

Electron Charge

Millikan Oil Drop Apparatus

AP-8210A

See complete experiment on page 366.

- ▶ Nobel prize-quality physics in the student lab
- ▶ Ionization source for changing droplet charge
- ▶ Measures the charge of an electron to within $\pm 3\%$

The Millikan Oil Drop Experiment is one of the most popular experiments in undergraduate physics for several reasons:

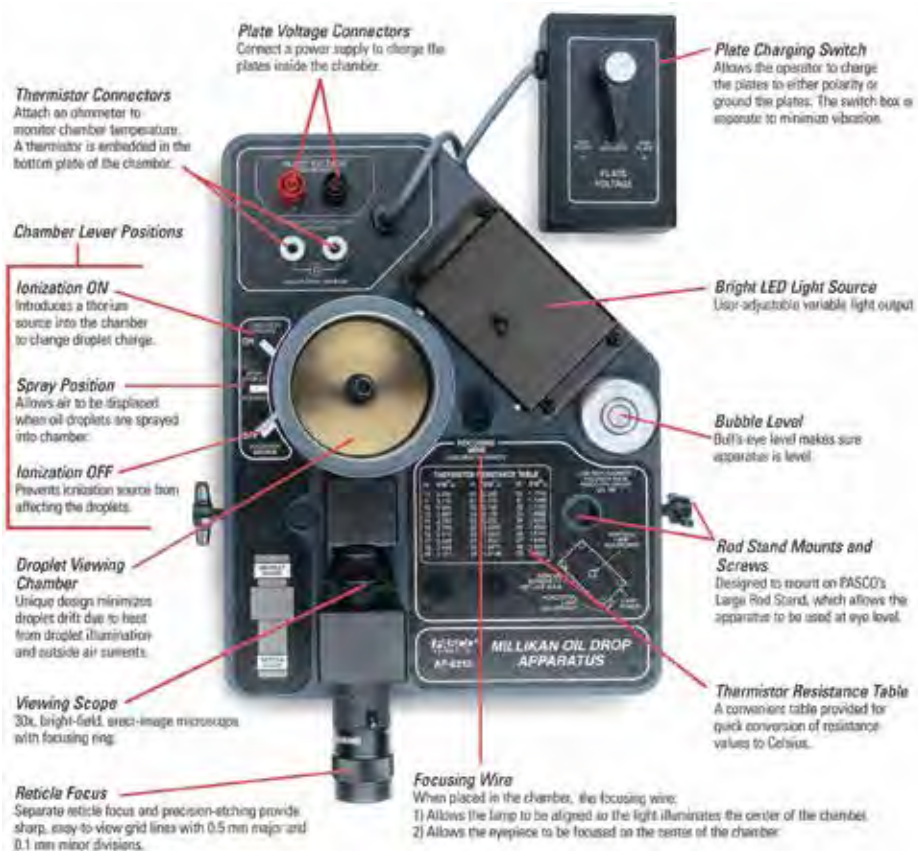
- ▶ The experimental principle is straightforward and easy to understand.
- ▶ It measures a fundamental atomic constant using a method that won its originator, Robert Millikan, the Nobel Prize.
- ▶ The observation of the effects of one or more electrons upon oil drops in an electric field provides a striking demonstration of the quantized nature of electricity.



The Millikan Oil Drop Apparatus mounted on a rod stand for easy, eye-level viewing

Specifications

- Maximum Plate Voltage:** 500 VDC
- Light Source:** Cool LED
- Reticle Line Separation:** 0.5 mm major divisions
0.1 mm minor divisions
- Plate Spacing:** 7.62 mm
- Plate Diameter:** 60 mm



Includes

- Millikan Oil Drop Apparatus with Switch
- Non-volatile Oil and Atomizer
- 12 VAC Lamp Power Adapter

Order Information

| | |
|--|---------------------|
| Millikan Oil Drop Apparatus | AP-8210A |
| Required: | |
| Basic Digital Multimeter (2) | SE-9786A p. 235 |
| High Voltage Power Supply | SF-9585A p. 251 |
| Recommended: | |
| <i>For mounting unit at eye level on a standard lab table:</i> | |
| Large Rod Base | ME-8735 pp. 190-191 |
| 45 cm Steel Rod (2) | ME-8736 pp. 190-191 |
| Complete System: | |
| Charge of an Electron | EX-9929A p. 366 |
| Replacement Parts: | |
| 4 oz. Bottle Mineral Oil (qty. 4) | AP-8211 |
| Millikan LED Light Source | AP-8212 |

Clear droplet observation and low droplet drift are essential for success with Millikan's classic experiment. PASCO's apparatus uses a pre-aligned optical system and special condenser to achieve these conditions.

Accuracy in the Oil Drop Experiment depends on the student's ability to precisely measure all the variables involved: plate voltage, plate separation, time and distance of droplet rise and fall, temperature, oil density, etc. Extreme care taken in the design and manufacture of this unit ensures that the student's best efforts will be rewarded with more accurate results. Typically, a careful student can achieve results within 3% or less of the accepted value.

Electromagnetism

Charge of an Electron

EX-9929A

Concepts:

- ▶ Accurately measure the charge of a single electron
- ▶ Recreate Robert Millikan's historical experiment

Small droplets of oil are introduced into a chamber where an electric field of known strength is present. Using the viewing scope and a stopwatch, the velocity of a falling oil droplet is measured and recorded. Next, the electric field in the chamber is increased, causing the oil droplet to move upward. This allows the measurement of the force on the droplet and, ultimately, the charge of the droplet. By measuring the charge of several different oil droplets, the smallest difference in charge between them can be equated to the charge of an electron.



PASCO Advantage

PASCO's Charge of an Electron Experiment features a 30x, bright-field, erect-image microscope for clear viewing of the oil droplets. The droplet viewing chamber utilizes a special condenser to minimize droplet drift typically caused by droplet illumination and outside air currents. An ionization source allows the droplet charge to be changed.

Experiment Includes

- Millikan Oil Drop Apparatus AP-8210
- Basic Digital Multimeter SE-9786A
- High Voltage Power Supply SF-9585A
- Large Rod Base ME-8735
- 45 cm Steel Rod (2) ME-8736
- Red Banana Plug Cords (5 Pack) SE-9750
- Black Banana Plug Cords (5 Pack) SE-9751
- Charge of an Electron Experiment Manual

Easy Cleaning

The condenser system easily disassembles for cleaning and inspection.

Condenser Housing

Minimum Electric Field Distortion

A 0.5 mm diameter droplet entry hole in the top capacitor plate has a negligible effect on the electric field.

Ionization Source

The thorium-232 alpha source can be activated by the switch on the side of the chamber. The source allows the charge on the oil droplets to be changed.

Droplet Hole Cover

Prevents additional droplets from entering the chamber once the experiment has started.

Polished Surfaces

Polished surfaces on the plate spacer minimize absorption of light (and heat) through the chamber walls.

Electrical Connection

Electrical connection to the top plate

Condenser Assembly

To Download This Experiment

Search for EX-9929A at www.pasco.com

Order Information

Charge of an ElectronEX-9929A

(No interface required.)