Electrons

<u>Review</u>

de Broglie's Hypothesis – electrons have a dual nature; similar to light, electrons can have wave-like characteristics and particle-like characteristics.

Heisenberg Uncertainty Principle – it is <u>impossible</u> to know exactly both the location and momentum of a particle at a given time (including electrons).

Schrodinger Wave Equation – incorporates both wave-like and particle-like behavior of an electron.

- Led to quantum mechanics (remember: quantum)

<u>New</u>

We determine the **probability** of where an electron may be at any given time.

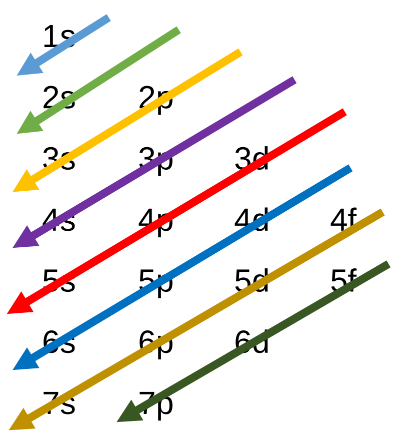
Aufbau principle – electrons occupy the lowest energy orbitals available.

So now we need to know the sequence in which the orbitals will be filled – lowest energy to highest energy.

Aufbau diagram

- list all possible orbitals at each energy level

1s			
2s	2p		
3s	3p	3d	
4s	4p	4d	4f
5s	5p	5d	5f
6s	6p	6d	
7s	7p		



Then, starting at 1s (the lowest energy level orbital), cross out the orbitals from top right to bottom left.

1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p 6s 4f 5d 6p 7s 5f 6d 7p

Pauli's Exclusion Principle – only 2 electrons can occupy a single orbital, as long as they have opposite spins.

At every energy level:

There is one type of S orbital – therefore, only 2 electrons can fit.

There are 3 types of P orbitals – therefore, 6 electrons can fit.

There are 5 types of D orbitals – therefore, 10 electrons can fit.

There are 7 types of F orbitals – therefore, 14 electrons can fit.

When you are writing an electron configuration for an element, the exponent is the number of electrons in each of those orbitals.

$1s^2$ = first energy level, s orbital, 2 electrons

$4p^6$ = fourth energy level, p orbitals, 6 electrons

Example:

Determine the electron configuration of Lead (Pb)

Contains 82 protons; therefore, a neutral atom will have 82 electrons

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{14}\ 5d^{10}\ 6p^2$

Count up all of the exponents to verify that you have the correct number of electrons.