

Preparation Guide

Level 2 Module 1

Matter with Spotlight Lessons on Forces and Motion

Materials: This section lists the quantity of each material necessary for the lesson. Lesson materials may be from a *PhD Science*® materials kit or they may be school supplied. In addition to the listed materials, teachers should have access to the following common classroom items: sticky notes, chart paper, pencils, a whiteboard, and markers.

Preparation: This section identifies preparation teachers should complete before the lesson, including resources teachers should gather or cue. This section has two subsections:

- **Resources:** This subsection lists module resources (from Appendix A in the Teacher Edition) and core texts used in the lesson. Classrooms also need daily access to the module’s Teacher Edition, Science Logbooks, and, if applicable, PhD Projected. A symbol (☐) identifies resources that appear in PhD Projected.
- **Setup:** This subsection lists media teachers must cue before the lesson, activities that require setup, and items in the current lesson that are reused in future lessons. Note that items found in a typical elementary classroom (e.g., glue, tape, scissors) are not listed for reuse. This subsection also describes advance preparation for upcoming lessons. For example, if teachers need to prepare one day in advance for an activity in Lesson 11, an advance preparation note appears in the Setup subsection for Lesson 10. A symbol (⌚) identifies lessons with advance preparation notes.

Advance Materials Preparation


Several activities in this module require advance preparation. A version of this list appears in the Module Overview of the Teacher Edition. The expanded version in this guide identifies all lessons for which preparation may take longer than a planning period. A symbol (+) identifies preparation that can be done earlier than the suggested time.

Lesson	Time in Advance	Investigation	Description
12	1 day	Conceptual Checkpoint	Prepare for the materials in honey bee nests observation. (See Lesson 12 Resource A.)
14	1 day	Heating Investigation	Prepare for heating investigation. (See Lesson 14 Resource C.)
14	Varies ⁺	Heating Investigation	Plan to complete Lessons 14 and 15 on consecutive days. Lesson 14 requires access to hot water (100°F–105°F). Consider enlisting a fellow school employee to help during the investigation.


17	Varies†	Toasting Bread Investigation	Plan to complete Lessons 17 and 18 on consecutive days.
17	1 day	Toasting Bread Investigation	If a toaster is not available to bring into the classroom, toast 1 slice of bread per student pair and several extra slices ahead of time. Note that an additional slice of white sandwich bread will be required per student pair so students can observe slices of both toasted and untoasted bread.

Matter Lesson Materials and Preparation

Lesson 1

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Angel hair vine (1 oz) <input type="checkbox"/> Feathers (12) <input type="checkbox"/> Moss, Spanish (0.5 L) <input type="checkbox"/> String, 8"–10" (12 pieces) <input type="checkbox"/> Twigs, 3"–6" (18) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Cotton balls (6) <input type="checkbox"/> Scissors (1)
	Preparation <p>Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 1 Resource: Baya Weaver Nests Photograph  <input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015) <p>Setup</p> <ul style="list-style-type: none"> <input type="checkbox"/> Prepare a set of bird nest building materials for each group. Break the twig garland into 18 twigs that are 3" to 6" in length, and cut the string into 12 pieces that are 8" to 10" in length. <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 5 requires 6 of the twigs. Save all the twigs for Lesson 23. <input type="checkbox"/> Lesson 6 requires the cotton balls. 	


Lesson 2

Materials	Kit Items None	School Supplied Items None
	Preparation <p>Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 2 Resource: Bird Nest Photographs  <input type="checkbox"/> <i>A Nest Is Noisy</i> <p>Setup None</p>	


Lesson 3

Materials	Kit Items <input type="checkbox"/> Sentence strips (4)	School Supplied Items <input type="checkbox"/> Fork, metal, large (1) <input type="checkbox"/> Fork, plastic, white (6) <input type="checkbox"/> Markers, at least 8 colors (1 set) <input type="checkbox"/> Pencils, at least 8 colors (12 sets) <input type="checkbox"/> Pocket chart (1) <input type="checkbox"/> Teaspoons, metal (6) <input type="checkbox"/> Teaspoon, plastic, white (1)
	Preparation Resources None	Setup None


