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).

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	Part No.	Qty
1	ENZYME ACTIVITY	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Oxygen Gas Sensor or PASCO Pressure Sensor	PS-2126A	1
		Sampling bottle, 250-mL*		1
		Graduated cylinder, 25-mL		1
		Pipet, 1-mL		1
		Magnetic stirrer and stirring bar		1
		Base and support rod		1
		3-Finger clamp		1
		1.5% Hydrogen peroxide (H_2O_2)		20 mL
		Catalase suspension prepared from dried bakers' yeast		2 mL
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Hot plate or water bath		As needed
		Buffers, pH 3 to pH 10		As needed
		3.0% Hydrogen peroxide		As needed
		Catalase or peroxidase suspension from other sources (beef liver, turnips, rutabaga, other plants.)		As needed
		Ice		As needed

Lab	Title	Materials and Equipment	Part No.	Qty
2	DIFFUSION	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO pH Sensor	PS-2102	1
		Graduated cylinder, 25-mL		1
		Beaker or cup, 250-mL–400-mL		1
		Dialysis tubing, 1 inch × 28-cm[1]		1
		Disposable pipet or 10-mL syringe		1
		Paper clip or binder clip		1
		Small cup to capture the 25 mL (or less) of fluid from the dialysis bag		1
		Apple cider vinegar		25 mL
		Pickle juice		25 mL
		Magnetic stir bar and plate (if available)		1
		Spring water (or distilled water)		200 mL
		Plastic wash bottle with distilled water		1
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		PASCO Conductivity Sensor	PS-2116A	1
		Other commercially available solutions, such as: olive juice, jalepeño juice, beet juice		As needed
		Hot plates or warm water baths		As needed
		Other "extracellular" solutions to replace water		As needed
		Additional dialysis tubing , including tubing of a different diameter or with different pore sizes		As needed
		Ice		As needed
		Food coloring, different colors		As needed
3	OSMOSIS	**FOR EACH STUDENT STATION**		
		Data collection system		1
		PASCO Colorimeter	PS-2121	1
		Sensor extension cable*	PS-2500	1
		Cuvettes*		4
		Cups or beakers, 250-mL		2
		Small funnel		1
		Graduated cylinders, 25-mL		2
		Dialysis tubing, 12-cm piece		2
		Solution A (tap water)		100 mL
		Solution B (0.8 M sucrose)		20 mL
		Solution C (1.0 M sucrose)		100 mL
		Solution D (0.1 M sucrose)		20 mL
		Plastic pipets		2
		Small binder clips		2

Lab	Title	Materials and Equipment	Part No.	Qty
4	PLASMOLYSIS	**FOR EACH STUDENT STATION**		
		Data collection system		1
		PASCO Conductivity Sensor	PS-2116A	1
		Microscope, 400× magnification		1
		Microscope slides and cover slips (4)		4
		Plastic pipet or eye dropper		1
		Three NaCl salt solutions of unknown concentration		Several drops
		Red onion		Section
		Water		Several drops
		Paper towel		1
		TEACHER DEMONSTRATION		
		Electronic balance		1
		Celery stalks		2
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Sucrose solutions (1.0 M)		2 L
		Distilled water		600 mL
		Containers for preparing sucrose dilutions		As needed
		Electronic balance		1
		Small cups		As needed
		White potatoes		As needed
		Sweet potatoes or yams		As needed
		Celery, carrots, or other vegetables		As needed
		Apples or other fruits		As needed
5	CELL SIZE	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Quad Temperature Sensor	PS-2143	1
		PASCO Fast-response temperature probes*	PS-2135	3
		Metric ruler		1
		Small knife or scalpel		1
		Cutting board or other appropriate surface		1
		Potato		1
		Plastic containers (for ice water), 24 oz or larger (approximately 700 mL)		1
		Water		~500 mL
		Toothpicks		2
		Permanent marker		1
		Tape		As needed
		Ice		~100 mL
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENT		
		Melon baller (to form spherical potato "cells")		1
		Shortening (or similar solid fat source)		As needed
		Cork borer (to form cylindrical potato "cells")		1
		Additional potatoes		As needed

