

**FOCUS ON**

**Grades 5-8**

**MIDDLE SCHOOL**



**Teacher's Manual**

**3rd Edition**

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# Materials at a Glance

Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
pencil and eraser Objects chosen by students, such as: rubber ball cotton ball orange banana apple paper sticks leaves rocks grass Legos building blocks other objects <b>Optional</b> several sheets of paper	plastic petri dishes <sup>1</sup> dehydrated agar powder <sup>2</sup> distilled water K-12 safe E. coli bacterial culture <sup>3</sup> inoculation loop <sup>4</sup> candle or gas flame cooking pot mixing spoon oven mitt or pot holder measuring spoons measuring cup black permanent marker red marker rubber gloves, 2 pairs	microscope with 4X, 10X, and 40X objective lenses; 100X objective lens recommended but not required. (See beginning of chapter for purchasing info.) glass microscope slides <sup>5</sup> glass microscope cover slips <sup>6</sup> immersion oil (if using 100X objective lens) <sup>7</sup> Samples: piece of paper with lettering strands of hair droplet of blood insect wing	tincture of iodine [VERY POISONOUS—DO NOT ALLOW STUDENTS TO EAT any food items that have iodine on them] bread, 1 slice timer wax paper marking pen cup refrigerator a green vegetable one or more other vegetables or fruits	pencil colored pencils/crayons student-selected materials for model cell <b>Experiment 6</b> dehydrated agar <sup>2</sup> distilled water cooking pot measuring spoons measuring cup cup plastic petri dishes (20) <sup>1</sup> cotton swabs permanent marker oven mitt or pot holder
Experiment 7	Experiment 8	Experiment 9	Experiment 10	Experiment 11
microscope with a 10X objective microscope depression slides <sup>8</sup> 10 or more eyedroppers fresh pond water or water mixed with soil protozoa study kit <sup>9</sup> (must be used within 1-2 days of arrival) methyl cellulose <sup>10</sup> measuring cup and measuring spoons baker's yeast distilled water Eosin Y stain <sup>11</sup>	agar powder <sup>2</sup> distilled water cooking pot measuring spoons measuring cup plastic petri dishes <sup>1</sup> permanent marker oven mitt or pot holder jar with lid (big enough to hold 235 ml (about 1 cup) liquid 1 slice of bread, preferably preservative free small clear plastic bag white vinegar bleach borax mold or mildew cleaner 1-2 pairs rubber gloves	colored pencils handheld magnifying glass field notebook (blank or faintly lined pages) backpack, water, snacks 2 plant pots potting soil and water corn seeds, 8 or more with packet bean seeds, 8 or more with packet <b>Optional</b> field guide to the plants book iPad, camera, or smartphone with camera plant identification app: do some online research to find the best app to use with a specific mobile device	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; a 100X objective lens is recommended glass microscope slides (plain) <sup>5</sup> glass coverslips <sup>6</sup> immersion oil (if using 100X objective lens) <sup>7</sup> water eyedropper sharp knife toothpick colored pencils Samples: raw celery stalk with leaves raw carrot a large leaf other plant parts: students' choice 3 or more small jars several fresh white carnation flowers food coloring

As of this writing the following materials are available from <http://www.hometrainingtools.com/>

1. A stack of 20 petri dishes: [petri-dishes-plastic-20-pk/p/BE-PETRI20/](http://www.hometrainingtools.com/petri-dishes-plastic-20-pk/p/BE-PETRI20/)

2. Nutrient-agar-8-g-dehydrated/p/CH-AGARN08/

3. Escherichia-coli-bacteria/p/LD-ESCHCOL/

4. Inoculating-needle-looped-end/p/BE-INOCUL/

5 Glass microscope slides: MS-SLIDP72 or MS-SLIDEPL

6 Glass microscope cover slip: MS-SLIDCV

7. Immersion oil: MI-IMMOIL

8. Glass Depression Slides, MS-SLIDC72 or MS-SLIDC12

9. Basic Protozoa Set, LD-PROBASC

10. Methyl Cellulose, CH-METHCEL

11. Eosin Y, CH-EOSIN

(Or search by the name of the item needed)

