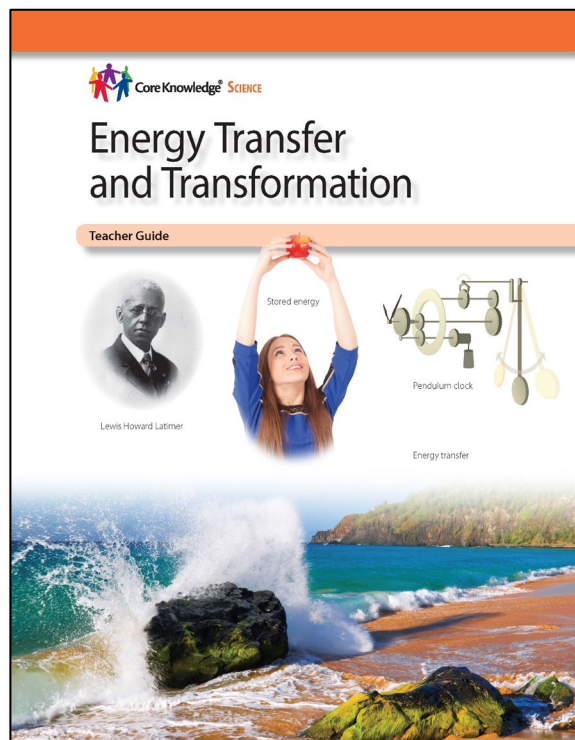


## Energy Transfer and Transformation

Click on each link below to access additional activities to supplement and extend the core lessons of CKSci. Page numbers refer to pages in the Teacher Guide where these activities are best integrated. 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>
<b>Part A</b>	<a href="#">Lesson 1</a>
	<a href="#">Lesson 2</a>
<b>Part B</b>	<a href="#">Lesson 3</a>
	<a href="#">Lesson 4</a>
	<a href="#">Lesson 5</a>
<b>Part C</b>	<a href="#">Lesson 6</a>
	<a href="#">Lesson 7</a>
	<a href="#">Lesson 8</a>
	<a href="#">Lesson 9</a>
<b>Part D</b>	<a href="#">Lesson 10</a>
	<a href="#">Lesson 11</a>
<b>Part E</b>	<a href="#">Lesson 12</a>
	<a href="#">Lesson 13</a>
	<a href="#">Teacher Resources</a>



## About This Unit

Page	Resource Links
13	<p>The <i>Energy Transfer and Transformation</i> unit is one of five science units in the Grade 4 Core Knowledge Curriculum Series™. In the Teacher Guide Introduction, there is a Sample Pacing Guide that provides guidance to select and use the core resources in this unit. This pacing guide suggests you allocate 20 days of instruction to complete the unit. However, there are many options to individualize instruction for your students, based on their interests and needs. Use the blank Pacing Guide to reflect your individualized activity choices and pacing for your class. <b>The Additional Activities found in this document are recommended as extensions to the 20-day set of core lessons.</b> If you plan to create a customized pacing guide for your class, including one or more of these additional activities, we recommend that you preview the entire unit and create your pacing guide before teaching the first lesson. We recommend that you do not exceed 30 instructional days for this unit, so you have instructional time to complete all Grade 4 units.</p>
	<p>[VIDEO – Teacher Background Information]</p> <p><a href="#">Smithsonian Science Education Center // Fired Up about Energy</a></p> <p>7min 14sec</p> <p>This video is a good idea starter to help you think about your students’ background knowledge and ways you might address any misconceptions that should be addressed while meeting the unit’s learning objectives.</p>

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## Part A: Introduction to Energy

### Lessons 1 & 2

Page	Resource Links
22	<p>[VIDEO – Additional Activity and Discussion of Students’ Background Knowledge]  <a href="#">National Geographic – What is Energy?</a>            4min 7sec runtime (½ class session)</p> <p>Start Lesson 1 with an additional activity that asks students to articulate their own definitions of energy before the unit begins. Then, compare their initial definitions to what they have read after Chapter 1 of the Student Reader. The video linked above offers a model for such an extension of Lesson 1. This will also inform extended discussions at the beginning of Lesson 2.</p>
26	<p>[VIDEO – Teacher Background Information]  <a href="#">Misconceptions About Heat</a>            5min 10sec</p> <p>This video may support your knowledge before speaking about heat as a form of energy. You can dig deeper with your students into what is “hot” and what is not.</p> <p>Additional Resources regarding Misconceptions of Heat and Energy, including more activities for formative assessments, can be found at:  <a href="https://beyondpenguins.ehe.osu.edu/issue/keeping-warm/common-misconceptions-about-heat-and-insulation">https://beyondpenguins.ehe.osu.edu/issue/keeping-warm/common-misconceptions-about-heat-and-insulation</a></p>

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## Part B: Energy & Motion

### Lessons 3–5

\*Please note that there are clear connections between this Grade 4 unit and Grade 3 Unit 1 *Investigating Forces*. We recommend that you coordinate with your Grade 3 colleagues who may already use the following Additional Activities and to focus on your grade-specific learning objectives as found in the CKSci Teacher Guide.

