Master Materials and Equipment List

Italicized entries indicate items not available from PASCO. The quantity indicated is per student or group. NOTE: Some activities also require protective gear for each student (for example, safety goggles, gloves, apron, or lab coat).

Teachers can conduct some lab activities with sensors other than those listed here. For assistance with substituting compatible sensors for a lab activity, contact PASCO Teacher Support (800-772-8700 inside the United States or http://www.pasco.com/support).

Act	Title	Materials and Equipment	Qty
1	**Archimedes' Principle** Use a force sensor to measure the change in gravitational force on an object in the air and on that same object immersed in water.	Date collection system PASPORT Force Sensor with hook *Objects to be suspended in water* *Water, enough to fill bucket or tub* Balance *String (10 to 20 cm per object)* *Bucket or tub*	1 1 2 1 per class 2 1
2	**Boyle's Law** Use an absolute pressure sensor to investigate the effect of changes in the volume of a confined gas on pressure at constant temperature.		
	Teacher Demonstration	Data Collection System PASPORT Absolute Pressure Sensor Quick-release connector *Syringe (20 ml or 20 cc)* Plastic tubing *Plastic soda bottle, 1-L* Eyedropper *Tap water* *Glass or beaker, 100-mL or tall enough to hold the eyedropper ("diver")*	1 1 1 1 1 1 1 10 mL 1
	Student or Group	Data Collection System PASPORT Absolute Pressure Sensor Quick-release connector PASPORT Sensor Extension Cable *Syringe (20 ml or 20 cc)* Plastic tubing *Clean toilet plunger*	1 1 1 1 1 1 1

Act	Title	Materials and Equipment	Qty
3	**Conservation of Matter** Use a temperature sensor and absolute pressure sensor to measure the change in temperature and pressure of an oxidation reaction.		
	Teacher Demonstration	Balance or scale with 0.1g sensitivity *2-liter clear plastic soda bottle, with cap* *Alka-Seltzer tablets* *Tap water, warm*	1 per class 1 2 200 mL
	Student or Group	Data Collection System PASPORT Temperature Sensor* PASPORT Absolute Pressure Sensor Quick-release connector *Erlenmeyer flasks, 250- mL* Balance or scale with 0.1g sensitivity Tubing *Disposable plastic cup* *Vinegar* *2-hole rubber stopper* *Rubber stopper (no holes)* *Steel wool* *Paper towel (to dry steel wool)* *Glycerin*	1 1 1 1 2 1 per class 1 to 2 cm 1 ~100 mL 1 1 ~2 g 1 1 to 2 drops
4	**Energy Transfer** Use a stainless steel temperature sensor to measure the transfer of heat energy of a candle flame through convection and conduction.	Data Collection System PASPORT Stainless Steel Temperature Sensors Ring stands *Clamps* *Matches*	1 2 2 3 1 or 2
5	**Exploring Velocity and Inertia** Use a motion sensor to measure the velocity of a cart as it travels down an inclined track and collides with an obstacle.	Data Collection System PASPORT Motion Sensor Dynamics track PASCar *Marble* *Small bean bag* Meter stick	1 1 1 1 1 1 1
6	**Heat Transfer in Fluids** Use a fast response temperature sensor to investigate what happens to the temperature of a solution when two substances of different temperatures are mixed.	Data Collection System PASPORT Fast Response Temperature Sensor *Graduated cylinder, 250-mL* *Beakers or cups, 150-mL* *Insulated container* *Hot water* *Cold water* *Red and blue food dyes (optional)* *Stirring rod*	1 1 1 2 1 125 mL 125 mL 2 to 4 drops 1

* Either the PASPORT Fast Response Temperature Sensor or the PASPORT Stainless Steel Temperature Sensor can be used for this activity.

