SCIENCE • GRADE 3

California Content Standards
Physical Sciences: 1.A
Physical Sciences: 1.B
Physical Sciences: 1.C
Physical Sciences: 1.D

Below Level

What Is Energy?

FOCUScurriculum

Curriculum materials for **your** content standards

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What Is Energy?
California's Science Content Standards Met

GRADE 3 SCIENCE

PHYSICAL SCIENCES: 1—Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept:

a. Students know energy comes from the Sun to Earth in the form of light.

b. Students know sources of stored energy take many forms, such as food, fuel, and batteries.

c. Students know machines and living things convert stored energy to motion and heat.

d. Students know energy can be carried from one place to another by waves, such as water waves and sound waves, by electric current, and by moving objects.

GRADE 3 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

***Vocabulary and Concept Development 1.6*—**Use sentence and word context to find the meaning of unknown words.

***Vocabulary and Concept Development 1.8*—**Use knowledge of prefixes (e.g., un-, re-, pre-, bi, mis-, dis-) and suffixes (e.g., -er, -est, -ful) to determine the meaning of words.

2.0 READING COMPREHENSION

***Comprehension and Analysis of Grade-Level-Appropriate Text 2.2*—**Ask questions and support answers by connecting prior knowledge with literal information found in, and inferred from, the text.

1.0 WRITING

***Organization and Focus 1.1*—**Create a single paragraph: a. Develop a topic sentence. b. Include simple supporting facts and details.

SCIENCE • GRADE 3

Below Level

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Physical Sciences: 1.A
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Student Book

What Is Energy?

Print pages 5–18 of this PDF for the student book.

How to Make the Student Book

- **The student book is contained on pages 5–18 of this PDF. It begins on the next page.**
- **To make one student book, or a two-sided master copy that can be photocopied, you will print on both sides of seven sheets of 8.5″ x 11″ paper.**
- **Do a test printout of one book first to familiarize yourself with the procedure.**
- **Follow these instructions carefully.**

First–Select the Paper

Since you will be printing on both sides of the sheets of paper, select a good quality white paper. We recommend using at least a 22lb sheet.

Second–Check Printer Settings

Be sure you have the correct page setup settings for your computer and printer. You will print these pages in landscape format.

Third–Print EVEN Pages

Open the PDF of the book you want to print. Select print from your file menu. In your printer's dialogue box enter pages 5–18 to print. Then select EVEN pages only. It is important to print only the EVEN pages first. Click "Print" to print the even pages. (**Important note**: The first page that prints will be blank. DO NOT discard this page. It will be needed to print the cover in the next step.)

Forth–Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages. Place the stack back in your printer. Select print from the file menu again. In your printer's dialogue box, select ODD pages. Click "Print" to print the odd the pages.

Fifth–Fold the Book

You now have a complete book. Check to be sure the pages are in the correct order with the book's cover as the top page. Then fold the stack of paper in half.

Sixth–Staple the Book

Use an extended-length stapler to staple the pages together. Place three staples in the spine of the book.

Please note that printers vary in how they output pages. Do a test printing with one book and adjust the procedure as necessary.

If you want to make a one-sided master copy, print ALL pages 5–18 at once. Then select "one-sided to two-sided" on the copy machine.

What Is Energy?

California's Science Content Standards Met

BL

GRADE 3 SCIENCE

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GRADE 3 ENGLISH LANGUAGE ARTS

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FOCUS ON CALIFORNIA STANDARDS

