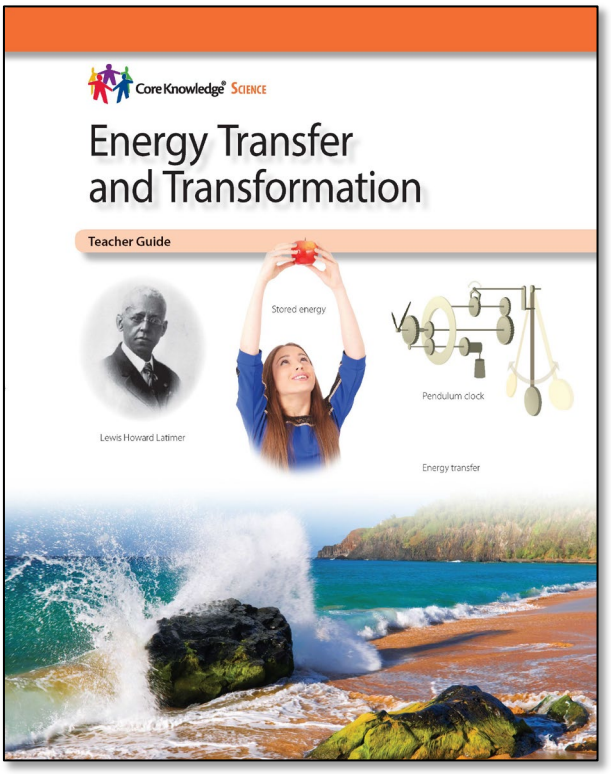
Online Resources

Energy Transfer and Transformation

Click on each section link 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).



Extend and customize this unit for your students using the CKSci Additional Activities

Note: References to the "Framework" in this guide are to the National Research Council's *A Framework for K-12 Science Education*, published by the National Academies of Science.

About This Unit

Page	Resource Links
1	Note to Teachers and Curriculum Planners: • The learning progressions of Disciplinary Core Idea PS3.A *Definitions of Energy* offer guidance regarding the scope and sequence of learning about energy in the elementary grades and beyond. • Learn more about this core idea and its related content by reading the corresponding section of *A Framework for K–12 Science Education*: Bottom of pg. 120–124 See also the Teacher Resources section of this guide.
2	Note to Core Knowledge Teachers: ***2019 Core Knowledge Science Sequence* for this unit:** Domain—Energy Transfer and Transformation **CKSci correlations to the *2010 Core Knowledge Sequence*—** • GRADE 3 • GRADE 4 • GRADE 5
3	This unit has been informed by the following Next Generation Science Standards (NGSS) Performance Expectations: Topic—4. Energy • 4-PS3-1 • 4-PS3-2 • 4-PS3-3 • 4-PS3-4* ** Expectations that integrate engineering design practices and knowledge are noted with an asterisk.* Learn more about the Next Generation Science Standards: Resources to Understand the Three Dimensions of the NGSS
11	Resources for Effective & Safe Classroom Activities
12	Materials Supply List: Grade 4 Unit 1 Energy
14	Pacing Guides for CKSci Grades 3–5

← Table of Contents Lesson 1 →

Part A: Introduction to Energy

Lesson 1

Page	Resource Links
18	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Stability and Change* • From the *Framework*: Middle of pg. 98–101
21	[VIDEO OPTIONS] • Rocket Launch 1 (~1 minute) • Rocket Launch 2 (~40 seconds) • Rocket Launch 3 (~30 seconds)

Lesson 2

Page	Resource Links
23	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Cause and Effect* • From the *Framework*: pg. 86–89

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Part B: Energy and Motion

Lesson 3

Page	Resource Links
31	Disciplinary Core Idea: PS3.B *Conservation of Energy* • From the *Framework*: pg. 124–126
	Disciplinary Core Idea: PS3.C *Relationship between Energy and Forces* • From the *Framework*: Bottom of pg. 126–127
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Also introduced in this lesson: • Science and Engineering Practice (SEP) #2: *Developing and Using Models* Middle of pg. 56–59

Lesson 4

Page	Resource Links
33	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Constructing Explanations and Designing Solutions (SEP #6); From the *Framework* pg. 67-71

Part B: Energy and Motion (continued)

Lesson 5

Page	Resource Links
39	Performance Expectation: 4-PS3-1
	Evidence Statements for 4-PS3-1
	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Science and Engineering Practices • Constructing Explanations and Designing Solutions (SEP #6); From the *Framework* pg. 67-71

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Part C: Energy Transfer

Lesson 6

Page	Resource Links
46	Performance Expectation: 4-PS3-2
	Evidence Statements for 4-PS3-2
	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Constructing Explanations and Designing Solutions (SEP #6); From the *Framework* pg. 67-71

50	[VIDEO OPTIONS]
	• Vocal sounds through a tube causing visible motion of a laser light":
	  ○ "Seeing" Sound 1
	  ○ "Seeing" Sound 2
	• Sound (at specific frequencies) disrupting a stream of water from a hose: Sound and Water
	• "Singing" test tube
	• Breaking a glass with sound
	• [Teacher Reference] Sound breaking glass
	• Acoustic propulsion

