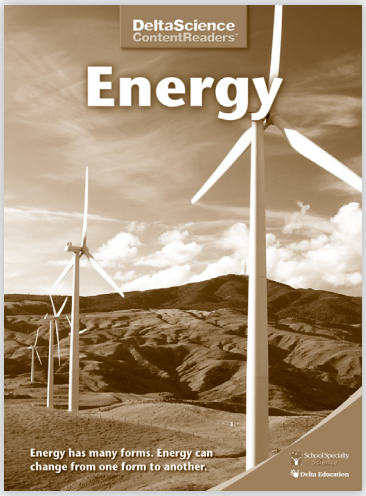


Red Edition
Grade 3–4
reading level

Purple Edition
Grade 4–5
reading level

Objectives

- Define the science meaning of the word *energy*: the ability to make changes occur.
- Compare two main kinds of energy: kinetic and potential.
- Describe six important forms of energy: sound energy, light energy, thermal energy, electric energy, chemical energy, and nuclear energy.
- Explain ways in which energy can move.
- Discuss some changes in energy from one form to another.
- Compare renewable and nonrenewable energy resources.
- List ways to use energy resources wisely.

Reading Comprehension Skills

Preview the Book ◆ How to Read Diagrams

Main Idea and Details ◆ Cause and Effect

Skillbuilders are available for this title.

Supporting English Learners

Use Photographs and Other Visuals Develop background knowledge and support the development of new concepts and science vocabulary by using the photographs and other visuals in *Energy*. Point out and name objects in the photos. Have students repeat after you.

Summary

In the Delta Science Content Reader *Energy*, students learn that the word *energy* has a specific meaning in science. They discover the difference between kinetic energy, or the energy of motion, and potential energy, or the energy an object has because of where it is or what condition it is in. The book introduces six important forms of energy. It also describes how energy changes form, and it compares renewable and nonrenewable energy resources.

Science Background

Energy is the ability to cause change. Energy exists in many forms, such as motion and heat. Energy can be transferred from object to object or from place to place. Energy can travel in different ways, such as in light and sound waves and in electricity. All kinds of motion and changes in matter depend on energy flowing and changing back and forth from one form to another.

Without energy, nothing could ever change. Energy can cause changes in temperature, speed, position, momentum, or pressure. Energy can also cause changes in materials, such as burning wood changing into ashes, smoke, and gases. Here are some other examples of energy:

- A gust of wind has energy because it can move objects or turn the blades of a wind turbine.
- You have energy because you can change the motion of your body.
- Batteries have energy because they can be used in a radio to make sound.
- Gasoline has energy because it can be burned in an engine to move a car.
- A ball at the top of a hill has energy because it can roll down the hill and move objects in its path.

What Is Energy?

(pages 2–7)

Before Reading

Discuss the Cover

Cover Image Discuss the photograph on the cover of *Energy*. Use the information on the inside front cover to support the discussion.

Science Statement Discuss the science statement. Ask: *Do you think wind turbines change energy from one form to another? Why do you think so?*

Build Reading Skills (page 2)

Preview the Book Use Build Reading Skills on page 2 to review how to preview a book. Discuss the steps. Then model previewing the Table of Contents.

> **Think Aloud** *Why are some words in red boldfaced print and others in lighter black print? The words in red must be the main sections. The words in black must be smaller parts of each main idea. Let me check. When I turn to page 3, I see the main section "What Is Energy?" When I turn to page 4, I see the smaller section "Energy and Change." I was right. "Energy and Change" is a smaller section. It tells about a smaller part of the main idea.*

Guide students as they finish previewing *Energy*. Focus on nonfiction text features.

- Prompt them to look at the headings, photographs, captions, and diagrams. Ask questions such as *Why do you think that feature is there? How will it help you understand what you read?*
- Prompt them to look at the bold Vocabulary words. Guide the class in looking up a Vocabulary word in the Glossary.

Students can apply the skill in the Reflect on Reading activity on page 7.

K-W-L Chart Have students begin a K-W-L chart. They should add to it after each section.

