MASTER MATERIALS AND EQUIPMENT LIST

This Master Materials and Equipment List shows the equipment required to perform the *Structured* version of each lab activity from the *Advanced Physics 2 through Inquiry* lab manual. Italicized entries indicate items not available from PASCO. The quantity indicated is per student or group.

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

Lab	Title	Materials and Equipment	PASCO Part Number	Qty
1	HYDROSTATIC PRESSURE Students use a low-pressure sensor to measure the static pressure at different depths in a column of water and use their data to determine the mathematical relationship between static pressure and depth in a fluid.	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASPORT Barometer/Low-Pressure Sensor	PS-2113A	1
		PASPORT Sensor Extension Cable*	PS-2500 or w/PS-2162	1
		Quick connector*	w/PS-2113A	1
		Tubing, 1/4" diameter*	w/PS-2113A	30 cm
		Four-Scale Meter Stick	SE-8695	1
		Water reservoir, transparent, over 30 cm high		1
		Distilled water, to fill the reservoir 3/4 full		2 L
2	BUOYANT FORCE Students use a high-resolution force sensor to measure the buoyant force on a metal cylinder lowered into a fluid and then determine the relationship between the buoyant force on a submerged object and a) its volume and b) the weight of the fluid displaced by the submerged object.	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASPORT High Resolution Force Sensor with hook	PS-2189	1
		PASCO Overflow Can	SE-8568	1
		PASCO Aluminum Table Clamp	ME-8995	1
		Brass cylinder[1]	w/ME-8569A	1
		Aluminum cylinder[1]	w/ME-8569A	1
		Rod, 45-cm	ME-8736	2
		Right angle clamp	SE-9444	1
		Four-Scale Meter Stick	SE-8695	1
		Thread	ME-9875	60 cm
		Beaker, 100-mL		1
		Beaker, 1-L		1
		Glass stir rod		1
		Felt-tipped pen with permanent ink		1
		Liquid dish soap		3 mL
		Distilled water		500 mL
		Paper towel		1 roll
		[1]Any two metal cylinders (of different metals) that can be suspended vertically above their center can be used.		
		FOR THE ENTIRE CLASS		
		Ohaus Scout Pro Balance 400-g	SE-8756A	1

Lab	Title	Materials and Equipment	PASCO Part Number	Qty
3	FLUID DYNAMICS Students determine the relationship between the velocity of a water stream as it leaves the nozzle at the bottom of a water column and the height of the water column.	**FOR EACH STUDENT STATION** Four-Scale Meter Stick *Water reservoir with a nozzle or hole at the bottom* *Support stand, 10 cm high* *Distilled water to fill the water reservoir* *Water catch basin* *Pen, felt marker*	 SE-8695	 1 1 1 2 L 1 1
4	BOYLE'S LAW Students use a low-pressure sensor and a syringe to determine the inverse proportionality between the pressure and volume of an enclosed gas.	**FOR EACH STUDENT STATION** Data Collection System PASPORT Barometer/Low-Pressure Sensor PASPORT Sensor Extension Cable* Quick connector* Tubing* Syringe, 60-mL* *Scissors*	 PS-2113A PS-2500 or w/PS-2162 w/PS-2113A w/PS-2113A w/SE-7562	 1 1 1 1 2 cm 1 1
5	SPHERICAL MIRROR REFLECTION Students use an optics light source, optics track, and half screen to measure the image and object distances associated with the real image formed by a concave spherical mirror and then use principles of reflection and the spherical mirror equation to determine the mirror's radius of curvature.	**FOR EACH STUDENT STATION** PASCO Optics Track[2] PASCO Basic Optics Light Source PASCO Concave Mirror Accessory PASCO Half-Screen Accessory* [2]or PASCO Dynamics Track with three Optics Carriages (OS-8472)	 OS-8508 OS-8470 OS-8457 w/OS-8457	 1 1 1 1
6	SNELL'S LAW Students use an optics ray table to measure the incident and refraction angles of a light ray travelling from air into a material with unknown index of refraction, and then, using the principles of refraction and Snell's law, they determine the material's index of refraction.	**FOR EACH STUDENT STATION** PASCO Basic Optics Ray Table PASCO Basic Optics Light Source D-shaped lens*	 OS-8465 OS-8470 w/OS-8465	 1 1 1
7	FOCAL LENGTH OF A CONVERGING LENS Students use an optics light source, optics track, and viewing screen to measure the image and object distances associated with the real image formed by a converging lens, and then determine the focal length of the lens.	**FOR EACH STUDENT STATION** PASCO Optics Track[2] PASCO Basic Optics Light Source PASCO Basic Optics Viewing Screen PASCO Adjustable Lens Holder Converging lens, 50-mm diameter * [2]or PASCO Dynamics Track with three Optics Carriages (OS-8472)	 OS-8508 OS-8470 OS-8460 OS-8474 w/OS-8466A	 1 1 1 1 1