Lesson 4

Materials	Kit Items <input type="checkbox"/> Bins, clear plastic, 6 qt (6, optional) <input type="checkbox"/> Building blocks, plastic, blue or green (12) <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (24) <input type="checkbox"/> Magnifiers, handheld, plastic (24) <input type="checkbox"/> Marbles, blue or green (12) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Washers, metal (12)	School Supplied Items <input type="checkbox"/> Cups, clear plastic, 4 oz (48) <input type="checkbox"/> Dish soap, blue or green (12 fl oz) <input type="checkbox"/> Seltzer (12 fl oz) <input type="checkbox"/> Tape, masking (partial roll) <input type="checkbox"/> Water (12 fl oz)
	Preparation Resources <input type="checkbox"/> Lesson 4 Resource: Objects and Materials Observation Setup Instructions	Setup <input type="checkbox"/> Set up objects and materials observation activity. (See Lesson 4 Resource.) <input type="checkbox"/> Cue hummingbird adding material to nest video: http://phdsci.link/1541 . 


Lesson 5

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Building blocks, plastic, blue or green (6) <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (6) <input type="checkbox"/> Marbles, blue or green (6) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Twigs, 3"–6" (6) <input type="checkbox"/> Washers, metal (6) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Honey (12 fl oz) <input type="checkbox"/> Paper clips, metal (6) <input type="checkbox"/> Tape, masking (partial roll) <input type="checkbox"/> Teaspoons, metal (6) <input type="checkbox"/> Teaspoons, plastic, clear (6)
	<p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Dish soap, seltzer, and water samples from Lesson 4 (6 each) 	
Preparation	<p>Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 5 Resource A: Shapes Image  <input type="checkbox"/> Lesson 5 Resource B: Objects and Materials Classification Setup Instructions 	
	<p>Setup</p> <ul style="list-style-type: none"> <input type="checkbox"/> Set up objects and materials classification activity. (See Lesson 5 Resource B.) 	
	<p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Disassemble the dish soap, seltzer, and water samples, and save all the jars and lids. <input type="checkbox"/> Lesson 6 requires 5 of the building blocks, 4 of the jars, 5 of the marbles, and 5 of the paper clips. Save 12 of the jars with lids for Lesson 7, and save all the marbles for Lesson 8. <input type="checkbox"/> Lesson 8 requires the twigs. <input type="checkbox"/> Lesson 12 requires the prepared honey samples. 	

Lesson 6

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Bins, clear plastic, 6 qt (6, optional) <input type="checkbox"/> Building blocks, plastic (5) <input type="checkbox"/> Containers, clear plastic, rectangular, 6 oz (4) <input type="checkbox"/> Containers, clear plastic, round, 8 oz (4) <input type="checkbox"/> Jars, clear plastic, 4 oz (4) <input type="checkbox"/> Marbles (5) <input type="checkbox"/> Safety goggles (24) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Cotton balls (6) <input type="checkbox"/> Dish soap (2 fl oz) <input type="checkbox"/> Paper clips, metal (5) <input type="checkbox"/> Seltzer (2 fl oz) <input type="checkbox"/> Water (2 fl oz)
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 6 Resource: Pouring Stations Setup Instructions 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Cue hummingbird adding material to nest video: http://phdsci.link/1541.  <input type="checkbox"/> Set up pouring stations. (See Lesson 6 Resource.) 	
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 8 requires the marbles. <input type="checkbox"/> Lesson 10 requires the building blocks. <input type="checkbox"/> Lesson 12 requires the jars. <input type="checkbox"/> Lesson 14 requires the bins. 	

Lesson 7

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (12) <input type="checkbox"/> Magnifiers, handheld, plastic (24) <input type="checkbox"/> Sand, coarse (24 oz) <input type="checkbox"/> Sentence strips (2) 	School Supplied Items None
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 7 Resource: Magnified Sand Photograph  <input type="checkbox"/> <i>A Nest Is Noisy</i> 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Prepare a sand sample for each student pair by adding 2 oz sand to a 4 oz clear plastic jar. Seal each jar tightly. 	
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 12 requires the jars with lids and the handheld magnifiers. 	



