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Student Technology Fee
Funding Request Form
Special Initiative Fiscal Year 2007-08
Northwestern State University of Louisiana

This document will not be accepted without complete information, detailed budget, specifications of each piece of equipment requested and pricing.

Prepared by: _____Greg Giering_____ For:___Chemistry & Physics_____

College: _Science & Technology___ Campus: _Natchitoches_ Department: _Chemistry & Physics

Where will requested equipment be located/installed/housed: Bldg. _Fournet Hall____

Total amount requested $_77,328.00___Any matched funds: Yes No Department __No_____

Are property policies and procedures in place by the department for equipment requested. Yes_____

Delivery to the Student Technology office located in Watson Library, Room 113. Date _____

1. Describe target audience.

All Science majors enrolled at NSU and all students enrolled in any science classes at NSU.

2. Describe project/initiative for which you are requesting funds.

The Department of Chemistry and Physics is requesting the funding of:

1. Ten (10) Student Spectrometer with Wide Aperture Optics. These Spectrometers will be used in the Physics lab, Fournet Rm. 124.

2. Ten (10) Gravitational Torsian Balance for conducting gravitation experiments.

3. Ten (10) Coulomb's Law Apparatus for conducting experiments in electricity and magnetism.

4. Ten (10) Photoelectric Effect Apparatus for conducting experiments in light and energy.

5. One (1) Speed of Light Apparatus for conducting tests of fundamental constants.

3. State measurable objectives that will be used to determine the impact/effectiveness of the project.

The objective of the proposed project is to procure and install the equipment necessary to upgrade and outfit the Physics lab with the installation of new and advanced equipment. This objective can be divided into three phases:

1. **Procurement Phase:** The Student Technology Department will collect final pricing bids from vendors.

2. **Installation Phase:** This phase will begin as soon as the new equipment arrives. The Department of Chemistry & Physics will install equipment immediately upon receipt.

3. **Utilization and Evaluation Phase:** After the new equipment is installed the science students will begin to use them immediately.

4. Indicate how each project objective will be evaluated.

1. **Procurement Phase:** We will consider this objective complete when all purchase orders have been submitted to the purchasing department. Copies of all purchase order for all equipment will be on file in the Department of Chemistry & Physics.

2. **Installation Phase:** This objective will be complete when the new equipment is installed and operational. Copies of inventory will be on file in the One Card Office.

3. **Utilization and Evaluation Phase:** This is an ongoing phase. Surveys will be given and compiled semi-annually. Copies of evaluations will be on file in the Department of Chemistry & Physics.

5. Provide a justification for funding of the project. Estimate the number of students that will be served per academic year and in what ways. Please indicate also any unique needs of the target group.

This will replace all of the obsolete and broken spectrometers. The number of students able to use this equipment will be approximately 200 per semester. All Science majors and students enrolled in science and physics classes.

6. If funded, which NSTEP (http://www.nsula.edu/nstep/NSTEP.pdf) objective(s) will this funding of this project advance. How will funding of the project advance the University and College / unit technology plan? **To improve access to technology by students, faculty, and staff at Northwestern State University.**

Objective 1:
To improve access to technology by students, faculty, and staff at Northwestern State University.

Objective 2:

To provide classrooms with updated technology and equipment

Objective 3:

To upgrade laboratories with modern technology.

Objective 8:

To encourage innovation and research.

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7. List those individuals who will be responsible for the implementation of the project/initiative and indicate their demonstrated abilities to accomplish the objectives of the project.

Dr. Paul Withey, Dept. Head, Chemistry & Physics
Mr. Greg Giering, Faculty, Physics Dept.
Dr. Weijia Zhu, Asst. Professor, Chemistry & Physics

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8. Describe any personnel (technical or otherwise) required to support the project/initiative.

None

9. Provide a schedule for implementation and evaluation.

If the equipment in this proposal is approved for purchase, the Department of Chemistry & Physics is prepared to perform the procurement and installation of the new spectrometers as soon as they are delivered.

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10. Estimate the expected life of hardware and software. Explain any anticipated equipment/software upgrades during the next five years.

The expected life of hardware is 7-10 years.

