

Advanced Physics

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 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>).

Act	Title	Materials and Equipment	PASCO Part Number	Qty
1	Scientific Inquiry Use a fast response temperature sensor in the design of a simple experiment as students attempt to slow the cooling rate of the water by adding insulation to the cup.	Data Collection System PASPORT Fast Response Temperature Sensor <i>9-12 oz. cup</i> <i>Hot water</i> <i>Insulating devices readily available in the laboratory (styrofoam, foil, plastic wrap, cloth, wool, packing peanuts)</i>	 PS-2135 (set of 3)	1 1 1 A variety
2	Measurements and Graphical Analysis	<i>Circular disks with different radii</i> Balance Meter Stick Stainless Steel Caliper	 SE-8756A SE-8695 SF-8711	5 1 1 1
3	Graphical Analysis: Motion	Data Collection System PASPORT Motion Sensor Dynamics Track (PAstrack) Dynamics Cart (PAScar (Set of 2)) Meter Stick	 PS-2103A ME-6960 ME-6950 (set of 2) SE-8695	1 1 1 1 1
4	1-Dimensional Motion: Inclined Plane	Data Collection System PASPORT Motion Sensor Dynamics Track (PAstrack) Dynamics Cart (PAScar (Set of 2)) Dynamics Track End Stop (2 Pack) Large Base and Support Rod	 PS-2103A ME-6960 ME-6950 (set of 2) ME-8971 (set of 2) ME-9355	1 1 1 1 1 1

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Act	Title	Materials and Equipment	PASCO Part Number	Qty
		Dynamics Track Rod Clamp (Pivot Clamp)	ME-9810	1
5	Determining the Acceleration Due to Gravity	Data Collection System PASPORT Digital Adapter PASCO Freefall Adapter Steel Ball Right Angle Clamp Large Base and Support Rod Meter Stick	 PS-2159 ME-9207B (included with ME-9207B) SE-9444 ME-9355 SE-8695	1 1 1 1 1 1 1
6	2-Dimensional Motion: Projectiles	Data Collection System PASPORT Digital Adapter Photogate (Photogate Head) Photogate Mounting Bracket PASCO Mini Projectile Launcher Mini Launcher Table Clamp Push Rod or Plunger Meter Stick Carbon paper	 PS-2159 ME-9498A ME-6821A ME-6825A (included with ME-6825A) (included with ME-6825A) SE-8695 SE-8693 (100 sheets)	1 1 2 1 1 1 1 1 1-sheet
7	Coefficients of Friction	Data Collection System PASPORT Motion Sensor PASPORT Force Sensor (High Resolution) PASCO Discover Friction Accessory Balance, 1200-g capacity 250 g or 500 g Masses (Compact Cart Mass, 250-g) String (Black Thread (3 pack))	 PS-2103A PS-2189 ME-8574 SE-8757A ME-6755 ME-9875 (3 spools, 137-m ea.)	1 1 1 1 4 20-cm
8	Atwood's Machine	Data Collection System PASPORT Rotary Motion Sensor Mass and Hanger Set Right Angle Clamp Large Base and Support Rod Small Rod (Stainless Steel Rod, 60 cm Threaded) String (Black Thread (3 pack)) <i>Scissors</i>	 PS-2120 ME-8979 SE-9444 ME-9355 ME-8977 ME-9875 (3 spools, 137-m ea.)	1 1 1 1 1 1 1.5-m
9	Air Drag	Meter Stick	SE-8695	2

