




# Preparation Guide


## Level 2 Module 1

### MATTER

#### with Spotlight Lessons on Weather Events

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

**Resources:** This section lists module resources (from the Module Resources section 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, digital slides. A symbol () identifies resources that appear in the digital slides. Additional supports and Spanish resources are available in the Implementation Resources and Level Overview sections of the digital platform.

**Preparation:** This section identifies preparation teachers should complete before the lesson, including media teachers must cue before the lesson and activities that require setup. This section also describes advance preparation for upcoming lessons. For example, if teachers need to prepare 1 day in advance for an activity in Lesson 11, an advance preparation note appears in the Preparation section for Lesson 10. A symbol () identifies lessons with advance preparation notes.


## Matter | Advance 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
17	Varies†	Heating Investigation	Plan to complete Lessons 17 and 18 on consecutive days. Lesson 17 requires access to hot water (100°F to 105°F). Consider arranging for an adult to help during the investigation.
20	Varies†	Toasting Bread Investigation	Plan to complete Lessons 20 and 21 on consecutive days.
20	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. Provide an additional slice of untoasted white sandwich bread per student pair so students can observe slices of both toasted and untoasted bread.

# Matter | Lesson Preparation

## Lesson 1

<b>Materials</b>	<b>Kit Items</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Angel hair vine wreath (1)</li> <li><input type="checkbox"/> Cotton balls (6)</li> <li><input type="checkbox"/> Feathers (12)</li> <li><input type="checkbox"/> Moss, Spanish (<math>\frac{1}{2}</math> L)</li> <li><input type="checkbox"/> String, 8" to 10" (12 pieces)</li> <li><input type="checkbox"/> Twigs, 3" to 6" (18)</li> </ul> <b>School-Supplied Items</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> </ul> <b>Item Reuse</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 5 requires 6 of the twigs. Save all the twigs for Lesson 26.</li> <li><input type="checkbox"/> Lesson 29 requires the remaining moss.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource: Baya Weaver Nests Photograph </li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare a set of bird nest building materials for each group. If using twig garland, break the twig garland into 18 twigs that are 3" to 6" in length. Cut the string into 12 pieces that are 8" to 10" in length. If using the vine wreath, separate the wreath into 12 small sections.</li> </ul>


## Lesson 2

<b>Materials</b>	<b>Kit Items</b> None  <b>School-Supplied Items</b> None
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 2 Resource: Bird Nest Photographs </li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015) </li> </ul>
<b>Preparation</b>	None


## Lesson 3

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Fork, metal, large (1)</li> <li><input type="checkbox"/> Fork, plastic, white (6)</li> <li><input type="checkbox"/> Teaspoons, metal (6)</li> <li><input type="checkbox"/> Teaspoon, plastic, white (1)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Sentence strips (5)</li> <li><input type="checkbox"/> String, 8" to 10" long (1 piece)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pocket chart (1)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 4 requires the class properties list.</li> <li><input type="checkbox"/> Lesson 5 requires the metal teaspoons.</li> <li><input type="checkbox"/> Lesson 17 requires the white plastic teaspoon.</li> </ul>
<p><b>Resources</b></p>	<p>None</p>
<p><b>Preparation</b></p>	<p>None</p>


## Lesson 4

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bags, resealable plastic, 1 gal (6)</li> <li><input type="checkbox"/> Bins, clear plastic, 6 qt (6, optional)</li> <li><input type="checkbox"/> Building blocks, plastic, blue or green (12)</li> <li><input type="checkbox"/> Cups, clear plastic, 4 oz (48)</li> <li><input type="checkbox"/> Dish soap, blue or green (12 fl oz)</li> <li><input type="checkbox"/> Jars with lids, clear plastic, 4 oz (24)</li> <li><input type="checkbox"/> Magnifiers, handheld, plastic (24)</li> <li><input type="checkbox"/> Marbles, blue or green (12)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Washers, metal (12)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pencil (1)</li> <li><input type="checkbox"/> Seltzer (12 fl oz)</li> <li><input type="checkbox"/> Tape, masking (partial roll)</li> <li><input type="checkbox"/> Water (12 fl oz)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Class properties list started in Lesson 3</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 5 requires 6 of the blue or green building blocks; 6 of the jars with lids; 6 of the marbles; 6 of the washers; the prepared class properties list; and the prepared dish soap, seltzer, and water samples. Save all the building blocks for Lesson 13, and save all the marbles for Lesson 17.</li> <li><input type="checkbox"/> Lesson 6 requires the bins.</li> <li><input type="checkbox"/> Lesson 15 requires the handheld magnifiers.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 4 Resource: Objects and Materials Observation Setup Instructions</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Set up objects and materials observation activity. (See Lesson 4 Resource.)</li> <li><input type="checkbox"/> Cue hummingbird builds nest video (<a href="http://phdsci.link/1541">http://phdsci.link/1541</a>). </li> </ul>