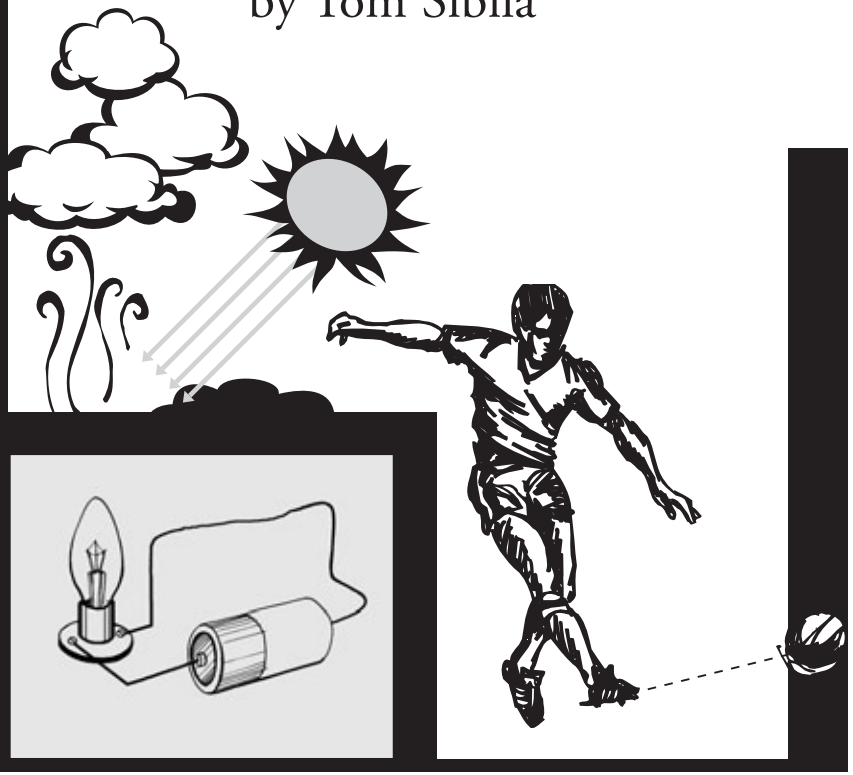
SCIENCE • GRADE 3

California Content Standards

Physical Sciences: 1.A, 1.B, 1.C, 1.D

What Is Energy?

by Tom Sibila



SCIENCE • GRADE 3

California Content Standards

Physical Sciences: 1.A, 1.B, 1.C, 1.D

What Is Energy?

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Curriculum materials for **your** content standards

Table of Contents

What do you think you will learn from this book?

INTRODUCTION

Present but Never Seen

What is something that is always here but never seen? Think about about air. We can't see air, but we know it exists, or is real. We can see and feel the effects of air. We can feel air blowing against our skin. We can see a balloon **inflate** because of air.

What else is present but never **visible**? Think about energy. We can't see energy, but we know it exists. Like air, we can **detect**, or notice, the effects of the energy. So just what is energy?

inflate: to make something expand by blowing air into it
visible: able to be seen
detect: to notice or discover something

The Power to Change

Energy is the ability or **capacity** to do work. Energy makes things move, stretch, or grow. It is heat and light. It runs machines. Energy causes changes in **matter**.

Energy changes forms in many ways. For example, when we burn wood, we change the wood's energy into heat and light.

capacity: the ability to do something
matter: anything that takes up space or has mass

