**Photoelectric effect** – is the process whereby electrons are ejected from a metal/ surface when light is incident on that surface.

Conditions needed: light and a metal

Light has a dual nature : wave and particle nature

Light is carried in small packets of energy called photons

Formula to calculate energy of the light (E)

**E = hf**

E – energy of light (in joules)

h = planck’s constant **( 6.63x10-34 )**

f = frequency

**c = fλ**

c is the speed of light in a medium **( 3x108 )**

f = frequency

λ – wavelength

Light shines on a metal so that the metal can eject the electrons

Work function ( Wo)

* Is the minimum energy needed to remove an electron from the surface of the metal

Threshold frequency (fo)

* Is the minimum frequency of light needed to remove an electron from a metal surface.

 Wo = hfo,

If E = Wo, or if F=Fo, then an electron will be displaced onto the surface but will not have any kinetic energy. The photoelectron will not move away.

If E ≥Wo, electrons will be released

If F≥Fo electrons will be released. Remaining energy is converted to Ek

If E is less than Wo electrons will not be released

If F is less than Fo electrons will not be released

Ek = ½ mv2 where m is the mass of an electron **(9,11x10-31 kg)**

GRAPHS

Linear ---- y = mx + c

Always make sure to rearrange the equation E = Wo + Ekmax to get the gradient

**An atomic absorption spectrum** is formed when certain frequencies of electromagnetic radiation passing through a substance is absorbed. For example, when light passes through a cold gas, atoms in the gas absorb characteristic frequencies of the light and the spectrum observed is a continuous spectrum with dark lines where characteristic frequencies of light were removed. The

frequencies of the absorption lines are unique to the type of atoms in the gas.

**An atomic emission spectrum** is formed when certain frequencies of electromagnetic radiation are emitted due to an atom making a transition from a higher energy state to a lower energy state.

For example, atoms in a hot gas emit light at characteristic frequencies. The spectrum observed is a line spectrum with only a few coloured lines of frequencies unique to the type of atom that is producing the emission lines.