

**ScienceWorkshop<sup>®</sup>**

**Physics Labs with Computers**

# **Teacher's Guide**

**Volume 2**

Physics experiments using the *ScienceWorkshop*<sup>®</sup>  
or *DataStudio*<sup>™</sup> program and interfaces from PASCO scientific<sup>®</sup>

**PASCO<sup>®</sup>**  
scientific

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## Equipment List

**Boldface** type indicates items available from PASCO scientific. *Italics* type indicates optional items.  
NOTE: Each activity also requires protective gear for each student (e.g., safety goggles).

Act	Title	Equipment	Qty	Cat. #
P36	Instantaneous Speed and Average Speed	<b>Photogate</b>	2	ME-6838
		<b>Dynamics Cart (w/ Track)</b>	1	ME-9430
		<b>Five Pattern Picket Fence</b>	1	648-04704
		Meter stick	1	
		<b>Photogate Bracket</b>	2	003-04662
		<b>1.2 m Track System</b>	1	ME-9429A
P37	Time of Flight vs Initial Speed for a Projectile	<b>Photogate</b>	2	ME-6838
		C-clamp	1	
		<b>Extension Cable</b>	1	PI-8117
		<b>Photogate Mounting Bracket</b>	1	ME-6821
		<b>Projectile Launcher</b>	1	ME-6800
		<b>Time-of-Flight Accessory</b>	1	ME-6810
P38	Conservation of Linear Momentum	<b>Motion Sensor</b>	2	CI-6742
		<b>Balance</b>	1	SE-8723
		<b>Dynamics Cart (w/ Track)</b>	2	ME-9430
		<b>2.2 m Track System</b>	1	ME-9452
P39	Motor Efficiency	<b>Photogate</b>	1	ME-6838
		<b>Power Amplifier</b>	1	CI-6552A
		<b>Voltage Sensor</b>	1	CI-6503
		<b>Balance</b>	1	SE-8723
		<b>Mass Set</b>	1	SE-8705
		<b>Motor/Generator Kit</b>	1	CI-6513
		<b>String</b>	1.2 m	SE-8050
P40	Driven Harmonic Motion - Mass on a Spring	<b>Force Sensor</b>	1	CI-6537
		<b>Motion Sensor</b>	1	CI-6742
		<b>Power Amplifier</b>	1	CI-6552
		<b>Balance</b>	1	SE-8723
		<b>Base and Support Rod</b>	1	ME-9355
		<b>Clamp, Right angle</b>	1	SE-9444
		<b>Mass Set</b>	1	SE-8705
		Meter stick	1	
		<b>Patch Cord</b>	2	SE-9750
		<b>Rod</b>	1	ME-8736
		<b>Spring, k~2 to 4 N/m</b>	1	632-04978
		<b>Wave Driver</b>	1	WA-9753
P41	Waves on a String	<b>Power Amplifier</b>	1	CI-6552A
		<b>Balance</b>	1	SE-8723
		<b>Clamp, Table</b>	1	ME-9376
		Meter stick	1	
		<b>Patch Cords</b>	2	SE-9750
		<b>Pulley Mounting Rod</b>	1	SA-9242
		<b>Rod</b>	1	ME-8736
		<b>String</b>	10 m	SE-8050
		<b>Super Pulley</b>	1	ME-9450
		<b>Wave Driver</b>	1	WA-9753