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Part C: Energy Transfer (continued)

Lesson 7

Page	Resource Links
51	Performance Expectation: 4-PS3-2
	Evidence Statements for 4-PS3-2
	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Planning and Carrying Out Investigations (SEP #3); From the *Framework* pg. 59-61
55	[VIDEO OPTIONS] • How Power Gets to Your Home • Follow Electricity's Journey

Lesson 8

Page	Resource Links
56	Performance Expectation: 4-PS3-2
	Evidence Statements for 4-PS3-2
	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Planning and Carrying Out Investigations (SEP #3); From the *Framework:* pg. 59-61

Part C: Energy Transfer (continued)

Lesson 9

Page	Resource Links
60	Performance Expectation: 4-PS3-2
	Evidence Statements for 4-PS3-2
	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Planning and Carrying Out Investigations (SEP #3); From the *Framework* pg. 59-61
62	[PHOTO OPTIONS] • Toaster & Toasted Bread • Fireworks [VIDEO OPTION] • Fireworks Display

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Part D: Collisions

Lesson 10

Page	Resource Links
65	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Disciplinary Core Idea: PS3.B *Conservation of Energy* • From the *Framework*: pg. 124–126
	Disciplinary Core Idea: PS3.C *Relationship between Energy and Forces* • From the *Framework*: Bottom of pg. 126–127
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Asking Questions and Defining Problems (SEP #1); From the *Framework* pg. 54-56

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Part D: Collisions (continued)

Lesson 11

Page	Resource Links
72	Performance Expectation: 4-PS3-3
	Evidence Statements for 4-PS3-3
	Disciplinary Core Idea: PS3.A *Definitions of Energy* • From the *Framework*: Bottom of pg. 120–124
	Disciplinary Core Idea: PS3.B *Conservation of Energy* • From the *Framework*: pg. 124–126
	Disciplinary Core Idea: PS3.C *Relationship between Energy and Forces* • From the *Framework*: Bottom of pg. 126–127
	Crosscutting Concept: *Cause and Effect* • From the *Framework*: Bottom of pg. 87–89
73	[VIDEO OPTIONS] • Newton's Cradle • Giant Newton's Cradle • [Teacher Reference] Coupled Pendulum

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Part E: Energy Transformation & Engineering

Lesson 12

Page	Resource Links
79	Disciplinary Core Ideas: • PS3.B *Conservation of Energy* From the *Framework*: pg. 124–126 • PS3.D *Energy in Chemical Processes and Everyday Life*—From the *Framework*: pg. 128–130 • ETS1.A *Defining Engineering Problems* From the *Framework:* Bottom of pg. 204-206
	Science and Engineering Practices • Constructing Explanations and Designing Solutions (SEP #6); From the *Framework* pg. 67-71
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96

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Part E: Energy Transformation & Engineering (continued)

Lesson 13

Page	Resource Links
85	Performance Expectation: 4-PS3-4
	Evidence Statements for 4-PS3-4
	Disciplinary Core Idea ETS1 (A, B, and C) • From the *Framework:* Bottom of pg. 204-210
	Crosscutting Concept: *Energy and Matter* • From the *Framework*: Bottom of pg. 94–96
	Science and Engineering Practices • Constructing Explanations and Designing Solutions (SEP #6); From the *Framework* pg. 67-71
	[Teacher Reference] • Amazing Rube Goldberg Machines

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Unit Review and Assessment

UR Lesson

Page	Resource Links
94	This unit has been informed by the following NGSS Performance Expectations: Topic—4. Energy • 4-PS3-1 • 4-PS3-2 • 4-PS3-3 • 4-PS3-4* ** Expectations that specifically integrate engineering design practices and knowledge are noted above with an asterisk.*
	Consider supporting your students with a review of select video examples used in Lessons 1–13. *Jump to the Table of Contents*

Culminating Unit Assessment

Page	Resource Links
141	Unit Assessment: Teacher Evaluation Guide

← Table of Contents Teacher Resources →

Teacher Resources

Page	Resource Links
2	***2019 Core Knowledge Science Sequence* for this unit:** Domain—Energy Transfer and Transformation **CKSci correlations to the *2010 Core Knowledge Sequence*—** • GRADE 3 • GRADE 4 • GRADE 5
3	Resources to Understand the Three Dimensions of the Next Generation Science Standards
11	Resources for Effective & Safe Classroom Activities
12	Materials Supply List: Grade 4 Unit 1 Energy
14	Pacing Guides for CKSci Grades 3–5
137	Activity Pages Answer Key
141	Unit Assessment: Teacher Evaluation Guide
145	Additional Support for Safety in the Science Classroom: • NSTA Safety Resources • Safety Resources for Elementary Teachers (see also Appendix B below)
	Teacher Guide Appendices: Appendix A—Unit Glossary Appendix B—Classroom Safety for Activities and Demonstrations Appendix C—Strategies for Acquiring Materials Appendix D—Advance Preparation for Activities and Demonstrations Appendix E—What to Do When Activities Don't Give Expected Results

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