What I Know	What I Want to Learn	What I Learned
Food gives us energy to play sports.	Where does energy come from?	

Make a Connection (page 3)

Make a Connection Discuss the Make a Connection questions. Use this discussion to build background and activate prior knowledge about energy.

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a T-chart on the board for examples of *kinetic energy* and *potential energy*. Have students suggest examples as they read.

During Reading

Energy and Change (page 4)

- Ask: *Can you give two examples of changes that require energy?* (change in speed, change in height)
- Discuss the photograph of the foot kicking the ball. Ask: *What change is happening? Why does it happen?* (The ball changes from not moving to moving; energy moves from the foot to the ball.)

✔ **Checkpoint** (Possible answer: A rolling bowling ball transfers some of its energy to the pins and knocks them down.)

Kinetic Energy (page 5)

- Explain that all things, both living and nonliving, are made of matter. Solids, liquids, and gases are the three main states of matter.
- Explain that mass is the amount of matter in an object. The heavier something is, the more matter it has. You can use a balance to compare the mass of two objects.
- Mass is not the same as weight. Weight is the force of gravity pulling on an object. You can use a scale to measure the weight of an object.
- Ask: *What are some objects that have kinetic energy?* (Possible answers: plane flying, child jumping)
- Ask: *Which would hurt more, dropping a rock or a small pebble on your foot? Would a small pebble or a rock have more kinetic energy? Why?* (rock, because it has more mass)

✔ **Checkpoint** (A bird flying has more kinetic energy because it is moving.)

Potential Energy (page 6)

- Ask: *When a rubber band is stretched, does it have potential energy? Why?* (Yes, because if you let it go, it will fly away.)
- Discuss the photograph of the rock on page 6. Ask: *Would the rock have less potential energy if the cliff were lower? If it were a smaller rock? Why?* (Yes, because the rock would not fall as far; yes, because it would have less mass.)

Checkpoint (at the top of the hill, before it starts moving downhill)

After Reading

Reflect on Reading (page 7) Ask: *If I push a book along the table, what change happens? What would cause this change?* (movement, because energy moves from my hand to the book) Have students suggest their own examples.

Apply Science Concepts (page 7) This activity applies a concept from Find Out About on page 3. Help students plan their pictures. Ask: *What kind of energy do you have at the top of the slide, before you start moving?* (potential) *What about when you are moving down the slide?* (some kinetic and some potential)

What Are Some Forms of Energy? (pages 8–15)

Before Reading

Build Reading Skills (page 8)

How to Read Diagrams Use Build Reading Skills on page 8 to review how to read diagrams. Then model reading the diagram on page 10.

> **Think Aloud** *What does this diagram show me? The title tells me that it is about a model of a sound wave. The label and the arrow tell me that the diagram shows how a sound wave travels. The diagram will help me picture what I read.*

Students can apply the skill in the Reflect on Reading Activity on page 15.

Make a Connection (page 9)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about forms of energy. Students may mention thunder, lightning, and electricity. Explain that students will read about sound, light, and electric energy in this section.

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Forms of Energy* in the center. Have students suggest examples as they read.

During Reading

Sound Energy (page 10)

- Point out the photograph of the drum on page 10. Ask: *If no one hits the drum, does it make a sound? Explain.* (No, because it is not vibrating.)
- Have students look again at the diagram on page 10. Point out the title. Explain that models can help them think about objects or processes that are hard to see. For example, a solar system model helps us understand huge objects far away in space.
- Review the tips in Build Reading Skills on page 8. Ask: *Why does the diagram show a spring toy?* (It models how a sound wave moves through air.)

Checkpoint (The string vibrates, pushing on the air around it, creating sound waves.)

Light Energy (page 11)

- Ask: *What happens when light hits a window? Why?* (It keeps moving; light waves can pass through clear glass.)
- Ask: *What happens when light hits a brick building?* (The building blocks the light and a shadow forms on the other side.)

Checkpoint (Light from other sources bounces, or reflects, off them and enters our eyes.)