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11. Explain in detail a plan and policy that will be in place to ensure property security/controls for any equipment received through Student Tech Fee.

The Department of Chemistry and Physics follows the Property Control Policy implemented by Northwestern State University.

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12. Attach a detailed budget, including: specs., description, cost, state contract number, and vendor for each item; cost of outside support personnel; and a description of how the proposal will support University/College/unit resources (i.e., cash match, funds from other sources, or

reallocation of existing hardware/software or other equipment. **All of the information requested must be attached or the request will not be accepted.**

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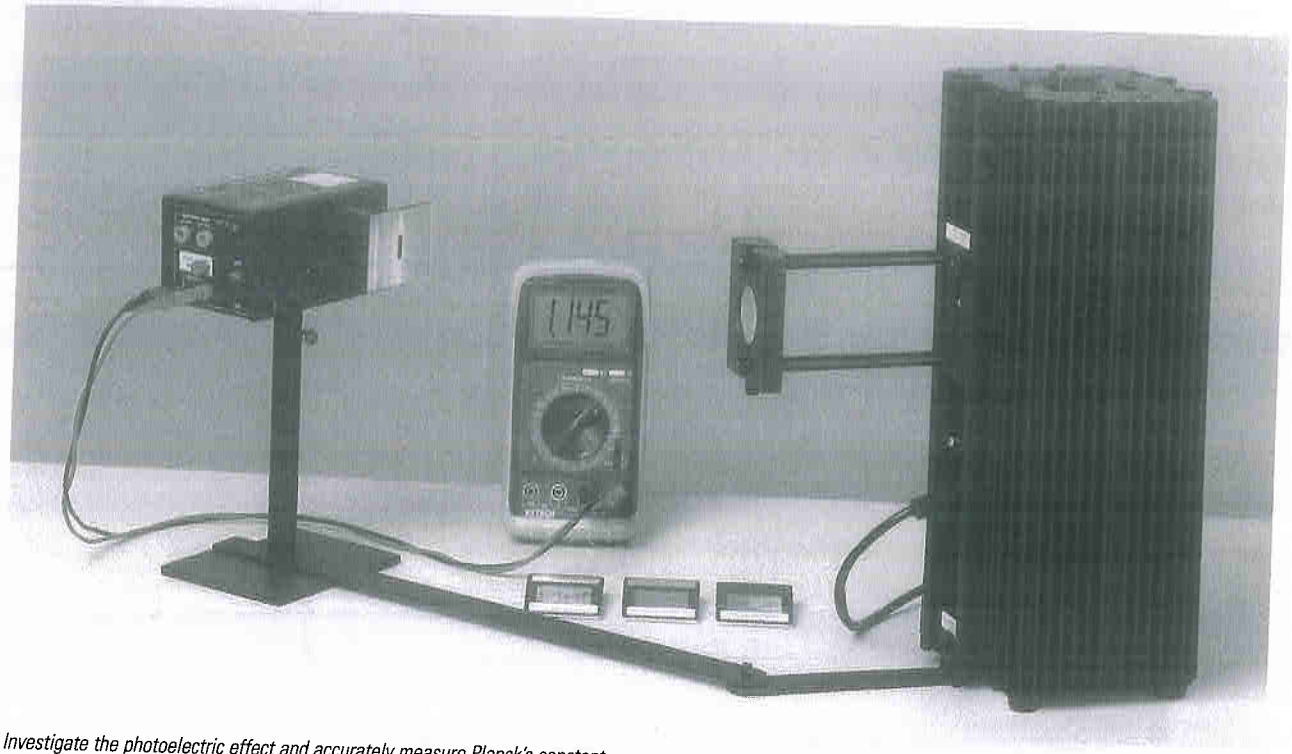
13. List two individuals and their letters of support for the project. The letters needs to be from unit's Dean, the appropriate Vice President or the SGA President.

1. Dr. Paul Withey, Dept. Head, Chemistry & Physics
2. Shane Creppel, SGA President

Photoelectric Effect

EX-9934



Investigate the photoelectric effect and accurately measure Planck's constant.

