MASTER MATERIALS AND EQUIPMENT LIST

Italicized entries indicate items not available from PASCO. The quantity indicated is per student or group. NOTE: The activities also require protective gear for each student (for example, safety goggles, gloves, apron, or lab coat). Teacher preparation quantities are designed for approximately 8 student groups per class. The volumes or quantities may be adjusted according to a teacher's discretion.

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 Technical Support (800-772-8700 inside the United States or http://www.pasco.com/support).

Lab	Title	Materials and Equipment	Qty
1	ANALYZING FOOD DYES IN SPORTS DRINKS (SPECTROSCOPY)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Colorimeter	1
		Cuvettes*	8
		Plastic transfer pipettes or eyedroppers	1
		Graduated cylinder, 10-mL	1
		Test tubes	8
		Test tube rack	1
		Wash bottle with distilled water	1
		FD&C Blue # 1 food dye stock solution	1
		Sport drink with FD&C Blue # 1 food dye	20 mL
		FOR TEACHER PREPARATION	
		FD&C Blue # 1 stock solution	100 mL
		FD&C Red # 40 stock solution	100 mL
		FD&C Yellow # 5 stock solution	100 mL

Lab	Title	Materials and Equipment	Qty
2	INVESTIGATING THE COPPER CONTENT OF BRASS (SPECTROPHOTOMETRY)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Colorimeter	1
		Cuvettes*	5
		Plastic transfer pipettes or eyedroppers	6
		Disposable pipets, graduated, 1-mL	2
		Test tubes	6
		Test tube rack	1
		Graduated cylinder, 10-mL	1
		Graduated cylinder, 50-mL	1
		Wash bottle with distilled water	As needed
		Volumetric flask, 100-mL	1
		Concentrated nitric acid (HNO_3)	10-15 mL
		Watch glass	1
		Brass sample	1 g
		ADDITIONAL MATERIALS AND EQUIPMENT	
		PASCO Wireless Spectrometer	
		PASCO Spectrometer Software	
		Precision balance (to 0.001 g)	
		FOR TEACHER PREPARATION	
		0.2 M Copper(II) nitrate ($Cu(NO_3)_2$) solution	100 mL
		0.1 M Copper(II) nitrate ($Cu(NO_3)_2$) solution	100 mL
		0.1 M Copper(II) sulfate($CuSO_4$) solution	100 mL
		0.1 M Iron(III) nitrate ($Fe(NO_3)_3$) solution	100 mL
		0.1 M Iron(II) sulfate ($FeSO_4$) solution	100 mL
		0.1 M Zinc nitrate ($Zn(NO_3)_2$) solution	100 mL
3	HOW HARD IS YOUR TAP WATER? (GRAVIMETRIC ANALYSIS)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Conductivity Sensor	1
		PASCO Wireless Drop Counter	1
		Syringe reservoir assembly	1
		Magnetic stirrer and micro sitr bar	1
		Beakers, 150-mL	1
		Graduated cylinders, 25-mL	1
		Wash bottle with distilled water	1
		Filter paper and funnel	1
		Ring stand	1
		ADDITIONAL MATERIALS AND EQUIPMENT	
		Precision balance (to 0.001 g)	1
		Drying oven, optional	1
		FOR TEACHER PREPARATION	
		Unknown A: 0.1 M Calcium chloride ($CaCl_2$)	1 L
		Unknown B: 0.05 M Calcium chloride ($CaCl_2$)	1 L
		Unknown C: 0.02 M Calcium chloride ($CaCl_2$)	1 L
		0.1 M Calcium chloride ($CaCl_2$) solution	1 L
		0.1 M Sodium carbonate (Na_2CO_3) solution	1 L
		0.5 M Calcium chloride ($CaCl_2$) solution	1 L
		0.5 M Sodium carbonate (Na_2CO_3) solution	1 L
		Hard water samples for 20X concentration	500 mL-1 L

