# Atomic structure

3 major subatomic particles

Proton
- Determines identity
- Positively charged particle
- Has 1 atomic mass unit (amu)

Neutron
- Can vary between isotopes
- Neutral charge (zero charge)
- Has 1 amu

Electron
- Determines the charge of an atom
- Negatively charged particle
- Essentially massless (1/1800 of a proton)

Review Bohr Model (Reference page 8)

Electrons can jump energy levels if they absorb enough energy

High energy electrons emit light when returning to lower energy levels.

Now we want to look at that light

# Particle/Wave Duality of Light

## Wave nature

We can discuss light radiation in the context of wavelength and frequency.

Units for wavelength are in meters or nanometers

Units for frequency are in Hz, waves/sec, 1/s, or $s^{-1}$

They are inversely related to one another based on the speed of light (in a vacuum).

The speed of light that we will use is constant at $3.00 \times 10^8$ m/s

$C = \lambda\nu$ → speed of light = wavelength x frequency

Note that when the frequency increases, the wavelength decreases.

## Particle nature

It is also possible to calculate how much energy is carried in radiation of a specific frequency.
In this case, you must know Planck's constant – $6.626 \times 10^{-34}$ J x s

When we look at a "light particle" we call it a photon. A photon contains the exact amount of energy required to go from one energy level up to the next. This amount of energy is called a quantum.

$E_{photon} = E_{quantum} = h\nu$ → energy = Planck's constant x frequency

Note the units of Planck's constant and frequency – the seconds cancel out leaving only Joules – a unit of energy.