

Exploring *The*
BUILDING BLOCKS
of
SCIENCE
Book 7
TEACHER'S MANUAL



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Materials at a Glance

Experiment 1	Experiment 3	Experiment 4	Experiment 5	Experiment 6
internet or library notebook or blank paper imagination	tincture of iodine [Iodine is VERY poisonous — DO NOT LET STUDENTS EAT any food items with iodine on them.]	liquid laundry starch, 120 ml (1/2 cup) — or 10 ml (2 tsp.) borax + 10 ml (2 tsp.) cornstarch + 320 ml (1 1/3 cup) water Elmer's white glue, 60 ml (1/4 cup) Elmer's blue glue or other glue, 60 ml (1/4 cup) water 2 small jars marking pen that will write on glass Popsicle sticks measuring cup safety goggles rubber gloves apron 10 ml graduated cylinder beaker or glass jar glass stirring rod Nylon Synthesis and Rope Trick Kit from Home Science Tools*	tincture of iodine [VERY POISONOUS— DO NOT LET STUDENTS EAT] bread (1-2 slices) timer wax paper marking pen cup one raw egg one raw onion table salt clear liquid dish washing detergent rubbing alcohol (isopropanol, 70- 90%) wooden stir stick or Q-tip coffee filter (any color) sieve 2 glass jars or large test tubes measuring cup and measuring spoons blender	colored pencils handheld magnifying glass field notebook (an existing one or a new one with blank or faintly lined pages) backpack with water and snacks 2 plant pots potting soil corn seeds, 8 or more, with packet bean seeds, 8 or more, with packet water warm, sunny location Optional field guide to the plants book iPad, camera, or smartphone with camera plant identification app of your choice
Experiment 2	raw foods, including: pasta bread celery, slice potato, slice banana and other fruits, sliced	liquid laundry starch (or borax and corn starch mixture) absorbent white paper eyedropper cookie sheet marking pen 1 green banana knife		
about 120 ml (1/2 c.) ea.: water ammonia vegetable oil rubbing alcohol melted butter vinegar small jars (7 or more) food coloring (6 colors) dish soap, 30 ml (2 tbsp) eyedropper measuring cup & spoons marking pen spoon ballpoint ink pens (see Experiment 2) rubbing alcohol coffee filters (white) shoebox (or similar box) tape, scissors, ruler				
Experiment 7	Experiment 8	Experiment 9	Experiment 10	Experiment 11
plant with at least 6 flat, green leaves (a tree may be used) lightweight cardboard or construction paper— enough to cut out 6 pieces that are bigger than a leaf scissors tape 2 small jars marking pen 4 or more plant pots potting soil bean seeds (12 or more)	microscope with 4X, 10X, and 40X objective lenses; 100X recommended glass microscope slides (plain) glass microscope coverslips immersion oil for 100X lens water eyedropper sharp knife toothpick colored pencils raw celery stalk with leaves (1) raw carrot (1) large leaf (1) other plant parts of students' choice 3 or more small jars several fresh white carnation flowers food coloring	fresh vegetable scraps (see Exper. 9) knife toothpicks several small glass jars or small drinking glasses colored pencils or pens several plant pots potting soil water Optional existing or new field notebook garden trowel or spoon	10-20 copper pennies (pennies made before 1982 work best) aluminum foil paper towels salt water: 30-45 ml (2-3 Tbsp.) salt per 240 ml (1 cup) water voltmeter (see Exper. 10) 2 plastic-coated copper wires, each 10-15 cm (4"-6") long duct tape (or other strong tape) scissors wire cutters fine steel wool, plain (no soap), 1 pad 9 volt battery ovenproof pan or dish heatproof pad or surface Optional wire stripping tool bucket of water	jar, small glass with lid aluminum foil paperclip tape, duct (or other strong tape) rod, plastic or rubber rod (or balloon) silk fabric (or hair) scissors ruler awl or other tool to make a hole straws, thin, bendable plastic, several paper tissues (Kleenex) or cloth made of silk or wool paper, small piece aluminum foil, small piece book(s), with thin pages combs, plastic, 1-2 cup, plastic bowl, shallow or a plate