Lesson 8

Materials	Kit Items <input type="checkbox"/> Marbles (6) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Scales, plastic (6) <input type="checkbox"/> Twigs, 3"–6" (6)	School Supplied Items <input type="checkbox"/> Container to hold 200 mL of water (1) <input type="checkbox"/> Scissors, blunt tip (6) <input type="checkbox"/> Water (200 mL)
Preparation	Resources None	
	Setup None	
	Item Reuse <input type="checkbox"/> Lesson 9 requires 1 marble. Save all the marbles for Lesson 14. <input type="checkbox"/> Lesson 23 requires the twigs.	




Lesson 9

Materials	Kit Items <input type="checkbox"/> Graduated cylinder, 25mL (1) <input type="checkbox"/> Marble (1) <input type="checkbox"/> Sentence strips (1)	School Supplied Items <input type="checkbox"/> Food coloring (1 fl oz, optional) <input type="checkbox"/> Tape, masking (1 piece) <input type="checkbox"/> Water (15 mL)
Preparation	Resources <input type="checkbox"/> Lesson 9 Resource: Water Displacement Demonstration Setup Instructions and Procedure <input type="checkbox"/> <i>A Nest Is Noisy</i>	
	Setup <input type="checkbox"/> Set up water displacement demonstration. (See Lesson 9 Resource.)	
	Item Reuse <input type="checkbox"/> Lesson 14 requires the marble.	


Lesson 10

Materials	Kit Items <input type="checkbox"/> Building blocks, plastic, blue, green, red (40 each color)	School Supplied Items <input type="checkbox"/> Bags, resealable plastic, 1 qt (6)
Preparation	Resources <input type="checkbox"/> Lesson 10 Resource: Baya Weaver Nest Photographs  <input type="checkbox"/> <i>A Nest Is Noisy</i>	
	Setup <input type="checkbox"/> Cue baya weaver nest construction videos: http://phdsci.link/1551 , http://phdsci.link/1552 , and http://phdsci.link/1553 .  <input type="checkbox"/> Prepare 6 sets of plastic building blocks for building block construction activity by placing 20 blocks of the same color in separate resealable plastic bags.	
Item Reuse <input type="checkbox"/> Lesson 11 requires 30 of the building blocks, all the same color.		



Lesson 11

Materials	Kit Items <input type="checkbox"/> Building blocks, plastic (30 same color) <input type="checkbox"/> Gloves, disposable (24 pairs) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Sentence strips (2)	School Supplied Items <input type="checkbox"/> Knife (1) <input type="checkbox"/> Oranges, whole (4) <input type="checkbox"/> Paper towels (6 sheets)
Preparation 	Resources <input type="checkbox"/> Lesson 11 Resource A: Brick Wall Photograph  <input type="checkbox"/> Lesson 11 Resource B: Orange Parts Observation Setup Instructions and Procedure <input type="checkbox"/> Lesson 11 Resource C: Orange Part Cards 	
	Setup <input type="checkbox"/> Build 5 × 6 × 1 wall out of 30 plastic building blocks of the same color from Lesson 10. <input type="checkbox"/> Prepare materials for orange parts observation activity. (See Lesson 11 Resource B.) <input type="checkbox"/> Prepare orange part cards. (See Lesson 11 Resource C.)	
Advance Preparation for Lesson 12 1 Day Before: Prepare for the materials in honey bee nests observation. (See Lesson 12 Resource A.)		

