

## PHOTOELECTRIC EFFECT:

The process of emission of electrons from metal surface, when illuminated by a light (or other radiations) of suitable frequency is called as **photo electric effect**.

The electrons emitted due to the illumination of light (photons) are called as photo electrons.

The current associated with the flow of photo elections is called as **photo electric current** (or photo current).

**Photoelectric effect can be observed in any material medium (solid, Liquid or gas).**

# **Threshold frequency ( $f_0$ ):** The minimum frequency of photon (radiation) below which no photoelectrons are emitted from the surface of a material is called as threshold frequency.

Photoelectric effect is not possible using the radiation having frequency less than the threshold frequency.

The threshold frequency is the property of material - does not depend upon the frequency of photon.

The threshold frequency, however, depends upon the temperature of surface of material.

# **Threshold wavelength ( $\lambda_0$ ):** The maximum wavelength of photon above which no photoelectrons are emitted from the which surface of a material is called as threshold wavelength.

**The wavelength corresponding to threshold frequency is called as threshold wavelength.**

Photo electric effect is not possible using the radiation having wavelength more than the threshold wavelength.

The threshold wavelength depends up on the nature of material only.

# **Work function ( $\phi$  or  $W$ ):** The minimum energy of photon (radiation) below which no photoelectron is emitted from the surface of a material is called as Work function.

Photoelectric effect is not possible using radiation having energy less than the work function of the material.

The work function depends upon the nature material only.

The work function is written as:  $\phi = hf_0 = \frac{hc}{\lambda_0}$

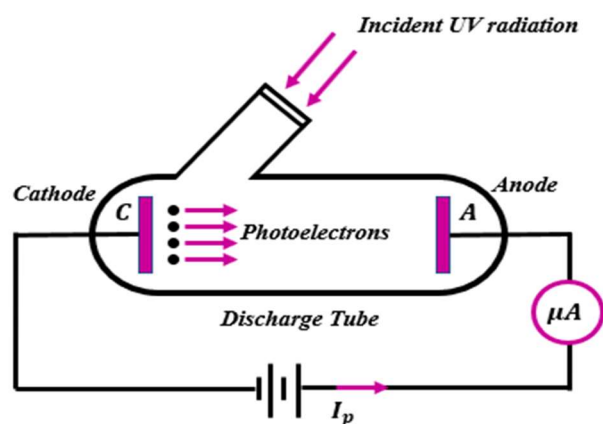
### Short questions: (NEB)

1. Explain why photo electric effect cannot be observed with all wavelengths of light.
2. Explain why photo electric effect cannot be observed with wall frequencies of light.
3. If the wavelength of electromagnetic radiation is doubled, what will happen to the energy of photons?
4. Human skin is relatively insensitive to vision light, but UV radiation can cause severe burns, why?

### Experimental demonstration of photoelectric effect:

The simple experimental demonstration of photoelectric effect is shown in the given figure.

Here, two zinc plates C and A are enclosed in an evacuated quartz bulb (tube) and are connected to a battery and an ammeter. The plate C is connected to the negative terminal while plate A is connected to the positive terminal of the battery. When an UV radiation falls on plate C (through window w), the ammeter records a current in the circuit. The observed current is due to the flow of electrons from plate C to A. These elections are called as photoelectrons and the current is called as photoelectric current.



**Experimental arrangement for demonstration of photoelectric effect.**

**Here, plate C is called as emitter plate (as electrons are emitted from the plate- and is photosensitive in nature.) and plate A is called as collector plate (as electrons are collected in the plate-need not be photosensitive).**