Lab	Title	Materials and Equipment	Qty
4	How Much Acid is in Your Fruit Juice? (Titration)	**For Each Student Station**	
		Data collection system	1
		PASCO Wireless pH Sensor	1
		Burette, 50-mL	1
		Burette clamp	1
		Beakers, 250-mL	2
		Magnetic stirrer and stir bar	1
		Graduated cylinders, 10-mL	2
		For Teacher Preparation	
		0.1 M Sodium hydroxide (NaOH)	1 L
		0.1 M Acetic acid (CH_3COOH)	1 L
		Fruit juices, variety	As needed
5	Separating Food Dyes Using Chromatography (Chromatography)	**For Each Student Station**	
		Data collection system	1
		PASCO Wireless colorimeter	1
		Cuvettes*	1
		Plastic transfer pipettes or eyedroppers	3
		Graduated cylinders, 10-mL	1
		Test tubes, 1.5 cm × 13 cm	6
		Test tube rack	1
		Chromatography paper	1
		FD&C Blue # 1 food dye stock solution	5 mL
		FD&C Red # 40 food dye stock solution	5 mL
		Toothpicks	As needed
		Distilled water	50 mL
		Chromatography chambers	1
		Sep-Pak® C18 chromatography cartridge (Flinn Scientific)	1
		Additional Materials and Equipment	
		Electronic balance (to 0.01 g)	
		Other Kool-Aid® flavors, variety	
		For Teacher Preparation	
		2.0% Sodium chloride (NaCl) solution	1 L
		0.1% Sodium chloride (NaCl) solution	1 L
		5.0% Isopropyl alcohol	1 L
		25% Isopropyl alcohol	1 L
		Grape Kool-Aid®, dry mix, no sugar, prepared according to package directions	
		Other Kool-Aid	

Lab	Title	Materials and Equipment	Qty
6	A CHEMISTRY MYSTERY: NAME THAT UNKNOWN! (BONDING IN SOLIDS)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Conductivity Sensor	1
		PASCO Wireless pH Sensor	1
		Hot plate	1
		Beaker, 250-mL	1
		Beakers, 100-mL	2
		Stirring rod	1
		Spatula	1
		Tongs	1
		Aluminum foil squares (5 cm x 5 cm)	8
		Masking tape	1
		Wash bottle with distilled water	1
		Table salt	~1/4 tsp
		Table sugar	~1/4 tsp
		Paraffin wax	~1/4 tsp
		FOR TEACHER PREPARATION	
		0.1 M Hydrochloric acid (HCl)	1 L
		0.1 M Sodium hydroxide (NaOH)	1 L
		Unknown A: Aspartame or Equal® Sweetener	~1/4 tsp
		Unknown B: Potassium chloride (KCl)	~1/4 tsp
		Unknown C: Potassium bitartrate ($KC_4H_5O_6$) or Cream of Tartar	~1/4 tsp
		Unknown D: Sodium carbonate (Na_2CO_3)	~1/4 tsp
		Unknown E: Salicylic acid ($C_7H_6O_3$)	~1/4 tsp
7	STOICHIOMETRY IN SOLUTIONS (STOICHIOMETRY)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Conductivity Sensor	1
		PASCO Wireless Temperature Sensor	1
		PASCO Wireless Drop Counter	1
		Syringe reservoir assembly	1
		Beaker, 250-mL	1
		Beakers, 150-mL	2
		Graduated cylinder, 50-mL	1
		Volumetric pipette, 25-mL with pipette bulb	1
		Magnetic stirrer and stir bar	1
		Ring stand	1
		Phenolphthalein, dropper bottle	1
		Wash bottle with distilled water	1
		FOR TEACHER PREPARATION	
		2.0 M Sodium hydroxide (NaOH)	1 L
		1.0 M Hydrochloric acid (HCl)	1 L
		1.5 M Hydrochloric acid (HCl)	1 L

Lab	Title	Materials and Equipment	Qty
8	PERCENTAGE OF H_2O_2 IN YOUR DRUGSTORE HYDROGEN PEROXIDE (REDOX TITRATION)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless ORP (Redox) Probe	1
		PASCO Wireless Drop Counter	1
		Syringe reservoir assembly*	1
		Magnetic stirrer and stir bar	1
		Serological pipette, 1-mL with pipette bulb	1
		Erlenmeyer flasks, 250-mL	2
		Ring stand	1
		Beakers, 100-mL	2
		Volumetric pipette, 10-mL	1
		Graduated cylinder, 10-mL	1
		Wash bottle with distilled water	1
		Disposable weigh boats	As needed
		FOR TEACHER PREPARATION	
		0.1 M Ferrous ammonium sulfate hexahydrate ($Fe(NH_4)_2(SO_4)_2.6H_2O$	1 L
		0.3% Hydrogen peroxide (H_2O_2)	500 mL
		4 M Sulfuric acid (H_2SO_4)	500 mL
		0.02 M Potassium permanganate ($KMnO_4$)	1 L
9	INVESTIGATING THE PHYSICAL AND CHEMICAL CHANGES OF MATTER (PHYSICAL AND CHEMICAL CHANGES)	**FOR EACH STUDENT STATION**	
		Data Collection System	1
		PASCO Wireless Temperature Sensor	1
		PASCO Wireless pH Sensor	1
		PASCO Wireless Conductivity Sensor	1
		Beakers, 100-mL	6
		Test tubes, 2 cm x 15 cm	2
		Test tube rack	1
		Stirring rod	1
		Wash bottle with distilled water	1
		Graduated cylinder, 10-mL	1
		Tongs	1
		FOR TEACHER PREPARATION	
		Unknowns 1A: food color solution, blue	500 mL
		Unknown 1B: food color solution, yellow and red	500 mL
		Unknown 1C: 0.5 M Hydrochloric acid (HCl)	1 L
		Unknown 1D: 0.5 M Sodium hydroxide (NaOH)	1 L
		Unknowns 2A: Ethanol, 2 mL per group	20 mL
		Unknown 2B: Steel wool	As needed
		Variety of test solids: Sucrose, sodium chloride, sodium acetate, calcium metal, ammonium nitrate	As needed

