Advanced Chemistry
Notes: Atomic Theory II

Niels Bohr (1885-1962) A Danish physicist who came up with a new atomic model. He proposed that electrons are arranged in concentric circular paths known as orbits, around the nucleus.
This is known as the planetary model.

Energy Level of an electron is the region around the nucleus where the electron is likely to be moving

Heisenberg uncertainty principle states that it is impossible to know exactly both the velocity and the position of a particle at the same time. Therefore it would take very complex mathematical equations to describe the position of electron

Erwin Schrodinger (1887-1961) Used a new quantum theory to write and solve mathematical equation describing the location and energy of an electron in a hydrogen atom.

Quantum mechanical model, comes from the mathematical solutions of the Schrodinger equation
      *Does not define an exact path an electron takes around the nucleus.

   Atomic orbital: the regions around a nucleus where electrons are likely to be found
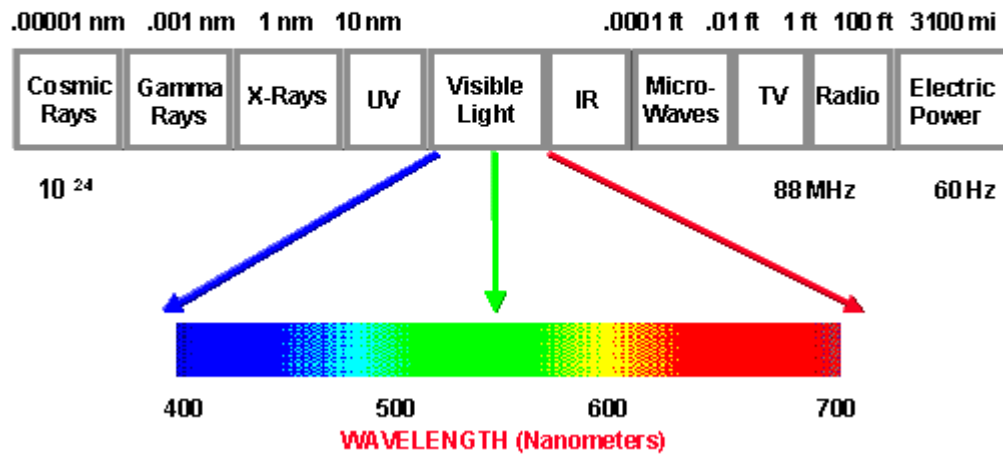
 Electron configurations The ways in which electrons are arranged around the nuclei of atoms

   **Aufbau principle** states that electrons enter orbitals of lowest energy first.
   Pauli exclusion principle: states that an atomic orbital may describe at most two electrons
   Hund's rule: When electrons occupy orbitals of equal energy, one electron enters each
             orbital until all of the orbitals contain one electron with parallel spins.

electromagnetic spectrum

.00001 nm	.001 nm	1 nm	10 nm			.0001 ft	.01 ft	1 ft	100 ft	3100 mi
Cosmic Rays	Gamma Rays	X-Rays	UV	Visible Light	IR	Micro-Waves	TV	Radio	Electric Power	

10^{24} 88 MHz   60 Hz

400   500   600   700

WAVELENGTH (Nanometers)

Electromagnetic radiation: Includes radio waves, microwaves, infared waves,
visible light, ultraviolet waves, x-rays, and gamma rays all
traveling at the speed of light

Speed of Light $= 3.0 \times 10^{10}$ cm/s (3.0×10^8 m/s)

$$c = v \cdot \lambda$$

E

λ = Wavelength

t
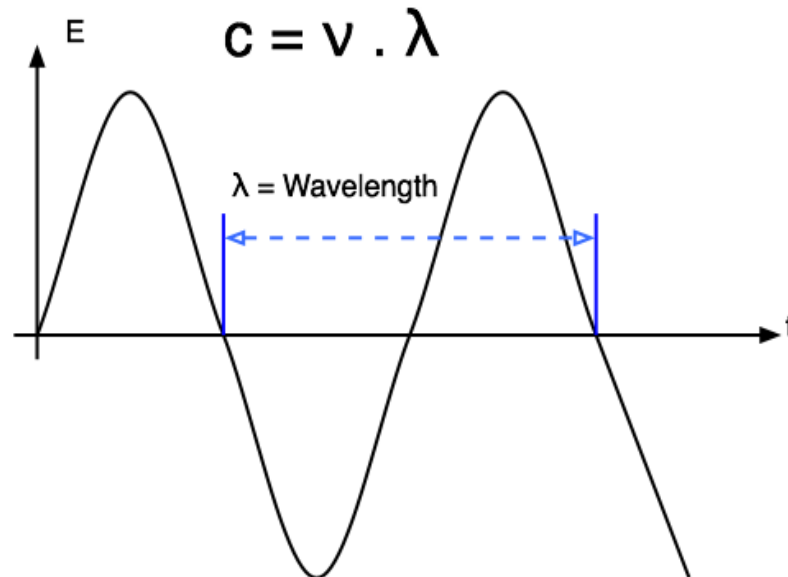
Amplitude of a wave is the wave's height from the origin to the crest
Wavelength (the Greek letter lambda) is the distance between crests

Frequency (the Greek letter nu) is the number of wave cycles to pass a
given point per unit of time.
hertz (Hz) The SI unit of cycles per second

Velocity of Wave :   **Speed of light = wavelength (lambda) X frequency (nu)**
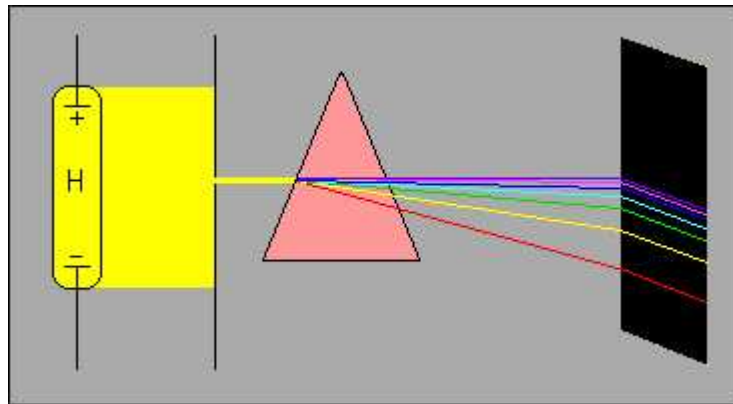
Atomic emission spectrum is the result of passing the light emitted by an element through a prism

Hydrogen Problems:

Photons Light quanta. The energy of photons is quantized according to the equation $E = h \times v$

Planck's constant The constant (*h*) which has a value of 6.6262×10^{-34} J x s

Ground state the lowest energy level of an atom