Concepts:

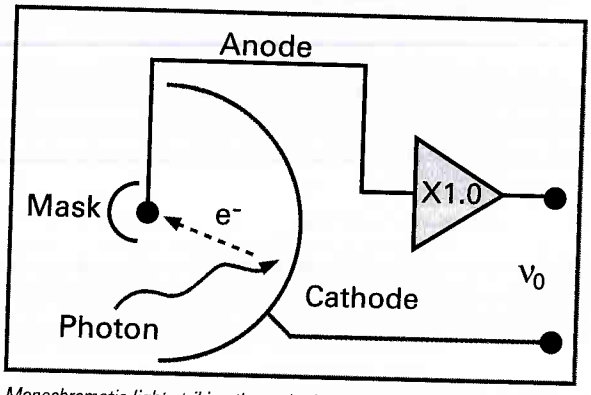
- Wave Model of Light versus the Quantum Model of Light
- Relationship between Energy, Wavelength and Frequency

The Photoelectric Effect Experiments allows students to directly observe the emission of electrons in a photoelectric tube. The experiment gives students the opportunity to juxtapose the wave model of light with the quantum model of light.

Photons from a monochromatic light source strike the cathode in an evacuated tube, causing it to emit electrons. The kinetic energy (E_k) of each electron is equal to the energy deposited by each photon (hν) minus the work function (binding energy) of the cathode (W_0). Some of the emitted electrons strike the anode, causing it to become negatively charged with respect to the cathode. When the anode potential becomes sufficiently large, the photoelectrons have insufficient energy to overcome the potential difference. Therefore, no more electrons reach the anode and the anode potential stabilizes. DataStudio can be used to plot stopping potential vs. frequency of the incident light. The slope of the graph is equal to h/e and the vertical intercept is W_0 /e.

Experiment Includes:

Complete h/e System	AP-9370A
Basic Digital Multimeter	SE-9786A
Banana Plug Cord - Black (5 pack)	SE-9751
Photoelectric Effect Experiment Manual	



Monochromatic light striking the cathode causes electrons to be emitted, some of which strike the anode.

PASCO Advantage

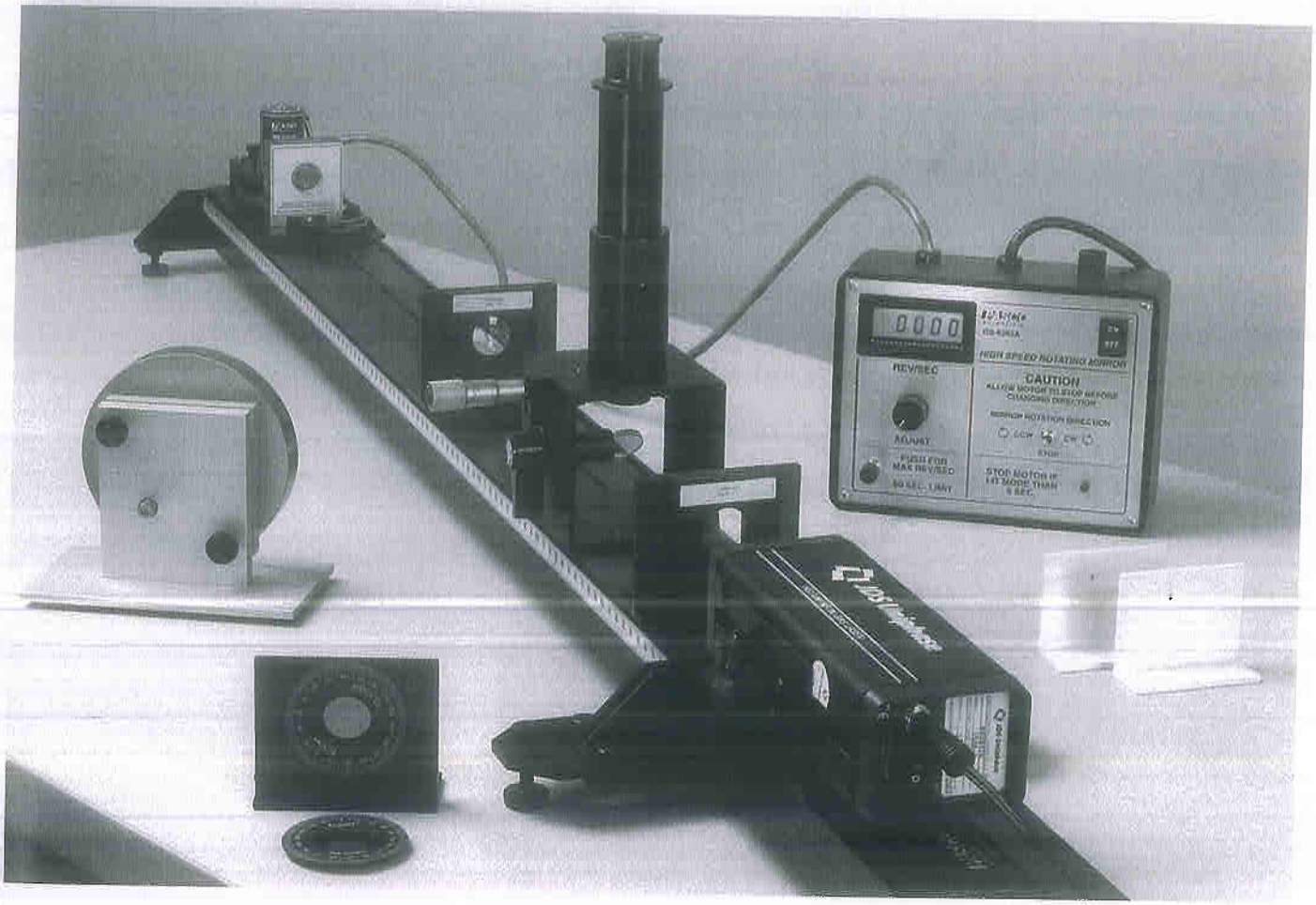
PASCO's h/e experiment features a photoelectric head designed to minimize secondary emissions from the anode, which typically interfere with the measurement of Planck's constant. The stopping potential is measured directly, eliminating the need to control extremely small currents during the experiment.

