Electrons

Review

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 impossible 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)

New

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

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.

1s2 = first energy level, s orbital, 2 electrons

4p6 = 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

1s2 2s2 2p6 3s2 3p6 4s2 3d10 4p6 5s2 4d10 5p6 6s2 4f14 5d10 6p2

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