



SCIENCE • GRADE 3

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

On Level

What Is Energy?

FOCUScurriculum

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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 1.4—Use knowledge of antonyms, synonyms, homophones, and homographs to determine the meanings of words.

Vocabulary and Concept Development 1.7—Use a dictionary to learn the meaning and other features of unknown words.

2.0 READING COMPREHENSION

Comprehension and Analysis of Grade-Level-Appropriate Text 2.4—Recall major points in the text and make and modify predictions about forthcoming information.

Comprehension and Analysis of Grade-Level-Appropriate Text 2.5—Distinguish the main idea and supporting details in expository text.



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Physical Sciences: 1.A

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On Level

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?
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Content Standards Met**

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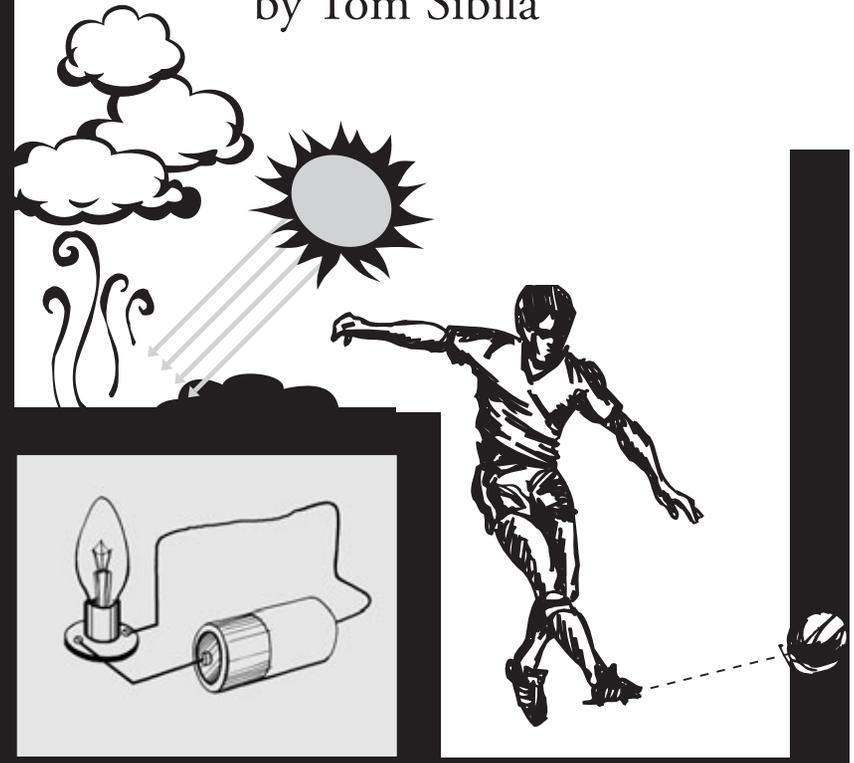
SCIENCE • GRADE 3

California Content Standards

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

What Is Energy?

by Tom Sibila





SCIENCE • GRADE 3

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*What do you think you will
learn from this book?*

INTRODUCTION

Present but Never Seen

What is something that is always present but never seen? Think about air. We can't see air, but we know it exists. 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 see or feel the effects of energy.

Kicking a soccer ball requires energy. Eating lunch requires energy. Playing a guitar requires energy. So does hearing the sound made by the guitar strings. You can't see the energy required to do these things, but you can **detect** the effects of the energy. So 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 supplies the power to change things. It is the ability or **capacity** to do work. Energy makes things move, stretch, or grow. It is heat and light and can run machines. It causes physical and chemical 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. Plants use energy from sunlight and change it into energy rich food. Cars use energy stored in gasoline and air to power the engine which makes the car move.

We know energy exists even though we cannot see it. But where does energy come from? Read on to shed some light on this question.

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

Energy Comes from the Sun

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.

Heat and light energy from the sun are very important to living things on Earth. Some of the light energy from the sun is changed to heat when it enters Earth's **atmosphere**. The heat warms the planet so that plants can grow. Light energy from the sun is used by plants to make food.

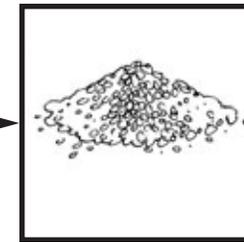
Plants also store energy from the sun. Most plants make seeds. Some of these seeds grow into new plants. Other seeds are used by humans and animals for food. For example, we use wheat seeds to make bread. When we eat the bread, we get the energy from the seeds to help us survive.

atmosphere: layer of air that surrounds Earth

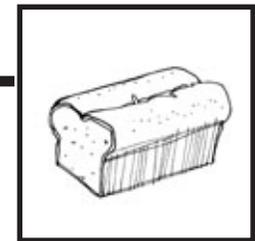
How Energy from the Sun Is Used



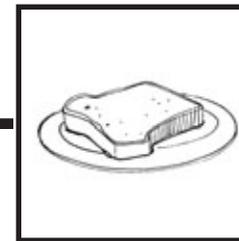
The sun provides heat and light energy for plants to grow.



