PASCO’s Advanced Chemistry Solution

Make AP* Chemistry inquiry easier with PASCO’s reliable data acquisition & analysis tools!

www.pasco.com

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PASCO Advanced Chemistry

PASCO: Making AP* Chemistry Inquiry Easier with Reliable Data Collection & Analysis Tools

PASCO’s new 21st century science learning environment enhances AP* Chemistry. With easy-to-use and time-saving probeware, curriculum, and interfaces, PASCO has integrated inquiry-based science with research-based, state-of-the-art learning.

Called SPARKscience, this new science learning environment is:

- **Simple yet powerful**, so students stay focused on the science.
- **Completely integrated**... one seamless environment contains content, real-time data display with interactive visualization and analysis tools, assessment and reflection, and electronic student journal.
- **Runs on almost any platform**... on your computers, the SPARK handheld, and available in summer 2012 for the iPad® and Android™ tablets.
- **Ideal for STEM programs**, for both teachers and students.
- **Fully supported** by PASCO, which has provided innovative solutions for science education since 1964.

PASCO’s Advanced Solution for AP* Chemistry Includes:

- **PASCO’s Advanced Guides**: Designed by educators for educators, these standards-based Advanced Guides cover core activities in the AP* course outline.

- **70+ PASPORT Sensors**: For authentic data collection and analysis, PASCO’s PASPORT sensors, including 24 MultiMeasure sensors, give your students an affordable way to quickly and easily collect real-world data.

- **SPARKvue® and SPARKvue HD Software**: Collect data and analyze it with probeware and this all-in-one interactive platform. With the SPARKlink interface, SPARKvue adapts to almost any classroom technology, including your own computers. Coming in summer 2012: SPARKvue HD for iPad® and Android™!

- **The SPARK Science Learning System™**: This stand-alone device can be used anywhere and is perfect for collaborative learning. Includes a full-color touch-screen, two sensors, and 61 free SPARKlab investigations.

For more information on these products and the complete SPARKscience story, go to pasco.com

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What AP* Chemistry Students Gain When They Use PASCO Probeware…

- They become actively engaged in constructing science concepts.
- They produce real-time graphs, which allow them to explore concepts not normally performed in the science classroom.
- They use more sophisticated techniques and equipment that reflect real-world methods used in the lab.
- Their learning is enhanced with hands-on, interactive data collection and analysis.
- They have more opportunities to predict, question, and apply science concepts.
- Both teachers and students benefit from more efficient use of valuable class time.

Why Use PASCO’s Solution for AP* Chemistry?

Students grasp even difficult concepts more easily, and retain them better, when they see for themselves with their own data.

Why isn’t the equivalence point of a titration always at a pH of 7? How can pressure and temperature data lead to the Kelvin scale? What is the order of a reaction? When students use PASCO tools, these fundamental concepts and a variety of others become more easily understood as they collect and analyze their own data.

Using PASCO probeware saves money for your school and time in your classroom.

PASCO’s Chemistry Sensor is a MultiMeasure sensor, which means that with this one sensor, your students can measure pH, temperature, voltage, and pressure. One MultiMeasure sensor costs less than purchasing several separate sensors, and it’s easier to store, manage, and maintain.

Powerful software allows your students to collect and analyze data in one lab period. For example, a pH meter with the High Accuracy Drop Counter is used to create precise titration curves in a fraction of the time.

Students who use PASCO probeware “see” what others cannot see.

Powerful tools such as the Amadeus Spectrometer allow students to “see” the unseen. Analyzing the spectral lines of hydrogen and helium emission tubes gives students access to the electronic structure of atoms and the development of atomic theory.

Quick quantitative identification of emission peaks from elemental and molecular species.

Multiple trials of titration curves can easily be collected in one class period.
PASCO’s Advanced Chemistry Solution
Compatible with the AP* Chemistry Curriculum

Designed by educators for educators, these standards-based Advanced Teacher Guides cover core activities in the AP* course outline and national science standards.

The lab activities engage students as they make predictions, use critical thinking skills to solve sequencing challenges, and answer questions embedded throughout each activity.

Includes all 22 currently recommended Chemistry AP* Labs and more.

