PASCO Science Technology

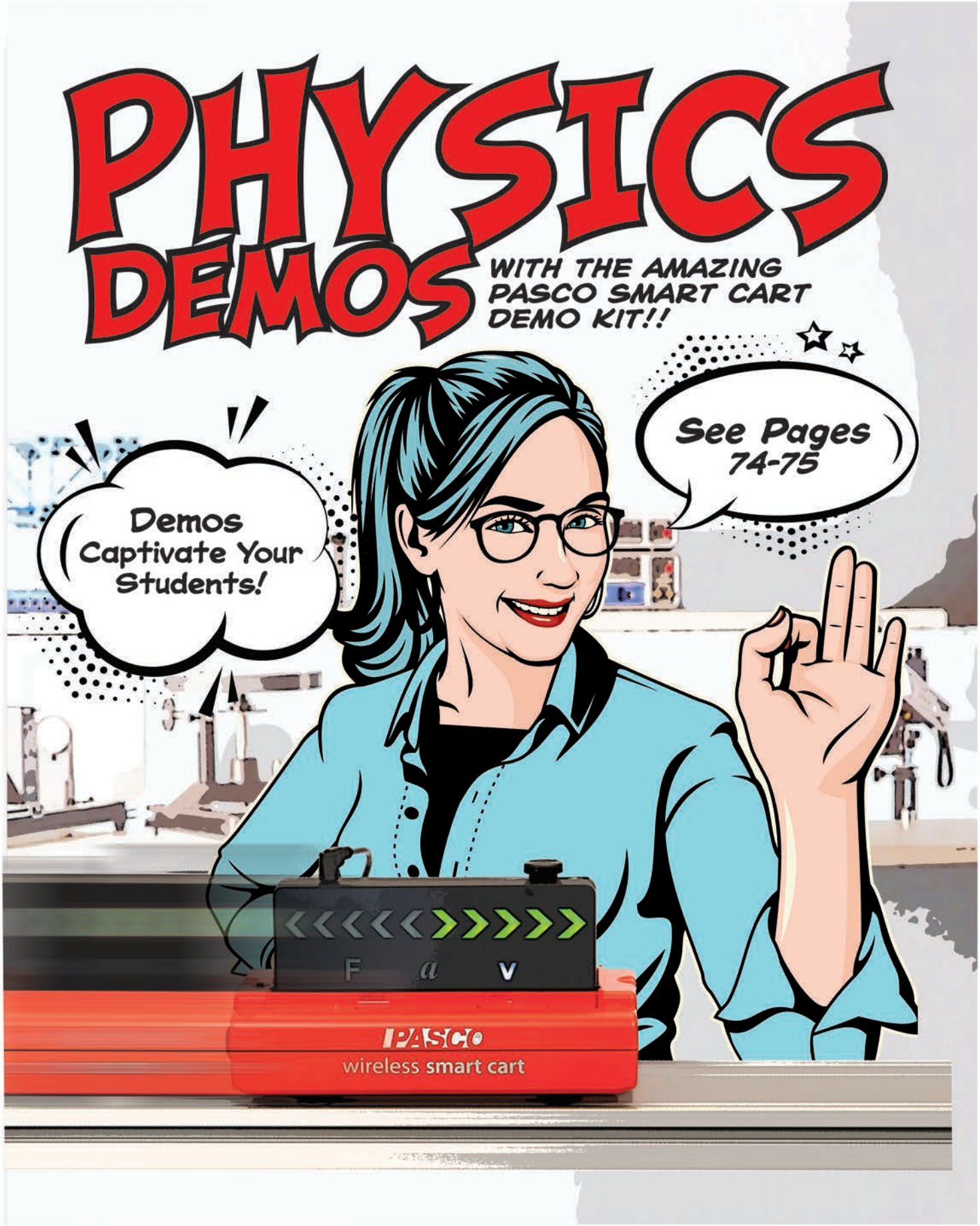
Biology, Chemistry, Environmental & Physics

NEW! Lab Stations
Complete, convenient, low-cost solutions for primary and secondary science (Page 6)

virtually UNSTOPPABLE

Science Delivered
In-Person • Distance • Hybrid

NEW! **Coding Solutions - Coding to Learn for Science and STEM**
Bring your students' code beyond the screen to the real world (Page 89)


PHYSICS
DEMOS
WITH THE AMAZING
PASCO SMART CART
DEMO KIT!!
Demos
Captivate Your
Students!
See Pages
74-75
F a v
PASCO
wireless smart cart

With the //code.Node you can bring your students' code beyond the screen to the real world.

PASCO's new //code.node and //code.Node Solution Set offer great ways to introduce coding into your STEM program. These solutions utilize applied computational thinking activities to promote the development of technical and soft skills, and are applicable to all coding levels (see pages 15 and 89).

Complete Lab Stations for Science

PASCO's new Lab Stations make it easy and affordable to begin using sensor-based technology in your science classroom or at home. Lab Stations are available for K-8 science, Biology, Chemistry, Physics and Agricultural Science.

Table of Contents

PASCO Digital Catalogs

Our new digital flipbook catalogs have the convenience of 24/7 online access, with the friendly, familiar catalog look-and-feel. The FREE flipbook catalog is searchable, shareable, and connected to our online store.

Go to pasco.com/catalogs

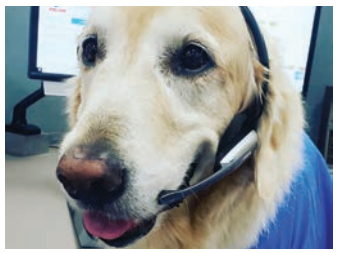
Sensor Technology
Our innovative, award-winning wireless sensors are low-cost, rugged, and easy to use. PASCO now offers more than 30 wireless sensors.

Data Collection + Coding
Intuitive SPARKvue® works on iOS, Android™, and Chrome™ devices, as well as Mac® and Windows® computers. Plus, SPARKvue now includes Blockly block-based coding, enabling students to code with any PASCO sensor.

Complete Lab Stations
These lab station kits make it easy to use sensor-based technology in the science classroom. There are lab stations for Biology, Chemistry, Agricultural Science, Physics, Middle School Science, and K-5 Science.

Curriculum Solutions
The Essential curriculums are the only curricular solutions that include a Student Textbook, an e-Book, Teacher e-Resources, Lab Manuals, and award-winning equipment kits.

Storage & Classroom Management
Use these rolling carts and storage trays to decrease your classroom management time and increase teaching and learning time.



Professional Development & Tech Support
Our PD is relevant for teachers at all grade levels, and includes ongoing teacher support. You can also take advantage of our wealth of training videos at pasco.com.

Sensor Technology

PASCO's award-winning line of wireless sensors are durably designed, easy to use, and affordably priced to help educators bring real-world technology into the hands of students everywhere. Our wireless sensors feature student-friendly designs, manual and automated data collection, interactive displays and other modern features that enhance science learning. Plus, they connect directly to computers, Chromebooks, tablets, and mobile devices, allowing students to quickly collect data, so they can spend more time analyzing and interpreting their results.

- Original PASCO innovations, such as the //code.Node, Smart Cart, Modular Circuits and Wireless Weather Sensor with GPS
- Award-winning software supports Blockly coding for every sensor
- Onboard sensor memory with Logging Mode for long-term experiments
- Hundreds of free labs available for download from our online Experiment Library
- PASCO-ensured quality and backed by our five-year warranty

Wireless Weather Sensor with GPS

Capable of making 19 measurements and logging GPS data, this all-in-one instrument is ideal for investigating complex environmental conditions.

Wireless Motion Sensor

This sensor measures the position, velocity, and acceleration of objects, and it even includes a 180° rotatable head for creative applications.

Wireless Smart Cart Patent Number 10,481,173

Upgrade to the revolutionary Wireless Smart Cart and start collecting live data for position, velocity, acceleration, force, and rotation directly on your device.

Wireless CO_2 Sensor

Use this sensor to explore respiration and photosynthesis, chemical reactions, and so much more with real-time CO_2 data on your device.

Wireless Colorimeter and Turbidity Sensor

This dynamic sensor simultaneously measures a sample's absorbance and transmittance at six different wavelengths, and it doubles as a turbidity sensor for water quality investigations.

Wireless Temperature Sensor

A staple of every science class, this sensor drastically simplifies temperature measurements with its small footprint, long-lasting battery, and live datalogging.

Our growing line now includes over 30 wireless sensors!

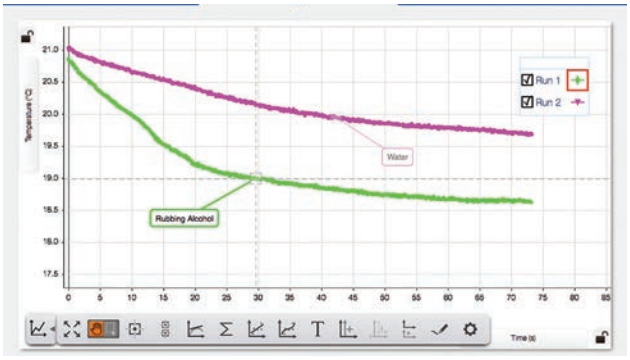
Data Collection and Coding

SPARKvue

This award-winning data collection and analysis software works on any platform!

SPARKvue's intuitive design has made it an award-winning tool for collecting and analyzing experimental data. The user-friendly platform optimizes data collection and provides tools for in-depth analysis within a compact, yet powerful workspace.

In SPARKvue 4, we've added new features, including Blockly coding. Now, students can use block-based code to sense and control PASCO devices, including any of our sensors.

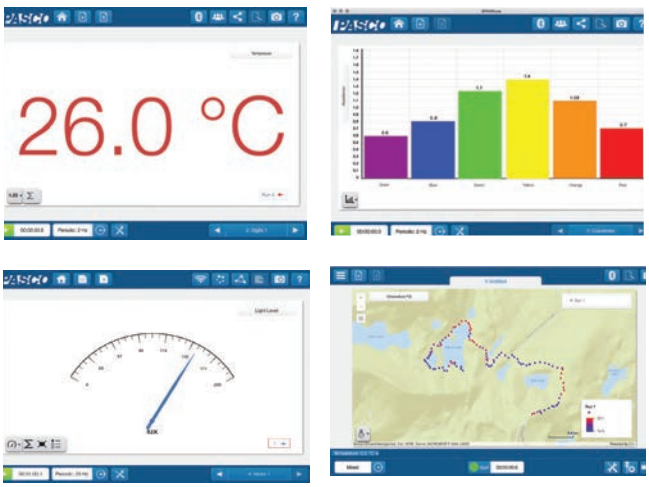


800.772.8700 (inside US) +1 916.786.3800 (outside US)

Data Collection:
- Live Data Bar: See sensor readings before recording
- Periodic Sampling: Automatic sampling at a fixed rate
- Manual Sampling: Saves data only when a user specifies
- Blockly: Use block-based code to control sensor data collection
- Collaborate: Start a shared session to stream data and results in real-time to all participants

Data Displays:
- Graph displays with multiple plot areas and axes
- Digits
- Meter
- Data Tables
- FFT
- Map Display
- Weather Dashboard
- Oscilloscope

Tools for Data Analysis:
- Scale-to-Fit: Adjust axes for optimal data view
- Data Selection: Easily select a portion of data for analysis
- Prediction Tool: Visualize a prediction alongside the data
- Smart Tool: Find data coordinates and calculate delta values
- Calculation Tools for Statistics: Easily obtain statistics such as minimum, maximum, mean value, and more
- Slope Tool: Find the slope of a curve at a specific point
- Curve Fits: Various curve fits with goodness of fit values

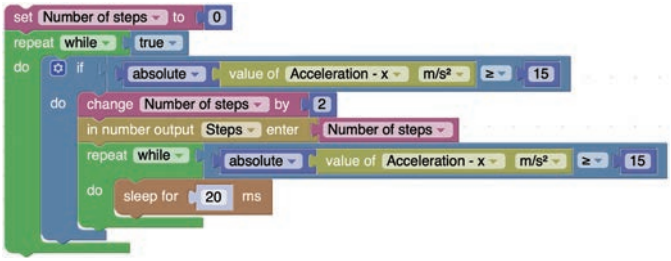


Blockly Coding

Help Students Develop Computational Thinking Skills

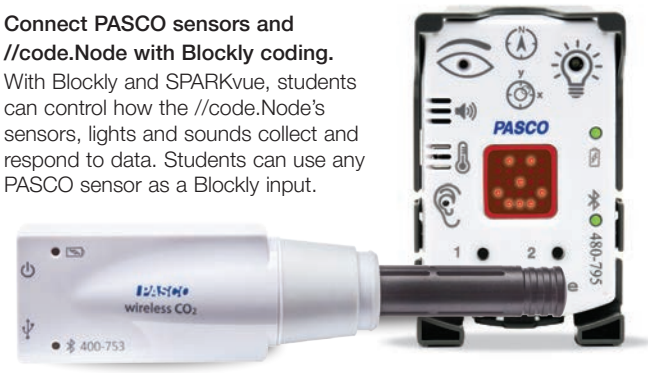
Introducing students to coding and computer-controlled outcomes is easier than ever before with Blockly coding. Blockly integrates computational thinking into the exploration of phenomena to provide students with a new world of STEM opportunity. With Blockly, students can create custom data collection parameters, feedback loops, data displays, and so much more.

Use Blockly in SPARKvue to:
- Introduce students to computational thinking
- Investigate phenomena while learning to code
- Create data-driven feedback loops
- Program collection parameters for any PASCO sensor or interface



Connect PASCO sensors and //code.Node with Blockly coding.

With Blockly and SPARKvue, students can control how the //code.Node's sensors, lights and sounds collect and respond to data. Students can use any PASCO sensor as a Blockly input.



Try SPARKvue software for FREE. Get Started Today!

The complete version of SPARKvue is now available as a FREE app for Chromebook™, iPad®, Android™ tablets, and Apple® and Android™ smartphones.

Download on the App Store | Available in the Chrome Web Store | ANDROID APP ON Google play

We also offer 60-day free trials for Windows™ and Mac®*.
Visit www.pasco.com/downloads

Order Information

SPARKvue Single User License.....PS-2401
SPARKvue Single User License - Download.....PS-2401-DIG

Order Information

SPARKvue Site License PS-2400
SPARKvue Site License - Download PS-2400-DIG

Complete Lab Stations

PASCO's new Lab Stations make it easy and affordable to begin using sensor-based technology in your science classroom or home.

Elementary Science Starter Lab Station

PS-3314

This Starter Lab Station includes the wireless sensors used to perform some of the key lab activities from the Essential Elementary Science Lab Manual (See Page 9).

Middle School Science Starter Lab Station

PS-3312

This Starter Lab Station includes the wireless sensors used to perform some of the key lab activities from the Essential Middle School Science Lab Manual (See Page 13).

Biology Starter Lab Station

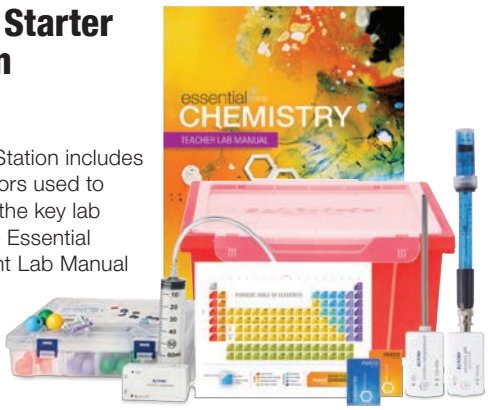
EB-6334

This Starter Lab Station includes the wireless sensors used to perform some of the key lab activities from the Essential Biology Lab Manual (See Page 17).

Chemistry Starter Lab Station

EC-6362

This Starter Lab Station includes the wireless sensors used to perform some of the key lab activities from the Essential Chemistry Student Lab Manual (See Page 33).



Agricultural Science Starter Lab Station

EB-6336

The Agricultural Starter Lab Station includes the 5 wireless sensors used to perform key lab activities from the Agricultural Science Lab Manual (See Page 49).

Physics Starter Lab Station

EP-3579

This Starter Lab Station includes the wireless sensors used to perform some of the key lab activities from the Physics Lab Station Investigations Manual (See Page 61).

Curriculum Solutions

Essential Physics & Essential Chemistry (See Pages 34 and 66)

PASCO offers two complete curriculum solutions. Each program includes a Student Textbook, Student e-Book, Teacher e-Resources, Student Lab Manual, Teacher Lab Manual, and Equipment Kits, all at a very affordable price. Other program features include:

- Innovative and interactive media
- Animations and videos
- Flexible assessment options
- Interactive simulations
- Investigations and design challenges

Storage & Classroom Management

Gratnells Rolling Carts, Storage Trays and Charging Stations (See Page 126)

Gratnells storage solutions are the best way to store PASCO sensors and equipment. These movable storage rack carts include large castors with brakes for added stability, and make transporting materials to and from the classroom a breeze.

These carts can be used to store the equipment kits from the *Essential Physics* or *Essential Chemistry* curriculum, the storage trays we offer for wireless sensors, or any of the four sizes of empty trays that we offer for everything else you'd like to store.

Teacher Support

Professional Development & Technical Support (See Page 136)

PASCO Professional Development provides teachers with the training, guidance, and innovative solutions they need to lead sensor-based science lessons. Our trainers are curriculum experts who model how to confidently guide students through inquiry-based science lessons. PASCO PD features:

- Training sessions for teachers at all grade levels
- Alignment with STEM-based national/state standards
- Ongoing teacher support and a free follow-up webinar
- Investigations and design challenges

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PASCO's Hands-on Solutions for K–8 Science

At PASCO, we develop STEM solutions so simple and accessible that even the youngest scientists can use them. Our wireless sensors and experiment solutions are the perfect way to introduce K–8 students to inquiry-based discovery learning, without overwhelming them. With our NGSS-based solutions, students of all ages are engaged in the active learning process as they navigate their way through hands-on exercises that form lasting STEM foundations.

K–8 Index

Elementary Science Starter Lab Station

PS-3314

The Elementary Science Starter Lab Station makes it easy and affordable to begin using sensor-based technology in your elementary school science classroom or home. Inside the Starter Lab Station are the wireless sensors used to perform seven activities from the Essential Elementary Science Lab Manual. Available separately is the Elementary Science Extension Lab Station (PS-3315) which, when combined with the Elementary Science Starter Lab Station, comprises all the wireless sensors used to perform the ten labs inside the Essential Elementary Science Lab Manual. Once comfortable, you can explore our growing set of over 40 elementary labs in our online experiment library!

Starter Station Lab Titles (1-7)

1. Temperature and Change
2. Evidence of Chemical Reactions
3. Thermal Insulators and Conductors
4. Can Plants Survive Without Light?
5. How a Greenhouse Works: Heat
6. How a Greenhouse Works: Light
7. MatchGraph

Extension Station Lab Titles (8-10)

8. Determining Sound Levels
9. Weather and Climate: Microclimates
10. Weather and Climate: Monitoring Weather

Elementary Science Lab Station with extension sensors

The Elementary Science Starter Lab Station is a complete solution that includes these wireless sensors and materials:

- Temperature
- Light
- Motion
- Storage Case
- Lab Manual

The Elementary Science Extension Lab Station has the additional wireless sensors (Sound PS-3227 and Weather PS-3209) needed to perform all 10 labs inside the Essential Elementary Science Lab Manual.

Order Information

Elementary Science Starter Lab Station PS-3314
Elementary Science Extension Lab Station.....PS-3315

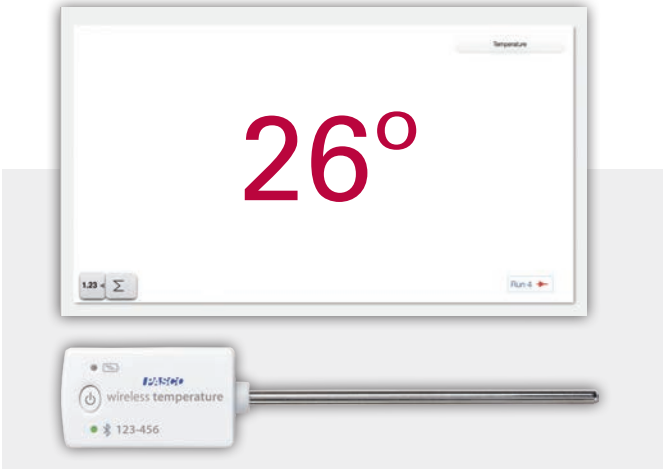
Wireless Temperature Sensor

PS-3201

Welcome to the modern thermometer. The Wireless Temperature Sensor transmits live data and allows students to continuously monitor, log, and plot temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, weeks, or months, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts over a year*. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

Features:

- Simply pair and go, no cables or adapters to manage
- Variable sampling rate for capturing small, fast changes or experiments that run for hours, days, or weeks
- Bluetooth® connectivity and long-lasting coin cell battery
- Logs temperature data directly onto the sensor for long-term experiments
- Dust, dirt, and sand-proof and water resistant (IP-X7 certified)



Order Information

Wireless Temperature Sensor.....PS-3201

Wireless Light Sensor

PS-3213

The Wireless Light Sensor features two separate apertures - one for ambient light measurements and one for directional light measurements. The ambient sensor measures illuminance and UV Index, while the spot (directional) aperture measures light level and color intensity. Our software displays the relative intensities of Red, Green, and Blue light, then sums them to determine the level of White light.

Features:

- Wirelessly connects to computers, Chromebooks, tablets, and smartphones
- Simply pair and go, no cables or adapters to manage
- On-board memory enables the sensor to function as an independent datalogger
- Variable sampling rate for short, precise experiments or lengthy, multi-day data collection.
- Bluetooth® connectivity and long-lasting coin cell battery

Order Information

Wireless Light Sensor PS-3213

Wireless Weather Sensor with GPS

PS-3209

The Wireless Weather Sensor is an all-in-one instrument for monitoring complex environmental conditions. It houses several sensing elements within a single unit to provide 19 different measurements. Use the sensor in logging mode with the Weather Vane Accessory for long-term monitoring, or use it as a handheld instrument to study microclimates and record ambient conditions relevant to environmental phenomena. You can wirelessly export data to your device for classroom analysis and group activities that are constrained by time. With the built-in GPS, you can collect location data for student investigations and analyze it on the map display, powered by ESRI ArcGIS, within SPARKvue software.

Features:

- Logging mode for long-term experiments
- Water resistant for extended environmental monitoring
- Built-in light sensor for measuring light level and UV index
- New map display (in SPARKvue software) for analyzing spatial data
- 19 different measurements that can be collected and analyzed individually or simultaneously

Order Information

Wireless Weather Sensor with GPS PS-3209

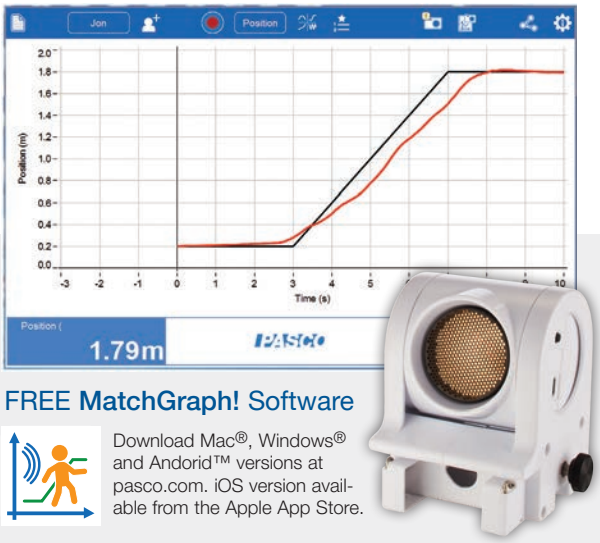
Wireless Motion Sensor

PS-3219

The Wireless Motion Sensor connects via Bluetooth or USB to your device, and uses ultrasound to measure the position, velocity, and acceleration of objects. This enables students to take turns measuring their own distance to the sensor, while the class observes their motion materializing as a graph in real time. The sensor can detect objects ranging from 15 cm to 4.0 m away, and without cables to get in the way, students can explore handheld and ceiling-mounted applications.

Features:

- Measures position, velocity, and acceleration
- False Target Rejection Technology produces cleaner data
- Clips directly to PASCO Dynamics Tracks
- Rod clamp for mounting
- 180° pivoting head
- Rechargeable Lithium-ion battery
- Bluetooth® or USB connectivity



FREE **MatchGraph!** Software

Download Mac®, Windows® and Andorid™ versions at pasco.com. iOS version available from the Apple App Store.

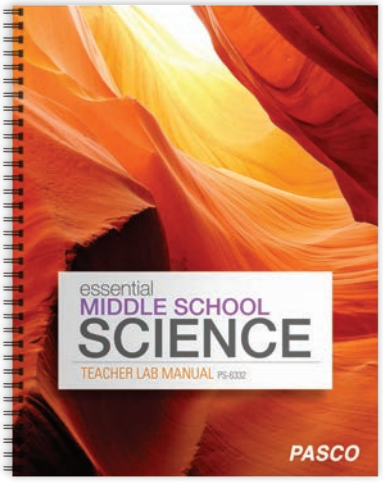
Order Information

Wireless Motion Sensor PS-3219

Middle School Science Starter Lab Station

PS-3314

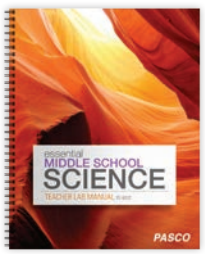
The Middle School Science Starter Lab Station makes it easy and affordable to begin using sensor-based technology in your middle school science classroom or home. Inside the Starter Lab Station are the wireless sensors used to perform six activities from the Essential Middle School Science Lab Manual. Available separately is the Middle School Science Extension Lab Station (PS-3313) which, when combined with the Middle School Science Starter Lab Station, comprises all the wireless sensors used to perform all 10 labs included inside the Essential Middle School Science Lab Manual, as well as many of the Middle School labs in PASCO's online experiment library.



Middle School Science Lab Titles

The Middle School Science Starter Lab Station supports 6 of the 10 labs. Add the Extension Lab Station* to do all 10 lab titles.

1. **Describing Motion**
2. Humidity and Dew Point*
3. **Night and Day**
4. **Seasons and Temperatures**
5. **Thermoregulation**
6. **Introduction to Acids**
7. Photosynthesis*
8. **Acid Rain and Weathering**
9. Forces and Interactions*
10. Waves and Energy*



Middle School Science Lab Station with extension sensors

The Middle/Secondary School Science Starter Lab Station includes these wireless sensors and materials:

- Temp
- Light
- pH
- Motion
- Storage Case
- Lab Manual

The Middle School Science Extension Lab Station has the additional wireless sensors (CO_2 PS-3208 and Weather PS-3209) needed to perform all 10 labs inside the Essential Elementary Science Lab Manual.

Order Information

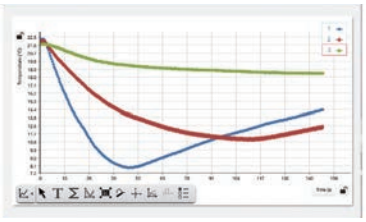
Middle School Science Starter Lab Station.....PS-3312

Middle School Science Extension Lab Station.....PS-3313

Wireless Temperature Sensor

PS-3201

Welcome to the modern thermometer. Now, students can access real-time data that continuously monitors, logs, and plots temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts up to a year. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.



Order Information

Wireless Temperature Sensor.....PS-3201

Wireless Motion Sensor

PS-3219

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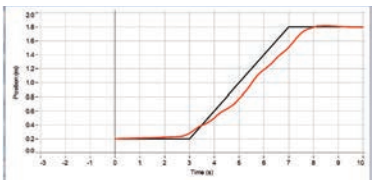

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Order Information

Wireless Motion Sensor PS-3219

Wireless Light Sensor

PS-3213

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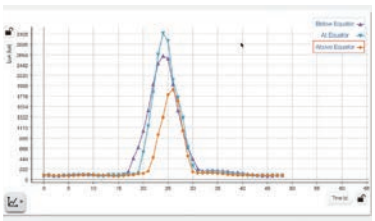


Order Information

Wireless Light Sensor PS-3213

Wireless pH Sensor

PS-3204

The Wireless pH Sensor is a must-have for any chemistry, biology, or environmental science course. Equally capable in the lab or field, the sensor eliminates the hassle of cables, reducing spills and improving safety. Plus, it rarely requires charging; the sensor's coin cell battery lasts for 2-3 years in most labs and costs about one dollar to replace. It can transmit data in real time, or store data for days when continuous monitoring is required. The Wireless pH Sensor enhances countless activities, including acid-base titrations, investigations into household chemicals, analyses of chemical reactions, water quality studies, and much more.

Order Information

Wireless pH Sensor.....PS-3204

//code.Node

Learning to code. Coding to learn.

Bring your students' code beyond the screen to the real world.

Real-World Device for All Coding Levels

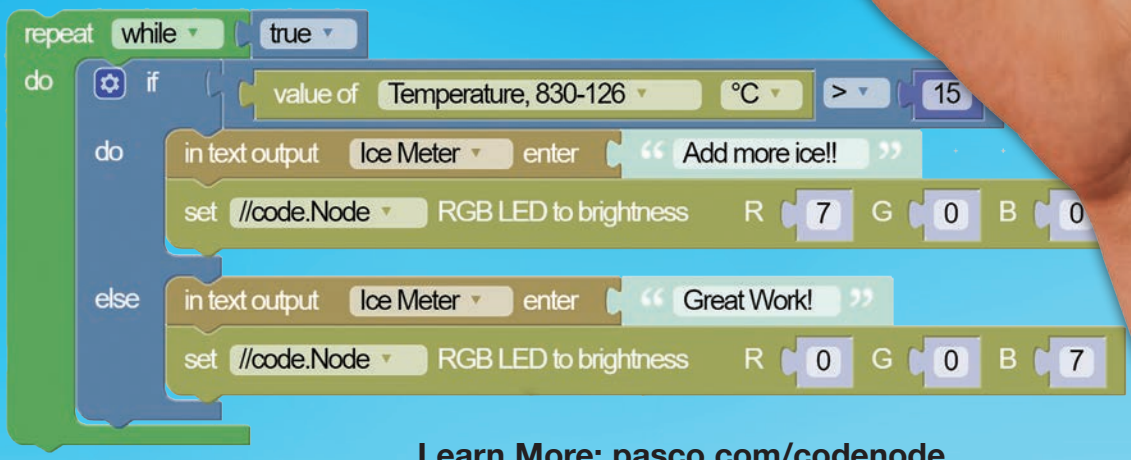
- Interactive sensor inputs and device outputs
- Ready to use out of the box
- Low-cost, durable design

Applied Computational Thinking Activities

- Hands-on activities with real-world sensors
- Standards-aligned, phenomena-based STEM coding lessons
- Designed for elementary and middle grades

Develop Technical and Soft Skills

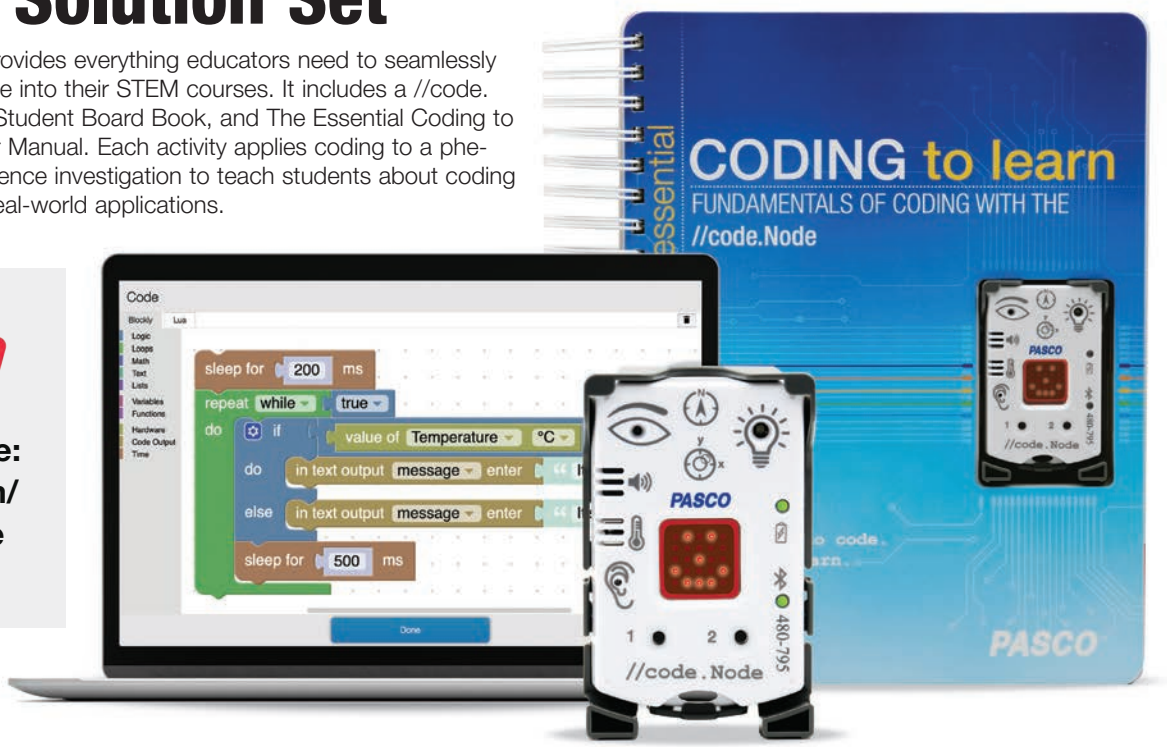
- Integrates ISTE/CSTA-aligned computational thinking into STEM learning
- Cultivates critical thinking and problem-solving skills
- Promotes perseverance, cooperation, and other emotional learning skills



Learn More: pasco.com/codenode

Coding Solution Set

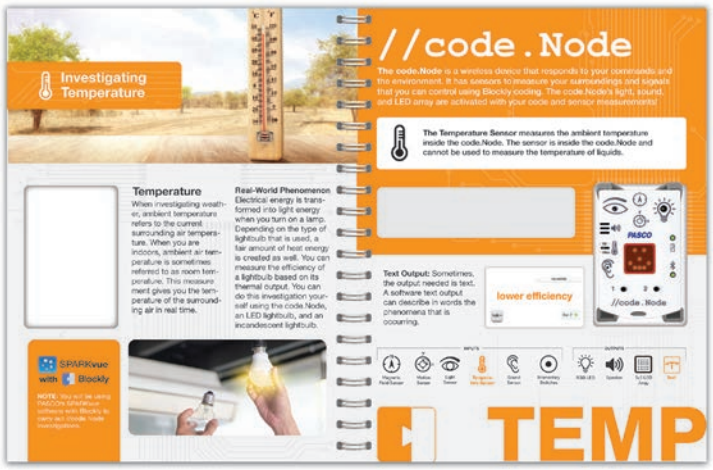
This awesome set provides everything educators need to seamlessly integrate //code.Node into their STEM courses. It includes a //code.Node, //code.Node Student Board Book, and The Essential Coding to Learn Digital Teacher Manual. Each activity applies coding to a phenomenon-based, science investigation to teach students about coding concepts and their real-world applications.



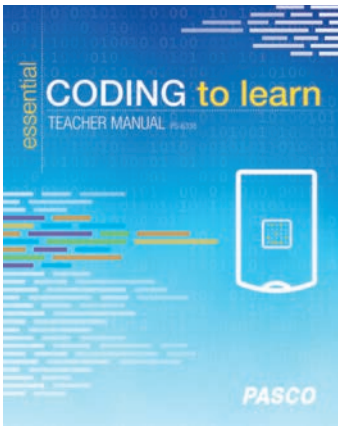
NEW

Learn More: pasco.com/codenode

The //code.Node Solution Set includes a //code.Node, //code.Node holder, Essential Coding to Learn Board Book, coding video support, and the Essential Coding to Learn Digital Teacher Manual.



The //code.Node Book is an instructional, student board book that highlights 5 activities from the manual. It uses engaging visuals and guides to help new coders build strong foundations in key coding concepts. The //code.Node device can be nestled in the book to keep students in the flow of learning.



The Essential Coding to Learn Digital Teacher Manual includes 10 activities with teacher and student versions. Each engaging activity teaches students about a new scientific phenomenon and coding concept using the //code.Node and Blockly coding.

Order Information

//code.Node.....PS-3231
//code.Node Solution Set PS-3316

Advanced Biology Through Inquiry Labs for AP® & IB®

PASCO's award-winning Advanced Biology through Inquiry Teacher Guide is newly revised and contains 18 labs that have been specifically designed to support student inquiry, as well as AP® and IB® curriculum*. This manual is available in a print version and an all-digital version.

- Most labs can be completed in one lab session with readily available materials, including the Biology Extension Bundle on the opposite page.
- Easy and meaningful data collection leads to increased time for data analysis and open inquiry.
- Labs integrate high-order analysis and synthesis questions.
- Includes sample data for investigations and inquiry, answers to analysis and synthesis questions, an assessment rubric, teacher tips, lab preparation information, and more.

Advanced Biology Through Inquiry Labs and Sensors Used	Starter Bundle				Extension Bundle					
Lab Title	Temperature	CO_2	Pressure	pH	Optical Dissolved Oxygen	Conductivity	Colorimeter	EcoChamber	AP® Big Ideas*	IB® Standards**
1A. Enzyme Activity			●						1, 2, 4	2.5
1B. Enzyme Activity**									1, 2, 4	2.5
1C. Enzyme Activity***									1, 2, 4	2.5
2. Diffusion				●					2	1.4, 10.3
3. Osmosis							●		2, 3	1.4
4. Plasmolysis						●			2	1.4
5. Cell Size						●			1, 2	1.1
6. Homeostasis	●								3, 4	N/A
7. Cellular Respiration		●							1, 2, 4	2.8
8. Photosynthesis					●				2, 4	2.9
9. Plant Pigments***							●		2, 4	2.9
10. Transpiration			●						2, 4	9.1
11. Mitosis	*No sensors required.*								3	1.6
12. Meiosis									3	3.3, 10.1
13. Energy Dynamics		●						●	2, 4	4.2
14. Artificial Selection	*No sensors required.*								1	N/A
15. BLAST Bioinformatics									1	3.1, B.5
16. Population Genetics									1	10.3
17. Mathematical Modeling of Evolution									1	10.3
18. Animal Behavior									2, 4	A.4

*AP is a registered trademark of the College Board, which was not involved in the production of, and does not endorse, this product. IB is a registered trademark of the International Baccalaureate Organization, which was not involved in the production of, and does not endorse, this product.
**Requires Wireless O_2 Sensor; see page 28. ***Requires the Wireless Spectrometer; see page 26.

Order Information

Advanced Biology Through Inquiry Teacher Guide	PS-2852A	*Includes lab prep instructions, expected answers/results, and editable student files. Manual is available in eco-friendly digital format or in print.*

Biology Lab Stations Support Advanced Biology

The Biology Starter Lab Station and Extension Station, together with PASCO's *Advanced Biology Through Inquiry Lab Manual,* offer a truly complete Biology solution. With over 25 sensor-based labs covering a range of Biology and Advanced Biology topics and all of the equipment and apparatus required to conduct the labs hands-on, inquiry with data collection and analysis has never been easier or more affordable. For investigations in Physiology, add the Physiology Bundle and extend your studies even further.

Biology Station Lab Titles

Together, the Biology Starter and Extension Lab Stations support over 20 Advanced Biology labs. Conduct the 10 labs below right out of the box.

1. **Enzyme Action**
2. **Membrane Permeability**
3. **Osmosis**
4. **Plant Respiration & Photosynthesis***
5. **Respiration of Germinating Seeds**
6. **Acid Rain**
7. **Regulation of Body Heat**
8. **Plant Pigments**
9. **Cell Size**
10. **Cellular Respiration in Yeast**

Shown here: Biology Starter and Extension Lab Stations

The Biology Starter & Extension Lab Stations include a storage tray, as well as these wireless sensors and materials:

- Temperature
- Pressure
- pH
- CO_2
- Storage Case
- Lab Manual*
- Optical Dissolved Oxygen
- Colorimeter & Turbidity
- Conductivity Sensor
- EcoChamber

Physiology Extension Bundle

PS-2935C

The Physiology Extension Bundle enables students to study the heart cycle, lung function, human respiration, stimulus and response, homeostasis, and more! This bundle includes a PASPORT EKG Sensor, PASPORT Spirometer, Spirometer Mouth Pieces, Wireless Blood Pressure Sensor with Standard Cuff, Wireless Hand-Grip Heart Rate Sensor, and an AirLink Interface.

1. AirLink PS-3200
2. Hand-Grip Heart Rate PS-3206
3. EKG Sensor PS-2111
4. Spirometer PS-2152
5. Spirometer Mouth Pieces PS-2522
6. Wireless Blood Pressure PS-3218

Order Information

Biology Starter Lab Station.....EB-6334

Biology Extension Lab Station.....EB-6335

Physiology Extension Bundle.....PS-2935C

Biology Starter and Extension Lab Stations come standard with 10 Essential Biology Through Inquiry Labs. The Advanced Biology Through Inquiry Lab Manual is sold separately (see page 18 for order information).

PASCO's Hands-on Solutions for Your Biology Lab

PASCO offers dynamic educational solutions for General, AP®, IB®, and Honors Biology courses. Our Wireless Sensors facilitate hands-on engagement and help students develop data analysis skills, while our labs provide inquiry-based planning support. Using PASCO's SPARKvue software, sensors, and lab experiments, students can deeply explore topics such as photosynthesis, cellular respiration, enzyme reactions, human physiology, spectrometry, and more.

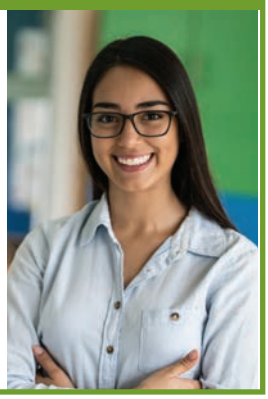
Biology Index

World Class Support & Professional Development

Committed to Your Success

We want you to have all the support, guidance, and training you need. Just let us know how we can help.

CONTACT US TODAY
pasco.com



Biology Starter Lab Station

EB-6334

The Biology Starter Lab Station makes it easy and affordable to begin using sensor-based technology in your biology classroom or home. Designed for convenience, the lab station contains the wireless sensors used to perform 10 Biology labs. These ten explorations range from the cellular to organismal level and investigate processes such as respiration, photosynthesis, enzymatic activity, membrane permeability and osmosis. Students can also investigate cell size, body regulation, and the impacts of environmental factors on reaction rates and organism responses. An additional 60 biology labs are available on our website.

Biology Station Lab Titles

The Biology Starter Lab Station supports 7 of the 10 labs. Add the Extension Lab Station* to do all 10 lab titles.

1. **Enzyme Action**
2. **Membrane Permeability**
3. **Osmosis**
4. Plant Respiration & Photosynthesis*
5. **Respiration of Germinating Seeds**
6. **Acid Rain**
7. **Regulation of Body Heat**
8. Plant Pigments*
9. Cell Size*
10. **Cellular Respiration in Yeast**

The Biology Starter Lab Station

The Biology Starter Lab Station includes a storage tray, as well as these wireless sensors and materials:

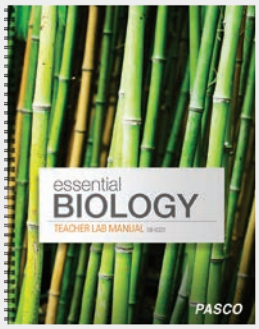
- Temperature
- Pressure
- pH
- CO_2
- Storage Case
- Lab Manual

**To do the remaining 3 labs listed above and another 4 labs from the Essential Biology Lab Manual, add the Extension Lab Station (see page 18) and the Essential Biology Through Inquiry Lab Manual.*

Order Information

Biology Starter Lab Station.....EB-6334

Essential Biology Teacher Lab Manual.....EB-6331



Essential Biology Teacher Lab Manual

EB-6331

This printed lab manual includes 23 lab activities (list below) that can be edited to suit the needs of your students or to better coordinate with your classroom lectures. Teacher guides and student handouts are included for each investigation. Student handouts include procedural instructions, blank graphs and tables for data entry, and analysis questions with space for students to record their answers. Each investigation is tightly integrated with our innovative software, sensors, and equipment.

