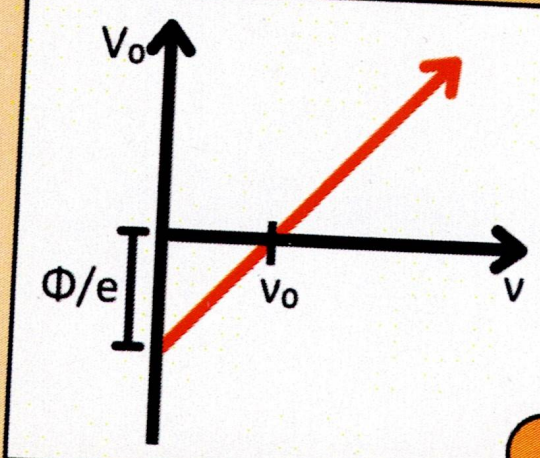
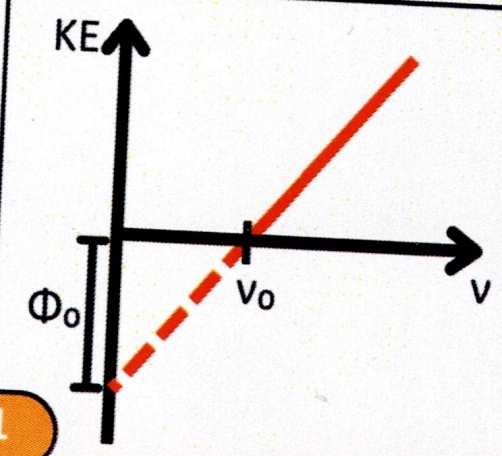
DUAL NATURE OF MATTER

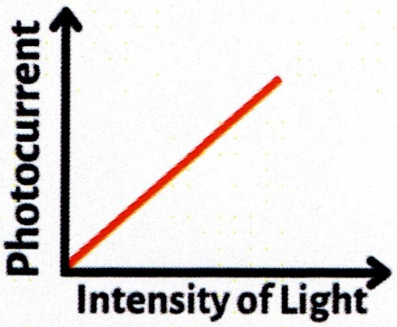
Electron Emission	
Thermionic emission	$J = AT^2 e^{-\phi_o/K_B T}$
Field Emission	$J = aE^2 e^{b/E}$
Photo Electric Effect	
Einstein's Photoelectric eq.	$(E_K)_{max} = h\nu - \phi_o = [h\nu - \nu_o]$
Stopping Potential	$eV_o = hc\left(\frac{1}{\lambda} - \frac{1}{\lambda_o}\right)$
Photo Electric Efficiency	$\frac{\text{no. if } e^- \text{ emitted}}{\text{no. of photons absorbed}}$
Power	$\text{Power} = n_p \varepsilon_p$



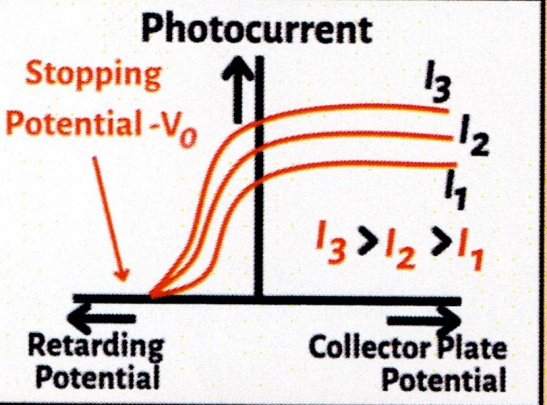


Important Graphs

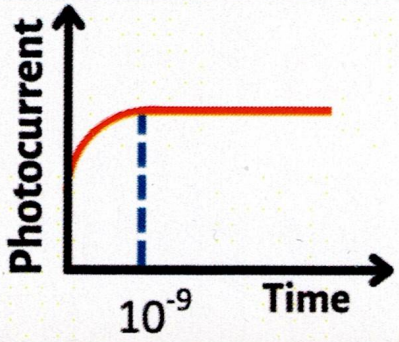
Variation of Photoelectric Current with Intensity



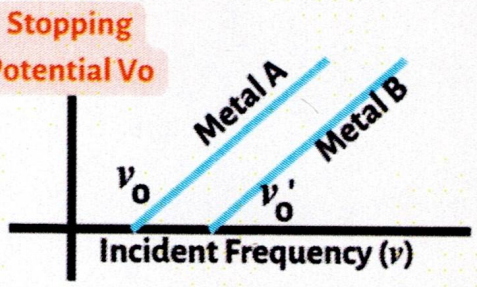
Variation of Photoelectric Current with Potential diff.