CHAPTER 1

Energy Comes from the Sun

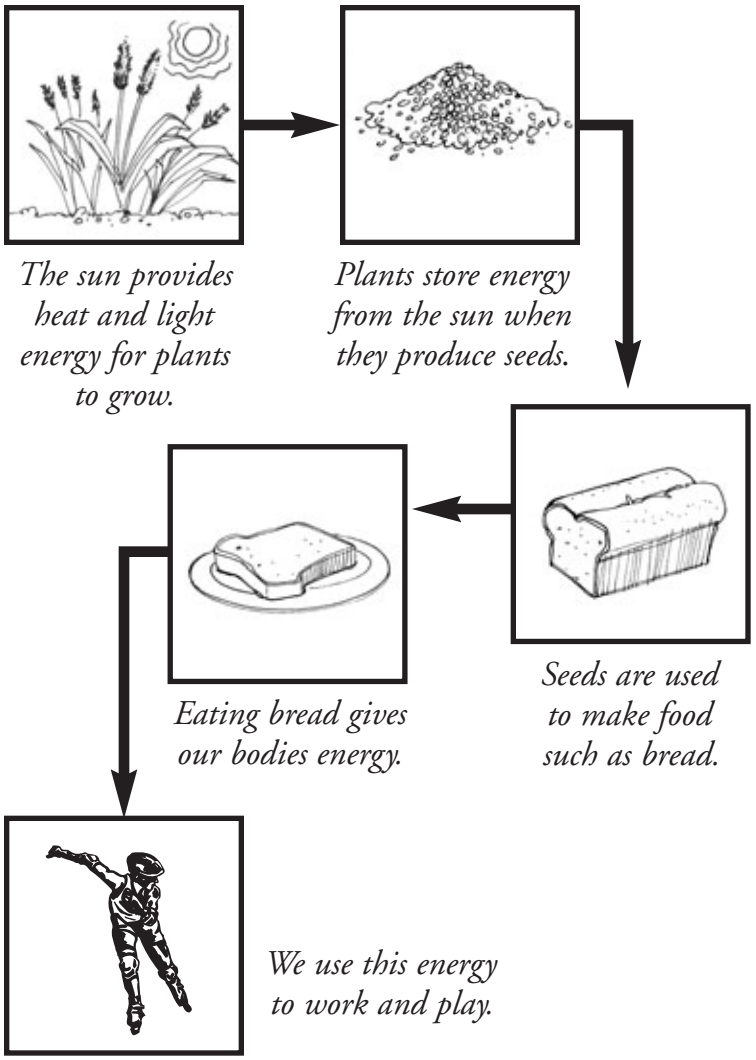
Where does energy come from? Most energy on Earth comes from the sun. Here on Earth we see the sun's energy as light. We feel the sun's energy as heat. Light and heat are both forms of energy.

Heat and light energy from the sun are very important to living things on Earth. Energy from the sun enters the Earth's **atmosphere**. Then it turns to heat. This heat warms Earth so that plants can grow here.

Plants also store energy in their seeds. Some of these seeds grow into new plants. Other seeds are used by people for food. When people eat the seeds and plants, they get the energy stored in the seeds. Then they can work and play.

atmosphere: layer of air that surrounds Earth

How Energy from the Sun Is Used



Explain why energy from the sun is important to living things on Earth.