Thermal Energy (page 12)

- Explain that in science *heat* has a different meaning than in daily life. Heat is the movement of thermal energy from one object to another.
- Discuss the photograph of the pot and the bowl on page 12. Ask: *What made the soup hot?* (energy from the stove) *What happened inside the soup as the temperature rose?* (The particles inside the soup moved faster.)

- Some students may assume that the pot has more thermal energy because there is a heat source underneath it. Explain that the pot has more thermal energy even when the heat source is off because it has more soup in it than the bowl does.

Checkpoint (how fast the particles in the object are moving and the number of particles)

Electric Energy (page 13)

- Have students look at the diagram of the atom on page 13. Review the tips in Build Reading Skills on page 8. *What paragraphs does this diagram support?* (page 13, paragraphs 1–2)
- Discuss the labels for the particles of an atom. Ask: *Which of these have electric charge?* (Protons: positive charge; Electrons: negative charge)
- *What can happen when electrons move from one atom to another?* (Positive and negative charges can get out of balance.)

Checkpoint (from the movement of electrons from one place to another)

Chemical Energy (page 14)

- Ask: *Does fruit in a bowl have energy?* (yes, chemical energy) *How does this energy get released?* (When our bodies break down the food we eat, chemical changes happen that release energy.) Point out that everything we do uses this energy from food—running, playing, even sleeping.
- Ask: *What chemical change happens to gasoline in a car's engine?* (burning, or combustion) *Is energy released when that happens? How do you know?* (Yes, because the car runs.)

Checkpoint (through chemical change, when substances combine and react to make new substances)

Nuclear Energy (page 15)

- Have students go back to the diagram of the atom on page 13. Explain that the nucleus is the center of the atom, where the protons and neutrons are.
- Ask: *What is released during both nuclear fission and nuclear fusion?* (energy)

Checkpoint (Fusion: when the nucleus of one atom joins with the nucleus of another atom; Fission: when a nucleus is split apart)

After Reading

Reflect on Reading (page 15) Have students create visuals to represent Vocabulary words. Distribute six index cards to each student. Have them use the headings on pages 10–15 to write the name of one kind of energy on each card. Have them reread to find the definition of each form of energy. Encourage students to discuss each picture, symbol, or diagram they draw.

Apply Science Concepts (page 15) This activity applies a concept from Find Out About on page 9. Have partners brainstorm as many examples as possible of the six forms of energy.

What Are Some Ways Energy Changes Form? (pages 16–19)

Before Reading

Build Reading Skills (page 16)

Main Idea and Details Use Build Reading Skills on page 16 to review how to identify main idea and details. Read and discuss the tips. Then read aloud the first paragraph on page 18 and model identifying the main idea and details in a paragraph.

> **Think Aloud** *What is the most important idea in this paragraph? I'll reread the first sentence to see if it helps me answer that question: "Energy can change from one form to another." Do the details in this paragraph tell more about this one idea? Yes. For instance, a burning log is an example of a way energy changes form. Examples are details.*

Then read aloud the fourth paragraph on page 18 and guide students to identify main idea and details. Students can apply the skill in the Reflect on Reading activity on page 19.

Make a Connection (page 17)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about ways energy changes form. (Possible answers: to grow, to make food)

Find Out About Read the statement to help students set a reading purpose. Explain that this is the important topic that they will learn about in this section.

During Reading

Changes in Energy (page 18)

- Discuss the photograph of a burning log. Ask: *What does the chemical energy in a burning log change to?* (light and thermal energy)
- Point out the photograph of the hand crank flashlight. Ask: *What changes in energy happen when you use this flashlight?* (Kinetic energy changes to electric energy [crank] and electric energy changes to light energy and thermal energy [bulb].)

Checkpoint (Light energy changes to chemical energy.)

After Reading

Reflect on Reading (page 19) Before students start creating their concept webs, ask: *What main idea should go in the center?* (Energy can change from one form to another.) Then have partners work together to fill in the details on their concept webs. (Possible answers: Photosynthesis changes light energy to chemical energy; fire changes chemical energy in wood to light and thermal energy.)

