

Name: Divya

Enroll no.: B65189

Batch: B9

Experiment-5

Aim: To determine the planck's constant from kinetic energy versus frequency graph.

Apparatus required: Ammeter, Voltmeter, light source, cathode tube, simulator

Formula used: $h\nu = \phi_0 + K.E_{\max}$ and $c = \nu\lambda$

where ν is frequency of light, ϕ_0 is work function of metal, c is speed of light and λ is wavelength of light.

$$K.E_{\max} = eV_0$$

where V_0 is the stopping potential

Observation:

Area of plate = 0.3 cm^2

Intensity of light source = 15 W/m^2

S.No.	Element	Wavelength(nm)	Stopping Potential(V)	K.E.(eV)
1.	Copper	236 nm	0.6V	$9.6 \times 10^{-20} \text{ J}$
2.	Sodium	236 nm	3V	$4.8 \times 10^{-19} \text{ J}$
3.	Platinum	172 nm	0.9V	$1.44 \times 10^{-19} \text{ J}$
4.	Zinc	172 nm	3V	$4.8 \times 10^{-19} \text{ J}$

Teacher's Signature _____

Calculation:

$$K.E._{\max} = h\nu - \phi_0$$

$$h\nu = K.E._{\max} + \phi_0$$

$$h = \frac{K.E._{\max} + \phi_0}{\nu}$$

$$h = \left(\frac{K.E._{\max} + \phi_0}{c} \right) \lambda \text{ eV-}\Delta$$

(i) For copper, $\phi_0 = 4.5 \text{ eV}$

(ii) For sodium, $\phi_0 = 2.3 \text{ eV}$

(iii) For platinum, $\phi_0 = 6.4 \text{ eV}$

(iv) For zinc, $\phi_0 = 4.33 \text{ eV}$

(i) For copper,

$$h = \frac{(9.6 \times 10^{-20} + 4.5 \times 1.6 \times 10^{-19})}{3 \times 10^8} \times 236 \times 10^{-9} \text{ J-}\Delta$$

$$h = 6.42 \times 10^{-34} \text{ J-}\Delta$$

(ii) For sodium,

$$h = \frac{(4.8 \times 10^{-19} + 2.3 \times 1.6 \times 10^{-19})}{3 \times 10^8} \times 236 \times 10^{-9} \text{ J-}\Delta$$

$$h = 6.67 \times 10^{-34} \text{ J-}\Delta$$

(iii) For platinum,

$$h = \frac{(1.44 \times 10^{-19} + 6.4 \times 1.6 \times 10^{-19})}{3 \times 10^8} \times 172 \times 10^{-9} \text{ J-}\Delta$$

$$h = 6.69 \times 10^{-34} \text{ J-}\Delta$$

(iv) For zinc,

$$h = \frac{(4.8 \times 10^{-19} + 4.33 \times 1.6 \times 10^{-19})}{3 \times 10^8} \times 172 \times 10^{-9} \text{ J-}\Delta$$

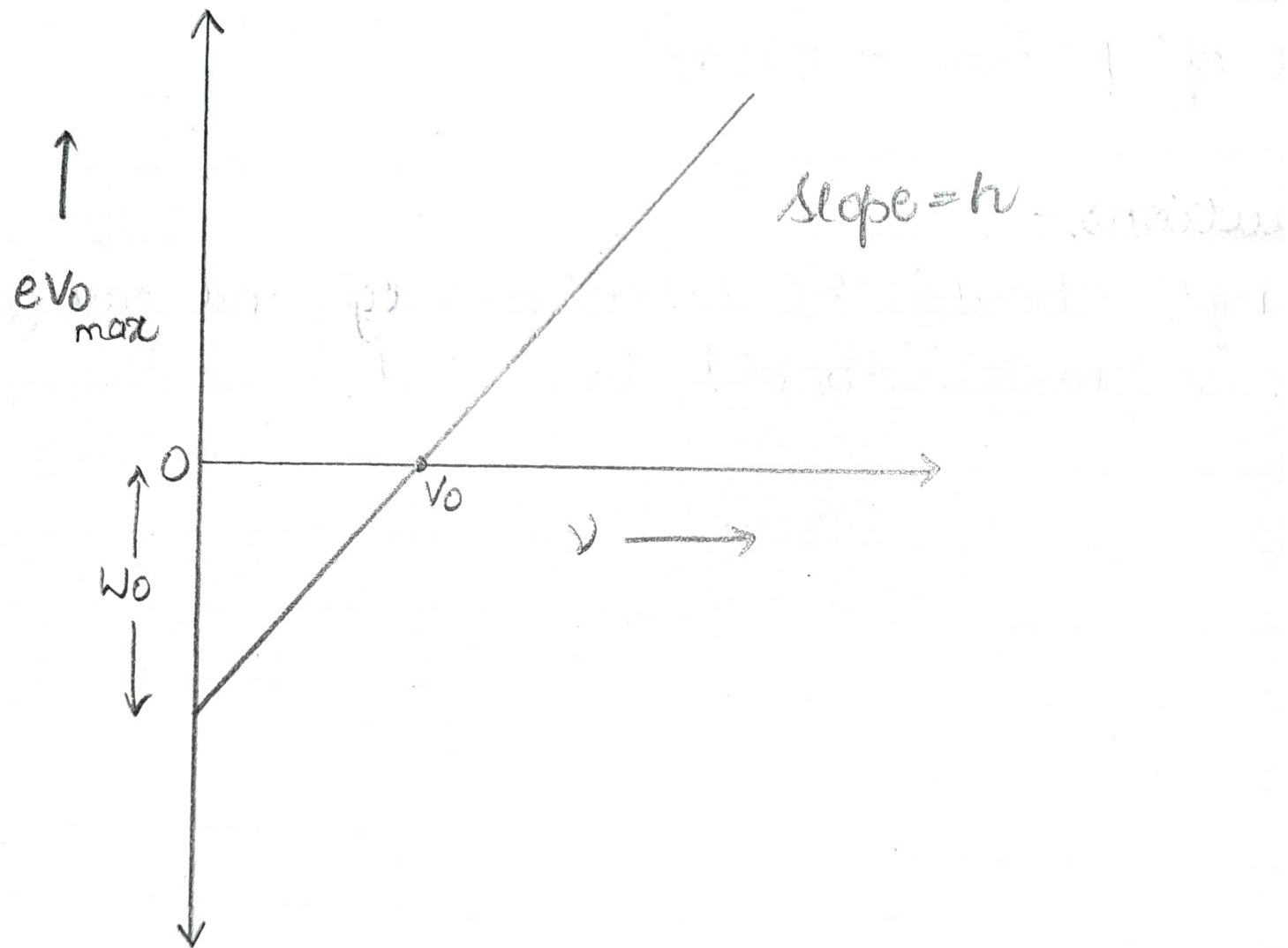
$$h = 6.72 \times 10^{-34} \text{ J-}\Delta$$