Advanced and AP* Chemistry Labs

Chemical Composition & Stoichiometry
- Determining the Empirical Formula of a Compound
- Determining the Percentage of Water in a Hydrate
- Mole Relationships in a Chemical Reaction
- Gravimetric Determination of a Precipitate
- Identifying an Unknown Metal
- Synthesis of a Coordination Compound
- Analysis of a Coordination Compound

Thermochemistry & Thermodynamics
- Enthalpy of a Chemical Reaction

Atomic & Nuclear Structure
- Absorption Spectra**
- Determining the Half-life of an Isotope

Gas Laws
- Determine the Molar Mass of a Volatile Liquid
- Molar Volume of a Gas
- Exploring Gas Laws

Intermolecular Forces & States of Matter
- Molecular Interaction in Ethanol & Acetone

Solutions & Solubility
- Molecular Weight by Freezing Point Depression
- Colorimetric Analysis
- Separation by Liquid Chromatography
- Conductometric Titration
- Separation & Analysis of Cations
- Analysis of Anions

Acid–Base Chemistry
- Standardizing a Solution of Sodium Hydroxide
- Acid–Base Titrations
- Using Different Indicators for pH Determination
- Properties of Buffer Solutions
- Determining $K_a$ by Half-Titration of a Weak Acid
- Determining $K_a$ Values of Two Isomeric Multi-Proton Acids

Kinetics & Equilibrium
- Determine the Equilibrium Constant for a Chemical Reaction
- Determine the Rate of Decomposition of Hydrogen Peroxide
- Determination of a Solubility Product
- Order of Reaction

Electrochemistry
- Oxidation–Reduction Titration
- Determination of Electrochemical Series
- Electroplating
- Breathalyzer Test™ for Alcohol

Organic Chemistry
- Organic Synthesis I – Preparation
- Organic Synthesis II – Analysis

Advanced Chemistry Teacher Guide
PS-2877B

Includes a printed manual and flash drive. Manual contains detailed teacher version complete with guided inquiry lab activities, suggested answers, and much more. Flash drive contains teacher tips, a PDF of the full teacher edition, and an editable MS Word version of student handouts.

Also includes a 60-day license of the Advanced ODYSSEY molecular modeling software.


Also Available:
Teacher Guide Flash Drive only PS-2887A $79
(Contains all materials from the teacher guide and teacher tips in electronic format only)

Student Lab Activity Blackline Master PS-2897A $59
(A printed version of the same student handouts that are included electronically with both the Teacher Guide and Teacher Guide Flash Drive only)

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** Required for use: Amadeus Spectrometer (see page 7).
Advanced Chemistry Standard Sensor Bundle
Allows you to do 35 of the 36 lab activities in the Teacher Guide. The Amadeus Spectrometer (on page 7) is required to perform the Absorption Spectra lab.

PS-2928
1. Chemistry Sensor PS-2170
2. Conductivity Sensor PS-2116A
3. Colorimeter PS-2121
4. High Accuracy Drop Counter PS-2117
5. Voltage/Current Sensor PS-2115
6. Alpha Beta Gamma Radiation Sensor PS-2166 (includes Digital Adapter PS-2159)
7. Oxidation Reduction Potential Probe CI-8716

PASCO Interface Options

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<tr>
<th>For use with or without a computer</th>
<th>OR</th>
<th>For use with a computer</th>
<th>OR</th>
<th>For use with your tablet</th>
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<tr>
<td><strong>SPARK Science Learning System™</strong> PS-2008A</td>
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<td>Includes Fast Response Temperature Probe, Voltage Probe and more than 60 pre-installed, guided-inquiry SPARKlabs.</td>
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<td><strong>SPARKlink®</strong> PS-2009</td>
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<td><strong>SPARKvue® Site License</strong> PS-2400</td>
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<td>Includes two sensor ports, built-in Temperature and Voltage Sensors with probes, USB connection, and rugged polycarbonate case.</td>
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Get the full-featured version of SPARKvue® HD for your iPad® or Android™ tablet. Includes full suite of display and analytical tools, 61 free SPARKlabs®, all in an integrated learning environment. (Coming in Summer 2012: SPARKvue® HD for the iPad® arrives at the App Store. Also coming: SPARKvue HD for Android™, for select Android™ tablets.)

**We’d love to give you more information. Email or call us:**
chemistry@pasco.com • + 1 786-3800, ext. 551 • Or go to pasco.com/AP
Take AP* Chemistry to the Next Level with PASCO!

**Colorimeter**

PS-2121

Also available: Cuvette and Caps (Set of 6) PS-2509

Determine the concentration of a solution with ease! Study absorbance vs. concentration to explore Beer’s Law, and measure chemical rates of reaction.