Speed of Light

EX-9932

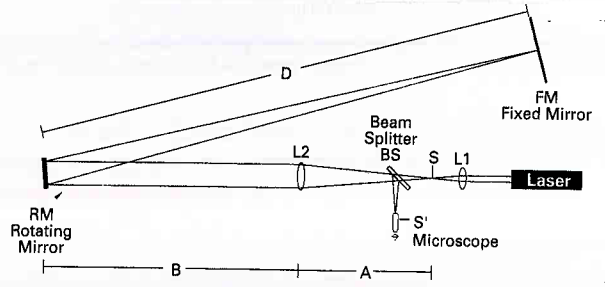
Concepts:

- Determine the Speed of Light in Air
- Recreate Foucault's Historical Experiment



The Speed of Light Experiment uses laser light and a high-speed rotating mirror to determine this fundamental constant using the Foucault method.

Laser light passes through a series of lenses to produce an image of the light source at a measured position. The light is then directed to a rotating mirror, which reflects the light to a fixed mirror at a known distance from the rotating mirror. The laser light is reflected back through its original path and a new image is formed at a slightly different position. The difference between final/initial positions, angular velocity of the rotating mirror and distance traveled by the light are then used to calculate the speed of light in air.



Experiment Includes:

Complete Speed of Light Apparatus	OS-9261A
Speed of Light Experiment Manual	

PASCO Advantage

PASCO's Speed of Light Experiment allows students to experimentally measure the speed of light within 5% of the accepted value. In addition, the experiment can be performed on a desktop or in a hallway.

