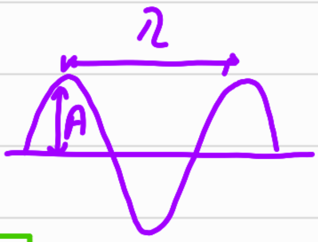
MODERN PHYSICS

Dual Nature

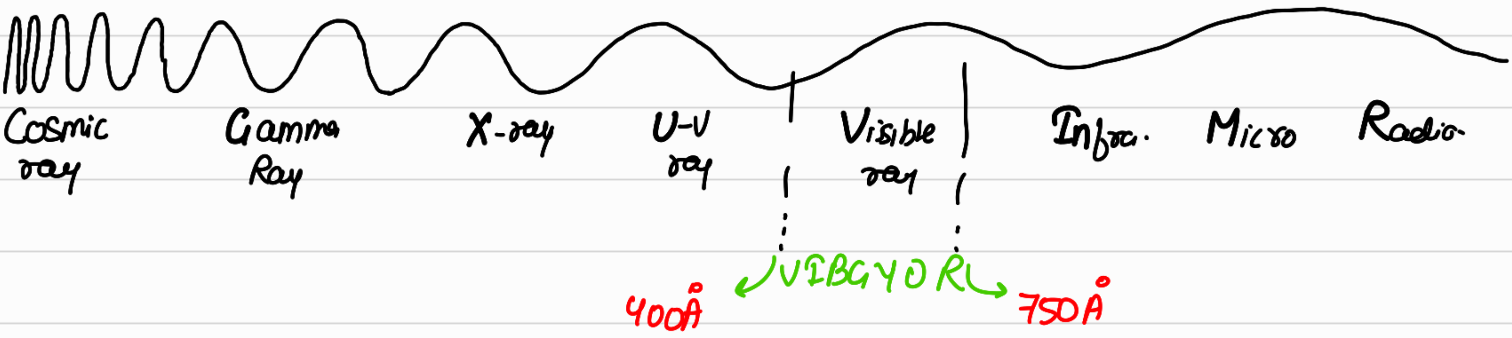
- Wave length ⇒



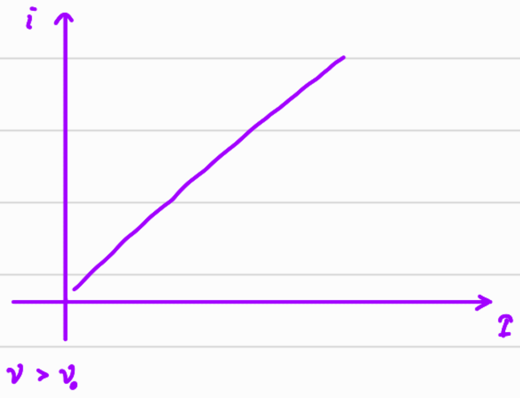
A = amplitude

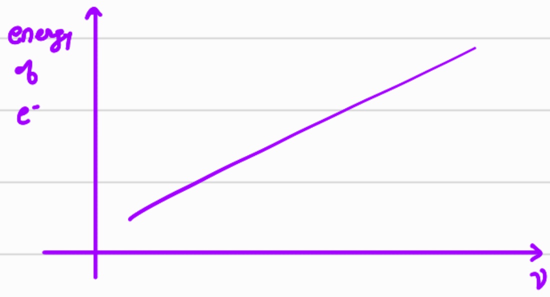
- wave number ⇒ $\boxed{\bar{\nu} = \frac{1}{\lambda}}$ (no. of wave pass through unit length.)
- Frequency ⇒ no. of waves per second.
- Time Period ⇒ $\boxed{T = \frac{1}{\nu}}$ (time taken by 1 wave to pass through a point)
- Wave velocity ⇒ Dist. trav. by wave in unit sec

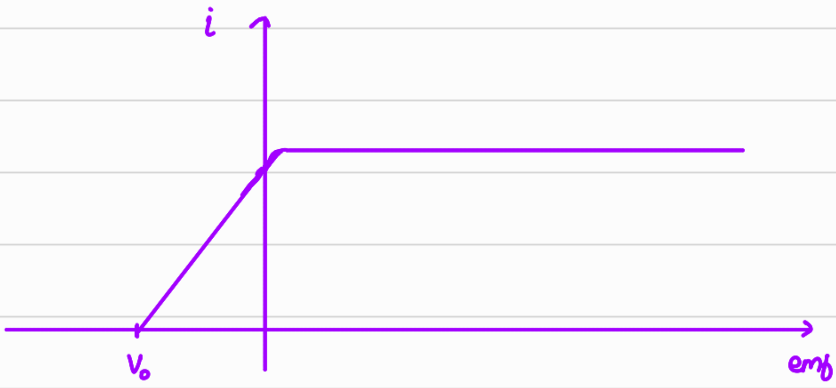
$\boxed{\nu = \frac{c}{\lambda}}$ $\boxed{c = \lambda\nu}$