Lab	Title	Materials and Equipment	Part No.	Qty
6	HOMEOSTASIS	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Quad Temperature Sensor	PS-2143	1
		PASCO Fast-response temperature probes *	PS-2135	2
		Large shallow bowl or pan[2] (for submerging a hand in ice water)		1
		Ice		As needed
		Water		As needed
		Adhesive bandages or medical tape for securing temperature probes to the skin		2 pieces
		Paper towel		As needed
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Non-latex disposable gloves		As needed
		PASCO physiology sensor(s) such as a hand-grip heart rate sensor, EKG sensor, spirometer sensor, and blood pressure sensor and cuff		As needed
7	CELLULAR RESPIRATION	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Carbon Dioxide Gas Sensor	PS-2110	1
		Sensor extension cable*	PS-2500	1
		Sample bottle, 250 mL*		1
		Balance, readability: 0.01 g		1
		Paper towel		1
		Germinating pinto beans		20
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		PASCO Fast-response Temperature Sensor	PS-2135	1
		PASCO Oxygen Gas Sensor	PS-2126A	1
		Solutions of different pH or salinity levels		As needed
		Additional germinating pinto beans		As needed
		Germinating and dormant seeds of other species, or small animals[3]		As needed

Lab	Title	Materials and Equipment	Part No.	Qty
8	FERMENTATION	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Ethanol Sensor	PS-2194	1
		Sampling bottle* or glass flask (125-mL or 250-mL)		2
		Graduated cylinders (2), 50-mL		1
		Plastic pipet		1
		Small beaker		1
		Magnetic stir plate and stir bar		1
		Rod stand and 3-finger clamp (optional)		1
		1% Ethanol (derived from anhydrous ethanol)		25 mL
		Yeast suspension, derived from active dry yeast		40–60 mL
		2% Sucrose solution		30 mL
		2% Starch solution		150 mL
		Iodine indicator (IKI)		5–10 drops
		Water from germinating seeds		5 mL
		2% Starch solution mixed with amylase (optional)		30 mL
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		PASCO Oxygen Gas Sensor	PS-2126A	1
		PASCO pH Sensor	PS-2102	1
		PASCO EcoChamber™ container	ME-6667	1
		Additional yeast suspension		As needed
		Different types of yeast		As needed
		Additional energy sources: glucose, fructose, lactose, artificial sweeteners		As needed
9	PHOTOSYNTHESIS	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Carbon Dioxide Gas Sensor	PS-2110	1
		Sensor extension cable*	PS-2500	1
		Sampling bottle, 250-mL*		1
		Box, foil, or cloth for shading the setup		As needed
		Light source		1
		Compact fluorescent light bulb, 60 W equivalent(or higher), red		1
		Compact fluorescent light bulb, 60 W equivalent (or higher) green		1
		Fresh spinach leaves[2]		As needed
		Forceps or pencil		1
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		PASCO Oxygen Gas Sensor	PS-2126A	1
		PASCO EcoChamber container (to accommodate larger plants)	Me-6667	1
		Variety of leaf types, such as: non-green or less-green, and needles		As needed
		Variety of light sources, such as a grow light and other types of fluorescent bulbs		1

Lab	Title	Materials and Equipment	Part No.	Qty
10	PLANT PIGMENTS	**FOR EACH STUDENT STATION – PART 1**		
		Data Collection System		1
		PASCO Colorimeter	PS-2121	1
		PASCO Wireless Spectrometer and spectrometry software	PS-2600	1
		Colorimeter cuvette		2
		Spectrometer cuvette (1-cm glass cuvette)		2
		Plastic pipets, 1-mL		3
		Capillary tube or eye dropper without a bulb		1
		Chromatography chamber with solvent[2,3]		1
		Chromatography paper		1 sheet
		Ethanol		30 mL
		Pigment extract:		10 mL
		Spinach leaves		3
		Ethanol		5–10 mL
		Beaker, small		1
		Mortar and pestle		1
		Cheesecloth or coffee filter paper		1
		Scissors		1
		Small stapler or paper clips		1
		Ruler		1
		Pencil		1
		Kimwipes®		As needed
		FOR EACH STUDENT STATION – PART 2		
		Data Collection System		1
		PASCO Colorimeter	PS-2121	1
		Colorimeter cuvettes		3
		Plastic pipets (4), 1-mL		4
		Chloroplast suspension:		9 drops
		Spinach leaves		Handful
		0.5 M Sucrose		100–200 mL
		Cheesecloth		1
		0.1 M Phosphate buffer (KH_2PO_4 and K_2HPO_4[3]		3 mL
		DPIP (2,6-dichlorophenolindophenol) solution,		2 mL
		Lamp with a compact fluorescent (CFL) light bulb		1
		Kimwipes		As needed
		Aluminum foil, to cover a cuvette		Small piece
		Distilled water		10 mL
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Different types of leaves		As needed
		Different light sources: different colored lightbulbs or lightbulbs of different wattage		As needed
		Additional chromatography paper and solvent		As needed
		Hot plate		1
		Frozen or canned spinach		As needed