Lesson 12

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Beeswax pellets, yellow (12 tbsp) <input type="checkbox"/> Binder rings, 1" (24) <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (18) <input type="checkbox"/> Magnifiers, handheld, plastic (24) <input type="checkbox"/> Knowledge Deck™ cards, Honey Bees (24) <input type="checkbox"/> Knowledge Deck poster, Honey Bees (1) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Container, plastic or glass, 24 oz or larger (1) <input type="checkbox"/> Cornmeal, yellow (12 tbsp) <input type="checkbox"/> Long spoon or stirring rod (1) <input type="checkbox"/> Sugar, granulated, white ($1\frac{1}{2}$ cups) <input type="checkbox"/> Tape, masking (partial roll) <input type="checkbox"/> Water (12 fl oz)
	Prepared Items from Previous Lessons <ul style="list-style-type: none"> <input type="checkbox"/> Honey samples from Lesson 5 (6) 	
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 12 Resource A: Materials in Honey Bee Nests Observation Setup Instructions <input type="checkbox"/> Lesson 12 Resource B: Conceptual Checkpoint Part A  <input type="checkbox"/> <i>A Nest Is Noisy</i> 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> If not done in advance, prepare for the materials in honey bee nests observation. (See Lesson 12 Resource A.) <input type="checkbox"/> Prepare to distribute a copy of Lesson 12 Resource B to each student. 	
	Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 13 requires the handheld magnifiers, the Honey Bees Knowledge Deck cards and poster, and the prepared beeswax, cornmeal, sugar solution, and honey samples. 	

Lesson 13


Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Magnifiers, handheld, plastic (24) <input type="checkbox"/> Knowledge Deck cards, Honey Bees (24) <input type="checkbox"/> Knowledge Deck poster, Honey Bees (1) 	School Supplied Items None
	Prepared Items from Previous Lessons <ul style="list-style-type: none"> <input type="checkbox"/> Beeswax, cornmeal, and sugar solution samples from Lesson 12 (6 each) <input type="checkbox"/> Honey samples from Lesson 5 (6) 	
Preparation 	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 13 Resource: Conceptual Checkpoint Part B  	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Prepare to distribute a copy of Lesson 13 Resource to each student. 	

	<p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Disassemble the prepared cornmeal, sugar solution, and honey samples. <input type="checkbox"/> Lesson 17 requires the handheld magnifiers. <input type="checkbox"/> Lesson 19 requires 6 of the jars with lids, the Honey Bees Knowledge Deck cards and poster, and the prepared beeswax samples. Save all the jars with lids for use in Lesson 30. <p>Advance Preparation for Lesson 14</p> <p>1 Day Before: Prepare for heating investigation. (See Lesson 14 Resource C.)</p>
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Lesson 14

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bins with lids, clear plastic, 6 qt (6) <input type="checkbox"/> Bucket, plastic, 10 qt (1) <input type="checkbox"/> Marbles (30) <input type="checkbox"/> Measuring cup, 1 L (1) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Thermometer, indoor-outdoor (1) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bags, resealable plastic, 1 qt (30) <input type="checkbox"/> Binder clips, medium (30) <input type="checkbox"/> Butter, solid (6 tbs) <input type="checkbox"/> White chocolate chips (48) <input type="checkbox"/> Cooler bag, insulated, or freezer (1) <input type="checkbox"/> Ice cubes (6) Scissors (1) <input type="checkbox"/> Tape, packing, clear, 2" wide (partial roll) <input type="checkbox"/> Teaspoons, plastic, white (6) <input type="checkbox"/> Water, hot (100°F–105°F) (access)
Preparation	<p>Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 14 Resource A: Niagara Falls Photographs <input type="checkbox"/> Lesson 14 Resource B: Color Band Thermometer Preparation Instructions <input type="checkbox"/> Lesson 14 Resource C: Heating Investigation Setup Instructions <p>Setup</p> <ul style="list-style-type: none"> <input type="checkbox"/> Plan to complete Lessons 14 and 15 on consecutive days. <input type="checkbox"/> Prepare color band thermometer. (See Lesson 14 Resource B.) <input type="checkbox"/> If not done in advance, prepare for heating investigation. (See Lesson 14 Resource C.) <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 15 requires the prepared color band thermometer and prepared heating investigation materials. 	