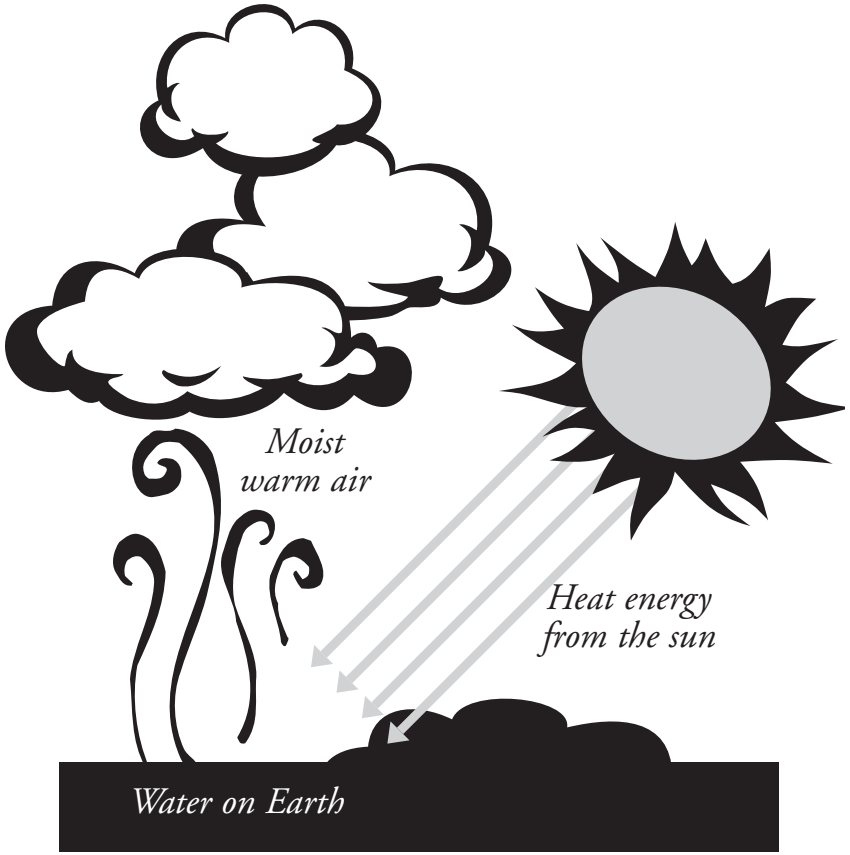
Heat Energy and Freshwater

Heat energy from the sun also gives us freshwater. Freshwater is water with very little salt. When water is warmed by the sun, it **evaporates** and rises. As this water **vapor** rises, it cools. Tiny water droplets form. These droplets form clouds. Clouds are moved over land by wind. When too much water collects in a cloud, it falls back to Earth.

Water goes up into the air and falls back to Earth all the time. This is called the water cycle. It provides fresh water to life on land. The cycle happens because of heat energy from the sun.

evaporates: changes from a liquid to a gas
vapor: the gas formed when a liquid is heated

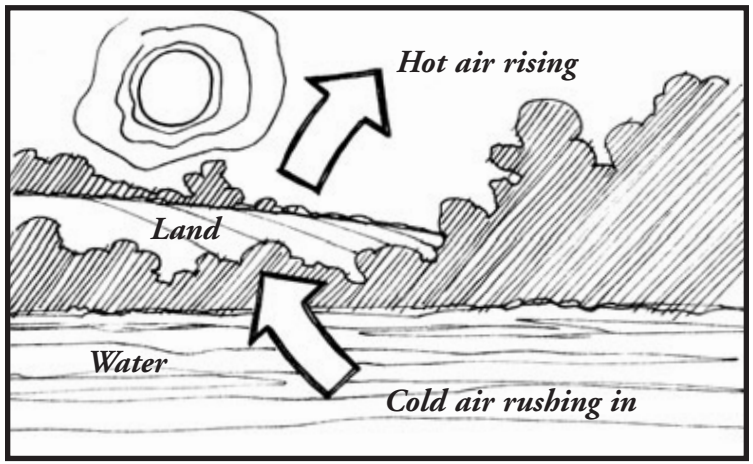
Heat Energy and the Water Cycle



Clouds form when warm, moist air rises off Earth's surface. When clouds build up too much moisture, freshwater falls back to Earth.

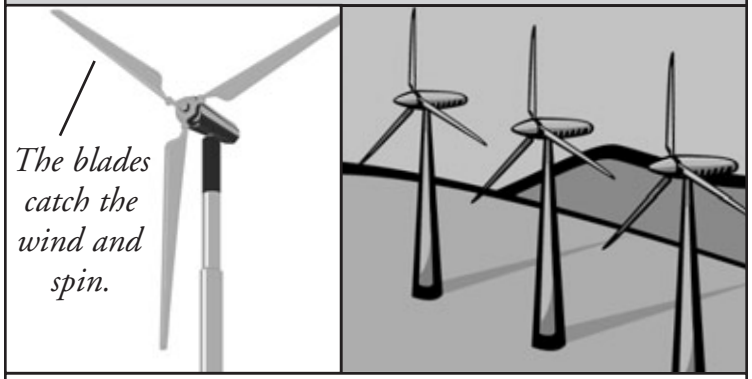
Heat Energy and Wind

Wind is created by energy from the sun. First, the sun heats Earth. Next, the air closest to the surface of Earth warms up. This warm air rises. Then cooler air rushes in to fill the space the warm air left behind. This creates wind.



Windmills, or wind machines, have large blades. When wind hits the blades, they capture the energy of the wind and the blades spin. The spinning blades are connected to a **generator** which creates electricity.