Lab	Title	Materials and Equipment	PASCO Part Number	Qty
8	INTERFERENCE AND DIFFRACTION	**FOR EACH STUDENT STATION**		
	Students shine laser light through a double-slit aperture onto paper, measure the distances between the maxima of the resulting interference pattern, and use the principles associated with double-slit interference and diffraction to determine the spacing between the slits.	PASCO Diffraction Plate	OS-8850	1
		PASCO Aluminum Table Clamp	ME-8995	2
		Rod, 45-cm	ME-8736	2
		Three finger clamp	SE-9445	2
		Stainless steel calipers	SE-8710	1
		Laser pointer with known wavelength	SE-9716B	1
		Four-Scale Meter Stick	SE-8695	1
		White paper		1 sheet
		Pencil		1
		Measuring tape		1
		FOR THE ENTIRE CLASS		
		Tape		1 roll
9	ELECTRIC FIELD MAPPING	**FOR EACH STUDENT STATION**		
	Students use a DC power supply and semi-conductive paper to create dipole and parallel plate electrodes, and then use the principles of electric fields and electric potential energy to determine the shape and direction of the electric field lines in each configuration.	PASCO Field Mapper Kit	PK-9023	1
		Conductive paper*	w/PK-9023	2 sheets
		Conductive ink pen*	w/PK-9023	1
		Cork board*	w/PK-9023	1
		Pushpin, metal*	w/PK-9023	6
		Student power supply, 18 VDC, 3 A	SE-8828	1
		4-mm banana plug patch cord*	w/SE-9750 or w/PS-2115	4
		4-mm banana plug alligator clip*	w/SE-9756 or w/PS-2115	4
		Digital multimeter	SE-9786A	1
		T-pin, metal		1
		Felt-tip marker, silver		1
		Pencil		1
10	MAGNETIC FIELDS	**FOR EACH STUDENT STATION**		
	Students use an AC/DC electronics laboratory, a power supply, and a Magnaprobe™ wand to detect and compare the magnetic field pattern surrounding a bar magnet and a current-carrying coil.	PASCO AC/DC Electronics Lab Kit	EM-8656	1
		Wire lead*	w/EM-8656	1
		Student power supply, 18 VDC, 3 A	SE-8828	1
		Magnaprobe™ wand	SE-7390	1
		Bar magnet	EM-8620	1
		4-mm banana plug patch cord*	w/SE-9750 or w/PS-2115	2
		Magnet wire or enameled wire, 22-gauge		4 m
		Sandpaper		1 sheet
		Scissors or wire cutters		1
		Beaker, 400-mL		1

Lab	Title	Materials and Equipment	PASCO Part Number	Qty
11	MAGNETIC FIELD STRENGTH Students use a 2-axis magnetic field sensor and the AC/DC electronics laboratory to determine how the strength of the magnetic field at the center of a current-carrying coil depends on the coil current and radius.	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASPORT 2-Axis Magnetic Field Sensor w/handle	PS-2162	1
		PASPORT Sensor Extension Cable*	w/PS-2162	1
		PASCO AC/DC Electronics Lab Kit	EM-8656	1
		Wire lead*	w/EM-8656	1
		Student power supply, 18 VDC, 3 A	SE-8828	1
		4-mm banana plug patch cord*	w/SE-9750 or w/PS-2115	2
		PASCO Aluminum Table Clamp	ME-8995	1
		Rod, 45-cm	ME-8736	1
		Right angle clamp	SE-9444	1
		Four-Scale Meter Stick	SE-8695	1
		Magnet wire or enameled wire, 22-gauge		10 m
		Beakers of different diameter		5
		Sandpaper		1 sheet
		Scissors or wire cutters		1
12	ELECTROMAGNETIC INDUCTION Students use an induction wand, rotary motion sensor, variable gap magnet, and 2-axis magnetic field sensor to determine how the rate of change of magnetic flux through a coil affects the magnitude and direction of the average emf induced in it.	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASPORT Voltage–Current Sensor	PS-2115	1
		PASPORT Rotary Motion Sensor	PS-2120A	1
		PASPORT 2-Axis Magnetic Field Sensor	PS-2162	1
		PASPORT Sensor Extension Cable*	w/PS-2162	1
		PASCO Variable Gap Magnet	EM-8618	1
		PASCO Induction Wand	EM-8099	1
		PASCO Aluminum Table Clamp	ME-8995	1
		Right angle clamp	SE-9444	1
		Rod, 45-cm	ME-8736	2
13	CAPACITOR FUNDAMENTALS Students use a digital capacitance meter and construct capacitors from aluminum foil and paper to determine how physical properties of a parallel-plate capacitor affect its ability to store electric charge.	**FOR EACH STUDENT STATION**		
		4-mm banana plug patch cord*	w/SE-9750 or w/PS-2115	2
		4-mm banana plug alligator clip*	w/SE-9756 or w/PS-2115	2
		Four-Scale Meter Stick	SE-8695	1
		Digital capacitance meter, 0.01-nF resolution		1
		Aluminum foil sheet, 8 ½" × 11"		4
		Paper sheet, 8 ½" × 11"		6
		Scissors		1
		Heavy textbook		1
14	SERIES AND PARALLEL CAPACITORS Students use a capacitance meter to measure the equivalent capacitance in simple series and parallel circuits and determine the equivalent capacitance of capacitors connected in series and parallel.	**FOR EACH STUDENT STATION**		
		PASCO AC/DC Electronics Lab Kit	EM-8656	1
		Wire lead*	w/EM-8656	6
		4-mm banana plug patch cord*	w/SE-9750 or w/PS-2115	2
		4-mm banana plug alligator clip*	w/SE-9756 or w/PS-2115	2
		Digital capacitance meter, 1-μF resolution		1
		Capacitor, 100-□F		5