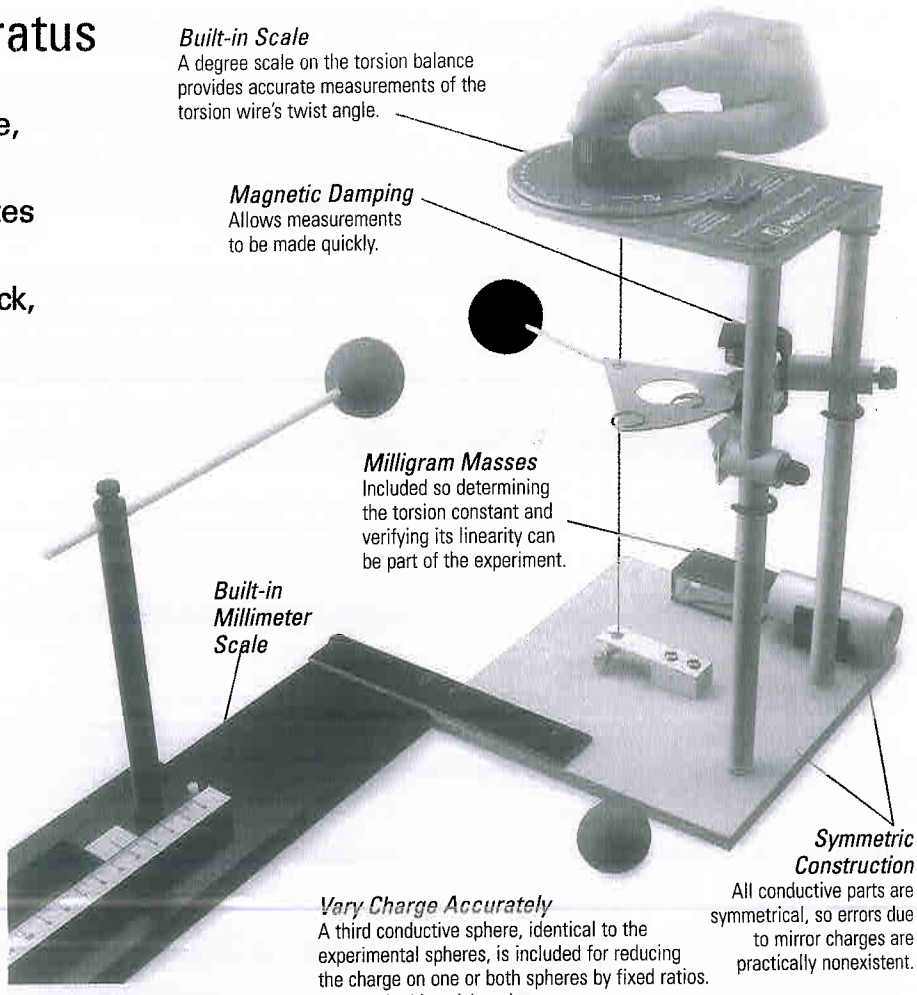
$4159

$4510.00

Coulomb's Law Apparatus

ES-9070

- Accurately Measure Charge, Force and Distance
- Symmetric Design Minimizes Stray and Mirror Charges
- Magnetic Damping for Quick, Accurate Measurements



How It Works

A conductive sphere is mounted on the end of an insulating, counterbalanced rod and suspended from a thin torsion wire. An identical sphere is mounted on a calibrated linear track. This second sphere can be positioned at various distances from the first. When the conductive spheres are charged, the force between them is proportional to the twist of the torsion wire that is required to bring the balance back to its equilibrium position. Beginning students can determine the Inverse Square Law in a simple experiment. Advanced students can perform a more sophisticated investigation into all the variables of electrostatic repulsion.

Additional Equipment

To perform a basic experiment, the conductive spheres can be charged with a piezoelectric gun, or by contact with a charged rod. This allows the Inverse Square Law to be verified with reasonable accuracy. However, for more accurate and thorough investigations, we strongly recommend the following (see the ordering information for recommended equipment):

- A Kilovolt Power Supply, which provides a fixed and repeatable charge. The charge can be refreshed before each measurement, which practically eliminates errors due to leakage currents.
- An Electrometer and a Faraday Ice Pail, for accurate measurement of the charge on the spheres (required only if you wish to measure the Coulomb Constant).