- Enzyme Action (Pressure Sensor)
- Enzyme Action (Oxygen Sensor)
- Membrane Permeability
- Organisms and pH
- Osmosis
- Plant Respiration and Photosynthesis
- Respiration of Germinating Seeds
- Buffers in Biological Systems
- Acid Rain
- Cellular Respiration in Yeast
- Energy Content of Food
- Metabolism of Yeast
- Photosynthesis of Aquatic Plants
- Soil pH
- Transpiration
- Water and pH
- Water Purification
- Weather in a Terrarium
- EKG: Factors that Affect the Heart
- Exercise and Heart Rate
- Exercise and Blood Pressure
- Muscle Strength
- Regulation of Body Heat
- Volume of Breath

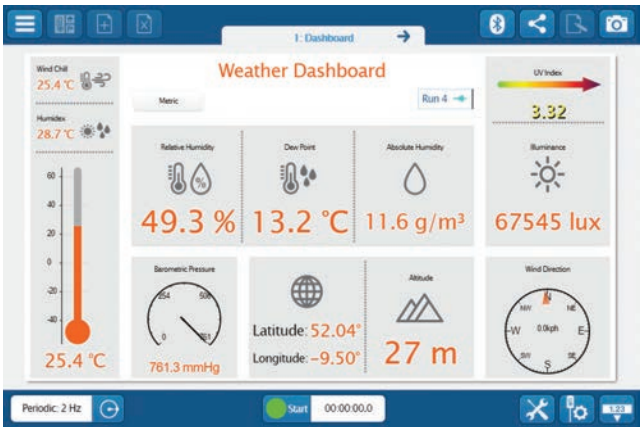
Wireless Weather Sensor with GPS

PS-3209

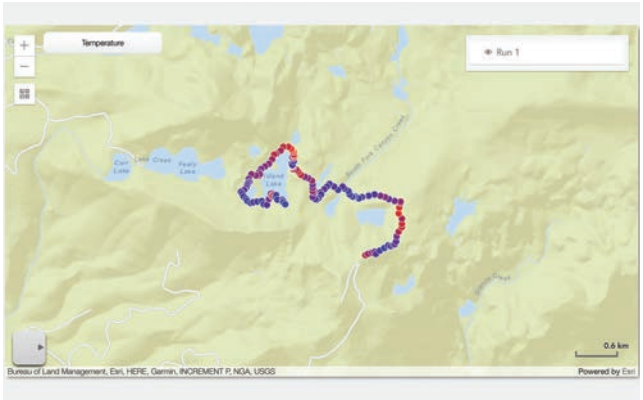
The Wireless Weather Sensor is an all-in-one instrument for monitoring complex environmental conditions. It houses several sensing elements within a single unit to provide 19 different measurements. Use the sensor in logging mode with the Weather Vane Accessory for long-term monitoring, or use it as a handheld instrument to study microclimates and record ambient conditions relevant to environmental phenomena. You can wirelessly export data to your device for classroom analysis when group activities are constrained by time. With the built-in GPS, you can collect location data for student investigations and analyze it on the map display, powered by ESRI ArcGIS, within SPARKvue software.

Features:

- Logging mode for long-term experiments
- Water resistant for extended environmental monitoring
- Built-in light sensor for measuring light level and UV index
- Special map display (in SPARKvue software) for analyzing spatial data
- 19 different measurements that can be collected and analyzed individually or simultaneously



Student-friendly weather dashboard to visualize its multiple sensors.



esri Partner Network

With ESRI's ArcGIS online you can visualize data in seconds with a FREE account!

Weather Vane Accessory sold separately.

Order Information

Wireless Weather Sensor with GPS PS-3209
Weather Vane Accessory.....PS-3553

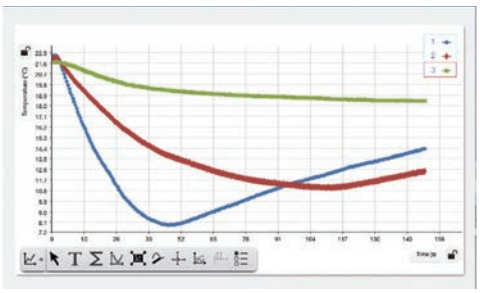
Wireless Temperature Sensor

PS-3201

Welcome to the modern thermometer. The Wireless Temperature Sensor transmits live data and allows students to continuously monitor, log, and plot temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, weeks, or months, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts over a year*. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

Features:

- Simply pair and go, no cables or adapters to manage
- Variable sampling rate for capturing small, fast changes or experiments that run for hours, days, or weeks
- Bluetooth® connectivity and long-lasting coin cell battery
- Logs temperature data directly onto the sensor for long-term experiments
- Dust, dirt, and sand-proof and water resistant (IP-X7 certified)



Order Information

Wireless Temperature Sensor.....PS-3201

Wireless pH Sensor

PS-3204

The Wireless pH Sensor is a must-have for any chemistry, biology, or environmental science course. Equally capable in the lab or field, the sensor eliminates the hassle of cables, reducing spills and improving safety. Plus, it rarely requires charging; the sensor's coin cell battery lasts for 2-3 years in most labs and costs about one dollar to replace. It can transmit data in real time, or store data for days when continuous monitoring is required. The Wireless pH Sensor enhances countless activities, including acid-base titrations, investigations into household chemicals, analyses of chemical reactions, water quality studies, and much more.

Features:

- Simply pair and go, no cables or interfaces to manage
- Compatible with ion-selective electrodes (ISE) and the oxidation reduction probe (ORP)
- Bluetooth® connectivity and a long-lasting coin cell battery
- Logs pH data directly onto the sensor for long-term experiments
- Wirelessly connects to SPARKvue and Capstone for convenient analysis and lab reports

Display pH in digits, graphs, tables, or bar charts, so your students can get the most out of their measurements.

Order Information

Wireless pH Sensor.....PS-3204

Wireless Conductivity Sensor

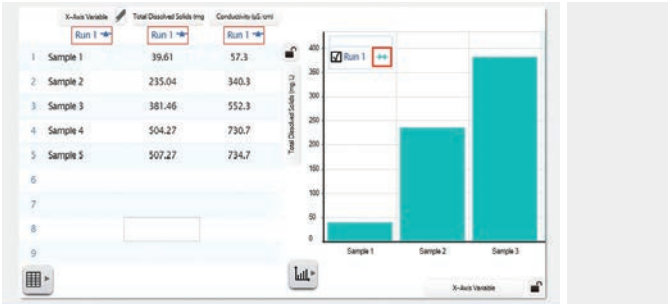
PS-3210

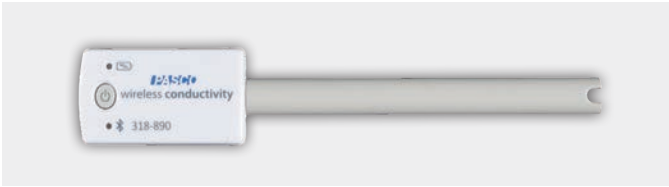
The Wireless Conductivity Sensor measures the electrical conductivity of an aqueous solution. It is ideal for investigating the properties of solutions, including total dissolved solids (TDS) for water quality inquiry. Because it is temperature compensated, calibrations are less frequent and can be applied across a range of temperatures. With a range of 0 to 20,000 µS/cm, this sensor can be utilized for chemical, biological, and environmental studies.

Teacher tip: To measure brackish or marine samples, perform a dilution until the measurement falls within the range, then multiply to determine sample conductivity.

Features:

- Measure conductivity and total dissolved solids
- Automatic temperature compensation
- Battery life >1 year
- Remote logging with built-in memory
- Dust-proof, sand-proof, and water-resistant (1 meter for 30 minutes)





Order Information

Wireless Conductivity Sensor PS-3210

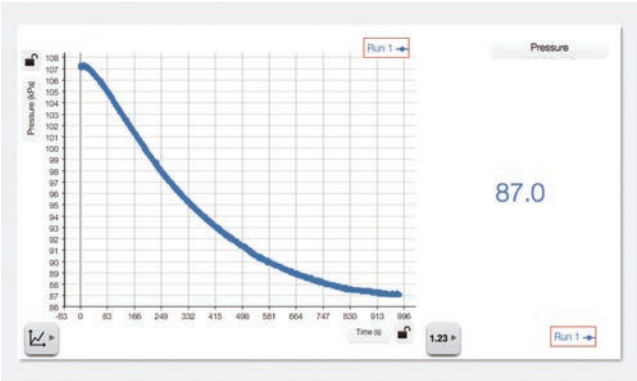
Wireless Pressure Sensor

PS-3203

The Wireless Pressure Sensor allows students to easily collect accurate gas pressure data for a wide range of applications. Included is a 60cc syringe, tubing, and connectors that facilitate experiments such as Boyle's Law or measuring pinch-grip strength. Within PASCO's software, students can easily select their desired units from a list containing kPa, mmHg, inHg, mbar, psi, atm, and torr.

Features:

- Measures pressure even when the pressure within the system drops below ambient pressure
- Supports common units (kPa, atm, psi, mmHg, or N/m^2) for many applications
- Bluetooth® connectivity and long-lasting rechargeable battery



Order Information

Wireless Pressure Sensor PS-3203

Wireless Light Sensor

PS-3213

The Wireless Light Sensor features two separate apertures - one for ambient light measurements and one for directional light measurements. The ambient sensor measures illuminance and UV Index, while the spot (directional) aperture measures light level and color intensity. Our software displays the relative intensities of Red, Green, and Blue light, then sums them to determine the level of White light. The light available to drive photosynthesis (PAR) and total light power per area (irradiance) are also available as calculated measurements within PASCO Capstone (version 1.8 or later) and SPARKvue software (version 2.6 or later).

Features:

- Wirelessly connects to computers, Chromebooks, tablets, and smartphones
- Simply pair and go, no cables or adapters to manage
- On-board memory enables the sensor to function as an independent datalogger
- Variable sampling rate for short, precise experiments or lengthy, multi-day data collection
- Bluetooth® connectivity and long-lasting coin cell battery
- Indirect PAR measurements for biological studies

Order Information

Wireless Light Sensor PS-3213

Diffusion/Osmosis Kit

ME-6942

It is an image that appears in practically every biology text to help students with conceptual understanding: a U-shaped tube with a permeable membrane separating a hypotonic and hypertonic solution. And yet few classroom methods of studying osmosis take advantage of this simple and elegant design for lab work.

Features:

- Plastic rather than glass columns for durability and student safety
- Free standing unit requires no additional lab equipment to hold it in place
- Air tight joints prevent pressure leaks
- Membranes are quick and easy to replace when compromised
- Graduated transparent columns allow changes in volume to be seen and quantified
- The U-shaped design provides familiarity for students and the straight columns keep the volume of gas above the fluid constant

Wireless Temperature Sensor Link

PS-3222

The Wireless Temperature Sensor Link enables wireless connection for any PASCO temperature probe with a 3.5 mm connection. The link comes with a Fast Response Temperature Probe, but it can also connect to the Stainless Steel Temperature Probe, Skin/Surface Temperature Probe, the Absolute Zero Sphere, and the Ideal Gas Law Apparatus.

Order Information

Diffusion/Osmosis Kit.....ME-6942
Wireless Temperature Sensor Link.....PS-3222

Wireless CO_2 Sensor

PS-3208

Measure changes in carbon dioxide (CO_2) gas levels quickly and easily with the Wireless CO_2 Sensor. The sensor is temperature compensated and can operate in high humidity environments. This sensor employs live data to make core labs, such as photosynthesis, cellular respiration, and metabolism experiments engaging and impactful. With the ability to store more than 55,000 data points, this sensor enables studies to run overnight or throughout an entire weekend for long-term carbon cycling investigations. Includes 250-ml sample bottle that enables gas sensor analysis using multiple sensors.

Features:

- Logging ability for long-term experiments, store up to 55,000 data points
- Integrated stopper for use with included sample bottle and common glassware
- Temperature compensated for accurate results

Order Information

Wireless CO_2 Sensor.....PS-3208

Wireless Oxygen Gas Sensor

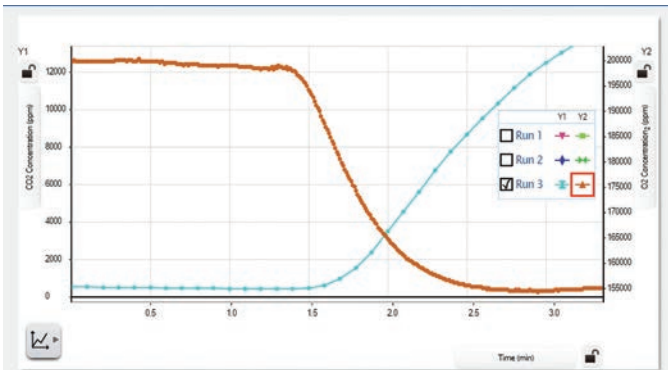
PS-3217

The Wireless Oxygen Gas Sensor measures gaseous O_2 concentrations as well as humidity and air temperature for a range of biology, environmental science, and physiology activities.

The Wireless Oxygen Gas Sensor is accurate and easy to use, making it the perfect sensor for studying photosynthesis, respiration, and oxygen cycling in a closed or open system. With remote logging, experiments can go beyond the lab period and easily give students hours or days of data for analysis. In addition to measuring oxygen gas levels, the Wireless Oxygen Gas Sensor also contains sensors to measure ambient temperature and humidity.

Features:

- Bluetooth® and USB connectivity
- 0-100% Oxygen Gas Concentration
- ±1% Oxygen at constant temperature and pressure
- Also reports ambient temperature and humidity
- 2-3 year operating life with replaceable sensing element



Metabolism Chamber

ME-6936

The Metabolism Chamber is a 250 mL sample bottle with 2 holes cut specifically for PASCO gas sensors to allow simultaneous measurements of carbon dioxide gas and oxygen gas

Order Information

Wireless Oxygen Gas Sensor.....PS-3217
Metabolism Chamber.....ME-6936

Wireless Optical Dissolved Oxygen Sensor

PS-3224

The Wireless Optical Dissolved Oxygen (ODO) Sensor is ideal for monitoring DO_2 in the lab or field. The Wireless Optical DO Sensor contains three different probes. In addition to the dissolved oxygen sensor, it also includes probes for measuring atmospheric pressure and water temperature. The optical technology is accurate, fast, and does not require stirring, filling solutions, warm-up, or frequent calibration. When equipped with the included cover, the sensor has a waterproof design and is submersible to a depth of 10 m.

A PASCO exclusive feature allows you to log data using the sensor's built-in memory. After collecting data for hours or even days, simply connect the sensor to your device and you're ready to download your data. With this powerful sensor, educators can explore day and night nutrient cycles, changes in metabolic processes, seasonal changes in water quality, and more.

Wireless Optical Dissolved Oxygen Sensor Metal Guard

PS-3604

This metal guard protects the sensing element of the Wireless Dissolved Oxygen Sensor. It also helps weigh the sensor down when making measurements under water.

Order Information

Wireless Optical Dissolved Oxygen Sensor PS-3224

Wireless Optical Dissolved Oxygen Sensor Metal Guard PS-3604

Photosynthesis Tank

PS-2521B

Typical experiments involving photosynthesis require students to infer photosynthetic rate changes by using chloroplasts and dye. Help your students understand this concept more completely with the Photosynthesis Tank, which allows you to directly measure the production of oxygen. The tank's lid features a convenient slot for sensors. We recommend using a pH, Wireless CO_2 Sensor, and/or a Wireless Optical Dissolved Oxygen Sensor.

Features:

- Outer tank can act as water bath to control temperature
- Can be placed on a hot plate to study the effects of temperature
- Dyes can be used to add color filters between the tanks

Order Information

Photosynthesis Tank PS-2521B

EcoChamber

ME-6667

The EcoChamber is designed to help students model and understand complex interactions within and between ecosystems. The clear, acrylic EcoChamber is specially designed to accommodate PASCO sensors, making qualitative and quantitative measurements as easy as observing a classroom aquarium or terrarium. Students can model interactions between different ecosystems by connecting them via their side ports. Establish a traditional terrestrial, aquatic or decomposition arrangement, or create your own unique biome to model and measure. With the EcoChamber, students can easily alter conditions for controlled studies in how light, moisture, humidity, temperature, acidity, or the introduction of other species impacts the ecosystem! Student groups can selectively manipulate conditions to create their own investigations.

Order Information

EcoChamber ME-6667

EcoZone System

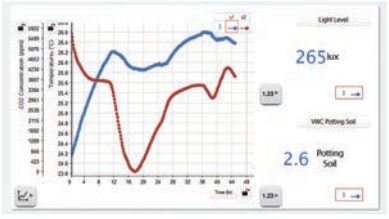
ME-6668

PASCO's EcoZone System is designed to help students model and understand complex interactions within, and among, different ecosystems. The three clear, acrylic EcoChambers are specially designed to accommodate PASCO sensors, making qualitative and quantitative measurements easily accessible.

With three interconnected chambers, students can model interactions between three different ecosystems. Choose the traditional terrestrial, aquatic, and decomposition environments, or create unique biomes to model and measure. With the EcoZone System, students can create two identical ecosystems for precise control of variable impact, decouple the system for isolated investigations, or connect all three chambers to study interactions.

Features:

- Total volume of each chamber is 4534 cubic centimeters
- Sturdy construction designed for easy setup and cleanup
- Quantitatively study the interaction of different ecosystems
- Custom molded for use with PASCO sensors
- Clear acrylic allows for observations from all sides



Order Information

EcoZone System.....ME-6668

Wireless Colorimeter & Turbidity Sensor

PS-3215

The Wireless Colorimeter simultaneously measures the absorbance and transmittance of six different wavelengths. The sensor can be used to study Beer's Law (absorbance vs. concentration), enzyme activity, photosynthesis, and the rates of chemical reactions (absorbance vs. time). After a simple calibration, students can quickly begin viewing live measurements as they materialize across the visible spectrum at 650 nm (red), 600 nm (orange), 570 nm (yellow), 550 nm (green), 500 nm (blue), and 450 nm (violet).

This sensor also functions as a high-quality turbidimeter for water quality analysis. Rather than simply measuring transmitted light, the Wireless Colorimeter and Turbidity Sensor measures light scattered at a 90 degree angle from the sample, resulting in accurate and repeatable measurements. Additionally, the internal housing for the cuvette is opaque, which limits ambient light interference to preserve accuracy.

Features:

- Stabilized light source for consistent readings
- Measures six different wavelengths simultaneously
- PASCO software displays the absorbance & transmittance at each wavelength in the appropriate color
- Quick and easy calibration
- Functions as both a colorimeter and turbidimeter
- Wireless design enables data collection in the field

Measure the absorbance and transmittance of a solution at six different wavelengths... simultaneously!

WARNING! This product can expose you to chemicals including Formaldehyde, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Order Information

Wireless Colorimeter & Turbidity Sensor.....PS-3215

Includes USB Charging cable, 9 cuvettes, 2 cuvette racks, and one 100 NTU calibration cuvette.

Wireless Spectrometer (VIS)

PS-2600

The Wireless Spectrometer from PASCO is specifically designed for modern chemistry, biology, and physics labs. With Bluetooth and USB connectivity, students can quickly connect from their device or computer using the free PASCO Spectrometry Software. With this affordable spectrometer students can gather a full spectrum of data in under one second. After specifying a target wavelength, students can study concentrations (Beer's Law), rates of reactions, or investigate emission spectra using the optional fiber optic cable.

Perform these labs with the PASCO Spectrometer:

- Photosynthesis with DPIP
- Absorption spectra of plant pigments
- Concentration of proteins in solution
- Rate of an enzyme-catalyzed reaction
- Growth of a cell culture

Includes USB Charging cable, 10 cuvettes, and Spectrometry Software.

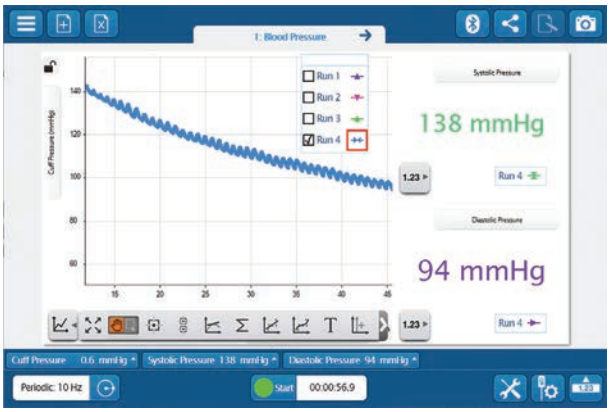
Order Information

Wireless Spectrometer (VIS).....PS-2600

Wireless Blood Pressure Sensor with Standard Cuff

PS-3218

PASCO's Wireless Blood Pressure Sensor allows students to quickly and easily measure both systolic and diastolic arterial blood pressure (mmHg) as well as heart rate (pulse in bpm). Comparing the digits display for systolic and diastolic pressure with the display of blood pressure from the real-time graph helps students gain a contextual understanding of the physiology of blood pressure.



Observe heart rate plus systolic and diastolic blood pressure

Order Information

Wireless Blood Pressure Sensor with Standard Cuff.....PS-3218

Wireless Hand-Grip Heart Rate Sensor

PS-3206

With these wireless hand grips, conducting physiology labs on the cardiovascular system or homeostasis is easier than ever before. Continuously monitor heart rate during exercise, or use the sensor to take initial and final measurements with fast and reliable heart rate detection.

Order Information

Wireless Hand-Grip Heart Rate Sensor.....PS-3206

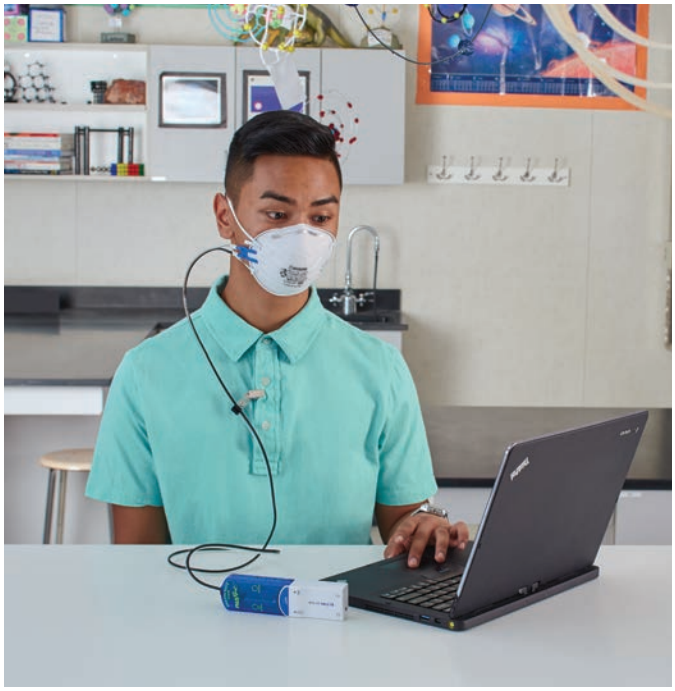
Wireless Exercise Heart Rate Sensor

PS-3207

The Wireless Exercise Heart Rate Sensor has a chest strap and will transmit data wirelessly up to 10 m away! The electrode belt fits around the ribcage (worn against the skin for best results, but can be worn over a shirt if a drop of saline solution is applied under the electrodes). Live and recorded data can be analyzed using any device with PASCO software installed.

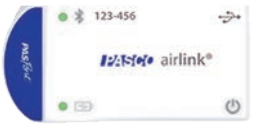
Order Information

Wireless Exercise Heart Rate Sensor.....PS-3207



Go Wireless with PASPORT Sensors

PASCO's AirLink Interface connects PASPORT (blue or black) sensors to your computer using Bluetooth or USB technology.



AirLink Interface

PS-3200

The Airlink connects PASPORT sensors to a Mac or Windows computer, Chromebook, iPad, tablet, or smartphone via Bluetooth or USB connection. The USB cable is included.

Order Information

AirLink Interface PS-3200

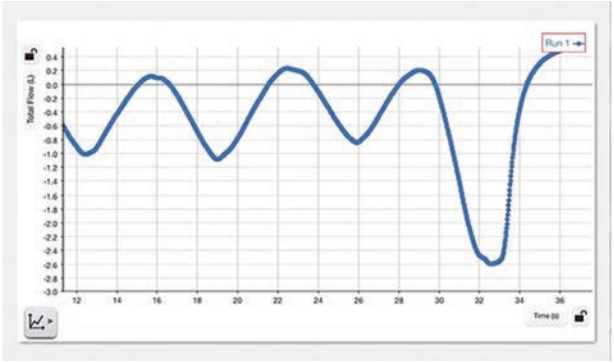
PASPORT Spirometer

PS-2152

With our Spirometer Sensor, students can easily measure flow rate, pressure, and lung volume, making it perfect for human physiology courses. The mouthpieces are designed to be used by a single student, and the sensor includes an exchangeable filter to ensure every use is hygenic. The Spirometer Sensor facilitates the safe and accurate measurement of airflow both inward (inspiration) and outward (expiration). Additional mouthpieces are available in convenient packs of ten.

Features:

- Bi-directional air flow (inspiration and expiration)
- Minimal resistance to air flow
- Displays volume in liters
- Exchangeable filter and hygenic mouthpieces



Order Information

PASPORT Spirometer PS-2152
Spirometer Mouth Piece Replacements (10).....PS-2522

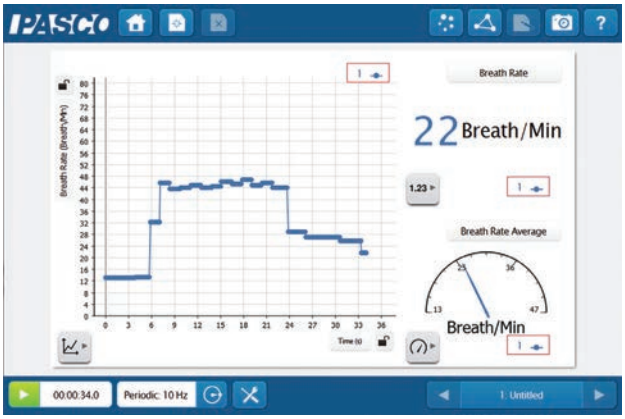
PASPORT Breath Rate Sensor

PS-2187

The Breath Rate Sensor measures breath rate by sensing pressure changes within a standard, disposable dust mask. It generates consistently stable output, even when used during exercise. The sensor's tubing connects to the disposable pressure clips that fasten to the sides of the mask.

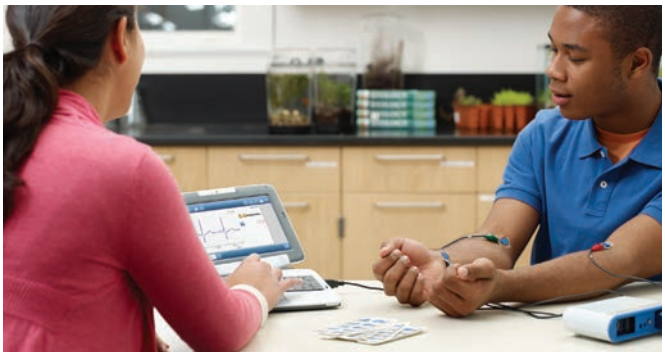
Two modes:

- One reading every breath
- Running average over last four breaths



Order Information

PASPORT Breath Rate Sensor PS-2187



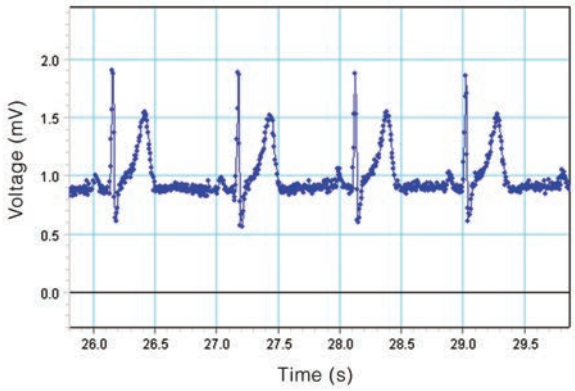
PASPORT EKG Sensor

PS-2111

The EKG Sensor measures electrical signals produced by the heart. As cardiac muscle depolarization and repolarization occur, the EKG trace graphically illustrates the beating of the heart. The sensor comes with 100 self-adhesive conductive patches that are easily removed from the skin after use.

Features:

- Standard three-electrode design
- Easy-to-use, disposable stick-on electrodes
- No messy gel required
- Great for stimulus response reflex studies



Order Information

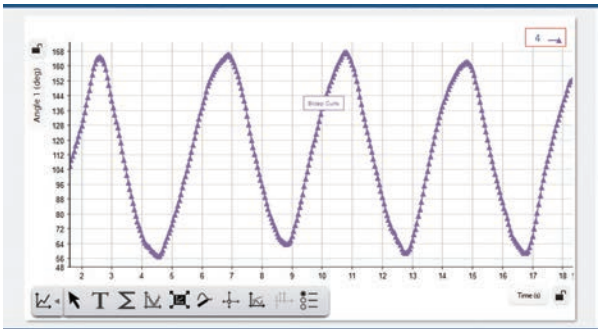
PASPORT EKG Sensor PS-2111

PASPORT Goniometer Sensor

PS-2137

The PASPORT Goniometer Sensor allows students to use their own bodies to contextualize physics. The Goniometer can be connected to knee, hip, or elbow joints to measure angle changes throughout a variety of movements. It can be used to measure the angular position, velocity, and acceleration of an arm or leg.

The PS-2137 includes one Angle Sensor (PS-2139) and one Goniometer Probe with a Velcro connection kit. An add-on Goniometer Probe (PS-2138) must be purchased to measure the motion of two joints simultaneously.



Order Information

PASPORT Goniometer Sensor.....PS-2137

Human Arm Model

PS-2611

The Human Arm Model simulates the muscles and motion of an actual human arm. To activate the arm motion, students pull on the cord with a Force Sensor. Changes in position are measured at the shoulder and elbow using the two built-in potentiometers plugged into the included Angle Sensor (PS-2139). From this information, the torque applied when lifting an object can be determined. Also, students can evaluate the work done by the arm in throwing a ball and the resulting kinetic energy delivered to the ball.

The Arm can perform many types of motion, such as extending and lifting an object, curling, or throwing a ball overhand. Different arm muscles are activated depending on which pulleys are selected. Static force measurements can also be made to see how the muscle tension changes at various arm positions.

Applications:

- Evaluate the work done when throwing a ball
- Measure the torque produced from lifting weights
- Associate Triceps/Biceps muscle action with arm motion
- Investigate different levels of muscle tension

Includes Human Arm Model kit and an Angle Sensor (PS-2139).

Order Information

Human Arm Model.....PS-2611

Microscope with Detachable Tablet (40-1000x)

SE-6203

The SE-6203 features the same high speed, full-resolution imaging technology built into some of our most popular microscopes. The 8" WiFi digital tablet transmits live images to iOS and Android devices. Use it as a conventional microscope, or share live images using a WiFi tablet, wireless laptop, or HD-ready LCD monitor/projector through HDMI. Tablet includes preloaded Motic apps. Connect, view, and share images easily and affordably with the SE-6203.

Order Information

Microscope with Detachable Tablet (40-1000x)....SE-6203

USB 3.0 Microscope Camera

SE-6204

This high-resolution camera permits you to use your own microscope to create still or moving microscope images on your PC. With the included Motic Images Plus software, you can view, enhance, label, measure, print, and store the images all with one program. This lightweight digital camera mounts over almost any microscope eyepiece (stereo or compound) with the supplied C-ring adapter and microscope eyepiece adapters. Provides 3.0 megapixels at 2048x1536 framed resolution, everything included for easy plug-and-play, for use with Windows 7 and above and OSX.

Order Information

USB 3.0 Microscope Camera SE-6204

WiFi Microscope Camera

SE-6205

The Moticam X3 is a high resolution, streaming WiFi camera. It creates its own WiFi signal, so you can simply connect your Android or iOS device to view, capture, and edit live images from your microscope with our free MotiConnect app. Download it today!

Order Information

WiFi Microscope Camera SE-6205

Award-Winning Solutions for Your Chemistry Lab

PASCO provides chemistry educators with the most complete and innovative classroom solutions on the market. Our goal is to provide teachers with affordable, turnkey STEM solutions that combine versatile sensor technology with interactive, NGSS-based curriculum. Using SPARKvue® software and our wireless sensors, students can see real-time data collection and analysis on their own devices. Plus, our *Essential Chemistry* textbook and interactive e-book reinforce student engagement at home and in the classroom.

Chemistry Index

Chemistry Starter Lab Station

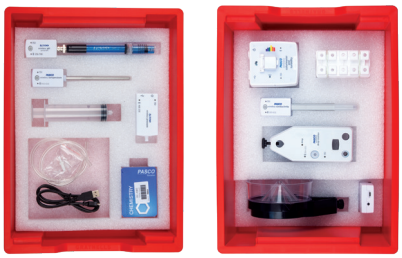
EC-6362

The Chemistry Starter Lab Station makes it easy and affordable to begin using sensor-based technology in your chemistry classroom or at home. Inside the Starter Lab Station are the wireless sensors used to perform lab activities from the Essential Chemistry Student Lab Manual. Available separately is the Chemistry Extension Lab Station (EC-6363) which, when combined with the Chemistry Starter Lab Station, comprises the set of wireless sensors used to perform all of the labs inside the Essential Chemistry Student Lab Manual, plus many of the lab activities found in our Advanced Chemistry Through Inquiry Teacher Guide.

Chemistry Station Lab Titles

The Chemistry Starter Lab Station supports 7 of the 10 included labs. Add the Extension Lab Station* to do all 10 lab titles + over 50 more investigations from the Essential Chemistry Lab Manual.

1. **Physical or Chemical Change**
2. **Specific Heat**
3. **Chemical Reactions**
4. **Determining Limiting Reactions**
5. Types of Bonding*
6. **Evaporative Cooling**
7. Solution Concentration*
8. **What is pH**
9. **Investigation of Acid-Base Titration**
10. Lemon Battery*



Shown here: Chemistry Starter & Extension Lab Stations

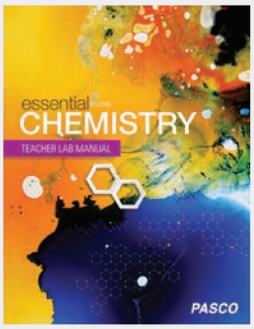
The Chemistry Starter & Extension Lab Stations include these wireless sensors and materials:

Starter
- Temperature
- Presure
- pH
- Molecular Model
- Periodic Table
- Periodic Trend Cards
- Spectrum Cards
- Storage Case

Extension
- Drop Counter
- Colorimeter
- Conductivity
- Voltage
- Condensor
- Electrode Support

Order Information

Chemistry Starter Lab Station EC-6362
Chemistry Extension Lab Station.....EC-6363
Essential Chemistry Teacher Lab Manual EC-6330



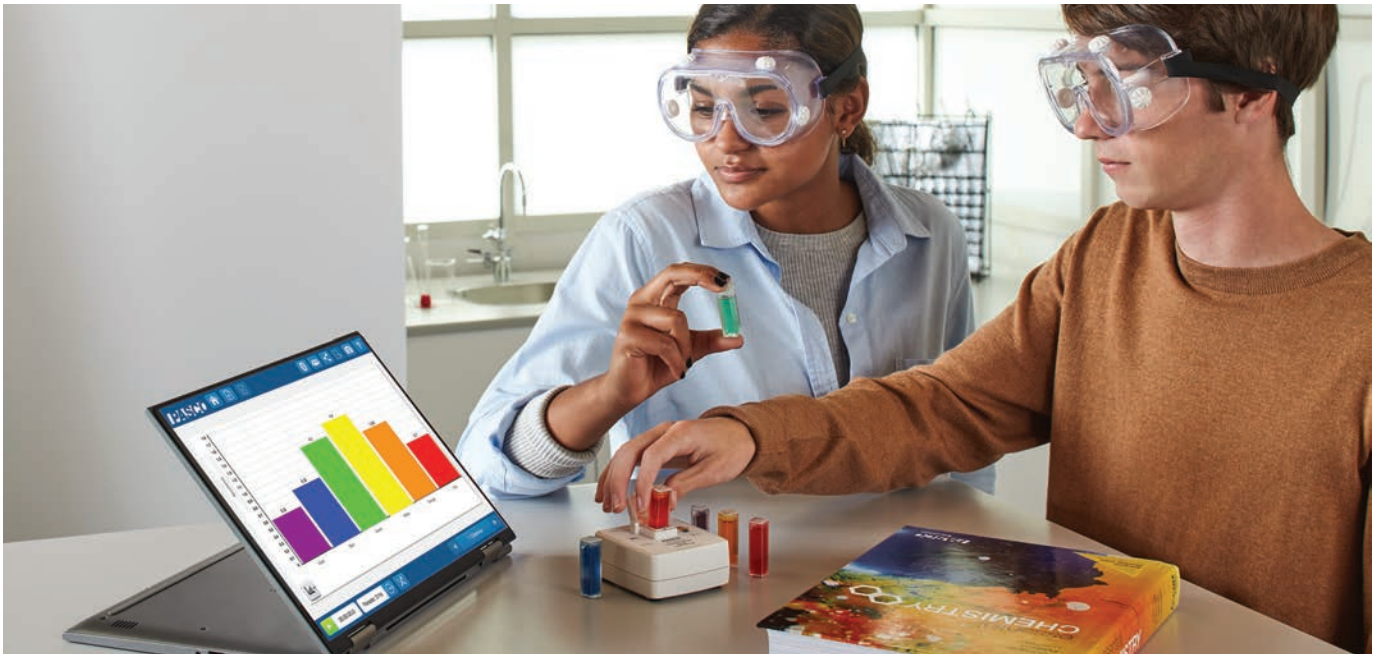
Essential Chemistry Teacher Lab Manual

EC-6330

The Essential Chemistry Teacher Lab Manual is a complete set of teacher answer keys for the 73 labs inside the Essential Chemistry Student Lab Manual (the printed student lab manual is sold separately). Each teacher key provides sample data, graphs tables, and correct or sample responses to the analysis questions within each of the 73 student lab investigation. Below is a partial list of labs from the Essential Chemsitry Lab Manual:

Experimental Variables
Density of a Liquid
Physical or Chemical Change
Specific Heat
Naming Ionic Compounds
Molar Mass
Percent Composition of a Hydrate
Empirical Formula of Magnesium Oxide
Chemical Reactions
Solubility Rules
Determining Limiting Reactants
Flame Tests
Lewis Structures and VSEPR
Evaporative Cooling
Hess's Law
Boyle's Law
Charles' Law
Solution Concentration
Catalysts
Le Châtelier's Principle
Titration of an Unknown Acid
Electrochemical Cells
Electroplating
Bonding and Organic Chemistry
+ 49 more labs available.

Your COMPLETE Chemistry Solution



PASCO's *Essential Chemistry* curriculum is the only curriculum solution that includes a Student Textbook, Student e-Book, Teacher e-Resources, Student Lab Manual, Teacher Lab e-Resources, and Equipment Kits, all at a very affordable price. This 3-D STEM program includes a full year of instruction for both General and Honors Chemistry classes. Use our complete solution or integrate Essential Chemistry into your existing curriculum. Essential Chemistry is multiplatform and works on iOS, Android™, Chrome™, Windows®, and Mac®. What's more, it includes 24/7 online access, as well as correlations to NGSS and your state standards.

Student Textbook

- 24 chapters cover a full year of instruction for General and Honors Chemistry
- One main idea per page
- Quality illustrations
- 71 complete investigations
- 4 Engineering Design Projects
- Section and Chapter Reviews

Student e-Book

- Same great features and layout as the print book
- **Multiplatform:** works on your devices
- Interactive simulations and Equation Solver
- Formative assessment
- Infinite Test Bank
- Embedded animations

Teacher e-Resources for Lab Manual

- Editable documents
- PowerPoint presentations
- Answer keys
- Video lab assistance
- NGSS Alignment details

Teacher e-Resources for Textbook

- Correlation to NGSS and your state standards
- Teacher User Guide
- Teacher e-Book with up to 5-year access
- Student e-Book with up to 5-year access
- SPARKvue software

Student Lab Manual

- More than 70 labs and activities
- Labs are completely integrated with PASCO sensors, equipment, and software, including our Standard Equipment Kit.

Equipment

- Standard Equipment Kit supports 47 labs
- Individual sensors and apparatus can be ordered separately
- Equipment ships in convenient Gratnells storage trays

Essential Chemistry correlates with NGSS and is constructed around the three dimensions:

- Science and Engineering Practices
- Crosscutting Concepts
- Disciplinary Core Ideas

Textbook + e-Book + Equipment

Essential Chemistry Student Textbook

EC-6350

This rigorous yet accessible textbook includes core Chemistry topics that cover a complete year of instruction. The lessons follow the 5E model and include tools for ELL students, as well as tools for students with different learning styles. And the curriculum aligns to your standards for both regular and advanced coursework. The accessible textbook includes one main idea per page, quality illustrations, 71 complete investigations, four Engineering Design Projects, and Section and Chapter Reviews. The 24 chapters cover these topics:

- The Science of Chemistry
- Measurement and Analysis
- Classifying Matter
- Temperature and Heat
- Chemical Compounds
- Moles
- Chemical Reactions
- Stoichiometry
- Atomic Structure
- Bonding and Valence
- Energy and Change
- Gases
- Solutions
- Reaction Rates
- Equilibrium
- Acids and Bases
- Oxidation and Reduction
- Electrochemistry
- Nuclear Chemistry
- Organic Chemistry
- Molecular Biology
- Biochemistry
- The Earth
- The Universe

Essential Chemistry Student e-Book

EC-6350-EB5 (5-yr lic) or EC-6350-EB1 (1-yr lic)

The e-Book is an electronic version of the full textbook plus interactive elements. Throughout the electronic text, content and theory are supported with optional audio reading, as well as interactive elements such as interactive equations, videos, animations, and simulations. Students may also expand content using the 'more' button to go deeper into concepts.

Essential Chemistry Student Lab Manual

EC-6352

The *Essential Physics* Student Lab Manual is a student-consumable print book. In the manual there are 46 labs that cover a full year of instruction. Best of all, the labs are completely integrated with PASCO equipment and software.

Essential Chemistry Standard Equipment Kit

EC-6361

This equipment kit will outfit a single chemistry lab station of 2-5 students. When used in conjunction with the Essential Chemistry program, including the e-Book and lab manual, it creates a complete solution for teaching high school chemistry. It can also be used to supplement your existing textbook, serving as the lab component of your curriculum. This use is supported by the more than 70 standards-based Essential Chemistry labs that are available for free download in the PASCO Digital Library.

Standard Equipment Kit

42 labs are designed to use this equipment set.

Includes 1 of each of the following:

- Wireless Temperature Sensor, PS-3201
- Wireless pH Sensor, PS-3204
- Wireless Conductivity Sensor, PS-3210
- Wireless Pressure Sensor, PS-3203
- Wireless Voltage Sensor, PS-3211
- Wireless Colorimeter and Turbidity, PS-3215*
- Molecular Model Kit, PS-3400
- Electrode Support, PS-3505
- Gratnells® Storage Trays (2)
- Periodic Trend Cards, EC-3405
- Periodic Table, EC-3404
- Spectrum Cards, EC-3403
- Condenser, PS-3402

Order Information

Essential Chemistry 1st Edition: Student Textbook EC-6350
Essential Chemistry 1st Edition: Student e-Book (1-yr lic) EC-6350-EB1
Essential Chemistry Student Lab Manual EC-6352
Essential Chemistry Teacher Lab Manual EC-6330
Essential Chemistry Lab Investigations Resources EC-6353-DIG
Essential Chemistry Standard Equipment Kit.. .....EC-6361

Advanced Chemistry Through Inquiry Labs for AP® & IB®

PASCO's Advanced Chemistry through Inquiry Teacher Guide is newly revised and contains 16 labs that have been specifically designed to support student inquiry, as well as AP® and IB® curriculum*. This manual is available in both a print version and an all-digital version.

- Most labs can be completed in one lab session with readily available materials, including the sensor bundles on the opposite page.
- The flexible format provides guided inquiry opportunities and scaffolding, so students can create their own experiments.
- Easy and meaningful data collection leads to increased time for data analysis and open inquiry.
- Labs integrate high-order analysis and synthesis questions.
- Includes sample data for investigations and inquiry, answers to analysis and synthesis questions, an assessment rubric, teacher tips, lab preparation information, and more.

  Initial Investigation includes step-by-step procedure, questions, and analysis.

  Advanced Investigation presents a higher level experiment that expands on concepts from the Initial Investigation.

  Extended Inquiry includes student inquiry and experimental design questions with sample answers.

Advanced Chemistry Through Inquiry Labs and Sensors Used

Lab Title	Starter Bundle: Temperature	Starter Bundle: Pressure	Starter Bundle: pH	Starter Bundle: Conductivity	Extension Bundle: Colorimeter	Extension Bundle: ORP Probe	Extension Bundle: Drop Counter	AP® Big Ideas*	IB® Standards**
1. Analyzing Food Dyes in Sports Drinks					●			1.3, 11.2, 11.3	1.15, 1.16
2. Investigating the Copper Content of Brass**					●			1.2, 11.2, 11.3, 12.1	1.16, 3.4
3. How Hard Is Your Tap Water?			●	●				1.2, 1.3	1.19, 2.10, 3.2, 3.3
4. How Much Acid is in Your Fruit Juice?			●				●	1.3, 8.1-8.4, 18.2, 18.3	1.20, 3.3
5. Separating Food Dyes Using Chromatography**					●			1.1, 4.4	1.20, 2.3
6. A Chemistry Mystery: Name That Unknown!				●				1.1, 4.1, 4.4	2.22, 2.24, 2.32
7. Stoichiometry in Solutions	●			●			●	1.2, 1.3	1.5, 3.3
8. Percentage of H_2O_2 in Your Drugstore Hydrogen Peroxide						●	●	9.1	3.9, 1.20, 3.3
9. Investigating the Physical and Chemical Changes of Matter	●	●	●	●				1.1, 4.1, 4.4	2.3, 2.5, 3.1, 3.10, 5.10
10. What Does Acid Rain Do to Coral Reefs?		●						6.1	4.1, 4.2
11. Kinetics of Crystal Violet Fading					●			16.1	4.2, 4.1
12. Building a Better Hand Warmer	●							5.1, 5.3	5.6, 5.7
13. Applications of Le Chatelier's Principle**	●				●			7.1, 17.1	6.9, 6.10
14. Investigation of Acid-Base Titrations			●				●	1.3, 8.1-8.4, 18.2, 18.3	1.20, 6.11, 6.12, 6.13
15. Introduction to Buffers			●				●	18.3	6.20, 1.20
16. Evaluating Lemonade as a Buffer			●				●	18.3	6.18, 1.4

*AP is a registered trademark of the College Board, which was not involved in the production of, and does not endorse, this product. IB is a registered trademark of the International Baccalaureate Organization, which was not involved in the production of, and does not endorse, this product.