* Nylon Synthesis and Rope Trick Kit from Home Science Tools Item # KT-ISNYLON, <http://www.hometrainingtools.com/>

Experiment 12	Experiment 13	Experiment 14	Experiment 15	Experiment 16
<p>(2) D cell batteries and battery holder (2) 3.7 volt light bulbs and sockets (1) switch (4) alligator clip connectors (2) 5 ohm, 1/4 watt resistors (1) DC motor with propeller</p> <p>Materials are available as a kit from Home Science Tools (as of this writing): Product #: EL-KITBASC http://www.hometrainingtools.com/</p>	<p>metal rod, 16d nail, or unmagnetized screwdriver electrical wire, .3-.6 meter (1'-2') 10-20 paperclips 6v or larger battery (use a 12v battery if a screwdriver is used) electrical tape or 2 alligator clips scissors wire cutters bar magnet small plastic baggie small flat-bottomed clear plastic container with lid [about 5 cm x 8 cm x 1.5 cm (2" x 3" x 1/2")] clear Karo syrup spoon 2 pencils or other props</p> <p>Optional wire stripping tool iron filings*</p>	<p>about 1-2 liters (1-2 qts): gravel, sand, dirt (soil) and pottery clay water (4) Styrofoam cups, about 355 ml (12 ounce) size (4) 16 oz. clear plastic cups, glasses, or other clear containers pencil marking pen measuring cups graduated cylinder, 100 ml large bowl scissors plastic wrap or plastic bags cardboard strong tape knife, utility or X-Acto bucket and/or outdoor area</p> <p>Optional: clock w/ second hand screen or cloth</p>	<p>field notebook, 1-2 (new or existing) pencil and colored pencils small backpack water bottle snacks binoculars (inexpensive ones are fine; small, lightweight ones are easier to carry) field guide to the birds book (for example, <i>The Young Birder's Guide to Birds of North America</i>)</p> <p>Optional magnifying glass bird feeders and birdseed camera cellphone or tablet bird identification app (such as free app from Audubon Society, http://www.audubon.org/apps)</p>	<p>steel needle bar magnet piece of cork tape medium size bowl water compass small object of student's choice to use for treasure</p>
Experiment 17	Experiment 18	Experiment 19	Experiment 21	Experiment 22
<p>pencil, pen imagination Optional notebook</p>	<p>computer internet connection</p>	<p>computer internet connection</p>	<p>computer internet connection</p>	<p>computer internet connection</p>
		<p>Experiment 20</p>		
		<p>computer or tablet internet connection</p>		

*Iron filings can be ordered from Home Science Tools, CH-IRON, <http://www.hometrainingtools.com/>

Materials

Quantities Needed for All Experiments

Equipment	Equipment (continued)	Foods
alligator clip connectors, 4** apron awl or other tool to make a hole backpack, small, with water and snacks battery, 6v or larger (use a 12v battery if a screwdriver is used) Exper. 13 battery, 9 volt beaker or glass jar binoculars (inexpensive ones are fine; small, lightweight ones are easier to carry) blender book(s), with thin pages bowl, large bowl, medium size bowl, shallow or a plate bucket and/or outdoor area combs, plastic, 1-2 compass computer container with lid, small flat-bottomed clear plastic [about 5 cm x 8 cm x 1.5 cm (2" x 3" x 1/2")] cookie sheet copper pennies, 10-20 (pennies made before 1982 work best) cup cup, plastic cups, 16 oz. clear plastic cups, drinking glasses, or other clear containers, 4 cups, Styrofoam, about 355 ml (12 ounce) size, 4 D cell batteries, 2, and battery holder** eyedropper field guide to the birds book (for example, The Young Birder's Guide to Birds of North America) graduated cylinder, 10 ml graduated cylinder, 100 ml heatproof pad or surface jar, small glass with lid jars, small glass (7 or more) jars, glass 2, or large test tubes jars, several small glass, or small drinking glasses	knife knife, sharp knife, utility or X-Acto light bulb, 3.7 volts and sockets, 2** magnet, bar, 1 magnifying glass, handheld measuring cups and measuring spoons microscope with 4X, 10X, and 40X objective lenses; 100X recommended microscope coverslips, glass microscope slides, glass (plain) motor, DC with propeller, 1** Nylon Synthesis and Rope Trick Kit from Home Science Tools* object, small, of student's choice to use for treasure pan or dish, ovenproof plant pots, several resistors, 5 ohm, 1/4 watt 2** rod (metal), 16d nail, or unmagnetized screwdriver rod, glass stirring rod, plastic or rubber rod (or balloon) rubber gloves ruler safety goggles scissors sieve silk fabric (or hair) spoon switch for electric circuit, 1** timer voltmeter (see Exper. 10) water bottle wire cutters Optional bird feeders camera cellphone or tablet clock w/second hand or stopwatch field guide to the plants book garden trowel iPad or other tablet, camera, or smartphone with camera wire stripping tool	banana and other fruits, sliced, raw banana, green, 1 bread (1-2 slices) bread, raw butter, melted [about 120 ml (1/2 c.)] carrot, raw 1 celery stalk with leaves, raw, 1 celery, slice, raw egg, raw, 1 food coloring (6 colors) Karo syrup, clear onion, raw, 1 pasta, raw potato, slice, raw snacks table salt vegetable oil [about 120 ml (1/2 c.)] vegetable scraps, fresh (see Exper. 9) vinegar [about 120 ml (1/2 c.)] water

