EXPT - 5 PHOTOELECTRIC EFFECT 29/8/16

AIM: To determine the plank's constant using photoelectric effect.

APPARATUS REQUIRED:

Light source, guide, scale, draw table, covers, focus lens, colour filter

FORMULA:

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

$$h\nu = e\phi + eV_0$$

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

E = Energy

h = Plank's constant

ν = frequency of light

e = charge of an electron

ϕ = work function of metal

V_0 = stopping potential

λ = wavelength of light

m = mass of ejected electron

v = velocity of ejected electron

c = velocity of light.

OBSERVATION :

S.No	FILTER	ν ($Sec^{-1} \times 10^{14}$)	Stopping voltage (V)
1	Red (685nm)	4.72	-0.36
2	Yellow (570nm)	5.263	-0.60
3	Light Green (540 nm)	5.55	-0.76
4	Dark Green (500nm)	6.0	-0.84
5	Blue (460 nm)	6.52	-1.07

CALCULATIONS

As $h = e\frac{\Delta V_s}{\Delta \nu} = 1.602 \times 10^{-19} \times \frac{(11.071 - 10.361)}{10^{14} \times (6.52 - 4.72)}$

$= 1.602 \times 10^{-19} \times \frac{0.71}{1.8} \times 10^{-14}$

$= 1.602 \times 0.394 \times 10^{-33}$

$= 6.311 \times 10^{-34}$ J Sec

by graph :

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1.25 - 0.25}{7 - 4.45} = \frac{1}{2.55} = 0.392$

by finding

$\frac{\Delta V_s}{\nu} = 0.394$

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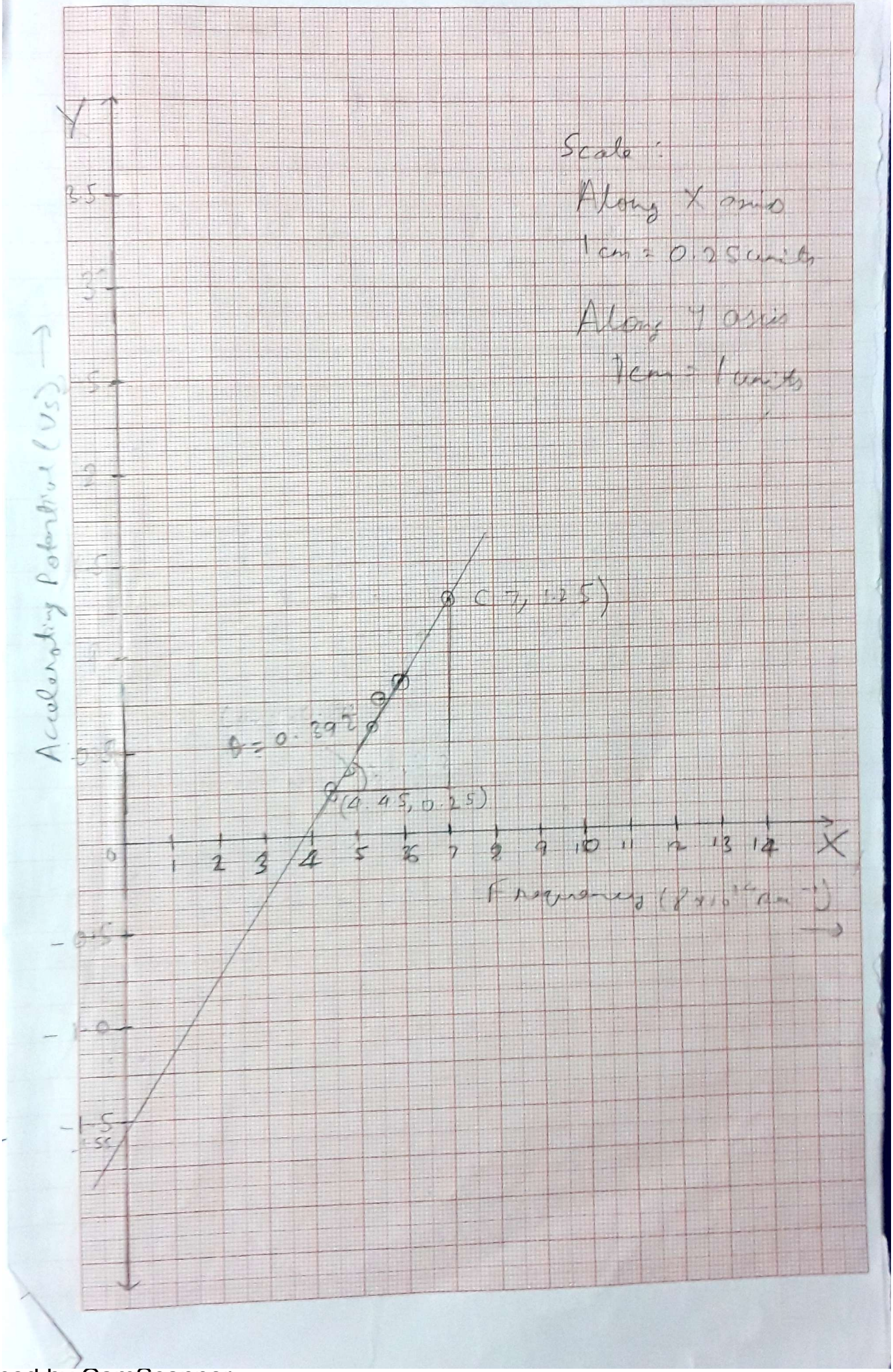

From the graph, intercept of $y = 0$, the value of $\phi = 1.46 eV$

RESULT

The value of Plank's constant according to our Experiment is

$6.311 \times 10^{-34} J_{sec}$