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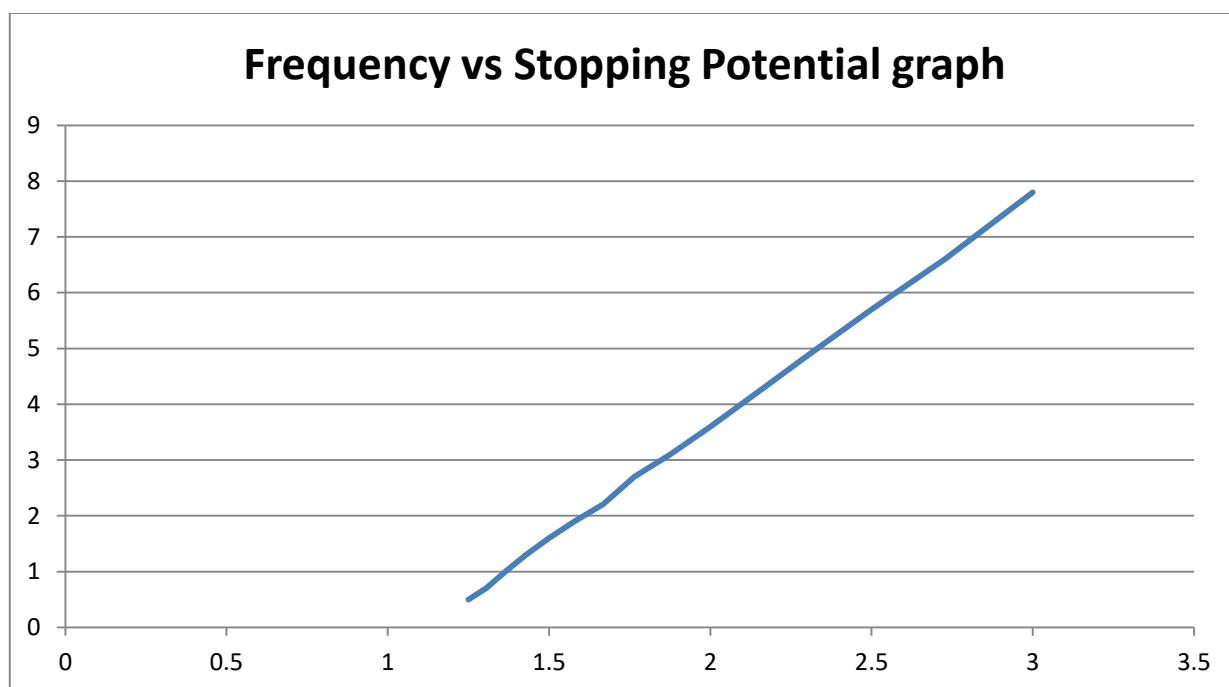
EXPERIMENT - 2

AIM:

To determine the Planck's constant by photoelectric effect.

Observations:

Wavelength (nm)	Stopping Potential (V)	Frequency (PHz)
100	7.8	3
110	6.6	2.7273
120	5.7	2.5
130	4.9	2.3077
140	4.2	2.14286
150	3.6	2
160	3.1	1.875
170	2.7	1.7647
180	2.2	1.6667
190	1.9	1.579
200	1.6	1.5
210	1.3	1.42857
220	1	1.3637
230	0.7	1.304348
240	0.5	1.25

Frequency vs Stopping Potential graph

Calculations:

For Copper (Cu):

Area of Plate = $0.1 \ cm^2$

Intensity of light = $5 \ W/m^2$

As the stopping potential (V) vs Frequency (PHz) plot is a straight line with

$$Slope = \frac{h}{e}$$

Where h is Planck's constant and e is electron charge.

Thus,

h = slope x e

Let 2 points on the curve be (1.579, 1.9) and (2.14286, 4.2)

Slope of the straight line is

$$slope = \frac{4.2 - 1.9}{2.14286 - 1.579} \text{x } 10^{-15}$$

$slope = 4.0790267088 \text{ x } 10^{-15}$

$h_{obs} = slope \text{ X } e = (4.0790267088 \text{ x } 10^{-15})(1.602 \text{ x } 10^{-19})$

$h_{obs} = 6.5346 \text{ x } 10^{-34} Js$

Percentage Error:

Actual value of Planck's constant, h is $6.62607 \text{ x } 10^{-34} Js$

Percentage Error,

$$\%E = \frac{(6.62607 \text{ x } 10^{-34}) - (6.5346 \text{ x } 10^{-34})}{6.62607 \text{ x } 10^{-34}} \text{ x } 100 = 1.38\% \ (approx)$$

Results:

Value of Plank's constant determined by experiment is $h_{obs} = 6.5346 \text{ x } 10^{-34} Js$

Actual value of Plank's constant is $h = 6.62607 \text{ x } 10^{-34} Js$

Percentage error is $\%E = 1.38\% \ (approx)$