## Lesson 5

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bags, resealable plastic, 1 gal (6)</li> <li><input type="checkbox"/> Building blocks, plastic, blue or green (6)</li> <li><input type="checkbox"/> Honey (12 fl oz)</li> <li><input type="checkbox"/> Jars with lids, clear plastic, 4 oz (6)</li> <li><input type="checkbox"/> Marbles, blue or green (6)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Teaspoons, metal (6)</li> <li><input type="checkbox"/> Teaspoons, plastic, clear (6)</li> <li><input type="checkbox"/> Twigs, 3" to 6" (6)</li> <li><input type="checkbox"/> Washers, metal (6)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Paper clips, metal (6)</li> <li><input type="checkbox"/> Tape, masking (partial roll)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Class properties list started in Lesson 3</li> <li><input type="checkbox"/> Dish soap, seltzer, and water samples from Lesson 4 (6 each)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Disassemble the dish soap, seltzer, and water samples, and save all the jars and lids.</li> <li><input type="checkbox"/> Lesson 6 requires 5 of the building blocks, 4 of the jars, 5 of the marbles, 5 of the paper clips, and the prepared class properties list.</li> <li><input type="checkbox"/> Lesson 7 requires all the marbles and building blocks.</li> <li><input type="checkbox"/> Lesson 11 requires the twigs.</li> <li><input type="checkbox"/> Lesson 15 requires the prepared honey samples.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 5 Resource A: Shapes Illustration </li> <li><input type="checkbox"/> Lesson 5 Resource B: Objects and Materials Classification Setup Instructions</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Set up objects and materials classification activity. (See Lesson 5 Resource B.)</li> </ul>


## Lesson 6

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bins, clear plastic, 6 qt (6, optional)</li> <li><input type="checkbox"/> Building blocks, plastic (5)</li> <li><input type="checkbox"/> Containers, clear plastic, rectangular, 6 oz (4)</li> <li><input type="checkbox"/> Containers, clear plastic, round, 8 oz (4)</li> <li><input type="checkbox"/> Cotton balls (6)</li> <li><input type="checkbox"/> Dish soap (2 fl oz)</li> <li><input type="checkbox"/> Jars with lids, clear plastic, 4 oz (4)</li> <li><input type="checkbox"/> Marbles (5)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Paper clips, metal (5)</li> <li><input type="checkbox"/> Seltzer (2 fl oz)</li> <li><input type="checkbox"/> Water (2 fl oz)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Class properties list started in Lesson 3</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 7 requires 1 of the paper clips, the plastic building blocks, and the marbles.</li> <li><input type="checkbox"/> Lesson 12 requires the class properties list.</li> <li><input type="checkbox"/> Lesson 13 requires the building blocks.</li> <li><input type="checkbox"/> Lesson 15 requires the jars.</li> <li><input type="checkbox"/> Lesson 17 requires the bins.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 6 Resource: Pouring Stations Setup Instructions</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue hummingbird builds nest video (<a href="http://phdsci.link/1541">http://phdsci.link/1541</a>). </li> <li><input type="checkbox"/> Set up pouring stations. (See Lesson 6 Resource.)</li> </ul>

## Lesson 7


<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Building blocks, plastic (6)</li> <li><input type="checkbox"/> Clay, modeling, nonhardening, gray (<math>\frac{1}{4}</math> lb)</li> <li><input type="checkbox"/> Cotton balls (6)</li> <li><input type="checkbox"/> Marbles (6)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Sentence strips (2)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Paper clip, metal (1)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 8 requires the building blocks.</li> <li><input type="checkbox"/> Lesson 11 requires the marbles.</li> <li><input type="checkbox"/> Lesson 29 requires the modeling clay.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Roll nonhardening modeling clay into 1" balls for the shape change activity.</li> </ul>

## Lesson 8

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Building blocks, plastic (18)</li> <li><input type="checkbox"/> Rubber bands, size 32 (12)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Sticky notes (6)</li> <li><input type="checkbox"/> Tape (partial roll)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 9 requires the prepared pushes and pulls investigation materials.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 8 Resource A: Pushes and Pulls Investigation Setup Instructions</li> <li><input type="checkbox"/> Lesson 8 Resource B: Pushes and Pulls Investigation Procedure Sheet</li> <li><input type="checkbox"/> Lesson 8 Resource C: Investigation Template</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue woodpecker video (<a href="http://phdsci.link/2376">http://phdsci.link/2376</a>). </li> <li><input type="checkbox"/> Prepare pushes and pulls investigation materials. (See Lesson 8 Resources A and B.)</li> </ul>



## Lesson 9

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Tape (partial roll)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pushes and pulls investigation materials from Lesson 8 (6 sets)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 13 requires the building blocks from the pushes and pulls investigation materials.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 8 Resource C: Investigation Template</li> <li><input type="checkbox"/> Lesson 9 Resource: Investigation Illustrations </li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare pushes and pulls investigation work areas. For each group, designate a smooth surface (e.g., floor, table) approximately 3.5 ft long, and print and cut out 1 copy of the template in Lesson 8 Resource C. Position the template so that its Bottom label aligns with one end of the work area, marking the starting point for the investigation. Secure the template to the work area with tape.</li> </ul>

## Lesson 10

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <p>None</p>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<p>None</p>




## Lesson 11

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Container to hold 200 mL of water (1)</li> <li><input type="checkbox"/> Marbles (6)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Scales, plastic (6)</li> <li><input type="checkbox"/> Twigs, 3" to 6" (6)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors, blunt tip (6)</li> <li><input type="checkbox"/> Water (200 mL)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 12 requires 1 marble. Save all the marbles for Lesson 17.</li> <li><input type="checkbox"/> Lesson 26 requires the twigs.</li> </ul>
<b>Resources</b>	None
<b>Preparation</b>	None


