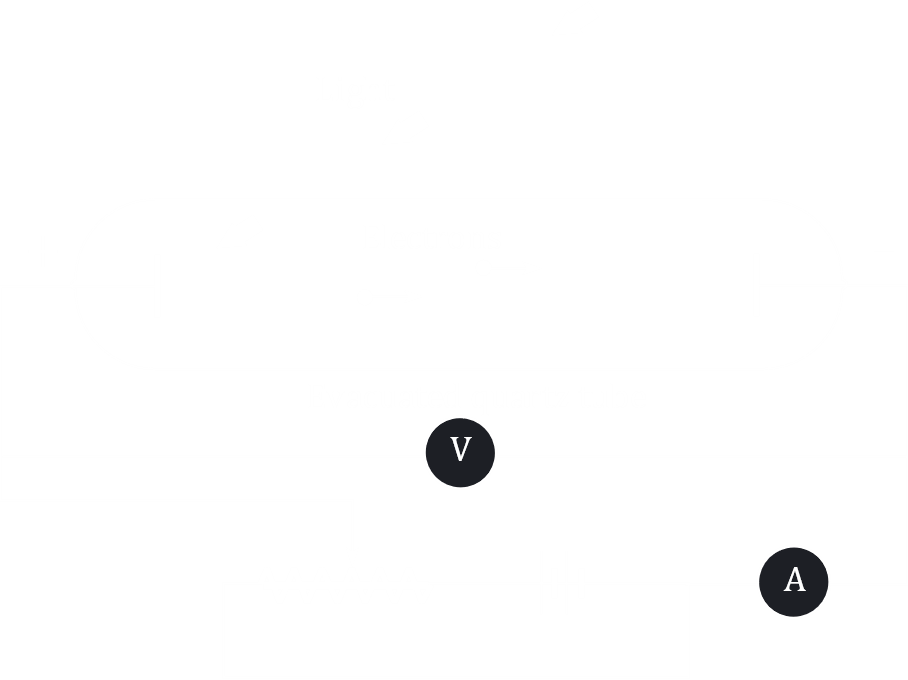
**Chapter 02: Particle Properties of Waves**

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## 2.3 Photoelectric Effect



* Electrons should require time to accumulate enough energy to leave the surface of the metal. However, the electrons are emitted immediately.
* A brighter light yields more electrons but individual electrons still have the same energy.
* A higher frequency light causes the electrons to have more energy.
* Minimum frequency needed to release any electrons at all. Known as threshold frequency.

(work function)

Work function is the minimum energy needed to release an electron from a metal. This is for electrons on the surface. Electrons deeper in the metal need more energy.

Equation for Photoelectric effect

Stopping Potential: Voltage needed to just stop an electron from reaching the cathode. It depends on frequency of the electromagnetic wave, not its intensity. This indicates the energy of the electron increases with frequency, but not intensity.

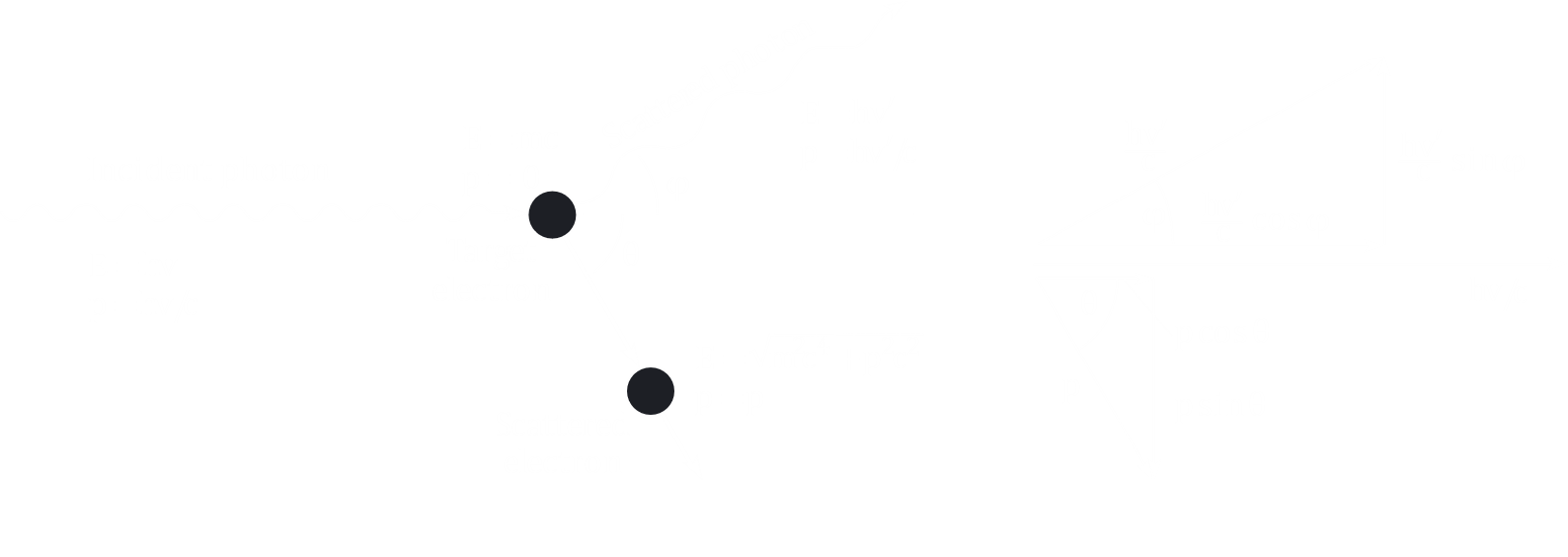
## 2.7 Compton Effect

The Compton Effect is the change in wavelength of -rays or gamma rays when they are scattered.

Compton Wavelength:

Derivation:

Photons behave like particles, so if a photon collides with an electron, the electron (assumed to be at rest) is scattered at an angle . The electron gains energy from the photon, which means the wavelength of the photon must change.



The initial momentum of the photon is given by:

Scattered photon

Thus,

And

Multiplying both sides of each equation by , we get

Squaring each side of both equations and adding them gives us:

Now,

Substituting this into the equation found earlier,

Dividing by ,

This equation gives the change in wavelength expected of a photon that is scattered through an angle .

The above is the Compton wavelength of the scattering particle.