Lesson 15

Materials	Kit Items <input type="checkbox"/> Safety goggles (24)	School Supplied Items <input type="checkbox"/> Paper towels (30 sheets)
	Prepared Items from Previous Lessons <input type="checkbox"/> Color band thermometer from Lesson 14 (1) <input type="checkbox"/> Heating investigation materials from Lesson 14	
Preparation	Resources None	
	Setup <input type="checkbox"/> Plan to complete Lessons 14 and 15 on consecutive days. <input type="checkbox"/> Cue melting plastic spoon and molten glass videos: http://phdsci.link/1578 and http://phdsci.link/1579 . 	
	Item Reuse <input type="checkbox"/> Lesson 16 requires the prepared color band thermometer.	

Lesson 16

Materials	Kit Items <input type="checkbox"/> Sentence strips (3)	School Supplied Items <input type="checkbox"/> Pencils, blue, green, orange, purple, red, yellow (6 sets)
	Prepared Items from Previous Lessons <input type="checkbox"/> Color band thermometer from Lesson 14 (1)	
Preparation 	Resources <input type="checkbox"/> Lesson 14 Resource A: Niagara Falls Photograph  <input type="checkbox"/> Lesson 16 Resource: Reversible Change Model Cards  <input type="checkbox"/> <i>A Nest Is Noisy</i>	
	Setup <input type="checkbox"/> Cue melting icicles and blowtorching log videos: http://phdsci.link/1580 and http://phdsci.link/1581 .  <input type="checkbox"/> Prepare to distribute a set of reversible change model cards (6 arrows and 6 color photographs) to each group. (See Lesson 16 Resource.)	
	Item Reuse <input type="checkbox"/> Lesson 17 requires the prepared color band thermometer.	
	Advance Preparation for Lesson 17 1 Day Before: If a toaster is not available to bring into the classroom, toast 1 slice of bread per student pair and several extra slices ahead of time. Provide an additional slice of untoasted white sandwich bread per student pair so students can observe slices of both toasted and untoasted bread.	




Lesson 17

Materials	Kit Items <input type="checkbox"/> Gloves, disposable (24 pairs) <input type="checkbox"/> Magnifiers, handheld, plastic (24)	School Supplied Items <input type="checkbox"/> Bags, resealable plastic, 1 qt (12) <input type="checkbox"/> Bread slices, white sandwich (16) <input type="checkbox"/> Toaster (1)
	Prepared Items from Previous Lessons <input type="checkbox"/> Color band thermometer from Lesson 14 (1)	
Preparation	Resources None	
	Setup <input type="checkbox"/> Plan to complete Lessons 17 and 18 on consecutive days. <input type="checkbox"/> Gather materials for toasting bread investigation.	
	Item Reuse <input type="checkbox"/> Lesson 18 requires the handheld magnifiers and toasted bread slices.	

Lesson 18

Materials	Kit Items <input type="checkbox"/> Magnifiers, handheld, plastic (24) <input type="checkbox"/> Sentence strip (1)	School Supplied Items <input type="checkbox"/> Pencils, at least 8 colors (12 sets)
	Prepared Items from Previous Lessons <input type="checkbox"/> Slices of bread from Lesson 17 (12)	
Preparation	Resources None	
	Setup <input type="checkbox"/> Plan to complete Lessons 17 and 18 on consecutive days.	
	Item Reuse <input type="checkbox"/> Lesson 30 requires the handheld magnifiers.	

Lesson 19

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Beeswax pellets, yellow (12 tbsp) <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (6) <input type="checkbox"/> Knowledge Deck cards, Honey Bees (24) <input type="checkbox"/> Knowledge Deck poster, Honey Bees (1) 	School Supplied Items None
	Prepared Items from Previous Lessons <ul style="list-style-type: none"> <input type="checkbox"/> Beeswax samples from Lesson 12 (6) 	
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 19 Resource: Conceptual Checkpoint  <input type="checkbox"/> <i>A Nest Is Noisy</i> 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Prepare to distribute a copy of Lesson 19 Resource to each student. <input type="checkbox"/> Prepare a beeswax sample for each student pair. Gather the beeswax samples from Lesson 12. To prepare additional samples, add 2 tbsp beeswax pellets to each clean plastic jar, and seal the jars tightly. After the lesson, save the beeswax samples for use during the End-of-Module Assessment. <input type="checkbox"/> Cue beeswax melting video: http://phdsci.link/1582.  <input type="checkbox"/> Cue dog playing in mud video: http://phdsci.link/1583.  Item Reuse <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 23 requires the Honey Bees Knowledge Deck cards and poster. <input type="checkbox"/> Lesson 30 requires the prepared beeswax samples. 	