## Lesson 12

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Graduated cylinder, 25 mL (1)</li> <li><input type="checkbox"/> Marble (1)</li> <li><input type="checkbox"/> Sentence strip (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Food coloring (1 fl oz, optional)</li> <li><input type="checkbox"/> Tape, masking (1 piece)</li> <li><input type="checkbox"/> Water (15 mL)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Class properties list started in Lesson 3</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 17 requires the marble.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 12 Resource: Water Displacement Demonstration Setup Instructions and Procedure</li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Set up water displacement demonstration. (See Lesson 12 Resource.)</li> </ul>


## Lesson 13

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bags, resealable plastic, 1 qt (6)</li> <li><input type="checkbox"/> Building blocks, plastic, blue, green, red (40 each color)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 14 requires 30 of the building blocks (all the same color).</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 13 Resource: Baya Weaver Nest Photographs</li> <li><input type="checkbox"/> A Nest Is Noisy (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue             <ul style="list-style-type: none"> <li><input type="radio"/> weaverbird builds a nest video (<a href="http://phdsci.link/1551">http://phdsci.link/1551</a>), </li> <li><input type="radio"/> weaverbird builds a nest 2 video (<a href="http://phdsci.link/1552">http://phdsci.link/1552</a>),  and</li> <li><input type="radio"/> weaverbird builds a nest 3 video (<a href="http://phdsci.link/1553">http://phdsci.link/1553</a>). </li> </ul> </li> <li><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.</li> </ul>


## Lesson 14

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Building blocks, plastic (30 of the same color)</li> <li><input type="checkbox"/> Gloves, disposable (24 pairs)</li> <li><input type="checkbox"/> Knife (1)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Sentence strips (2)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Oranges, whole (4)</li> <li><input type="checkbox"/> Paper towels (6 sheets)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 17 requires the knife.</li> <li><input type="checkbox"/> Lesson 29 requires the building blocks.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 14 Resource A: Brick Wall Photograph </li> <li><input type="checkbox"/> Lesson 14 Resource B: Orange Parts Observation Setup Instructions and Procedure</li> <li><input type="checkbox"/> Lesson 14 Resource C: Orange Part Cards</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Build a 5 × 6 × 1 wall with 30 plastic building blocks of the same color.</li> <li><input type="checkbox"/> Prepare materials for orange parts observation activity. (See Lesson 14 Resource B.)</li> <li><input type="checkbox"/> Prepare orange part cards. (See Lesson 14 Resource C.)</li> </ul>


## Lesson 15

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Beeswax pellets, yellow (<math>\frac{3}{4}</math> cup)</li> <li><input type="checkbox"/> Container, plastic or glass, 24 oz or larger (1)</li> <li><input type="checkbox"/> Cornmeal, yellow (<math>\frac{3}{4}</math> cup)</li> <li><input type="checkbox"/> Jars with lids, clear plastic, 4 oz (18)</li> <li><input type="checkbox"/> Magnifiers, handheld, plastic (24)</li> <li><input type="checkbox"/> Measuring cup (1)</li> <li><input type="checkbox"/> Measuring spoon, 1 tbsp (1)</li> <li><input type="checkbox"/> Spoon, long, or stirring rod (1)</li> <li><input type="checkbox"/> Sugar, granulated, white (<math>1\frac{1}{2}</math> cups)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tape, masking (partial roll)</li> <li><input type="checkbox"/> Water (12 fl oz)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Honey samples from Lesson 5 (6)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Disassemble the prepared cornmeal, sugar solution, and honey samples. Save all the jars with lids for use in Lesson 33.</li> <li><input type="checkbox"/> Lesson 20 requires the handheld magnifiers.</li> <li><input type="checkbox"/> Lesson 22 requires the prepared beeswax samples.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 15 Resource A: Materials in Honey Bee Nests Observation Setup Instructions</li> <li><input type="checkbox"/> Lesson 15 Resource B: Conceptual Checkpoint </li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare the materials for honey bee nests observation. (See Lesson 15 Resource A.)</li> <li><input type="checkbox"/> Prepare a copy of Lesson 15 Resource B for each student.</li> </ul>


## Lesson 16

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Binder rings, 1" (24)</li> <li><input type="checkbox"/> Knowledge Deck™ cards, Honey Bees (24)</li> <li><input type="checkbox"/> Knowledge Deck poster, Honey Bees (1)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 22 requires the Honey Bees Knowledge Deck cards and poster.</li> </ul>
<p><b>Resources</b></p>	<p>None</p>
<p><b>Preparation</b></p> 	<p>None</p> <p><b>Advance Preparation for Lessons 17 and 18</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Plan to complete Lessons 17 and 18 on consecutive days.</li> <li><input type="checkbox"/> Lesson 17 requires access to hot water (100°F to 105°F).</li> <li><input type="checkbox"/> Consider arranging for an adult to help during the investigation.</li> <li><input type="checkbox"/> Make or obtain ice cubes.</li> </ul>