Wind Machine



A generator uses the spinning blades to make electricity.

You can see that energy can change from one form to another. Energy from the sun creates wind energy. Wind energy can be used to create electrical energy.

generator: a machine that produces electricity by turning a magnet inside a coil of wire

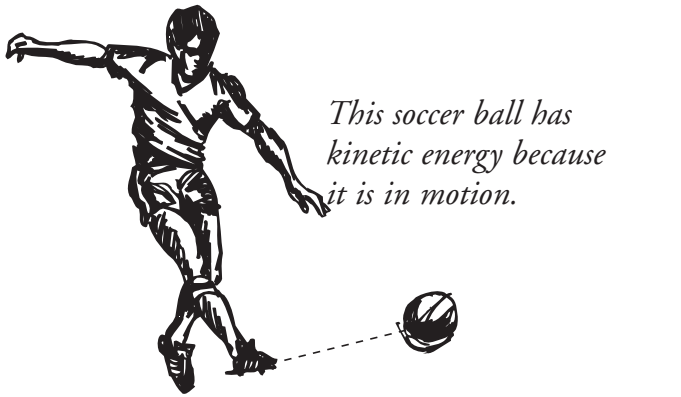
CHAPTER 2

Categories of Energy

Energy can be found in many different forms. Heat, light, sound, and motion are some examples. Although there are many different forms of energy, all of them can be grouped under two categories—kinetic energy and potential energy.

Kinetic Energy–Motion

Kinetic energy is the energy of moving objects. A moving car or a kicked soccer ball are all objects that have kinetic energy.



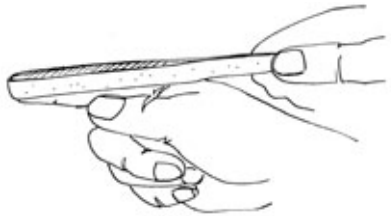
This soccer ball has kinetic energy because it is in motion.

Potential Energy–Stored

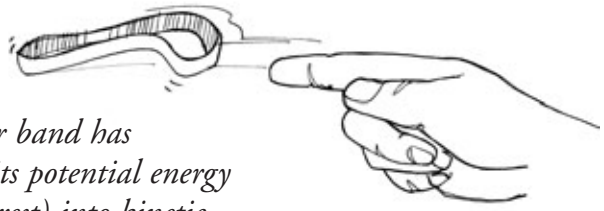
Potential energy is energy at rest. Potential energy is stored energy. It is energy that has the possibility to change into kinetic energy. Then it can do work.

Look at the stretched rubber band. It has potential energy. It is not moving. It is at rest. But the rubber band has the potential to move.

This stretched rubber band is at rest. It has potential energy.



When you let go of one end of the rubber band, it springs forward. The potential energy of the rubber band is changed into kinetic energy.



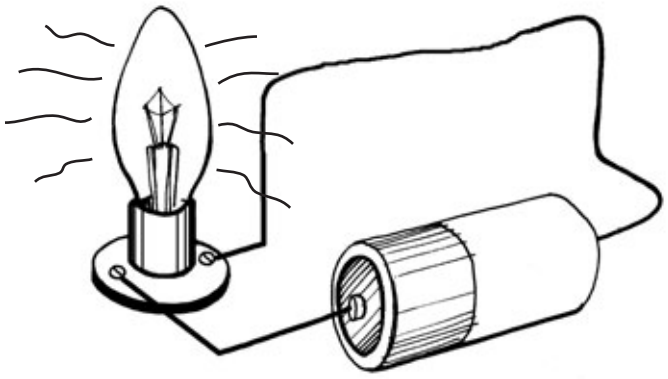
The rubber band has converted its potential energy (energy at rest) into kinetic energy (energy in motion).

CHAPTER 3

Converting Stored Energy

Potential energy can be stored in many things. You know that plants store energy from the sun in their seeds. Batteries store energy too.