Lab	Title	Materials and Equipment	Qty
10	WHAT DOES ACID RAIN DO TO CORAL REEFS? (KINETICS: RATE OF REACTION)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Pressure Sensor	1
		Stopper # 6, connectors and pressure tubing*	1
		Digital balance (to 0.01 g)	1
		Erlenmeyer flasks, 150-mL	3
		Graduated cylinders, 10-mL and 25-mL	1
		Mortar and pestle	1
		Scoopula	1
		Beaker, 150- mL	1 sheet
		Ring stand with single clamp	10 mL
		Weighing boats	10 mL
		Wash bottle with distilled water	3
		Limestone samples, optional	5 g
		Marble chips	5 g
		Granular calcium carbonate	5 g
		Blackboard chalk, optional	5 g
		FOR TEACHER PREPARATION	1
		6.0 M Hydrochloric acid (HCl)	1 L
		3.0 M Hydrochloric acid (HCl)	200 mL
		2.0 M Hydrochloric acid (HCl)	200 mL
		1.0 M Hydrochloric acid (HCl)	200 mL

Lab	Title	Materials and Equipment	Qty
11	KINETICS OF CRYSTAL VIOLET FADING (KINETICS: RATE LAWS)	**FOR EACH STUDENT STATION**	
		PASCO Spectrometer Software	1
		PASCO Wireless Spectrometer	1
		Cuvettes*	10
		Test tubes, 15 cm x 2 cm	8
		Test tube rack	1
		Plastic transfer pipettes	As needed
		Deionized water	20 mL
		Marking pen	1
		Kimwipes®	As needed
		FOR TEACHER PREPARATION	
		0.1 M Sodium hydroxide (NaOH)	1 L
		2.5 x 10^{-5} M Crystal violet	1 L

Lab	Title	Materials and Equipment	Qty
12	BUILDING A BETTER HAND WARMER	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless Temperature Sensor	1
		PASCO Calorimeter (TD-8825A)	1
		Graduated cylinder, 100-mL	1
		Electronic balance (to 0.01 g)	3
		Heat-resistant gloves	2
		Support stand and ring clamp	1
		Magnetic stirrer and stir bar	2
		Weighing boats	1
		Ammonium chloride (NH_4Cl)	15 g
		Calcium chloride ($CaCl_2$)	15 g
		Sodium acetate ($NaCH_3COO$)	15 g
		Lithium chloride (LiCl)	15 g
		Magnesium sulfate ($MgSO_4$)	15 g
13	APPLICATIONS OF LE CHÂTELIER'S PRINCIPLE (EQUILIBRIUM)	**FOR EACH STUDENT STATION**	
		Data colletion system	1
		PASCO Wireless Temperature Sensor	1
		PASCO Wireless Colorimeter	1
		Cuvettes*	3
		Beakers, 50-mL	3
		Beakers, 250-mL	2
		Test tubes, 2 cm x 15 cm	2
		Distilled water	2 mL
		Transfer pipette, 10-mL with pipette bulb	1
		Scoopula	1
		Glass stirring rod	1
		Marking pen	1
		Graduated cylinder, 10-mL	1
		ADDITIONAL MATERIALS AND EQUIPMENT	
		Water bath	1
		Ice	As needed
		Hot plate	1
		Kimwipes®	As needed
		FOR TEACHER PREPARATION	
		0.0080 M Iron(III) nitrate ($Fe(NO_3)_3$)	100 mL
		0.0010 M Potassium thiocyanate (KSCN)	100 mL
		0.0030 M Potassium thiocyanate (KSCN)	100 mL
		Cobalt chloride ($CoCl_2$), solid	20 g
		0.10 M Silver nitrate ($AgNO_3$)	100 mL
		6.0 M Hydrochloric acid (HCl)	100 mL