## Lesson 17

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bags, resealable plastic, 1 qt (30)</li> <li><input type="checkbox"/> Binder clips, medium (30)</li> <li><input type="checkbox"/> Bins with lids, clear plastic, 6 qt (6)</li> <li><input type="checkbox"/> Bucket, plastic, 10 qt (1)</li> <li><input type="checkbox"/> Knife (1)</li> <li><input type="checkbox"/> Marbles (30)</li> <li><input type="checkbox"/> Measuring cup, 1 L (1)</li> <li><input type="checkbox"/> Rubber stoppers (6, if needed)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Teaspoons, plastic, white (6)</li> <li><input type="checkbox"/> Thermometer, indoor-outdoor (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Beaker, 1 L (1, optional)</li> <li><input type="checkbox"/> Butter, solid (6 tbsp)</li> <li><input type="checkbox"/> Cooler bag, insulated, or freezer (1)</li> <li><input type="checkbox"/> Gloves, heat-resistant (1 pair, optional)</li> <li><input type="checkbox"/> Hot plate (1, optional)</li> <li><input type="checkbox"/> Ice cubes (6)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Tape, packing, clear, 2" wide (partial roll) or laminating machine (access)</li> <li><input type="checkbox"/> Water, hot (100°F to 105°F) (access)</li> <li><input type="checkbox"/> White chocolate chips (48)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 18 requires the prepared color band thermometer and prepared heating investigation materials.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 17 Resource A: Niagara Falls Photographs </li> <li><input type="checkbox"/> Lesson 17 Resource B: Color Band Thermometer Preparation Instructions</li> <li><input type="checkbox"/> Lesson 17 Resource C: Heating Investigation Station Setup Instructions</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Plan to complete Lessons 17 and 18 on consecutive days.</li> <li><input type="checkbox"/> Prepare color band thermometer. (See Lesson 17 Resource B.)</li> <li><input type="checkbox"/> Prepare heating investigation stations. (See Lesson 17 Resource C.)</li> <li><input type="checkbox"/> If using a hot plate to heat the water for the heating investigation, turn the hot plate to its highest setting. In a beaker, heat 1 L of water to boiling. While the water heats, fill the 10-qt bucket half full with tap water, and then use heat-resistant gloves to pour the boiling water into the bucket. Continue adding boiling water, 1 L at a time, until the water temperature reaches 100°F to 105°F.</li> </ul>

## Lesson 18

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Paper towels (30 sheets)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Color band thermometer from Lesson 17 (1)</li> <li><input type="checkbox"/> Heating investigation materials from Lesson 17</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 19 requires the prepared color band thermometer.</li> </ul>
<b>Resources</b>	None
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Plan to complete Lessons 17 and 18 on consecutive days.</li> <li><input type="checkbox"/> Cue melting plastic spoon video (<a href="http://phdsci.link/1578">http://phdsci.link/1578</a>) and molten glass video (<a href="http://phdsci.link/1579">http://phdsci.link/1579</a>). </li> </ul>

## Lesson 19

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Sentence strips (3)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pencils, blue, green, orange, purple, red, yellow (6 sets)</li> <li><input type="checkbox"/> Scissors (1)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Color band thermometer from Lesson 17 (1)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 20 requires the prepared color band thermometer.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 19 Resource: Reversible Change Model Cards</li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue melting icicles video (<a href="http://phdsci.link/1580">http://phdsci.link/1580</a>) and blowtorching log video (<a href="http://phdsci.link/1581">http://phdsci.link/1581</a>). </li> <li><input type="checkbox"/> Prepare a set of reversible change model cards (6 arrows and 6 color photographs) for each group. (See Lesson 19 Resource.)</li> </ul> <p><b>Advance Preparation for Lessons 20 and 21</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Plan to complete Lessons 20 and 21 on consecutive days.</li> <li><input type="checkbox"/> 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.</li> </ul>

## Lesson 20




<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bags, resealable plastic, 1 qt (12)</li> <li><input type="checkbox"/> Gloves, disposable (24 pairs)</li> <li><input type="checkbox"/> Magnifiers, handheld, plastic (24)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bread slices, white sandwich (16)</li> <li><input type="checkbox"/> Toaster (1)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Color band thermometer from Lesson 17 (1)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 21 requires the handheld magnifiers and toasted bread slices.</li> </ul>
<b>Resources</b>	None
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Plan to complete Lessons 20 and 21 on consecutive days.</li> <li><input type="checkbox"/> Cue the bread toasting video (<a href="http://phdsci.link/2375">http://phdsci.link/2375</a>).</li> </ul>

## Lesson 21

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Magnifiers, handheld, plastic (24)</li> <li><input type="checkbox"/> Sentence strip (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pencils, at least 8 colors (12 sets)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Toasted bread slices from Lesson 20 (16)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 33 requires the handheld magnifiers.</li> </ul>
<b>Resources</b>	None
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Plan to complete Lessons 20 and 21 on consecutive days.</li> </ul>