A battery in a flashlight stores electrical energy. When you turn on the flashlight, the electrical energy is released, or let go. The electrical energy is converted, or changed, into light energy.

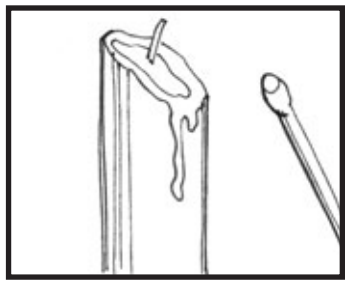


The potential energy in this battery is released and converted to light energy. What other form of energy is converted from the battery?

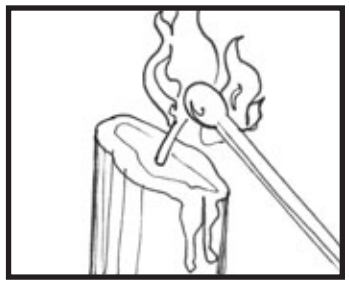
Converting Stored Energy into Heat

Over time, people have learned how to convert, or change, potential energy to produce heat. Matches are an example.

A match resting in a box is cold, but it has potential energy. When you strike the match, it burns. The potential energy in the match is released and converted into heat and light energy.



This match and candle is not releasing any energy. However, both have potential energy.



This match and candle is releasing potential energy and converting it into heat and light.

Converting Stored Energy into Motion

We can also convert stored energy into motion. For example, we can release the potential energy in gasoline and air to make a car move.

Think about a parked car. Gasoline and air are mixed together and are ignited in the car's engine. The potential energy stored in the gas and air is converted to kinetic energy. The car can now move.

ignite: to set fire to something

CHAPTER 4

Transfer of Energy

What are some other ways that energy can be transferred, or moved, from one form to another?

Motion is one way. Rub your hands together rapidly. What happens? Your hands make heat. The energy from your hands rubbing together is transferred into heat energy through friction.

Waves are another way that energy can be transferred. Hold a pebble above a tub of water. Now drop the pebble in the water.

What happens? How is energy transferred from one form to another? Write down your findings on a piece of paper. Then continue reading.

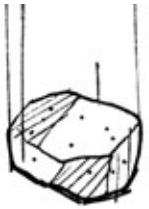
friction rubbing of one thing against another

Transfers of Energy

1. When you hold a pebble above a tub of water, you are using the kinetic energy in your muscles—the energy of motion—to move the pebble.

2. When you hold the pebble at rest above the water, you transfer kinetic energy into potential energy. The pebble now has potential energy—the ability to do work.

3. When the pebble is released and falls down, the potential energy in the pebble is transferred back to kinetic energy.



4. When the pebble hits the water, it creates waves in the water. The energy from the pebble is transferred into wave energy in the water.

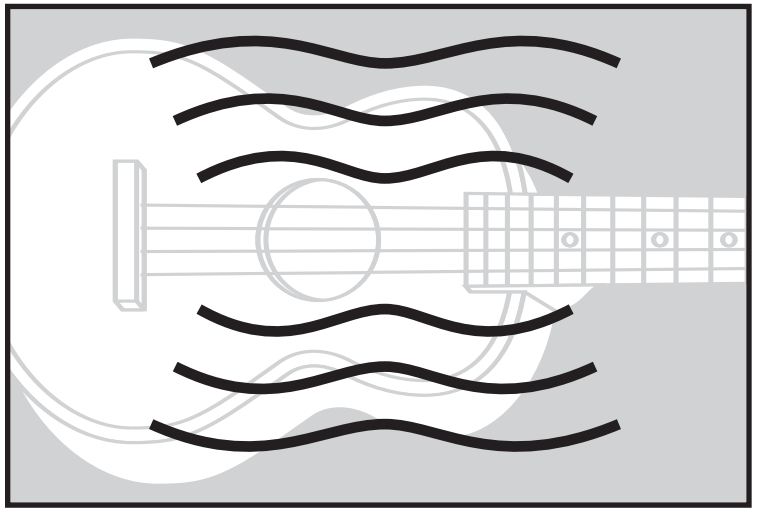
5. What if there was a toy boat in the water? What would happen to the boat? Some of the energy from the waves would be transferred to the toy boat. This would cause the boat to bob.

