

Exploring

The

BUILDING BLOCKS

of

SCIENCE

Book 3

TEACHER'S MANUAL



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Materials at a Glance

Experiment 1	Experiment 3	Experiment 4	Experiment 5	Experiment 6
pencil or pen Optional colored pencils	glasses or plastic cups, several measuring cup 3 bags, small paper or plastic several small rocks (5-10) Legos (handful) sand (2 handfuls) sugar (handful) salt (2 handfuls) water food coloring, several colors 1-2 white coffee filters white paper, several sheets scissors several pencils tape	Elmer's white glue, approx. 30-60 ml ($\frac{1}{8}$ - $\frac{1}{4}$ cup) liquid laundry starch, approx. 30-60 ml ($\frac{1}{8}$ - $\frac{1}{4}$ cup)* 2 plastic cups measuring cup 30 metal paper clips <i>Just For Fun:</i> non-toxic glue such as blue glue, clear glue, wood glue, glitter glue, or paste glue; approx. 30-60 ml ($\frac{1}{8}$ - $\frac{1}{4}$ cup) *If you are unable to find liquid laundry starch, you can use a mixture of equal parts cornstarch and borax mixed with enough water to dissolve them. Make about 30-60 ml ($\frac{1}{8}$ - $\frac{1}{4}$ cup) for this experiment. Optional food coloring	flour, 2 liters (8 cups) 1 package active dry yeast, 7 grams ($\frac{1}{4}$ oz.) lukewarm water, 240 ml (1 cup) cold water, 240 ml (1 c.) sugar, 30 ml (2 Tbsp.) vegetable oil, approx. 60 ml (4 Tbsp.) salt, 5 ml (1 tsp.) butter, 120 ml ($\frac{1}{2}$ cup) softened double-acting baking powder, 15 ml (1 Tbsp.) milk, 360 ml (1 $\frac{1}{2}$ cups) measuring cups measuring spoons marking pen 4 mixing bowls mixing spoon floured bread board 2 bread pans or cookie sheets refrigerator oven timer Optional rolling pin biscuit cutter	notebook or drawing pad with blank pages (not ruled) to make a nature journal pencil colored pencils Optional camera and printer tape
Experiment 2				
clear plastic cups, 15 or more measuring cup measuring spoons spoon for mixing liquid soap marking pen food items (approx. 60 ml ($\frac{1}{4}$ c.) each): water milk juice vegetable oil melted butter				

Experiment 7	Experiment 8	Experiment 9	Experiment 10	Experiment 11
2 small houseplants of the same kind and size 2 more small houseplants of the same kind and size water measuring cup closet or cardboard box colored pencils	2-4 white carnations 1 or more other white flowers (rose, lily, etc.) 2-3 small jars food coloring water tape knife colored pencils	1-2 small clear glass jars 2 or more dried beans (white, pinto, soldier, etc.) 2 or more additional dried beans (different kind) or other seeds absorbent white paper scissors knife plastic wrap clear tape rubber band water Optional magnifying glass	3-5 large lemons knife 3-5 copper pennies older than 1982 3-5 galvanized (zinc coated) nails LED (Radio Shack #276-30700 [as of this writing]) 4-6 pairs alligator clips* plastic coated copper wire, .6-1.2 m (2-4 feet) wire clippers small Phillips screwdriver *duct tape can be substituted for alligator clips]	2-3 rubber balloons string or thread, at least 2 meters (6 feet) cut in half scissors different materials to rub the balloon on, such as: cotton clothing silk clothing wool clothing wooden surface plaster wall metal surface leather surface