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		Dynamics Track (PAstrack)	(set of 2) ME-6960	1
		PASCO Discover Collision Bracket	ME-8973	1
		Dynamics Track Rod Clamp (Pivot Clamp)	ME-9810	1
		Large Base and Support Rod	ME-9355	1
13	Circular Motion	Data Collection System		1
		PASPORT Force Sensor (High Resolution)	PS-2189	1
		PASCO Discover Centripetal Force Kit	ME-9837	1
		Balance	SE-8756A	1
		Universal Table Clamp	ME-9376B	1
		Pulley Mounting Rod	SA-9242	1
		Meter Stick	SE-8695	1
		Rubber Stopper with Hole, Size 10	(included with ME-9837)	1
		Durable String	(included with ME-9837)	1.5-m
		Plastic Tie	(included with ME-9837)	1
		Hollow Tube	(included with ME-9837)	1
		<i>Permanent marker</i>		1
14	Periodic Motion: Mass and Spring System	Data Collection System		1
		PASPORT Force Sensor (High Resolution)	PS-2189	1
		Mass and Hanger Set	ME-8979	1
		PASCO Demonstration Spring Set	ME-9866	1
		Spring ($k < 20$ N/m)	(included with ME-9866)	1
		Meter Stick	SE-8695	1
		Large Base and Support Rod	ME-9355	1
		Right Angle Clamp	SE-9444	1
		Small Rod (Stainless Steel Rod, 60 cm Threaded)	ME-8977	1
15	Simple Harmonic Motion and Pendulums	Data Collection System		1
		Photogate (Photogate Head)	ME-9498A	1
		PASPORT Digital Adapter	PS-2159	1
		PASCO Photogate Pendulum Set	ME-8752	1
		Pendulum Bob	(included with ME-8752)	1
		Pendulum Clamp	SE-9443	1
		Meter Stick	SE-8695	1
		Large Base and Support Rod	ME-9355	1
		Small Rod (Stainless Steel Rod, 60 cm Threaded)	ME-8977	1
		String (Black Thread (3 pack))	ME-9875	2-m

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Act	Title	Materials and Equipment	PASCO Part Number	Qty
		<i>Scissors</i>	(3 spools, 137-m ea.)	1
16	Hooke's Law	Data Collection System PASPORT Force Sensor (High Resolution) PASCO Demonstration Spring Set Spring ($k < 20$ N/m) Meter Stick	PS-2189 ME-9866 (included with ME-9866) SE-8695	1 1 2 1
17	Rotational Dynamics	Data Collection System PASPORT Rotary Motion Sensor Mass and Hanger Set PASCO Mini Rotational Accessory Balance, 400-g capacity Stainless Steel Caliper Large Base and Support Rod Meter stick String (Black Thread (3 pack)) <i>Scissors</i>	PS-2120 ME-8979 CI-6691 SE-8756A SF-8711 ME-9355 SE-8695 ME-9875 (3 spools, 137-m ea.)	1 1 1 1 1 1 1 1 1.5-m 1
18	Buoyant Force	Data Collection System PASPORT Force Sensor (High Resolution) <i>Beaker, glass with graduations, 500-mL</i> PASCO Density Set Metal Cylinder Large Base and Support Rod Right Angle Clamp <i>Pen, black marker</i> String (Black Thread (3 pack)) <i>Water,</i> Meter Stick Small Rod (Stainless Steel Rod, 60 cm Threaded)	PS-2189 ME-8569 (included with ME-8569) ME-9355 SE-9444 ME-9875 (3 spools, 137-m ea.) SE-8695 ME-8977	1 1 1 1 1 1 1 10-cm ~ 400 mL 1 1
19	Static Pressure and Flow	Data Collection System PASPORT Low Pressure Sensor Quick-Release Connectors Plastic Tubing, 1/4" diameter <i>Support stand, 10 cm tall</i> Meter stick	PS-2113A (included with PS-2113A) (included with PS-2113A)	1 2 1 1 1 1

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Act	Title	Materials and Equipment	PASCO Part Number	Qty
		<i>Water reservoir with a nozzle at the bottom</i>		1
		<i>Water catch basin</i>		1
		<i>Pen, felt marker</i>		1
		<i>Distilled water</i>		
20	Latent Heat and Specific Heat of Water	Data Collection System		1
		PASPORT Temperature Sensor (Absolute Pressure/Temperature)	PS-2146	1
		PASPORT Stainless Steel Temperature Probe	PS-2153	1
		Calorimeter Cup	TD-8825 (set of 12)	1
		Balance	SE-8756A	1
		<i>Beakers, glass, 400-mL</i>		2
		Stopwatch	ME-1234	1
		Hot Plate	SE-8830	1
		<i>Distilled water</i>		~200 mL
		<i>Ice</i>		~200 mL
21	Thermal Expansion	Data Collection System		1
		PASPORT Rotary Motion Sensor	PS-2120	1
		PASPORT Temperature Sensor (Absolute Pressure/Temperature)	PS-2146	1
		PASCO Computer Based Thermal Expansion Apparatus	TD-8579A	1
		PASCO Steam Generator	TD-8556A	1
		<i>Oven Mitts or Towels to protect hands</i>		1
		Meter Stick	SE-8695	1
		<i>Tray (to catch condensed steam)</i>		1
22	Gas Laws	Data Collection System		1
		PASPORT Absolute Pressure Sensor (Absolute Pressure/Temperature)	PS-2146	1
		Plastic Tubing, 1/4" in diameter	(included with PS-2146)	~5 cm
		Quick-Release Connectors	(included with PS-2146)	2
		Syringe	(included with PS-2146)	1
23	Ohm's Law: Series and Parallel Resistors	Data Collection System		1
		PASPORT Voltage-Current Sensor	PS-2115	1
		AC/DC Electronics Laboratory	EM-8656	1
		Variable DC Power Supply	SE-8828	1
		Resistors, 330-Ω	(included with EM-8656)	3
		Alligator Clip Adapters	(included with PS-2115)	4
		<i>Wire leads</i>	(included with EM-8656)	4

