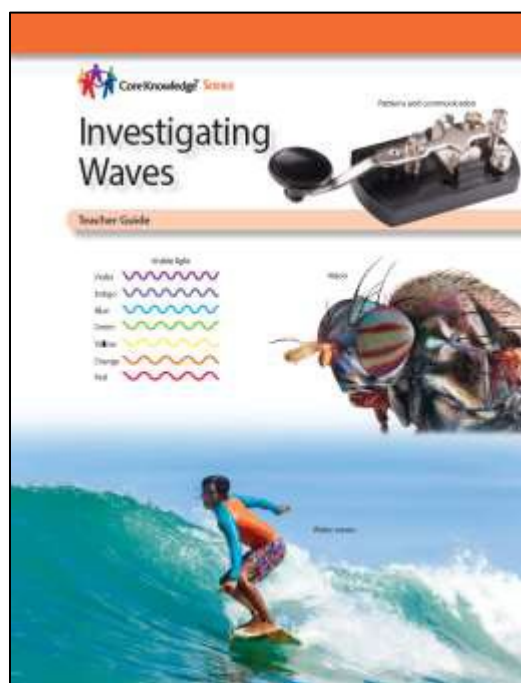


## Investigating Waves

Click on each Lesson to access its online resources. Page numbers refer to pages in the Teacher Guide. Some links provide access to files created by the Core Knowledge Foundation, including PDF documents that you can download and view with the appropriate software (such as [Adobe Reader](#)).

	<a href="#">About This Unit</a>
Part A	<a href="#">Lesson 1</a>
	<a href="#">Lesson 2</a>
	<a href="#">Lesson 3</a>
Part B	<a href="#">Lesson 4</a>
	<a href="#">Lesson 5</a>
	<a href="#">Lesson 6</a>
	<a href="#">Lesson 7</a>
Part C	<a href="#">Lesson 8</a>
	<a href="#">Lesson 9</a>
	<a href="#">Lesson 10</a>
	<a href="#">Lesson 11</a>
Part D	<a href="#">Lesson 12</a>
	<a href="#">Lesson 13</a>
	<a href="#">Lesson 14</a>
Unit Review & Assessment	<a href="#">UR Lesson</a>
	<a href="#">Culminating Assessment</a>
	<a href="#">Teacher Resources</a>



Extend and customize this unit for your students using the [CKSci Additional Activities](#)



## Online Resources

### About This Unit

Page	Resource Links
1	<p>Note to Teachers and Curriculum Planners:</p> <ul style="list-style-type: none"><li>The learning progressions of Disciplinary Core Ideas <a href="#">PS4.A Wave Properties</a>, <a href="#">PS4.C Information Technologies and Instrumentation</a>, and <a href="#">ETS1.C Optimizing the Design Solution</a> offer guidance regarding the scope and sequence of learning about properties of waves in the elementary grades and beyond.</li><li>Learn more about these core ideas and their related content by reading the corresponding section of <i>A Framework for K-12 Science Education</i>: <a href="#">pg. 130-133</a>.</li></ul> <p>See also the <a href="#">Teachers Resources</a> section of this guide.</p>
2	<p>Notes to Core Knowledge Teachers:</p> <p><b>2019 Core Knowledge Science Sequence for this unit:</b></p> <p>Domain—<a href="#">Investigating Waves</a></p> <p><b>CKSci correlations to the 2010 Core Knowledge Sequence—</b></p> <ul style="list-style-type: none"><li><a href="#">GRADE 3</a></li><li><a href="#">GRADE 4</a></li><li><a href="#">GRADE 5</a></li><li><a href="#">Interactive graphic of these correlations</a></li></ul>
3	<p>This unit has been informed by the following Next Generation Science Standards (NGSS) Performance Expectations:</p> <p>Topic—<a href="#">4. Waves</a></p> <ul style="list-style-type: none"><li><a href="#">4-PS4-1</a></li><li><a href="#">4-PS4-3*</a></li><li><a href="#">4-PS3-4*</a></li></ul> <p><i>* Expectations that integrate engineering design practices and knowledge are note above with an asterisk.</i></p>
9	<a href="#">Resources for Effective and Safe Classroom Activities</a>
10	<a href="#">Materials Supply List: Grade 4 Unit 2 Investigating Waves</a>
14	<a href="#">Pacing Guides for CKSci Grades 3–5</a>

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## Online Resources

### Part A: Waves Transfer Energy

#### Lesson 1

Page	Resource Links
18	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Crosscutting Concept: <i>Cause and Effect</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 87-89</a></li></ul>
20	[video options] <a href="#">Waves on the surface of water</a>

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## Online Resources

### Lesson 2

Page	Resource Links
24	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Cause and Effect</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 87-89</a></li></ul>
	Science and Engineering Practices: <i>Developing and Using Models</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 56-59</a></li></ul>
25	[video options] <a href="#">The Science of Ocean Waves</a>
26	[video options] <a href="#">Water Droplet Breaking the Surface of Water</a>

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## Online Resources

### Lesson 3

Page	Resource Links
30	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Science and Engineering Practices: <i>Developing and Using Models</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 56-59</a></li></ul>
	Science and Engineering Practices: <i>Scientific Knowledge Is Based on Empirical Evidence</i> <ul style="list-style-type: none"><li><a href="#">Connections to the Nature of Science</a></li></ul>
32	[video options] <a href="#">Wave Machine</a>
34	[video options] <a href="#">Wave Properties</a>