## Lesson 22

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Beeswax pellets, yellow (12 tbsp)</li> <li><input type="checkbox"/> Jars with lids, clear plastic, 4 oz (6)</li> <li><input type="checkbox"/> Knowledge Deck cards, Honey Bees (24)</li> <li><input type="checkbox"/> Knowledge Deck poster, Honey Bees (1)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Beeswax samples from Lesson 15 (6)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 26 requires the Honey Bees Knowledge Deck cards and poster.</li> <li><input type="checkbox"/> Lesson 33 requires the prepared beeswax samples.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 22 Resource: Conceptual Checkpoint </li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare a copy of Lesson 22 Resource for each student.</li> <li><input type="checkbox"/> Prepare a beeswax sample for each student pair. Reuse the beeswax samples from Lesson 15. To prepare additional samples, add 2 tbsp beeswax pellets to each empty plastic jar and seal the jars tightly. After the lesson, save the beeswax samples for use during the End-of-Module Assessment.</li> <li><input type="checkbox"/> Cue beeswax melting video (<a href="http://phdsci.link/1582">http://phdsci.link/1582</a>). </li> <li><input type="checkbox"/> Cue dog playing in mud video (<a href="http://phdsci.link/1583">http://phdsci.link/1583</a>). </li> </ul>


## Lesson 23

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


## Lesson 24

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aluminum foil, 3" × 3" (6)</li> <li><input type="checkbox"/> Cardboard or chipboard, 3" × 3" (6)</li> <li><input type="checkbox"/> Chalk, white (2 sticks)</li> <li><input type="checkbox"/> Plastic wrap, 3" × 3" (6)</li> <li><input type="checkbox"/> Sentence strips (2)</li> <li><input type="checkbox"/> Wax paper, 3" × 3" (6)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Crayons, dark colored (2)</li> <li><input type="checkbox"/> Markers, 2 different colors (1 of each)</li> <li><input type="checkbox"/> Paper, printer, 8.5" × 11" (4 sheets)</li> <li><input type="checkbox"/> Pencils (2)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Tape, masking (partial roll, optional)</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 24 Resource: Writing Tool Investigation Setup Instructions and Sample Results</li> <li><input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i> (Biebow and Salerno 2019)</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare materials for writing tool investigation. (See Lesson 24 Resource.)</li> </ul>


## Lesson 25

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <p>None</p>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> <li><input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i> (Biebow and Salerno 2019)</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue video of flamingo building a nest (<a href="http://phdsci.link/1590">http://phdsci.link/1590</a>). </li> </ul>

## Lesson 26

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Knowledge Deck cards, Honey Bees (24)</li> <li><input type="checkbox"/> Knowledge Deck poster, Honey Bees (1)</li> <li><input type="checkbox"/> Twigs, 3" to 6" (24)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 29 requires the twigs.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 26 Resource: Conceptual Checkpoint </li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare a copy of Lesson 26 Resource for each student.</li> </ul>

## Lesson 27

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <p>None</p>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 27 Resource: Engineering Design Process Visual </li> <li><input type="checkbox"/> <i>A Nest Is Noisy</i> (Aston and Long 2015)</li> <li><input type="checkbox"/> <i>The Crayon Man: The True Story of the Invention of Crayola Crayons</i> (Biebow and Salerno 2019)</li> </ul>
<b>Preparation</b>	<p>None</p>

## Lesson 28

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aluminum foil, 3" × 5" (6)</li> <li><input type="checkbox"/> Cheesecloth, 3" × 5" (6)</li> <li><input type="checkbox"/> Craft sticks, jumbo (30)</li> <li><input type="checkbox"/> Plastic wrap, 3" × 5" (6)</li> <li><input type="checkbox"/> Spray bottles, 16 oz (4)</li> <li><input type="checkbox"/> Trays, plastic or metal (12–18)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Construction paper, blue, brown, or purple, 9" × 12" (19 sheets)</li> <li><input type="checkbox"/> Index cards, 3" × 5" (6)</li> <li><input type="checkbox"/> Leaves, 3" × 5" (6)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Water (access)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 30 requires a spray bottle filled with water and the construction paper squares drawn on by students.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 27 Resource: Engineering Design Process Visual</li> <li><input type="checkbox"/> Lesson 28 Resource A: Engineering Challenge Rubric</li> <li><input type="checkbox"/> Lesson 28 Resource B: Materials Test Sample Results</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare construction paper squares. Cut construction paper into 2" squares so each student receives one square.</li> <li><input type="checkbox"/> Prepare materials for the materials test. Cut cheesecloth or cotton cloth, aluminum foil, leaves, and plastic wrap into 3" × 5" pieces. 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.</li> </ul>