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Act	Title	Materials and Equipment	PASCO Part Number	Qty
		Patch Cord, 4 mm Banana Plug, Black Patch Cord, 4 mm Banana Plug, Red	SE-9751 (set of 5) (included with PS-2115)	2 2
24	RC Circuits	Data Collection System PASPORT Voltage-Current Sensor AC/DC Electronics Laboratory Alligator Clip Adapters <i>Batteries, D-cell</i> Patch Cord, 4 mm Banana Plug, Red	PS-2115 EM-8656 (included with PS-2115) (included with PS-2115)	1 1 1 2 2 2
25	Electric Field Mapping	Data Collection System PASPORT Voltage-Current Sensor DC Power Supply (up to 20 V) PASCO Field Mapper Kit Alligator Clip Adapters <i>T-pins (or metal pins or thumbtacks)</i> Conductive Paper	PS-2115 SE-8828 PK-9023 (included with PS-2115) (included with PK-9023)	1 1 1 4 4 3 to 6
26	Electromagnetic Fields	Data Collection System PASPORT Voltage-Current Sensor PASPORT Magnetic Field Sensor PASPORT Sensor Extension Cable PASCO Primary and Secondary Coil Set Variable DC Power Supply, 1 A Large Base and Support Rod Three Finger Clamp Patch Cord, 4 mm Banana Plug	PS-2115 PS-2112 PS-2500 SE-8653 SE-8828 ME-9355 SE-9445 (included with PS-2115)	1 1 1 1 1 1 2 3
27	Wave Speed	PASCO Snakey (or other long spring with length > 2 m) Stopwatch Meter Stick	SE-7331 ME-1234 SE-8695	1 1 1
28	Resonance and Standing Waves	Tuning Forks (each with different frequency) Graduated cylinder, 1-L, or other tall water reservoir Meter stick <i>Plastic pipe, both ends open, 3 cm or larger diameter</i> <i>Water to fill reservoir</i>	SE-7342 (set of 8) ME-8594 SE-8695	5 1 5 1
29	Index of Refraction	PASCO Basic Optics Kit Basic Optics Ray Table	OS-8515C (included with OS-8515C)	1 1

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Act	Title	Materials and Equipment	PASCO Part Number	Qty
		Basic Optics Light Source with Power Supply D-shaped Lens	(included with OS-8515C) (included with OS-8515C)	1 1
30	Focal Length of a Lens	PASCO Basic Optics Kit Optics Bench, 1.2-m Viewing Screen Basic Optics Light Source with Power Supply Lens in Holder (“unknown” focal length) Stainless Steel Calipers	OS-8515C (included with OS-8515C) (included with OS-8515C) (included with OS-8515C) (included with OS-8515C) SF-8711	1 1 1 1 1 1
31	Spherical Mirror Reflection	PASCO Basic Optics Kit Optics Bench, 1.2-m Half Viewing Screen Stainless Steel Calipers Basic Optics Light Source with Power Supply Concave Mirror in Holder (“unknown” radius of curvature)	OS-8515C (included with OS-8515C) (included with OS-8515C) SF-8711 (included with OS-8515C) (included with OS-8515C)	1 1 1 1 1
32	Interference and Diffraction of Light	Data Collection System PASPORT Rotary Motion Sensor PASPORT High Sensitivity Light Sensor PASPORT Sensor Extension Cable Linear Translator – Basic Optics Optics Bench, 1.2-m Red Diode Laser – Basic Optics ($\lambda=632\text{nm}$) Precision Diffraction Slits – Basic Optics Aperture Bracket	 PS-2120 PS-2176 PS-2500 OS-8535 OS-8508 (also included with OS-8515C) OS-8525A OS-8453 OS-8534	1 1 1 1 1 1 1 1

Equipment List by Item

This list shows each item needed for the activities and where the item is used.

