

## Electron Configurations

Four quantum numbers:

$n, l, m_l, m_s$

$n$  = energy level

$l$  = angular momentum (orbital shape: s, p, d, f)

$m_l$  = Magnetic (axis: x, y, z)

$m_s$  = spin (up or down arrow)

### **Aufbau Principle**

An electron occupies the lowest energy orbital that can receive it

### **Pauli Exclusion Principle**

No two electrons in the same atom can have the same set of four quantum numbers

### **Hund's Rule**

Orbitals of the same energy are occupied by one electron before any orbital is occupied by a second electron and all electrons in singly occupied orbitals must have the same spin.

Orbital	Max number of electrons	Energy Level
s	2	all
p	6	2 and above
d	10	3 and above
f	14	4 and above

## Orbital Diagrams

1. Determine the number of electrons from the atomic number on the periodic table
2. Determine the highest energy level
3. Draw lines for each of the orbitals available to each energy level
4. Fill in electrons using up and down arrows according to Aufbau, Hund, and Pauli principles

## Electron Configurations

$1s^2 2s^2 2p^6$

1. Determine the number of electrons using the atomic number from the periodic table
2. Write the energy level number
3. Write the orbital number

4. Write the number of electrons in that orbital as a superscript
5. Repeat until all electrons have been used

### Quantum Numbers

\*\*Quantum numbers are written for *electrons*.

\*\*It is easiest to write quantum numbers if you have an orbital diagram

1. Determine the energy level of the electron
  - a. Assign 1 for energy level 1, 2 for level 2, etc.
2. Determine the orbital

Orbital	Angular Momentum Quantum Number
s	0
p	1
d	2
f	3

3. Determine the axis (degenerate orbital) that the electron is on

Orbital	Magnetic Quantum number				
s	0				
p	-1	0	+1		
d	-2	-1	0	+1	+2

4. Determine the spin
  - a. Up = +  $\frac{1}{2}$
  - b. Down = -  $\frac{1}{2}$