Lab	Title	Materials and Equipment	Part No.	Qty
11	TRANSPIRATION	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Barometer/Low Pressure Sensor	PS-2113A	1
		PASCO Weather Sensor	PS-2154A	1
		Sensor extension cables	PS-2500	2
		*Quick-release connector**		1
		*Clear plastic tubing, 40–50 cm**		1
		One-hole rubber stopper that goes on tubing		1
		Large tub or bucket (for water)		1
		Paraffin film or petroleum jelly (if available)		As needed
		Plant sample containing numerous leaves, such as ornamental pear, oleander, hydrangea, and gardenia		1
		Base and support rod		1
		3-finger clamps		2
		Test tube clamp		1
		Clear plastic bag, 1 gallon		1
		Spray bottle with water		1
		Electronic balance, centigram		1
		Small syringe, 60-mL or larger, without needle		1
		Pipet		1
		Metric ruler		1
		Large scissors or small pruning shears		1
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		PASCO EcoChamber containers, including stoppers	ME-6667	At least 2
		PASCO Weather Sensor for each EcoChamber container	PS-2154A	At least 2
		PASCO Carbon Dioxide Gas Sensor	PS-2110	1
		Small plants that fit in the EcoChamber container, such as pansy, marigold, and impatiens		As needed
		Clear plastic bags and twist-ties to cover the root ball (or quart or gallon zip-close bags)		As needed
		Additional plant samples (different species) that fit in the tubing of the potometer[2]		As needed
		Electronic balance, centigram		1
		Small fan		1
		Lamp with incandescent or UV bulb that provides heat		1
		Lamp with a CFL bulb that remains cool		1
		Lamp with a CFL bulb that remains cool		1

Lab	Title	Materials and Equipment	Part No.	Qty
12	MITOSIS	**FOR EACH STUDENT STATION**		1
		Dissection scissors		1
		Forceps		1
		Razor blade or scalpel		1
		Glass test tube		1
		Glass microscope slides		3
		Cover slips		2
		Compound microscope with 400× magnification		1
		Disposable pipets 1-mL		2
		Plastic cup, 16-oz		1
		Spot plate		1
		Personal protective equipment: Disposable gloves and chemical apron		1
		Carbol fuchsin solution		1 mL
		1 M Warm hydrochloric acid (HCl), 1 mL		1 mL
		Onion bulb (green onion, small white onion, or garlic)		1
		Paper towel		As needed
		Large toothpicks		4
		Pencil with eraser		1
		Plastic wrap		As needed
		Disposable plastic gloves		1 pair
		Permanent marker		1
		Distilled water		As needed
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Data Collection System		1
		PASCO Conductivity Sensor		1
		PASCO pH Sensor		1
		Herbicide samples		As needed
		Additional onion bulbs, or other plant samples (such as garlic)		As needed
		Plant food samples: fertilizers or root growth stimulants		As needed
13	MEIOSIS	**FOR EACH STUDENT STATION**		
		Drosophila *Chromosome Sheet (included in the lab)*		1
		Karyotype of Offspring Fly Sheet (included in the lab)		1
		Scissors		1
		Tape		1
		Pop beads for chromosomes (4), 2 colors, 2 sizes, plus enough to make sister chromatids		150 (75 of each color)
		String, approximately 1 m and 0.5 m		2 pieces
		Cards with images or photographs of Sordaria *asci (Cards with images or photographs can be purchased from supply companies such as Flinn Scientific or Ward's Science.)*		As specified
		or		
		Sordaria *crossing over kit (Crossing-over kits can be purchased from many different science supply companies. Refer to the documentation included with the kit for additional preparation directions if students prepare their own slides to observe asci.)*		1