** Materials are available as a kit from Home Science Tools (as of this writing): Product #: EL-KITBASC, <http://www.hometrainingtools.com/>

Materials

Quantities Needed for All Experiments

Materials	Materials (continued)	Plants
<p>aluminum foil ammonia [about 120 ml (1/2 c.)] baggie, small plastic, 1 cardboard cardboard, lightweight, or construction paper—enough to cut out 6 pieces that are bigger than a leaf clay, pottery, , about 1-2 liters (1-2 qts) coffee filter (any color) coffee filters (white), several copper wires, 2 plastic-coated, each 10-15 cm (4"-6") long cork, piece dirt (soil), about 1-2 liters (1-2 qts) dish soap, 30 ml (2 tbsp) dish washing detergent, clear liquid field notebook (existing or new with blank or faintly lined pages), 1-2 glue, Elmer's blue, or other glue different from white, 60 ml (1/4 cup) glue, Elmer's white, 60 ml (1/4 cup) gravel, about 1-2 liters (1-2 qts) immersion oil for 100X lens iron filings* iodine, tincture of [Iodine is VERY poisonous — DO NOT LET STUDENTS EAT any food items with iodine on them.], small amount laundry starch, liquid, 120 ml (1/2 cup) — or 10 ml (2 tsp.) borax + 10 ml (2 tsp.) cornstarch + 320 ml (1 1/3 cup) water [you will need a little more than this amount] needle, steel notebook or blank paper paper, blank paper tissues (Kleenex) or cloth made of silk or wool paper towels paper, absorbent white paperclips, 10-20 pen pen, marking pen, marking (that will write on glass) pencil pencils, colored pens, ballpoint ink (see Experiment 2)</p>	<p>plastic wrap or plastic bags Popsicle sticks, several potting soil rubbing alcohol (isopropanol, 70-90%) rubbing alcohol [about 120 ml (1/2 c.)] salt water: 30-45 ml (2-3 Tbsp.) salt per 240 ml (1 cup) water sand, about 1-2 liters (1-2 qts) shoebox (or similar box) steel wool, fine, plain (no soap), 1 pad straws, thin, bendable plastic, several tape tape, duct (or other strong tape) tape, electrical or 2 alligator clips toothpicks wax paper wire, electrical, .3-.6 meter (1'-2') wooden stir stick or Q-tip</p> <p>Optional</p> <p>birdseed bucket of water screen or cloth, small piece</p>	<p>carnation flowers with stems, white, several fresh leaf, large, 1 plant parts of students' choice plant with at least 6 flat, green leaves (a tree may be used) seeds, bean (12 or more) seeds, bean, 8 or more, with packet seeds, corn, 8 or more, with packet</p> <p style="text-align: center;">Other</p> <p>imagination internet connection internet or library warm, sunny location for plants</p> <p>Optional</p> <p>bird identification app (such as free app from Audubon Society, http://www.audubon.org/apps) plant identification app of your choice</p>

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