$$\boxed{E = \frac{hc}{\lambda}}$$

$c = 3 \times 10^{8}\ m/s$

$h = 6.636 \times 10^{-34}\ Js$

$\boxed{E = hf}$ ... $\left(\frac{c}{\lambda} = f\right)$

$$\boxed{p = \frac{h}{\lambda}}$$

if $\lambda \to nm$

$$\boxed{E = \frac{1240}{\lambda}\ eV}$$

Einstein's photoelectric equation

$$\boxed{K.E_{max} = E - \phi}$$

$$\boxed{K.E_{max} = \frac{hc}{\lambda} - \phi}$$

$$\boxed{K.E_{max} = hf - \phi}$$

Threshold frequency (f_0)

↳ Min frequency ($f \geq f_0$)

for e^- emission

$E \geq \phi$

$hf \geq \phi$

$f \geq \frac{\phi}{h}$

$f_{min} = \frac{\phi}{h} = f_0$

$$\boxed{\phi_0 = hf_0}$$

$K_{max} = E - \phi$

$$\boxed{K_{max} = hf - hf_0}$$

Threshold wavelength (λ_0)

($\lambda \leq \lambda_0$) maximum

e^- emission

$E \geq \phi$

$hf \geq \phi$

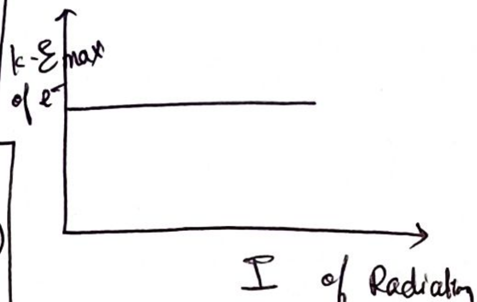
$\frac{hc}{\lambda} \geq \phi$

$\lambda \leq \frac{hc}{\phi}$

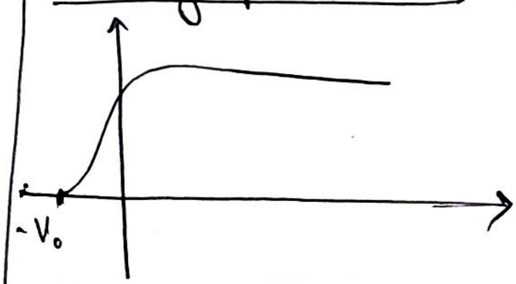
$\lambda_{max} = \frac{hc}{\phi} = \lambda_0$

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

$$\boxed{K_{max} = \frac{hc}{\lambda} - \frac{hc}{\lambda_0}}$$

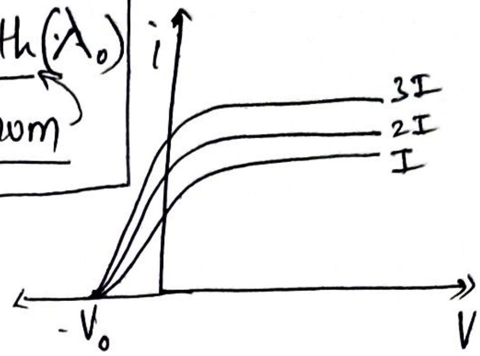


Stopping potential



$$\boxed{V_0 = \frac{K_{max}}{e}}$$

$$\boxed{V_0 = \frac{hc}{\lambda e} - \frac{\phi}{e}}$$



De-Broglie hypothesis

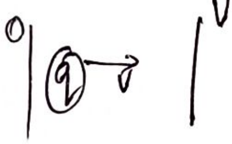
for electron,

$m_e = 9.1 \times 10^{-31}\ kg$

$$\boxed{\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mK}}}$$

$$\boxed{p = \sqrt{2mK}}$$

Case I:- Accelerating Potential



Work done $= q\Delta V = qV$

$$\boxed{\lambda = \frac{h}{\sqrt{2mqV}}}$$ potential

for e^- only,

$$\text{Å} \leftrightarrow \boxed{\lambda = \sqrt{\frac{150}{V}}}$$ ⟶ potential

$$\boxed{\lambda = \frac{12.27}{\sqrt{V}}} \rightarrow \text{Å}$$

$$\boxed{\lambda = \frac{1.228}{\sqrt{V}}} \rightarrow \text{nm}$$

De-Broglie gas molecule

$$\boxed{\lambda = \frac{25.6}{\sqrt{M}\sqrt{T}}}$$

$M \rightarrow$ molar mass in (amu)

$T \rightarrow$ (in k)

$$1\,\text{amu} = 1.67 \times 10^{-27}\ \text{kg}$$

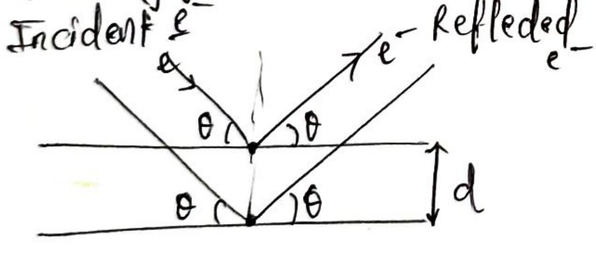
$$\boxed{\lambda = \frac{h}{\sqrt{3m k_B T}}}$$

$m \rightarrow$ mass of one molecule of gas

$k_B \rightarrow$ Boltzman constant

$T \rightarrow$ (in k)

Bragg's law



$d \rightarrow$ Distance Btw two atomic layer

$\theta \rightarrow$ Angle Incident/Reflected wave & atomic layer

$$\boxed{2d\sin\theta = n\lambda}$$

for constructive

$$\Delta x = \lambda, 2\lambda, 3\lambda \ldots n\lambda$$

$$\Delta x = n\lambda$$

$$2d\sin\theta = \Delta x$$

$$\boxed{2d\sin\theta = n\lambda}$$

$$1\,\text{J} = 6.242 \times 10^{18}\ \text{eV}$$

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

$$M_\alpha = 4m_p$$

$$M_p = 1836\, M_e$$

$$M_\alpha = 7344\, M_e$$

$$\boxed{\lambda_{\text{in orbit of H}} = \frac{2\pi r}{n}}$$

$$\lambda_p = \frac{1}{\sqrt{12.2\,V}} \rightarrow \text{Å}$$

De-Broglie wavelength

1. for proton: $\boxed{\lambda_p = \frac{0.286}{\sqrt{V}}\ \text{Å}}$
2. for Deutron: $\boxed{\lambda_d = \frac{0.202}{\sqrt{V}}\ \text{Å}}$
3. for α-particle: $\boxed{\lambda_\alpha = \frac{0.101}{\sqrt{V}}\ \text{Å}}$

$$\boxed{E = \frac{hc}{\lambda} = \frac{1240}{\lambda(\text{nm})}}\ \text{eV}$$

$$\boxed{E = \frac{hc}{\lambda} = \frac{12400}{\lambda(\text{Å})}}$$