

# Photoelectric Effect – Measurement of $h/e$

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## Apparatus

Mercury vapor light source

$h/e$  apparatus with photodiode detector

Voltmeter, timer, filters

## Introduction

The purpose of this experiment is to introduce the student to the photoelectric effect and to allow a determination of  $h/e$ , the ratio of the Planck constant  $h$  to the elementary charge  $e$ .

## Collection and analysis of experimental data

Refer to the  $h/e$  instruction manual for information on the apparatus and the two experiments to be carried out. Other useful references are listed below. Be sure to perform the data analysis and answer all the questions in the instruction manual. Use the least-squares method to fit your data for stopping voltage versus frequency to a straight line. Do this both “by hand” (see Melissinos, Chapter 10, sections 3.2 and 3.3) and also using graphing software, e.g., Microsoft Excel. As usual, carry out an analysis of the experimental uncertainties in your results.

## Questions

1. The cutoff frequency in the photoelectric effect is the frequency of light below which no photoelectrons are observed. Determine the cutoff frequency for this apparatus from your results for Experiment 2.
2. What is the meaning of the intercept on the voltage axis? Do contact potentials play a role in determining this intercept?

## References

Melissinos, A.C., *Experiments in Modern Physics*, Academic Press (Chapters 1 and 10)

Taylor, J.R. and C.D. Zafiratos, *Modern Physics for Scientists and Engineers*, Prentice Hall (Sect. 5.3)

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