6. The waves would cause the toy boat to bob up and down and back and forth. But the toy boat would stay at the same place in the water.

As the pebble rests at the bottom of the tub, what happens to its energy?

Sound Waves

Sound energy is also transferred through waves. If you pluck a guitar string, the string **vibrates**. It hits tiny particles in the air causing them to move back and forth. These moving air particles produce a sound wave—a push, of energy that travels through the air.



A guitar string vibrates back and forth. It hits tiny particles of air. This creates a sound wave.

vibrate: to cause a rapid motion back and forth

Transfer of Electrical Energy

You know that we can use energy from the wind to create electrical energy. There are other sources of energy that we use as well. Coal is burned in power plants to generate electricity. Dams are built to convert the energy of flowing water into electricity.

The electrical energy is then carried through wires to our homes. We convert the electrical energy into heat, light, sound, motion, and other forms of energy.

It All Starts with the Sun

The source of most energy on Earth is the sun. Without energy, there would be no life on Earth.

Glossary

atmosphere—layer of air that surrounds Earth

capacity—the ability to do something

detect—to notice or discover something

evaporates—changes from a liquid to a gas

friction—rubbing of one thing against another

generator—a machine that produces electricity by turning a magnet inside a coil of wire

ignite—to set fire to something

inflate—to make something expand by blowing air into it

matter—anything that takes up space or has mass

vapor—the gas formed when a liquid is heated

vibrate—to cause a back and forth motion

visible—able to be seen

To Find Out More . . .

Want to learn more about energy?

Try these books

Eyewitness: Energy by Jack Challoner. Dorling Kindersley, 2000.

What Is Energy?: Exploring Science With Hands-on Activities (In Touch With Basic Science) by Richard Spilsbury and Louise Spilsbury. Enslow Elementary, 2008.

Janice VanCleave's Energy for Every Kid: Easy Activities That Make Learning Science Fun (Science for Every Kid Series) by Janice VanCleave. Jossey-Bass, 2005.

Access these Web sites

Energy Kid's Page
http://www.eia.doe.gov/kids/energyfacts/sources/whatsenergy.html

Energy Story
http://www.energyquest.ca.gov/story/chapter01.html

Just for Kids Energy
http://www.depweb.state.pa.us/justforkids/cwp/view.asp?a=3&q=464796

Index

ENGLISH-LANGUAGE ARTS • GRADE 3

Below Level

California Content Standards
Vocabulary and Concept Development: 1.6
Vocabulary and Concept Development: 1.8
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.2
Organization and Focus: 1.1

English-language Arts Activities

What Is Energy?

Print pages 20–24 of this PDF for the reading activities.

Compound Words

Compound words are made by joining two short words. The two short words do not always have the same meaning when they are part of a compound word. Still, understanding the two short words will help you figure out the meaning of the longer word.

For example, *windmill* is a compound word. *Wind* means "air that is moving." *Mill* means "a machine for grinding, cutting, or crushing." However, *windmill* does not mean "a machine that crushes or grinds air." It means "a machine that gets its power from the wind."

Read the definition. Then choose the correct compound word for the definition.

