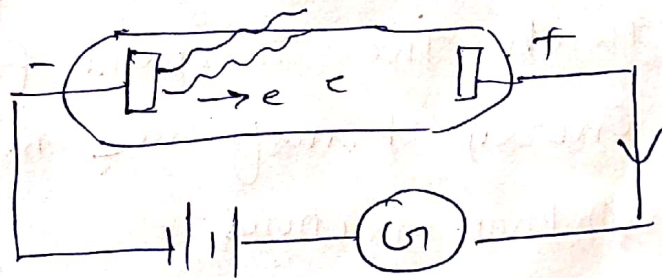


# Atomic Structure

## Photoelectric effect

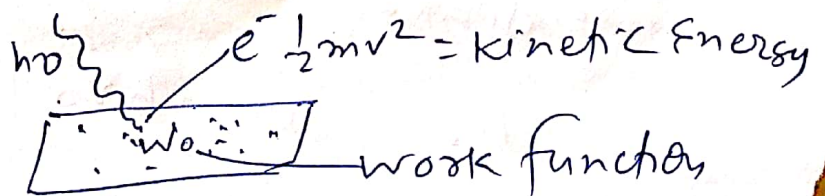
- This effect was discovered by Hertz in 1887 and further explained by Einstein.

- The phenomenon of emission of electrons from a metal surface, upon irradiation with a beam of light of suitable frequency on a metal cathode in vacuum is known as photoelectric effect and the current is called photocurrent.



The metal surface emits electrons by the action of light, that can be demonstrated using negatively charged gold leaf electroscope.

As light falls on metal plate, the divergence of leaves is reduced slowly. This shows that electrons come out of metal plate.



When light incident on metal cathode, electron ejection takes place.

The frequency of radiation must be more than the frequency required to eject electron from metal cathode.

The minimum energy needed to eject electron is called work function or Threshold Energy ( $w_0$ )

$$w_0 = h\nu_0 = \frac{hc}{\lambda_0} \rightarrow \text{Threshold wavelength}$$

- When incident frequency is greater than the threshold frequency, the excess energy transformed into kinetic energy of photoelectrons.

Hence According to Einstein relation

$$E_{\text{Total}} = w_0 + \text{Kinetic Energy}$$

$$h\nu = h\nu_0 + \frac{1}{2}mv^2$$

The Kinetic Energy of ejected photoelectrons varies directly with frequency of incident radiation

$$K.E = h\nu - h\nu_0$$

$y = mx + c$