Lab	Title	Materials and Equipment	Part No.	Qty
14	TRANSFORMATION	**FOR TEACHER PREPARATION**		
		Edvotek™ EDVO-Kit: 223/AP08		1
		Water bath, 60 °C		1
		Pipet pump and 10 mL glass pipet (optional)		1
		Sterile water		50 µL
		Micropipet with sterile tips (to aliquot plasmid)		1
		Microwave or hot plate and beaker with water		1
		Heat-resistant glove		1 pair
		Incubator		1
		Permanent marker, fine		1
		FOR EACH STUDENT STATION		
		LB (Luria Broth) Petri plate		1
		LB/Amp Petri plate (2)		2
		LB/Amp/IPTG Petri plate		1
		Inoculating loops (2), sterile		2
		Transfer pipets (4), 1-mL, sterile		4
		Micropipet with a sterile tip		1
		Microcentrifuge tubes (2)		2
		Small cup or beaker, 100-mL, for ice		1
		Tube with 0.5 M Calcium chloride ($CaCl_2$), 1 mL		1
		Tube with Recovery Broth, 1.5 mL		1
		Tube with pFluoroGreen™ (pGFP) plasmid, 12 µL		1
		Toothpick, sterile		1
		Ice		50 mL
		Permanent marker, fine		1
		Masking tape		As needed
		ONE PER CLASS		
		E. coli *host cells*		5 large Petri plates
		Warm water baths, 37 °C and 42 °C		2
		Incubator (37 °C)		1
		Long wave UV light source		1
		Disinfectant		As needed
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Additional E. coli *and other bacteria species*		As needed
		Additional Petri plates and LB agar		As needed
		Filter paper		As needed
		Hole punch		1
		Other antibiotics: kanamycin, penicillin, or others		As needed
		Other plasmids: pUC18, pBLU®, pKAN, or others		As needed
		Sterile forceps		As needed

Lab	Title	Materials and Equipment	Part No.	Qty
15	UNDERSTANDING INHERITED MITOCHONDRIAL DISORDERS	**FOR TEACHER PREPARATION**		
		Mitochondrial Genetics Kit (BP-6946)		1
		Erlenmeyer flasks, 500-mL		2
		Large beaker or container, 3-L (to dilute buffer)		1
		Balance		1
		Microwave or hot plate		1
		Heat-resistant gloves		1 pair
		Gel casting trays		1 per group
		Scissors		1
		Plastic wrap or aluminum foil		1
		Distilled water, 3 L		3 liters
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		QuickStrip™ DNA samples		1
		InstaStain® Blue card		1
		Horizontal gel electrophoresis apparatus		1
		DC power supply		1
		Automatic micropipet, 5 to 50 µL, with tips		1
		Tray with 0.8% agarose gel		1
		Plastic tray for gel staining		1
		Plastic wrap		1 piece
		Graduated cylinder, 100-mL		1
		Waste receptacles (for used tips)		1
		Disposable gloves		1 pair
		Distilled water or buffer for staining		75–100 mL
		OPTIONAL		
		Camera (USB or other)		1
		Permanent marker		1
		Transparency film (for tracing the results)		1
		ONE PER CLASS		
		DNA visualization system (white light)		1
		Spatula		1

Lab	Title	Materials and Equipment	Part No.	Qty
16	SICKLE CELL GENE DETECTION	**FOR TEACHER PREPARATION**		
		Genetically Inherited Disease Detection Kit (BP-6947)		1
		Balance		1
		Distilled water, 3 L		3 L
		Erlenmeyer flasks, 500-mL		2
		Gel casting trays		1 per group
		Heat-resistant gloves		1 pair
		Large beaker or container, 3-L (to dilute buffer)		1
		Microwave or hot plate		1
		Plastic wrap or aluminum foil		1
		Scissors		1
		FOR EACH STUDENT STATION		
		InstaStain® Blue card[1]		1
		QuickStrip™ DNA samples[1]		1
		Automatic micropipet, 5 to 50 µL, with tips		1
		DC power supply		1
		Disposable gloves		1 pair
		Distilled water or buffer for staining		75–100 mL
		Graduated cylinder, 100-mL		1
		Horizontal gel electrophoresis apparatus		1
		Plastic tray for gel staining		1
		Plastic wrap		Piece
		Tray with 0.8% agarose gel		1
		Waste receptacles (for used tips)		1
		OPTIONAL		
		Camera (USB or other)		1
		Permanent marker		1
		Transparency film (for tracing the results)		1
		ONE PER CLASS		
		DNA visualization system (white light)		1
		Spatula		1