Experiment 12	Experiment 13	Experiment 14	Experiment 15	Experiment 16
<p>several fresh vegetable scraps such as: carrot top, lettuce leaves or the root end of a head of lettuce, red beet top, turnip top, garlic bulb, onion bulb, scallions, either or both ends of a zucchini squash or cucumber, basil leaves with stem, potato (piece or peeling with eyes), or other vegetables of students' choice</p> <p>knife toothpicks several small glass jars or small drinking glasses colored pencils or pens several plant pots potting soil water</p> <p><b>Optional</b> existing or new field notebook garden trowel or spoon</p>	<p>toothpicks or cotton swabs glass microscope slides<sup>1</sup> plastic pipette or eyedropper<sup>1</sup> methylene blue solution (0.5% to 1%)<sup>1</sup> (iodine can be used instead—follow the same safety precautions) plastic cover slip<sup>1</sup> paper towels or tissues thin rubber, vinyl, or latex gloves that are a tight fit goggles or other eye protection<sup>1</sup> microscope misc. household materials to make microscope dyes</p> <p><b>Optional</b> immersion oil<sup>1</sup></p>	<p><b>14A</b> preserved specimens: clam, crayfish, sea star, and earthworm, (non-injected or injected)<sup>2</sup> dissection guide for each organism<sup>2</sup> safety goggles lab apron gloves dissection tray dissection pins dissecting probe forceps scissors scalpel hand lens or magnifying glass paper towels water</p> <p><b>14B</b> food items: sugar cube small piece of animal protein (chunk of turkey, ham, roast beef, etc.) cheese apple bread oil or butter choice chamber, homemade: shallow pan, shallow cardboard box, short jar, or plastic Petri dish cardboard or paper cut into strips choice chamber, purchased: available from Home Science Tools; search on “choice chamber.”<sup>1</sup></p>	<p><b>15A</b> preserved specimens: frog, shark, and perch (Specimens don't need to be injected.) dissection guide for each organism safety goggles lab apron gloves dissection tray dissection pins dissecting probe forceps scissors scalpel hand lens or magnifying glass paper towels water</p> <p><b>15B</b> ebird.org app (free) Merlin Bird ID app (free) or other bird ID app and/or a print book field guide to the birds, such as <i>The Young Birder's Guide to North America</i> smartphone or iPad with internet access and camera; or desktop or laptop computer and digital camera, if available an email address field notebook (existing or new) pen, pencil, colored pencils</p> <p><b>Optional</b> binoculars</p>	<p><b>16A</b> preserved fetal pig (doesn't need to be injected) dissection guide safety goggles lab apron gloves dissection tray dissection pins dissecting probe forceps scissors scalpel hand lens or magnifying glass paper towels water</p> <p><b>16B</b> smartphone, iPad, or computer with internet access and camera; or desktop or laptop computer and digital camera, if available an email address field notebook (an existing one or start a new one for citizen science projects)</p> <p><b>Or</b> Local library, zoo, or natural history museum field notebook (an existing one or start a new one for citizen science projects)</p>

1. Available from Home Science Tools: <https://www.homesciencetools.com/>  
Type the name of the item needed in the website search bar.

#### Experiments 14-16

Most of the supplies are available from Home Science Tools. Type the name of the item needed in the website search bar.

For preserved organisms and dissection guides search on the Home Science Tools website for “dissection specimen” and “dissection guide.” Choose the organisms listed for each experiment. (At the time of this writing, Home Science Tools offers an “Animal Specimen Set of 9 with Pig” that has most of the specimens needed for Experiments 14-16) Dissection tools are also available from Home Science Tools. Search for individual tools or a dissection kit. Look for other supplies too.