## Lesson 29

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aluminum foil (remaining roll)</li> <li><input type="checkbox"/> Blocks, foam (60)</li> <li><input type="checkbox"/> Building blocks, plastic, blue, green, red (40 each color)</li> <li><input type="checkbox"/> Cheesecloth (3 sq ft)</li> <li><input type="checkbox"/> Chenille stems (120)</li> <li><input type="checkbox"/> Clay, modeling, nonhardening, gray (10 oz)</li> <li><input type="checkbox"/> Coffee stirrers, wooden (120)</li> <li><input type="checkbox"/> Cotton balls (120)</li> <li><input type="checkbox"/> Cotton swabs (120)</li> <li><input type="checkbox"/> Craft sticks, jumbo (60)</li> <li><input type="checkbox"/> Moss, Spanish (remaining)</li> <li><input type="checkbox"/> Paper bags (12)</li> <li><input type="checkbox"/> Plastic wrap (remaining roll)</li> <li><input type="checkbox"/> Straws, plastic (60)</li> <li><input type="checkbox"/> Toothpicks (120)</li> <li><input type="checkbox"/> Twigs, 3" to 6" (remaining)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Index cards (60)</li> <li><input type="checkbox"/> Paper clips (60)</li> <li><input type="checkbox"/> Paper, printer, 8.5" × 11" (12 sheets)</li> <li><input type="checkbox"/> Paper towels (partial roll)</li> <li><input type="checkbox"/> Scissors, blunt tip (6)</li> <li><input type="checkbox"/> Tape, masking, 12" long strip (at least 6)</li> <li><input type="checkbox"/> Various natural resources (e.g., bark, leaves from trees) (6 sets)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 30 requires the prepared Engineering Challenge materials.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 27 Resource: Engineering Design Process Visual</li> <li><input type="checkbox"/> Lesson 28 Resource A: Engineering Challenge Rubric</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare the Engineering Challenge materials, and place them at the front of the classroom.</li> </ul>

## Lesson 30

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Spray bottle filled with water, 16 oz (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Construction paper, blue, brown, or purple, 9" x 12" (6 sheets)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Construction paper squares drawn on by students from Lesson 28</li> <li><input type="checkbox"/> Engineering Challenge materials from Lesson 29</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 33 requires one 5" x 36" piece of cheesecloth (or twelve 3" x 5" pieces) and 6 ounces of the modeling clay.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 27 Resource: Engineering Design Process Visual</li> <li><input type="checkbox"/> Lesson 28 Resource A: Engineering Challenge Rubric</li> <li><input type="checkbox"/> Lesson 30 Resource: Shelter Test Procedure</li> </ul>
<b>Preparation</b>	None

## Lesson 31

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Whiteboards, personal (6, optional)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 27 Resource: Engineering Design Process Visual </li> <li><input type="checkbox"/> Lesson 28 Resource A: Engineering Challenge Rubric</li> </ul>
<b>Preparation</b>	None

## Lesson 32

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 32 Resource: Key Term Cards</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare key term cards. (See Lesson 32 Resource.)</li> </ul>

## Lesson 33

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Clay, modeling, nonhardening, gray (6 oz)</li> <li><input type="checkbox"/> Craft sticks, jumbo (12)</li> <li><input type="checkbox"/> Jars with lids, clear plastic, 4 oz (12)</li> <li><input type="checkbox"/> Magnifiers, handheld, plastic (24)</li> <li><input type="checkbox"/> <i>Little Dancer Aged Fourteen</i> Knowledge Deck cards (24)</li> <li><input type="checkbox"/> <i>Little Dancer Aged Fourteen</i> Knowledge Deck poster (1)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Paper clips, metal (12)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Tape, masking (partial roll)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Beeswax samples from Lesson 22 (12)</li> <li><input type="checkbox"/> Cheesecloth strip (1) or pieces (12) from Lesson 30</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 33 Resource A: Edgar Degas Background Information</li> <li><input type="checkbox"/> Lesson 33 Resource B: End-of-Module Assessment Setup Instructions</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare materials for End-of-Module Assessment. (See Lesson 33 Resource B.)</li> <li><input type="checkbox"/> Prepare to distribute a copy of the End-of-Module Assessment to each student.</li> </ul>

## Lesson 34

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 34 Resource: Recurring Themes and Concepts Cards</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Score End-of-Module Assessment and write individual feedback.</li> <li><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.</li> <li><input type="checkbox"/> Prepare Energy and Matter card and Stability and Change card. (See Lesson 34 Resource.)</li> <li><input type="checkbox"/> Select student work products that show evidence of links between phenomena, ideas, concepts, and practices in science and engineering, 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.</li> </ul>

## Weather Events | Advance Preparation




Activities in these lessons requires advance preparation. 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
5	1 day†	Thermometer Setup	Prepare student thermometers.
9	1 day†	Wind Models	Prepare wind models. (See Lesson 9 Resource B.)




# Weather Events | Lesson Preparation


## Lesson 1

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Map of the United States (1)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 6 requires the map of the United States.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource A: St. John's Church Photographs </li> <li><input type="checkbox"/> Lesson 1 Resource B: National Public Radio Broadcast Excerpt (Burnett 2017) </li> <li><input type="checkbox"/> Lesson 1 Resource C: Galveston Before and After the Storm Photographs </li> </ul>
<b>Preparation</b>	None


## Lesson 2

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <p>None</p>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource B: National Public Radio Broadcast Excerpt</li> <li><input type="checkbox"/> Lesson 1 Resource C: Galveston Before and After the Storm Photographs </li> </ul>
<b>Preparation</b>	None


## Lesson 3

<b>Materials</b>	<b>Kit Items</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cardboard 6" × 6" (12)</li> <li><input type="checkbox"/> Clothespins (12)</li> <li><input type="checkbox"/> Flagging tape, 1" wide (9 ft)</li> <li><input type="checkbox"/> Rulers (12)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <b>School-Supplied Items</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> </ul> <b>Item Reuse</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 5 requires the prepared wind observation tools.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 3 Resource A: Cloud Cover Cards</li> <li><input type="checkbox"/> Lesson 3 Resource B: Wind Observation Setup Instructions</li> <li><input type="checkbox"/> Lesson 3 Resource C: Weather in Galveston Photograph </li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare cloud cover cards. (See Lesson 3 Resource A.)</li> <li><input type="checkbox"/> Prepare wind observation tools and cardboard sheets. (See Lesson 3 Resource B.)</li> </ul>