Act	Title	Materials and Equipment	Qty
7	**Investigating Evaporative Cooling** Use a fast response temperature sensor to measure the change in water temperature as it cools.	Data Collection System PASPORT Fast Response Temperature Sensors *Graduated cylinder, 25 to 50 mL* *Warm tap water (not over 40 °C)* *Small fan* *Petri dishes* *Aluminum foil*	1 2 1 ~ 100 mL 1 2 ~ 0.5 m
8	**Investigating Solar Energy** Use a temperature sensor to measure the change in temperature of black coffee as it is warmed by sunlight.		
	Teacher Demonstration	Data Collection System PASPORT Temperature Sensor* *Graduated cylinder, 25- or 50-mL* *Small, polystyrene foam coffee cups that nest within each other* *Black coffee, cold* *Rubber bands* *Clear plastic wrap, 6 in. x 6 in.* *Small metric ruler or tape measure* *Large insulated container or Thermos™ bottle (optional)*	1 1 1 2 20 mL 2 2 1 1
	Student or Group	Data Collection System PASPORT Temperature Sensor* *Graduated cylinder, 25- or 50-mL* *Black coffee, cold* *Rubber bands* *Small, polystyrene foam coffee cups that nest within each other* *Clear plastic wrap, 12 in. x 18 in.*	1 1 1 15 mL 2 2 1
9	**Measuring Light Intensity** Use a light sensor to investigate how light intensity changes as it gets further from the source.		
	Teacher Demonstration	Data Collection System PASPORT Light Sensor PASPORT Sensor Extension Cable *Lamp, with incandescent light bulb without a shade* *Sheet of white paper* Meter stick *Clear and frosted incandescent light bulbs (optional)*	1 1 1 1 1 1 1
	Student or Group	Data Collection System PASPORT Light Sensor PASPORT Sensor Extension Cable *Lamp, with incandescent light bulb without a shade* Meter stick *Clear and frosted incandescent light bulbs (optional)*	1 1 1 1 1 1

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Act	Title	Materials and Equipment	Qty
10	**Measuring the Voltage of Elements in Series** Use a voltage sensor to investigate the voltage drop across a varying number of elements in series in a circuit.		1
	Teacher Demonstration	Data Collection System PASPORT Voltage Sensor, with leads *Holiday "mini" light* *Wire strippers* *Fresh 9-volt battery*	1 10 1 1 1
	Student or Group	Data Collection System PASPORT Voltage Sensor, with leads *Holiday "mini" lights* *Wire strippers* *Fresh 9-volt battery*	1 1 10 1 1
11	**Motion Graphs** Use a motion sensor to measure the position of a moving object.		
	Teacher Demonstration	Data Collection System PASPORT Motion Sensor Reflector (optional)	1 1 1
	Student or Group	Data Collection System PASPORT Motion Sensor Reflector (optional)	1 1 1
12	**Neutralizing an Acid and a Base** Use a pH sensor to measure change in pH and to determine the endpoint of a titration.		
	Teacher Demonstration	Data Collection System PASPORT pH Sensor *Erlenmeyer flask, 250-mL* Balance *Graduated cylinder, 100-mL* Pipet or eyedropper *Vinegar* *Baking soda* *Sample paper* Buffer solution pH 4 Buffer solution pH 10 *Water*	1 1 2 1 per class 1 1 50 mL ~2 g 1 25 mL 25 mL 100 mL
	Student or Group	Data Collection System PASPORT pH Sensor *Erlenmeyer flasks, 250-mL* Balance *Graduated cylinder, 100-mL* *Beaker, 200 mL* Pipet or eyedropper *Vinegar* *Baking soda* *Sample paper* *Water* *Distilled water in wash bottle*	1 1 2 1 per class 1 1 1 50 mL ~2 g 1 100 mL 200 mL