Lesson 20

Materials	Kit Items None	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Wax paper, 6" × 6" (12) <input type="checkbox"/> Crayons, dark colored (12) <input type="checkbox"/> Scissors (1)
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i> (Biebow and Salerno 2019) 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Prepare materials for crayon exploration. Cut wax paper into 6" squares. 	


Lesson 21

Materials	Kit Items <input type="checkbox"/> Sentence strips (2)	School Supplied Items <input type="checkbox"/> Aluminum foil, 3" × 3" (6) <input type="checkbox"/> Cardboard or chipboard, 3" × 3" (6) <input type="checkbox"/> Chalk, white (2 sticks) <input type="checkbox"/> Crayons, dark colored (2) <input type="checkbox"/> Markers, black, blue (1 each) <input type="checkbox"/> Paper, printer, 8.5" × 11" (4 sheets) <input type="checkbox"/> Pencils (2) <input type="checkbox"/> Plastic wrap, 3" × 3" (6) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape, masking (partial roll, optional) <input type="checkbox"/> Wax paper, 3" × 3" (6)
	Preparation	Resources <input type="checkbox"/> Lesson 21 Resource: Writing Tool Investigation Setup Instructions and Sample Results <input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i>
	Setup <input type="checkbox"/> Prepare materials for writing tool investigation. (See Lesson 21 Resource.)	


Lesson 22

Materials	Kit Items None	School Supplied Items None
Preparation	Resources <input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i> <input type="checkbox"/> <i>A Nest Is Noisy</i>	
	Setup <input type="checkbox"/> Cue video of flamingo building a nest: http://phdsci.link/1590 . 	

Lesson 23

Materials	Kit Items	School Supplied Items
	<input type="checkbox"/> Twigs, 3”–6” (24) <input type="checkbox"/> Knowledge Deck cards, Honey Bees (24) <input type="checkbox"/> Knowledge Deck poster, Honey Bees (1)	None
Preparation	Resources	
	<input type="checkbox"/> Lesson 23 Resource: Conceptual Checkpoint 	
	Setup	
	<input type="checkbox"/> Prepare to distribute a copy of Lesson 23 Resource to each student. <input type="checkbox"/> If necessary, break the twig garland from Lesson 1 into additional 3”–6” pieces or gather additional twigs so that each student receives a twig.	

Lesson 24

Materials	Kit Items	School Supplied Items
	None	None
Preparation	Resources	
	<input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process Visual  <input type="checkbox"/> <i>A Nest Is Noisy</i> <input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i>	
	Setup	
	None	

Lesson 25

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Cheesecloth, 3" × 5" (8) <input type="checkbox"/> Craft sticks, jumbo (40) <input type="checkbox"/> Spray bottles, 24 oz (4) 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum foil, 3" × 5" (8) <input type="checkbox"/> Construction paper, blue, brown, or purple, 9" × 12" (26 sheets) <input type="checkbox"/> Index cards, 3" × 5" (8) <input type="checkbox"/> Large leaf (1) <input type="checkbox"/> Plastic wrap, 3" × 5" (8) <input type="checkbox"/> Trays, plastic or metal (16–24) <input type="checkbox"/> Water (access)
<p>Preparation</p>	<p>Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process Visual <input type="checkbox"/> Lesson 25 Resource: Materials Test Sample Results <hr/> <p>Setup</p> <ul style="list-style-type: none"> <input type="checkbox"/> Prepare paper squares for students to draw the person, animal, or object that they plan to protect. Cut construction paper into 2" squares so each student receives a square. <input type="checkbox"/> Prepare the materials test materials. Cut cheesecloth or cotton cloth, aluminum foil, leaves, and plastic wrap into 3" × 5" pieces to prepare 1 piece of each material per group. If large leaves are not available, consider having students place multiple smaller pieces of leaf side-by-side. <input type="checkbox"/> Fill the spray bottles with water. <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 27 requires the spray bottles filled with water and the construction paper squares drawn on by students. 	