**Requires the Wireless Spectrometer; see page 37.

Order Information

Advanced Chemistry Through Inquiry.....PS-2828A

Includes lab prep instructions, expected answers/results, and editable student files. Manual is available in eco-friendly digital format or in print.

Lab Stations Support Advanced Chemistry

The Chemistry Starter Lab Station and Extension Station, together with PASCO's *Advanced Chemistry Through Inquiry Lab Manual,* offer a truly complete solution. With over 15 sensor-based labs covering a range of Chemistry and Advanced Chemistry topics, and all of the equipment and apparatus required to conduct the labs, hands-on inquiry with data collection and analysis has never been easier or more affordable. Add the Wirelesss Spectrometer and Oxidation Reduction Potential Probe to the Lab Stations, for more IB® and AP® investigations.

The Chemistry Starter & Extension Lab Stations these wireless sensors and materials:

Starter

- Temperature
- Pressure
- pH
- Molecular Model Kit
- Periodic Table
- Periodic Trend cards
- Spectrum Cards
- Storage Case

Extension

- Drop Counter
- Colorimeter
- Conductivity
- Voltage
- Condensor
- Electrode Support

Wireless Spectrometer (VIS)

PS-2600

The Wireless Spectrometer from PASCO is specifically designed for modern chemistry, biology, and physics labs. With Bluetooth and USB connectivity, students can quickly connect from their device or computer using the free PASCO Spectrometry Software. With this affordable spectrometer students can gather a full spectrum of data in under one second. After specifying a target wavelength, students can study concentrations (Beer's Law), rates of reactions, or investigate emission spectra using the optional fiber optic cable.

Oxidation Reduction Potential Probe

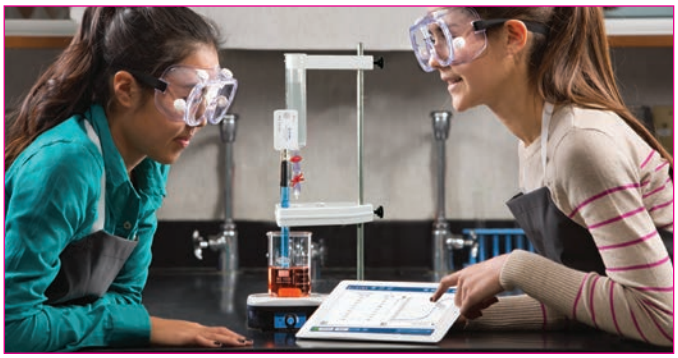
PS-3515

This probe connects to the Wireless pH Sensor and allows students to determine the ability of a species in a solution to act as an oxidizing agent or reducing agent during redox reactions.

Use this probe to monitor solutions during oxidation-reduction titrations, perform water quality studies, and study the effects of water chlorination. This probe is not a standalone sensor. It connects to and requires an amplifier.

Order Information

Chemistry Starter Lab Station	EC-6362
Chemistry Extension Lab Station	EC-6363
Wireless Spectrometer (VIS)	PS-2600
Oxidation Reduction Potential Probe	PS-3515



Wireless pH Sensor

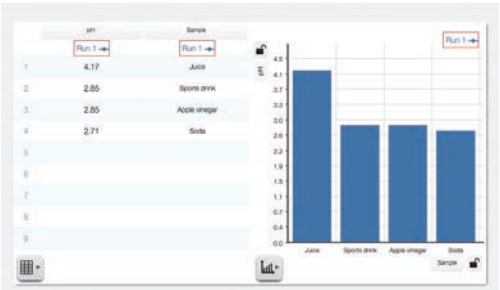
PS-3204

The Wireless pH Sensor is a must-have for any chemistry, biology, or environmental science course. Equally capable in the lab or field, the sensor eliminates the hassle of cables, reducing spills and improving safety. Don't worry about charging, the sensor has a coin-cell battery that lasts for 2-3 years in most labs and costs about one dollar to replace. The sensor can transmit data in real-time, or store data for hours or days when continuous monitoring is required. The Wireless pH Sensor can perform countless experiments, including acid-base titrations, investigating household chemicals, changes in pH during reactions, water quality studies, and much more.

Features:

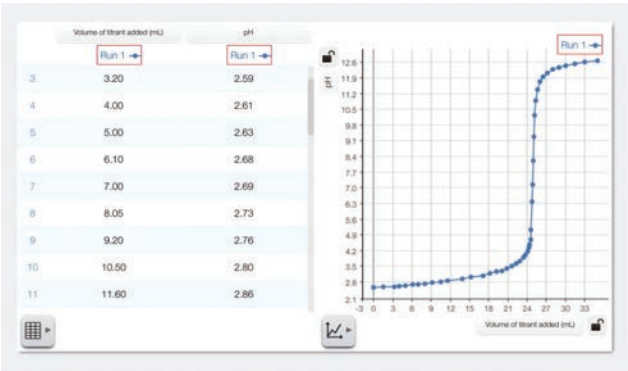
- Simply pair and go, no cables or interfaces to manage
- Compatible with ion-selective electrodes (ISE) and the oxidation reduction probe (ORP)
- Features Bluetooth® wireless connectivity and a long-lasting coin cell battery
- Logs pH data directly onto the sensor for long-term experiments
- Wireless connection to Sparkvue and Capstone for intuitive analysis and lab reports

Display pH in digits, graphs, tables, or bar charts, so your students can get the most out of their measurements.



Order Information

Wireless pH Sensor.....PS-3204



Wireless Drop Counter

PS-3214

The Wireless Drop Counter has a wider (18 x 13 mm) drop window for better drop detection and easier alignment with burettes. It works equally well with large or small, fast or slow drops.

Measures up to 10 drops per second with drops as small as 0.5 mm.

Teaching Advantage:

- IR filter assures accurate counts because room lighting cannot affect results
- Sensor unit can suspend two other probes in solution, simplifying many experiments
- Wider drop window (18x13mm) means better drop detection and easier alignment with burettes

Includes: Wireless Drop Counter, Stopcock Valves (2), 60 cc Drop Dispenser Syringe with Tip, and Syringe Holder. Included but not shown: Micro Stir Bar and Micro USB Cable (1 m.)

Order Information

Wireless Drop Counter PS-3214

Wireless Colorimeter & Turbidity Sensor

PS-3215

The Wireless Colorimeter simultaneously measures the absorbance and transmittance of six different wavelengths. The sensor can be used to study Beer's Law (absorbance vs. concentration), enzyme activity, photosynthesis, and the rates of chemical reactions (absorbance vs. time). After a simple calibration, students can quickly begin viewing live measurements as they materialize across the visible spectrum at 650 nm (red), 600 nm (orange), 570 nm (yellow), 550 nm (green), 500 nm (blue), and 450 nm (violet).

This sensor also functions as a high-quality turbidimeter for water quality analysis. Rather than simply measuring transmitted light, the Wireless Colorimeter and Turbidity Sensor measures light scattered at a 90 degree angle from the sample, resulting in accurate and repeatable measurements. Additionally, the internal housing for the cuvette is opaque, which limits ambient light interference to preserve accuracy.

Features:

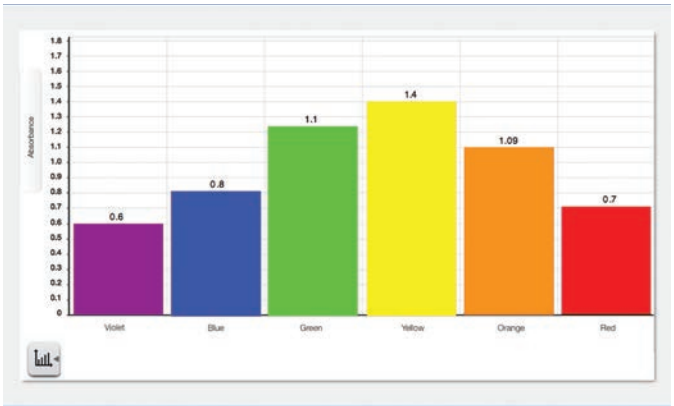
- Stabilized light source for consistent readings
- Measures six different wavelengths simultaneously
- PASCO software displays the absorbance & transmittance at each wavelength in the appropriate color
- Quick and easy calibration
- Functions as both a colorimeter and turbidimeter
- Wireless design enables data collection in the field

Includes: USB Charging cable, 9 cuvettes, 2 cuvette racks, and one 100NTU claibration cuvette.

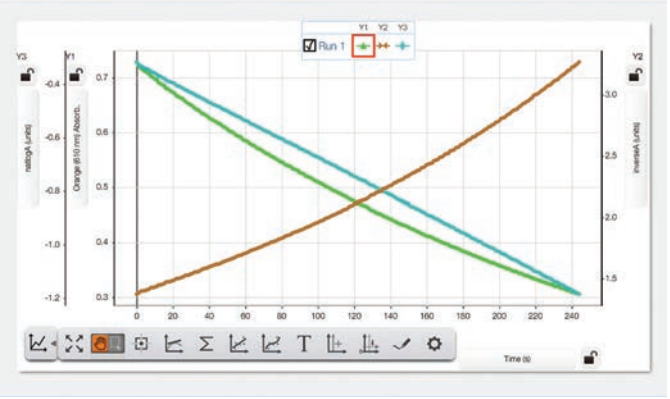
WARNING! This product can expose you to chemicals including Formaldehyde, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Order Information

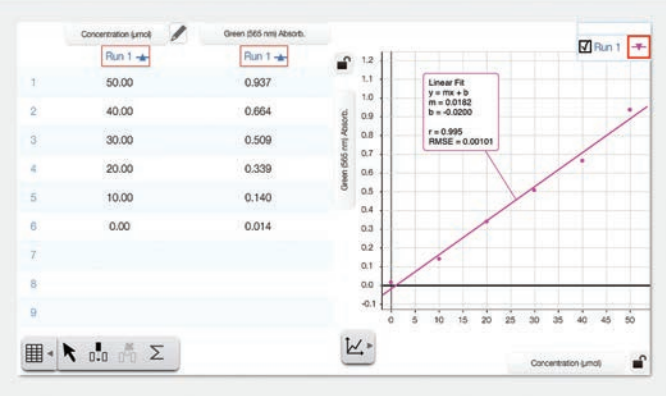
Wireless Colorimeter & Turbidity Sensor.....PS-3215



Measure the absorbance and transmittance of a solution at six different wavelengths... simultaneously!



Graphically analyze how a reaction changes over time. Use SPARKvue to see multiple measurements on the same graph.



Cuvettes and Caps

SE-8739

This is a set of 100 identical 3.5 mL polystyrene cuvettes and caps.

Order Information

Cuvettes and Caps.....SE-8739

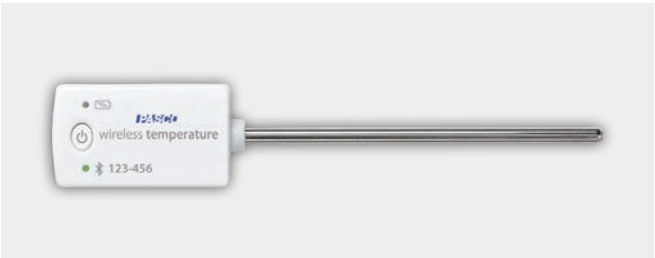
Wireless Temperature Sensor

PS-3201

Welcome to the modern thermometer. The Wireless Temperature Sensor transmits live data and allows students to continuously monitor, log, and plot temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, weeks, or months, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts over a year*. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

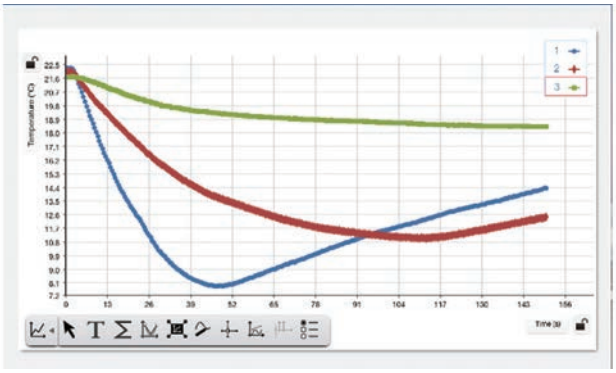
Features:

- Simply pair and go, no cables or adapters to manage
- Variable sampling rate for capturing small, fast changes or experiments that run for hours, days, or weeks
- Bluetooth® connectivity and long-lasting coin cell battery
- Logs temperature data directly onto the sensor for long-term experiments
- Dust, dirt, and sand-proof and water resistant (IP-X7 certified)



Order Information

Wireless Temperature Sensor.....PS-3201



Heats of evaporation indicate strength of intermolecular motion.

Heater Stirrer

PS-3401

This compact hot plate and stirrer has a white ceramic top that is ideal for heating and for seeing color changes when mixing solutions. It has been designed to withstand spills. Its safety features include warning labels and indicator LEDs. And the included rod makes it easy to support sensors.

Order Information

Heater Stirrer.....PS-3401

Calorimetry Cups (6)

TD-8825A

These styrofoam calorimeter cups (7.5 cm inside diameter, 10 cm deep) have 1.3 cm thick walls for excellent thermal properties. The lids have a hole for a temperature probe. Includes set of six cups with lids.

Order Information

Calorimetry Cups (6).....TD-8825A

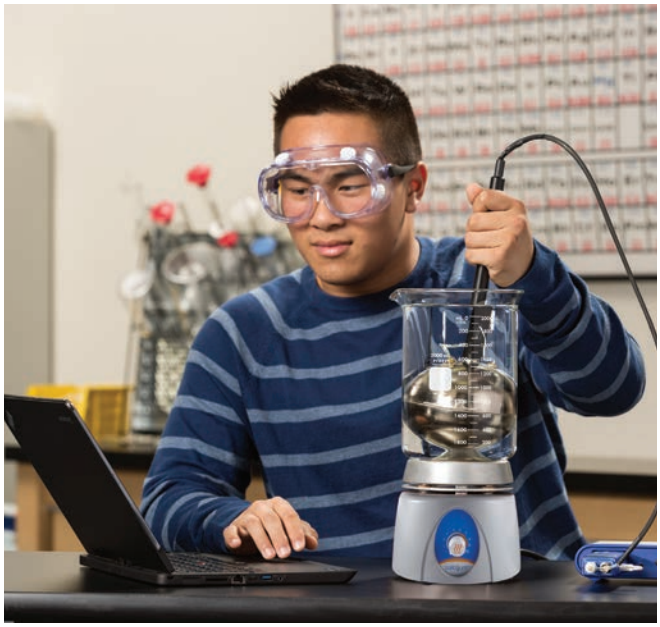
Wireless Temperature Sensor Link

PS-3222

The Wireless Temperature Sensor Link enables wireless connection for any PASCO temperature probe with a 3.5 mm connection. The link comes with a Fast Response Temperature Probe, but it can also connect to the Stainless Steel Temperature Probe, Skin/Surface Temperature Probe, the Absolute Zero Sphere, and the Ideal Gas Law Apparatus.

Order Information

Wireless Temperature Sensor Link.....PS-3222 $71



Absolute Zero Sphere

TD-8595

The Absolute Zero Sphere is an effective tool for determining absolute zero temperature. Students connect Pressure and Temperature Sensors before immersing the sphere in water baths of varying temperatures. As the pressure and temperature change, a live graph is generated in PASCO Capstone™. Once the data is collected, students can use a linear fit to extrapolate the value of absolute zero.

Includes built-in fast response thermistor, with male leur connector. For data collection a Wireless Pressure Sensor (PS-3203) and Wireless Temperature Link (PS-3222) are required.

Absolute Zero Sphere Connector

Ideal Gas Law Apparatus

TD-8596A

Investigating the Ideal Gas Law is simple using PASCO's Ideal Gas Law Apparatus. By connecting a Pressure Sensor and a Temperature Sensor to the syringe, students can quantitatively look at the relationships between pressure, temperature, and volume.

Includes Ideal Gas Law Syringe, built-in fast response thermistor, with male leur connector. A Wireless Pressure Sensor (PS-3203) and Wireless Temperature Link (PS-3222) are required for data collection.

Order Information

Ideal Gas Law Apparatus TD-8596A

Order Information

Absolute Zero Sphere.....TD-8595

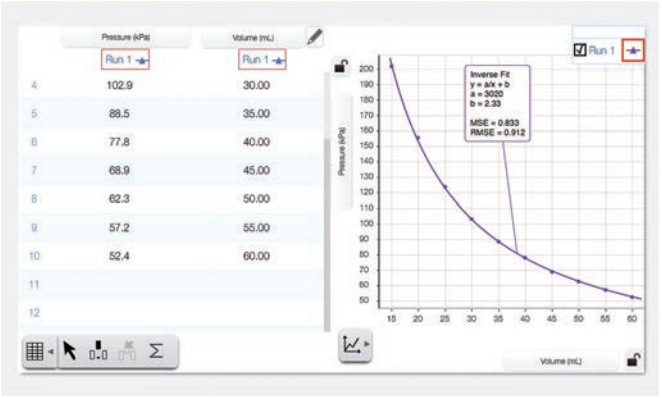
Wireless Pressure Sensor

PS-3203

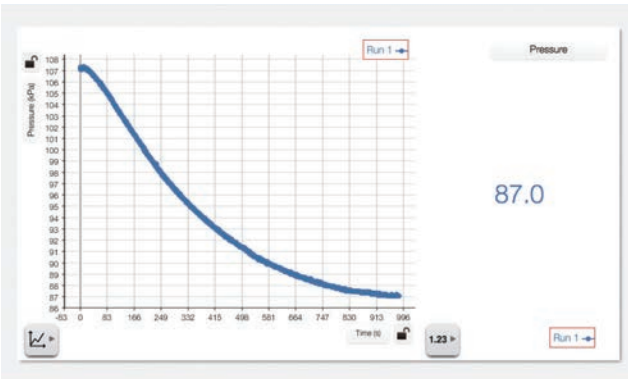
The Wireless Pressure Sensor allows students to easily collect accurate gas pressure data for a wide range of applications. Included is a 60cc syringe, tubing, and connectors that facilitate experiments such as Boyle's Law and measuring pinch-grip strength. Within PASCO's software, students can easily select their desired units from a list containing kPa, mmHg, inHg, mbar, psi, atm, and torr.

Features:

- Measures pressure even when the pressure within the system drops below ambient pressure
- Supports common units (kPa, atm, psi, mmHg, or N/m^2) for many applications
- Bluetooth® wireless connectivity and long-lasting rechargeable battery



With the included syringe, your students can easily quantify the relationship between pressure and volume.



Monitor the Pressure digit display while live data is graphed in real time as steel wool reacts with oxygen.

Order Information

Wireless Pressure Sensor PS-3203

Wireless Conductivity Sensor

PS-3210

The Wireless Conductivity Sensor measures the electrical conductivity of an aqueous solution. It is ideal for investigating the properties of solutions, including total dissolved solids (TDS) for water quality inquiry. Because it is temperature compensated, calibrations are less frequent and can be applied across a range of temperatures. With a range of 0 to 20,000 µS/cm, this sensor can be utilized for chemical, biological, and environmental studies.

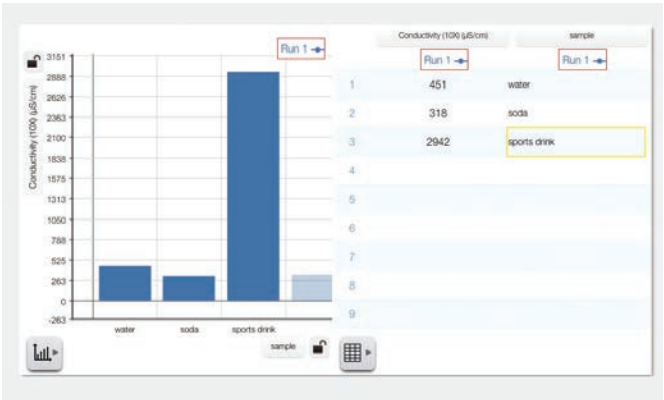
Teacher tip: To measure brackish or marine samples, perform a dilution until the measurement falls within the range, then multiply to determine sample conductivity.

Features:

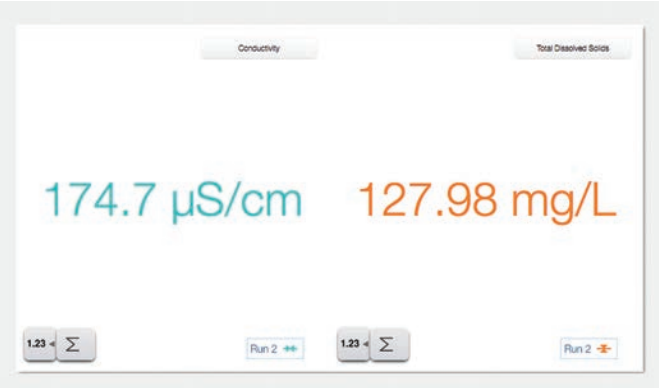
- Measure conductivity and total dissolved solids
- Automatic temperature compensation
- Battery life >1 year
- Remote logging with built-in memory
- Dust-proof, sand-proof, and water-resistant (1 meter for 30 minutes)

Order Information

Wireless Conductivity Sensor.....PS-3210



Compare the types of bonding or the concentration of electrolytes when measuring the conductivity of solutions.



The Wireless Conductivity Sensor can measure conductivity and total dissolved solids.

Wireless Voltage Sensor

PS-3211

In Chemistry, the Wireless Voltage Sensor helps students investigate redox reactions, electrolytic cell potentials, and the impact solution strength on these generated potentials. By testing potential differences between two half reactions, separated by a salt bridge, students can begin to understand the driving forces behind modern batteries.

Features:

- **Two Ranges:** ±15 V, ±5 V
- **Resolution:** 7 mV (±15 V range); 2 mV (±5 V range)
- Bluetooth® sampling rate of 1 kHz
- Higher speed sampling via USB
- Includes remote logging

Order Information

Wireless Voltage Sensor.....PS-3211

Wireless Current Sensor

PS-3212

Current sensors enable chemistry students to count the electrons involved in driving reactions, much like how a scale accounts for mass in reactions. Amperage determines how many atoms are involved in a chemical reaction. Since the two are related, current can be used to find out how much reactant is available in a solution. Integrating currents keeps track of how much metal might electroplate onto an electrode.

Features:

- **Two Ranges:** ±1.0 A and ±0.1 A
- **Resolution:** 0.2 mA at ±1 A range and 0.02 mA at ±0.1 A range
- Bluetooth® sampling rate of 1.0 kHz
- High-speed sampling via USB
- Remote logging
- Variable sampling rate for recording small, fast changes or experiments that run for hours, days, or weeks

Order Information

Wireless Current Sensor PS-3212

Molecular Model Set

PS-3400

The Molecular Model Set is the perfect tool to help students understand core science concepts such as chemical formulas, equation balancing and the conservation of mass. They are critical to making more advanced concepts easier to visualize and allow students to predict polarity and study reaction mechanisms. Students can explore intermolecular attractions, steric hindrances, nomenclature and complex structure. Anything is possible for students, from creating simple water or carbon dioxide molecules to complex biochemicals such as amino acids and lipids. The set is ideal for studying Chemistry and Biochemistry.

Order Information

Molecular Model Set.....PS-3400

Density Set

ME-8569A

Use this versatile set of materials with the Overflow Can to investigate Archimedes' Principle of displacement, specific heats, and basic length/volume relationships.

Includes pieces that have the same shape, volume, density, and mass, so the variable of interest can readily be isolated. Each piece has a hole, so it can be suspended from a string.

Order Information

Density Set.....ME-8569A

Specific Heat Set

SE-6849

This specific heat set has five different materials, all with the same mass (80 g). Each has a hole to tie a loop of string to hang the samples in water.

Order Information

Specific Heat Set.....SE-6849

Discover Density Set

SE-9719A

This set of 22 separate pieces allows students to discover the relationship between density, volume, and dimensions. Two unique series of pieces hold one dimension constant while varying another.

Order Information

Discover Density Set.....SE-9719A

Wireless Spectrometer (VIS)

PS-2600

The Wireless Spectrometer from PASCO is specifically designed for modern chemistry, biology, and physics labs. With Bluetooth and USB connectivity, students can quickly connect from their device or computer using the free PASCO Spectrometry Software. With this affordable spectrometer students can gather a full spectrum of data in under one second. After specifying a target wavelength, students can study concentrations (Beer's Law), rates of reactions, or investigate emission spectra using the optional fiber optic cable.

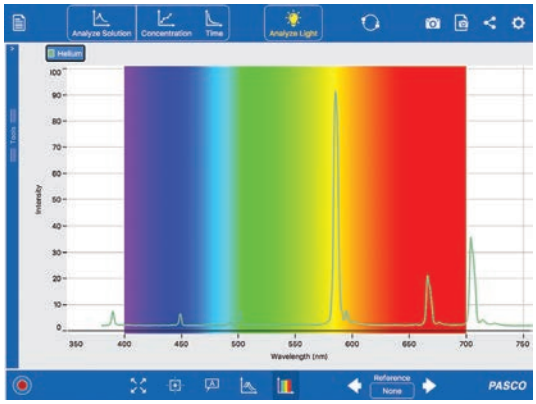
Perform these labs with the PASCO Spectrometer:

- Emission Spectra of Light
- Absorbance Spectra
- Beer's Law
- Kinetics
- Flourescence

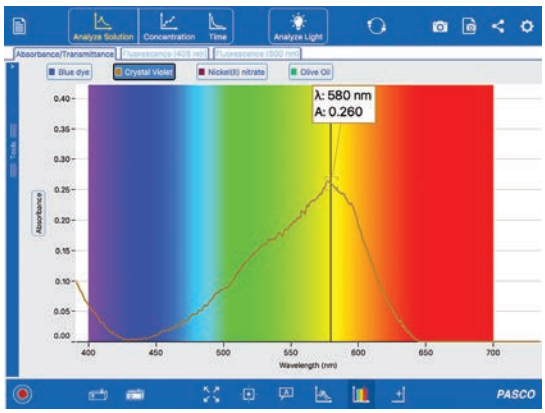
Order Information

Wireless Spectrometer (VIS).....PS-2600

Includes USB Charging cable, 10 cuvettes, and Spectrometry Software.



Analyze light sources with the optional Fiber Optic Cable. Easily compare the spectrum to known reference lines in the software.



Full visible spectrum analysis of solutions with a large digits display helps set the wavelength and see the absorbance.

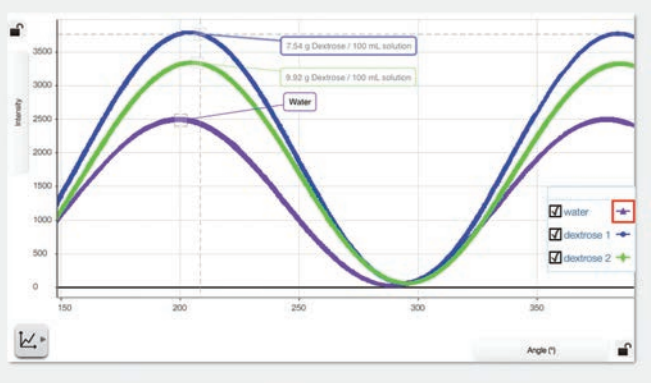
Polarimeter

PS-3237

PASCO's Polarimeter has both Bluetooth® and USB connectivity, so it works on your iPad®, Chromebook™, tablets, and computers. It is ideal for introductory Organic and Biochemistry experiments with chiral compounds.

Polarimeters pass plane polarized light through a sample, which contains a chiral compound, through an analyzer and a detector. The degree of optical rotation of the plane polarized light is based on the concentration of sample present.

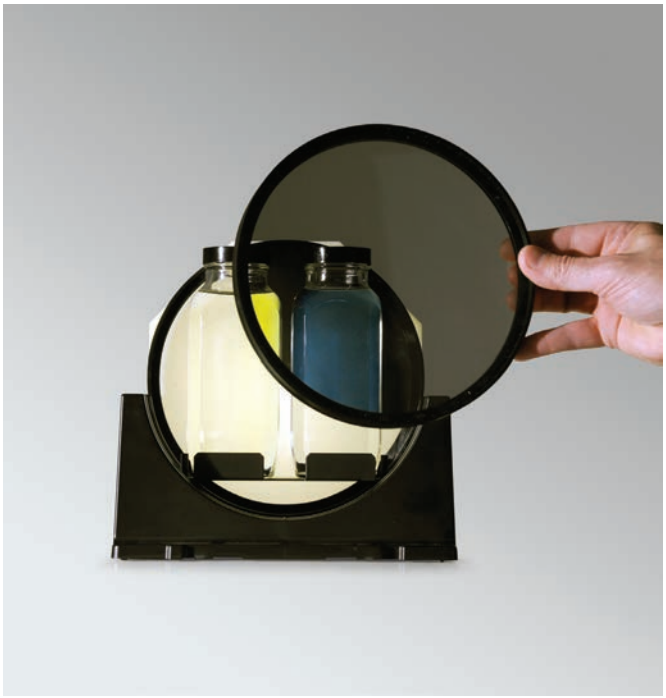
- Determine the concentration of a sugar solution based on the optical rotation of plane polarized light.
- Explore the simple sugar families and determine which of each students obtain as unknowns
- Differentiate between common chiral and nonchiral compounds
- Calculate a racemic mixture's purity



Optical rotation of sucrose

Order Information

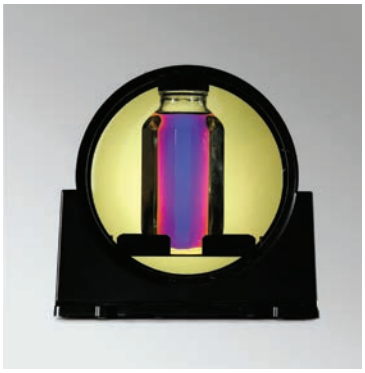
Polarimeter PS-3237



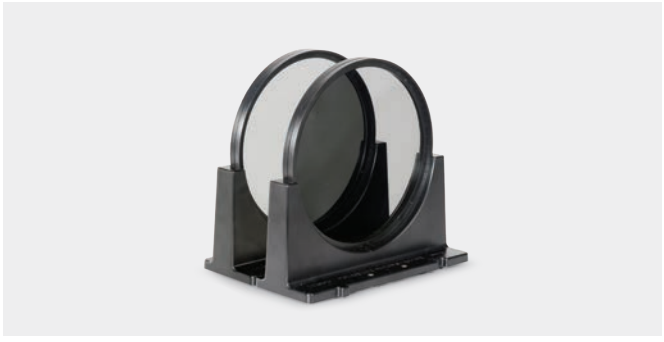
Polarizer Demonstrator

OS-9477A

Confirm Malus' Law using the Polarizer Demonstrator and a Light Sensor. The angle is read directly from the polarizer, which is marked in 5° increments. Any light source can be used, but the experiment works especially well with the PASCO Color Mixer (OS-8496). See pasco.com for more information



Introduce the concept of polarization with this colorful and meaningful demonstration.



Order Information

Polarizer Demonstrator OS-9477A

PASCO's Integrated Solutions for Environmental Science

Facilitate discovery-based environmental inquiry in your classroom with PASCO. We offer cutting-edge solutions for both general and advanced Environmental Science classes, as well as Ag Science. Using our award-winning wireless sensors and SPARKvue software, students can collect and analyze data and see their lab results, all in real time and on their own devices. Our wireless sensors are rugged, suitable for use inside or outside the classroom, and have a long battery life. These sensors are powerful tools for environmental monitoring and experimentation anytime, anywhere. And our free digital labs may provide the exact lab investigation you have been seeking!

Environmental Science Index

AG Science Starter Lab Station

EB-6336

The Agricultural Science Starter Lab Station makes it easy and affordable to begin using sensor-based technology in your classroom or home. Inside the Starter Lab Station are the wireless sensors used to perform 10 agriculture labs. Using these 10 lab printouts, students can investigate soil and water quality, greenhouse gases, cellular processes of diffusion in plants, respiration and photosynthesis. Students will also work to extract and separate pigments from leaves, determine the energy content stored in plant-based food materials, and model ecosystems using factors that create challenging and optimal growing conditions.

AG Science Station Lab Titles

The AG Science Starter Lab Station supports 7 of the 10 labs. Add the Extension Lab Station* to do all 10 lab titles.

Determining Soil Quality	**Plant Pigments & Photosynthesis**
Water Treatment	**Plant Respiration & Photosynthesis**
Freshwater Quality Monitoring*	Modeling an Ecosystem*
Respiration of Germinating Seeds	Greenhouse Gases*
	Energy Content of Food
	Diffusion

Shown here: AG Science Starter Lab Station

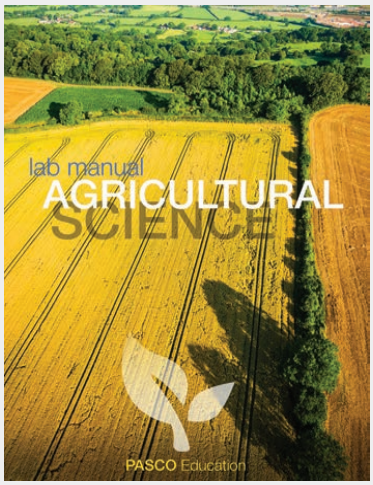
The AG Science Starter Lab Station includes a lab manual and these wireless sensors and apparatus:

- Temperature
- Conductivity
- pH
- Colorimeter & Turbidity
- CO_2
- Storage Case

**To do the remaining 3 labs from the AG Science Lab Manual (listed above), add the Extension Lab Station (see page 51). Add the AG Science Teacher Lab Manual to perform an additional 4 AG science labs.*

Order Information

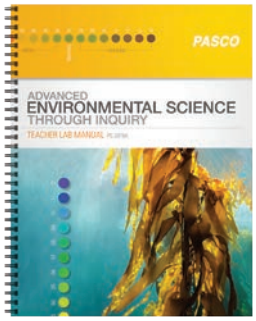
Agricultural Science Starter Lab Station.....EB-6336



AG Science Lab Manual

The following is a complete list of lab activities from PASCO's online Agricultural Science Lab Manual. You may preview and download individual student lab activities and SPARKvue data files, view AP/IB correlations, and access the Teacher Files by creating or signing in to a free PASCO account. Browse and download AG science labs for free at pasco.com.

- Determining Soil Quality
- Water Treatment
- Freshwater Quality Monitoring
- Water and pH
- Respiration of Germinating Seeds
- Plant Pigments and Photosynthesis
- Plant Respiration and Photosynthesis
- Modeling an Ecosystem
- Greenhouse Gases
- Energy Content of Food
- Diffusion
- Soil and pH



Advanced Environmental Science Through Inquiry Labs for AP® & IB®

PASCO's Advanced Environmental Science Through Inquiry Teacher Lab Manual contains 20 labs that have been specifically designed to support student inquiry, as well as AP® and IB® curriculum*. This manual is available in both a print version and an all-digital version.

- Most labs can be completed in one lab session with readily available materials, including the sensor bundles on the opposite page.
- Easy and meaningful data collection leads to increased time for data analysis and open inquiry.
- Includes sample data for investigations and inquiry, answers to analysis and synthesis questions, an assessment rubric, teacher tips, lab preparation information, and more.
- Labs integrate high-order analysis and synthesis questions.
- The flexible format provides guided inquiry opportunities and scaffolding, so students can create their own experiments.

Note: Labs use a variety of structured, guided and open inquiry approaches. Students can explore focused to self-driven concepts of environmental interest.

Advanced Environmental Science Through Inquiry Labs and Sensors Used

Lab Title	Starter Bundle				Extension Bundle				AP® Big Ideas*	IB® Connections*
	Weather with GPS	Temperature	pH	Conductivity	Optical Dissolved Oxygen	CO_2	Colorimeter	EcoZone		
1. Determining Soil Quality			●	●		●			1.2	5.1, 5.2, 5.3
2. Insolation and the Seasons		●							1	1.2
3. Investigating Specific Heat		●							1	1.2, 2.3
4. Monitoring Microclimates	●								4	7.1, 7.2, 7.3
5. Sunlight Intensity and Reflectivity	●	●							1	2.3, 7.1-7.3
6. Tracking Weather	●								1	7.2, 7.3
7. Earth's Magnetic Field**									1	1.2
8. Radiation Energy Transfer		●							1	1.2, 2.3
9. Seafloor Spread Plate Tectonics**									1	1.2
10. Modeling an Ecosystem	●	●	●	●	●	●			2	1.2, 2.4, 2.5, 3.1
11. Photosynthesis and Primary Productivity					●				1, 2	1.1, 1.2, 2.3, 5.2
12. Photosynthesis and Cell Respiration		●				●			1, 2	1.1, 1.2, 2.3, 5.2
13. Cellular Respiration and Carbon Cycle						●			1	1.1, 1.2, 6.1, 6.2
14. Energy Content of Food		●							1	1.3, 2.3
15. Weather in a Terrarium	●								1, 2	1.1, 1.2, 7.2, 7.3
16. Yeast Respiration		●			●	●			1, 2	1.1, 1.2
17. Properties of Water		●							1	4.1, 4.2
18. Air Pollution and Acid Rain			●						4	6.1, 6.2, 6.3, 6.4
19. Monitoring Water Quality	●	●	●	●	●		●		4	4.1, 4.2, 4.4
20. Toxicology Using Yeast			●			●			2	1.1, 1.2
21. Water Treatment			●	●			●		4	4.1, 4.2, 4.4
22. Greenhouse Gases		●						●	4	6.1, 6.2, 6.3, 6.4

*AP is a registered trademark of the College Board, which was not involved in the production of, and does not endorse, this product. IB is a registered trademark of the International Baccalaureate Organization, which was not involved in the production of, and does not endorse, this product.

**Requires Wireless 3-Axis Magnetic Field Sensor; see opposite page.

AG Science Lab Stations Support Advanced Environmental Science Investigations

The AG Science Starter Lab Station and Extension Station, together with PASCO's *Advanced Environmental Science Through Inquiry Lab Manual,* offer a truly complete solution. With over 20 sensor-based labs covering a range of Environmental and Advanced Environmental topics and all of the equipment and apparatus required to conduct the labs hands-on, inquiry with data collection and analysis has never been easier or more affordable. For investigations in water quality, add the Water Quality Field Guide and extend your investigations.

AG Science Station Lab Titles

Together, the AG Science Starter and Extension Lab Stations support over 20 Advanced Environmental labs. Conduct the 10 labs below right out of the box.

1. Determining Soil Quality
2. Water Treatment
3. Freshwater Quality Monitoring
4. Respiration of Germinating Seeds
5. Plant Pigments & Photosynthesis
6. Plant Respiration & Photosynthesis
7. Modeling an Ecosystem
8. Greenhouse Gases
9. Energy Content of Food
10. Diffusion

Shown here: AG Science Starter and Extension Lab Stations

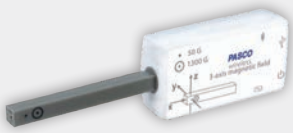
The AG Science Starter & Extension Lab Stations include these wireless sensors and materials:

- Temperature
- Conductivity
- pH
- CO_2
- Colorimeter Turbidity
- Optical Dissolved Oxygen
- Weather with GPS
- EcoZone System
- Lab Manual
- Storage Case

Water Quality Field Guide

PS-2829A

The Water Quality Field Guide is a combination 'how-to' and 'why?' reference. It covers how to plan for and successfully measure water quality in the field, and it explains why these measurements are important and what they mean.



Wireless Magnetic Field Sensor

PS-3221

This 3-Axis Magnetic Field Sensor can sense the Earth's magnetic field and fields from coils and bar magnets. There are two ranges: ±50 gauss and ±1300 gauss. This sensor is primarily for static fields.

Order Information

Advanced Environmental & Earth Teacher Guide PS-2979
Agricultural Science Starter Lab Station EB-6336
Agricultural Science Extension Lab Station.....EB-6337
Water Quality Field Guide.....PS-2829A
Wireless Magnetic Field Sensor PS-3221

Wireless CO_2 Sensor

PS-3208

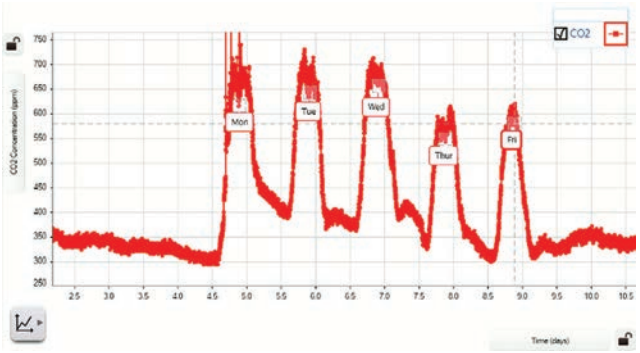
Measure changes in carbon dioxide (CO_2) gas levels quickly and easily with the Wireless CO_2 Sensor. The sensor is temperature compensated and can operate in high humidity environments, like the included 250-mL sample bottle. This sensor employs live data to make core labs, such as photosynthesis, cellular respiration, and metabolism experiments engaging and impactful. With the ability to store more than 55,000 data points, this sensor enables studies to run overnight or throughout an entire weekend for long-term carbon cycling investigations.

Features:

- Logging ability for long-term experiments, store up to 55,000 data points
- Integrated stopper for use with sample bottle and common glassware
- Temperature compensated for accurate results

Order Information

Wireless CO_2 Sensor.....PS-3208



Dissolved CO_2 Waterproof Sleeve

PS-3545

The Wireless CO_2 Sensor can be equipped for aqueous measurements using this semipermeable sleeve. The sleeve is waterproof but allows CO_2 gas to pass through the membrane, creating a headspace around the sensor. Monitor the photosynthesis and respiration of aquatic plants or animals with the sample bottle or with other chambers. Please note: Improper use will void sensor warranty.

Order Information

Dissolved CO_2 Waterproof Sleeve.....PS-3545

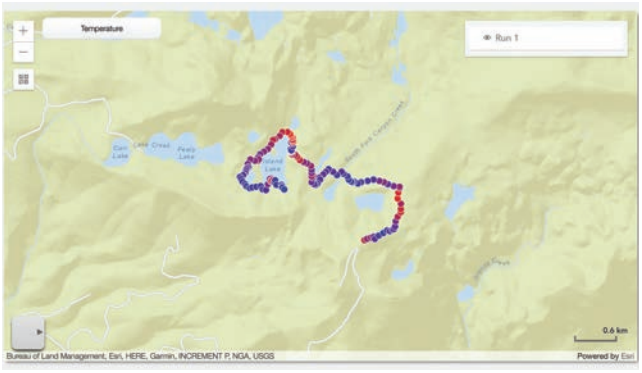
Wireless Weather Sensor with GPS

PS-3209

The Wireless Weather Sensor is an all-in-one instrument for monitoring complex environmental conditions. It houses several sensing elements within a single unit to provide 19 different measurements. Use the sensor in logging mode with the Weather Vane Accessory for long-term monitoring, or use it as a handheld instrument to study microclimates and record ambient conditions relevant to environmental phenomena. You can wirelessly export data to your device for classroom analysis and group activities that are constrained by time. With the built-in GPS, you can collect location data for student investigations and analyze it on the map display, powered by ESRI ArcGIS, within SPARKvue software.

Features:

- Logging mode for long-term experiments
- Water resistant for extended environmental monitoring
- Built-in light sensor for measuring light level and UV index
- Map display (in SPARKvue software) for analyzing spatial data
- 19 different measurements that can be collected and analyzed individually or simultaneously



esri Partner Network

With ESRI's ArcGIS online you can visualize data in seconds with a FREE account!

Measurements

Weather	1. Ambient Temperature 2. Barometric Pressure 3. Wind Speed 4. Wind Direction (true) 5. Relative Humidity 6. Absolute Humidity 7. Dew Point 8. Wind Chill 9. Heat Stress Index
Light	10. Ambient Light (lux) 11. UV Index 12. PAR 13. Irradiance
GPS	14. Latitude 15. Longitude 16. Altitude 17. Speed 18. Magnetic Direction 19. True Direction

The weather dashboard displays data from the multiple sensors.

Weather Vane Accessory sold separately.