## Lesson 4

<b>Materials</b>	<b>Kit Items</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bottle, clear plastic, 2 L (1)</li> <li><input type="checkbox"/> Bottles, clear plastic, 16.9 oz (6)</li> <li><input type="checkbox"/> Gravel (2½ cups)</li> <li><input type="checkbox"/> Rubber bands (14)</li> <li><input type="checkbox"/> Rulers (7)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <b>School-Supplied Items</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Marker, permanent (1)</li> <li><input type="checkbox"/> Paper clips (16)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Water (access)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 4 Resource A: Rainstorm Photograph </li> <li><input type="checkbox"/> Lesson 4 Resource B: Class Rain Gauge Setup Instructions</li> <li><input type="checkbox"/> Lesson 4 Resource C: Rain Gauge Station Setup Instructions</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare class rain gauge. (See Lesson 4 Resource B.)</li> <li><input type="checkbox"/> Prepare rain gauge stations. (See Lesson 4 Resource C.)</li> </ul>




## Lesson 5

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Thermometers, Fahrenheit, plastic-backed (12)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Stapler (1)</li> <li><input type="checkbox"/> Tape, packing, clear, 2" wide (1 roll) or laminating machine (access)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Wind observation tools from Lesson 3 (12)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 5 Resource A: Thermometer Setup Instructions</li> <li><input type="checkbox"/> Lesson 5 Resource B: Weather Conditions from Hurricane Ike Photograph </li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare Thermometers. (See Lesson 5 Resource A.)</li> </ul>




## Lesson 6

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Map of the United States (1)</li> <li><input type="checkbox"/> Rulers (24)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 7 requires the rulers.</li> <li><input type="checkbox"/> Lesson 9 requires the map of the United States.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 6 Resource A: Amarillo, Texas, January 2017 Weather Calendar </li> <li><input type="checkbox"/> Lesson 6 Resource B: Amarillo, Texas, 2018–2020 Weather Calendars</li> <li><input type="checkbox"/> Lesson 6 Resource C: Amarillo, Texas, Temperature Summary Table </li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare to distribute Amarillo, Texas, 2018–2020 weather calendars. (See Lesson 6 Resource B.)</li> <li><input type="checkbox"/> (Optional) Use local temperature and precipitation data from the NOAA NCEI Climate at a Glance website (<a href="http://phdsci.link/1168">http://phdsci.link/1168</a>) to create weather calendars for students to analyze. If using local data, allow additional time to prepare calendars. </li> </ul>




## Lesson 7

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Rulers (24)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 6 Resource A: Amarillo, Texas, January 2017 Weather Calendar </li> <li><input type="checkbox"/> Lesson 6 Resource B: Amarillo, Texas, 2018–2020 Weather Calendars</li> <li><input type="checkbox"/> Lesson 7 Resource: Amarillo, Texas, 2017 Precipitation Graph </li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare to distribute Amarillo, Texas, 2018–2020 weather calendars. (See Lesson 6 Resource B.)</li> <li><input type="checkbox"/> (Optional) Use local temperature and precipitation data from the NOAA NCEI Climate at a Glance website (<a href="http://phdsci.link/1168">http://phdsci.link/1168</a>) to create weather calendars for students to analyze. If using local data, allow additional time to prepare calendars. </li> </ul>



## Lesson 8

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Computers or tablets with internet access (6)</li> <li><input type="checkbox"/> Scissors (1)</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource B: National Public Radio Broadcast Excerpt</li> <li><input type="checkbox"/> Lesson 8 Resource A: Galveston Jetty Photographs </li> <li><input type="checkbox"/> Lesson 8 Resource B: Storm Photographs </li> <li><input type="checkbox"/> Lesson 8 Resource C: Severe Weather Cards</li> </ul>
<p><b>Preparation</b></p> 	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare three hurricane stations and three tornado stations. Prepare three sets each of the hurricane and tornado cards from Lesson 8 Resource C. Place one set of hurricane cards at each hurricane station. Place one set of tornado cards at each tornado station. Cue the hurricane video (<a href="http://phdsci.link/2363">http://phdsci.link/2363</a>) and the tornado video (<a href="http://phdsci.link/2370">http://phdsci.link/2370</a>) at the appropriate stations.</li> </ul> <p><b>Advance Preparation for Lesson 9</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare wind models. (See Lesson 9 Resource B.)</li> </ul>