Lesson 26

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Clay, modeling, nonhardening, gray (10 oz) <input type="checkbox"/> Safety goggles (24) <p>Possible Engineering Challenge Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Building blocks, plastic <input type="checkbox"/> Cheesecloth <input type="checkbox"/> Craft sticks, jumbo <input type="checkbox"/> Foam blocks 	<p>School Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Scissors, blunt tip (8) <input type="checkbox"/> Tape, masking (partial roll) <p>Possible Engineering Challenge Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aluminum foil <input type="checkbox"/> Chenille stems <input type="checkbox"/> Coffee stirrers, wooden <input type="checkbox"/> Cotton balls <input type="checkbox"/> Cotton cloth <input type="checkbox"/> Cotton swabs <input type="checkbox"/> Index cards <input type="checkbox"/> Paper bags <input type="checkbox"/> Paper clips <input type="checkbox"/> Paper, printer, 8.5" x 11" <input type="checkbox"/> Paper towels <input type="checkbox"/> Plastic wrap <input type="checkbox"/> Straws, plastic <input type="checkbox"/> Toothpicks
	<p>Preparation</p> <p>Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process Visual <p>Setup</p> <ul style="list-style-type: none"> <input type="checkbox"/> Prepare the Engineering Challenge materials, and place them at the front of the classroom. <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 27 requires the prepared Engineering Challenge materials. 	

Lesson 27

Materials	Kit Items <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Spray bottles filled with water, 24 oz (4)	School Supplied Items <input type="checkbox"/> Construction paper, blue, brown, or purple, 9" × 12" (8 sheets) <input type="checkbox"/> Scissors, blunt tip (8) <input type="checkbox"/> Tape, masking (partial roll)
	Prepared Items from Previous Lessons <input type="checkbox"/> Engineering Challenge materials from Lesson 26 <input type="checkbox"/> Construction paper squares drawn on by students from Lesson 25	
Preparation	Resources <input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process Visual <input type="checkbox"/> Lesson 27 Resource: Shelter Test Procedure	
	Setup None	
	Item Reuse <input type="checkbox"/> Lesson 30 requires one 5" × 36" piece of cheesecloth (or twelve 3" × 5" pieces), 6 ounces of the modeling clay, and 12 of the jumbo craft sticks.	

Lesson 28

Materials	Kit Items None	School Supplied Items <input type="checkbox"/> Chart paper or printer paper, 8.5" x 11" or personal white boards (8)
Preparation	Resources <input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process Visual	
	Setup None	

Lesson 29

Materials	Kit Items None	School Supplied Items None
	Preparation	
	Resources <input type="checkbox"/> Lesson 29 Resource: Key Term Cards	
	Setup <input type="checkbox"/> Prepare key term cards (See Lesson 29 Resource.)	

Lesson 30

Materials	Kit Items <input type="checkbox"/> Clay, modeling, nonhardening, gray (6 oz) <input type="checkbox"/> Craft sticks, jumbo (12) <input type="checkbox"/> Jars with lids, clear plastic, 4 oz (12) <input type="checkbox"/> Magnifiers, handheld, plastic (24) <input type="checkbox"/> <i>Little Dancer Aged Fourteen</i> Knowledge Deck card (24) <input type="checkbox"/> <i>Little Dancer Aged Fourteen</i> Knowledge Deck poster (1)	School Supplied Items <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape, masking (partial roll)
	Prepared Items from Previous Lessons <input type="checkbox"/> Beeswax samples from Lesson 19 (12) <input type="checkbox"/> Cheesecloth samples from Lesson 27 (12)	
	Preparation	
	Resources <input type="checkbox"/> Lesson 30 Resource A: Edgar Degas Background Information <input type="checkbox"/> Lesson 30 Resource B: End-of-Module Assessment Setup Instructions	
	Setup <input type="checkbox"/> Prepare materials for End-of-Module Assessment. (See Lesson 30 Resource B.)	