Order Information

Wireless Weather Sensor with GPS PS-3209
Weather Vane Accessory.....PS-3553

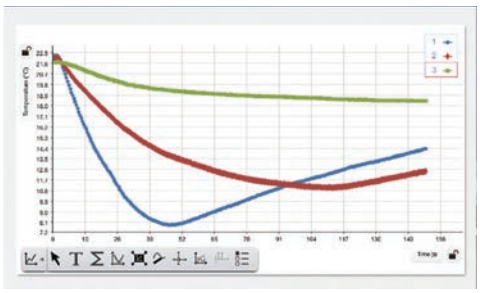
Wireless Temperature Sensor

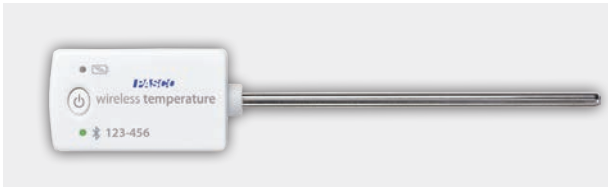
PS-3201

Welcome to the modern thermometer. The Wireless Temperature Sensor transmits live data and allows students to continuously monitor, log, and plot temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, weeks, or months, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts over a year*. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

Features:

- Simply pair and go, no cables or adapters to manage
- Variable sampling rate for capturing small, fast changes or experiments that run for hours, days, or weeks
- Bluetooth® connectivity and long-lasting coin cell battery
- Logs temperature data directly onto the sensor for long-term experiments
- Dust, dirt, and sand-proof and water resistant (IP-X7 certified)





Order Information

Wireless Temperature Sensor.....PS-3201

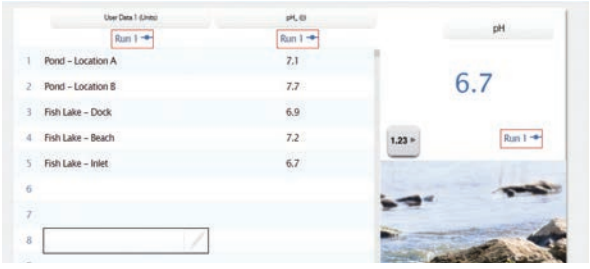
Wireless pH Sensor

PS-3204

The Wireless pH Sensor is a must-have for any chemistry, biology, or environmental science course. Equally capable in the lab or field, the sensor eliminates the hassle of cables, reducing spills and improving safety. Don't worry about charging, the sensor has a coin-cell battery that lasts for 2-3 years in most labs and costs about one dollar to replace. The sensor can transmit data in real-time, or store data for hours or days when continuous monitoring is required. The Wireless pH Sensor can perform countless experiments, including acid-base titrations, investigating household chemicals, changes in pH during reactions, water quality studies, and much more.

Features:

- Simply pair and go, no cables or interfaces to manage
- Compatible with ion-selective electrodes (ISE) and the oxidation reduction probe (ORP)
- Bluetooth® connectivity and a long-lasting coin cell battery
- Logs pH data directly onto the sensor for long-term experiments
- Wirelessly connects to SPARKvue and Capstone for intuitive analysis and lab reports



Measure the pH of water in different locations and annotate with text and pictures.

Order Information

Wireless pH Sensor.....PS-3204

Wireless Conductivity Sensor

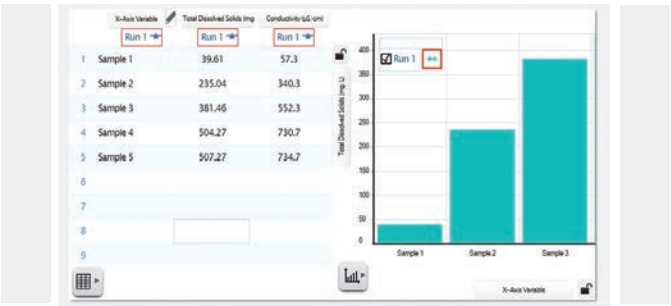
PS-3210

The Wireless Conductivity Sensor measures the electrical conductivity of an aqueous solution. It is ideal for investigating the properties of solutions, including total dissolved solids (TDS) for water quality inquiry. Because it is temperature compensated, calibrations are less frequent and can be applied across a range of temperatures. With a range of 0 to 20,000 µS/cm, this sensor can be utilized for chemical, biological, and environmental studies.

Teacher tip: To measure brackish or marine samples, perform a dilution until the measurement falls within the range, then multiply by that factor to determine sample conductivity. (10:1 demineralized to salt water solution is a good start).

Features:

- Measure conductivity and total dissolved solids
- Automatic temperature compensation
- Battery life >1 year
- Remote logging with built-in memory
- Dust-proof, sand-proof, and water-resistant (1 meter for 30 minutes)



Order Information

Wireless Conductivity Sensor PS-3210

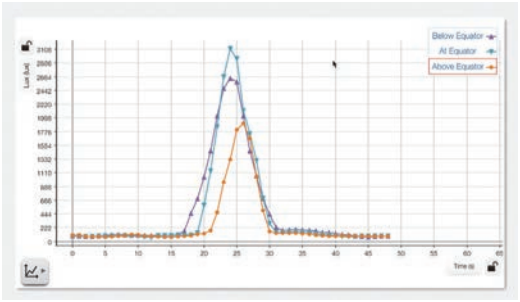
Wireless Light Sensor

PS-3213

The Wireless Light Sensor features two separate apertures - one for ambient light measurements and one for directional light measurements. The ambient sensor measures illuminance and UV Index, while the spot (directional) aperture measures light level and color intensity. Our software displays the relative intensities of Red, Green, and Blue light, then sums them to determine the level of White light. PAR and irradiance are also available as calculated measurements within PASCO Capstone (version 1.8 or later) and SPARKvue software (version 2.6 or later).

Features:

- Wirelessly connects to computers, Chromebooks, tablets, and smartphones
- Simply pair and go, no cables or adapters to manage
- On-board memory enables the sensor to function as an independent datalogger
- Variable sampling rate for short, precise experiments or lengthy, multi-day data collection.
- Bluetooth connectivity and long-lasting coin cell battery
- Indirect PAR measurements for biological studies



Order Information

Wireless Light Sensor PS-3213

Wireless Colorimeter & Turbidity Sensor

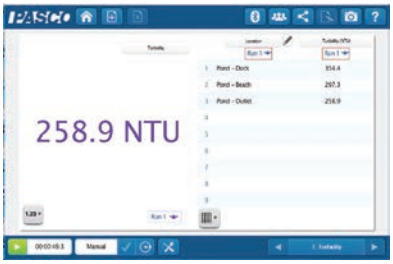
PS-3215

The Wireless Colorimeter simultaneously measures the absorbance and transmittance of six different wavelengths. The sensor can be used to study Beer's Law (absorbance vs. concentration), enzyme activity, photosynthesis, and the rates of chemical reactions (absorbance vs. time). After a simple calibration, students can quickly begin viewing live measurements as they materialize across the visible spectrum at 650 nm (red), 600 nm (orange), 570 nm (yellow), 550 nm (green), 500 nm (blue), and 450 nm (violet).

This sensor also functions as a high-quality turbidimeter for water quality analysis. Rather than simply measuring transmitted light, the Wireless Colorimeter and Turbidity Sensor measures light scattered at a 90 degree angle from the sample, resulting in accurate and repeatable measurements. Additionally, the internal housing for the cuvette is opaque, which limits ambient light interference to preserve accuracy.

Features:

- Stabilized light source for consistent readings
- Measures six different wavelengths simultaneously
- PASCO software displays the absorbance & transmittance at each wavelength in the appropriate color
- Quick and easy calibration
- Functions as both a colorimeter and turbidimeter
- Wireless design enables data collection in the field



Measure the absorbance and transmittance of a solution at six different wavelengths... simultaneously!

WARNING! This product can expose you to chemicals including Formaldehyde, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Order Information

Wireless Colorimeter & Turbidity Sensor.....PS-3215

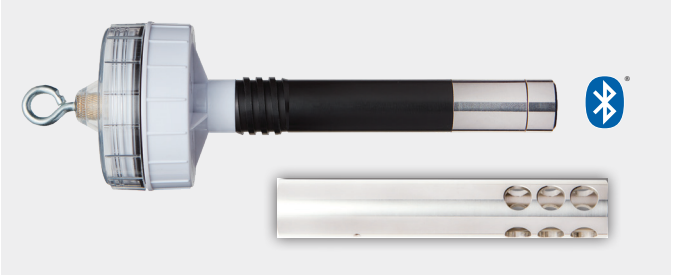
Includes USB Charging cable, 9 cuvettes, 2 cuvette racks, and one 100 NTU calibration cuvette.

Wireless Optical Dissolved Oxygen Sensor

PS-3224

The Wireless Optical Dissolved Oxygen (ODO) Sensor is ideal for monitoring DO_2 in the lab or field. The Wireless Optical DO Sensor contains three different probes. In addition to the dissolved oxygen sensor, it also includes probes for measuring atmospheric pressure and water temperature. The optical technology is accurate, fast, and does not require stirring, filling solutions, warm-up, or frequent calibration. When equipped with the included cover, the sensor has a waterproof design and is submersible to a depth of 10 m.

A PASCO exclusive feature allows you to log data using the sensor's built-in memory. After collecting data for hours or even days, simply connect the sensor to your device and you're ready to download your data. With this powerful sensor, educators can explore day and night nutrient cycles, changes in metabolic processes, seasonal changes in water quality, and more.



Wireless Optical Dissolved Oxygen Sensor Metal Guard

PS-3604

This metal guard protects the sensing element of the Wireless Dissolved Oxygen Sensor. It also helps weigh the sensor down when making measurements under water.

Order Information

Wireless Optical Dissolved Oxygen Sensor.....PS-3224

Wireless Optical Dissolved Oxygen Sensor Metal Guard PS-3604

EcoZone System

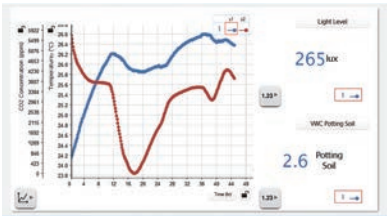
ME-6668

PASCO's EcoZone System is designed to help students model and understand complex interactions within, and among, different ecosystems. The three clear, acrylic EcoChambers are specially designed to accommodate PASCO sensors, making qualitative and quantitative measurements easily accessible.

With three interconnected chambers, students can model interactions between three different ecosystems. Choose the traditional terrestrial, aquatic, and decomposition environments, or create unique biomes to model and measure. With the EcoZone System, students can create two identical ecosystems for precise control of variable impact, decouple the system for isolated investigations, or connect all three chambers to study interactions.

Features:

- Total volume of each chamber is 4,534 cm^3
- Sturdy construction designed for easy setup and cleanup
- Quantitatively study the interaction of different ecosystems
- Custom molded for use with PASCO sensors
- Clear acrylic allows for observations from all sides



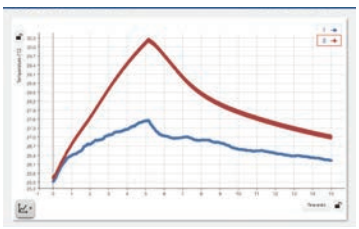
Order Information

EcoZone System ME-6668

EcoChamber

ME-6667

The EcoChamber is designed to help students model and understand complex interactions within and between ecosystems. The clear, acrylic EcoChamber is specially designed to accommodate PASCO sensors, making qualitative and quantitative measurements as easy as observing a classroom aquarium or terrarium. Students can model interactions between different ecosystems by connecting them via their side ports. With the EcoChamber, students can easily alter conditions for controlled studies in how light, moisture, humidity, temperature, acidity, or the introduction of other species impacts the ecosystem! Ask students to establish a traditional terrestrial, aquatic or decomposition arrangement, or challenge them to create their own unique biomes to model and measure.



This graph shows two trials - one control & one with greenhouse gas. The greenhouse-gas trial resulted in a higher temperature and a longer cooling-off period.

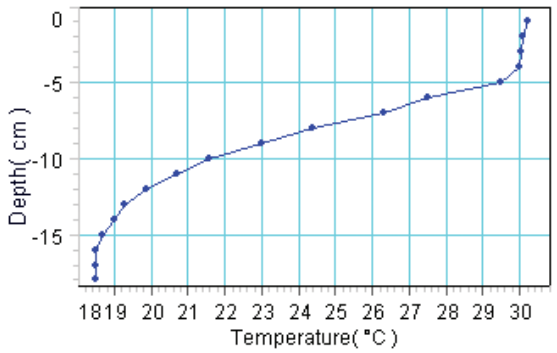
Order Information

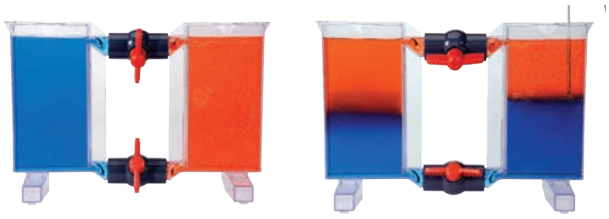
EcoChamber ME-6667

Density Circulation Model

ME-6816

The PASCO Density Circulation Model allows students to model, measure and understand the complex density-driven circulation associated with heat transfer through convection. Students can recreate vertical ocean currents driven by water bodies with density differences. They can extend this learning by using sensors to collect data and create graphs showing the thermocline, halocline and pycnocline using a Salinity Sensor PS-2195 (next page).





Order Information

Density Circulation Model ME-6816

Chemical Water Quality Testing in the Field

PASCO's ezSample water quality test kits simplify the chemical testing of water sources. Avoid the mess and difficulty of handling chemicals directly and get great results, even in the field.

Colorimetric Analysis

Conduct colorimetric tests in the field and avoid the mess and tedium of mixing chemicals. These ezSample Snap Vials contain a pre-formulated reagent to test a variety of water quality parameters. No more guessing at color variations—drop the vial into the Water Quality Colorimeter and read the concentration.

ezSample Snap Vial Kits
Requires Water Quality Colorimeter (right)

ezSample Field Titrator Kits

Water Quality Colorimeter

Order Information

PASPORT Water Quality Colorimeter PS-2179

ezSample Snap Vial - Iron EZ-2331

ezSample Snap Vial - Nitrate.....EZ-2333B

ezSample Snap Vial - Ammonia EZ-2334A

ezSample Snap Vial - Phosphate.....EZ-2337

ezSample Field Titrator - Chlorine EZ-2339A

ezSample Field Titrator - Total Hardness EZ-2338

ezSample Field Titrator - Alkalinity EZ-2340

* **WARNING!** This product can expose you to chemicals including phenolphthalein, which is known to the State of California to cause cancer, and methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

** **WARNING!** This product can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

PASPORT Salinity Sensor

PS-2195

The PASPORT Salinity Sensor works with the 10X Salinity Sensor Probe to measure the salinity, conductivity, and temperature of fresh to brackish water sources. The sensor determines salinity based on electrical conductivity. It also features a built-in calculation, based on the Practical Salinity Scale (PSS), that compensates for changes in conductivity caused by temperature changes.

Order Information

PASPORT Salinity Sensor PS-2195

PASPORT Soil Moisture Sensor

PS-2163

The Soil Moisture Sensor measures the water content of soil and reports it in percent. It can be used to conduct experiments in environmental science, agricultural science, horticulture, and biology.

Order Information

PASPORT Soil Moisture Sensor.....PS-2163

PASPORT Flow Rate/Temperature Sensor

PS-2130

PASCO's Flow Rate Sensor allows students to measure the rate of movement and temperature of streams, rivers, and other flowing systems. The propeller is a rugged, single-piece unit encased by protective material — no more losing pieces at the bottom of the stream.

Order Information

PASPORT Flow Rate/Temperature Sensor.....PS-2130

PASPORT Non-Contact Temperature Sensor

PS-2197

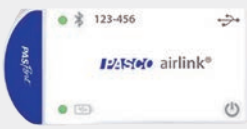
The Non-Contact Temperature Sensor measures surface temperature by detecting the emitted infrared light. Record the temperature of objects without touching them!

Order Information

PASPORT Non-Contact Temperature Sensor PS-2197

Go Wireless with PASPORT Sensors

PASCO's AirLink Interface connects PASPORT (blue or black) sensors to your computer using Bluetooth or USB technology.



AirLink Interface

PS-3200

The Airlink connects PASPORT sensors to a Mac or Windows computer, Chromebook, iPad, tablet, or smartphone via Bluetooth or USB connection. The USB cable is included.

Order Information

AirLink Interface PS-3200

PASCO's Integrated Solutions for Physics

PASCO provides High School Physics educators with the most groundbreaking solutions on the market. Our solutions incorporate wireless, cross-platform technology with inquiry-based, hands-on activities to foster active learning. Using our award-winning data collection and analysis software, sensors, and curriculum, you can easily explore topics such as Mechanics; Electricity and Magnetism; Optics; Thermodynamics; Oscillations, Waves, and Sound; and much more. Whether you teach Honors, IB®, AP® Physics 1 or 2, or General Physics courses, we offer lab manuals, experiments, and textbooks for your curricular needs.

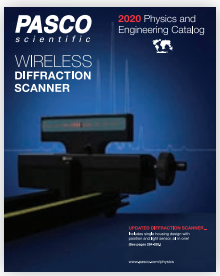
Physics Index

See the amazing Smart Cart Demo Kit!

For information about this and PASCO's other Physics investigation kits see pages 68-69.

Are you receiving our Physics Catalog? It includes our full line of Physics equipment!

Go to pasco.com/downloads



Physics Lab Stations

EP-3579/EP-3580

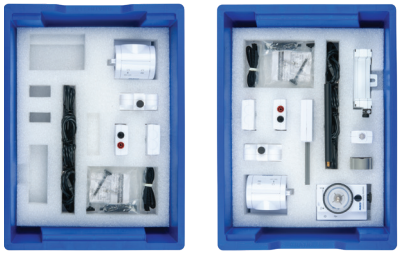
The Physics Starter Lab Station makes it easy and affordable to begin using sensor-based technology in your physics classroom or at home. Inside the Starter Lab Station are the wireless sensors used to perform 9 kinematics, dynamics, voltage, and circuit lab activities from the Physics Lab Station Investigations manual. Available separately is the Physics Extension Lab Station (EP-3580) which, when combined with the Physics Starter Lab Station, comprises all the wireless sensors used to perform the 20 labs inside the Physics Lab Station Investigations manual, plus many of the lab activities found in PASCO's Advanced Physics 1 Lab Manual and Advanced Physics 2 Lab Manual.

NEW

Physics Station Lab Titles

Included with the Starter Lab Station are 10 printed labs from the 21 labs inside the digital Physics Lab Station Investigations Manual.

1. **Position, Distance and Displacement**
2. **Newton's 2nd Law**
3. **Crash Cushions**
4. **Momentum and Impulse**
5. **Change in Kinetic Energy**
6. **Rotational Dynamics**
7. **Measuring the Speed of Sound - Echo**
8. **Ohm's Law**
9. **DC Circuits**
10. **RC Circuits**



Shown here: Physics Starter & Extension Lab Stations

The Physics Starter & Extension Lab Stations include a lab manual as well as these wireless sensors and materials:

Starter

- Motion
- Current
- Voltage
- Force
- Storage Case

Extension

- 3-Axis Acceleration/ Altimeter
- 3-Axis Magnetic Field
- Rotary Motion
- Smart Gate
- Sound

Order Information

Physics Starter Lab Station EP-3579

Physics Extension Lab Station.....EP-3580

Essential Physics Lab Station Investigations

The following is a complete list of lab activities from PASCO's Physics Lab Station Investigations manual. You may preview and download individual student lab activities and materials lists for free from our online Experiment Library.

Position, Distance, and Displacement

Newton's Second Law

Modeling the Force of Friction

Designing and Testing Crash Cushions

Impulse and Change in Velocity

Change in Kinetic Energy

Atwood's Machine

Angular Velocity and Centripetal Acceleration

Rotational Dynamics

Rotational Collisions

Simple Pendulum

Properties of Sound Waves

Measuring the Speed of Sound with an Echo

Decoding DTMF Tones

Magnetic Field Strength

Magnetic Field of a Permanent Magnet

Ohm's Law

DC Circuits

Capacitors and RC Circuits

Fruit Battery

Blockly Extension: Acoustic Stopwatch

Advanced Physics 1 Lab Manual

This experiment guide covers the latest standards for College Board Advanced Placement Physics 1.

- Every lab is based on the College Board Learning Objectives.
- Data Analysis and Assessment Questions are designed to prepare students for the AP® Physics 1 exam.
- Every lab employs the same strategies found in free response questions on the AP® exam.
- Includes editable student handouts.

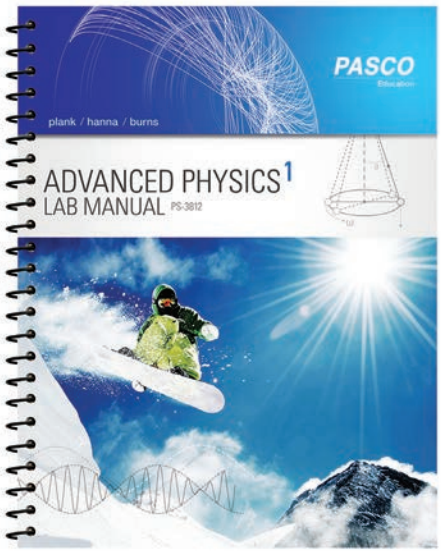
Prepare your students for inquiry investigations in the physics lab. Each lab is presented three ways:

- Structured
- Guided inquiry
- Student designed

You decide which level of inquiry is appropriate for each lab.

Each lab includes teacher resources:

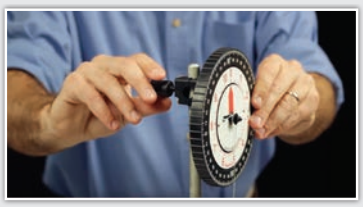
- Pre-lab discussion and questions
- Procedural overview
- Teacher tips
- Sample data
- Assessment and synthesis questions
- Extended inquiry suggestions



ADV PHYSICS 1 EXPERIMENTS	EQUIPMENT		ALIGNMENT	
LAB	Perform these labs with the PS-3813 Equipment Kit	Add the PS-3814 Expansion Kit to perform all these labs	IB® Standards*	AP® 1 Standards**
1. Graphical Analysis: Motion	✔	✔	2.1	3.A.1.1, 2, 3
2. Newton's Second Law	✔	✔	2.2	3.B.1.1, 2, 3, 3.B.2.1
3. Atwood's Machine	✔	✔	2.2	3.B.1.1, 2
4. Coefficients of Friction	✔	✔	2.2	3.C.4.1,2
5. Two Dimensional Motion: Projectiles		✔	1.3, 2.1	3.E.1.3, 4
6. Conservation of Mechanical Energy	✔	✔	2.3	5.B.4.1,2
7. Work and Kinetic Energy	✔	✔	2.3	4.C.2.1, 2
8. Conservation of Momentum		✔	2.4	5.D.1.3,5.D.2.2, 4
9. Momentum and Impulse	✔	✔	2.4	3.D.2.3, 4
10. Rotational Dynamics		✔	B.1	3.F.2.1, 2, 3.A.1.3
11. Rotational Statics		✔	B.1	3.F.1.1, 2, 3, 4, 5
12. Periodic Motion: Mass and Spring	✔	✔	4.1, 9.1	3.B.3.1, 2, 3, 4
13. Simple Pendulum	✔	✔	4.1, 9.1	3.B.3.1, 2, 3
14. Resonance and Standing Waves		✔	4.5, B.4	6.D.3.4, 6.D.4.1, 2
15. DC Circuits		✔	5.1, 5.2	1.B.1.2, 5.B.9.2, 3, 5.C.3.1

Each experiment guide includes video support

How-to videos are included with the manual, on the PASCO website and on YouTube, and can be installed on your own computers.



Try It!

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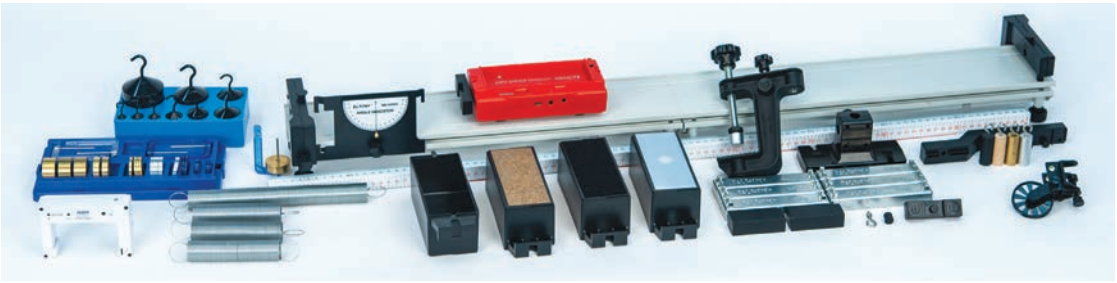
** AP is a trademark registered and/or owned by the College Board, which was not involved in the production of, and does not endorse, this product.

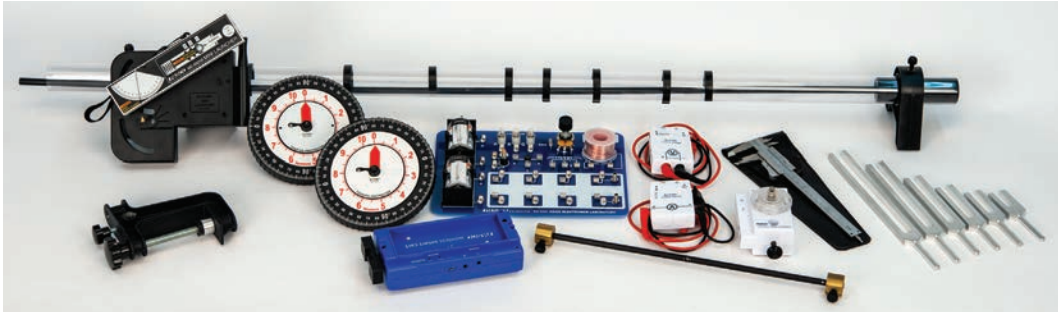
Advanced Physics 1 Equipment Kit

Equipment	Part #	Qty
Smart Cart (red)	ME-1240	1
PAStrack	ME-6960	1
Dynamics Track End Stop (2 pack)	ME-8971	1
Four Scale Meter Stick	SE-8695	1
250-g Compact Cart Mass	ME-6755	2
Mass & Hanger Set	ME-8979	1
Super Pulley Kit	ME-9433	1
Thread	ME-9875	1
60-cm Stainless Steel Rod	ME-8977	1
Aluminum Table Clamp	ME-8995	1
Wireless Smart Gate	PS-3225	1
Right Angle Clamp	SE-9444	1
250-g Cart Mass (set of 2)	ME-6757A	3
Discover Friction Accessory Tray	ME-8574	1
45-cm Stainless Steel Rod	ME-8736	1
Angle Indicator	ME-9495A	1
Dynamics Track Rod Clamp	ME-9836	1
Bumper Accessory Set	ME-9884	1
Smart Cart Rod Stand Adapter	ME-1244	1
90-cm Stainless Steel Rod	ME-8738	1
Demonstration Spring Set	ME-9866	1
Hooked Mass Set	SE-8759	1
Photogate Pendulum Set	ME-8752	1
Pendulum Clamp	ME-9506	1



Advanced Physics 1 Expansion Kit

Equipment	Part #	Qty
Smart Cart (blue)	ME-1241	1
Pendulum Accessory	ME-8969	1
Aluminum Table Clamp	ME-8995	1
Wireless Rotary Motion Sensor	PS-3220	1
Stainless Steel Calipers	SF-8711	1
Tension Protractor	ME-6855	2
60-cm Stainless Steel Rod	ME-8977	1
Aluminum Table Clamp	ME-8995	1
Tuning Fork Set	SE-7342	1
Resonance Air Column	WA-9606	1
AC/DC Electronics Lab Kit	EM-8656	1
Wireless Voltage Sensor	PS-3211	1
Wireless Current Sensor	PS-3212	1
Photogate Mounting Bracket	ME-6821A	1
Mini Launcher	ME-6825B	1
Carbon Paper	SE-8693	1



Advanced Physics Sensor Bundle

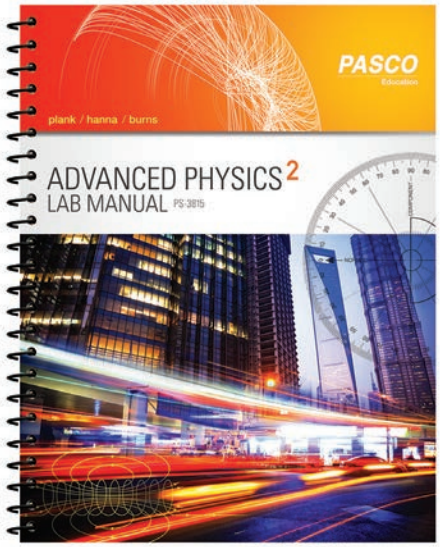
Just need sensors?

Equipment	Part #	Qty
1. Smart Cart (red)	ME-1240	1
2. Wireless Smart Gate	PS-3225	1
3. Smart Cart (blue)	ME-1241	1
4. Wireless Rotary Motion Sensor	PS-3220	1
5. Wireless Voltage Sensor	PS-3211	1
6. Wireless Current Sensor	PS-3212	1
7. Wireless Pressure Sensor	PS-3203	1
8. Wireless Magnetic Field Sensor	PS-3221	1

Order Information

Advanced Physics 1 Equipment Kit PS-3813
Advanced Physics 1 Expansion Kit PS-3814
Advanced Physics Sensor Bundle.....PS-3818
Advanced Physics 1 Lab Manual.....PS-3812

Advanced Physics 2 Lab Manual



This experiment guide covers the latest standards for College Board Advanced Placement Physics 2.

- Every lab is based on the College Board Learning Objectives.
- Data Analysis and Assessment Questions are designed to prepare students for the AP® Physics 2 exam.
- Every lab employs the same strategies found in free response questions on the AP® exam.
- Includes editable student handouts.

Prepare your students for inquiry investigations in the physics lab. Each lab is presented three ways:

- Structured
- Guided inquiry
- Student designed

You decide which level of inquiry is appropriate for each lab.

Each lab includes teacher resources:

- Pre-lab discussion and questions
- Procedural overview
- Teacher tips
- Sample data
- Assessment and synthesis questions
- Extended inquiry suggestions

ADV PHYSICS 2 EXPERIMENTS	EQUIPMENT		ALIGNMENT	
LAB	Perform these labs with the PS-3816 Equipment Kit	Add the PS-3817 Expansion Kit to perform all these labs	IB® Standards*	AP® 2 Standards**
1. Hydrostatic Pressure	✔	✔	B.3	3.C.4.1, 3.C.4.2
2. Buoyant Force		✔	B.3	1.E.1.2, 3.A.3.1, 3.C.4.2
3. Fluid Dynamics	✔	✔	B.3	5.B.10.1, 5.B.10.3, 5.B.10.4
4. Boyle's Law	✔	✔	3.2	5.B.7.2, 7.A.3.2, 7.A.3.3
5. Spherical Mirror Reflection	✔	✔	C.1	6.E.4.1, 6.E.4.2
6. Snell's Law	✔	✔	4.4	6.E.3.2, 6.E.3.3
7. Focal Length of a Converging Lens	✔	✔	C.1	6.E.5.1, 6.E.5.2
8. Interference and Diffraction	✔	✔	4.4, 9.2, 9.3	6.C.3.1
9. Electric Field Mapping		✔	5.1, 10.1	2.E.2.1
10. Magnetic Fields		✔	5.4	2.D.2.1, 2.D.3.1, 2.D.4.1
11. Magnetic Field Strength		✔	5.4	2.D.2.1
12. Electromagnetic Induction	✔	✔	11.1	4.E.2.1
13. Capacitor Fundamentals		✔	11.3	4.E.4.2, 4.E.4.3
14. Series and Parallel Capacitors		✔	11.3	4.E.5.3, 5.B.9.5
15. RC Circuits		✔	11.3	4.E.5.1, 4.E.5.2, 4.E.5.3
16. Planck's Constant		✔	12.1	6.F.3.1, 6.F.4.1

Each experiment guide includes video support!

How-to videos are included with the manual, on the PASCO website and on YouTube, and can be installed on your own computers.

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Advanced Physics 2 Equipment Kit

Equipment	Part #	Qty
Water Reservoir	ME-8594	1
Wireless Pressure Sensor	PS-3203	1
Four-Scale Meter Stick	SE-8695	1
Concave Mirror Accessory	OS-8457	1
Basic Optics Light Source	OS-8470	1
Optics Track, 1.2 m	OS-8508	1
Basic Optics Ray Table	OS-8465	1
Basic Optics Viewing Screen	OS-8460	1
Converging Lens, 50-mm diam.	OS-8466A	1
Adjustable Lens Holder	OS-8474	1
Diffraction Plate	OS-8850	1
Rod, 45-cm	ME-8736	2
Aluminum Table Clamp	ME-8995	2
Stainless Steel Calipers	SE-8710	1
Three-finger Clamp	SE-9445	2
Laser Pointer (with known wavelength)	SE-9716B/C	1
Wireless Voltage Sensor	PS-3211	1
Not Pictured: .539 ID Plastic Tube, 12”		1
Magnet or Enameled Wire, 22-gauge		1

Advanced Physics 2 Expansion Kit

Equipment	Part #	Qty
Smart Cart (red)	ME-1240	1
Aluminum Table Clamp	ME-8995	1
Thread	ME-9875	1
Overflow Can	SE-8568	1
Right Angle Clamp	SE-9444	1
Field Mapper Kit	PK-9023	1
Student Power Supply, 18 VDC, 3 A	SE-8828	1

Equipment	Part #	Qty
Digital Multimeter	SE-9786A	1
Neodymium Magnets, solid (16 pack)	EM-8648B	1
AC/DC Electronics Lab Kit	EM-8656	1
Magnaprobe™ Wand	SE-7390	1
4-mm Banana Plug Patch Cord (5 pack)	SE-9750	2
Wireless 3-Axis Magnetic Field Sensor	PS-3221	1
Wireless Current Sensor	PS-3212	1

Not Pictured:	Qty
Aluminum Cylinder	1
Brass Cylinder	1
Magnet or Enameled Wire, 22-gauge	1
Capacitor, 100-µF	5
Blue LED (450–500 nm)	1
Green LED (501–565 nm)	1
Yellow/Amber LED (566–620 nm)	1
Red LED (621–750 nm)	1

Advanced Physics Sensor Bundle

Just need sensors?

Equipment	Part #	Qty
1. Smart Cart (red)	ME-1240	1
2. Wireless Smart Gate	PS-3225	1
3. Smart Cart (blue)	ME-1241	1
4. Wireless Rotary Motion Sensor	PS-3220	1
5. Wireless Voltage Sensor	PS-3211	1
6. Wireless Current Sensor	PS-3212	1
7. Wireless Pressure Sensor	PS-3203	1
8. Wireless Magnetic Field Sensor	PS-3221	1

Order Information

Advanced Physics 2 Equipment Kit PS-3816

Advanced Physics 2 Expansion Kit PS-3817

Advanced Physics Sensor Bundle.....PS-3818

Advanced Physics 2 Lab Manual.....PS-3815

Essential Physics - Your COMPLETE Physics Solution

PASCO's Essential Physics is the only curriculum solution that includes a Student Textbook, Student e-Book, Teacher e-Resources, Student Lab Manual, and Equipment Kits, all at a very affordable price. This 3-D STEM program includes a full year of instruction for both General and Honors Physics classes. Use our complete solution or integrate Essential Physics into your existing curriculum. Essential Physics is multiplatform and works on iOS, Android™, Chrome™, Windows®, and Mac®. What's more, it includes 24/7 online access, as well as correlations to NGSS and your state standards.

Student Textbook

- 27 chapters cover a full year of instruction for High School General and Honors Physics programs
- One main idea per page
- Quality illustrations
- 89 complete investigations
- 8 Design Projects
- Section and Chapter Reviews

Student e-Book

- Same great features and layout as the print book
- **Multiplatform:** 24/7 online access works on your devices
- More than 30 videos
- Formative assessment tools
- Infinite Test Bank
- Embedded animations
- Interactive simulations and Equation Solver

Teacher e-Resources for Lab Manual

- Editable documents
- PowerPoint presentations
- Answer keys
- Video lab assistance
- NGSS alignment details

sequence follow a traditional linear approach to teaching physics - starting with basic scientific and physics concepts and moving through motion, kinetic and potential energy, waves and sound, electricity and magnetism, light and optics, matter and atoms. Many earth science and physical science topics are covered. Modern physics is also covered, with sections on Einstein's special relativity, quantum and nuclear physics. More advanced concepts such as general relativity and the Standard Model of particle physics are also introduced to the student.

Teacher e-Resources for Textbook

- Correlation to NGSS and your state standards
- Teacher User Guide
- Teacher e-Book with 5-year access
- Student e-Book with 5-year access
- SPARKvue software

Student Lab Manual

- More than 45 labs and activities
- Answer keys

Equipment

- Comprehensive Equipment Kit supports the textbook and lab manual
- **Comprehensive Equipment Kit includes these individual kits:** Forces and Motion; Oscillations, Waves, and Sound; Simple Machines Engineering; Modular Circuits; Light, Color, and Optics; and more
- Standard Equipment Kit includes Forces and Motion Kit and Modular Circuits Kit

Essential Physics correlates with NGSS and is constructed around the three dimensions:

NEXT GENERATION SCIENCE STANDARDS

- Science and Engineering Practices
- Crosscutting Concepts
- Disciplinary Core Ideas

Textbook + e-Book + Equipment

Essential Physics Student Textbook

EP-6323

This rigorous yet accessible textbook includes core Physics topics that cover a complete year of instruction for both High School General and Honors Physics classes. The lessons follow the 5E model and include tools for ELL students, as well as tools for students with different learning styles. And the curriculum aligns to NGSS and your state standards for both regular and advanced coursework. The accessible textbook includes one main idea per page, quality illustrations, 89 complete investigations, eight Design Projects, and Section and Chapter Reviews. The 27 chapters cover these topics:

- Science of Physics
- Physical Quantities and Measurement
- Position and Velocity
- Acceleration
- Forces and Newton's Laws
- Motion in Two and Three Dimensions
- Circular Motion
- Static Equilibrium and Torque
- Work and Energy
- Conservation of Energy
- Momentum and Collisions
- Machines
- Angular Momentum
- Harmonic Motion
- Sound Waves
- Electricity and Circuits
- Electric and Magnetic Fields
- Electromagnetism
- Light and Reflection
- Refraction and Lenses
- Electromagnetic Radiation
- Properties of Matter
- Heat Transfer
- Thermodynamics
- Quantum Physics and the Atom
- Nuclear Physics

Essential Physics Student e-Book

The Student e-Book is an electronic version of the full textbook with interactive elements. Throughout the electronic text, content and theory are supported with optional audio reading, as well as interactive elements, such as digital equations, videos, animations, and simulations. Students also have the option of expanding the content using the 'more' button to go deeper into concepts.

Essential Physics Student Lab Manual

EP-6326

The *Essential Physics Student Lab Manual* is a student-consumable print book. In the manual there are 46 of the 89 labs (from the *Essential Physics 3* textbook) that cover a full year of instruction. Best of all, the labs are completely integrated with PASCO equipment and software.

Comprehensive Physics Equipment Kit

EP-6490

This kit is designed to support the lab investigations in the Essential Physics 3rd Edition curriculum. When used as part of our Essential Physics program, including the e-Book and lab manual, it creates a complete solution for teaching high school Physics. It can also be used to supplement your existing textbook, serving as the lab component of your curriculum. This use is supported by the more than 46 standards-based Essential Physics labs, representing a full year of investigations for a standard physics course. Inside this comprehensive kit are the following:

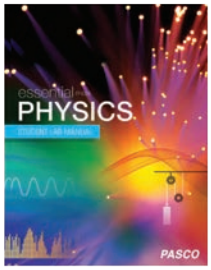
- Forces and Motion Kit
- Simple Machines Engineering Kit
- Oscillations, Waves, and Sound Kit
- Light, Color, and Optics Kit
- Essential Physics Modular Circuits Kit
- Projectile Launcher
- Additional Red Smart Cart

Also available:

Standard Physics Equipment Kit

EP-3567

- Forces and Motion Kit
- Modular Circuits Kit



Essential Physics Student Lab Manual

EP-6326

The *Essential Physics* Student Lab Manual is a student-consumable print book. In the manual there are 46 labs that cover a full year of instruction. Best of all, the labs are completely integrated with PASCO equipment and software.

Investigations and activities in the student lab manual cover topics such as:

- Graphs of Motion
- Motion Graphs
- Acceleration
- A Model for Accelerated Motion
- Newton's Second Law
- Hooke's Law
- Static and Kinetic Friction
- Projectile Motion
- Acceleration on an Inclined Plane
- Static Equilibrium
- Work and the Force vs. Distance Graph
- Inclined Plane and the Conservation of Energy
- Work and Energy
- Springs and the Conservation of Energy
- Work Done by Friction
- Design a Crash Barrier
- Conservation of Momentum
- Inelastic Collisions
- Elastic Collisions
- Levers
- Pulleys
- Ramps and Inclined Planes
- Gear Ratios
- Designing Gear Machines
- Torque
- Mechanical Advantage of Gears
- Oscillators
- Resonance
- Waves
- Interference
- Resonance and Sound
- Design a Musical Instrument
- Electricity and Circuits
- Voltage and Batteries
- Design a Lemon Battery
- Resistors and Ohm's Law
- Series and Parallel Resistances
- Electrical Power
- Compound Circuits
- Magnification of Mirrors and Lenses
- Reflection in a Plane Mirror
- Refraction of Light
- Creating Real and Virtual Images with Lenses
- Image Formation for a Convex Lens
- Build a Microscope and Telescope
- Phosphorescence

Comprehensive Equipment Kit *46 labs are designed to use this equipment set.*

- Forces & Motion Kit
- Simple Machines Engineering Kit
- Oscillations, Waves & Sound Kit
- Light, Color & Optics Kit
- Essential Physics Modular Circuits Kit

Each kit includes a Gratnells® Storage Tray.

- Additional Red Smart Cart
- Mini Launcher, Clamp & Rod
- One 1.2 m Metal Dynamics Track
- Two Tripod Stands

Standard Equipment Kit *25 labs are designed to use this equipment set.*

Includes 1 of each of the following:

- Smart Cart (Blue), ME-1241
- Friction Block, ME-9807
- PAScar Cart Mass (set of 2), ME-6757A
- Angle Indicator, ME-9495A
- Track End Stop (set of 2), ME-8971
- Super Pulley with Clamp, ME-9448B
- 1.2 m Dynamics Track, ME-9493
- Track Feet (set of 2), ME-8972
- Weights
- Modular Circuits
- Wireless Current Module
- Wireless Voltage Sensor
- Gratnells® Storage Tray

Order Information

Essential Physics Teacher Lab Manual EP-6329

Essential Physics Student Lab Manual EP-6326

Essential Physics Comprehensive Equipment Kit..EP-6490A

Standard Equipment Kit: Essential Physics EP-3567A

Essential Physics Kits

Choose the kit you need for your investigations.

EP-3558

Light, Color & Optics Kit

Sample Labs

- Magnification of Mirrors and Lenses
- Reflection in a Plane Mirror
- Refraction of Light
- Creating Real and Virtual Images with Lenses
- Image Formation for a Convex Lens
- Build a Microscope and Telescope

EM-3536

Essential Physics Modular Circuits Kit

Sample Labs

- Electricity and Circuits
- Voltage and Batteries
- Design a Lemon Battery
- Resistors and Ohm's Law
- Series and Parallel Resistances
- Electrical Power
- Compound Circuits

EP-3576

Forces & Motion Kit

Sample Labs

- Graphs of Motion
- Motion Graphs
- Acceleration
- A Model for Accelerated Motion
- Newton's Second Law
- Hooke's Law
- Static and Kinetic Friction
- Acceleration on an Inclined Plane
- Conservation of Momentum

EP-3577

Simple Machines Engineering Kit

Sample Labs

- Static Equilibrium
- Levers
- Pulleys
- Gear Ratios
- Designing Gear Machines
- Torque
- Mechanical Advantage of Gears

EP-3578

Oscillations, Waves & Sound Kit

Sample Labs

- Oscillators
- Resonance
- Waves
- Interference
- Resonance and Sound
- Design a Musical Instrument

Go to **pasco.com** and enter the **kit part number** for complete kit contents

THE AMAZING SMART CART DEMO KIT!!

Smart Cart Demo Kit Includes: Wireless Smart Cart (red or blue), Smart Fan Accessory, Smart Cart Vector Display, Smart Ballistic Cart Accessory, Rod Adapter, Hook, Cart Mass (2), Magnetic Bumper, Sail, Demonstration Manual, and storage case

Demos Include: Differences Between Velocity and Acceleration, Independence of x and y Projectile Motion, Newton's First Law, Newton's Second Law, Newton's Third Law, Impulse and Force, Collisions, Centripetal Acceleration, Simple Harmonic Motion, and Buoyant Force

Order Information

Essential Physics Light, Color & Optics Kit.....EP-3558
Simple Machines Engineering Kit.....EP-3577
Essential Physics Modular Circuits Kit.....EM-3536
Essential Physics Waves and Sound Kit.....EP-3578
Forces and Motion Kit.....EP-3576
Red Smart Cart Demonstration Kit.....ME-1272
Blue Smart Cart Demonstration Kit.....ME-1273

Basic Modular Circuits Kit

EM-3535

These circuit modules are designed specifically for introductory circuit investigations. For students who have never wired a circuit, this modular system makes it easy for them to see their circuit physically laid-out exactly as it appears in their circuit diagram.