Experiment 12	Experiment 13	Experiment 14	Experiment 15	Experiment 16
<p>lemon battery supplies (see Experiment 10)</p> <p>suggested test materials:</p> <ul style="list-style-type: none"> Styrofoam plastic block cotton ball nickel coin metal paper clip plastic paper clip glass of water table salt, 15 ml (1 Tbsp) 	<p>two bar magnets with the poles labeled “N” and “S”</p>	<p>3 Styrofoam cups: 355 ml (12 oz.) size about 240 ml (1 cup) each:*</p> <ul style="list-style-type: none"> sand pebbles small rocks <p>* student-collected or purchased from a place that sells aquarium supplies</p> <p>3 containers for collecting sand, pebbles, and small rocks</p> <p>garden trowel or small shovel</p> <p>pencil</p> <p>1-2 measuring cups</p> <p>water</p> <p>enough dirt, pebbles, rocks, water, etc. to make a mud city</p> <p>Optional</p> <p>stopwatch or clock with second hand</p>	<p>pencil</p> <p>colored pencils</p>	<p>2 bar magnets (narrow magnets work best)</p> <p>small, flat-bottomed, clear plastic box (big enough for 2 magnets to fit underneath with some space around them)</p> <p>corn syrup</p> <p>iron filings, about 5 ml (1 teaspoon) (see Experiment section for how students can collect iron filings — or iron filings may be purchased: www.hometrainingtools.com)</p> <p>Optional</p> <p>tape</p> <p>2 plastic bags for collecting iron filings</p>

Experiment 17	Experiment 18	Experiment 19	Experiment 20	Experiment 21
<p>seeds (student selected)</p> <p>a garden bed or containers and potting soil</p> <p>tools for tending plants</p> <p>herb seeds or small herb plants (student selected)</p> <p>This experiment is done over the course of several weeks.</p>	<p>student-selected materials to make a model of a galaxy, such as colored modeling clay, Styrofoam balls, tennis balls, marbles, sand, candies, etc.</p> <p>cardboard or poster board, .3-1 meter (1'-3") on each side</p> <p>Optional</p> <p>colored pencils or markers</p> <p>camera and printer</p>	<p>colored pencils</p> <p>a dark, moonless night</p> <p>sky far away from city lights</p> <p>Optional</p> <p>computer with internet access</p> <p>pictures of cities</p>	<p>2 bar magnets</p> <p>iron filings, purchased* or student collected (see Chapter 16)</p> <p>shallow, flat-bottomed plastic container (or a plastic box top or large plastic jar lid)</p> <p>corn syrup</p> <p>plastic wrap</p> <p>Jell-O or other gelatin</p> <p>and items to make it</p> <p>assorted fruit cut in pieces and/or berries</p> <p>Optional</p> <p>cardboard box</p> <p>*As of this writing, available from Home Science Tools: http://www.hometrainingtools.com</p> <p>Item #CH-IRON</p>	<p>small plastic pail that will fit in freezer</p> <p>water</p> <p>dirt</p> <p>small stones</p> <p>dry ice (available at most grocery stores)</p> <p>heavy gloves or oven mitts</p> <p>freezer</p> <p>If dry ice is in a block:</p> <p>safety goggles</p> <p>mallet or hammer</p> <p>grocery bag (cloth or paper)</p>
				<p>Experiment 22</p> <p>library or internet access</p> <p>Optional</p> <p>old toys to take apart for computer chips (1 or more)</p>