Lab	Title	Materials and Equipment	PASCO Part Number	Qty
15	RC CIRCUITS Students use a voltage–current sensor and an AC/DC electronics laboratory to determine how the potential differences across the resistors and capacitor in a simple RC circuit differ when the capacitor is charging, discharging, and fully charged, and how these differences affect the current through each component in the circuit.	**FOR EACH STUDENT STATION** Data Collection System PASPORT Voltage–Current Sensor 4-mm banana plug patch cord* 4-mm banana plug alligator clip* PASCO AC/DC Electronics Lab Kit Capacitor, 470-µF* Resistor, 33-Ω* Resistor, 100-Ω* Wire lead* *D-cell Battery*	 PS-2115 w/PS-2115 w/PS-2115 EM-8656 w/EM-8656 w/EM-8656 w/EM-8656 w/EM-8656	 1 1 2 4 1 1 1 1 6 2
16	PLANCK'S CONSTANT Students use a voltage–current sensor and an AC/DC electronics laboratory to measure the turn-on voltage of various colors of LEDs and then plot the turn-on voltage versus LED frequency to determine the value of Planck's constant.	**FOR EACH STUDENT STATION** Data Collection System PASPORT Voltage–Current sensor PASCO AC/DC Electronics Lab Kit Wire lead* Resistor, 330-Ω* *LED, blue (450–500 nm)* *LED, green (501–565 nm)* *LED, yellow/amber (566–620 nm)* *LED, red (621–750 nm)* *D-cell Battery*	 PS-2115 EM-8656 w/EM-8656 w/EM-8656	 1 1 1 5 1 1 1 1 1 2

* These items are included with the specific kit, apparatus, or sensor used in the experiment.

ACTIVITY BY PASCO ITEM

This table indicates which lab activities use the PASCO scientific sensors or special equipment listed. The quantities shown indicate the number of each item required to complete all the activities that require the specified item.

Items Available from PASCO	PASCO Part Number	Qty	Activity Where Used
PASCO SENSORS			
PASPORT Barometer/Low-Pressure Sensor	PS-2113A	1	1, 4
PASPORT High Resolution Force Sensor with hook	PS-2189	1	2
PASPORT 2-Axis Magnetic Field Sensor	PS-2162	1	11, 12
PASPORT Sensor Extension Cable*	w/PS-2162	1	1, 4, 11, 12
PASPORT Rotary Motion Sensor	PS-2120A	1	12
PASPORT Voltage-Current Sensor	PS-2115	1	12, 15, 16
PASCO LABWARE			
PASCO AC/DC Electronics Lab Kit	EM-8656	1	10, 11, 14, 15, 16
PASCO Adjustable Lens Holder	OS-8474	1	7
PASCO Aluminum Table Clamp	ME-8995	1	2, 8, 11, 12
PASCO Basic Optics Light Source	OS-8470	1	5, 6, 7
PASCO Basic Optics Ray Table	OS-8465	1	6
PASCO Basic Optics Viewing Screen	OS-8460	1	7
PASCO Concave Mirror Accessory	OS-8457	1	5
PASCO Diffraction Plate	OS-8850	1	8
PASCO Field Mapper Kit	PK-9023	1	9
PASCO Induction Wand	EM-8099	1	12
PASCO Optics Track	OS-8508	1	5, 7
PASCO Overflow Can	SE-8568	1	2
PASCO Variable Gap Magnet	EM-8618	1	12
OTHER LABWARE			
Brass cylinder	w/ME-8569A	1	2
Aluminum cylinder	w/ME-8569A	1	2
Bar magnet	EM-8620	1	10
Converging lens, 50-mm diameter*	OS-8466A	1	7
Digital multimeter	SE-9786A	1	9
Four-Scale Meter Stick	SE-8695	1	1, 2, 3, 8, 11, 13
Laser pointer with known wavelength	SE-9716B	1	8
Magnaprobe™ wand	SE-7390	1	10
Right angle clamp	SE-9444	1	2, 11, 12
Rod, 45-cm	ME-8736	2	2, 8, 11, 12

Items Available from PASCO	PASCO Part Number	Qty	Activity Where Used
Stainless steel calipers	SE-8710	1	8
Student power supply, 18 VDC, 3 A	SE-8828	1	9, 10, 11
Syringe, 60-mL*	w/SE-7562	1	4
Thread	ME-9875	60 cm	2
Three finger clamp	SE-9445	2	8

* These items are included with the specific kit, apparatus, or other sensor.