Act	Title	Materials and Equipment	Qty
13	**Newton's First Law** Use a motion sensor and force sensor to determine how the change in an object's motion is related to the force (push or pull) applied to the object.		
	Teacher Demonstration	Data Collection System PASPORT Motion Sensor PASPORT Force Sensor with hook and rubber bumper *Chair with wheels*	1 1 1 1
	Student or Group	Data Collection System PASPORT Force Sensor with hook and rubber bumper PASPORT Motion Sensor GOcar or other dynamics cart or toy car *Duct tape or packing tape* Metric ruler or meter stick	1 1 1 1 Several strips 1
14	**Newton's Third Law** Use two force sensors to measure a pair of oppositely directed forces.		
	Teacher Demonstration	Data Collection System PASPORT Force Sensors with hooks *Balloons, empty* *Strong rubber band*	1 2 1 or 2 1
	Student or Group	Data Collection System PASPORT Force Sensors with hooks *Strong rubber band* *Towel*	1 2 1 1
15	**Observing Freezing Point Depression** Use a temperature sensor to investigate the effect of solid-liquid transitions on the temperature of ice water solutions.	Data Collection System PASPORT Temperature Sensor* *Graduated cylinder or measuring cups* *Small beaker or cup* *Measuring spoons* *Spoon or stirring stick* Balance *Ice cube tray* *Plastic food wrap, 30 cm. x 30 cm.* *Common kitchen ingredients (salt, sugar, juice, food dye, et cetera)* *Distilled water*	1 1 1 1 1 set 1 1 per class 1 1 ~ 2 g each of several samples 200 mL

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Act	Title	Materials and Equipment	Qty
16	**Observing Phase Changes** Use a temperature sensor to measure the change in temperature during the heating of two different mixes of ice and water – one with distilled water only and one with salt dissolved in distilled water.		
	Teacher Demonstration	Data Collection System PASPORT Temperature Sensor* *Erlenmeyer flask, 250-mL* *Ice cubes* *Distilled water* *One-hole stopper*	1 1 1 at least 5 200 mL 1
	Student or Group	Data Collection System PASPORT Temperature Sensor* *Erlenmeyer flask, 250-mL* *Graduated cylinder, 50- or 100-mL* *Distilled water* Balance *Ice cubes* *Hot plate* *Measuring spoons* *One-hole stopper* *Table salt* *Towel*	1 1 1 1 200 mL 1 per class at least 5 1 1 set 1 ~2 g 1
17	**Simple Harmonic Motion** Use a motion sensor to measure the period of a simple pendulum.		
	Teacher Demonstration	*2-liter soda bottle with cap* *String, non-stretch, ~2 m* *Food coloring (optional)*	1 ~2 m 3 to 4 drops
	Student or Group	Data Collection System PASPORT Motion Sensor *2-liter soda bottle with cap* Meter stick *String, non-stretch, ~2 m* *Food dye (optional)* *Funnel* *Container of tap water (~500 mL)*	1 1 1 1 ~2 m 2 to 4 drops 1 1

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Act	Title	Materials and Equipment	Qty
18	**Simple Machines and Force** Use a force sensor to measure the force required to lift a mass with varying configurations of fixed and moveable pulleys.		
	Teacher Demonstration	*Tinker Toys™ or other suitable building materials* Pulley *String*	1 set 1 1
	Student or Group	Data Collection System PASPORT Force Sensor with hook Pulleys *String* 0.2 to 0 .5 kg mass Balance *Tinker Toys™ or other suitable building materials*	1 1 2 1 1 1 per class 1 set
19	**Speed and Velocity** Use a motion sensor to measure the position and velocity of a moving object.		
	Teacher Demonstration	*Watch with second hand, or stopwatch*	1
	Student or Group	Data Collection System PASPORT Motion Sensor Reflector (optional)	1 1 1
20	**Transfer of Energy in Chemical Reactions** Use a fast response temperature sensor and an absolute pressure sensor to measure the change in temperature of an endothermic reaction and the temperature and pressure change of an exothermic reaction.	Data Collection System PASPORT Fast Response Temperature Sensor PASPORT Absolute Pressure Sensor *Erlenmeyer flask, 250 mL* *Graduated cylinder, 100 mL* Quick-release connector Tubing, 20 to 30 cm *1-hole stopper for Erlenmeyer* *Beaker or clear plastic cup, 250 mL* *Instant hot-pack (disposable type)* *Alka-Seltzer® tablets* *Distilled water*	1 1 1 1 1 1 1 1 1 1 2 100 mL