Photocurrent vs Time

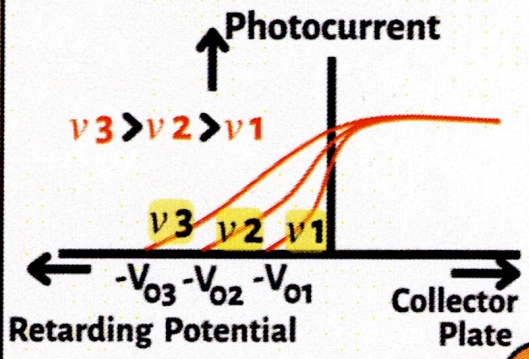


V_0 vs ν

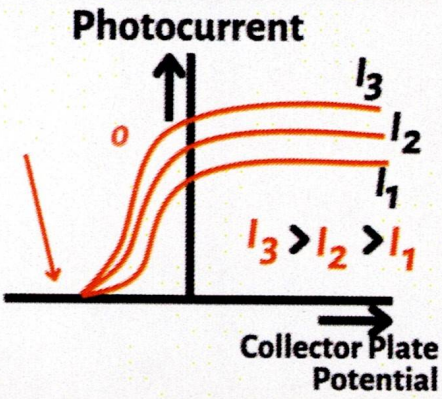


Photocurrent vs Voltage

with diff. frequency



with diff. Intensity



De-Broglie Equation

Particle of mass *m* moving with velocity *v*

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

$$\lambda = \frac{k}{\sqrt{2m\,K.E.}}$$

particle in electric field

$$\lambda = \frac{k}{\sqrt{2mq\Delta V}}$$

Particle is moving in Potential diff.

for electron

$$\lambda = \frac{12.2}{\sqrt{V}}\,\text{Å}$$

for proton

$$\lambda = \frac{0.286}{\sqrt{V}}\,\text{Å}$$

for deutron

$$\lambda = \frac{0.202}{\sqrt{V}}\,\text{Å}$$

for α particle

$$\lambda = \frac{0.101}{\sqrt{V}}\,\text{Å}$$

Collision

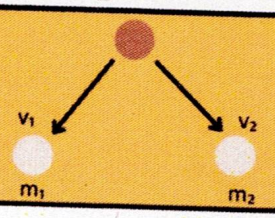
$$V_1 = \frac{(m_1 - em_2)u_1 + (1+e)m_2u_2}{m_1+m_2}$$

$$V_2 = \frac{(m_2 - em_1)u_2 + (1+e)m_1u_1}{m_1+m_2}$$

in Magnetic Field

$$\lambda = \frac{h}{qBr}$$

for Explosion



$$\lambda_1 = \frac{h}{m_1v_1} = \frac{h}{p}$$

$$\lambda_2 = \frac{h}{m_2v_2} = \frac{h}{p}$$

Kinetic Theory of Gases

$$\lambda = \frac{h}{\sqrt{fmK_BT}}$$

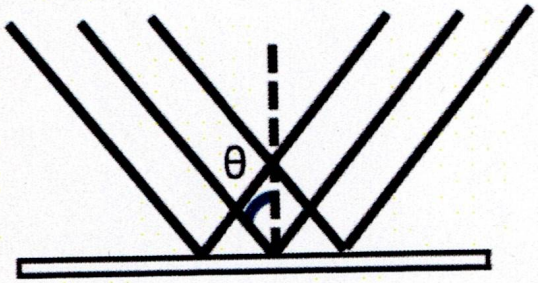
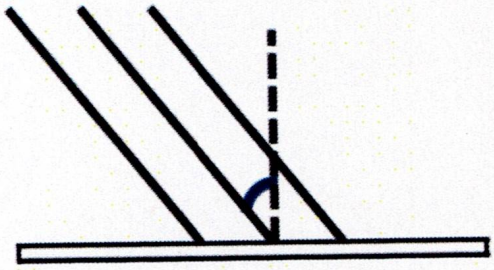
$$\lambda_{\text{gas molecule}} = \frac{h}{\sqrt{3mKT}}$$

Heisenberg Uncertainity Principle

It is impossible to predict simultaneously the position and momentum of an elementary particle

$$\Delta x \Delta p \geq \frac{h}{2\pi}$$

Radiation and Pressure

Surface with 100% Reflection	Surface with 100% Absorption (Black Body)	
		
$F_{Plate} = \frac{2IA_s \cos^2\theta}{c}$	$F_y = \frac{IA_s \cos^2\theta}{c}$	$F_x = \frac{IA_s \sin\theta \cos\theta}{c}$
$P = \frac{2I}{c}$	$P = \frac{I}{c}$