Apply Science Concepts (page 19) This activity applies a concept from Find Out About on page 17. Discuss students' examples of home objects that change electric energy to another form of energy. (Possible answers: lamp: light; CD player: sound; blender: motion)

What Are Energy Resources? (pages 20–23)

Before Reading

Build Reading Skills (page 20)

Cause and Effect Use Build Reading Skills on page 20 to review cause and effect. Point out the photograph of solar panels on page 22. Read the caption aloud and model identifying cause and effect.

> **Think Aloud** *To identify an effect, I ask,* What happens? *Light energy changes into electric energy. That is an effect. To identify causes, I ask,* Why does this happen? *The solar panels take in sunlight and change the energy from one form to another.*

Students can apply the skill in the Reflect on Reading activity on page 23.

Make a Connection (page 21)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about what energy resources are. Point out that the fuel we use in cars is one example of an energy resource.

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Review that the prefix *non-* means "not" and the prefix *re-* means "again." Start a T-chart on the board for *renewable resources* and *nonrenewable resources*. Have students suggest examples as they read.

During Reading

Renewable and Nonrenewable Resources (page 22)

- Point out the photograph of a geothermal power plant. Guide students as they read the caption and identify a cause and an effect. (Thermal energy from inside Earth helps produce steam, which then helps produce electric energy.)
- Ask: *Why are fossil fuels a nonrenewable resource?* (They cannot be replaced easily.)

Checkpoint (because we cannot use it up)

Using Energy Wisely (page 23)

Checkpoint (We will use up the nonrenewable resources and make more pollution.)

After Reading

Reflect on Reading (page 23) Before students start creating their cause and effect charts, remind them that conserving energy means using energy wisely. Then have students fill in the Effect box. (Possible answers: The supply of fossil fuels will last longer; less pollution will be made.)

Apply Science Concepts (page 23) This activity applies a concept from Find Out About on page 21. Have partners or small groups brainstorm ideas for how your school can use energy wisely. Then have partners display and discuss their posters.

Continued on last page

Name: Date:

Test: **Energy**

Part A: Vocabulary

energy	fossil fuels	heat	nuclear energy
potential energy	renewable resources	temperature	waves

Choose the correct vocabulary word for each definition. Write the word on the line.

1. In science, _____ means the ability to make things change.

2. The kind of energy a ball on a high shelf has is _____.

3. Light energy moves in straight lines and travels in _____.

4. An object's _____ depends on how fast the particles in that object are moving.

5. The word _____ means the movement of thermal energy from one object to another.

6. Both fission and fusion can change _____ into other forms of energy.

7. Examples of _____ include solar energy and wind.

8. Oil and coal are called _____ because they are formed from things that were once alive.

Part B: Science Concepts

Mark the best answer to each question.

9. Which two things affect how much kinetic energy an object has?

Ⓐ speed and position
Ⓒ speed and mass
Ⓑ position and mass
Ⓓ temperature and mass

10. Which form of energy travels through matter but not through space?

Ⓐ light energy
Ⓒ potential energy
Ⓑ nuclear energy
Ⓓ sound energy

Test: **Energy** *(continued)*

11. A burning log is an example of which energy change?

Ⓐ from light energy to thermal energy and sound energy

Ⓑ from chemical energy to light energy and thermal energy

Ⓒ from electric energy to light energy and thermal energy

Ⓓ from chemical energy to electric energy and sound energy

12. Turning off the TV and using light bulbs that need less energy are ways to do what?

Ⓐ conserve energy

Ⓑ use fossil fuels

Ⓒ use solar energy

Ⓓ make pollution

Write the answer.

13. Your shirt and your father's shirt hang in the sun on a clothesline. Which shirt has more thermal energy? Why?

_____

_____

14. How are static electricity and current electricity alike? How are they different?

_____

_____

_____

15. Look at the diagram of the roller coaster. At which point on the track will the cars have the most kinetic energy? At which point on the track will the cars have the most potential energy? Why?