Act	Title	Materials and Equipment	Qty
21	**Varying Reaction Rates** Use a fast response temperature sensor to measure the change in temperature over time during four trials of Alka-Seltzer® tablets as they react and produce bubbles in a container of water.		
	Teacher Demonstration	*Alka-Seltzer® tablet* *Water, room temperature* *Clear plastic cup or beaker, 300 mL (10 oz)*	1 ~200 mL 1
	Student or Group	Data Collection System PASPORT Fast Response Temperature Sensor *Graduated cylinder, 100-mL* *Alka-Seltzer® tablets* *Stopwatch* *Clear plastic cups or beakers, 300-mL (10 oz)* *Spoon or stirring stick* *Warm water* *Ice water*	1 1 1 1 3 1 ~500 mL ~500 mL
22	**Voltage Time** Use a voltage sensor to measure the energy conversions that take place as the battery supplying energy for a miniature motor becomes exhausted.		
	Teacher Demonstration	*Collection of different batteries for display* *Battery, D-cell, in holder* *Magnets, small disk or rectangular* *Electrical lead wires with alligator clips* *20-gauge copper wire* Wire strippers or scissors (for insulated wire) *Sandpaper (for enameled wire)* *Large paper clips* *Cup, plastic, paper, or foam* *Small rubber band* *Masking tape* *Marking pen, permanent, dark color*	Several 1 5 2 ~ 60 cm 1 1 2 1 1 ~20 cm 1
	Student or Group	Data Collection System PASPORT Voltage Sensor *Battery, D-cell, in holder1* *Magnets, small disk or rectangular* *Electrical lead wires with alligator clips* *20-gauge copper wire* Wire strippers or scissors (for insulated wire) *Sandpaper (for enameled wire)* Alligator clip (optional) *Large paper clips* *Cup, plastic, paper, or foam* *Small rubber band* *Masking tape* *Marking pen, permanent, dark color*	1 1 1 5 2 ~ 60 cm 1 1 1 2 1 1 1 1

Act	Title	Materials and Equipment	Qty
23	**Work and Mechanical Advantage** Use a force sensor to measure the force required to lift a mass with varying configurations of fixed and moveable pulleys, in combination with an inclined plane (a ramp).		
	Teacher Demonstration	*Tinker Toys™ or other building materials* Cart or toy car Pulleys *String*	1 set 1 2 to 4 1
	Student or Group	Data Collection System PASPORT Force Sensor with hook Meter stick or ruler Balance *Tinker Toys™ or other building materials* Cart or toy car Pulleys *String*	1 1 1 1 per class 1 set 1 2 1

Calibration materials

If you want to calibrate various sensors, you will need the following:

pH Sensor

Item	Quantity	Where Used
Buffer solution, pH 4	25 mL	11, 26, 30, 45
Buffer solution, pH 10	25 mL	
Beaker, small	3	
Wash bottle with deionized or distilled water	1	

Activity by PASCO Sensors

This list shows the sensors and other PASCO equipment used in the lab activities.

Items Available from PASCO	Qty	Activity Where Used
Data Collection System	1	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
PASPORT Absolute Pressure Sensor	1	2, 3, 20
PASPORT Fast Response Temperature Sensor	1	6, 20, 21
PASPORT Fast Response Temperature Sensor	2	7
PASPORT Force Sensor	1	1, 13, 18, 23
PASPORT Force Sensor	2	14
PASPORT Light Sensor	1	9
PASPORT Motion Sensor	1	5, 11, 13, 17, 19
PASPORT pH Sensor	1	12
PASPORT Stainless Steel Temperature Sensor	2	4
PASPORT Temperature Sensor*	1	3, 8, 15, 16
PASPORT Voltage Sensor	1	10, 22
PASPORT Sensor Extension Cable	1	2, 9

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