Each module connects mechanically to another by sliding the tabs into each other. It works on any tabletop. No special surface is required. To electrically connect two modules, students insert a jumper clip, which emphasizes that an electrical connection has been made. The large size of the modules (8 cm x 8 cm) enables all the students around the table to see and understand the completed circuit.

Each module connects mechanically to another by sliding the tabs into each other. To make them visible, many of the components are mounted on top of the module or in a well for protection.

The Basic Modular Circuits Kit is a lower cost, introductory set with fewer components than the Essential Physics Modular Circuits Kit. The Wireless Voltage Sensor and Wireless Current Module are not included.

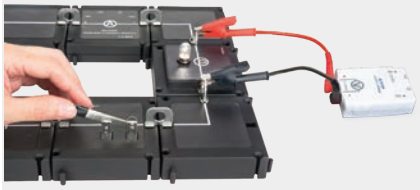
Order Information

Basic Modular Circuits Kit.....EM-3535

Essential Physics Modular Circuits Kit

EM-3536

The Essential Physics Modular Circuits Kit includes more modules, such as the Wireless Current Sensor Module and Wireless Voltage Sensor. The Essential Physics Modular Circuits Kit will also support applications like RC and RLC circuit analysis, electric motors, Kirchhoff's Laws, and much more!



The Essential Physics Modular Circuits Kit seamlessly integrates sensors, like the Wireless Current Sensor Module & Wireless Voltage Sensor.

Order Information

Essential Physics Modular Circuits Kit.....EM-3536

Modular Circuits Expansion Kit.....EM-3540

Choose from 3 Modular Circuit Kits

Kits include these modules and apparatus:

	Basic EM-3535	Essential EM-3536	Expansion EM-3540
Corner Wire	4	4	2
Straight Wire	4	5	2
Tee	2	2	2
Spring	1	1	1
Switch, SPDT	1	1	
Switch, SPST	1	1	
Resistor	2	3	
Capacitor	1	1	
Light Bulb	2	3	1
Potentiometer	0	1	
Motor	0	1	
LED	0	1	
1000 Turn Coil	0	1	
Battery Holder	2	2	1

	Basic EM-3535	Essential EM-3536	Expansion EM-3540
Battery, AA	2	2	
Jumper Clips	30	45	15
Diode	1	1	
330 ohm Resistor	1	2	
1000 ohm Resistor	1	2	
100 microfarad Capacitor	1	1	
330 microfarad Capacitor	1	1	
Magnets (0.45" x 0.25")	0	8	
Plotting Compass	0	1	
Alligator Clip Jumper Wire	0	1	
EM-3534 Wireless Current Sensor	0	1	
PS-3211 Wireless Voltage Sensor	0	1	
Gratnells® Storage Tray	1	1	1
Banana Jack Terminal			1

Wireless AC/DC Module

EM-3533

The Wireless AC/DC Module is a Bluetooth Low Energy wireless signal generator designed for use with PASCO's Modular Circuits. The AC/DC Module can act as a DC power supply, as well as generate Sine, Triangle, and Square AC signals. A built-in battery provides long lasting power for your basic circuits, and it can be recharged using the included USB cable. An internal voltage sensor monitors the output voltage at all times. The Wireless AC/DC Module is controllable in either PASCO Capstone or SPARKvue software. This latest circuit module expands the number and type of experiments you can perform with Modular Circuits including Ohm's Law, RC Circuit Time Constant, and LRC labs.

Programmable using Blockly programming in PASCO Capstone 2 software.

Features:

- Compatible with Modular Circuits
- ±3 V Output; 0.3 A Max
- DC, Sine, Triangle, Square
- Bluetooth Low Energy
- Rechargeable Battery
- Controllable with PASCO Capstone or SPARKvue Software

Order Information

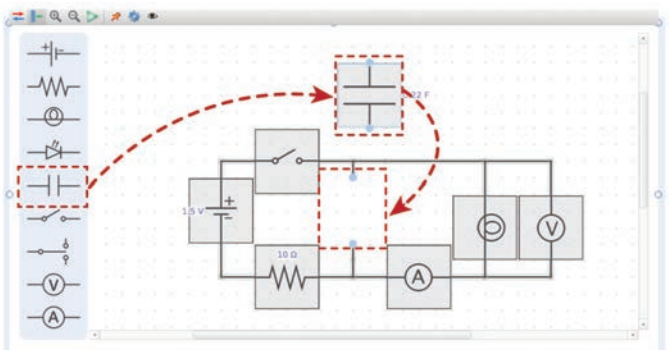
Wireless AC/DC Module EM-3533

Perform Circuits Emulations with Modular Circuits and PASCO Capstone 2

Reinforce circuit concepts and tackle student misconceptions using circuit visualization.

When you use Modular Circuits with PASCO Capstone 2 and its Circuits Emulation tool, you can:

- Construct and modify circuits
- Show conventional current or electron flow animation
- Animate circuits with live sensor data



Learn more about Capstone 2 on pages 84-87.

Wireless Motion Sensor

PS-3219

The Wireless Motion Sensor connects via Bluetooth or USB to your device, and uses ultrasound to measure the position, velocity, and acceleration of objects. This enables students to take turns measuring themselves, while the class observes their motion materializing as a graph in real time. The sensor can detect objects ranging from 15 cm to 4.0 m away, and without cables to get in the way, students can explore handheld and ceiling-mounted applications.

Features:

- Measures position, velocity, and acceleration
- False Target Rejection Technology produces clean data
- Clips directly to PASCO Dynamics Tracks
- Rod clamp for mounting
- 180° pivoting head
- Rechargeable lithium-ion battery
- Bluetooth® and USB connectivity

Order Information

Wireless Motion Sensor PS-3219

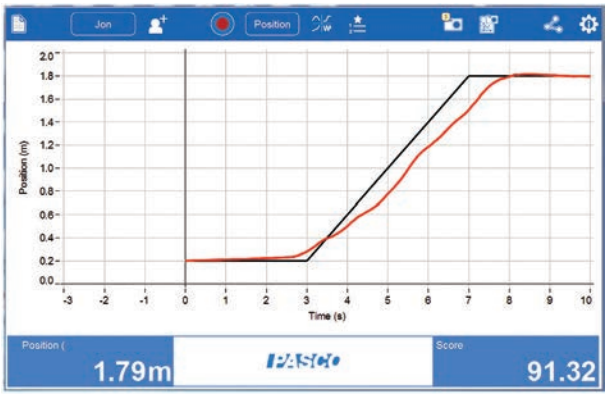
Free MatchGraph! Software

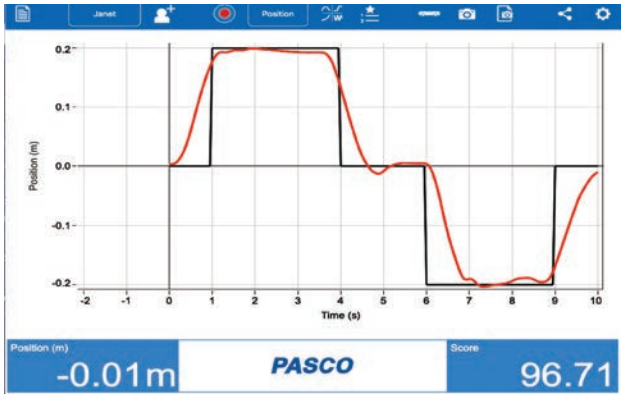
MatchGraph software is the most intuitive way to teach motion graphing. Engage your students with a kinesthetic experience that teaches graphing centered on motion. In MatchGraph, students attempt to match one of the nine provided graphs and are given a score showing how accurately they match the chosen curve. This activity gives them a deeper understanding of interpreting graphs as they see their own position and velocity graphed in real time.

Using a PASCO Motion Sensor, students create graphs of their own motion that they can then analyze. When using a Smart Cart, a real-time motion graph is displayed as students move the cart.

MatchGraph is great for teaching:

- Fundamental graphing skills
- Basic concepts of position and velocity
- The concept of slope
- What it means when the slope is zero
- How position and velocity graphs relate to each other





Download the Free *MatchGraph!* App

for Mac®, Android™, and Windows® computers at **pasco.com/downloads.** Download the free iPad® or Android™ app on the App Store or Google Play.

ANDROID APP ON Google play

Download on the App Store

Smart Cart (Red/Blue)

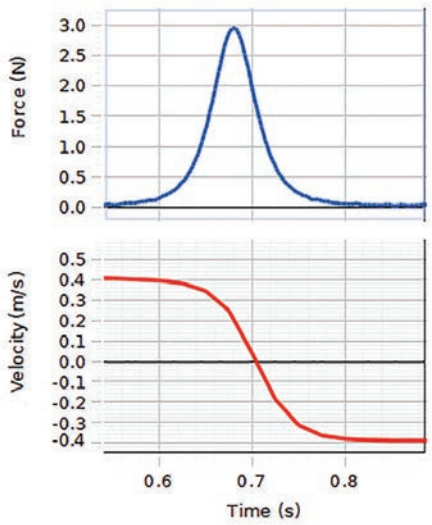
ME-1240/1241

The patented Smart Cart is the ultimate tool for studying kinematics, dynamics, Newton's Laws, and more. It is based on a durable ABS body with nearly frictionless wheels, just like our high quality PAScars. Now, we've added built-in sensors that measure force, position, velocity, and acceleration. The versatile Smart Cart can collect measurements on or off a track and transmit the data wirelessly over Bluetooth. In essence, it is a wireless dynamics cart that combines all the necessary sensors, without requiring any additional hardware.

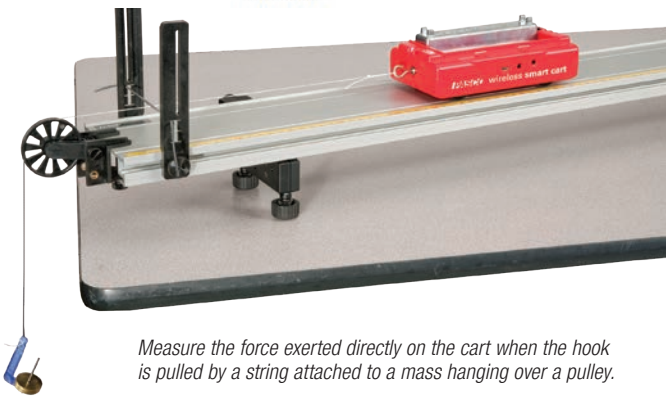
Smart Carts are ideal for studying mechanics topics, such as kinematics and dynamics. The built-in load cells enable two Smart Carts to visually demonstrate Newton's Third Law with ease. Additionally, built-in sensors for force and acceleration enable students to investigate Newton's Second Law in minutes. Smart Carts truly are a physics lab on wheels, and now you can own the most advanced physics cart ever created, all without the restrictions of cables.

Features:

- Built-in ±100 N force sensor
- 3-axis accelerometer
- Bluetooth® connectivity
- Rechargeable battery
- Motion encoder measures position and velocity on or off the track
- Magnetic bumper for force sensor
- 3-position plunger
- Mass tray
- Velcro® tabs
- Force sensor hook and rubber bumper



The graphs show the impulse experienced and the change in velocity created by a collision between two Wireless Smart Carts.



Measure the force exerted directly on the cart when the hook is pulled by a string attached to a mass hanging over a pulley.

Smart Cart Charging Garage

ME-1243

Charge up to five Smart Carts at once. Provides storage for the carts and accessory bumpers. Includes power adapter.

Order Information

Smart Cart (Red)	ME-1240
Smart Cart (Blue)	ME-1241
Smart Cart Charging Garage	ME-1243

Smart Cart Demonstration Kits

ME-1272 (RED)/ME-1273 (BLUE)

The Red & Blue Smart Cart Demonstration Kits come with a Smart Cart and all the accessories you need to perform amazing physics demonstrations in kinematics and dynamics.

Features:

- Smart Cart (red or blue)
- Smart Fan Accessory
- Two 250-g Cart Masses
- Smart Cart Rod Stand Adapter
- Ballistic Cart Accessory
- Smart Cart Vector Display
- Sail
- Gratnells Case
- Demonstration Manual

Order Information

Red Smart Cart Demonstration Kit ME-1272
Blue Smart Cart Demonstration Kit.....ME-1273

Smart Cart Vector Display

ME-1246

The Smart Cart Vector Display adds visual vectors to your Smart Cart for Force, Acceleration, or Velocity. Connect to the Smart Cart's accessory port to visualize vectors in real time! The arrows light up proportional to the sensor reading and indicate both magnitude and positive or negative direction.

Features:

- Choose from Force, Acceleration, or Velocity vectors, and watch them in real time.
- Students can visualize constant acceleration as a cart rolls up and then down an incline.
- Great for the student lab station or for a physics lecture demonstration!
- Selectable ranges

Order Information

Smart Cart Vector Display ME-1246

Smart Ballistic Cart Accessory

ME-1245

The Smart Ballistic Cart Accessory mounts to any PASCO dynamics cart for a classic demonstration on the independence of X and Y motion. A projectile fired from the accessory while a cart is in motion will be caught farther down the track. When mounted to a PASCO aluminum cart, or PAScar, the projectile is launched using a push button timer delay. When connected to a PASCO Smart Cart, the Smart Ballistic Accessory can launch the projectile based on measurements made by the Smart Cart in either SPARKvue or PASCO Capstone software.

Features:

- Compatible with all PASCO dynamics carts
- Push button timer to delay the launch of the projectile until after the cart is pushed
- Release mechanism does not affect cart motion or ball flight path
- The barrel has X and Y adjustments, so perfect vertical projections can be produced every time.
- Fires a colored nylon ball 0.5 meters or higher for impressive demonstrations
- Connects to the Smart Cart for measurement-based launching conditions
- USB rechargeable Li-ion battery

Order Information

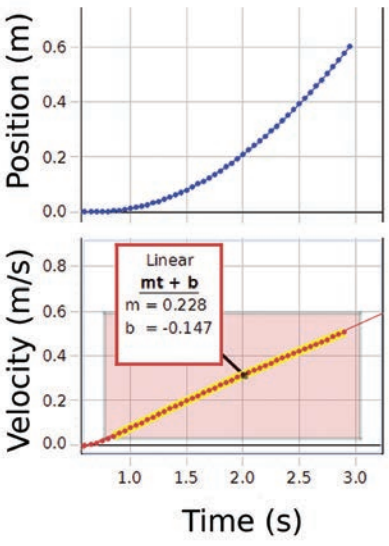
Smart Ballistic Cart Accessory ME-1245

Smart Fan Accessory

ME-1242

What makes this fan so smart? If you use this fan on a regular cart, you can turn it on and select one of three speeds by pushing the button on the side. But plugging it into a Smart Cart gives this Smart Fan Accessory added capabilities:

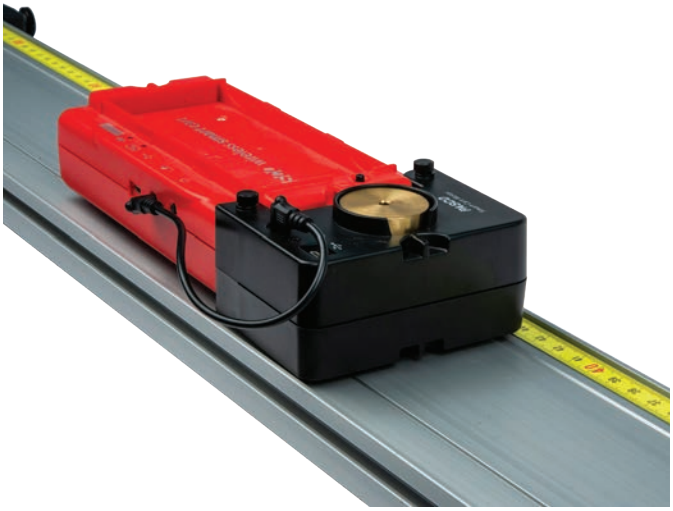
- **Hands-off Operation:** You can turn the Smart Fan on and off wirelessly from your computing device.
- **Adjust the Thrust:** Move the slider in the software and watch the fan respond.
- **Reverse the Spin of the Fan:** Input a negative thrust to make the fan blow in the opposite direction.
- **Set Start and Stop Conditions:** Choose to start the fan when a measurement (such as Position) reaches a certain value. Make the fan stop after a certain time, so the cart coasts during part of the experiment.
- **Sense and Control:** Program the Smart Fan thrust to respond to a calculation based on sensor measurements.



Sample data capture of position and velocity.

Order Information

Smart Fan Accessory ME-1242

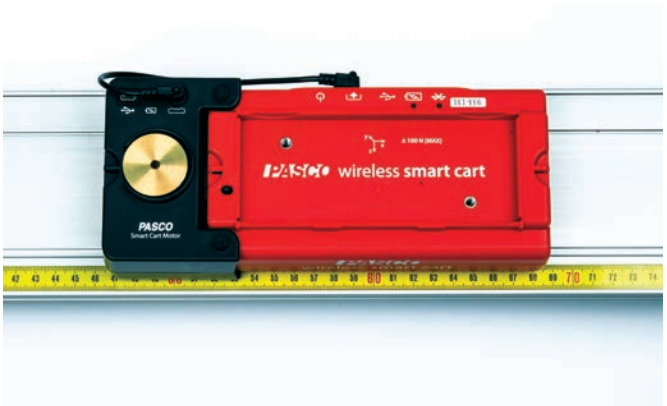


Smart Cart Motor

NEW

ME-1247

The Smart Cart Motor is a motor-driven wheel that attaches to the Smart Cart to make it go at a constant velocity, forwards or backwards. In PASCO Capstone or SPARKvue, you can control the motor remotely through its wired connection to the Smart Cart by setting the power on a scale of -100 to +100%.



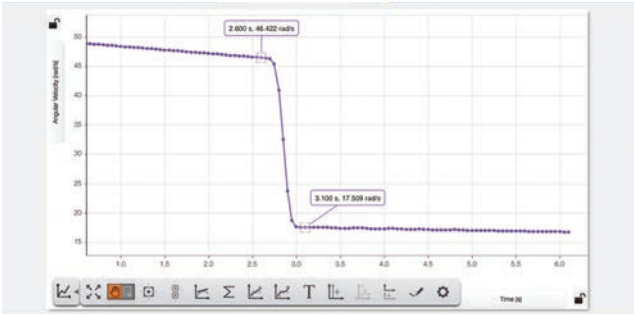
Order Information

Smart Cart Motor ME-1247

Wireless Rotary Motion Sensor

PS-3220

The Wireless Rotary Motion Sensor measures angle, angular velocity, and angular acceleration, as well as their linear equivalents. The included three-step pulley can be rotated at different rates of acceleration, allowing different torques to be applied. You can use the rod-mounting holes to orient the sensor for different experiments. The Wireless Rotary Motion Sensor connects directly to your devices via Bluetooth or USB.



Order Information

Wireless Rotary Motion Sensor PS-3220

Wireless Smart Gate

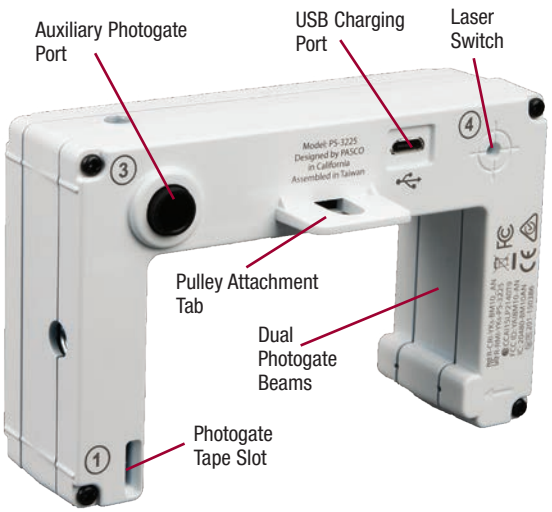
PS-3225

The Wireless Smart Gate has all the features of the wired Smart Gate. It has dual photogate beams spaced at 1.5 cm to accurately measure speed. The built-in laser switch (when used with any laser) allows you to time objects too large to fit through the standard photogate. Pass photogate tape through the photogate slot to measure the movement of objects. The auxiliary port is for adding an additional photogate head or Time-of-Flight Accessory.

We do not recommend using two Wireless Smart Gates in the same experiment unless the measured times are relatively long (greater than one-half second) since synchronization is limited to 2 ms.

Highlights:

- Dual photogate beams
- Laser switch
- Auxiliary photogate/ Time-of-Flight port
- Photogate tape slot
- USB and Bluetooth®
- Rechargeable



Projectile Launcher

ME-6800

The Projectile Launcher demonstrates the concept that motion in different dimensions is absolutely independent. A good launcher not only illustrates this non-intuitive idea, but also describes the exact motion of the projectile. PASCO has precision-engineered the Projectile Launcher to be durable, accurate, and consistent for highly repeatable results.

Projectile Launcher Wireless Smart Gate System

ME-6796

Choose this wireless option to eliminate cables between the computer and the projectile launcher. The Wireless Smart Gate has all the features of the Smart Gate (PS-2180), but it connects to your computing device via Bluetooth or USB; it does not require an interface.

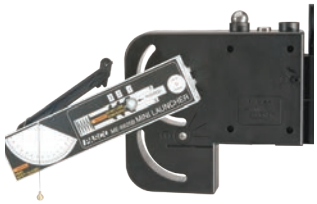
Includes:

- Wireless Smart Gate with Mounting Bracket
- Launcher with Mounting Stand
- Steel Balls with Loading Rod
- 2-D Collision Accessory
- Aluminum Table Clamp
- 45 cm Stainless Steel Rod

Mini Launcher

ME-6825B

PASCO's Mini Launcher provides a low-cost method for every student to thoroughly investigate projectile motion. The Mini Launcher has the same level of precision and accuracy as our larger Projectile Launcher (ME-6800), but is easier to assemble, simple to adjust, and provides built-in storage for the plunger and metal balls.



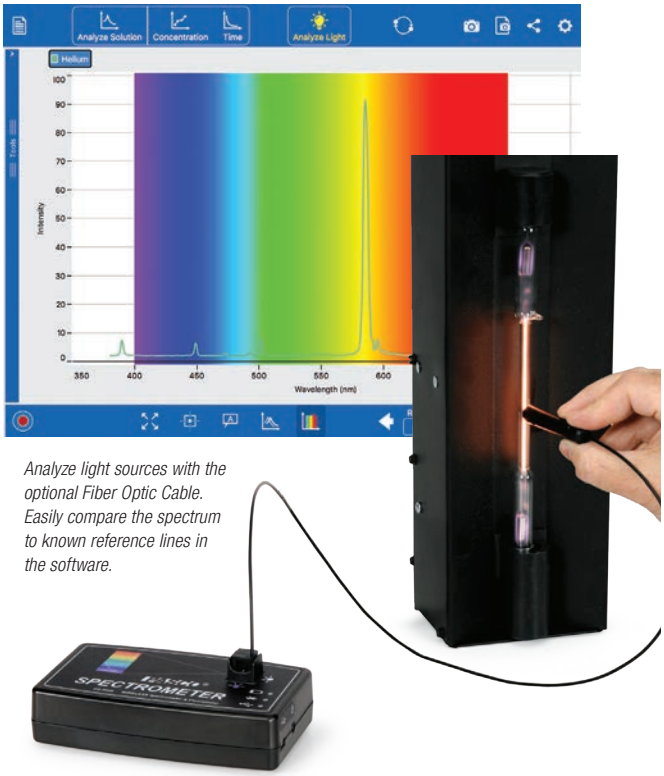
Order Information

Wireless Smart Gate	PS-3225
Mini Launcher	ME-6825B
Projectile Launcher Wireless Smart Gate System	ME-6796
Projectile Launcher	ME-6800

Wireless Spectrometer (VIS)

PS-2600

The Wireless Spectrometer from PASCO is specifically designed for modern chemistry, biology, and physics labs. With Bluetooth and USB connectivity, students can quickly connect from their device or computer using the free PASCO Spectrometry Software. With this affordable spectrometer students can gather a full spectrum of data in under one second. After specifying a target wavelength, students can study concentrations (Beer's Law), rates of reactions, or investigate emission spectra using the optional fiber optic cable.



Analyze light sources with the optional Fiber Optic Cable. Easily compare the spectrum to known reference lines in the software.

Order Information

Wireless Spectrometer (VIS).....PS-2600
Fiber Optics Cable.....PS-2601

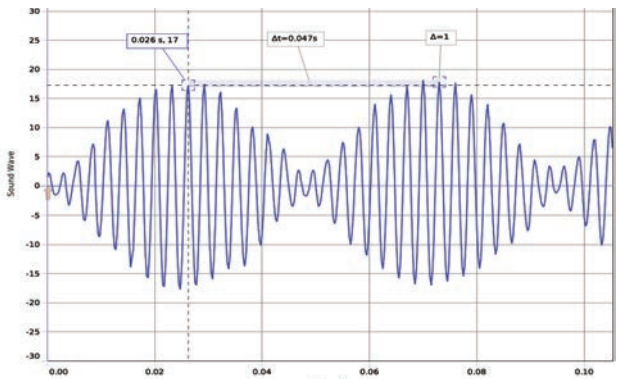
Wireless Sound Sensor

PS-3227

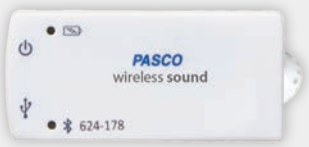
The Wireless Sound Sensor is two sensors in one wireless package: a sound wave sensor capable of measuring changes in relative pressure level as a function of time, and a sound level sensor with both dBA and dBC-weighted scales.

Features:

- Wireless and portable
- Wirelessly measure sound wave data at high sample rates (100 kHz)
- Two sound sensors in one (sound wave and sound level)
- High quality sensing element intended specifically for laboratory experiments
- Connects seamlessly to Scope and FFT displays in both SPARKvue and PASCO Capstone software
- Threaded 1/4-20 socket for easy mounting and alignment/ positioning



Easily observe and measure beat frequencies



Order Information

Wireless Sound Sensor PS-3227

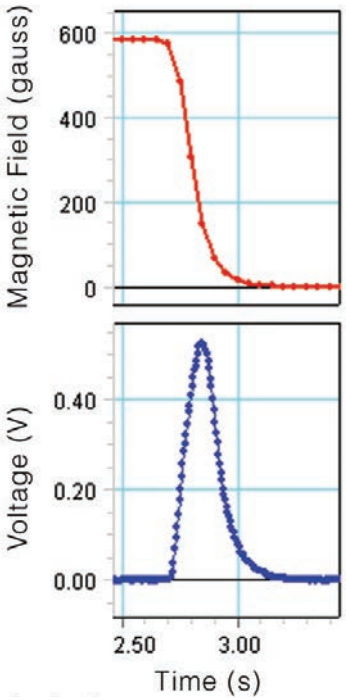
Wireless Magnetic Field Sensor

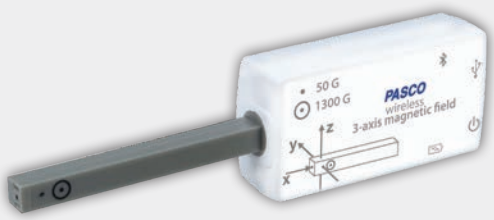
PS-3221

This 3-Axis Magnetic Field Sensor can sense the Earth's magnetic field and fields from coils and bar magnets. There are two ranges: ±50 gauss and ±1300 gauss. This sensor is primarily for static fields.

Highlights:

- Simultaneous measurements on three axes
- **Dual range:** ±50 G and ±1300 G
- Sensitive enough to measure the Earth's magnetic field
- Measure fields from bar magnets and coils





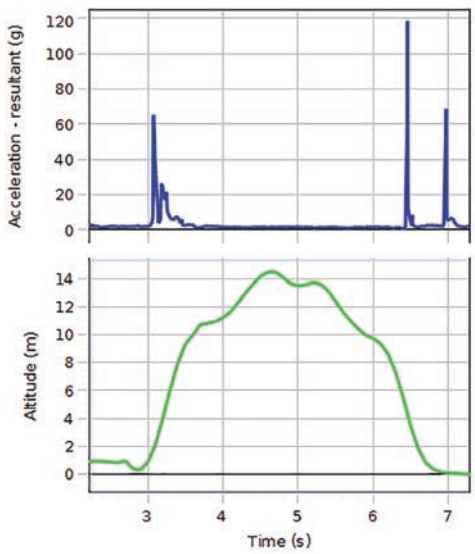
Order Information

Wireless Magnetic Field Sensor PS-3221

Wireless Acceleration/Altimeter

PS-3223

The Wireless 3-Axis Acceleration/Altimeter can remotely log acceleration in three dimensions and altitude, making it ideal for recording roller coaster rides.



Order Information

Wireless Acceleration/Altimeter.....PS-3223

Wireless Temperature Sensor

PS-3201

Welcome to the modern thermometer. The Wireless Temperature Sensor transmits live data and allows students to continuously monitor, log, and plot temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, weeks, or months, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts over a year*. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

Order Information

Wireless Temperature Sensor.....PS-3201

Wireless Current Sensor

PS-3212

The Wireless Current Sensor's wide current range enables introductory and advanced explorations of electricity and circuits. Designed with user safety in mind, the sensor can be used to measure currents up to 1 A and includes built-in overload protection. Collected data can be wirelessly transmitted to computers, Chromebooks, tablets, and smartphones. When combined with a Wireless Voltage Sensor, students can explore Ohm's Law, series and parallel circuits, and much more.

Wireless Voltage Sensor

PS-3211

The Wireless Voltage Sensor is ideal for exploring the fundamental concepts of electricity, voltage, and basic circuits. It measures voltages up to ±15 V with built-in overload protection, and features high-speed sampling rates when used with a USB. When combined with the Wireless Current Sensor, students can use it to explore Ohm's Law, circuits in series and parallel, and much more.

Order Information

Wireless Current Sensor PS-3212
Wireless Voltage Sensor.....PS-3211

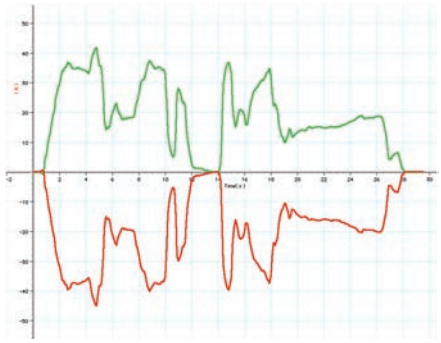
Wireless Force Acceleration Sensor

PS-3202

Capable of simultaneously measuring force, acceleration, and rotational velocity, this sensor is ideal for experiments involving rotating platforms, moving carts, spring oscillations, collisions, and impulse. The wireless design offers improved measurement accuracy by eliminating cords that affect data collection. Students can use the finger-holes for handheld applications, or mount it onto a cart or rod for more complex experiments.

Teaching Advantage:

- Bluetooth Low Energy and simple, one touch in-app pairing
- Long-lasting rechargeable battery
- Zeroing is completed within the software for accurate taring
- Logging mode stores data for force, acceleration, and rotation directly on the sensor for long-term experiments
- Simultaneously measures force and acceleration
- Built-in 3-axis acceleration sensor measures acceleration in x, y, and z axes, and calculates resultant acceleration
- Built-in gyroscope measures rotation about x, y, and z axes



The Wireless Force Acceleration Sensor is perfect for explorations of Newton's 3rd Law.

Order Information

Wireless Force Acceleration Sensor.....PS-3202

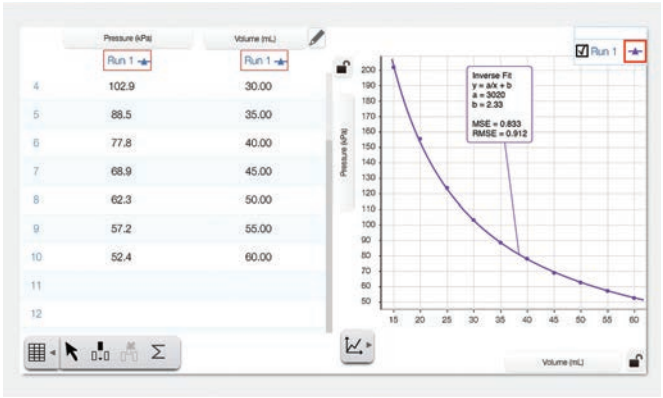
Wireless Pressure Sensor

PS-3203

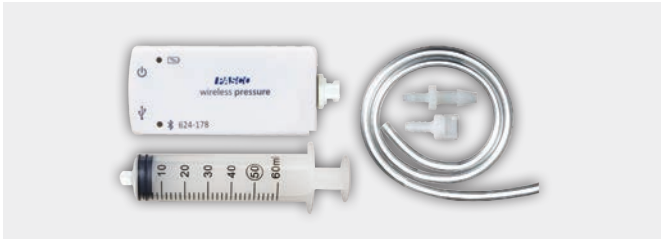
The Wireless Pressure Sensor allows students to easily collect accurate gas pressure data for a wide range of applications. Included is a 60cc syringe, tubing, and connectors that facilitate experiments such as Boyle's Law and measuring pinch-grip strength. Within PASCO's software, students can easily select their desired units from a list containing kPa, mmHg, inHg, mbar, psi, atm, and torr.

Features:

- Measures pressure even when the pressure within the system drops below ambient pressure
- Supports common units (kPa, atm, psi, mmHg, or N/m^2) for many applications
- Bluetooth® wireless connectivity and long-lasting rechargeable battery



With the included syringe, your students can easily quantify the relationship between pressure and volume.



Order Information

Wireless Pressure Sensor PS-3203

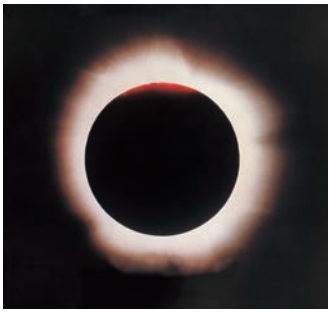
Wireless Light Sensor

PS-3213

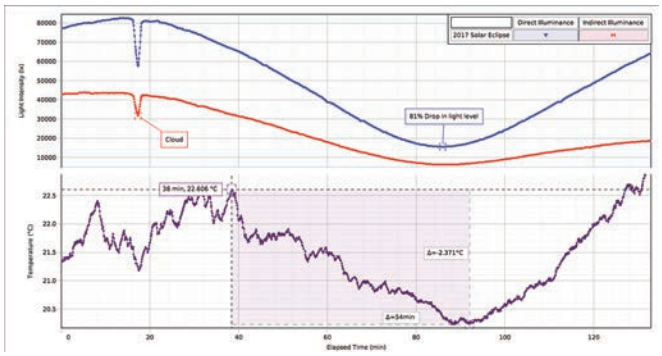
The Wireless Light Sensor features two separate apertures - one for ambient light measurements and one for directional light measurements. The ambient sensor measures illuminance and UV Index, while the spot (directional) aperture measures light level and color intensity. Our software displays the relative intensities of Red, Green, and Blue light, then sums them to determine the level of White light. PAR and irradiance are also available as calculated measurements within PASCO Capstone (version 1.8 or later) and SPARKvue software (version 2.6 or later).

Features:

- Wirelessly connects to computers, Chromebooks, tablets, and smartphones
- Simply pair and go, no cables or adapters to manage
- On-board memory enables the sensor to function as an independent datalogger
- Variable sampling rate for short, precise experiments or lengthy, multi-day data collection
- Bluetooth connectivity and long-lasting coin cell battery
- Indirect PAR measurements for biological studies



PASCO's Wireless Light Sensor provides students with the tools to explore the electromagnetic spectrum, model planetary motion, study gas laws, and relate photosynthesis to light color and intensity.



Order Information

Wireless Light Sensor PS-3213

SPARK LXi Datalogger

PS-3600A

The SPARK LXi Datalogger is a Bluetooth, handheld datalogger that enables students to connect wired and wireless sensors, collect data, generate graphs, and analyze results. It is durable, splash-proof, and works seamlessly with PASCO sensors. The SPARK LXi can simultaneously accommodate up to five wireless sensors, includes two ports for PASPORT sensors, as well as two ports for the included Fast Response Temperature Probe and Voltage Probe. It can be used with PASCO Wireless sensors, PASPORT sensors and an AirLink, SPARKlink® Air, and the 550 Universal Interface.

Built for Student Use:

- Portable
- Shock-absorbing case
- 8" Color Capacitive Touchscreen (1280 x 800 pixels)
- 1.4 GHz Quad Core Processor, 2.0 GB RAM, 16 GB Memory
- Voltage and temperature sensor ports with included probes
- Speakers, microphone, and two cameras
- GPS and accelerometer
- Wi-Fi enabled
- Wireless sensors and Smart Carts connect via Bluetooth®
- AirLink, SPARKlink Air, and 550 Universal Interface connect via USB or Bluetooth
- Two PASPORT sensor ports
- **Loaded with PASCO software:** SPARKvue® for data collection and analysis, MatchGraph!, and Spectrometry
- **Loaded with third-party software:** Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Scientific Calculator, Periodic Table, and Google Science Journal

The SPARK LXi features two PASPORT ports as well as ports for the included temperature and voltage probes.

Order Information

SPARK LXi Datalogger.....PS-3600A

550 Universal Interface

UI-5001

The 550 Universal Interface is fast, powerful, and incredibly affordable. The cost-effective 550 offers half the ports and many of the same features as our 850 Universal Interface, including both Bluetooth and USB connectivity. The 550 Universal Interface includes two PASPORT sensor ports, two digital sensor ports, two analog sensor ports, and a built-in signal generator.

The 550's two digital inputs are compatible with all ScienceWorkshop digital sensors, as well as timing devices, and photogates. The two analog ports connect with our analog ScienceWorkshop sensors and can support a 2.0 MHz max sampling rate and 1.22 mV resolution for voltage sensing.

The 550's built-in signal generator powers motors, speakers, circuits, and many other devices. With PASCO Capstone software and the 550, you can control various DC and AC waveforms, without requiring any other technology. The 550 provides 8 V at 400 mA, selectable voltage limits, built-in voltage and current measurements, and DC offset. Capstone software turns the 550 into a live oscilloscope that can display simultaneous traces.

Beyond having USB 2.0 connectivity, the 550 can also send data wirelessly to any Bluetooth enabled computer, iPad, or Android tablet using PASCO Capstone or SPARKvue software.

Features:

- USB and Bluetooth connectivity
- 3.2 W power amplifier
- 2.0 MHz max sampling rate
- 100 kHz signal generator with built-in Voltage and Current sensors
- Compatible with PASPORT, ScienceWorkshop, and Wireless Sensors
- 2 high-speed analog inputs
- 2 digital inputs for photogates and other timing sensors
- 2 PASPORT sensor inputs
- Can be used simultaneously with other PASPORT interfaces
- Uses Capstone Software or SPARKvue Software

The 550 Universal Interface allows you to connect Science Workshop (analog), PASPORT (USB), and Wireless (Bluetooth®) sensors. It also includes a power amplifier and signal generator (not shown).

Order Information

550 Universal Interface.....UI-5001

Interface Comparison

Compare the features and capabilities and see which interface works best in your lab.




	SPARK LXi PS-3600A	AirLink PS-3200	SPARKlink Air PS-2011	550 Universal Interface UI-5001
PASPORT Ports	2	1	2	2
Analog Inputs	0	0	0	2 (±10 V, optional gain voltage 10x, 100x)
Digital Inputs	5	0	0	2
Connects via USB	Yes	Yes	Yes	Yes
Connects via Bluetooth	Yes	Yes	Yes	Yes
Rechargeable battery (for cordless operation only)	Yes	Yes	Yes	No (AC adapter)
Works with PASCO Capstone Software	No	Yes	Yes	Yes
Works with SPARKvue Software	Yes	Yes	Yes	Yes
Accepts PASPORT Sensors	Yes	Yes	Yes	Yes
Accepts ScienceWorkshop Sensors	No*	No*	No*	Yes
Maximum Sampling Rate	Sensor dependent <1000 Hz	Sensor dependent <1000 Hz	Sensor dependent <1000 Hz	Up to 2 MHz on one channel
Signal Generator	N/A	N/A	N/A	±8 V, at 400 mA, DC to 100 kHz
Included Items	Ruggedized case, hands-free stand, SPARKvue, MatchGraph!, Spectrometry	USB Cable	AC adapter, USB cable, fast response temperature and voltage probe	USB cable, Power supply

* The AirLink and SPARKlink Air can accept most ScienceWorkshop sensors with the proper adapter, although they won't have the same high maximum sample rates. One exception is the Sound Sensor (UI-5101), which is not recommended for use with an adapter.

AirLink Interface

PS-3200

The Airlink connects PASPORT sensors to a Mac or Windows computer, Chromebook, iPad, tablet, or smartphone via Bluetooth or USB connection. The USB cable is included.

Order Information

AirLink Interface PS-3200

SPARKlink Air Interface

PS-2011

The SPARKlink® Air allows students and teachers to connect any of our 70+ PASPORT sensors to their device via USB or Bluetooth®.

Order Information

SPARKlink Air Interface PS-2011

Make the switch to PASCO capstone™ 2

The Most Advanced Data Collection Software in Science Education

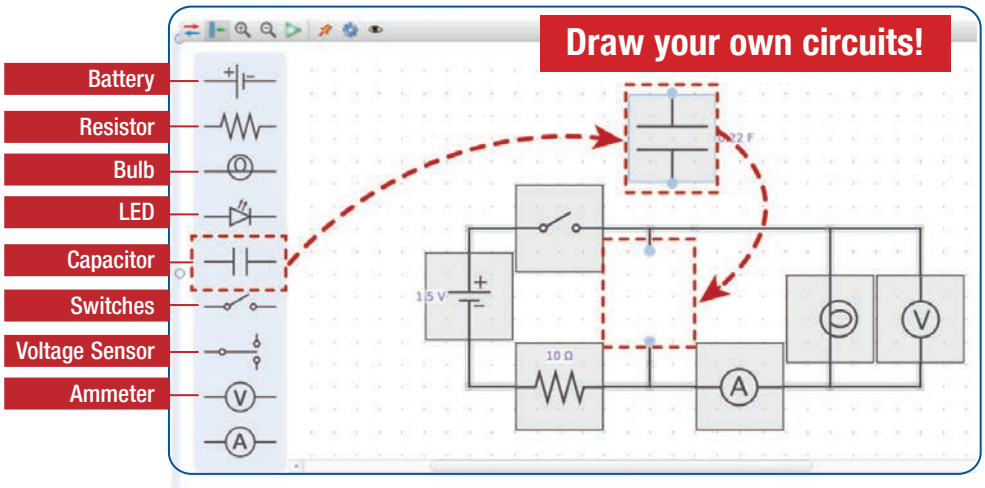
PASCO is pushing the limits of technology, so you can push your students to their potential. Working closely with educators, we continuously develop Capstone™, making improvements and enhancing the teaching features. Capstone is designed to handle large data sets, high-speed sampling, and customized preferences to fit the needs of your lab. A straightforward user interface is approachable for beginners, yet Capstone offers all the capabilities needed for even the most advanced users.

Features in PASCO Capstone 2

Visit **pasco.com/capstone** for more information.

Circuits Emulation

Reinforce circuit concepts and tackle student misconceptions using circuit visualization.



Combine real-world circuits with simulations, animation, and live measurements.

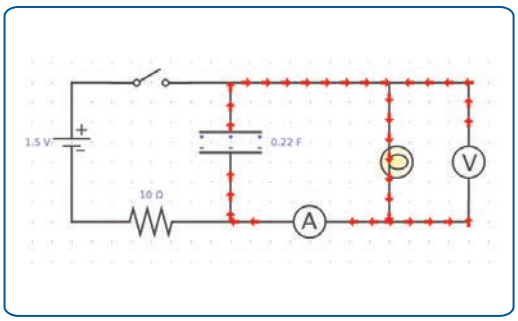
With this tool you can:

- Construct and modify circuits
- Show conventional current and electron flow animations
- Animate circuits with live sensor data

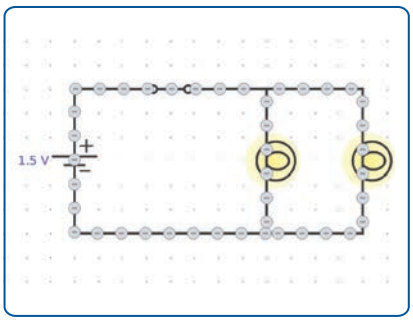
Build your own circuits in Capstone. Drag and drop components and draw wires to connect.