Lab	Title	Materials and Equipment	Part No.	Qty
17	ENERGY DYNAMICS	**FOR EACH STUDENT STATION**		
		Data Collection System		1
		PASCO Carbon Dioxide Gas Sensor	PS-2110	1
		Sensor extension cable*	PS-2500	1
		EcoChamber container, with lid and stoppers	ME-6667	1
		Electronic balance, centigram		At least 1 per class
		Weigh boat		1
		Plastic pipet, 1-mL		1
		Disposable gloves		1 pair
		Small knife (for cutting fruit)		1
		Filter paper or coffee filter (9 cm diameter)		1
		Yeast suspension or water (yeast is used in 2 of the 3 chamber configurations, water is used in the third)		5 mL
		Mealworms (used in 2 of the 3 chamber configurations)		20
		Detritus: organic material such as apples and banana peels		60 g
		Plastic wrap (ditritus of one of the two control chambers is wrapped in plastic wrap)		As needed
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Additional sensors such as a PASCO Oxygen Gas Sensor or PASCO Temperature Sensor	PS-2126A or PS-2102	One or more
		Additional EcoChamber containers	ME-6667	One or more
		Different detritivores (earwigs, earthworms, crickets, ants, and similar organisms)		As needed
		Different sources of detritus (various fruit or vegetable scraps such as potato)		60 g per chamber

Lab	Title	Materials and Equipment	Part No.	Qty
18	ARTIFICIAL SELECTION	**FOR EACH STUDENT STATION**		
		Wisconsin Fast Plants® seeds, standard		18
		Seed-starting soil or germinating mix (such as Jiffy Mix®) (This type of soil mix is not *potting soil)*		Enough to set up 3 growing systems twice
		Fertilizer, Osmocote™ pellets or a water-soluble fertilizer (use as directed)		24 pellets
		Wicking material, #18 nylon mason twine		3 pieces
		Recycled plastic bottles, 0.5 L to 1 L		3
		Soda bottle cap with hole (or aluminum foil with holes, held in place with a rubber band)		3
		Plant vermiculite		Enough to set up 3 growing systems twice
		Labeling tape and markers		1
		Black plastic to cover the water reservoir(optional)		3 pieces
		Water in a rinse bottle		As needed
		Lighting system with fluorescent lights		1 per class
		Bee sticks or cotton applicators (for pollination)		3
		Plastic plant labels (3)		3
		Scissors		1
		12-inch ruler		1
		Stakes and holders (wooden splints and plastic straws)		As needed
		Dechlorinated water or nutrient solution (for the reservoir), if water-soluble fertilizer is used.		As needed
		Hand-held plastic magnifier		1
		Petri dish lid		1
		Paper envelope, small		1
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Data Collection System		1
		PASCO pH Sensor	PS-2102	1
		Transfer pipets		As needed
		1 M nitric acid (HNO_3)		As needed
		1 M sulfuric acid (H_2SO_4)		As needed
19	BLAST	**FOR EACH STUDENT STATION**		
		Computer with Internet access		1
		DNA Sequences Worksheet		1
		ABI BLAST Sequences.docx		1
		Highlighter		1
		Scissors (optional)		1
		Ruler or large index cards		1
20	POPULATION GENETICS	**FOR EACH STUDENT**		
		PTC (phenylthiocarbamide) paper		1
		Control paper (optional)		1
		Calculator with square root function		1
		Allele cards from the gene pool		2
		Class data page		1 per class
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Beads, 2 or more contrasting colors		100 or as needed
		Large cups		2 or more

Lab	Title	Materials and Equipment	Part No.	Qty
21	MATHEMATICAL MODELING OF EVOLUTION	**FOR EACH STUDENT STATION**		
		Computer		1
		Mathematical model spreadsheet file: ABI Mathematical Modeling Spreadsheet.xlsx		1
		Spreadsheet program (such as Microsoft Excel®, Numbers®[1], or Google Docs™[2])		1
22	ANIMAL BEHAVIOR	**FOR EACH STUDENT STATION**		
		Clear drinking straw		1
		Droppers		2
		Cotton swabs		10
		Timer		1
		Sheet of white paper		1
		Wingless fruit flies , or similar small organism		10
		Mashed ripe banana		10 mL
		Mashed unripe banana		10 mL
		Distilled water		10 mL
		ADDITIONAL EQUIPMENT FOR STUDENT-DESIGNED EXPERIMENTS		
		Cold and warm packs		1
		Aluminum foil		As needed
		Light source		As needed
		Condiments (such as ketchup and mustard)		As needed
		Solution with low pH (HCl)		As needed
		Solution with high pH (NaOH)		As needed
		Ammonia		As needed
		Soil or sand		As needed

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

[1] Numbers is a trademark of Apple Inc., registered in the U.S. and other countries.

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