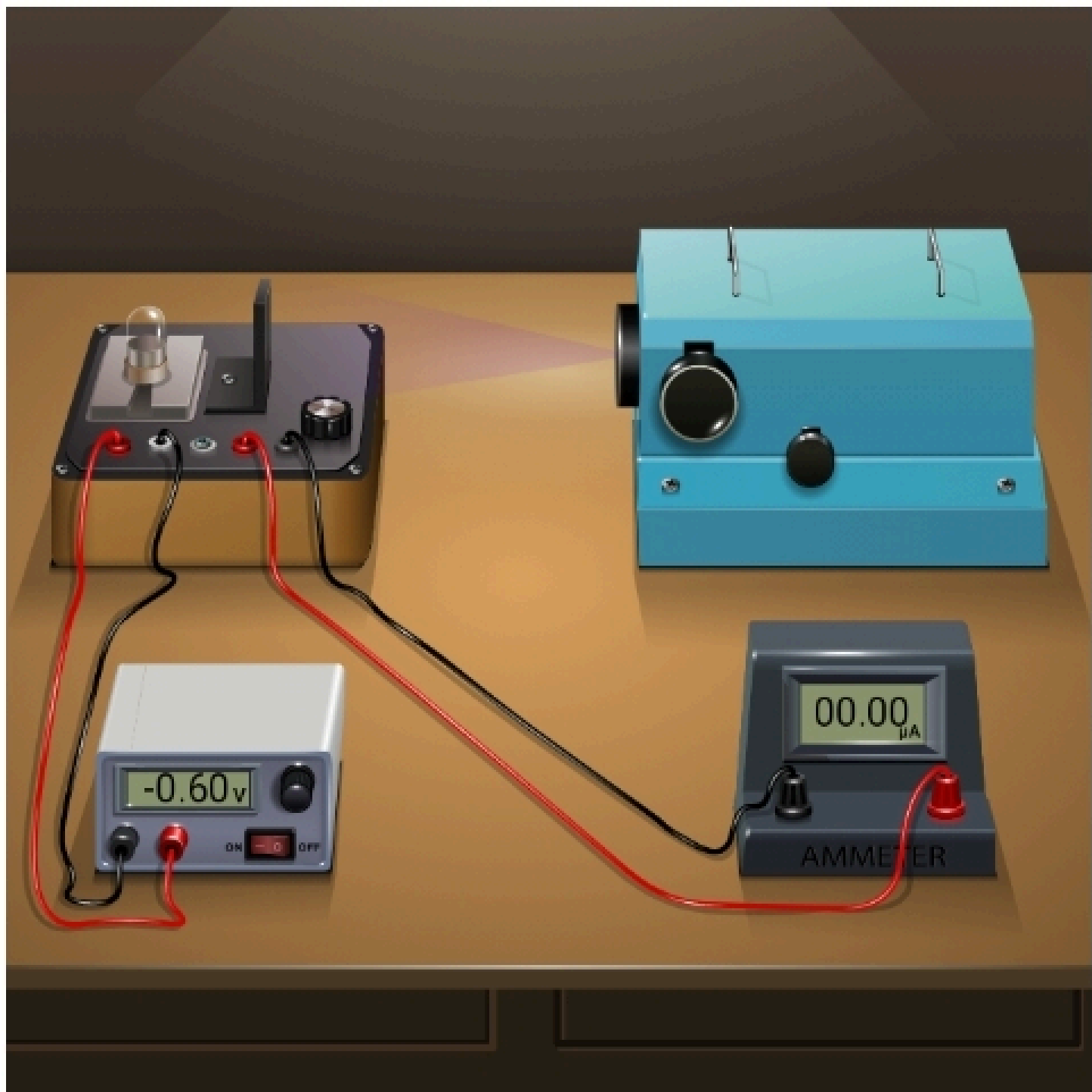
Result:

- i) For copper, $h = 6.42 \times 10^{-34} \text{ J-s}$
- ii) For Sodium, $h = 6.67 \times 10^{-34} \text{ J-s}$
- iii) For platinum, $h = 6.69 \times 10^{-34} \text{ J-s}$
- iv) For zinc, $h = 6.72 \times 10^{-34} \text{ J-s}$

Precautions:

1. Remember to switch off the power after requirement.
2. Make sure room is dry, cool and dust free.
3. Shield the setup from ambient light.





Copyright © Amrita University 2009 - 2015