- Demonstrate series and parallel
- Charge and discharge capacitors

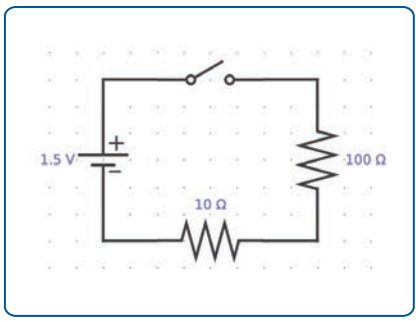
Examples of other circuit emulations



- Animated conventional current flow
- Animated capacitor—charge or discharge
- Edit capacitor values



- Animated electron flow
- Connect components in parallel or series

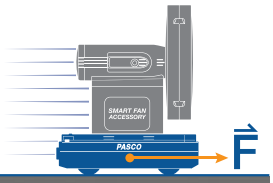


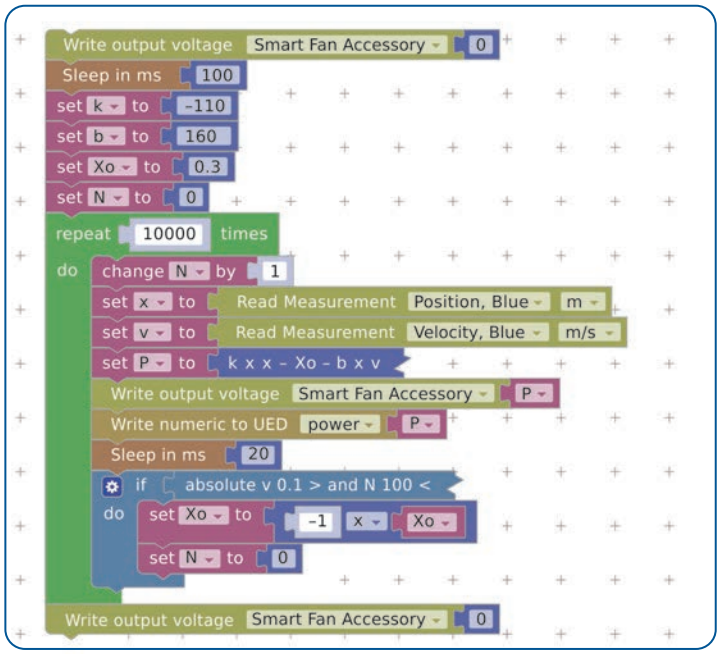
- Operate switches
- Edit voltage and resistor values

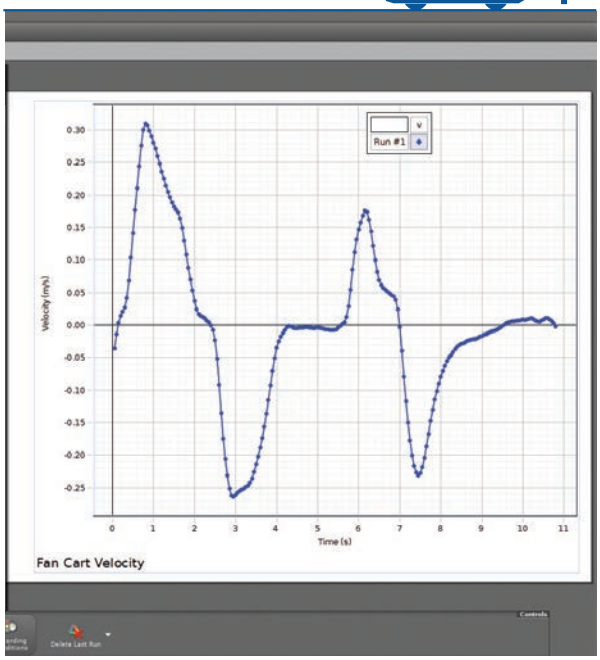
Blockly Block-based Coding

- Control all PASCO sensors and interfaces
- Create sense and control programs
- Control outputs from sensor inputs

Bring computational thinking into your science lab!



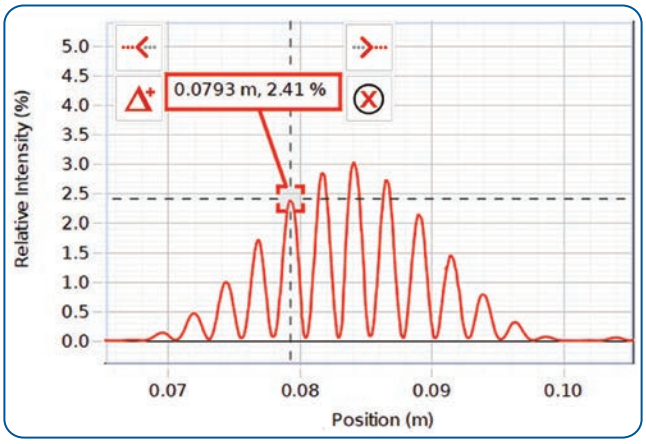




Visit **pasco.com/capstone** for more information.

Graph Pop-up Tools

Quick access to commonly used analysis tools



Capstone has all the software tools you need for data collection and analysis. And we continue to add more features, based on input from physics educators just like you!

- Exclude or delete selected data points from analysis.
- Create models using the calculator.
- Calculated columns in tables
- Error bars
- Weighted linear fit that takes into account error bars
- More complex curve fits such as damped sine, Gaussian, sine series, and user-entered fits
- Smooth data directly on a graph with slider tool
- Global preferences settings

Download the Free Trial
www.pasco.com/Capstone
Requires Mac or Windows

Order Information

PASCO Capstone Single User License ..... UI-5401 or UI-5401-DIG

PASCO Capstone Site License ..... UI-5400 or UI-5400-DIG

TOOLS

Configure PASCO Hardware
Works with PASPORT, ScienceWorkshop, and Wireless Sensors

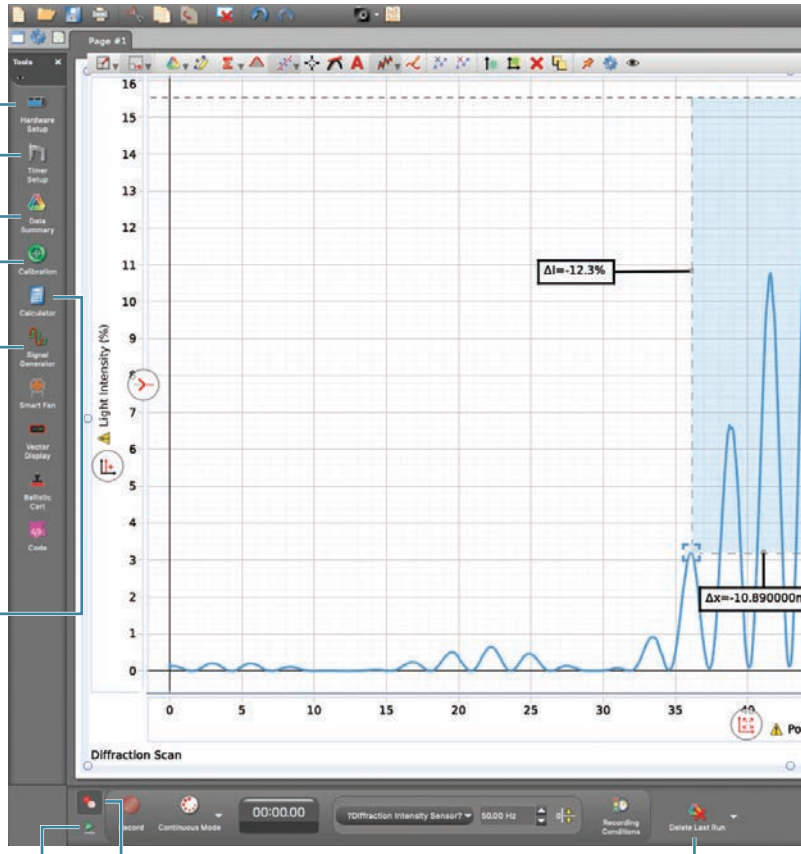
Photogate Timer Wizard
Easily configure photogates and timing measurements

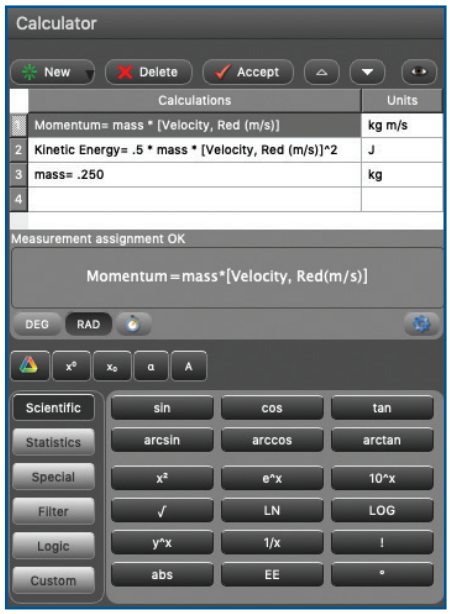
Data Summary
- Equations/calculations
- Fundamental constants
- Experimental constants
- Trials and runs

Sensor Calibration Wizard
- Step by step calibration
- Many calibration types

Signal Generator
- Scan through a range of frequencies
- Control signal output with a calculation

Calculator
- Graph modeling
- Create data sets using sensor data



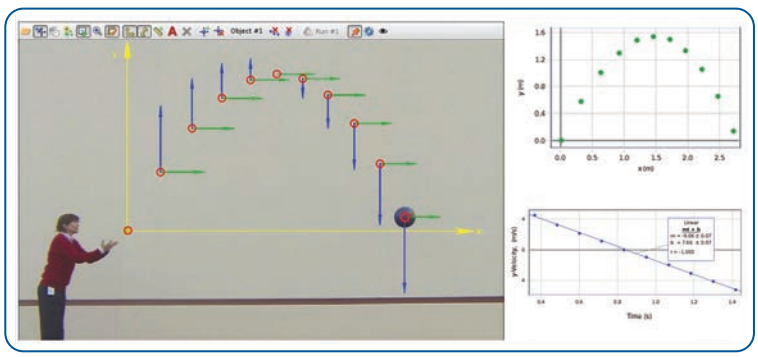


Sophisticated scientific calculator has statistics, calculus, filters, logic functions, and special operations such as amplitude and period.

Replay Your Data
- Change replay rate
- Increment by frame
- Loop playback

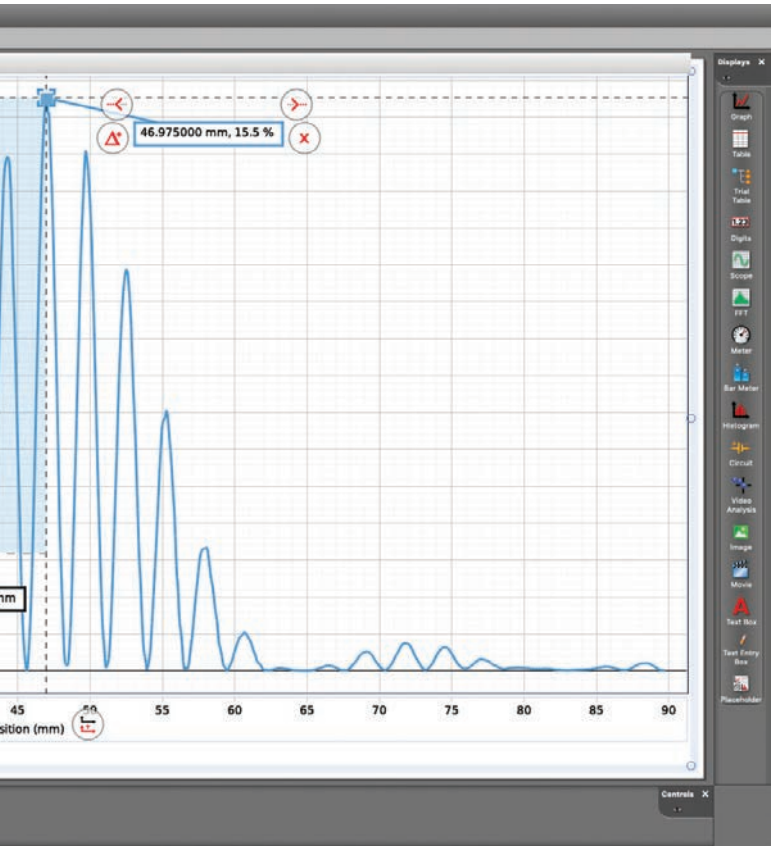
Sampling Options
- Continuous manual sampling
- Fast monitor mode
- Independent sensor sampling rates
- Start/stop conditions
- Zero sensor

Capstone 2 Includes Video Analysis



Import video and analyze the motion of objects to measure position, velocity, and acceleration. With this tool you can also:
- Show velocity and acceleration vectors
- Use magnifier to identify exact center of an object
- Use calibration ruler at any time
- And so much more!

PASCO's proximity in-app sensor pairing: U.S. Patent Number 10,356,594



DISPLAYS

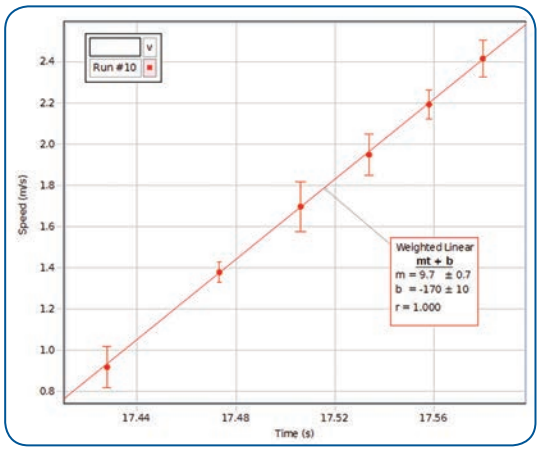
Display *Your* Data *Your* Way

▸ Graph ▸ Table ▸ Digits ▸ Scope ▸ FFT ▸ Meters

Graph Tools Include

- Draw predictions on graphs before taking data.
- Multiple *y*-axes and/or multiple plot areas
- Perform Quick-Calcs on the graph axis to linearize data.
- Curve-fits report the uncertainties in the parameters.
- Multi-coordinate tool gives *y*-values wherever it intersects data.

Error Bars and Weighted Linear Fits



Graph uncertainties using user-entered error bars, absolute error, or percent error. The weighted linear fit incorporates the error bars.

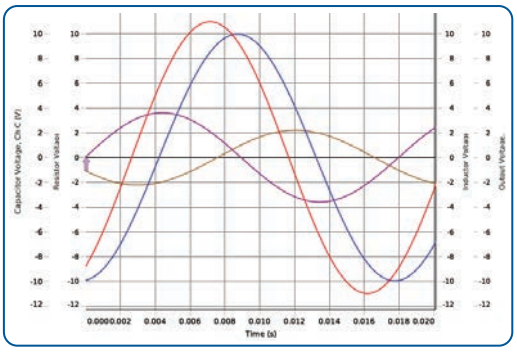
Visit **pasco.com/capstone** for more information.

Delete Runs

- Last run only
- Select from list
- All runs

Made a mistake?
Just hit
UNDO

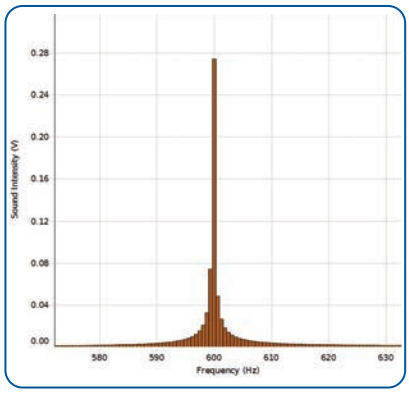
Oscilloscope Display



This display behaves like an authentic digital oscilloscope.

- Trigger
- Single trace collection
- Sample rate tied to time axis scale
- Set trace offset

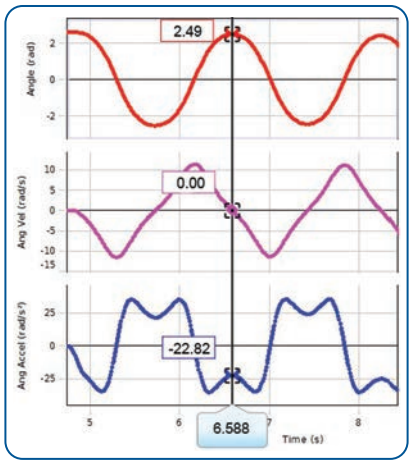
FFT



Display data in the frequency domain to find peak frequency and harmonics.

- Sample rate tied to axis scale
- Normalize data
- Adjust BIN width

Multi-Coordinate Tool



Easily show the relationship between multiple data plots by comparing data values across the time axis.

//code.Node

Learning to code. Coding to learn.

Bring your students' code beyond the screen to the real world.

Real-World Device for All Coding Levels

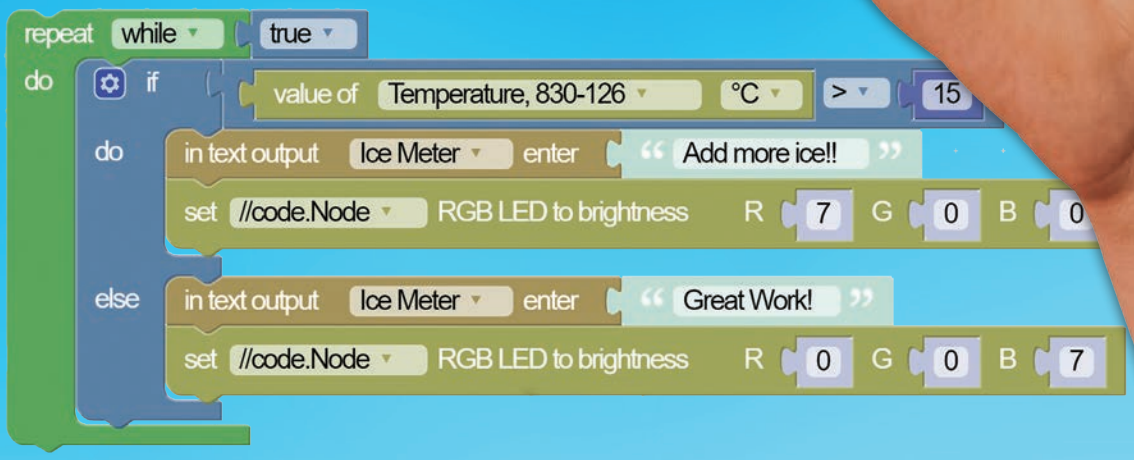
- Interactive sensor inputs and on-device outputs
- Ready to use out of the box
- Low-cost, durable design

Applied Computational Thinking Activities

- Hands-on activities with real-world sensors
- Standards-aligned, phenomena-based STEM coding lessons
- Designed for elementary and middle grades

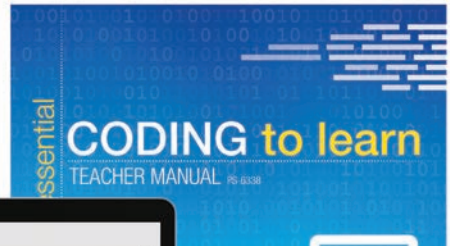
Develop Technical and Soft Skills

- Integrates ISTE/CSTA-aligned computational thinking into STEM learning
- Cultivates critical thinking and problem-solving skills
- Promotes perseverance, cooperation, and other emotional learning skills



Coding Solutions

The //code.Node is a turnkey coding solution that combines real-world sensor inquiry, Blockly coding, and live data displays to drive computational thinking in STEM learning. It includes six interactive sensors and four device outputs that measure and respond to phenomena using code created in PASCO's software.



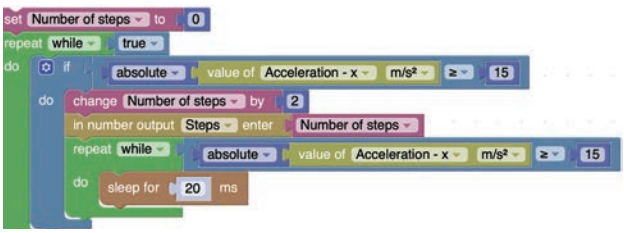
NEW

//code.Node activites challenge students to create an interactive program with external responses that bring their code beyond the screen to the real world.

The //code.Node has six built-in sensors, including a Temperature Sensor, Motion Sensor, Magnetic Field Sensor, Sound Sensor, Light Sensor, and two Momentary Switches. It has four device outputs including a Speaker, 5x5 LED Array, and RGB LED Light. The user-friendly coding platform, Blockly, is used within PASCO's software. Students can control how the //code.Node's sensor inputs collect and display data, as well as how the device's outputs respond to incoming sensor data.

The **//code.Node Cart** allows students to program the //code.Node to respond to physical phenomena. When the //code.Node is active and fitted inside the cart, velocity and position data are collected and reported wirelessly. Programmed values can trigger sounds, lights and displays.

Blockly Coding helps students develop computational thinking skills. Introducing students to coding and code-based outcomes is easier than ever before with Blockly coding. Blockly integrates computational thinking into the exploration of science phenomena to provide students with a new world of STEM opportunity. With Blockly, students can create custom data collection parameters, feedback loops, data displays, and so much more.



SPARKvue

Code with Sensors + //code.Node
Students can program the //code.Node's light, sound and display outputs to respond to sensor data. Students can use any PASCO sensor as an "input" to control outputs, such as text.

Use Blockly in SPARKvue to:

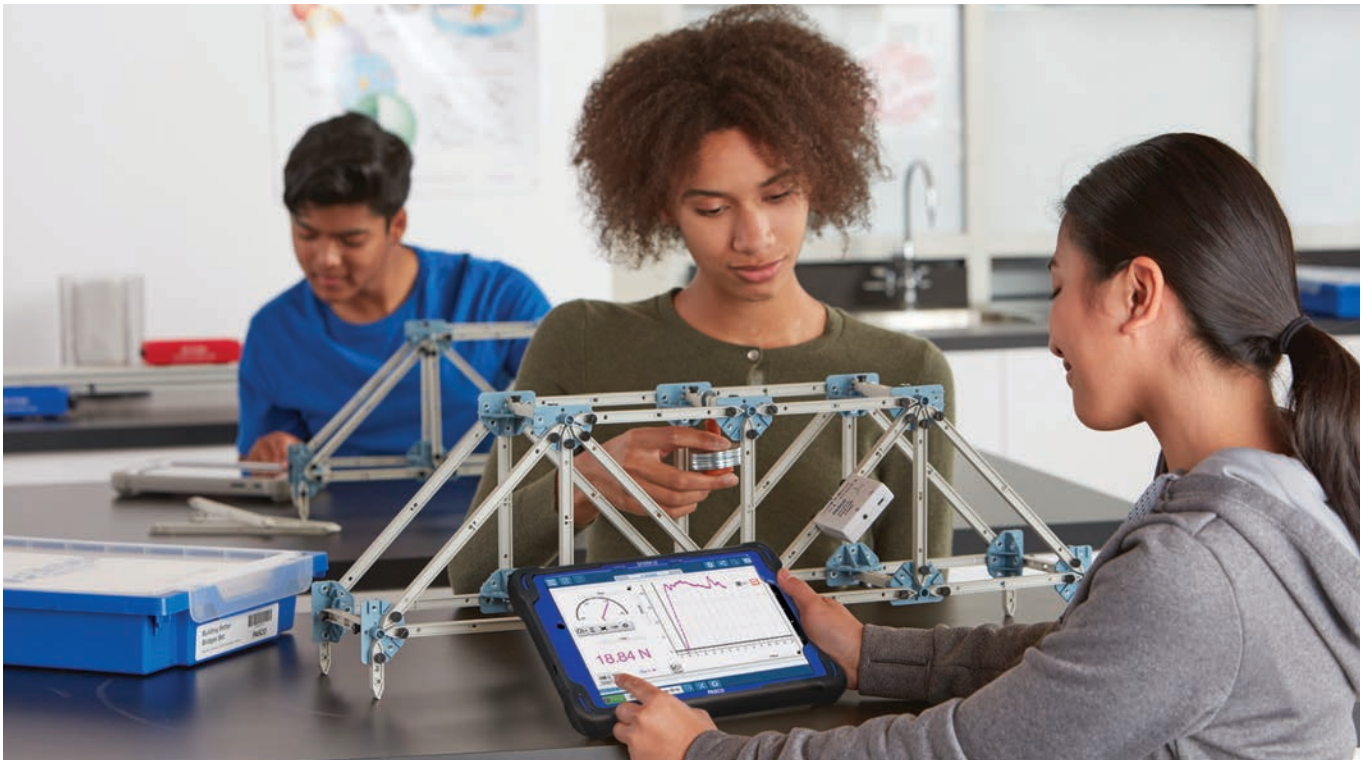
- Introduce students to computational thinking
- Investigate phenomena while learning to code
- Create data-driven feedback loops
- Program collection parameters for any PASCO sensor or interface

Order Information

//code.Node	PS-3231
//code.Node Cart	PS-3235

Building Better Bridges Kit

Teach engineering concepts with this complete STEM bridge-building kit.



Now is the perfect time for your students to learn about bridge-building and how bridges really work. This complete STEM kit allows students to learn and apply engineering design concepts. They can use the I-Beams to build bridges and structures that behave like the real thing! And with the included Wireless Load Cell, students can measure forces under tension or compression anywhere on their structures.

Students can perform the following lab investigations using PASCO's Building Better Bridges Kit.

- Measuring Forces
- Equilibrium of Forces
- Equilibrium of Rotation
- Forces in Trusses
- Forces in Bridges

This kit is compatible with PASCO Structures System.

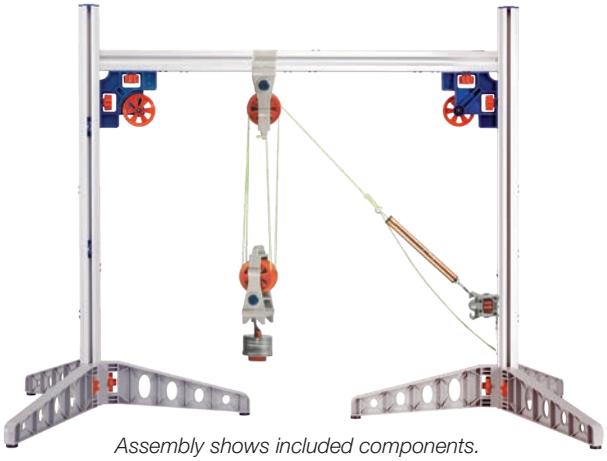
Includes Lab Activities, Wireless Load Cell (with Bluetooth® Low Energy), I-Beams (various sizes), Connectors, Truss Screws, Weight Set, a Gratnells® Case and more

Want another Load Cell?
Wireless Load Cell PS-3216

Simple Machines Engineering Kit

EP-3577

Our Simple Machines Engineering Kit engages students in a wide range of physics, physical science, and engineering concepts. Two triple-pulley blocks make it easy to build machines with mechanical advantage up to 6:1. Build all three classes of levers with our pair of 20-cm levers, or combine gears, levers, and pulleys together to show how rotating machines work.



Assembly shows included components.

Includes

- *10 N Metal Spring Scales (2)*
- *Tripod Stands (2) & Crossrail*
- *Universal Spring Hanger (2)*
- *Right-angle Connector with Pulley (2)*
- *Fixed Triple Pulley Block*
- *Hanging Triple Pulley Block*
- *Friction Block*
- *Quick-attach Gear Hubs (4)*
- *Gear Spacers (12)*
- *20 cm Levers (2)*
- *60 Tooth Spur Gears (2)*
- *40 Tooth Spur Gears (2)*
- *20 Tooth Spur Gears (3)*
- *20 cm-diam. Large Pulleys (2)*
- *Weights*
- *String*
- *Gratnells® Storage Tray*

Simple Machines Teacher Resources

EP-6483

Questions are embedded throughout the activities. Other features include sequencing and key-term challenges. Opportunities to predict outcomes prior to data collection and post-lab multiple choice questions help to make the connection between lectures and labs as seamless as possible. And the lab activities are correlated to state and national standards. For more information, visit pasco.com.

- Complete with guided inquiry lab activities, suggested answers, and much more
- Requires Simple Machines Engineering Kit

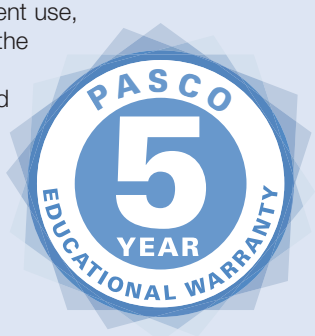
Order Information

Building Better Bridges Kit	ME-3581	
Simple Machines Engineering Kit	EP-3577	
Essential Physics Forces and Machines Teacher Resources	EP-6483	

Sensor Index

PASCO's 5-Year Educational Warranty

To withstand the rigors of student use, PASCO products are made of the highest quality materials. They are designed and manufactured by our team of education experts and engineers in Roseville, California. And we back up our products with a 5-year warranty, so you can be completely confident about buying PASCO solutions.



Wireless Acceleration/Altimeter

PS-3223

The Wireless 3-Axis Acceleration/Altimeter can remotely log acceleration in three dimensions and altitude, making it ideal for recording data during roller coaster rides.

Highlights:

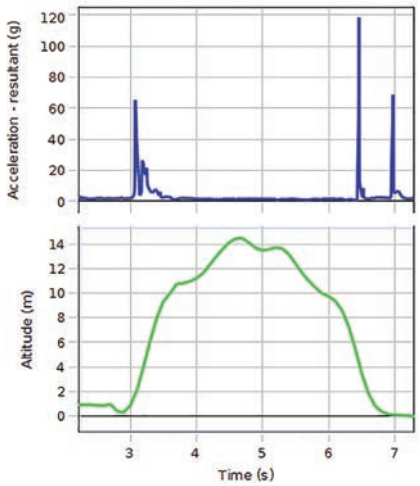
- 3-axis accelerometer
- 3-axis gyroscope
- Altimeter
- Rubberized case

Specifications:

Accelerometer Ranges: ±16 g, ±100 g, ±200 g, ±400 g
Measurements: Acceleration (3 axes and resultant); Altitude; Angular velocity (3 axes)
Battery: Coin Cell
Connectivity: Bluetooth 4.0
Logging: Yes

Includes:

- Sensor with rubberized case
- Adjustable strap



Order Information

Wireless Acceleration/Altimeter.....PS-3223

AirLink Interface

PS-3200

The AirLink Interface connects PASPORT sensors to a Mac or Windows computer, Chromebook, iPad, tablet, or smartphone via Bluetooth or USB connection. The USB cable is included.

Specifications:

Connectivity: Bluetooth 4.0
Bluetooth Range: 30 m (unobstructed)
Approximate Mass: 59 g

Includes:

- USB cable

Order Information

AirLink Interface PS-3200

Wireless Blood Pressure Sensor with Standard Cuff

PS-3218

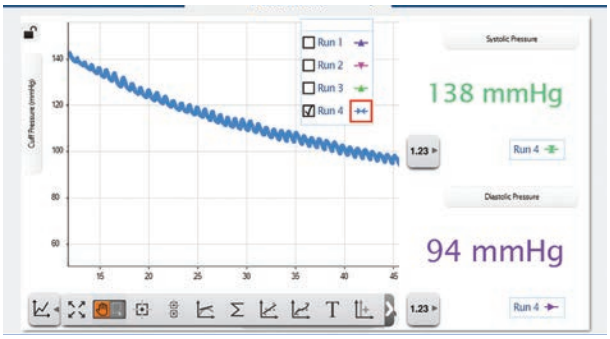
PASCO's Wireless Blood Pressure Sensor allows students to quickly and easily measure both systolic and diastolic arterial blood pressure (mmHg) as well as heart rate (pulse in bpm). Comparing the digits display for systolic and diastolic pressure with the display of blood pressure from the real-time graph helps students gain a contextual understanding of the physiology of blood pressure.

Applications:

- Determine effects of exercise on blood pressure and heart rate
- Compare the blood pressure and heart rate of different students in the class
- Explore effects of body position on blood pressure & heart rate

Specifications:

Heart Rate Range: 36 to 200 bpm
Heart Rate Accuracy: ±1 bpm
Heart Rate Resolution: 1 bpm
Blood Pressure Range: 0 to 375 mmHg
Blood Pressure Accuracy: ±3 mmHg
Blood Pressure Resolution: 0.05 mmHg
Gauge Pressure Units: mmHg, N/m^2, kPa, atm, psi
Gauge Pressure Range: 0 to 375 mmHg
Gauge Pressure Accuracy: ±3 mmHg
Gauge Pressure Resolution: 0.05 mmHg
Logging: No



Order Information

Wireless Blood Pressure Sensor - Standard Cuff ..PS-3218

Wireless CO_2 Sensor

PS-3208

Measure changes in carbon dioxide (CO_2) gas levels quickly and easily with the Wireless CO_2 Sensor. The sensor is temperature compensated and can operate in high humidity environments. It employs live data to make core labs, such as photosynthesis, cellular respiration, and metabolism experiments engaging and impactful. With the ability to store more than 55,000 data points, this sensor enables studies to run overnight or throughout an entire weekend, making it ideal for long-term, carbon cycling investigations. The included 250-ml sample bottle supports analyses with multiple gas sensors.

Features:

- Logging ability for long-term experiments, store up to 55,000 data points
- Integrated stopper for use with included sample bottle and common glassware
- Temperature compensated for accurate results

Demonstrate:

- Respiration in compost or other decomposer rich environments
- Carbohydrate consumption rates due to human activity
- Monitor CO_2 levels during photosynthesis and respiration experiments
- Study carbon cycling in a model ecosystem
- Monitor CO_2 levels for indoor air quality
- Measure carbon flux in aquatic environments with the waterproof sleeve

Specifications:

Range: 0 to 100,000 ppm
Resolution: 2 ppm
Connection: Bluetooth 4.0 or USB
Battery life: ≥18 hours of continuous use
Accuracy: 0 to 1,000 ppm: ±100 ppm, 1,000 to 10,000 ppm: ±5% of reading + 100ppm, 10,000 ppm to 50,000 ppm: ±10% of reading, 50,000 - 100,000 ppm: ±15% of reading
Warm-up time: 3 min
Response time: 90% in 30 sec
Logging: Yes

Order Information

Wireless CO_2 Sensor.....PS-3208

//code.Node

NEW

PS-3231

The //code.Node is a turnkey coding solution that combines real-world sensor inquiry, Blockly coding, and live data displays to drive computational thinking in STEM learning. It includes six interactive sensors and four device outputs that measure and respond to phenomena using code created in SPARKvue or Capstone software.

Specifications:

Light Level Sensor Range: Visible Spectrum (400 nm to 700 nm)
Light Level Sensor Sensitivity: Approximately 600 lx to 50,000 lx
Sound Level Sensor Sensitivity: Approximately 70 dB to 100 dB
Magnetic Field Sensor Range: ±50 gauss
Acceleration Sensor Range: 2-axes, ±8g
Ambient Temperature Range: -25 °C to 40 °C
Ambient Temperature Resolution: 0.05 °C
Ambient Temperature Accuracy: ±1 °C
Maximum Sample Rate: 50 Hz
Momentary Push Buttons (2): On/Off
Speaker Output Frequency Range: 10 Hz to 10,000 Hz
Multi-Color LED: Independently adjust intensity of Red, Green, Blue
Logging: No

Order Information

//code.Node.....PS-3231
//code.Node Holder.....PS-3233
//code.Node Multi-pack (Set of 8).....PS-3311

Wireless Colorimeter & Turbidity Sensor

PS-3215

The Wireless Colorimeter simultaneously measures the absorbance and transmittance of six different wavelengths. The sensor can be used to study Beer's Law (absorbance vs. concentration), enzyme activity, photosynthesis, and the rates of chemical reactions (absorbance vs. time). After a simple calibration, students can quickly begin viewing live measurements as they materialize across the visible spectrum at 650 nm (red), 600 nm (orange), 570 nm (yellow), 550 nm (green), 500 nm (blue), and 450 nm (violet). This sensor also functions as a high-quality turbidimeter for water quality analysis. Rather than simply measuring transmitted light, the Wireless Colorimeter and Turbidity Sensor measures light scattered at a 90 degree angle from the sample, resulting in accurate and repeatable measurements. Additionally, the internal housing for the cuvette is opaque, which limits ambient light interference to preserve accuracy.

Features:

- Stabilized light source for consistent readings
- Measures six different wavelengths simultaneously
- PASCO software displays the absorbance & transmittance at each wavelength in the appropriate color
- Quick and easy calibration
- Functions as both a colorimeter and turbidimeter
- Wireless design enables data collection in the field

Specifications:

Color detection/peak wavelengths: 650 nm (red), 600 nm (orange), 570 nm (yellow), 550 nm (green), 500 nm (blue), 450 nm (violet)

Detector ranges: ±25 nm from peak

Absorbance: 0-3 Abs units; useful range (0.05-1.5 Abs)

Transmittance: 0-100%

Turbidity range: 0-400 NTU

Accuracy: ±5% NTU

Logging: Yes

WARNING! This product can expose you to chemicals including Formaldehyde, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Order Information

Wireless Colorimeter & Turbidity Sensor.....PS-3215

Wireless Conductivity Sensor

PS-3210

The Wireless Conductivity Sensor measures the electrical conductivity of an aqueous solution. It is ideal for investigating the properties of solutions, including total dissolved solids (TDS) for water quality inquiry. Because it is temperature compensated, calibrations are less frequent and can be applied across a range of temperatures. With a range of 0 to 20,000 µS/cm, this sensor can be utilized for chemical, biological, and environmental studies.

Teacher tip: To measure brackish or marine samples above sensor range, perform a 10:1 distilled to salt water solution then multiply sample conductivity x 10.

Features:

- Measure conductivity and total dissolved solids
- Automatic temperature compensation
- Battery life >1 year
- Remote logging with built-in memory
- Dust-proof, sand-proof, and water-resistant (1 meter for 30 minutes)

Specifications:

Range: 0 to 20,000 µS/cm (0 to 10,000 mg/L TDS)

Accuracy from 200 µS/cm to 20,000 µS/cm: ± 10% of value

Resolution: 0.1 µS/cm

Response time: 95% of final reading in 5 seconds or less

Probe Environmental Tolerance (Min-Max): 0-80°C

Temperature Compensation: 0-35°C

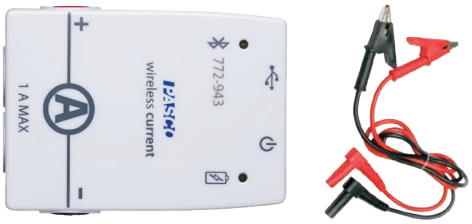
Probe Material: The probe is composed of 300 series stainless steel and glass filled polypropylene

Waterproof: IP-X7 rated (1 m for 30 min)

Logging: Yes

Order Information

Wireless Conductivity Sensor PS-3210



Wireless Current Sensor

PS-3212

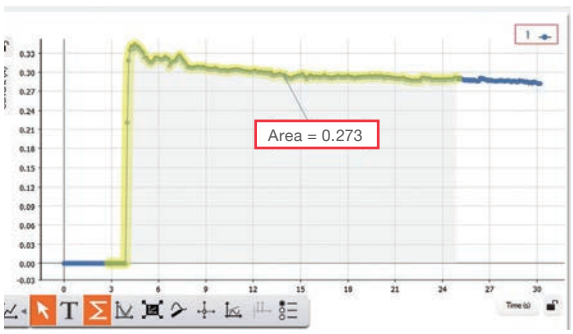
The Wireless Current Sensor's wide current range enables introductory and advanced explorations of electricity and basic circuits. Designed with user safety in mind, the sensor can be used to measure currents up to 1 A and includes built-in overload protection. Collected data can be wirelessly transmitted to computers, Chromebooks, tablets, and smart phones. When combined with a Wireless Voltage Sensor, students can explore Ohm's Law, series and parallel circuits, and much more.

Features:

- **Two Ranges:** ±1.0 A and ±0.1 A
- **Resolution:** 0.2 mA at ±1 A range and 0.02 mA at ±0.1 A range
- Bluetooth® sampling rate of 1.0 kHz
- High-speed sampling via USB
- Remote logging with built-in memory
- Variable sampling rate for recording small, fast changes or experiments that run for hours, days, or weeks

Specifications:

High Setting Range: ±1 A
Low Setting Range: ±0.1 A
Resolution: 0.2mA (±1A range); 0.02mA (±0.1A range)
Maximum Sampling Rate (Bluetooth): 1000 Hz
Maximum Sampling Rate (USB): 100 kHz
Input Resistance: 0.1 Ω
Logging: Yes



Order Information

Wireless Current Sensor PS-3212

Wireless Drop Counter

PS-3214

The Wireless Drop Counter has a wider (18 x 13 mm) drop window for better drop detection and easier alignment with burettes. It works equally well with large or small, fast or slow drops.

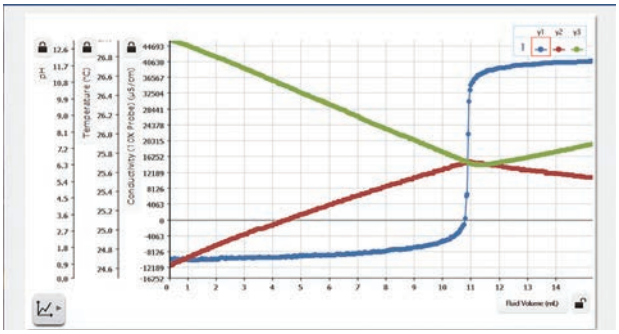
Measures up to 10 drops per second, with drops as small as 0.5 mm.

Teaching Advantage:

- IR filter assures accurate counts because room lighting cannot affect results
- Sensor unit can suspend two other probes in solution, simplifying many experiments
- Wider drop window (18 x 13 mm) means better drop detection and easier alignment with burettes

Specifications:

Maximum Drop Count Rate: 10 drops/second
Exterior Case: ABS Plastic
Optical Window: Acrylic
Logging: Yes



Order Information

Wireless Drop Counter PS-3214

Wireless Exercise Heart Rate Sensor

PS-3207

The Wireless Exercise Heart Rate Sensor has a chest strap and will transmit data wirelessly up to 10 m away! The electrode belt fits around the ribcage (worn against the skin for best results, but can be worn over a shirt if a drop of saline solution is applied under the electrodes). Live and recorded data can be analyzed using any device with PASCO software installed.

Applications:

- Compare a student's heart rate before, during, and after exercise
- Calculate recovery rate after physical activity
- Determine the effects of mild stimulants (e.g. caffeine)
- Investigate how heart rate changes when a student sits, reclines, stands or moves suddenly

Includes:

- Bluetooth Heart Rate Module
- Coin cell battery
- Chest strap (M-XXL)

Logging: Yes

A single data set shows heart rate during and after exertion.

Wireless Force Acceleration Sensor

PS-3202

Capable of simultaneously measuring force, acceleration, and rotational velocity, this sensor is ideal for experiments involving rotating platforms, moving carts, spring oscillations, collisions, and impulse. The wireless design offers improved measurement accuracy by eliminating cords that affect data collection. Students can use the finger-holes for handheld applications, or mount it onto a cart or rod for more complex experiments.

Teaching Advantage:

- Bluetooth Low Energy and simple, one touch in-app pairing
- Long-lasting rechargeable battery
- Zeroing is completed within the software for accurate taring
- Logging mode stores data for force, acceleration, and rotation directly on the sensor for long-term experiments
- Simultaneously measures force and acceleration
- Built-in 3-axis acceleration sensor measures acceleration in x, y, and z-axes, and calculates resultant acceleration
- Built-in gyroscope measures rotation about x, y, and z-axes

Typical Experiments:

- Impulse and momentum
- Determining static and kinetic friction coefficients
- Measuring centripetal acceleration and centripetal force
- Newton's Third Law
- Newton's Second Law
- Hooke's Law
- Acceleration and crash cushions

Specifications:

Force Range: ±50 N
Force Resolution: 0.03 N
Accuracy: 0.1 N
Acceleration Range: ±16 g
Angular Rotation Rate Range: up to ±2000 degrees per second
Battery: Rechargeable Lithium Polymer
Logging: Yes
Connectivity: Bluetooth 4.0

Order Information

Wireless Exercise Heart Rate Sensor.....PS-3207

Order Information

Wireless Force Acceleration Sensor.....PS-3202

Wireless Hand-Grip Heart Rate Sensor

PS-3206

With these wireless hand grips, conducting physiology labs on the cardiovascular system or homeostasis is easier than ever before. Continuously monitor heart rate during exercise, or use the sensor to take initial and final measurements with fast and reliable heart-rate detection.

Applications:

- Determine effects of exercise on heart rate
- Compare the heart rate of different students in the class
- Explore effects of body position on heart rate

Replacement Accessories:

- Replacement Hand Grips PS-3565
- Coin Cell Battery Pack PS-3504
- Wireless Hand-Grip Heart Rate Sensor Storage Tray PS-3597

Includes:

- Hand Grips
- Bluetooth Heart Rate Module
- Coin Cell Battery

Compare students' heartbeats during a variety of activities.

Order Information

Wireless Hand-Grip Heart Rate Sensor PS-3206

Wireless Light Sensor

PS-3213

The Wireless Light Sensor features two separate apertures - one for ambient light measurements and one for directional light measurements. The ambient sensor measures illuminance and UV Index, while the spot (directional) aperture measures light level and color intensity. Our software displays the relative intensities of Red, Green, and Blue light, then sums them to determine the level of White light. The light available to drive photosynthesis (PAR) and total light power per area (irradiance) are also available as calculated measurements within PASCO Capstone (version 1.8 or later) and SPARKvue software (version 2.6 or later).