<https://www.homesciencetools.com/>

# Materials

## Quantities Needed for All Experiments

Equipment	Materials	Materials
<p>backpack choice chamber, homemade:   shallow pan, shallow cardboard box,   short jar, or plastic Petri dish, and   cardboard or paper cut into strips choice chamber, purchased: available from   Home Science Tools; search on “choice   chamber” * cooking pot cup cup, measuring dissecting probe * dissection pins * dissection tray * forceps * goggles, safety, or other eye protection * hand lens or magnifying glass * inoculation loop <sup>4</sup> jar with lid (big enough to hold 235 ml   liquid (about 1 cup) jars, 5 or more small jars, small glass or small drinking glasses   (several) knife, sharp lab apron * microscope with 4X, 10X, and 40X   objective lenses; a 100X objective lens   is recommended (see Chapter 3 for   selection info &amp; advice) oven mitt or pot holder plant pots (6 or more) refrigerator scalpel * scissors smartphone or iPad with internet access   and camera; or desktop or laptop   computer and digital camera, if   available spoon, mixing spoons, measuring timer</p> <p><b>Optional</b></p> <p>binoculars field guide to plants print book/field guide   to birds iPad, camera, or smartphone with camera library, zoo, or natural history museum in   your area plant identification app (do some online   research to find the best app to use with   a specific mobile device) trowel, garden, or spoon</p>	<p>agar, dehydrated powder <sup>2</sup> bleach borax candle (or gas stove flame) cardboard, lightweight, or construction   paper carnation flowers, several fresh white cleaner, mold or mildew cotton swabs E. coli bacterial culture, K-12 safe <sup>3</sup> Eosin Y stain <sup>11</sup> eraser eyedroppers (11 or more) * food coloring gloves, rubber, 3-4 pairs gloves, thin rubber, vinyl, or latex, that are   a tight fit (several pairs) immersion oil (if using 100X objective   lens) <sup>7</sup> iodine, tincture of [VERY POISONOUS—   DO NOT ALLOW STUDENTS TO   INGEST] * leaf, large marker, black permanent marker, red permanent methyl cellulose <sup>10</sup> methylene blue solution (0.5% to 1%) <sup>1</sup>   (iodine can be used instead—follow the   same safety precautions) * microscope cover slips, glass <sup>6</sup> microscope cover slips, plastic * microscope slides, depression <sup>8</sup> microscope slides, plain, glass <sup>5</sup> notebook, for field notebook, existing or   new (1 or more), unlined or faint lines   works best paper paper towels or tissues pencil pencils, colored, or crayons petri dishes, plastic (50-60) <sup>1</sup> pipette, plastic, or eyedropper *</p>	<p>plant with at least 6 flat, green leaves (a   tree may be used) plastic bag, small clear potting soil protozoa study kit <sup>9</sup> (must be used within   1-2 days of arrival) seeds, bean 20 or more with packet seeds, corn, 8 or more with packet tape toothpicks vinegar, white water, distilled water, fresh pond or water mixed with soil wax paper</p> <hr/> <p><b>Materials, Misc.</b></p> <p>materials, household (misc.) to make   microscope dyes (students’ choice) materials, student-selected, to make a   model cell objects chosen by students, such as:   rubber ball   cotton ball   orange   banana   apple   paper   sticks   leaves   rocks   grass   Legos   building blocks   other objects plant parts, misc., students’ choice samples for microscopy:   blood, droplet   hair, a few strands   insect wing   paper, piece with lettering</p>

Other	Preserved Specimens *	Foods
ebird.org app (free) email address Merlin Bird ID app (free) or other bird ID app and/or a print book field guide to the birds, such as <i>The Young Birder's Guide to North America</i>	[can use either non-injected or injected specimens]  clam crayfish earthworm fetal pig frog perch sea star shark  dissection guide for each organism *	animal protein (chunk of turkey, ham, roast beef, etc.), small piece apple bread, any, 1-2 slices bread, 1 slice, preferably preservative free carrot, raw celery stalk with leaves, raw cheese oil or butter snacks sugar cube vegetable, green (student's choice) vegetables or fruits (misc.), one or more vegetable scraps, several fresh, such as: carrot top, lettuce leaves or the root end of a head of lettuce, red beet top, turnip top, garlic bulb, onion bulb, scallions, either or both ends of a zucchini squash or cucumber, basil leaves with stem, potato (piece or peeling with eyes), or other vegetables of students' choice yeast, baker's

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| 3. Escherichia-coli-bacteria/p/LD-ESCHCOL/                              | 9. Basic Protozoa Set, LD-PROBASC                    |
| 4. Inoculating-needle-looped-end/p/BE-INOCUL/                           | 10. Methyl Cellulose, CH-METHCEL                     |
| 5. Glass microscope slides: MS-SLIDP72 or MS-SLIDEPL                    | 11. Eosin Y, CH-EOSIN                                |
| 6. Glass microscope cover slip: MS-SLIDCV                               | (Or search by the name of the item needed)           |

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