

- a. Provide a graph of the photoelectric experiment data. If drawing a graph by hand, use the blank graph template on the next page and a ruler. If graphing on calculator, show a sketch of the graph properly labeled and the values for a and b in the formula $y = ax + b$.
- b. Using graphical analysis, determine the work function of the photocathode. In your response, show how the physics equation fits into $y = mx + b$.
- c. Explain the meaning or the significance of the x-intercept?

$$y = mx + b$$

b)

$$\begin{array}{c} f_{in} \\ \downarrow \\ x \end{array} \quad \begin{array}{c} V \\ \downarrow \\ y \end{array}$$

$$E_{in} = E_{max} + W$$

$$hf = qeV_{stop} + W$$

$$qeV_{stop} = hf - W$$

$$V_{stop} = \frac{hf}{qe} - \frac{W}{qe}$$

$$V_{stop} = \frac{h}{qe} \cdot f - \frac{W}{qe}$$

$$y = m x + (-b)$$

$$y_{int} = -1.04 \text{ V}$$

$$-1.04 \text{ V} = \frac{-W}{qe}$$

$$-1.04 \text{ V} \times 1.6 \times 10^{-19} = -W$$

$$W = 1.664 \times 10^{-19} \text{ J} \approx \frac{1 \text{ eV}}{1.6 \times 10^{-19} \text{ J}}$$

c) $x\text{-int} = f_0$

$$f_0 = 2.2 \times 10^{14} \text{ Hz}$$

d) $\frac{h}{qe} = \text{slope}$

$$\text{slope} = 4.616 \times 10^{-5} \frac{\text{V}}{\text{Hz}}$$

$$4.616 \times 10^{-5} = \frac{h}{qe}$$

$$4.616 \times 10^{-5} \times 1.6 \times 10^{19} = h$$

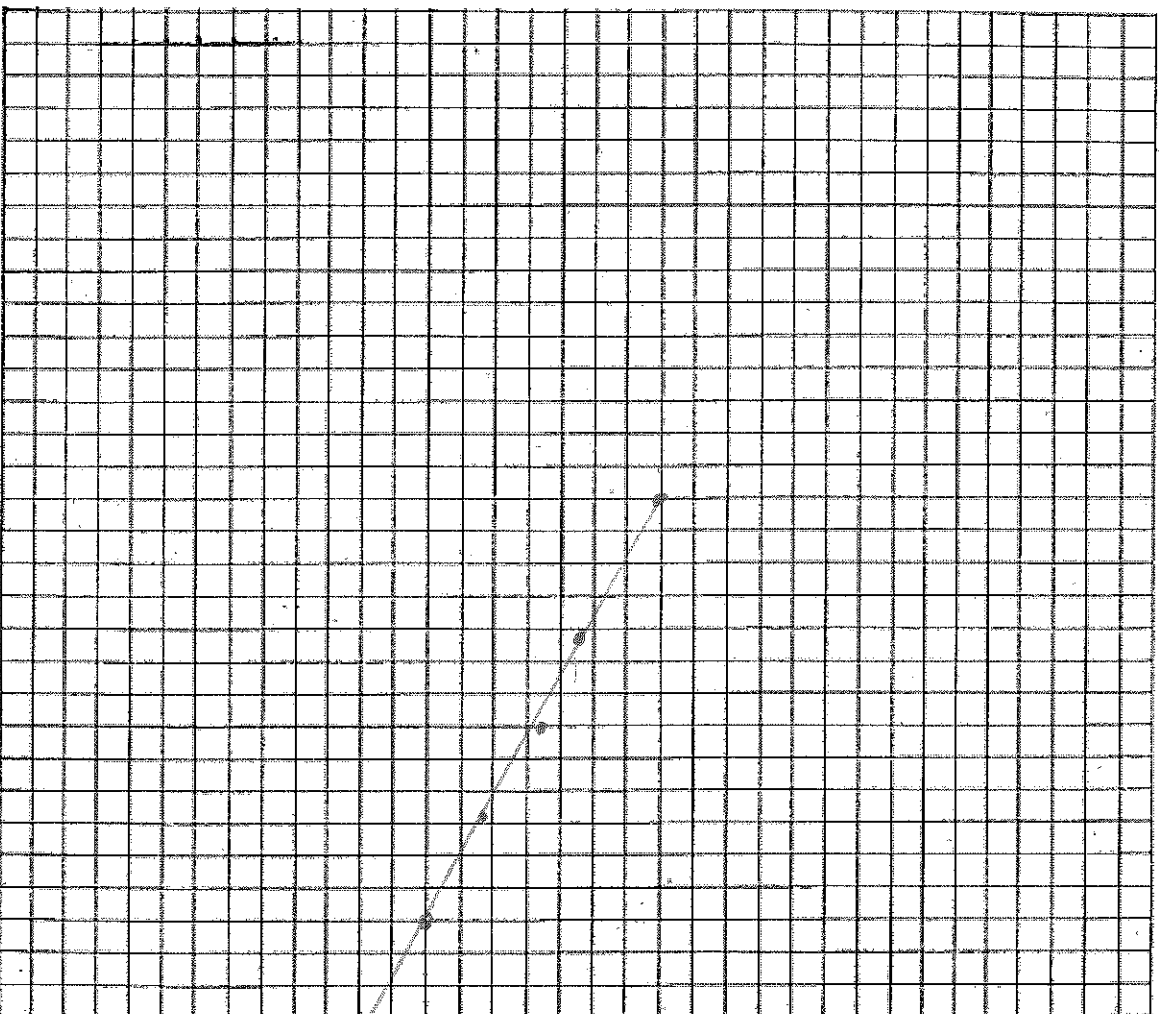
$$h = 7.3856 \times 10^{-34}$$

$$h = 7.4 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$W = 1.04 \text{ eV}$$

Stopping Voltage (V)

0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1



1.0

2.0

xint y=0
 f_0

3.0

4.0

Frequency $\times 10^{14}$ Hz