Features:

- Wirelessly connects to computers, Chromebooks, tablets, and smartphones
- Simply pair and go, no cables or adapters to manage
- On-board memory enables the sensor to function as an independent datalogger
- Variable sampling rate for short, precise experiments or lengthy, multi-day data collection.
- Bluetooth connectivity and long-lasting coin cell battery
- Indirect PAR measurements for biological studies

Specifications:

Spectral Response: 300 nm to 1100 nm
Illuminance Range: 0 to 131,000 lux
Irradiance Range: 0 to 1362 W/m^2
PAR Range: 0 to 2400 µmol/m^2/s
UV Index Range: 0 to 12 (typical in daylight)
RGB and White Light Range: 0 to 100%
Maximum Sample Rate: 2 Hz (ambient); 20 Hz (spot)
Battery: Coin cell
Connectivity: Bluetooth 4.0
Logging: Yes

Order Information

Wireless Light Sensor PS-3213

Wireless Load Cell and Accelerometer

PS-3216

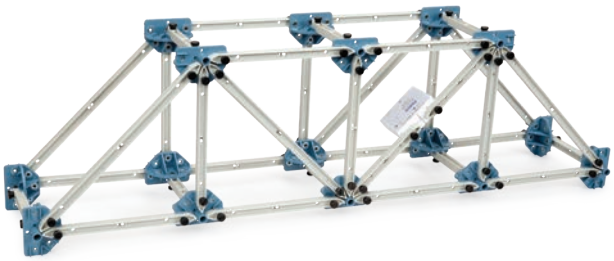
The Wireless Load Cell and Accelerometer is designed to measure loads in all PASCO Structures Systems. It is particularly useful for measuring vibrations because it includes an accelerometer and has no wires to impede movement.

Specifications:

Load Cell Range: ±50 N
Load Cell Resolution: 0.03 N
Load Cell Accuracy: 0.1 N
Load Cell Maximum Sample Rate: 2 kHz
Acceleration Range: ± 16 g (three-axis)
Acceleration Maximum Sample Rate: 500 Hz
Measurements: Force; Acceleration (3 axes and resultant)
Logging: Yes
Battery: Rechargeable Lithium Polymer
Connectivity: Direct USB or via Bluetooth 4.0

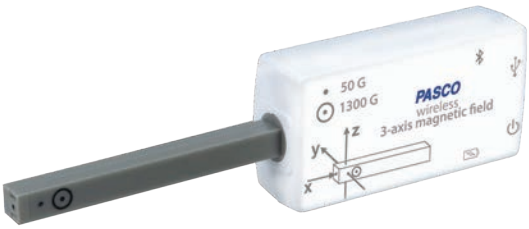
Shown-in-use Accessories:

- Building Better Bridges Kit ME-3581



Order Information

Wireless Load Cell and Accelerometer PS-3216



Wireless Magnetic Field Sensor

PS-3221

This 3-Axis Magnetic Field Sensor can sense the Earth's magnetic field, magnetic fields from current-carrying coils, and permanent magnets. There are two ranges: ±50 gauss and ±1300 gauss. This sensor is primarily for static fields.

Highlights:

- Simultaneous measurements on three axes
- Dual range: ±50 G and ±1300 G
- Sensitive enough to measure the Earth's magnetic field

Measure fields from permanent magnets and current-carrying coils

Specifications:

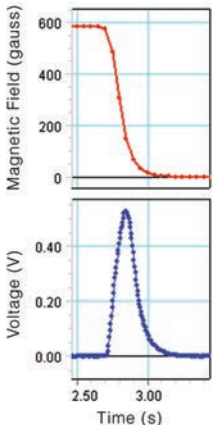
Ranges: ±50 G and ±1300 G
Resolution: ±0.01 G (50 G range); ±1 G (1300 G range)
Maximum Sample Rate: 100 Hz
Measurements: Magnetic Field Strength (3 axes and resultant)
Logging: Yes
Battery: Rechargeable Lithium Polymer
Connectivity: Direct USB or via Bluetooth 4.0

Applications:

- Measure magnetic field of permanent magnets
- Measure Earth's magnetic field
- Measure field strength of Helmholtz coils

Includes:

- 3-Axis Magnetic Field Sensor
- Sensor Mounting Rod
- USB Charging Cable



Order Information

Wireless Magnetic Field Sensor PS-3221

Wireless Motion Sensor

PS-3219

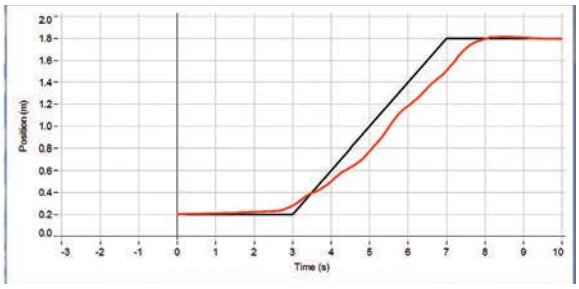
The Wireless Motion Sensor connects via Bluetooth or USB to your device, and uses ultrasound to measure the position, velocity, and acceleration of objects. This enables students to take turns measuring themselves, while the class observes their motion materializing as a graph in real time. The sensor can detect objects ranging from 15 cm to 4.0 m away, and without cables to get in the way, students can explore handheld and ceiling-mounted applications.

Features:

- Measures position, velocity, and acceleration
- False Target Rejection Technology produces cleaner data
- Clips directly to PASCO Dynamics Tracks
- Rod clamp for mounting
- 180° pivoting head
- Rechargeable Lithium-ion battery
- Bluetooth® or USB connectivity

Specifications:

Range: 0.15 to 4 m
Resolution: 1 mm
Maximum Sample Rate: 100 Hz
Transducer Rotation Range: 180°
Battery: Rechargeable Lithium-polymer
Connectivity: Direct USB or via Bluetooth (Bluetooth 4.0)
Logging: Yes



Order Information

Wireless Motion Sensor PS-3219

Wireless Oxygen Gas Sensor

PS-3217

The Wireless Oxygen Gas Sensor measures gaseous O_2 concentration as well as humidity and air temperature for a range of biology, environmental science, and physiology activities.

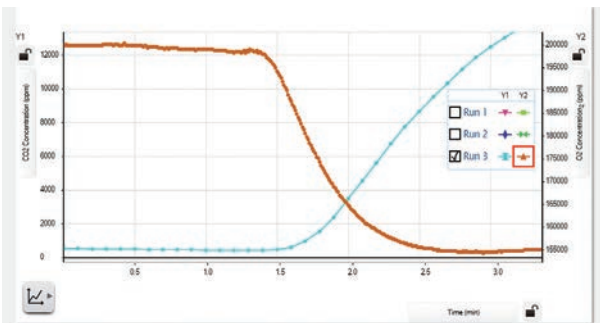
The Wireless Oxygen Gas Sensor is accurate and easy to use, making it the perfect sensor to study photosynthesis, respiration, and oxygen cycling in the environment. With remote logging, experiments can go beyond the lab period and easily give students hours or days of data for analysis. The Wireless Oxygen Gas Sensor also contains sensors to measure ambient temperature and humidity as well as oxygen gas levels.

Features:

- Bluetooth® and USB connectivity
- 0-100% Oxygen gas concentration
- ±1% Oxygen at constant temperature and pressure
- Also reports ambient temperature and humidity
- 2-3 year operating life with replaceable sensing element

Specifications:

Range: 0 to 100 % O_2 concentration; 0 to 1,000,000 ppm
Resolution: 0.01% oxygen
Repeatability: 0.5% oxygen
Accuracy: ±1% O_2 at constant temp and pressure; ±5% O_2 outside operating range
Operating Temps: 0 - 40 °C
Relative Humidity Range: 0 - 100% non condensing
Sensing Element Lifespan: 2+ years
Logging: Yes



Order Information

Wireless Oxygen Gas Sensor.....PS-3217

Wireless Optical Dissolved Oxygen Sensor

PS-3224

The Wireless Optical Dissolved Oxygen (ODO) Sensor is ideal for monitoring DO_2 in the lab or field. The Wireless Optical DO Sensor contains three different sensors. In addition to the dissolved oxygen sensor, it also includes sensors for measuring atmospheric pressure and water temperature. The optical technology is accurate, fast, and does not require stirring, filling solutions, warm-up, or frequent calibration. When equipped with the included cover, the sensor has a waterproof design and is submersible to a depth of 10 m.

A PASCO exclusive feature allows you to log data using the sensor's built-in memory. After collecting data for hours or even days, simply connect the sensor to your device and you're ready to download your data. With this powerful sensor, educators can explore day and night nutrient cycles, changes in metabolic processes, seasonal changes in water quality, and more.

Applications:

- Teaching field sampling techniques
- Exploring how temperature influences dissolved oxygen concentrations
- Measuring net primary productivity
- Modeling ecosystems
- Monitoring water quality and investigating watersheds
- Investigating photosynthesis and cellular respiration in aquatic environments

Specifications:

Dissolved Oxygen Range: 0 to 20 mg/L, 0 to 300% saturation
Accuracy - with user calibration: ±0.2 mg/L or 1% (whichever is greater)
Accuracy - out of the box: ±0.5 mg/L or 3% (whichever is greater)
Response Time: 90% in 45 sec
Measurements: Concentration (mg/L), Saturation (%), O_2 Gas (in air, qualitative) (%), Temperature (°C)
Waterproof Depth: 10 m (30 ft)
Logging: Yes

Wireless pH Sensor

PS-3204

The Wireless pH Sensor is a must-have for any chemistry, biology, or environmental science course. Equally capable in the lab or field, the sensor eliminates the hassle of cables, reducing spills and improving safety. Plus, it rarely requires charging; the sensor's coin cell battery lasts for 2-3 years in most labs and costs about one dollar to replace. It can transmit data in real time, or store data for days when continuous monitoring is required. The Wireless pH Sensor enhances countless activities, including acid-base titrations, investigations into household chemicals, analyses of chemical reactions, water quality studies, and much more.

Features:

- Simply pair and go, no cables or interfaces to manage
- Compatible with ion-selective electrodes (ISE) and the oxidation reduction probe (ORP)
- Features Bluetooth® wireless connectivity and a long-lasting coin cell battery
- Logs pH data directly onto the sensor for long-term experiments
- Wireless connection to SPARKvue and Capstone for intuitive analysis and lab reports

Perform These Experiments:

- Monitor pH during chemical reactions
- Investigate household chemicals
- Explore acid-base titrations
- Investigate the chemistry of buffers
- Measure pH for water quality studies

Specifications:

Range: 0-14 pH
Resolution: 0.02 pH
Accuracy: ±0.1 pH with calibration
Connectivity: Bluetooth 4.0
Temperature Range: 5°C to 60°C
Logging: Yes

Order Information

Wireless Optical Dissolved Oxygen Sensor.....PS-3224

Order Information

Wireless pH Sensor.....PS-3204

Polarimeter

PS-3237

PASCO's Polarimeter has both Bluetooth® and USB connectivity, so it works on your iPad®, Chromebook™, tablets, and computers. It is ideal for introductory Organic and Biochemistry experiments with chiral compounds.

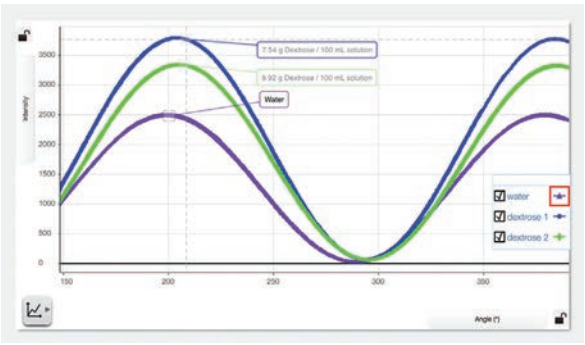
Polarimeters pass plane polarized light through a sample, which contains a chiral compound, and then through an analyzer and a detector. The degree of optical rotation of the plane polarized light is based on the concentration of sample present.

Applications:

- Determine the concentration of a sugar solution based on the optical rotation of plane polarized light.
- Explore simple sugar families by assigning unknowns and having students determine which family they have.
- Differentiate between common chiral and non-chiral compounds.
- Calculate a racemic mixture's purity.

Specifications:

Connectivity: Bluetooth and USB
LED light source: 589 nm
Optical Rotation Accuracy: ±0.09°
Cell Length (horizontal): 101 mm ± 0.6 mm
Logging: No



Optical rotation of sucrose

Order Information

Polarimeter PS-3237

Wireless Pressure Sensor

PS-3203

The Wireless Pressure Sensor allows students to easily collect accurate gas pressure data for a wide range of applications. Included is a 60-cc syringe, tubing, and connectors that facilitate experiments such as Boyle's Law, measuring pinch-grip strength and measuring hydrostatic pressure in water. Within PASCO's software, students can easily select their desired units from a list containing kPa, mmHg, inHg, mbar, psi, atm, and torr.

Features:

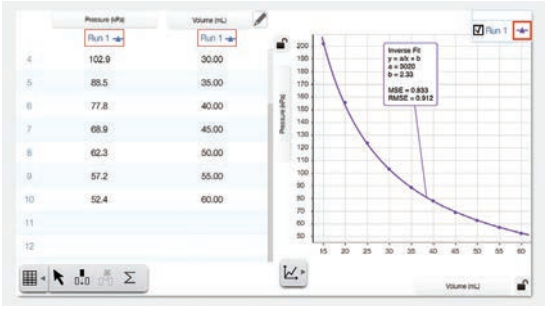
- Measures pressure even when the pressure within the system drops below ambient pressure.
- Supports common units (kPa, atm, psi, mmHg, or N/m^2) for many applications.
- Features Bluetooth® wireless connectivity and long-lasting rechargeable battery.

Perform These Experiments:

- Study Boyle's Law and Charles' Law
- Investigate pinch-grip strength and muscle fatigue
- Monitor plant transpiration when setup as a potometer
- Study enzyme reactions using hydrogen peroxide and catalase

Specifications:

Range: 0-400 kPa
Resolution: 0.1 kPa
Accuracy: ±2 kPa
Max sample rate: 1000 Hz
Connectivity: Bluetooth 4.0
Logging: Yes



Order Information

Wireless Pressure Sensor PS-3203

Wireless Rotary Motion Sensor

PS-3220

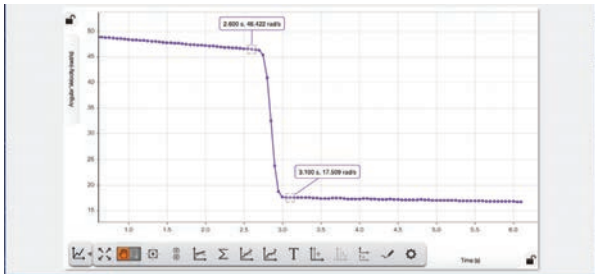
The Wireless Rotary Motion Sensor measures angle, angular velocity, and angular acceleration, as well as their linear equivalents. The included three-step pulley allows different torques to be applied, rotating a rigid system at different rates of acceleration. The included rod-mounting holes let you orient the sensor for different experiments. The Wireless Rotary Motion Sensor connects directly to your devices via Bluetooth or USB.

Applications:

- Conservation of Angular Momentum
- Rotational Inertia
- Centripetal Acceleration
- Torque

Specifications:

Angle resolution: 0.18° (0.00314 radian)
Linear resolution: 0.0157 mm (with 5 mm pulley radius)
Three-step pulley: 10, 29, and 48 mm diameter
Shaft diameter: 6.35 mm
Maximum rotation rate: 30 revolutions per second
Optical encoder: 2000 divisions/rev, bidirectional
Rechargeable battery: Lithium polymer
Connectivity: Direct USB or via Bluetooth 4.0
Logging: Yes



Show that angular momentum is conserved: The Wireless Rotary Motion Sensor records the angular velocity as a ring is dropped on a spinning disk.

Order Information

Wireless Rotary Motion Sensor PS-3220

Wireless Smart Gate

PS-3225

The Wireless Smart Gate has all the features of the wired Smart Gate. It has dual photogate beams spaced at 1.5 cm to accurately measure speed and velocity. The built-in laser switch (when used with any laser) allows you to time objects too large to fit through the arms of the Smart Gate. The integrated slot on the arm of the Smart Gate receives photogate tape that also helps measure the movement of larger and faster objects, like model rockets. The auxiliary port is for adding an additional photogate head or Time-of-Flight Accessory.

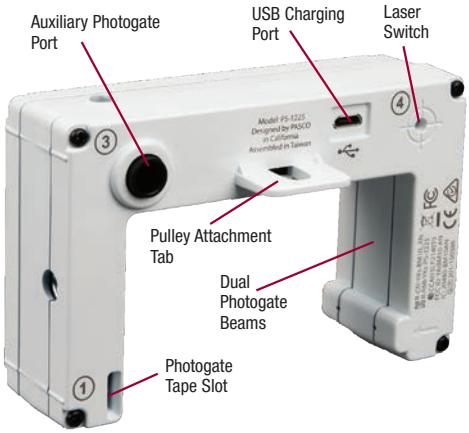
We do not recommend using two Wireless Smart Gates in the same experiment unless the measured times are relatively long (greater than one-half second) since synchronization is limited to 2 ms.

Highlights:

- Dual photogate beams
- Laser switch
- Photogate tape slot
- Auxiliary photogate/Time-of-Flight port
- USB and Bluetooth®
- Rechargeable

Specifications:

Battery: Rechargeable Lithium Polymer
Connectivity: Direct USB or via Bluetooth 4.0
Logging: No



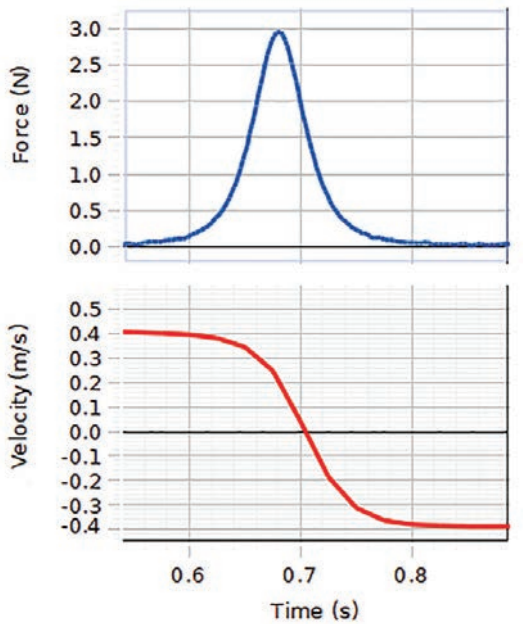
Order Information

Wireless Smart Gate PS-3225

Smart Cart (Red & Blue)

ME-1240/ME-1241

The patented Smart Cart is the ultimate tool for studying kinematics, dynamics, Newton's Laws, and more. It is based on a durable ABS body with nearly frictionless wheels, just like our high quality PAScars. Now, we've added built-in sensors that measure force, position, velocity, and acceleration. The versatile Smart Cart can collect measurements on or off a track and transmit the data wirelessly over Bluetooth. In essence, it is a wireless dynamics cart that combines all the necessary sensors, without requiring any additional hardware.



The graphs show the impulse experienced and the change in velocity created by a collision between two Wireless Smart Carts.

Features:

- Built-in ±100 N force sensor
- 3-axis accelerometer
- Bluetooth® connectivity
- Rechargeable battery
- Motion encoder measures position and velocity on or off the track
- Magnetic bumper for force sensor
- 3-position plunger
- Mass tray
- Velcro® tabs
- Force sensor hook and rubber bumper

Specifications:

Force Range: ±100 N
Force Resolution: 0.1 N
Force Accuracy: ±1.0%
Force Maximum Sampling Rate: 2.0 kHz
Position Resolution: ±0.2 mm
Max Velocity: ±3.0 m/s
Velocity Max Sample Rate: 500 Hz
Acceleration Range: ±16 g
Acceleration Max Sample Rate: 500 samples/second
Max Rotational Speed Sampling Rate: 500 samples/second
Max Wireless Range: 30 m (unobstructed)
Maximum Measurable Rotation Rate (Gyro): ±245 deg/second
Mass Without Accessories: 245 g
Patent No.: 10481173
Magnetic Bumper Mass: 23.6 g
Logging: No

Smart Cart Charging Garage

ME-1243

Charge up to five Smart Carts at once. Provides storage for the carts and accessory bumpers. Includes power adapter.

Order Information

Smart Cart (Red) ME-1240
Smart Cart (Blue) ME-1241
Smart Cart Charging Garage ME-1243

Smart Cart Demonstration Kits

ME-1272 (Red)/ME-1273 (Blue)

The Red & Blue Smart Cart Demonstration Kits come with a Smart Cart and all the accessories you need to perform amazing physics demonstrations in kinematics and dynamics.

Features:

- Smart Cart (red or blue)
- Smart Fan Accessory
- Two 250-g Cart Masses
- Smart Cart Rod Stand Adapter
- Ballistic Cart Accessory
- Smart Cart Vector Display
- Sail
- Gratnells Case
- Demonstration Manual

Order Information

Red Smart Cart Demonstration Kit ME-1272

Blue Smart Cart Demonstration Kit.....ME-1273

Wireless Sound Sensor

PS-3227

The PS-3227 Wireless Sound Sensor is two sensors in one wireless package: a sound wave sensor capable of measuring relative changes in sound pressure level as a function of time, and a sound level sensor with both dBA and dBC-weighted scales.

Sound Wave Sensor: The Sound Wave Sensor measures relative changes in sound pressure level as sound waves are incident on the sensor. With graphs of the sound wave measurement versus time, students can explore and analyze wave properties like wave shape, wave speed, amplitude, frequency, wavelength, and much more. Students can use this sensor to explore superposition of waves and beat frequencies, while also exploring standing wave harmonics, and the presence of overtones.

Sound Level Sensor: The Sound Level Sensor gives you true sound level (intensity) measurements with both dBA and dBC scales. The dBC weighting scale measures the intensity of sounds in a wide range of frequencies within, and outside the frequency range of human hearing. The dBA weighting scale filters some of the sound frequencies from a sound source to more closely match the frequency response of the human ear. This new sensor gives you a wireless solution to measure sound level with all the capability of a sound level meter, but adds the flexibility of recording data continuously as a function of time.

Features:

- Wireless and portable
- Wirelessly measure sound wave data at high sample rates (100 kHz)
- Two sound sensors in one (sound wave and sound level)
- High quality sensing element intended specifically for laboratory experiments
- Connects seamlessly to Scope and FFT displays in both SPARKvue and PASCO Capstone software
- Threaded 1/4-20 socket for easy mounting and alignment/ positioning

Specifications:

Microphone Frequency Range: 100 – 15,000 Hz
Sound Wave Maximum Sampling Rate: 100 kHz
Sound Level Range: 50 - 110 dB
Accuracy: ±2 dB
Response: A or C weighted
Logging: Yes

Order Information

Wireless Sound Sensor PS-3227

SPARK LXi Datalogger

PS-3600A

The SPARK LXi Datalogger is a Bluetooth, handheld datalogger that enables students to connect wired and wireless sensors, collect data, generate graphs, and analyze results. It is durable, splash-proof, and works seamlessly with PASCO sensors. The SPARK LXi can simultaneously accommodate up to five wireless sensors, includes two ports for PASPORT sensors, as well as two ports for the included Fast Response Temperature Probe and Voltage Probe. It can be used with PASCO Wireless sensors, PASPORT sensors, SPARKlink® Air, and the 550 Universal Interface.

Built for Student Use:

- Portable
- Shock-absorbing case
- 8” Color Capacitive Touchscreen (1280 x 800 pixels)
- 1.4 GHz Quad Core Processor, 2.0 GB RAM, 16 GB Memory
- Voltage and temperature sensor ports with included probes
- Speakers, microphone, and two cameras
- GPS and accelerometer
- Wi-Fi enabled
- Wireless sensors and Smart Carts connect via Bluetooth®
- AirLink, SPARKlink Air, or 550 Universal Interface via USB or Bluetooth
- Two PASPORT sensor ports
- **Loaded with PASCO software:** SPARKvue® for data collection and analysis, MatchGraph!, and Spectrometry
- **Loaded with third-party software:** Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Scientific Calculator, Periodic Table, and Google Science Journal*.

* LXi model PS-3600A does not include the Lab Manager application

Specifications:

CPU: Quad Core, 1.4 GHz
Screen: 8.00” color capacitive touchscreen, 1280 x 800 px; 16:10 aspect ratio
Memory: 16 GB Internal, 2.0 GB RAM
Camera: 8.0 MP back camera, 5.0 MP front camera
WiFi: 802.11
Bluetooth: 4.2
PASPORT Sensor Ports: 2
Built-In Sensors: Voltage port w/probe, Temperature port w/Fast Response Temp probe, Accelerometer, Microphone, GPS

Front view of the SPARK LXi

Rear view of the SPARK LXi

The SPARK LXi features two PASPORT ports as well as ports for the included temperature and voltage probes.

Order Information

SPARK LXi Datalogger.....PS-3600A

SPARKlink Air Interface

PS-2011

The SPARKlink® Air allows students and teachers to connect any of our 70+ PASPORT sensors to their device via USB or Bluetooth®. This device allows students to collect data using a desktop or laptop running SPARKvue or PASCO Capstone software, or with a Bluetooth iOS or Android device running the SPARKvue app.

Features:

- Includes a Fast Response Temperature Sensor and Voltage Sensor
- Connects via Bluetooth to Mac, Windows, iOS, and Android devices. (Bluetooth not supported on Chromebooks)
- Connects via USB to Mac or Windows computers and Chromebooks
- Rechargeable battery provides 4 to 6 hours of continuous data collection between charges
- Mobile design allows students to explore science inside and outside the classroom

Includes:

- AC Adapter
- USB Cable
- Fast Response Temperature Probe
- Voltage Probe

Specifications:

Interface Type: USB or Bluetooth 2.0 (classic)
Ports: 4 (2 PASPORT, 1 Voltage, 1 Temperature)

Order Information

SPARKlink Air Interface PS-2011

Wireless Spectrometer (VIS)

PS-2600

The Wireless Spectrometer from PASCO is specifically designed for modern chemistry, biology, and physics labs. With Bluetooth and USB connectivity, students can quickly connect from their device or computer using the free PASCO Spectrometry Software. With this affordable spectrometer, students can gather a full spectrum of data in under one second. After specifying a target wavelength, students can study concentrations (Beer's Law), rates of reactions, or investigate emission spectra using the optional fiber optic cable.

Applications:

- Photosynthesis with DPIP
- Absorption spectra of plant pigments
- Concentration of proteins in solution
- Rate of an enzyme-catalyzed reaction
- Growth of a cell culture
- Absorption spectrum of chlorophyll
- Emission spectra of light from flame tests or other sources
- Easily identify peak wavelengths for concentration data
- Study the relationship between concentration and absorbance (Beer's Law)
- Reaction Kinetics

Specifications:

Resolution: 2–3 nm FWHM
Detection Range: 380–950 nm
Fluorescence Excitation Wavelengths: 405 nm and 500 nm
Light Source: LED-boosted tungsten
Connectivity: USB or Bluetooth 2.0 (classic)
Logging: No

Order Information

Wireless Spectrometer (VIS).....PS-2600

Wireless Temperature Sensor Link

PS-3222

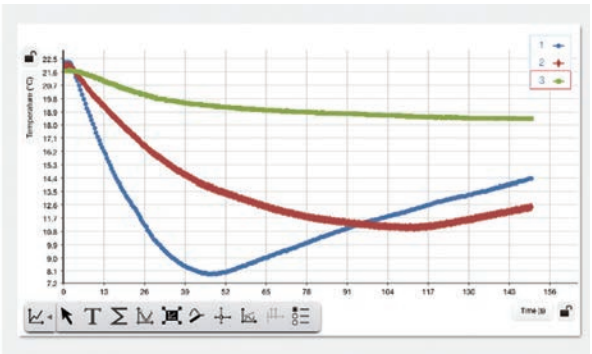
The Wireless Temperature Sensor Link enables wireless connection for any PASCO temperature probe with a 3.5-mm connection. The link comes with a Fast Response Temperature Probe, but it can also connect to the Stainless Steel Temperature Probe, Skin/Surface Temperature Probe, the Absolute Zero Sphere, and the Ideal Gas Law Apparatus.

Specifications:

Battery life: >1 year
Compatible Temperature Probes: Skin/Surface (PS-2131); Fast Response (PS-2135); Stainless Steel (PS-2153)
Range with Included Probe: -30°C to 105°C
Jack: 3.5 mm stereo
Connectivity: Bluetooth 4.0
Logging: Yes

Includes:

- Fast Response Temperature Probe



Wireless Temperature Sensor

PS-3201

Welcome to the modern thermometer. The Wireless Temperature Sensor transmits live data and allows students to continuously monitor, log, and plot temperature measurements on nearly any device. When lab-time ends but the experiment continues, students can set the sensor to log data autonomously for days, weeks, or months, then download it for analysis later. This durable, wireless sensor features a stainless steel probe for the most demanding of applications, as well as a battery that lasts over a year*. It can be used in a wide array of experiments and activities because it measures small, but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

Features:

- Simply pair and go, no cables or adapters to manage
- Variable sampling rate for capturing small, fast changes or experiments that run for hours, days, or weeks
- Bluetooth® connectivity and long-lasting coin cell battery
- Logs temperature data directly onto the sensor for long-term experiments
- Dust, dirt, and sand-proof and water resistant (IP-X7 certified)

Perform These Experiments:

- Explore freezing and melting points
- Study endothermic and exothermic reactions
- Measure the energy content of food
- Monitor environmental conditions and water quality
- Observe intermolecular forces and evaporative cooling

Specifications:

Range: -40°C to 125°C
Resolution: 0.01°C
Accuracy: 0.5°C
Connectivity: Bluetooth 4.0
Logging: Yes

Order Information

Wireless Temperature Sensor Link.....PS-3222

Order Information

Wireless Temperature Sensor.....PS-3201

Wireless Voltage Sensor

PS-3211

The Wireless Voltage Sensor is ideal for exploring the fundamental concepts of electricity, voltage, and basic circuits. It measures voltages up to ±15 V with built-in overload protection, and features high-speed sampling rates when used with a USB connection. When combined with the Wireless Current Sensor, students can use it to explore Ohm's Law, circuits in series and parallel, and much more.

Features:

- **Two Ranges:** ±15 V, ±5 V
- **Resolution:** 7 mV (±15 V range); 2 mV (±5 V range)
- Bluetooth® sampling rate of 1 kHz
- Higher speed sampling via USB

Includes:

- Wireless Voltage Sensor
- USB Cable
- Red, Banana-to-alligator-clip
- Black, Banana-to-alligator-clip

Specifications:

Low Setting Range: ±5 V
High Setting Range: ±15 V
Resolution: 2 mV (±5 V range); 7 mV (±15 V range)
Accuracy: ±1.0%
Maximum Sampling Rate (Bluetooth): 1000 Hz
Maximum Sampling Rate (USB): 100 kHz
Product Input Resistance: >1.0 MΩ
Logging: Yes

Order Information

Wireless Voltage Sensor.....PS-3211

Wireless Weather Sensor with GPS

PS-3209

The Wireless Weather Sensor is an all-in-one instrument for monitoring complex environmental conditions. It houses several sensing elements within a single unit to provide 19 different measurements. Use the sensor in logging mode with the Weather Vane Accessory for long-term monitoring, or use it as a handheld instrument to study microclimates and record ambient conditions relevant to environmental phenomena. You can wirelessly export data to your device for classroom analysis and group activities that are constrained by time. With the built-in GPS, you can collect location data for student investigations and analyze it on the map display, powered by ESRI ArcGIS, within SPARKvue software.

Specifications:

Water-Resistance: Splash proof and designed to withstand elements
Barometric Pressure Range: 225 to 825 mmHg
Barometric Pressure Accuracy: ± 0.1 mmHg
Barometric Pressure Resolution: 0.02 mmHg
Ambient Temperature Range: -40 to 125°C
Ambient Temperature Accuracy: ±0.2°C
Ambient Temperature Resolution: 0.1°C
Wind Speed Range: 0.5 to 15 m/s (winds of up to ~ 33 mph)
Wind Speed Accuracy: 3% of reading
Wind Speed Resolution: 0.1 m/s
Relative Humidity Range: 0 - 100%
Relative Humidity Accuracy: ±2%
Relative Humidity Resolution: 0.1%
Illuminance (Light Level) Range: 0 to 130,000 lux
PAR Range (Based on Solar Radiance): 0 to 2400 µmol/m^2/s
Irradiance Range (Based on Solar Radiance): 0 to 1362 W/m^2
UV Index Range: 1 to 12
UV Index Accuracy: ±1
UV Index Resolution: 1
Altitude (via GPS) Range: 0 to 18,000 m
Altitude (via GPS) Accuracy: 2.5 (50% CEP)
Altitude (via GPS) Resolution: 0.5 m
Speed (via GPS) Range: 0 to 515 m/s
Speed (via GPS) Accuracy: 0.05 m/s
Speed (via GPS) Resolution: 0.05 m/s
Operating Environment (Temperature): - 20 to 150°C
Operating Environment (Max Wind Speed): 65 mph
GPS Channels: 66
GPS Warm Up Time: 35 seconds or less
UV Index Range: 1 to 12
Logging: Yes

Order Information

Wireless Weather Sensor with GPS PS-3209

Sensor & Interface Index

AirLink Interface

PS-3200

The AirLink Interface connects PASPORT sensors to a Mac or Windows computer, Chromebook, iPad, tablet, or smartphone via Bluetooth or USB connection. The USB cable is included.

Specifications:

Bluetooth: 4.0
Bluetooth Range: 30 m (unobstructed)
Approximate Mass: 59 g

Includes:

- USB cable

Order Information

AirLink Interface PS-3200

PASPORT Breath Rate Sensor

PS-2187

The Breath Rate Sensor measures breath rate by sensing the pressure change within a standard, disposable dust mask. It generates consistently stable output, even when used during exercise. The sensor's tubing connects to the disposable pressure clips that fasten to the sides of the mask.

Two modes:

- One reading every breath
- Running average over last four breaths

Replacement Accessories:

- Breath Rate Sensor Disposable Masks (10 pack) PS-2567
- Breath Rate Sensor Clips (10 pack) PS-2568

Includes:

- Sensor with Tubing
- Pressure Clips
- Masks

How It Works:

The Breath Rate Sensor measures breathing rate before, during, and after exercise. Measurements are digitally sent to a computer or datalogger, where they're displayed and recorded for analysis. The sensor detects each breath by monitoring changes in air pressure within a mask worn by the subject. It measures the time between exhalations to determine breath rate. This sensor outputs measurements for breath rate and average breath rate.

Highlights:

- Works while exercising

PASPORT Charge Sensor

PS-2132

The Charge Sensor is designed for experiments in electrostatics such as inductive charging, charge production/distribution, and charge on a capacitor. The sensor features automatic scaling, eliminating the need for a gain switch. Designed with highly efficient input over-voltage protection, the Charge Sensor is virtually "blow-out" proof and will provide many years of use in the student lab.

When used with the Faraday Ice Pail, the Charge Sensor can measure the total charge on an object by the induction method.

The Charge Sensor can also be used as a high impedance voltmeter (10^{12} Ω). It includes a 0.9 m shielded cable with alligator clips to eliminate stray fields.

Features:

- Measures both charge and voltage
- No guessing if a charge is positive or negative – the polarity is shown
- Includes a 0.9 m shielded cable with alligator clips to eliminate stray fields for quick experiment setup

Specifications:

Charge Range: ±0.1 µC
Voltage Range: ±10 V
Input Resistance: 10^{12} Ω
Maximum Input Voltage: 150 V
Maximum Sample Rate: 100 Hz
Input Connector: BNC
Input Cable: 0.9 m length; shielded with alligator termination

PASPORT Displacement Sensor

PS-2204

The Displacement Sensor measures the travel of a spring-loaded indicator as a bridge is loaded with weight. The PASPORT Sensor plugs into the Digital Indicator, which includes its own digital LED readout and can be used as a standalone device. To record your data, simply plug the PASPORT sensor into an interface.

Features:

- Digital Gauge includes LED display with live readings
- Data can be downloaded from the PASPORT Sensor using an interface
- Digital Indicator can be used as a standalone device

Includes:

- Sensor
- Bracket
- Dial Gauge

Specifications:

Maximum Travel: 10 mm
Maximum Sample Rate: 5 Hz
Resolution: 0.013 mm (0.0005 in)

Order Information

PASPORT Breath Rate Sensor PS-2187

Order Information

PASPORT Charge Sensor PS-2132

Order Information

PASPORT Displacement Sensor PS-2204

PASPORT EKG Sensor

PS-2111

The EKG Sensor measures electrical signals produced by the heart. As cardiac muscle depolarization and repolarization occur, the EKG trace graphically illustrates the beating of the heart. The sensor comes with 100 self-adhesive conductive patches that are easily removed from the skin after use.

Features:

- Standard three-electrode design
- Easy-to-use, disposable stick-on electrodes
- No messy gel required
- Great for stimulus response reflex studies

Applications:

- Generate a personal EKG graph
- Compare EKG graphs before and after mild exercise

Replacement Accessories:

- EKG Sensor Electrode Patches CI-6620

Includes:

- 100 self-adhesive disposable electrode patches

Specifications:

Waveform Voltage: 0 to 4.5 mV
Waveform Resolution: 4.5 µV
Waveform Sample Rate: 50 to 200 samples per second (sps)
Waveform Default Sample Rate: 200 sps
Heart Rate (Beats) Range: 47 to 250 beats per minute (bpm)
Heart Rate (Beats) Resolution: 1 bpm

PASPORT Ethanol Sensor

PS-2194

The PASPORT Ethanol Sensor measures the concentration of gaseous ethanol up to 3%. In biology and environmental science labs, students can learn about anaerobic respiration by measuring the production of ethanol by bacterial or yeast fermentation. Physics and chemistry students can begin to explore combustion and thermodynamics. Connect your students to the study of respiration and alternative energy sources with the PASPORT Ethanol Sensor.

Note: This is a gas sensor - it should not be submerged into liquids. If exposed to gases with ethanol concentrations above the recommended maximum of 3% the sensor element will be depleted.

Applications:

- Monitor yeast activity by monitoring ethanol production at different temperatures, with different concentrations of sugar, or with different types of sugars.

Includes:

- Probe
- Sensor electronics amplifier
- PTFE tape for membranes

Specifications:

Accuracy: 20% of reading
Range: 0% to 3% gaseous ethanol

PASPORT Flow Rate/ Temperature Sensor

PS-2130

PASCO's Flow Rate Sensor allows students to measure the temperature and the rate of movement of streams, rivers, and other flowing systems. The propeller is a rugged, single-piece unit encased by protective material, so you'll never have to worry about losing pieces at the bottom of the stream.

Features:

- Telescoping handle reaches deep levels
- Revolutions of a magnet on the submersible impeller are counted and converted to linear flow rate measurements in ft/s or m/s
- Students can use Capstone or SPARKvue software to calculate volume discharge rates.
- Exclusive built-in temperature sensor conveniently measures temperature at the same point as flow rate

Specifications:

Flow Range: 0 m/s to 3.5 m/s
Accuracy: 0.1 ft/s
Pulse Frequency: 8.62 pulse/linear foot
Unit options: meter/sec; feet/sec; total pulses
Probe Length: 3 to 7 ft. with telescoping tube (Probe is 7 ft when fully expanded)
Temperature Range: -10°C to 50°C
Maximum Length: 1.8 m (6 feet)
Maximum Sample Rate: 20 Hz

Order Information

PASPORT
EKG Sensor.....PS-2111

Order Information

PASPORT
Ethanol Sensor PS-2194

Order Information

PASPORT Flow Rate/
Temperature Sensor PS-2130

PASPORT Force Sensor

PS-2104

The study of force is critical to many science explorations. This accurate and rugged sensor will ensure your students get the most out of their force experiments. Pull and push forces up to ±50 N are measured in one dimension. A simple ZERO button on the top of the sensor enables quick and easy restarts, eliminating the need for confusing data manipulations. The sensor includes an overload stop in the force beam and a polycarbonate, plastic case to protect it from damage. Finger holes are provided for handheld use, but the sensor can also be mounted directly to a PASCO Dynamics Cart or a 0.5" rod stand.

Looking for a wireless option? Check out our Wireless Force Acceleration Sensor (PS-3202).

Features:

- Easy to zero
- Force overload protection
- Includes a receiver and thumbscrew for mounting the sensor to a rod stand
- High speed sampling for data associated with collisions
- Minimized side-force measurements
- Mounts to the top of PASCO dynamics carts

Specifications:

Range: ±50 N

Resolution: 0.03 N

Zero (Tare) Function: Push-button

Max Sample Rate: 1000 Hz; 5000 Hz with the 550 and 850 interfaces

Force Overload Protection: Up to 75 N without damage

PASPORT High Resolution Force Sensor

PS-2189

The PASPORT High Resolution Force Sensor offers higher resolution than the PS-2104. It features a variable over-sampling rate that reduces measurement noise at lower sampling rates. The digital design minimizes drift, ensuring that the tare holds for hours. You can use this force sensor as a pan balance for long-term experiments, such as investigating the evaporation of liquids, like alcohol or liquid nitrogen, and the sublimation of dry ice.

Features:

- 0.002 N resolution
- Dynamic over-sampling
- Force overload protection up to 75 N
- Includes a receiver and thumbscrew for mounting
- Mounts to PASCO dynamics carts

Includes:

- Bumper Attachment
- Hook Attachment
- Bracket Thumbscrew
- Rod Clamp Thumbscrew

Specifications:

Range: ±50 N

Measurement Resolution: 0.002 N

Zero (Tare) Function: Push-button

Max Sample Rate: 1000 Hz; 5000 Hz with the 550 and 850 interfaces

Force Overload Protection: Up to 75 N

PASPORT Force Platform

PS-2141

The sturdy, glass-filled nylon platform is supported by four force beams that measure the total force acting on the platform. You can use the Force Platform to measure the static weight of a structure or person, as well as the dynamic, vertical force created when moving or jumping. The platform can be placed on a floor or tabletop to measure vertical force, and mounted to a wall to measure horizontal force.

Features:

- Large enough for jumping and standing
- Rugged design
- Force Overload Protection

Applications:

- Determine hang time
- Measure Impulse
- Measure max Force

Specifications:

Range: -1100 N to +4400 N

Force Overload Protection: up to 6600 N (1500 lb, 1700 N or 375 lb per beam)

Platform Size: 35 cm x 35 cm

Zero (Tare) Function: Push-button

Max Sample Rate: 1000 Hz (2000 Hz with the 850 Interface)

Resolution: 0.1 N

Mass: 4 kg (without handles)

Order Information

PASPORT
Force Sensor PS-2104

Order Information

PASPORT High Resolution
Force Sensor PS-2189

Order Information

PASPORT
Force Platform PS-2141

PASPORT 2-Axis Force Platform

PS-2142

The 2-axis Force Platform has a second plate that rides on rollers on the base force platform to measure the force parallel to the platform. There are a total of five force beams: four corner beams to measure the normal force and a fifth beam to measure the parallel (sideways) force.

Applications:

- Measure the sideways force during a broad jump
- Measure the normal and parallel forces on a wall as a ladder leans against the wall
- Measure the normal and parallel forces as a person walks or runs across the platform
- Pull an object across the platform and measure the normal and frictional forces

Specifications:

Range: -1100 N to +4400 N (in normal direction), -1100 N to +1100 N (in parallel direction)
Size: 35 cm x 35 cm
Mass: 6.4 kg (without handles)
Zero (Tare) Function: Push-Button Force Overload Protection
Max Sample Rate: 1000 Hz (2000 Hz with the 850 Interface)
Resolution: 0.1 N

PASPORT Galvanometer

PS-2160

The Galvanometer Sensor is designed to measure small voltages with high resolution. Dynamic variable over-sampling greatly reduces the measurement noise at low sampling rates. Shunt resistors are included to allow measurement of current.

Recommended Accessories:

- Alligator Clip Leads (Set of 10) EM-8634

Includes:

- BNC-to-banana plug cable
- BNC-to-banana jack adapter
- 0.1 Ω and 10 Ω resistors

Specifications:

Voltage Range: ±2000 mV
Resolution: 0.1 mV
Maximum Sample Rate: 1000 Hz
Input Impedance: 1 MΩ

PASPORT General Science Sensor

PS-2168

Simultaneously measure temperature, light, sound level, and voltage. Great for a variety of general science explorations.

Applications:

- Monitor environmental noise
- Measure relative light intensities in daylight
- Compare light intensity versus distance
- Study resistance, voltage, and capacitance in circuits
- Measure rapid temperature changes in the environment

Includes:

- Stainless Steel Temperature Probe
- Voltage Probe

Specifications:

Product Temperature*: –35°C to +135°C; ±0.5°C *Range is probe dependent.
Light: 0 to 150,000 Lux
Sound Level: 50 to 100 dBA
Voltage: ±24 V
Voltage Protection: up to 240 V
Maximum Sample Rate: 200 Hz

Order Information

PASPORT 2-Axis Force Platform PS-2142

Order Information

PASPORT Galvanometer PS-2160

Order Information

PASPORT General Science Sensor PS-2168

PASPORT Goniometer Sensor

PS-2137

The PASPORT Goniometer Sensor allows students to use their own bodies to contextualize physics. The Goniometer can be connected to knee, hip, or elbow joints to measure angle changes throughout a variety of movements. It can be used to measure the angular position, velocity, and acceleration of an arm or leg. The PS-2137 includes one Angle Sensor (PS-2139) and one Goniometer Probe with a Velcro connection kit. An add-on Goniometer Probe (PS-2138) must be purchased to measure the motion of two joints simultaneously.