**High-Accuracy Drop Counter**

PS-2117 $99

Includes Micro Stir Bar plus a stainless steel sensor rod for easy attachment to a ring stand.

A great sensor for experiments where every drop counts—literally! Use the Drop Counter in tandem with our pH Sensor to accurately determine the equivalence point in an acid–base titration. It works equally well with large or small, fast or slow drops.

**Chemistry Sensor**

PS-2170

Includes Stainless Steel Temperature Probe, pH Probe, Voltage Probe, built-in Pressure Sensor, Blix-syringe, tubing and quick-release connectors.

The all-in-one Chemistry Sensor measures temperature, pH, gas pressure, and voltage, and all measurements can be made simultaneously. This sensor provides a convenient solution for exploring gas laws, performing acid–base investigations, studying oxidation–reduction reactions, and more. Easy-to-use design requires no calibration.

**ODYSSEY AP Instructor Edition**

SE-7160-AP

ODYSSEY is chemistry education software for visualization and simulation at the molecular level. From carbon monoxide to DNA, from hydrogen gas to liquid water – ODYSSEY shows matter in full atomic detail and stunning molecular motion. ODYSSEY includes more than 85 core chemistry topics in self-contained units with ready-to-use activities. Each experiment is designed to engage students in discovery-based learning, but can also be used for classroom demonstrations.

**Ion Selective Electrodes**

Recommended for use with the Chemistry Sensor PS-2170

CI-6717 Ammonium
CI-6726 Carbon Dioxide
CI-6727 Calcium
CI-6732 Chloride
CI-6736 Lead
CI-6728 Fluoride
CI-6735 Nitrate
CI-6733 Potassium
CI-6734 Sodium

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Amadeus Spectrometer System
SE-7183
This affordable spectrometer from Ocean Optics is designed for ease of use at high schools. From the Tungsten light source to the included fiber optic cable, this system is a great value! Now compatible with SPARKvue software and SPARK Science Learning System
- Measure absorbance, emission and fluorescence!
- Spectral Range: 350 to 850 nm
- Resolution: 3 nm (FWHM) with a total of 300 datapoints

Includes Amadeus spectrometer, Tungsten light source with power supply, 1.8 meter fiber optic probe, USB cable, 10 cuvettes.

Atmospheric Properties Chamber
ME-6813A
This reaction vessel is designed for sensor-based measurement. Study gas reactions safely while collecting continuous real-time measurements. See what you’ve been missing. Use the provided syringe to vary the pressure in the chamber or introduce other gases.

As carbon dioxide is injected into the chamber, the pressure quickly rises. As the gaseous carbon dioxide equilibrates with the water, the indicator changes color and the pH drops.
- Gas laws
- Vapor pressure
- Reactions involving gases
- Gaseous equilibrium

Includes chamber, tubing, rubber stoppers, stop cocks, and syringe.

Recommended for use with the Chemistry Sensor PS-2170

Ideal Gas Law Apparatus
TD-8596A
Includes Ideal Gas Law syringe, built-in fast response thermistor, and quick connect pressure port. Recommended for use with the Chemistry Sensor PS-2170 $189.

The Ideal Gas Law Apparatus has a stable design that ensures consistently repeatable results and long-term reliability. By connecting the Chemistry Sensor’s pressure and temperature sensors to this large syringe, students will be able to quantitatively investigate relationships between pressure, temperature, and volume of a gas.
- Low thermal mass thermistor
- Quick connect port for a pressure sensor
- Mechanical stop on the plunger to prevent damage

Includes Ideal Gas Law syringe, built-in fast response thermistor, and quick connect pressure port.

Recommended for use with the Chemistry Sensor PS-2170

Absolute Zero Sphere
TD-8595
Includes built-in Fast Response Thermistor Probe and quick connect pressure port.

The Absolute Zero Sphere has a constant volume – perfect for determining absolute zero temperature. Connect the Chemistry Sensor’s pressure and temperature sensors and immerse the sphere in several different temperature water baths. See pressure and temperature changes in real time. Once the data is collected, students can use a linear fit to extrapolate the value of absolute zero.

Includes built-in Fast Response Thermistor Probe and quick connect pressure port.

Recommended for use with the Chemistry Sensor PS-2170
NEW for the iPad® and Android™...

SPARKvue® HD!
Learn more at pasco.com
(See page 5.)