_____

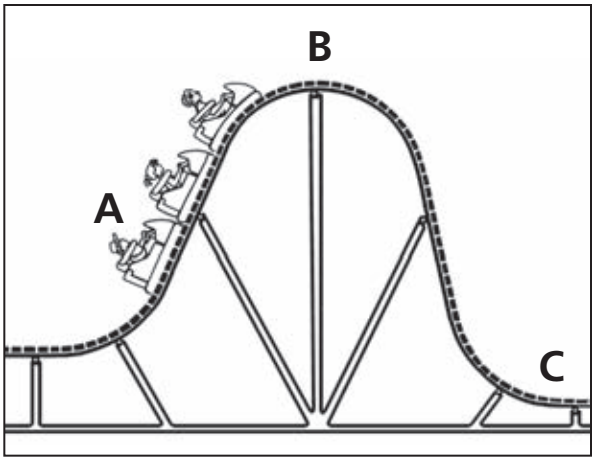
_____

_____

_____

_____

_____



Let's Review
(inside back cover)

Have students complete their K-W-L charts before answering these questions. Possible answers are shown.

1. **Cover Connection** (Energy has many forms: It can be kinetic energy or potential energy; it can be sound energy, light energy, or thermal energy. Energy can change from one form to another: For example, electric energy changes into thermal energy and light energy when you turn on a light bulb.)
2. (Kinetic energy is the energy an object has when moving. Potential energy is the stored energy an object has because of where it is or what its condition is.)
3. (Any four: Sound energy: vibrations from a drum; Light energy: sunlight; Thermal energy: energy of moving particles in hot soup; Electric energy: current electricity to run a computer; Chemical energy: the energy in batteries; Nuclear energy: nuclear fission, atom splitting)
4. (In photosynthesis, plants change the light energy from the Sun to chemical energy, which is stored in the plant as food. What we eat comes either from a plant or an animal that eats a plant.)
5. (Coal, oil, and natural gas are called fossil fuels because they formed over millions of years from the remains of living things that were buried under rock. They are nonrenewable because they cannot be replaced easily or quickly.)
6. **Cause and Effect** (Light energy always travels in a straight line. When it hits something like a wooden house, that object blocks the light from passing through, so shadows form on the other side of the object or building.)
7. **Write** (Stories should have energy as a superhero that changes form in order to achieve a goal. At least four Vocabulary words should be used.)

Try It! Guide students to realize that the rice bounces because of the sound waves, or vibrations, made by striking the pot.

Science at Home Have students do this activity at home with a family member. Remind them to list things they have at home that run on electricity and to sort and count them by room. Remind them also to list ways to conserve electricity.

Answers to Test
(Teacher's Guide pages 6–7)

1. energy **2.** potential energy **3.** waves **4.** temperature **5.** heat **6.** nuclear energy **7.** renewable resources **8.** fossil fuels **9.** C **10.** D **11.** B **12.** A **13.** father's shirt; It is bigger, so it has more particles, which gives it more thermal energy. **14.** Both involve the electric charge of protons and electrons. Static electricity is the buildup of charge on an object. Current electricity is the steady flow of charge from one place to another. **15.** At Point C, the cars have the most kinetic energy because they are moving at the greatest speed. At Point B, the cars have the most potential energy because they are at the highest point.

ADDITIONAL ASSESSMENT OPPORTUNITIES Use the Checkpoints, Reflect on Reading, and Apply Science Concepts features and Let's Review questions as additional assessment opportunities.

Delta Science Content Readers are 24-page nonfiction student books with informative, engaging text and full-color photos and illustrations. The readers present key science content and vocabulary found on state tests, present key reading skills and strategies useful for reading informational text, support and extend the experiences and content of hands-on activities, promote scientific inquiry, and serve as a home-school link. **They are available in two editions: Red Edition for Grades 3–4 and Purple Edition for Grades 4–5.**

This teacher's guide is available online at
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School Specialty Science

Delta Education

Energy
Teacher's Guide
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