P42	Sound Waves	<b>Sound Sensor</b> Musical instrument <b>Speaker</b> <b>Tuning Forks</b>	1 1 1 1 set	CI-6506B WA-9303 SF-9326
P43	Resonant Modes - Sonometer	<b>Voltage Sensor</b> <b>Power Amplifier</b> <b>Mass Set</b> <b>Sonometer with Coils</b>	1 1 1 1	CI-6503 CI-6552A SE-8705 WA-9757
P44	Resonant Modes - Tube	<b>Voltage Sensor</b> <b>Patch Cord</b> <b>Resonance Tube</b>	1 2 1	CI-6503 SE-9750 WA-9612
P45	Resonant Modes and Speed of Sound	<b>Voltage Sensor</b> <b>Patch Cord</b> <b>Resonance Tube</b>	1 2 1	CI-6503 SE-9750 WA-9612
P46	Heat Transfer	<b>Temperature Sensor</b> <b>Aluminum can, black</b> <b>Aluminum can, unpainted</b> <i>Fan</i> <i>Heat lamp</i> Thermal insulation pads Tongs Protective gear ----- Water, hot (90 °C)	2 1 1 1 1 2 1 pair PS  800 mL	CI-6505A TD-8750A TD-8750A
P47	Electrical Equivalent of Heat	<b>Power Amplifier</b> <b>Temperature Sensor</b> <b>Balance</b> <b>Heating Resistor, 10 Ω, 1 W</b> Styrofoam cup with lid Protective gear ----- Water	1 1 1 1 1 PS  200 mL	CI-6552A CI-6505A SE-8723 CI-6514A
P48	Ohm's Law: $V=IR$	<b>Light Bulb, 3 V</b> <b>Patch Cord</b> <b>Resistor, 10 Ω</b> <b>Wire Lead, 10 inch</b>	1 2 1 2	EM-8656 SE-9750 EM-8656 EM-8656
P49	Transformer	<b>Voltage Sensor</b> <b>Patch Cords</b> <b>Primary/Secondary Coils</b>	1 2 1	CI-6503 SE-9750 SE-8653
P50	RC Circuit	<b>Voltage Sensor</b> <b>LCR Meter</b> <b>Patch Cord</b> <b>Capacitor, 330 μF</b> <b>Resistor, 100 Ω</b>	1 1 2 1 1	CI-6503 SB-9754 SE-9750 EM-8656 EM-8656
P51	LR Circuit	<b>Voltage Sensor</b> <b>LCR Meter</b> <b>Multimeter</b> <b>Patch Cord</b> <b>Inductor Coil and Core</b> <b>Resistor, 10 Ω</b> <b>Wire Lead, 5 inch</b>	1 1 1 2 1 1 2	CI-6503 SB-9754 SE-9786 SE-9750 EM-8656 EM-8656 EM-8656

