Photoelectric Effect

EX-5549A

Designed for use with either of the following:

- 850 Universal Interface
- 550 Universal Interface

Concepts:

- Connects to the 850 Universal Interface for data collection in PASCO Capstone
- Find Planck's Constant to within 5%
- Verify that stopping voltage is independent of intensity
- Find characteristics of the photodiode

The Photoelectric Effect System is used to perform the photoelectric experiment, determining Planck's Constant to within 5%. This apparatus uses the conventional method of determining Planck's Constant. The metal plate in the photodiode is illuminated with various frequencies of light, selected from a mercury lamp using filters. The voltage is then adjusted to stop the photoelectric current. The stopping voltage is plotted vs. the frequency, and Planck's Constant is determined from the slope of the graph.

The concept that the stopping voltage does not change with light intensity is tested using the various apertures that change the light intensity by partially blocking the light.

Use the 850 Universal Interface and PASCO Capstone to collect and analyze data.

Both the picoammeter and the power supply for the stopping voltage have sensor ports on the front that connect to the analog sensor ports of the 850 Universal Interface. PASCO Capstone automatically recognizes these instruments and can read the current and the voltage. During the experiment, each time a different filter is applied, the user clicks "Keep" in PASCO Capstone and the value of the stopping voltage for that frequency is recorded and automatically graphed vs. frequency.

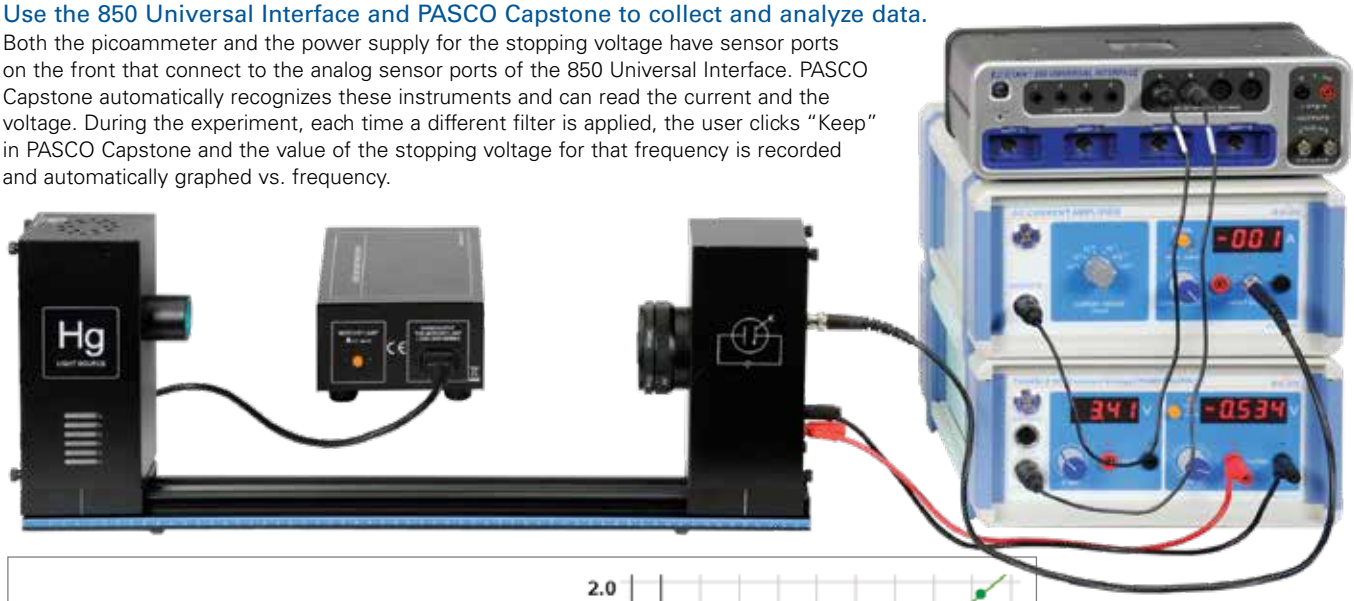
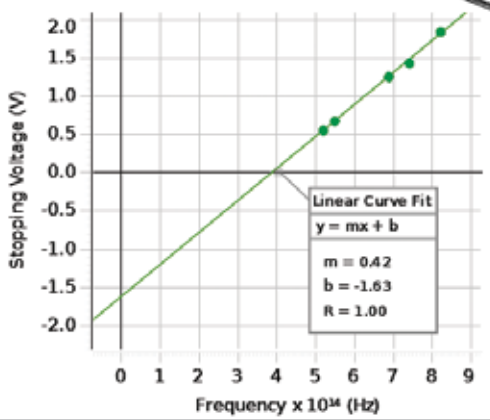


Table I: Photoelectric Effect with 4 mm Aperture

	▲ Run #1	■ Run #1
	Frequency x 10^{14} (Hz)	Stopping Voltage (V)
1	8.214	1.835
2	7.408	1.428
3	6.879	1.248
4	5.490	0.671
5	5.196	0.551



For the typical sample data shown, the graph of Stopping Voltage vs. Frequency gives a slope of 4.2 x 10^{-15} V·s. This results in a value for Planck's Constant of 6.7 x 10^{-34} J·s, which is 1.3% above the accepted value. Graph generated using PASCO Capstone software.

Experiment Includes

• Photoelectric Effect Apparatus	SE-6614
• DC Current Amplifier	SE-6621
• Tunable DC Power Supply	SE-6615
• Cables for 850 Interface	

Download This Experiment

The FREE experiment files include instructions in Microsoft Word®, PASCO Capstone workbook files with sample data, and graphics. Download these experiments at **www.pasco.com/CapstoneExperiments**.

Order Information

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Required:

550 or 850 Universal Interface.....p. 26

PASCO Capstone Software.....pp. 70-73