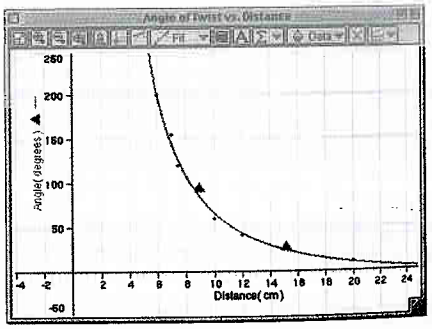
Specifications

Torsion Balance:
Torsion Assembly: 38 mm dia. conductive sphere on 12 cm rod with counterbalance vane
Torsion Wire: equals 10^{-6} Newtons/degree
Degree Plate: 1° increments
Magnetic Damping: dampens oscillations for quick measurements

Calibrated Linear Track:
Sphere: 38 mm dia. conductive sphere
Range of Movement: 350 mm in 1 mm increments
Material: phenolic (to minimize mirror charges)

Miscellaneous Equipment:
Charging Probe: 17 cm long plus 1.5 m cable; banana plug connector; 200 μΩ internal resistance
Calibration Masses: 50 mg (1), 20 mg (2)
Conductive Sphere on Insulating Thread: for reducing charge by fixed ratios
Spare Torsion Wire: 3 m

Shipping Information:
Size: 28 x 38 x 61 cm (11 x 15 x 24 in.)
Weight: 9.5 kg, 21 lbs



Actual data of the angle (force) vs. distance.

Coulomb's Law Apparatus	**ES-9070**		**$1229**
Recommended:			
Kilovolt Power Supply	SF-9586	p. 238	$659
Basic Electrometer	ES-9078	p. 208	$289
Faraday Ice Pail	ES-9042A	p. 209	$79
Charge Producers	ES-9057B	p. 209	$32
Complete System:			
Coulomb's Law	EX-9930	p. 342	$2259

$22,590.00 10

Gravitational Torsion Balance

AP-8215

- **Measure the Universal Gravitational Constant in a Single Lab Period**
- **Adjustment and Locking Mechanisms Decrease Lab Setup Time**
- **Torsion Band Easily Replaced**

Following Cavendish's classic design, PASCO's Gravitational Torsion Balance combines features that significantly improve ease of setup, durability of the Torsion Band and the quality of results.

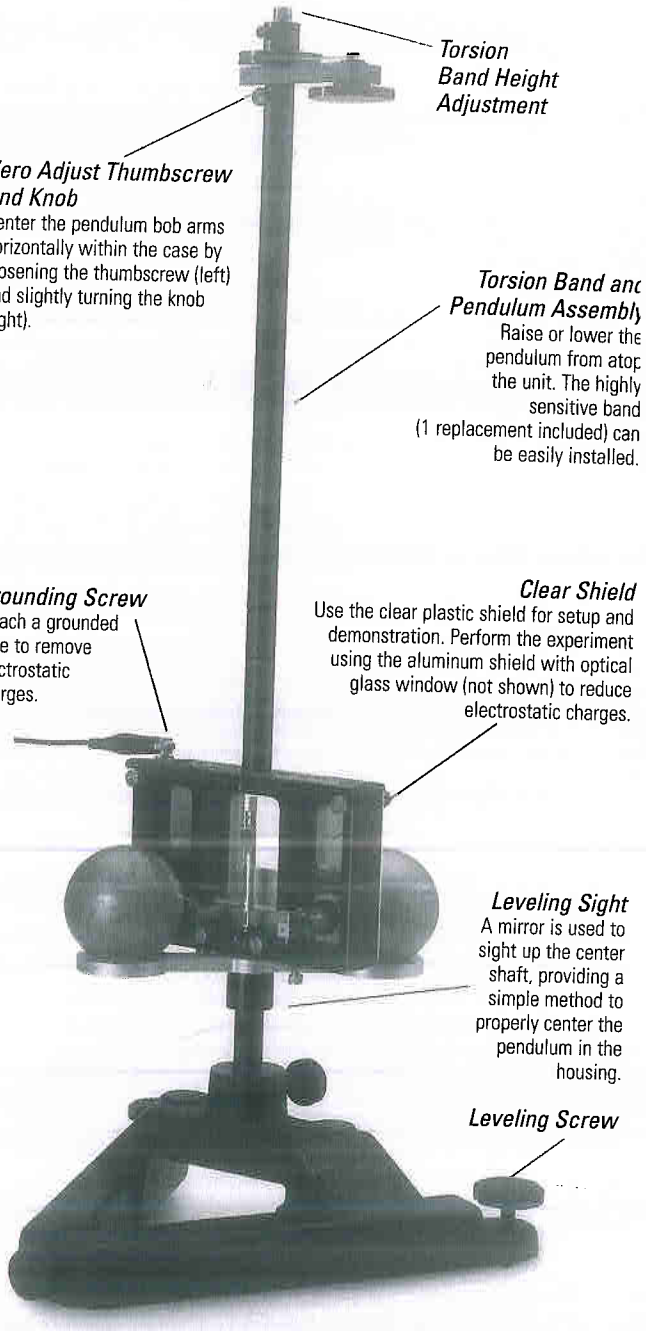
Features

Fast, Accurate Alignment— Proper alignment remains a critical component to successful measurement of "G." The AP-8215 enables optimum alignment in several ways:

- View the pendulum bob's position through a mirror in the unit's central shaft. Use the leveling screws in the cast iron base to accurately center the bob.
- The Equilibrium Adjustment knob and the mechanical advantage of the pulley and belt mechanism make fine adjustment of the equilibrium position easy.
- Easily adjust pendulum height with a single screw.
- The smooth action of the rotating large lead ball support ensures that the balls can be moved easily without disturbing the motion of the small lead balls.

Easy Torsion Band Replacement— The PASCO Torsion Band is stiffer and stronger than bands in other units, but the band will break at some time. Attachment clips mounted to the replacement band (one is included with the balance) allow easy band replacement with a screwdriver in less than 10 minutes.

A Complete Manual (not shown)—
The Instruction Manual and Experiment Guide contains illustrated instructions for setting up and performing the measurements, plus an explanation of the theory and mathematics necessary to understand the results.



Includes

Torsion Balance Assembly
ME-8735 Large Rod Stand
One Extra Torsion Band
Manual

Specifications

Torsion Band: beryllium copper ribbon, 26 cm long with a cross section of 0.0178 x 0.15 mm
Small Masses: 2 lead balls of 38 g each (fixed); 7.5 mm radius
Large Masses: 2 lead balls of 1.5 kg each; 32 mm radius
Period of Oscillation: 8 minutes (approx.)
Accuracy: 5% (approx.)

Gravitational Torsion Balance	AP-8215		$1599
Required:			
x-y Adjustable Diode Laser	OS-8526A	p. 292	$199
45 cm Steel Rod	ME-8736	p. 176	$18
Large Table Clamp	ME-9472	p. 178	$79
Replacement Supplies:			
Torsion Bands (2 pack) – Gravitational Torsion Balance	AP-8218		$99
Universal Gravitational Constant Experiment	EX-9908	p. 340	$1899

