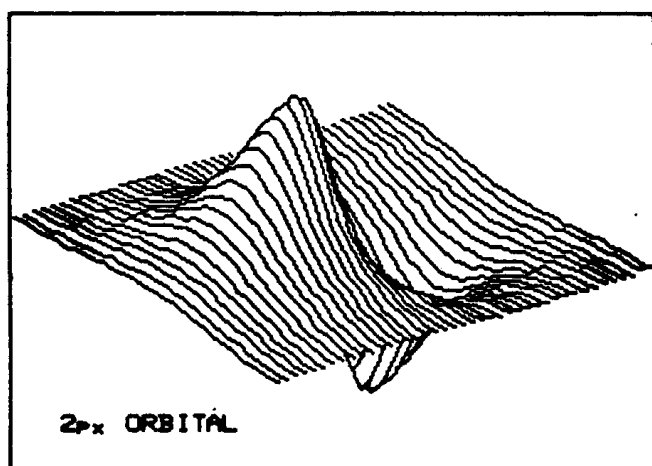


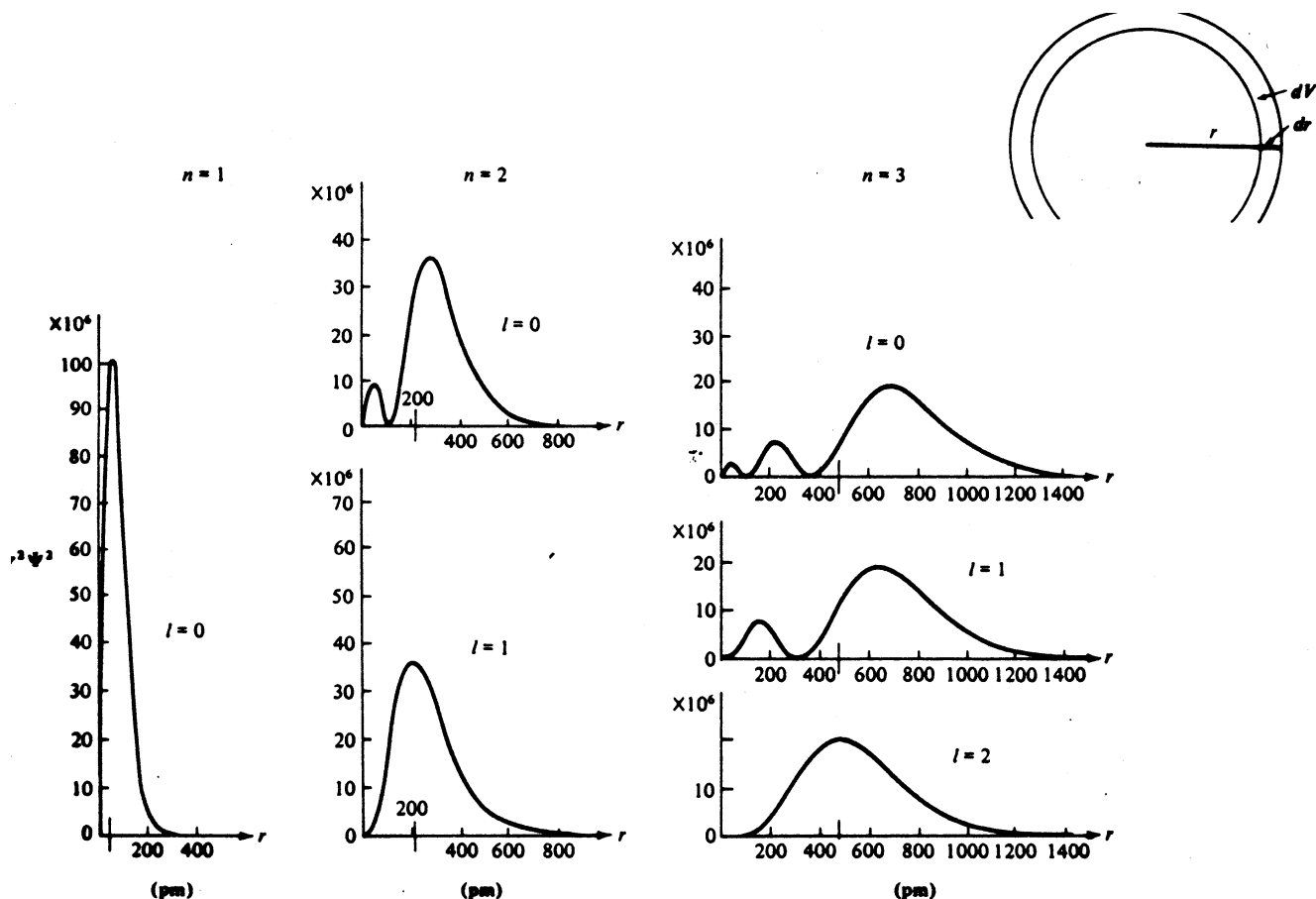
## Chemistry 0310 - Organic Chemistry 1

**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 (F) to 0.7 (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 ( $\sigma$ ) bond electrons.
- **Orbitals:** plots of the square of the wave function ( $\psi^2$ ) 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  $\psi=0$ ; 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:  $sp^3$ ,  $sp^2$ ,  $sp$  ( $\sigma$  and  $\pi$ -bonding).
- **Dipole moment:** a function of charge separation; equals distance times (partial) charge. Polar molecules have a dipole moment, but also apolar molecules can contain polar bonds whose dipole moments cancel each other.

### - Representation of structural formulae:

Representation of structural formula: Isobutanol (isobutyl alcohol)

- Molecular formula:  $C_4H_{10}O$

- condensed structural formulae:  $(CH_3)_2CHCH_2OH$  or  $HOCH_2CH(CH_3)_2$

- Lewis dot structure:

```

      H
      |
H : C : H   H
      |     |
H : C : C : O : H
      |     |     |
H : C : H   H
      |
      H
  
```

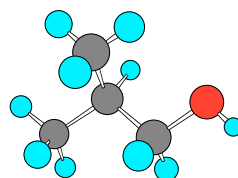
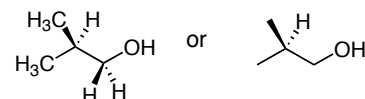
- Lewis dash structure:

```

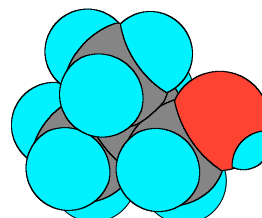
      H   H   H
      |   |   |
H - C - C - C - O - H
      |   |   |
      H   H   H
  
```

- Bond-line formula:

-3-dimensional formula:



Ball & Stick



Space filling (CPK)