Materials

Quantities Needed for All Experiments

Equipment	Foods	Foods (continued)
<p>alligator clips, 4-6 pairs (duct tape can be substituted for alligator clips)</p> <p>bowls, mixing, 4</p> <p>bread board</p> <p>bread pans or cookie sheets, 2</p> <p>freezer</p> <p>jars, 2-3 small clear</p> <p>knife</p> <p>LED (Radio Shack #276-30700 [as of this writing])</p> <p>magnets, 2 bar with the poles labeled "N" and "S"</p> <p>magnets, bar, 2 narrow</p> <p>measuring cup, 1-2</p> <p>measuring spoons</p> <p>oven</p> <p>pail, small plastic that will fit in freezer refrigerator</p> <p>scissors</p> <p>screwdriver, small Phillips</p> <p>spoon, mixing</p> <p>timer</p> <p>tools for tending plants</p> <p>trowel, garden, or small shovel</p> <p>wire clippers</p> <p>Optional</p> <p>biscuit cutter</p> <p>camera</p> <p>computer with internet access</p> <p>computer printer</p> <p>magnifying glass</p> <p>rolling pin</p> <p>stopwatch or clock with second hand</p>	<p>baking powder, double-acting, 15 ml (1 Tbsp.)</p> <p>beans, dried, 2 or more (white, pinto, soldier, etc.)</p> <p>beans, dried, 2 or more additional different or other seeds</p> <p>butter, 120 ml (½ cup)</p> <p>corn syrup</p> <p>flour, 2 liters (8 cups)</p> <p>food coloring, several colors</p> <p>food items (approx. 60 ml (¼ c.) each):</p> <p>water</p> <p>milk</p> <p>juice</p> <p>vegetable oil</p> <p>melted butter</p> <p>fruit, assorted, cut in pieces and/or berries</p> <p>Jell-O or other gelatin</p> <p>lemons, 6-10 large</p> <p>milk, 360 ml (1½ cups)</p> <p>salt, 25 ml (5 tsp.) + 2 handfuls</p> <p>sugar, 30 ml (2 Tbsp.) or more</p> <p>vegetable oil, approx. 60 ml (4 Tbsp.)</p> <p>water</p> <p>yeast, active dry, 1 package, 7 grams (¼ oz)</p>	

Materials

Quantities Needed for All Experiments

Materials	Materials (continued)	Other
<p>bags, 3 small paper or plastic bags, 2 plastic, for collecting iron filings balloons, 2-3 rubber box, small, flat-bottomed, clear plastic (big enough for 2 magnets to fit underneath with some space around them) cardboard or poster board, .3-1 meter (1'-3') on each side coffee filters, 1-2 white container, shallow, flat-bottomed plastic (or a plastic box top or large plastic jar lid) containers (3) for collecting sand, pebbles, and small rocks cotton ball cups, plastic, clear, 17 or more cups, plastic or glasses, several cups, Styrofoam (3) 355 ml (12 oz.) size dirt dry ice (available at most grocery stores) [If dry ice is in a block: safety goggles mallet or hammer grocery bag (cloth or paper)] flowers, carnations, 2-4 white flowers, white, 1 or more that are not carnations (rose, lily, etc.) gloves (heavy) or oven mitts glue, Elmer's white, approx. 30-60 ml (½-¼ cup) glue, non-toxic, such as blue glue, clear glue, wood glue, glitter glue, or paste glue; approx. 30-60 ml (½-¼ cup) herb seeds or small herb plants (student selected) houseplants, small, 4 (2 each of the same kind and size) iron filings, about 10 ml (2 teaspoons) (student-collected or purchased: www.hometrainingtools.com, Item #CH-IRON as of this writing)</p>	<p>laundry starch, liquid. approx. 30-60 ml (½-¼ cup), or a mixture of equal parts cornstarch and borax mixed with enough water to dissolve them Legos (handful) nails, 3-5 galvanized (zinc coated) nickel (coin) notebook or drawing pad with blank pages (not ruled) to make a nature journal paper, absorbent, white paper, white, several sheets paper clips, 30 (metal) paper clip, plastic pebbles, about 240 ml (1 cup) or more* pen pen, marking pencils (several) pencils, colored pennies, 3-5 copper, older than 1982 plastic wrap rocks, small* rubber band sand, more than 1 cup* seeds (student selected) soap, liquid stones, small string or thread, at least 2 meters (6 feet) cut in half Styrofoam, small piece tape tape, clear water wire, plastic coated copper, .6-1.2 m (2-4 feet)</p> <p>Optional</p> <p>markers, colored pictures of cities box, cardboard old toys to disassemble to look for computer chips (1 or more)</p> <p>* student-collected or purchased from a place that sells aquarium supplies</p>	<p>closet or cardboard box dirt, pebbles, rocks, water, etc. (enough to make a mud city) garden bed or containers and potting soil library or internet access materials (student-selected) to make a model of a galaxy, such as colored modeling clay, Styrofoam balls, tennis balls, marbles, sand, candies, etc. materials to rub a balloon on, such as: cotton clothing silk clothing wool clothing wooden surface plaster wall metal surface leather surface night sky, dark moonless, far away from city lights</p>