P52	LRC Circuit	<b>Voltage Sensor</b>	1	CI-6503
		<i>Graph paper</i>	1	
		<b>LCR Meter</b>	1	SB-9754
		<b>Patch Cord</b>	2	SE-9750
		<b>Capacitor, 100 <math>\mu</math>F</b>	1	EM-8656
		<b>Resistor, 10 <math>\Omega</math></b>	1	EM-8656
		<b>Wire Lead, 5 inch</b>	1	EM-8656
P53	Diodes Lab 1: Properties & LED's	<b>Voltage Sensor</b>	2	CI-6503
		<b>Patch Cord</b>	2	SE-9750
		<b>Diode, 1N-4007</b>	1	EM-8656
		<b>Light-emitting diode, red</b>	1	EM-8656
		<b>Light-emitting diode, yellow</b>	1	EM-8656
		<b>Light-emitting diode, green</b>	1	EM-8656
		<b>Light-emitting diode, bicolor</b>	1	EM-8656
		<b>Resistor, 1 k<math>\Omega</math></b>	1	EM-8656
<b>Wire Lead, 5 inch</b>	1	EM-8656		
P54	Diodes Lab 2: Rectifier & Power Supply	<b>Voltage Sensor</b>	2	CI-6503
		<b>Patch Cord</b>	2	SE-9750
		<b>Capacitor, 100 <math>\mu</math>F</b>	1	EM-8656
		<b>Diode, 1N-4007</b>	4	EM-8656
		<b>Light-emitting diode, red</b>	1	EM-8656
		<b>Resistor, 1 k<math>\Omega</math></b>	1	EM-8656
		<b>Resistor, 330 <math>\Omega</math></b>	1	EM-8656
		<b>Resistor, 10 <math>\Omega</math></b>	1	EM-8656
		<b>Wire Lead, 5 inch</b>	1	EM-8656
		<b>Wire Lead, 10 inch</b>	1	EM-8656
P55	Transistors Lab 1: NPN as Digital Switch	<b>Voltage Sensor</b>	1	CI-6503
		<b>Alligator Clip Adapter</b>	2	SE-9756
		<b>Patch Cord</b>	4	SE-9750
		<b>Power Supply, 5 V DC</b>	1	SE-9720
		<b>Light-emitting diode, red</b>	1	EM-8656
		<b>Resistor, 330 <math>\Omega</math></b>	1	EM-8656
		<b>Resistor, 22 k<math>\Omega</math></b>	1	EM-8656
		<b>Transistor, 2N3904</b>	1	EM-8656
		<b>Wire Lead, 5 inch</b>	2	EM-8656
P56	Transistors Lab 2: Current Gain, Emitter-Follower	<b>Voltage Sensor</b>	2	CI-6503
		<b>Alligator Clip Adapter</b>	2	SE-9756
		<b>Patch Cord</b>	3	SE-9750
		<b>Power Supply, 5 V DC</b>	1	SE-9720
		<b>Resistor, 1 k<math>\Omega</math></b>	1	EM-8656
		<b>Resistor, 22 k<math>\Omega</math></b>	1	EM-8656
		<b>Transistor, 2N3904</b>	1	EM-8656
		<b>Wire Lead</b>	3	EM-8656

P57	Transistors Lab 3: Common Emitter Amplifier	<b>Voltage Sensor</b> <b>Alligator Clip Adapter</b> <b>Patch Cord</b> <b>Power Supply, 5 V DC</b> <b>Capacitor, 1 <math>\mu</math>F</b> <b>Capacitor, 10 <math>\mu</math>F</b> <b>Resistor, 1 <math>k\Omega</math></b> <b>Resistor, 10 <math>k\Omega</math></b> <b>Resistor, 22 <math>k\Omega</math></b> <b>Transistor, 2N3904</b> <b>Wire Lead, 10 inch</b> <b>Wire Lead, 5 inch</b>	1 1 4 1 1 1 4 1 2 1 1 4	CI-6503 SE-9756 SE-9750 SE-9720 EM-8656 EM-8656 EM-8656 EM-8656 EM-8656 EM-8656 EM-8656
P58	Magnetic Field of a Solenoid	<b>Magnetic Field Sensor</b> <b>Power Amplifier</b> Meter stick <b>Patch Cord</b> <b>Solenoid</b>	1 1 1 2 1	CI-6520A CI-6552A  SE-9750 SE-8563
P59	Magnetic Field of Helmholtz Coils	<b>Magnetic Field Sensor</b> <b>Power Amplifier</b> <b>Rotary Motion Sensor</b> <b>Base and Support Rod</b> <b>Helmholtz Coil</b> <b>Lab Jack</b> <b>Mass and Hanger Set</b> Meter stick, wood <b>Patch Cord</b> <b>String</b>	1 1 1 1 2 2 1 1 3 1 m	CI-6520A CI-6552A CI-6538 ME-9355 EM-6711 SE-9374 ME-9348  SE-9750 SE-8050
P60	Inverse Square Law - Nuclear	<b>Nuclear Sensor</b> <b>Rotary Motion Sensor</b> <b>Base and Support Rod</b> <b>Clamp, Right angle</b> <b>Clamp, Three finger</b> <b>Linear Motion Accessory</b> <b>Radiation Sources</b> Tape	1 1 2 1 1 1 1 set 1 roll	SN-7997 CI-6538 ME-9355 SE-9444 SE-9445 CI-6688 SN-8110