Page	Resource Links
30	<p>[Interactive Media]  <a href="#">Forces and Motion Simulation</a> (½ to 1 class session)            Predict and explore the effects of balanced and unbalanced forces on an object’s motion with this interactive. This simulation can support students with background knowledge that is built early in Grade 3.</p>
	<p>[Additional Investigation]  <a href="#">Forces and Motion</a> (2 class sessions)            Vetted by the National Science Teaching Association (NSTA), this investigation plan may help students to explore energy and motion in another context before moving on to Part C of this unit.</p>
34	<p>[Additional Activity and Investigation]  <a href="#">PBS Learning - Spool Racers</a>            (1-2 classroom sessions)            Vetted by the NSTA, this activity can help students to investigate and challenge each other to a “spool race”. After watching the video at the link above, and click on “Support Materials”. This includes printable materials for background reading, handout instructions, as well as discussion questions.</p>

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## Part C: Energy Transfer

### Lessons 6–9

Page	Resource Links
47	<p>[Additional Activity Pages]</p> <p><a href="#">Instructional Master: Sound</a> (½ class session)</p> <p>This activity page helps students to extend their background knowledge and vocabulary about sound and human hearing. This activity page may also be used in conjunction with those found in later units, including Unit 2 <i>Investigating Waves</i> and/or Unit 3 <i>Structures and Functions of Living Things</i>.</p>
50	<p>[Interactive Media]</p> <p><a href="#">Forms of Energy and Change Simulation</a> (½ to 1 class session)</p> <p>The introduction section of this interactive simulation helps students to better visualize, describe, and predict how energy is transferred from a heat source to an object, as well as to its surrounding environment. Take care to adhere to the learning objective of Lesson 7 when using this as a demonstration, focusing on heat:</p> <ul style="list-style-type: none"> <li>Describe evidence that light, heat, and electricity transfer energy from place to place.</li> </ul>

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## Part D: Collisions

### Lessons 10–11

Page	Resource Links
66 & 73	<p>[Interactive Media]</p> <p><a href="#">Collision Lab Simulation</a> (½ class session)</p> <p>The introduction section of this interactive supports Grade 4 students as they study collisions. This simulation is an air hockey table, with the ability to see what might happen if different sizes of pucks are witness and at different strengths of force. At this grade level, we recommend focusing on the broad conceptual understanding that energy is related to speed (i.e., “The faster a given object is moving, the more energy it possesses”, as defined for this grade level by the Framework for K-12 Science Education). Refer to the Note to Teachers and Curriculum Planners in the Teacher Guide for guidance on terms such as velocity and vector.</p>
	<p>[VIDEO + Additional Activity page]</p> <p><a href="#">Ball hitting steel</a> (½ to 1 class session)</p> <p>15sec video runtime</p> <p>This slow motion video can support students as they consider, in more detail, what happens in real time without much thought. When objects move with pace and collide with other objects, strange things start to happen that you may miss, unless you look carefully. Use the below Additional Activity Page to ask students to articulate their thinking about this video and other collisions.</p> <p><a href="#">What Happens When a Bat Hits a Ball?</a></p>

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## Part E: Energy Transformations Lessons 12–13

Page	Resource Links
80 or 86	<p>[Additional Investigation]</p> <p><a href="#">Cooking with the Sun</a> (2-3 classroom sessions)</p> <p>Building solar ovens is a classic way to demonstrate that light transfers energy to objects in its path. Consider starting Part E off with this project before diving into Lesson 12, or use it as a concrete example of light → heat transformations between Lessons 12 and 13.</p> <hr/> <p>[Additional Investigations and Activity Pages]</p> <p><i>Electrical Circuits</i></p> <p>One of the most concrete examples of electrical transformation is the real-world applications of electricity. Consider these time-tested resources and idea to extend Lessons 12 and 13 to include more information about electricity and its applications to solve problems through energy transformation:</p> <ul style="list-style-type: none"> <li>• <a href="#">Build-a-Toy Workshop</a></li> <li>• <a href="#">Electricity Match-Up</a></li> <li>• <a href="#">Conductors vs. Insulators Lab</a></li> </ul>

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## Teacher Resources

Page	Resource Links
	<p>The following instructional masters may help you to further extend the core lessons of CKSci:</p> <ul style="list-style-type: none"> <li>• <a href="#">K-W-L Chart</a></li> <li>• <a href="#">T-Chart</a></li> <li>• <a href="#">T-Chart and Summary</a></li> <li>• <a href="#">Box and T-Chart</a></li> <li>• <a href="#">Venn Diagram</a></li> </ul>
	<p>[Trade Books]</p> <p>The following are optional trade books that can support and extend learning. Each trade book should take no more than 1 to 2 class sessions to read with students and discuss relative to the core learning objectives of this unit.</p> <ul style="list-style-type: none"> <li>• <i>Young Thomas Edison</i> by Michael Dooling ISBN: 099061350X (34 pages)</li> <li>• <i>Electrical Wizard: How Nikola Tesla Lit Up The World</i> by Elizabeth Rusch ISBN: 0763658553 (40 pages)</li> <li>• <i>The Boy Who Invented TV: The Story of Philo Farnsworth</i> by Kathleen Krull ISBN: 0385755570 (40 pages)</li> </ul>

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