1. A place where winged vehicles land

Ⓐ airline Ⓒ airplane
Ⓑ airport Ⓓ aircraft

2. A person whose name is not known at this time

Ⓐ someone Ⓒ something
Ⓑ someplace Ⓓ sometimes

TRY THE SKILL

3. All of the people

Ⓐ everything
Ⓑ everywhere
Ⓒ everyone
Ⓓ everyday

4. Part of a car

Ⓐ daylight
Ⓑ headlight
Ⓒ sunlight
Ⓓ flashlight

5. Land at the edge of a lake or river

Ⓐ watercolor
Ⓑ watermelon
Ⓒ waterfall
Ⓓ waterfront

6. A curved piece of glass on a car or truck

Ⓐ windmill
Ⓑ windpipe
Ⓒ windshield
Ⓓ windblown

Short Essay Questions

Some questions require more than a one-word answer. You are expected to write several sentences. These steps will help you plan your answer:

1. Read the question carefully, and underline any key words.
2. Figure out whether you are expected to provide a fact, an opinion, an explanation, or an example. Are you supposed to compare two things? If you are not sure about the form of your answer, ask your teacher.
3. Write your main idea first and then add details to support that idea.
4. Write in complete sentences. Leave time to check your spelling and grammar when you are finished.

TRY THE SKILL

Use these tips to answer the following questions.

1. How does the sun provide us with freshwater? Start with your main idea. Be sure to mention all the steps in the process.

_____

_____

_____

_____

_____

2. Explain what energy is and give examples of what it can do.

_____

_____

_____

_____

_____

Suffixes

Suffixes are groups of letters that are added to the ends of words. A suffix can change the word's part of speech. For example, *happy* is an adjective. When you add the suffix *–ness*, you get *happiness*, which is a noun.

Other suffixes can change the meaning of a word. For example, the suffix *–ful* means "full of." The suffix *–less* means "without." Look at how suffixes change the meanings of these words:

Word	Meaning	Word	Meaning
careful	full of care	joyful	full of joy
careless	without care	joyless	without joy
teacher	one who teaches	actress	one who acts

TRY THE SKILL

Read each sentence and each pair of words below it. Study the suffixes. Then write the letter of the correct word on the line.

1. _____ light energy from the sun can damage your skin.

A. Harmless **B**. Harmful

2. You must be _____ when you use electricity.

A. careless **B**. careful

3. Please be _____ about your use of energy.

A. thoughtless **B**. thoughtful

4. She wrapped the glass _____ so it would not break.

A. carelessly **B**. carefully

5. Scientists are _____ that we will discover new ways to save energy.

A. hopeless **B**. hopeful

Asking and Answering Questions

As you read, ask yourself who, what, when, why, where, and how questions. Answering these questions will help you understand what you read. Sometimes the answers will be clear. Other times, you will have to figure them out. To practice, read the paragraph below. Then study the questions and answers that follow it.

Windmills, or wind machines, have large blades. When wind hits the blades, they capture the energy of the wind and the blades spin. The spinning blades are connected to a generator which creates electricity.

What do windmills do? (They generate electricity.)

When do they do this? (When the wind is blowing.)

How do they do it? (Wind turns large blades that are connected to a generator.)

Where did they do it? (You have to figure out this answer. Windmills must be placed in an area open area of land that receives a great deal of wind.)

Sometimes, you can also ask "Who does this?" This paragraph does not answer that question.

TRY THE SKILL

Read this paragraph. Then answer the questions.

Sound energy is also transferred through waves. If you pluck a guitar string, the string vibrates. It hits tiny particles in the air causing them to move back and forth. These moving particles produce a sound wave—a push of energy that travels through the air.

1. What is this paragraph about?

Ⓐ guitars Ⓒ sound energy
Ⓑ air particles Ⓓ waves

2. When do air particles move?

_____

_____

3. What is sound energy?

_____

_____

Answer Key

Compound Words

1. B
2. A
3. C
4. B
5. D
6. C

Short Essay Questions

1. When water is warmed by the sun, it evaporates and rises. As water vapor rises it cools. Tiny water droplets form. These droplets form clouds. When too much water collects in a cloud, it falls back to Earth.
2. Energy is the power to change things. It is the ability or capacity to do work. Energy makes things move, stretch, or grow. It creates heat and light. It runs machines.

Suffixes

1. Harmful
2. careful
3. thoughtful
4. carefully
5. hopeful

Asking and Answering Questions

1. C
2. when a guitar string is plucked and vibrates
3. a surge of energy that travels through the air