Applications:

- **Angular Motion:** Measure the angular position, velocity and acceleration of an arm or leg.
- **Tangential Velocity:** Simply enter the correct radius and our software will calculate the linear velocity for any point on an arm or leg.
- **Torque and Power:** Use with a Force Sensor to measure the power generated by an arm or leg lifting an object. PASCO software can be used to integrate the power vs. time graph to determine energy consumption.

Includes:

- Goniometer Probe
- Angle Sensor
- Velcro Straps

Specifications:

Range: 0 to 340°

Accuracy: ±1° (calibrated), ±3° (uncalibrated)

Resolution: 0.1°

Maximum Sample Rate: 500 Hz

PASPORT Broad Spectrum Light Sensor

PS-2150

The Broad Spectrum Light Sensor is designed specifically for use with our Educational Spectrophotometer System OS-8539 and Prism Spectrophotometer Accessory OS-8543 for Black Body experiments. The Broad Spectrum Light Sensor uses a thermopile and window combination that respond to both the near infrared and visible light necessary for the Blackbody experiment.

Features:

- Ideal for Blackbody Spectrum
- For use with Spectrophotometer

Applications:

- Blackbody Experiment

Specifications:

Sensing Element: BaF_2 window, xenon gas-filled thermopile

Spectral Response: 300 to 10,000 nm

Maximum Sample Rate: 100 Hz

PASPORT High Sensitivity Light Sensor

PS-2176

The High Sensitivity Light Sensor is designed to perform visible light studies from low intensity spectral studies to daylight. Built-in automatic variable oversampling reduces noise.

Applications:

- Spectrophotometry
- Interference and diffraction patterns
- Measure light intensity vs. distance

Includes:

- PASPORT Sensor Extension Cable
- Sensor Handle

Specifications:

Sensing Element: Si PIN photodiode

Spectral Response: 320 nm to 1100 nm

Gain Levels: 10,000x, 100x, 1x, switch selectable

Approximate Lux Ranges: 0 to 1, 0 to 100, 0 to 10,000

Maximum Sample Rate: 1000 Hz

Resolution: ±0.01 Lux at 1000 Hz on 0 to 100 scale; ±0.0005 Lux at 5 Hz on 0 to 100 scale

Order Information

PASPORT
Goniometer Sensor PS-2137

Order Information

PASPORT
Broad Spectrum Light Sensor PS-2150

Order Information

PASPORT High Sensitivity
Light Sensor PS-2176

PASPORT Infrared Light Sensor

PS-2148

The Infrared Light Sensor is sensitive in the infrared portion (up to 40,000 nm) of the spectrum, but also detects the visible spectrum. It can detect the radiation from a person's hand. The response is linear over its entire frequency range.

Features:

- Built-in thermistor to measure temperature of the "cold" side of the thermopile in °C, °F or K.
- Measures intensity in Watts/Meter^2 (W/m^2)

Applications:

- Measure Blackbody radiance
- Perform Leslie's Cube experiments
- Measure solar radiance

Includes:

- Shutter with thumbscrew and washer

Specifications:

Maximum Sample Rate: 100 Hz

Spectral Response: 580 to 40,000 nm

Built-in Thermistor: Measures temperature of the "cold" side of the thermopile in °C, °F or K

Order Information

PASPORT Infrared Light Sensor PS-2148

PASPORT Load Cell and Dual Amplifier Set

PS-2206

The PASPORT Load Cell and Dual Amplifier Set can be used to test structure strength, manipulate force, and explore dynamic force relationships. The set includes the Dual Channel Load Cell Amplifier and one, 100 N Load Cell. You can insert a load cell by replacing one structure beam with a load cell connected to two, shorter beams. Multiple load cells can be purchased for more advanced structure experimentation.

Includes:

- 2 Load Cell Amplifiers (2-port)
- 100 N Load Cell

Highlights:

- Measure the compression and tension in the I-beam members
- Insert load cells into structures by substituting beams
- Use more than 6 load cells by connecting multiple amplifiers to one computer

100 N Load Cell

Order Information

PASPORT Load Cell and Dual Amplifier Set PS-2206

100 N Load Cell PS-2200

PASPORT Magnetic Field Sensor

PS-2112

The Magnetic Field Sensor provides magnetic field data in a compact package. The sensor at the tip of the probe measures magnetic field strength along the axis of the probe.

Features:

- Displays in gauss and millitesla
- Molded plastic protects the sensing element for enhanced durability
- Measures magnetic field along axis of probe

Applications:

- Study the field strength of bar magnets and electromagnets
- Understand the field strength of a solenoid
- Measure the field strength of a Helmholtz coil

Includes:

- Sensor handle

Specifications:

Range: ±1000 gauss

Accuracy: ±3 gauss or 5% of reading, whichever is greater at 25°C (after four minute warm-up)

Resolution: 0.1 gauss (0.01% full-scale)

Maximum Sample Rate: 20 Hz

Repeatability: 0.05%

Order Information

PASPORT Magnetic Field Sensor PS-2112

PASPORT 2-Axis Magnetic Field Sensor

PS-2162

Measure radial and axial fields simultaneously. Dynamic variable over-sampling greatly reduces noise at low sample rates.

Includes:

- Sensor handle
- Sensor extension cable

How It Works:

Use the PASPORT 2-Axis Magnetic Field Sensor in conjunction with a PASPORT interface to measure magnetic field strength simultaneously along two perpendicular axes.

The sensing elements are two Hall Effect devices oriented perpendicularly to one another and located at the end of the sensor's probe. The sensor measures the magnetic field in the Axial and Perpendicular directions. Two white dots on the probe mark the positions of the sensing elements.

Highlights:

- Measures radial and axial fields
- Tare button

Specifications:

Range: ±1000 gauss

Accuracy: 5% of reading at 25°C (after four minute warm-up and Tare using Zero Gauss Chamber)

Resolution: 0.01 gauss at 10 Hz

Maximum Sample Rate: 1000 Hz

Repeatability: 0.05%

PASPORT Motion Sensor

PS-2103A

The PASPORT Motion Sensor is used to measure the position, velocity, and acceleration of a target. The Motion Sensor can be set on a desktop, mounted to a rod stand, or attached to a PASCO Dynamics Track. The ultrasonic, pulse-ranging technology has a switch-selectable Standard Beam or Narrow Beam that rejects false signals for cleaner data collection.

Features:

- Measures position, velocity, and acceleration
- False Target Rejection Technology collects clean data
- Switch-selectable short range and long range settings
- Snaps onto PASCO dynamics tracks
- Mounts to rods for easy positioning
- 360° pivoting head

Specifications:

Minimum Range: 0.15 meters

Maximum Range: 8 meters

Resolution: 1 mm

Maximum Sampling Rate: 250 Hz

Transducer Rotation: 360°

Narrow Near/Far Switch Settings: For distances up to 2 meters to reject false target signals or ignore air track noise.

Standard Near/Far Switch Settings: For longer distances up to 8 meters.

Cable Length: 1.8 meter

Mounting Options: Non-skid rubber feet for table mount.

PASPORT Rotary Motion Sensor

PS-2120A

The PASPORT Rotary Motion Sensor is used to measure position and motion within physics labs. It measures position, velocity, and acceleration, both angular and linear, with incredible resolution and accuracy. The maximum spin rate of 30 rev/sec and bi-directional orientation enables the PASPORT Rotatory Motion Sensor to facilitate the performance of most motion experiments.

Features:

- Three-step pulley (10, 29, and 48 mm in diameter)
- Rod clamp for dynamic mounting orientations
- Measures magnitude and motion direction
- Ball bearings minimize friction and provide mechanical support to rotating objects

Specifications:

Three-step Pulley: 10 mm, 29 mm, and 48 mm diameters

Sensor Dimensions: 10 cm x 5 cm x 3.75 cm, 6.35 mm diameter shaft

Rotary Motion Resolution: 0.09° (0.00157 rad)

Linear Motion Resolution: 0.0078 mm

Maximum Rotation Rate: 30 revs/sec

Rotary Motion Optical Encoder: Bidirectional to indicate the direction of motion; 4000 divisions/rev

Order Information

PASPORT 2-Axis
Magnetic Field Sensor PS-2162

Order Information

PASPORT
Motion Sensor PS-2103A

Order Information

PASPORT Rotary
Motion Sensor PS-2120A

Picket Fence

ME-9377A

Conduct freefall experiments by dropping this Picket Fence through the PASCO Photogate. The distance from the leading edge of each black bar to the leading edge of the next black bar is 5.0 cm. The Picket Fence has eight black bars and is 40 cm long.

Cart Picket Fences (2 Pack) – IDS

ME-9804

These Picket Fences are included in PASCO's IDS Photogates and Fences Set (ME-9471A), and are available separately as replacement parts. The picket fences mount directly to PASCO's dynamics carts.

Order Information

Picket Fence ME-9377A

Cart Picket Fences (2 Pack) -- IDS
ME-9804 .....

Photogate Head

ME-9498A

The Photogate Head monitors the motion of objects passing through its gate, counting events as the object breaks the infrared beam. It includes a swivel mount to attach to a photogate stand. It does not include the heavy base and standard rod of the Accessory Photogate (ME-9204B). Can be used with ScienceWorkshop or PASPORT interfaces using a Digital Adapter (PS-2159).

Includes:

- Photogate Head with Cable

Specifications:

Photogate Width: 7.5 cm
Fall Time: < 50 ns
Spatial Resolution: < 1 mm
Timing Resolution: 0.1 millisecond
Connector: Stereo phone plug

Time-of-Flight Accessory

ME-6810A

The Time-of-Flight Accessory is designed primarily for freefall or projectile motion experiments. When an object hits the plate, a signal is sent to the interface. Note: When used with the Projectile Launcher, a photogate is used to start the timer and the 20' extension cable is recommended.

Recommended Accessory:

- Phone Jack Extender Cable
  PI-8117 $21.00

Includes:

- Time-of-Flight Accessory
- Instruction Manual
- Experiment Guide

Order Information

Photogate Head ME-9498A

Time-of-Flight Accessory ME-6810A

Smart Gate

PS-2180

The Smart Gate connects directly to any PASPORT interface, and has an auxiliary port to daisy chain to an additional Photogate. Can be used with cart picket fence, clamp-on super pulley, and flexible photogate tape.

Includes:

- Smart Gate
- PASPORT Cable
- Interface Cord

Highlights:

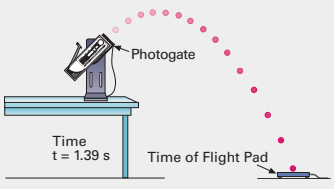
- Dual Photogate beams
- Photogate Tape Slot
- Daisy chain auxiliary Photogate or Time-of-Flight Accessory

Specifications:

Photogate Width: 7.5 cm
Fall Time: < 50 ns
Spatial Resolution: < 1 mm
Timing Resolution: 0.1 millisecond
Connector: Stereo phone plug

Order Information

Smart Gate PS-2180



Timing begins when the photogate beam is broken and ends when the projectile hits the pad and the signal is sent to the interface.

PASPORT Alpha Beta Gamma Radiation Sensor

PS-2166

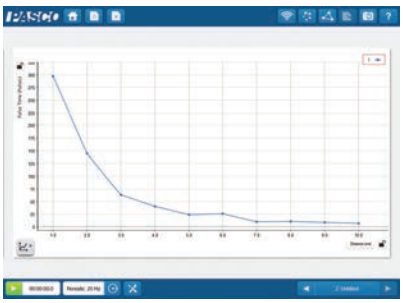
This highly sensitive Geiger-Muller Counter measures beta, gamma and alpha radiation. Provides audible beep for radiation count. Designed for easy mounting for superior position control in inverse square labs.

Includes plastic cap for protection of the mica membrane and Digital Adapter for connecting to PASPORT systems.

The Geiger-Muller Tube is also available separately (without the PASPORT adapter) and can be used directly with the 550 or 850 Universal Interfaces as well as legacy ScienceWorkshop interfaces such as the 500 or 750.

Includes:

- G-M Tube/Power Supply: SN-7927A
- PASPORT Digital Adapter: PS-2159



Students can compare their individual data to mathematical models.

PASPORT Salinity Sensor

PS-2195

The PASPORT Salinity Sensor works with the 10X Salinity Sensor Probe to measure the salinity, conductivity, and temperature of fresh to brackish water sources. It determines salinity based on electrical conductivity and includes a built-in calculation to compensate for the change in conductivity due to temperature changes based on the Practical Salinity Scale (PSS).

The Salinity Sensor measures the electric current through a solution between the two platinum electrodes in the Salinity Sensor Probe. The current through the solution is due to the movement of ions, so the higher the concentration of ions in the solution, the higher its conductivity. A voltage (AC) is applied across the two electrodes in the tip of the probe and the measured current is proportional to the conductivity of the solution.

Recommended Accessories:

- PASPORT Sensor Extension Cable PS-2500 $25.00

Specifications:

Conductivity Range: 1,000 to 100,000 µS/cm

Temperature Range: 0 to 50°C

Salinity Range: 1 to 55 ppt ±1% (with calibration)

Sample Rate (maximum): 50 Hz

Temperature Compensation: ±0.5 ppt from 0 to 45°C at 33 ppt

Cell Constant: 10X

PASPORT Soil Moisture Sensor

PS-2163

The Soil Moisture Sensor measures the water content of soil and reports it in percent. It can be used to conduct experiments in environmental science, agricultural science, horticulture, and biology.

Applications:

- Measure the loss of soil moisture over time due to evaporation and plant uptake
- Evaluate optimum soil moisture content for various species of plants
- Monitor soil moisture content to control irrigation in greenhouses

Specifications:

Range: 0 to 45% volumetric water content in soil

Probe Length: 5.5 cm

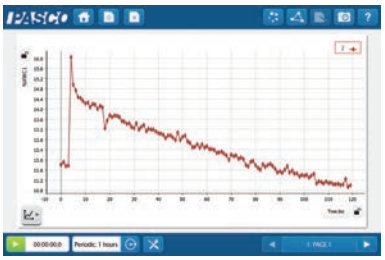
Probe Cable Length: 5 m

Accuracy: ±4%

Resolution: 0.1%

Power: 3 mA at 5 V DC

Operating Temperature: -40 to 60˚C



Soil moisture data over time shows evaporation.

Order Information

PASPORT Alpha Beta Gamma Radiation Sensor
PS-2166 .....

Order Information

PASPORT Salinity Sensor PS-2195

Order Information

PASPORT Soil Moisture Sensor
PS-2163 .....

PASPORT Spirometer

PS-2152

With our Spirometer Sensor, students can easily measure flow rate, pressure, and lung volume, making it perfect for human physiology courses. The mouthpieces are designed to be used by a single student, and the sensor includes an exchangeable filter to ensure every use is hygenic. The Spirometer Sensor facilitates the safe and accurate measurement of airflow both inward (inspiration) and outward (expiration). Additional mouthpieces are available in convenient packs of ten.

Features:

- Bi-directional air flow (inspiration and expiration)
- Minimal resistance to airflow
- Displays volume in liters

Applications:

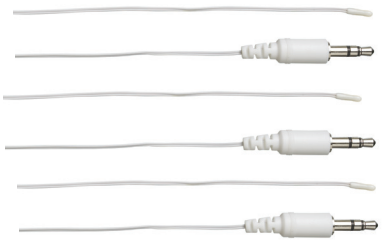
- Compare a student's airflow before and after exercise
- Investigate the lung volume of athletes vs. non-athletes
- Compare smokers vs. non-smokers
- Conduct respiratory experiments
- Determine total lung capacity

Includes:

- 2 Disposable Mouthpieces

Specifications:

Maximum Sample Rate: 100 Hz



PASPORT Fast Response Temperature Probe (3 pack)

PS-2135

Use with a Temperature Sensor to measure temperature in sensitive and fast-changing conditions, or study air convection, evaporative cooling, or endothermic and exothermic reactions. Temperature data displays immediately. For use with PASPORT and ScienceWorkshop Interfaces.

Features:

- Accurately measures temperature changes in real time
- Ideal for small or hard-to-reach spaces
- Includes 10 Adhesive Patches to hold the temperature probe in place
- 3.5-mm plug connects to the Wireless Temperature Link, SPARK LXi, SPARKlink and SPARKlink Air, PASPORT Temperature and Quad Temperature sensors, and Xplorer GLX.

Includes:

- 3-pack of Fast Response Temperature Probes
- 10 Adhesive Patches

Specifications:

Range: -30 to +105°C

PASPORT Skin/Surface Temperature Probe

PS-2131

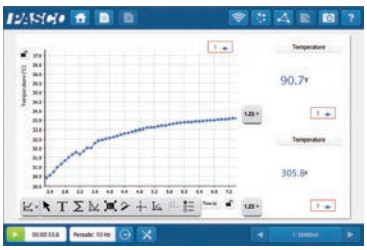
The PASPORT Skin/Surface Temperature Probe features a flat contact area with a wide, measurable range that allows students to measure a variety of surfaces. For use with PASPORT and ScienceWorkshop Interfaces.

Features:

- Wide temperature range allows a variety of surfaces and situations to be studied
- Flat surface areas assures good contact and accurate readings
- Quickly reaches equilibrium temperature with surfaces
- 3.5-mm plug connects to the Wireless Temperature Link, SPARK LXi, SPARKlink and SPARKlink Air, PASPORT Temperature and Quad Temperature sensors, and Xplorer GLX

Specifications:

Range: -10 to +70°C



Report surface temperatures using degrees Celsius and Fahrenheit simultaneously.

Order Information

PASPORT Spirometer PS-2152

Order Information

PASPORT Fast Response Temperature Probe (3 pack)
PS-2135 .....

Order Information

PASPORT Skin/Surface Temperature Probe
PS-2131 .....

PASPORT Stainless Steel Temperature Probe

PS-2153

The PASPORT Stainless Steel Temperature Probe is a versatile probe with a wide range that covers most student lab needs. It connects to the Wireless Temperature Link Sensor, PASPORT and ScienceWorkshop temperature sensors, as well as the built-in temperature ports on the SPARK LXi, Xplorer GLX, SPARK Science Learning System, SPARKlink and SPARKlink Air.

Features:

- 3.5-mm plug connects to the Wireless Temperature Link, SPARK LXi, SPARKlink and SPARKlink Air, PASPORT Temperature and Quad Temperature sensors, and Xplorer GLX.

Applications:

- Melting point
- Freezing point
- Measure rapid temperature changes found in endothermic-exothermic reactions
- Conduct environmental studies

Related Accessories:

- Wireless Temperature Sensor Link PS-3222
- PASPORT Temperature Sensor PS-2125
- PASPORT Quad Temperature Sensor PS-2143
- Temperature Sensor CI-6605A

Specifications:

Range: -35 to +135°C

PASPORT Non-Contact Temperature Sensor

PS-2197

The Non-Contact Temperature Sensor measures surface temperature by detecting the emitted infrared light. Record the temperature of objects without touching them!

Applications:

- Compare temperature of hands, skin, face, and clothes
- Measure the temperature of different outdoor ground surfaces
- Map the temperature profile of an exterior wall

Highlights:

- Non-contact
- Broad Temperature Range

Specifications:

Range: -70°C to 380°C

Accuracy: ±0.5°C

Response Time: Less than 0.1 s

Maximum Sample Rate: 200 Hz

Field of View: ±35°

PASPORT Thermocline Sensor

PS-2151

At last, students can measure temperature as a function of depth in local streams and lakes. PASCO's Thermocline measures depth automatically — no need to read markings on a cable and enter data manually. Weighted housing provides depth measurement stability in fast-flowing streams.

Applications:

- Study thermoclines in fresh and salt water environments
- Create depth profiles for streams, small rivers, shorelines, and swimming pools
- Study ocean tides

Specifications:

Depth-Sensing Element Range: 0 m to 10.5 m

Depth-Sensing Element Accuracy: 0.15 m (in fresh water after barometric pressure compensation)

Depth-Sensing Element Resolution: 0.03 m

Temperature-Sensing Element Range: 0°C to 100°C

Temperature-Sensing Element Accuracy: ±1.5°C

Temperature-Sensing Element Maximum Sample Rate: 10 Hz

Order Information

PASPORT Stainless Steel Temperature Probe
PS-2153 .....

Order Information

PASPORT Non-Contact Temperature Sensor
PS-2197 .....

Order Information

PASPORT Thermocline Sensor
PS-2151 .....

PASPORT Dual Pressure Sensor

PS-2181

The Dual Pressure Sensor is capable of reading two absolute pressures, one gauge pressure, or one differential pressure. Dynamic variable over-sampling automatically reduces the measurement noise at low sampling rates. Sample rates up to 1000 Hz make studies of both transient and steady-state pressure possible. Includes quick-connect tubing.

Includes:

- 4 Quick-release Connectors
- 4 Tubing Connectors
- Polyurethane Tubing (2.4 m)

Highlights:

- Measure pressure at two pipe pressure taps at once

Specifications:

Maximum Sample Rate: 1000 Hz

Absolute Pressure: 0 to 200 kPa, 0.01 kPa resolution at 10 Hz and 1 kPa repeatability (displays pressure in kPa, N/m^2, and psi)

Differential Pressure: ±100 kPa, 0.01 kPa resolution at 10 Hz and 1 kPa repeatability (displays pressure in kPa, N/m^2, and psi)

Order Information

PASPORT Dual Pressure Sensor
PS-2181 .....

PASPORT Water Quality Colorimeter

PS-2179

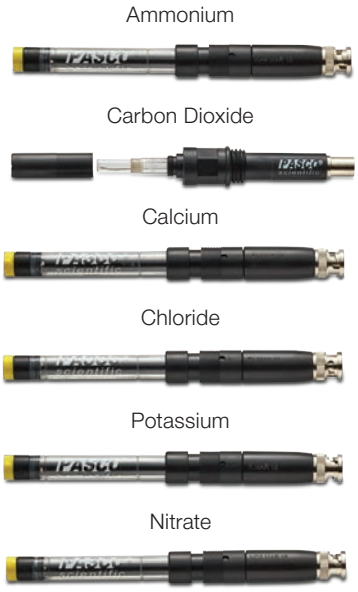
The PASPORT Water Quality Colorimeter is designed specifically to support the chemical analysis of water samples using PASCO's ezSample Snap Vial test kits (sold separately). It includes built-in calibration curves for determining the concentration of ions in the solution, making it incredibly simple to use in the classroom or field. Easy to use, and students avoid direct contact with chemicals!

Specifications:

Range: 0 to 100 % transmittance
Wave Lengths: 660 nm (red), 610 nm (orange), 565 nm (green), 461 nm (blue)
Accuracy: ±0.5 % transmittance
Resolution: 0.1 % transmittance
Default Sample Rate: 1 Hz
Maximum Sample Rate: 5 Hz
Operating Temperature: 0° to 40°C
Iron Test Kit Range: 1.5 to 8 mg/l
Nitrate Test Kit Range: 0.25 to 2 mg/l
Ammonia Test Kit Range: 0.20 to 3 mg/l
Phosphate Test Kit Range: 0.20 to 8 mg/l
Chlorine Test Kit Range: 0.50 to 6 mg/l
Total Hardness Test Kit Range:
20 to 200 mg/l
Dissolved CO2 Test Kit Range:
10 to 100 mg/l
Alkalinity Test Kit Range:
10 to 100 mg/l

Order Information

PASPORT Water Quality Colorimeter
PS-2179 .....



Electrodes

These PASCO Ion Selective Electrodes connect to PASCO's wired and Wireless pH Sensors and allow students to measure the concentration of the ions for which each one is named. Operation of these Ion Selective Electrodes assumes training in the safe handling of flammable, caustic and corrosive chemicals more typical of secondary and college settings. We do not recommend these for use by elementary or middle school students. This style of ISE utilizes a standard PVC membrane with a shorter lifespan than a typical pH sensor. We offer replacement PVC matrix sensor modules to replace the module, rather than the whole electrode.

Order Information

Ammonium Ion Selective Electrode
PS-3516 .....

Carbon Dioxide Ion Selective Electrode
PS-3517 .....

Calcium Ion Selective Electrode
PS-3518 .....

Chloride Ion Selective Electrode
PS-3519 .....

Potassium Ion Selective Electrode
PS-3520 .....

Nitrate Ion Selective Electrode
PS-3521 .....

Oxidation Reduction Potential Probe

PS-3515

This probe connects to the Wireless pH Sensor and allows students to determine the ability of a species in a solution to act as an oxidizing agent or reducing agent during redox reactions.

Use this probe to monitor solutions during oxidation-reduction titrations, perform water quality studies, and study the effects of water chlorination. This probe is not a standalone sensor. It connects to and requires an amplifier (PS-2102 or PS-3204).

Flat pH Probe

PS-3514

The Flat pH Probe gives you the freedom to measure what you want, where you want. Study pH levels in different kinds of foods, investigate the pH of common skin and hair care products, and easily collect pH data when doing soil analysis. Can be used on semi-solids by pressing the probe against a moist surface.

This product is intended for use with the Wireless pH Sensor.

PASPORT Analog Adapter

PS-2158

Use an Analog Adapter to connect ScienceWorkshop sensors with an 8-pin or 5-pin DIN connector to a PASPORT interface.

Applications:

- Remote data collection with Xplorer GLX and your ScienceWorkshop sensors
- AC/DC voltage experiments when used with a ScienceWorkshop Voltage Sensor
- Sound wave experiments when used with a ScienceWorkshop Sound Sensor

Related Accessories:

- PASPORT Digital Adapter PS-2159

Specifications:

Ranges: ±10 V, with 5 mV resolution; ±1 V, with 0.5 mV resolution; ±0.10 V, with 50 µV resolution

Absolute Maximum Input Voltage Range Without Damage: -40 V to +40 V

Input Impedance: 1 MΩ

Gain: 1, 10, and 100 (selectable in software)

Maximum Sampling Rate: 50 kHz with Xplorer GLX / 1000 Hz with other interfaces

Analog-to-Digital Conversion: 12 bit

Offset Voltage Accuracy: <±5 mV

Full-Scale Voltage Accuracy: <±15 mV

PASPORT Digital Adapter

PS-2159

The Digital Adapter is required to connect digital ScienceWorkshop sensors to PASPORT interfaces. Each Digital Adapter has two ports that can accommodate two single-channel digital sensors, or one dual-channel digital sensor. Each port on the Digital Adapter automatically detects a connection and initiates the selection of pre-configured or user-defined options. Several Digital Adapters can be used simultaneously when required.

Applications:

- Velocity of carts on a track
- Freefall
- Projectile motion
- Nuclear Radiation

Related Accessories:

- PASPORT Analog Adapter PS-2158

Specifications:

Resolution for Counting and Timing Devices: 2 µs

Resolution for Motion Sensors: 1 µs

Input: Two 1/4" stereo phone jacks

Order Information

Oxidation Reduction Potential Probe PS-3515.....

Flat pH Probe.....PS-3514

Order Information

PASPORT Analog Adapter.....PS-2158

Order Information

PASPORT Digital Adapter.....PS-2159

SPARK LXi Datalogger

PS-3600A

The SPARK LXi Datalogger is a Bluetooth, handheld datalogger that enables students to connect wired and wireless sensors, collect data, generate graphs, and analyze results. It is durable, splash-proof, and works seamlessly with PASCO sensors. The SPARK LXi can simultaneously accommodate up to five wireless sensors, includes two ports for PASPORT sensors, as well as two ports for the included Fast Response Temperature Probe and Voltage Probe. It can be used with PASCO Wireless sensors, PASPORT sensors, SPARKlink® Air, and the 550 Universal Interface.

Built for Student Use:

- Portable
- Shock-absorbing case
- 8" Color Capacitive Touchscreen (1280 x 800 pixels)
- 1.4 GHz Quad Core Processor, 2.0 GB RAM, 16 GB Memory
- Voltage and temperature sensor ports with included probes
- Speakers, microphone, and two cameras
- GPS and accelerometer
- Wi-Fi enabled
- Wireless sensors and Smart Carts connect via Bluetooth®
- AirLink, SPARKlink Air, or 550 Universal Interface via USB or Bluetooth
- Two PASPORT sensor ports
- **Loaded with PASCO software:** SPARKvue® for data collection and analysis, MatchGraph!, and Spectrometry
- **Loaded with third-party software:** Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Scientific Calculator, Periodic Table, and Google Science Journal*.
- * LXi model PS-3600A does not include the Lab Manager application

Specifications:

CPU: Quad Core, 1.4 GHz
Screen: 8.00" color capacitive touchscreen, 1280 x 800 px; 16:10 aspect ratio
Memory: 16 GB Internal, 2.0 GB RAM
Camera: 8.0 MP back camera, 5.0 MP front camera
WiFi: 802.11
Bluetooth: 4.2
PASPORT Sensor Ports: 2
Built-In Sensors: Voltage port w/probe, Temperature port w/Fast Response Temp probe, Accelerometer, Microphone, GPS

Front view of the SPARK LXi

Rear view of the SPARK LXi

The SPARK LXi features two PASPORT ports as well as ports for the included temperature and voltage probes.

Order Information

SPARK LXi Datalogger.....PS-3600A

SPARKlink Air Interface

PS-2011

The SPARKlink® Air allows students and teachers to connect any of our 70+ PASPORT sensors to their device via USB or Bluetooth®. This device allows students to collect data using a desktop or laptop running SPARKvue or PASCO Capstone software, or with a Bluetooth iOS or Android device running the SPARKvue app.

Features:

- Includes Fast Response Temperature and Voltage Sensors
- Connects via Bluetooth to Mac, Windows, iOS, and Android devices (Bluetooth not supported on Chromebooks)
- Connects via USB to Mac or Windows computers and Chromebooks
- Rechargeable battery provides 4 to 6 hours of continuous data collection between charges
- Mobile design allows students to explore science inside and outside the classroom

Includes:

- AC Adapter
- USB Cable
- Fast Response Temperature Probe
- Voltage Probe

Specifications:

Interface Type: USB or Bluetooth 2.0 (classic)

Ports: 4 (2 PASPORT, 1 Voltage, 1 Temperature)

Order Information

SPARKlink Air Interface PS-2011

550 Universal Interface

UI-5001

The 550 Universal Interface is fast, powerful, and incredibly affordable. The cost-effective 550 offers half the ports and many of the same features as our 850 Universal Interface, including both Bluetooth and USB connectivity. The 550 Universal Interface includes two PASPORT sensor ports, two digital sensor ports, two analog sensor ports, and a built-in signal generator.

The 550's two digital inputs are compatible with all ScienceWorkshop digital sensors, as well as timing devices and photogates. The two analog ports connect with our analog ScienceWorkshop sensors and can support a 2.0 MHz max sampling rate and 1.22 mV resolution for voltage sensing.

The 550's built-in signal generator powers motors, speakers, circuits, and many other devices. With PASCO Capstone software and the 550, you can control various DC and AC waveforms, without requiring any other technology. The 550 provides 8V at 400 mA, selectable voltage limits, built-in voltage and current measurements, and DC offset. Capstone software turns the 550 into a live oscilloscope that can display simultaneous traces.

Beyond having USB 2.0 connectivity, the 550 can also send data wirelessly to any Bluetooth enabled computer, iPad, or Android tablet using PASCO Capstone or SPARKvue software.

Features:

- USB and Bluetooth connectivity
- 3.2 W power amplifier
- 2.0 MHz max sampling rate
- 100 kHz signal generator with built-in Voltage and Current sensors
- Compatible with PASPORT, ScienceWorkshop, and Wireless Sensors
- 2 high-speed analog inputs
- 2 digital inputs for photogates and other timing sensors
- 2 PASPORT sensor inputs
- Can be used simultaneously with other PASPORT interfaces
- Uses Capstone Software or SPARKvue Software

Order Information

550 Universal Interface UI-5001

Gratnells® Rolling Carts - Convenient Mobile Storage

EP-3574 (2-column) EP-3575 (3-column)

Gratnells Rolling Cart (2 or 3-Column)

EP-3574 / EP-3575

Gratnells Rolling Carts are the best way to store and transport PASCO sensors and equipment. They can be configured for trays of any size and include large castors with brakes for added stability.

Designed for Gratnells trays, these movable storage rack carts can store up to 8 (2 column) or 12 (3 column) Gratnells F2 trays (sold separately). Each carts comes with either 16 or 24 pairs of runners.

They can be used to store the equipment kits from the Essential Physics or Essential Chemistry curriculum, the storage trays we offer for wireless sensors, or any of the four sizes of empty trays that we offer for everything else you'd like to store.

Assembly is required. Trays not included.

Stores up to 12 Gratnells F2 trays

Dimensions: 107 cm high, 102 cm wide, 43.5 cm deep

Stores up to 8 Gratnells F2 trays

Dimensions: 107 cm high, 70 cm wide, 43.5 cm deep

Order Information

Gratnells Rolling Cart (2-column) EP-3574
Gratnells Rolling Cart (3-column) EP-3575

Wireless Sensor Storage Trays with Lids

Each F1 storage tray (below) holds up to ten sensors; sensors sold separately.

Temperature/pH/ Conductivity Sensors
PS-3585

Pressure Sensors
PS-3586

Colorimeter & Turbidity Sensors
PS-3587

Voltage & Current Sensors
PS-3588

Motion Sensors
PS-3589

AirLink & Light Sensors
PS-3594

Force Acceleration Sensors
PS-3595

Weather Sensor with GPS
PS-3596

CO_2 Sensor
PS-3598

Order Information

Storage for Wireless Temperature, pH and Conductivity Sensors PS-3585
Storage Tray for Wireless Pressure Sensors.....PS-3586
Storage Tray for Wireless Colorimeter and Turbidity Sensor.....PS-3587
Storage Tray for Wireless Voltage & Current Sensor..... PS-3588
Storage Tray for Wireless Motion Sensor..... PS-3589

Order Information

Storage Tray for Wireless Light Sensor and AirLink..... PS-3594
Storage Tray for Wireless Force Sensor PS-3595
Wireless Weather Sensor Storage Tray PS-3596
Wireless CO_2 Sensor Storage Tray..... PS-3598

Gratnells® Storage Trays with Lids

These empty Gratnells storage trays with lids have a length of 427 mm and width of 312 mm. The depth of each follows:

F1: 75 mm
F2: 150 mm
F25: 225 mm
F3: 300 mm

Order Information

Storage Tray (F1) Shallow PS-3326
Storage Tray (F2) Deep.....PS-3327
Storage Tray (F25) X-Deep PS-3328
Storage Tray (F3) Jumbo PS-3329

Storage Bins

SE-7560

These stackable plastic bins with lids can be useful for storing equipment and accessories in your lab.

14" L x 9.5" W x 6.9" D

Order Information

Storage Bins (Set of 5).....SE-7560

Wireless Sensor Charging Station

This versatile charging station can be configured to fit any size sensor by adding or removing partitions.

Order Information

Wireless Sensor Charging Station PS-3599

— A —

— B —

— C —

— D —

— E —

— F —

— G —

— H —

— I —

— J-K-L —

— M —

— N —

— O —

— P —

— Q-R —

— S —

— T —

— U —

— V —

— W-X-Y-Z —

The PASCO Promise of Learning (90-day Satisfaction Guarantee)

We are confident that PASCO solutions will help your students achieve more in science. Within the first 90 days, if you are not satisfied that your students are more engaged and learning more effectively, return your purchase for a refund. We don't want you spending precious budget dollars on something you don't use. (We are sorry but we must exclude non-PASCO software that has been opened, radioactive products and products that contain perishables.) See instructions for Returns below.

PASCO 5-Year Limited Warranty for Education

PASCO products are built to survive. PASCO-manufactured products are covered by a limited warranty for a period of 5 years from delivery date against defects in material and workmanship. This warranty is valid for educational institution customers and only for educational use of these products. The PASCO warranty does not extend to any product, including touch screens, which have been subject to abuse, neglect, accident, improper installation or application, or products that have been repaired or altered outside of our factory. Consumables and limited-life products (such as pH probes, membranes, fast response temperature probes, batteries, chemical solutions, printed materials, etc.) are excluded.

Other Warranty Terms

The SPARK LXi datalogger carries a limited warranty for a period of 3 years from delivery date against defects in material and workmanship. This limited warranty applies only to hardware components of the SPARK LXi that are not subject to accident, misuse, neglect, fire, or other external damage. This warranty can also be voided by unauthorized use, alterations, or repair. This warranty is valid for education institution customers and only for educational use of these products.

Products manufactured by anyone other than PASCO are subject to the conditions of the warranty supplied by the manufacturer (generally 1 year). Additional warranty information on our products is available upon request.

Free Teacher and Technical Support

We want teachers to be successful with PASCO solutions. Please contact our support team with any questions via phone or email: +1 916-786-3800 or support@pasco.com. We are here to help.

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Shipping

Items in stock will normally be shipped in less than five working days from receipt of the order. Specific requests for air shipments or special carriers will be honored at an additional cost.

Returns

Please contact the authorized PASCO representative in your country for assistance in returning equipment for repair. PASCO's International Customer Service team can be reached at +1-916-462-8383 or at custserv@pasco.com. Out-of-Warranty products must be shipped prepaid, door-to-door. Returns for credit or exchange must be in new condition and packaged in original shipping cartons or packaging sufficient to prevent damage during international transport.

Trademarks

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More Product Information

Designed for education. PASCO products are designed for education; they are not intended for use in graduate research or industry, and should not be used in any apparatus involved with life support, patient diagnosis, or industrial control.

PASCO reserves the right to change the specifications of any product without prior notice. If a product is no longer available, PASCO reserves the right to substitute a product of equal, or higher, value and functionality.

FCC

Where appropriate, electrical products are marked to indicate that they conform to Federal Communications Commission (FCC) standards. Most commonly, FCC Part 15, Class A.

CE MARK

Where appropriate, products carry the CE marking, which indicates that they conform to the applicable European standards. This almost exclusively applies to products that are designed to meet the following applicable directives:

2014/30/EU	EMC Directive
2014/35/EU	Low Voltage Directive
2011/65/EU	RoHS Recast/RoHS-2
2014/53/EU	Radio Equipment Directive

Other Regulations May Apply

Local, national, and international regulations may restrict the purchase, storage, transport, use or disposal of certain products such as chemicals, radioactive sources, and specialty products and wireless transmission devices. Please consult your local regulations to ensure compliance.

Unless Otherwise Specified:

– Operating Temperature Range: 0°C – 40°C (32°F to 104°F).
– Maximum Altitude (Operational): 10,000 feet
– Recommended Storage Temperature: 10°C to 27°C (50°F to 80°F)

Quality

PASCO scientific Meets the Highest Quality Standards, and our Quality Management System is Registered to ISO 9001.

PASCO and the Environment

PASCO is committed to be in compliance with all laws and requirements in the countries in which our products are sold. PASCO is a responsible steward of the environment and as such, continually seeks to minimize the impact that our manufacturing, distribution, and consumption practices make on the planet's natural resources.

Miscellaneous

RoHS

European Union Restriction of Hazardous Substances. EU Directives 2011/65/EU:

- All applicable electrical products supplied by PASCO to the EU meet the requirements as specified in the RoHS directive either by substance limits or by product exemptions.

EU WEEE

Waste Electrical and Electronic Equipment. EU Directive 2012/19/EC, Effective July 4, 2012:

- All applicable products supplied by PASCO to the EU meet the requirements as specified in the WEEE directive and are marked with the WEEE symbol.

WEEE-Product End of Life Disposal Instructions (Reference):

Electronic products are subject to disposal and recycling regulations that vary by country and region. It is a user's responsibility to recycle electronic equipment per local environmental laws and regulations to ensure that equipment is recycled in a manner that protects human health and the environment. To find equipment recycling drop-off locations, please contact your local waste recycle/disposal service or the product representative.

The European Union (EU) WEEE (Waste Electrical and Electronic Equipment) symbol on our products and packaging indicates that this product must not be disposed of in a standard waste container.

EU REACH

Registration, Evaluation and Authorization of Chemicals, as of: Oct. 28, 2008:

- PASCO has reviewed the REACH SVHC list and, according to our current knowledge, cables supplied with some products may contain certain phthalate plasticizers at greater than 0.1% by weight
- Regarding the other SVHC's, to the best of our knowledge, none are present in PASCO products (articles) at concentrations of greater than 0.1% by weight

Battery Replacement and Disposal Instructions (Reference):

Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling, and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find a battery recycling drop-off location, please contact local waste disposal service or the product representative.

The battery or batteries used in PASCO products are marked with the European Union symbol for waste batteries that indicate the need for separate collection and recycling. For small batteries, the symbol is printed on the packaging.

EU Battery Directive

EU Directive 2006/66/EC on Waste Batteries:

- The European Union (EU) battery directive aims to reduce the environmental impact of waste batteries and accumulators.
- According to our specifications, all products supplied by PASCO Scientific into the EU that contain batteries meet the battery directive requirements, and are marked with the battery symbol.

PASCO

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When you have questions or need service, we want someone who understands your local needs. We carefully select, train, and support local Science Education Partners to serve our customers in each country.

When you work with a PASCO Science Education Partner, have confidence that the entire company here in California is ready to assist our Partner – and you, our Customer.

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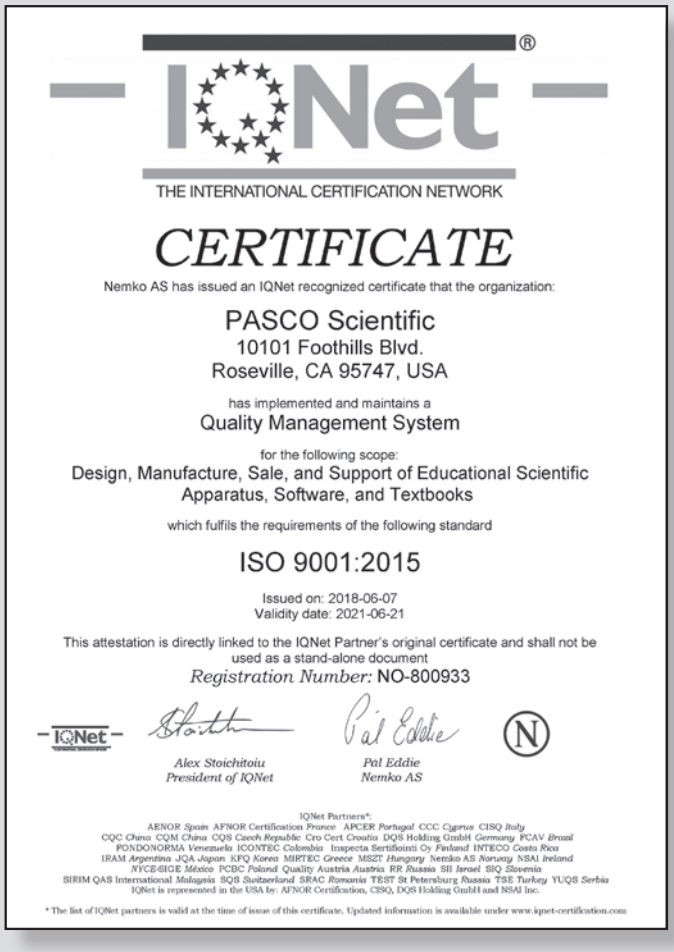

IQNet®

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

Nemko AS has issued an IQNet recognized certificate that the organization:

PASCO Scientific
10101 Foothills Blvd.
Roseville, CA 95747, USA

has implemented and maintains a
Quality Management System

for the following scope:
Design, Manufacture, Sale, and Support of Educational Scientific Apparatus, Software, and Textbooks

which fulfils the requirements of the following standard

ISO 9001:2015

Issued on: 2018-06-07
Validity date: 2021-06-21

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document
Registration Number: NO-800933

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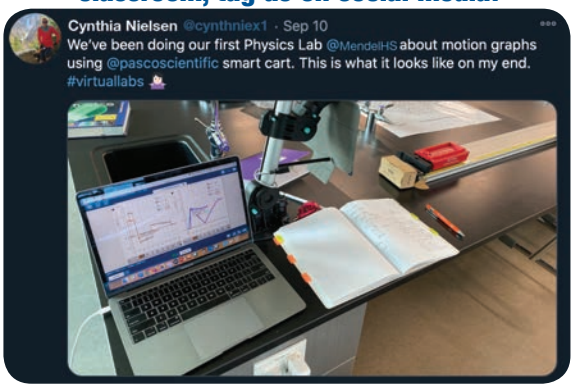

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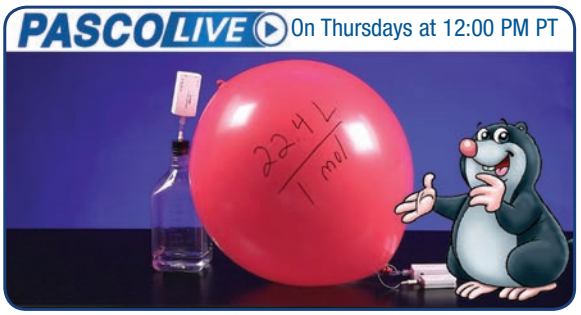

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