Items Available from PASCO	Qty	Where Used
PASPORT Temperature Sensor	1	19, 20
PASPORT Motion Sensor	1	2, 3, 6, 11
PASPORT Force Sensor	1	6, 10, 11, 12, 13, 15, 17
PASPORT Rotary Motion Sensor	1	7, 16, 20, 31
PASPORT Low Pressure Sensor	1	18
PASPORT Absolute Pressure Sensor	1	21
PASPORT Voltage and Current Sensor	1	22, 23, 24, 25
PASPORT Magnetic Field Sensor	1	25
PASPORT High Sensitivity Light Sensor	1	31
PASPORT Sensor Extension Cable	1	25, 31
PASPORT Digital Adapter	1	4, 5, 9, 10, 14
PASCO Field Mapper Kit	1	24
PASCO Photogate	2	5, 9, 10, 14
PASCO Calorimeter	1	19
PASCO Basic Optics Ray Table	1	28
PASCO Basic Optics Bench	1	29, 30
PASCO Freefall Adapter	1	4
PASCO Mini-Projectile Launcher	1	5
PASCO Discover Collision Bracket	1	11
PASCO PASTrack	1	3, 9, 10, 11
PASCO PASCAR	1	2, 3, 9, 10, 11
PASCO Curved PASTrack	1	9
Balance	1	1, 2, 6, 10, 11, 12, 16, 19
Hot Plate	1	19
Large Base and Support Rod	1	3, 4, 7, 9, 10, 11, 13, 15*, 16, 17, 25
Small Rod	1	14, 18
Quick Release Connector ¹	2	18, 21
Three-Finger Clamp	1	25
Dynamics Track Rod Clamp	1	3, 9, 10, 11
Steam Generator	1	20
Stainless Steel Caliper	1	1, 2, 16, 29, 30
Cart Picket Fence	1	9, 10
End Stop	1	3
Right Angle Clamp	1	4, 7, 13, 17
Meter Stick	1	4, 5, 8, 9, 10, 12, 13, 14, 15, 16, 18, 20, 27
Photogate Mounting Bracket	1	5
Photogate Bracket	1	9, 10
Pushrod or Plunger ¹	1	5
Discover Friction Accessory	1	6
Mass and Hanger Set	1	6, 7, 13, 16
Universal Table Clamp	1	12
Pulley Mounting Rod	1	12
Rubber Stopper with Hole, Size 10 ¹	1	12

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Items Available from PASCO	Qty	Where Used
Plastic Tie ¹	1	12
Durable String ¹	1	12
Hollow Tube ¹	1	12
Spring ¹	1	13, 15, 26
Pendulum Bob ¹	1	14
Pendulum Clamp	1	14
Mini-Rotational Accessory	1	16
Metal Cylinder ¹	1	17
Plastic Tubing, 1/4 inch diameter ¹	1	18,21
Water Reservoir (with a nozzle at the bottom)	1	18, 27*
Stopwatch	1	10, 19, 26
Syringe ¹	1	21
AC/DC Electronics Laboratory	1	22, 23
Variable DC Power Supply	1	22, 24, 25
Resistors, 330 ohm ¹	3	22
Alligator Clip Adapters ¹	4	22, 24, 24
Patch Cord, 4 mm Banana Plug	4	22, 23, 24
Conductive Paper ¹	1	24
Primary and Secondary Coils Set	1	25
Tuning Fork Set	1	27
Laser – Basic Optics	1	31
Basic Optics Light Source ¹	1	28, 29, 30
D-Shaped Lens – Basic Optics ¹	1	28
Viewing Screen – Basic Optics ¹	1	29
Half Viewing Screen – Basic optics ¹	1	30
Concave Mirror – Basic Optics ¹	1	30
Linear Translator – Basic Optics	1	31
1.2 m Optics Track – Basic Optics ¹	1	31
Precision Diffraction Slits – Basic Optics	1	31
Aperture Bracket – Basic Optics	1	31

¹ These items are included with the specific apparatus or sensor used in the experiment