Lab	Title	Materials and Equipment	Qty
14	INVESTIGATION OF ACID-BASE TITRATIONS (ACID-BASE TITRATION)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless pH Sensor	1
		PASCO Wireless Drop Counter	1
		Syringe reservoir assembly*	1
		Beaker, 150-mL	1
		Beakers, 250-mL	2
		Volumetric pipette, 25-mL and pipette bulb	1
		Magnetic stir plate	1
		Ring stand	1
		Wash bottle with distilled water	1
		Phenophthalein indicator solution	1
		FOR TEACHER PREPARATION	
		0.5 M Sodium hydroxide (NaOH)	1 L
		0.1 M Sodium hydroxide (NaOH)	1 L
		0.1 M Hydrochloric acid (HCl)	1 L
		0.05 M Hydrochloric acid (HCl)	250 mL
		0.025 M Hydrochloric acid (HCl)	250 mL
		1.0 M Acetic acid (CH_3COOH)	1 L
		0.10 M Acetic acid (CH_3COOH)	250 mL
		0.05 M Maleic acid ($C_3H_4O_4$)	250 mL

Lab	Title	Materials and Equipment	Qty
15	INTRODUCTION TO BUFFERS (BUFFERING ACTIVITY)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless pH Sensor	1
		Beakers, 50-mL	3
		Stirring rod	1
		Wash bottle with distilled water	1
		Graduated cylinder, 10-mL	1
		Graduated cylinder, 25-mL	1
		ADDITIONAL MATERIALS AND EQUIPMENT	
		Bufferin, 325 mg	1
		Aspirin tablet, 325 mg	1
		Mortar and pestle	1
		Distilled water	100 mL
		FOR TEACHER PREPARATION	
		Solution 1: Distilled water	1 L
		Solution 2: 0.01 M Acetic acid (CH_3COOH)	1 L
		Solution 3: Acetic acid (CH_3COOH) and sodium acetate (Na_2CO_3)	1 L
		Solution 4: Sodium bisulfate ($NaHSO_3$) and sodium sulfate (Na_2SO_4)	1 L
		Solution 5: Sodium bicarbonate ($NaHCO_3$) and sodium carbonate (Na_2CO_3)	1 L
		0.01 M Sodium hydroxide (NaOH)	1 L
		1.0 M Sodium hydroxide (NaOH)	1 L

Lab	Title	Materials and Equipment	Qty
16	EVALUATING LEMONADE AS A BUFFER (BUFFER DESIGN)	**FOR EACH STUDENT STATION**	
		Data collection system	1
		PASCO Wireless pH Sensor	1
		PASCO Wireless Drop Counter	1
		Syringe Reservoir Assembly*	1
		Wash bottle with distilled water	1
		Graduated cylinder, 50-mL	2
		Beaker, 150-mL	1
		Beaker, 250-mL	1
		Magnetic stir plate and stir bar	1
		Ring stand	1
		Volumetric flask, 500-mL	1
		Sodium citrate, dihydrate ($Na_3C_6H_5O_7 \cdot 2H_2O$)	
		FOR TEACHER PREPARATION	
		0.1 M Sodium hydroxide (NaOH)	1 L
		0.008 M Citric acid ($H_3C_6H_5O_7$)	1 L
		Country Time® Lemonade drink mix, no sugar	
		Variety of fruit-flavored dry drink mixes	

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

ACTIVITY BY PASCO SENSORS

This table indicates which lab activity uses the sensors or special equipment listed.

Items Available from PASCO	Lab Activity Where Used
PASCO Wireless Colorimeter (PS-3215)	1, 2, 5, 13
PASCO Wireless Conductivity Sensor (PS-3210)	3, 6, 7, 9
PASCO Wireless Temperature Sensor (PS-3201)	9, 12, 13
PASCO Wireless pH Sensor (PS-3204)	4, 6, 7, 9, 13, 14, 15, 16
PASCO Oxidation-Reduction Potential Probe (CI-6716)	8
PASCO Wireless Drop Counter (PS-3214)	3, 7, 8, 14, 16
PASCO Wireless Pressure Sensor (PS-3203)	10
PASCO Calorimeter (TD-8825)	12
PASCO Wireless Spectrometer (VIS) (PS-2600)[1]	2, 11

[1] This item is available with the Chemistry Expansion Bundle