$18,990.00

PASCO

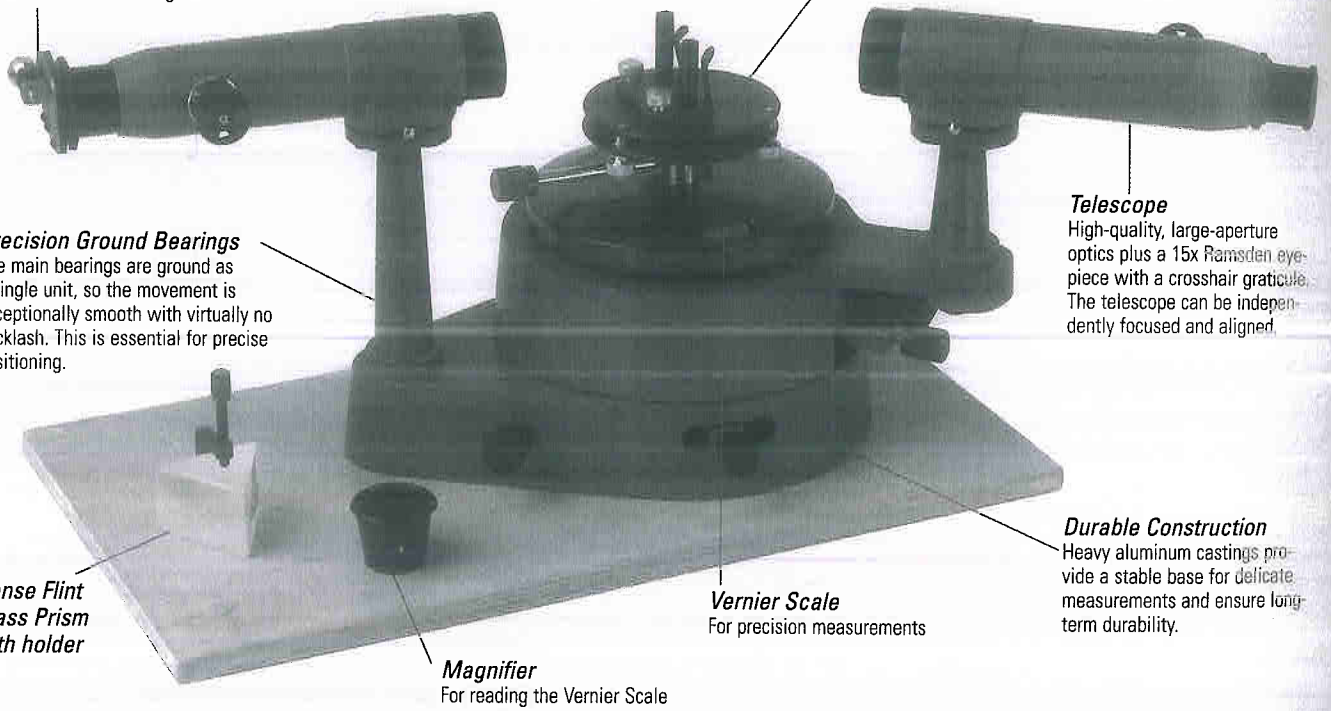
Student Spectrometer

SP-9268A

- Wide Aperture Optics
- Precision Vernier— Resolves 1 Minute of Arc
- Durable and Precise

Collimator
High-quality, large-aperture optics with a 6 mm long slit of adjustable width. The collimator can be independently focused, leveled and aligned.

Custom Prism/Grating Table
Threaded holes and engraved reference lines for accurate component placement.



Telescope
High-quality, large-aperture optics plus a 15x Ramsden eyepiece with a crosshair graticule. The telescope can be independently focused and aligned.

Precision Ground Bearings
The main bearings are ground as a single unit, so the movement is exceptionally smooth with virtually no backlash. This is essential for precise positioning.

Durable Construction
Heavy aluminum castings provide a stable base for delicate measurements and ensure long-term durability.

Dense Flint Glass Prism with holder

Vernier Scale
For precision measurements

Magnifier
For reading the Vernier Scale

Chemists use it to determine the constit-uents of molecules, astronomers use it to determine the constituents of stars and physicists use it to investigate the structure of the atom— not bad for an instrument for which few people can name the inventor (David Alter, with some important later enhancements by Joseph von Fraunhofer).

PASCO offers this high-quality spectrometer that allows students to perform accurate prism and grating spectrometry. High-quality, large-aperture optics produce sharp spectral images, while precision machining allows for precise rotation and accurate measurement.

The Student Spectrometer is most popular in upper division labs, where precision and durability are equally important.

Features

Resolution to 1 Minute of Arc: The 127 mm diameter, precision-engraved degree plate is complemented by 2 precision-engraved verniers, one on each side of the instrument for convenient reading.

Wider Aperture Optics: 32 mm wide apertures on the telescope and collimator provide more light for brighter and sharper images.

Rack and Pinion Focusing: On both the telescope and the collimator. Focusing is easier and more precise.

Rotatable Table: For greater flexibility in measurements. Turn the table by hand for coarse adjustments. Use the fine lead screw for delicate adjustments.

The Vernier Scale resolves angle measurements within 1 minute of arc.

Student Spectrometer	SP-9268A	$1159

Recommended:
Spectral Light Sources p. 290-291

STUDENT GOVERNMENT ASSOCIATION
NORTHWESTERN STATE UNIVERSITY
A Member of the University of Louisiana System
Natchitoches, Louisiana
318.357.4501

August 13, 2007

Student Technology Advisory Team:

I fully support the efforts of the Physics Department to seek and obtain funding from the Student Technology Fund for the purchase of new equipment for a long needed upgrade to the physics lab. This project would be most beneficial to our students and will allow our students better access to updated lab technology as well as keep our school competitive and attract more students.

Respectfully Yours,

Shayne Creppel
President
Northwestern State University
Student Government Association

Jorlem Demons!