ELECTRONS IN ATOMS (Ch4)

DALTON'S atomic theory

J.J. THOMSON'S - "plum pudding"

RUTHERFORD (...opposites attract- why aren't electron's falling into the nucleus?)

NIELS BOHR (electrons are arranged in fixed **orbits-shells-energy levels-paths-rings**)
Therefore, all electrons have a path of fixed ENERGY.

5

4

3 INCREASING energy

2

1

nucleus

SCHRODINGER (QUANTUM MODEL - THEORY)
"quantum" – excited state
It determines the allowed energies an e- can have and how likely it is to find the e- in a location by the nucleus

The exact path of the electron is not known in this model (unlike Bohr's, but an AREA is. (electron cloud).

Atomic Orbital (clouds, sublevels) – Each has a different shape, which is probably where the e- will be found. How fast is the e- going? Well, not sure about that (Heisenberg Uncertainty Principle).

4 Quantum Numbers:
*n = principal quantum number (energy level)
*l = sublevel or orbital (s, p, d, f)
- s - 1 orbital
- p - 3 orbitals
- d - 5 orbitals
- f - 7 orbitals

m = magnetic effect
s = clockwise or counterclockwise spin of e-

IN the atom,

Ring	Sublevel	Type	Written	max # e-
n=1	1	s	1s	
n=2	2	s, p	2s, 2p	
n=3	3	s, p, d	3s, 3p, 3d	
n=4	4	s, p, d, f	4s, 4p, 4d, 4f	

ELECTRON CONFIGURATIONS: the address of the electrons of an atom; the way in which electrons are arranged around nuclei.

*Some electrons will have an increase energy, making the entire atom unstable. So, these electrons will sometimes lose ENERGY to become stable.

RULES FOR FILLING ORBITALS:

I. AUFBAU PRINCIPLE = Electrons enter orbitals with the lowest energy first.
lowest energy orbital? (sublevel)

s p d f
----increasing energy---->
(with some exceptions because of overlap)

For example, notice that 4s is lower in energy than 3d.

II. PAULI EXCLUSION - Only 2 electrons in every orbital

↑ clockwise spin

↓ counterclockwise spin

↑↓ - full orbital ↑ - half full empty

III. HUND'S RULE - One electron fills every orbital (until there are none left) when electrons occupy = energy levels.

ex. Oxygen - 8 electrons

regular notation: $1s^2 2s^2 2p^4$

orbital notation:

Can you answer these?
How many e- are in the 1st energy level?

How many e- are in the 2nd energy level?

How many e- needed to be gained before oxygen are "happy?"

Electron Configurations and the Periodic Table

LIGHT AND ATOMIC SPECTRA

Light comes from electromagnetic waves. It travels at a speed of 3.0×10^{10} cm/s.

RADIO-MICROWAVES-IR-VISIBLE-UV-X-GAMMA-COSMIC
<---______________________________-__________________------>

DECREASE IN WAVELENGTH
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SPECTRUM: Light passes through a prism and the light is separated into ROYGBIV (visible light)

SPECTROSCOPY - Analyzing elements that emit light when heated by passing an electric discharge or current through its gas vapor.

WHITE: ALL LIGHT IS REFLECTED
BLACK: ALL LIGHT IS ABSORBED