Lesson 31

Materials	Kit Items None	School Supplied Items None
Preparation	Resources <input type="checkbox"/> Lesson 31 Resource: Matter Card	
	Setup <input type="checkbox"/> Score End-of-Module Assessment and write individual feedback. <input type="checkbox"/> Select at least one End-of-Module Assessment item for the class to debrief, and prepare a sample response for that item to share with students. <input type="checkbox"/> Prepare Matter card. (See Lesson 31 Resource.) <input type="checkbox"/> Select student work products that show evidence of three-dimensional learning, and display them in different areas of the classroom. Student work products may include the anchor model, other class charts, selected Science Logbook pages, and Engineering Challenge designs.	

Forces and Motion Lesson Materials and Preparation

Lesson 1

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Blocks, wooden (2) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Spinning top (1) <input type="checkbox"/> Stopwatch (6) <input type="checkbox"/> Toy cars (2) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Meter stick (6)
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 1 Resource A: Motion Stations Setup Instructions <input type="checkbox"/> Lesson 1 Resource B: Motion Station Procedure Sheets 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Cue the “Okinawa Aquarium” video: http://phdsci.link/1807. <input type="checkbox"/> Prepare procedure sheets for motion stations. (See Lesson 1 Resource B.) <input type="checkbox"/> Set up motion stations in a location with a smooth, hard surface. (See Lesson 1 Resource A.) Do not include meter sticks at the stations for Lesson 2. 	

Lesson 2

Materials	Kit Items <ul style="list-style-type: none"> <input type="checkbox"/> Blocks, wooden (2) <input type="checkbox"/> Safety goggles (24) <input type="checkbox"/> Spinning top (1) <input type="checkbox"/> Toy cars (2) 	School Supplied Items <ul style="list-style-type: none"> <input type="checkbox"/> Book (1)
Preparation	Resources <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 2 Resource: Identifying Patterns Procedure Sheets 	
	Setup <ul style="list-style-type: none"> <input type="checkbox"/> Set up motion stations in a location with a smooth, hard surface. (See Lesson 1 Resource A.) Do not include meter sticks at the stations for Lesson 2. <input type="checkbox"/> Prepare procedure sheets for the identifying patterns activity. (See Lesson 2 Resource.) 	

Lesson 3

Materials	Kit Items <input type="checkbox"/> Magnet (1)	School Supplied Items None
Preparation	Resources None	
	Setup <input type="checkbox"/> Use a magnet to display paper materials, such as handouts for a lesson, on the board. <input type="checkbox"/> Prepare for the scavenger hunt by placing in the classroom objects that use magnets to solve everyday problems. Examples include objects with magnetic fasteners, containers with magnetic backing to affix to a desk or whiteboard, and a magnetic dispenser for paperclips.	

Works Cited

Aston, Dianna Hutts, and Sylvia Long (illustrator). 2015. *A Nest Is Noisy*. San Francisco: Chronicle Books. [All references to *A Nest Is Noisy* are from this source.]

Biebow, Natascha, and Steven Salerno (illustrator). 2019. *The Crayon Man: The True Story of the Invention of Crayola Crayons*. Boston: Houghton Mifflin Harcourt. [All references to *The Crayon Man* are from this source.]

Credits

Pages 3, 5, Hummingbird video by andre baget/Shutterstock.com; page 7, Weaverbird videos by SARIN KUNTHONG/Shutterstock.com; page 10, Melting spoon video by BlackBoxGuild/Shutterstock.com, Molten glass video by Ivan Golenkov/Shutterstock.com; page 10, Icicles video by Film Master/Shutterstock.com, Blow Torch video by BlackBoxGuild/Shutterstock.com; page 12, Beeswax video by Lost Mountain Studio/Shutterstock.com, Dog video by Zayats Svetlana/Shutterstock.com; page 13, Flamingo nest video by BlackBoxGuild/Shutterstock.com; page 18, Edgar Degas, *Little Dancer Aged Fourteen* (detail), 1878–1881. Image Credit: National Gallery of Art, New York, NY, USA Collection of Mr. and Mrs. Paul Mellon.