## Lesson 9

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Balloon pumps, handheld (6)</li> <li><input type="checkbox"/> Bins, clear plastic, 6 qt (6)</li> <li><input type="checkbox"/> Bucket, plastic, 10 qt (1)</li> <li><input type="checkbox"/> Gravel (4½ cups)</li> <li><input type="checkbox"/> Map of the United States (1)</li> <li><input type="checkbox"/> Paintbrush, medium (1)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Sand (4½ cups)</li> <li><input type="checkbox"/> Shower caps, clear plastic (6)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Drill with <math>\frac{3}{8}</math>" bit (1)</li> <li><input type="checkbox"/> Pencils, brown, gray (24 of each color)</li> <li><input type="checkbox"/> Scissors (1)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 10 requires the prepared bins with sand and gravel mixture, map of the United States, paintbrush, and colored pencils.</li> </ul>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 9 Resource A: Storm Damage Photographs </li> <li><input type="checkbox"/> Lesson 9 Resource B: Wind Model Setup Instructions</li> <li><input type="checkbox"/> Lesson 9 Resource C: Wind Investigation Procedure Sheet</li> </ul>
<p><b>Preparation</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue the Hurricane Sandy Weather Conditions video (<a href="http://phdsci.link/2364">http://phdsci.link/2364</a>). </li> <li><input type="checkbox"/> Cue the Hurricane Sandy Damage video (<a href="http://phdsci.link/2365">http://phdsci.link/2365</a>). </li> <li><input type="checkbox"/> Prepare wind models. (See Lesson 9 Resource B.)</li> <li><input type="checkbox"/> Prepare wind investigation procedure sheet for each group. (See Lesson 9 Resource C.)</li> </ul>





## Lesson 10

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cups, paper, 8 oz (13)</li> <li><input type="checkbox"/> Map of the United States (1)</li> <li><input type="checkbox"/> Paintbrush, medium (1)</li> <li><input type="checkbox"/> Rubber stoppers (6)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> </ul> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pencil (1)</li> <li><input type="checkbox"/> Pencils, brown, gray (24 of each color)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Water (access)</li> </ul> <p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bins with sand and gravel mixture from Lesson 9 (6)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 11 requires the map of the United States.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 9 Resource A: Storm Damage Photographs </li> <li><input type="checkbox"/> Lesson 10 Resource A: Rain Model Setup Instructions</li> <li><input type="checkbox"/> Lesson 10 Resource B: Water Investigation Procedure Sheet</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue the Hurricane Sandy Damage video (<a href="http://phdsci.link/2365">http://phdsci.link/2365</a>). </li> <li><input type="checkbox"/> Prepare rain models. (See Lesson 10 Resource A.)</li> <li><input type="checkbox"/> Prepare water investigation procedure sheet for each group. (See Lesson 10 Resource B.)</li> </ul>






## Lesson 11

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Map of the United States (1)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 12 requires the map of the United States.</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource B: National Public Radio Broadcast Excerpt</li> <li><input type="checkbox"/> Lesson 11 Resource A: Hurricane Landfall Map, 1900–2010 </li> <li><input type="checkbox"/> Lesson 11 Resource B: Hurricane Graph</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare to distribute a copy of Lesson 11 Resource B to each student.</li> </ul>



## Lesson 12

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Map of the United States (1)</li> </ul> <p><b>School-Supplied Items</b></p> <p>None</p>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 12 Resource A: Galveston Seawall Photograph </li> <li><input type="checkbox"/> Lesson 12 Resource B: Modern Seawall Photograph </li> <li><input type="checkbox"/> Lesson 12 Resource C: Weather Maps </li> <li><input type="checkbox"/> Lesson 12 Resource D: Weather Satellite Image </li> </ul>
<b>Preparation</b>	None

## Lesson 13

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 13 Resource A: Key Term Cards</li> <li><input type="checkbox"/> Lesson 13 Resource B: Flash Flood Photograph </li> <li><input type="checkbox"/> Lesson 13 Resource C: Texas Flash Flood Map </li> <li><input type="checkbox"/> End-of-Spotlight Assessment Rubric </li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare key term cards. (See Lesson 13 Resource A.)</li> <li><input type="checkbox"/> Cue heavy wind and rain video (<a href="http://phdsci.link/2448">http://phdsci.link/2448</a>). </li> <li><input type="checkbox"/> Cue flash flood video (<a href="http://phdsci.link/2449">http://phdsci.link/2449</a>). </li> <li><input type="checkbox"/> Prepare to distribute a copy of the End-of-Spotlight Assessment to each student.</li> </ul>

## Lesson 14

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p> <p><b>School-Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scissors (1)</li> </ul>
<b>Resources</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 13 Resource B: Flash Flood Photograph </li> <li><input type="checkbox"/> Lesson 14 Resource: Recurring Themes and Concepts Cards</li> </ul>
<b>Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cue flash flood video (<a href="http://phdsci.link/2449">http://phdsci.link/2449</a>). </li> <li><input type="checkbox"/> Score End-of-Spotlight Assessment and write individual feedback.</li> <li><input type="checkbox"/> Select at least one End-of-Spotlight Assessment item for the class to debrief, and prepare a sample response for that item to share with students.</li> <li><input type="checkbox"/> Prepare Recurring Themes and Concepts cards. (See Lesson 14 Resource.)</li> </ul>

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## Matter | 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.]

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## Weather Events | Works Cited

Burnett, John. 2017. “The Tempest at Galveston: ‘We Knew There Was a Storm Coming, But We Had No Idea.’” November 30, 2017. National Public Radio, History, recording, 7:02. <https://www.npr.org/2017/11/30/566950355/the-tempest-atgalveston-we-knewthere-was-a-stormcoming-but-we-had-no-idea>. [All references to “The Tempest at Galveston: ‘We Knew There Was a Storm Coming, But We Had No Idea’” are from this source.]