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## Online Resources

### Part B: Sound Waves Transfer Energy Lesson 4

Page	Resource Links
39	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Energy and Matter</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 94-96</a></li></ul>
41	[video options] <a href="#">Science of Sound Waves</a>

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## Online Resources

### Lesson 5

Page	Resource Links
44	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Energy and Matter</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 94-96</a></li></ul>
46	[video options] <a href="#">Dolphin Sounds Underwater</a> <a href="#">Dolphin Sounds Above Water</a>
47	[video options] <a href="#">Whale Song</a>
48	[video options] <a href="#">The Doppler Effect</a>

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## Online Resources

### Lesson 6

Page	Resource Links
50	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
53	[video options] <a href="#">Tuning Fork in Water</a>
54	[video options] <a href="#">Humpback whale and her calf sing</a>
55	[video options] <a href="#">Sonic Boom from jet</a> <a href="#">Breaking glass with sound</a>
56	<a href="#">Snake hearing</a>
57	[video options] <a href="#">Wire hanger sound experiment</a>

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## Online Resources

### Lesson 7

Page	Resource Links
60	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Science and Engineering Practices: <i>Developing and Using Models</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 56-59</a></li></ul>

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## Online Resources

### Part C: Light Waves Transfer Energy Lesson 8

Page	Resource Links
66	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Science and Engineering Practices: <i>Asking Questions and Defining Problems</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 54-56</a></li></ul>

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## Online Resources

### Lesson 9

Page	Resource Links
72	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Science and Engineering Practices: <i>Developing and Using Models</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 56-59</a></li></ul>
	Science and Engineering Practices: <i>Scientific Knowledge Is Based on Empirical Evidence</i> <ul style="list-style-type: none"><li><a href="#">Connections to the Nature of Science</a></li></ul>
74	[video options] <a href="#">Lighthouse at night</a>
75	[video options] <a href="#">Solar fusion</a>
78	[video options] <a href="#">Phototropism</a>

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# Online Resources

## Lesson 10

Page	Resource Links
81	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Science and Engineering Practices: <i>Developing and Using Models</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 56-59</a></li></ul>
82	[video options] <a href="#">Balloon demonstration</a>
84	[video options] <a href="#">Build a Solar Oven</a>
88	[video options] <a href="#">Energy from the sun</a>

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## Online Resources

### Lesson 11

Page	Resource Links
90	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
93	[image option] <a href="#">Electromagnetic Spectrum</a>

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## Online Resources

### Part D: People Use Waves to Transfer Information Lesson 12

Page	Resource Links
95	Disciplinary Core Idea: PS4.C <i>Information Technologies and Instrumentation</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 136-137</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>

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## Online Resources

### Lesson 13

Page	Resource Links
100	Disciplinary Core Idea: PS4.C <i>Information Technologies and Instrumentation</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 136-137</a></li></ul>
	Disciplinary Core Idea: ETS1.C <i>Information Technologies and Instrumentation</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 208-210</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>
	Science and Engineering Practices: <i>Constructing Explanations and Designing Solutions</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 67-71</a></li></ul>

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## Online Resources

### Lesson 14

Page	Resource Links
106	Disciplinary Core Idea: PS4.A <i>Wave Properties</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">pg. 131-133</a></li></ul>
	Crosscutting Concept: <i>Patterns</i> <ul style="list-style-type: none"><li>From the Framework: <a href="#">Page 85-87</a></li></ul>

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## Online Resources

### Unit Review and Assessment

#### UR Lesson

Page	Resource Links
111	NGSS Performance Expectations addressed by this unit: Topic— <a href="#">4. Waves</a> <ul style="list-style-type: none"><li>• <a href="#">4-PS4-1</a></li><li>• <a href="#">4-PS4-3</a></li></ul>

### Culminating Unit Assessment

Page	Resource Links
148	<a href="#">Unit Assessment Teacher Evaluation Guide</a>

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## Online Resources

### Teacher Resources

Page	Resource Links
9	<a href="#">Resources for Effective and Safe Classroom Activities</a>
10	<a href="#">Materials Supply List: Grade 4 Unit 2 Investigating Waves</a>
156	<a href="#">Activity Pages Answer Key</a>
159	<a href="#">Unit Assessment: Teacher Evaluation Guide</a>
	Safety in the Science Classroom: <ul style="list-style-type: none"><li>• <a href="#">NSTA Safety Resources</a></li><li>• <a href="#">Safety Resources for Elementary Teachers</a> (See also Appendix B below)</li></ul>
	<b>Teacher Guide Appendices:</b> <ul style="list-style-type: none"><li>• <a href="#">Appendix A -- Glossary</a></li><li>• <a href="#">Appendix B -- Classroom Safety for Activities and Demonstrations</a></li><li>• <a href="#">Appendix C -- Strategies for Acquiring Materials</a></li><li>• <a href="#">Appendix D -- Advance Preparation for Activities and Demonstrations</a></li><li>• <a href="#">Appendix E -- What to Do When Activities Don't Give Expected Results</a></li></ul>

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