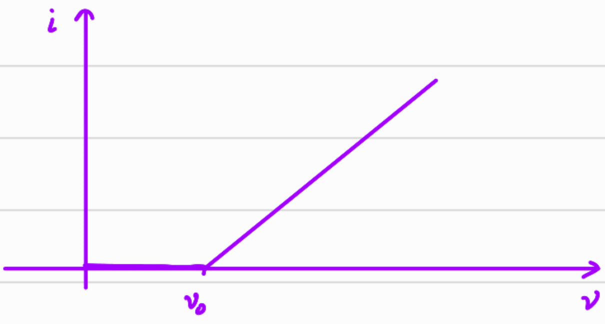


PHOTOELECTRIC EFFECT









$$E = \frac{hc}{\lambda} = h\nu$$

E = energy of 1 photon

h = Planck's constant $= 6.6 \times 10^{-34}$ Js

λ = wavelength

$$\boxed{E = \frac{1240}{\lambda_0} \text{ eV} = \frac{12400}{\lambda_0} \text{ eV}}$$

$1 \text{ eV} = 1.6 \times 10^{-19}$ J

λ_0 = nm $(10^{-9}$m$)$ $\quad$ $\lambda_0 = \text{Å}$ $(10^{-10}$m$)$

- Threshold frequency (ν_0) :- min. freq. jisp e^- phekna suru ho.

- Work function (ϕ) :- min. energy for photoelectric effect. (P.E.E.)

eV

$$\boxed{\phi = h\nu_0 = \frac{hc}{\lambda_0}}$$

h = Planck's constant $= 6.63 \times 10^{-34}$

c = speed of light $= 3 \times 10^8$ m/s

λ = wavelength of light

- Cut-off wavelength (λ_0) :- max. wavelength to start P.E.E.

Some Important Points:-

$E = \phi + K.E.$ $\Leftarrow$ cons. of NRG.

$$\boxed{\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + K.E.} \qquad \boxed{h\nu = h\nu_0 + K.E.}$$

$$\boxed{K.E. = eV}$$

(e = 1.6×10^{-19} C

V = stopping Potential)

Debroglie Hypothesis:-

$$\boxed{\lambda = \frac{h}{mv}} = \left(\lambda = \frac{h}{P}\right)$$

ek mass agar v vel. se move kare to us se associated ek wave hoti hai called matter wave

$m(K.E.) = \frac{1}{2} m^2 v^2$ $\quad$ $\left(\lambda = \frac{h}{\sqrt{2mK.E.}}\right)$

$2m(K.E.) = P^2$

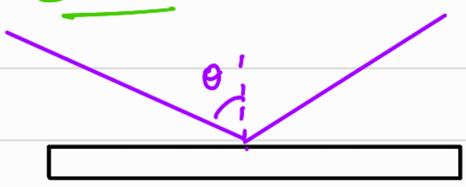
$P = \sqrt{2m(K.E.)}$

$$E = \frac{\cancel{h}c}{\cancel{h}} \times mv = mvc$$

(P = momentum) $\qquad$ ($E = Pc$)

Radiation force and Pressure:-

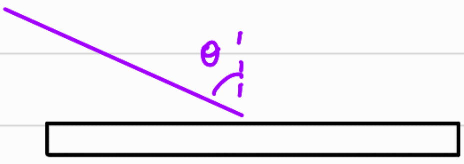
Case I



100 % ref.

$$\boxed{(F_{Plate})_y = \frac{2 I A_s \cos^2\theta}{c}}$$

I = Intensity of l8.
A_s = Area of surface
c = speed of l8.



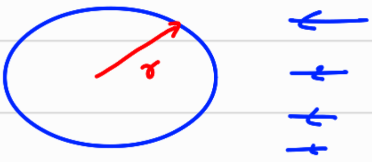
100 % abs.

$$\boxed{(F_{Plate})_y = \frac{I A_s \cos^2\theta}{c}}$$

$$\boxed{P = \frac{I}{c}}$$

(P = Pressure)

$$\boxed{(F_{Plate})_x = \frac{I A_s \sin\theta \cos\theta}{c}}$$



$$\boxed{F = \frac{I \pi r^2}{c}} = \boxed{F = \frac{IA}{c}}$$

(Only for spherical Bodies.) → formula same hoga chahe reflecting ho ya black body.