Plants store energy from the sun when they produce seeds.



Seeds are used to make food such as bread.



Eating bread gives our bodies energy.



We use this energy to work and play.

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

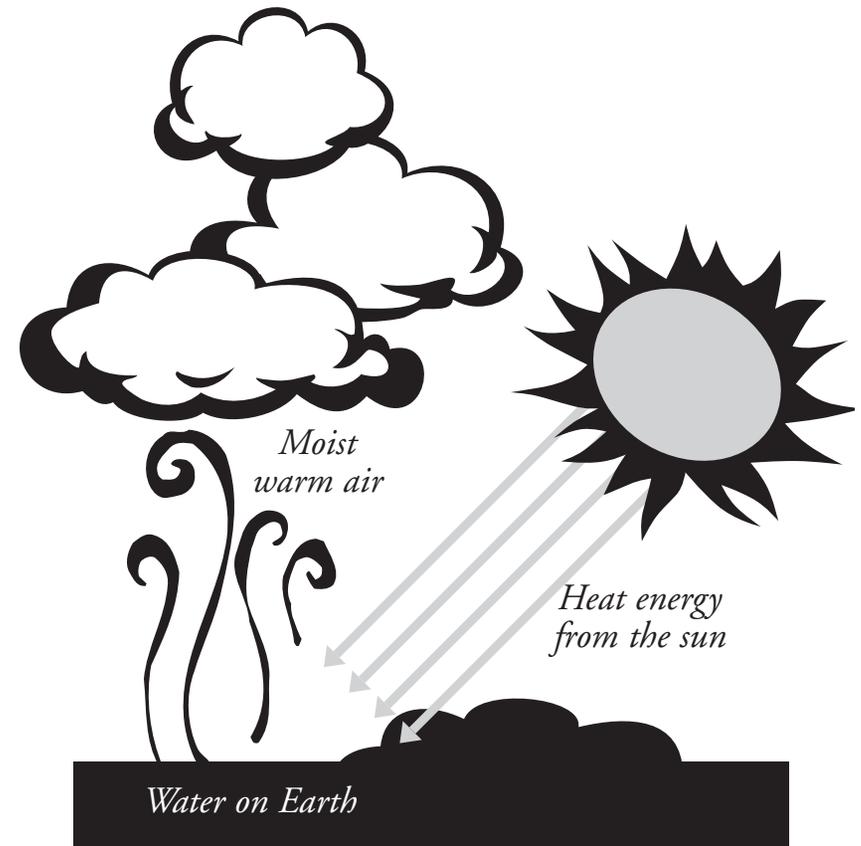
Heat Energy and Freshwater

Heat energy from the sun also provides us with freshwater. Freshwater is water with almost no salt. When water is warmed by the sun, it **evaporates** and rises. As water **vapor** rises it cools, and tiny water droplets form. When these droplets are packed closely together, they become visible and form a cloud. Clouds are moved over land by wind. When too much water collects in a cloud, the cloud can no longer contain all the water, and it falls.

Water goes up into the air and falls back to Earth all the time. This process is called the water cycle and provides freshwater to life on land. The cycle would never occur if not for 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

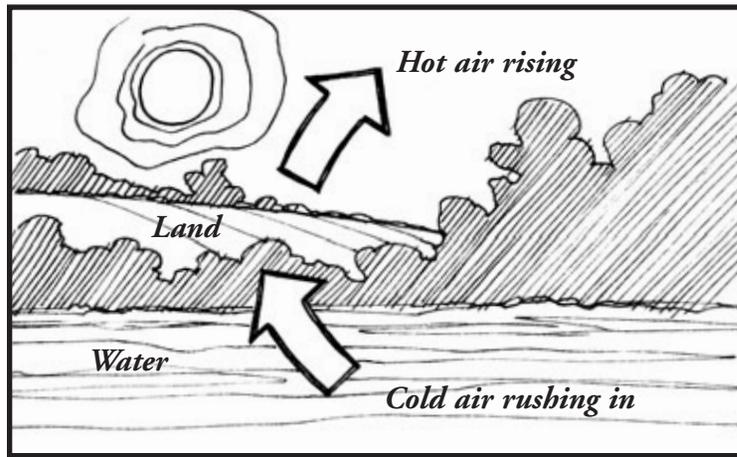


Clouds form when warm, moist air rises off Earth's surface. When clouds build up too much moisture, freshwater falls back to Earth.

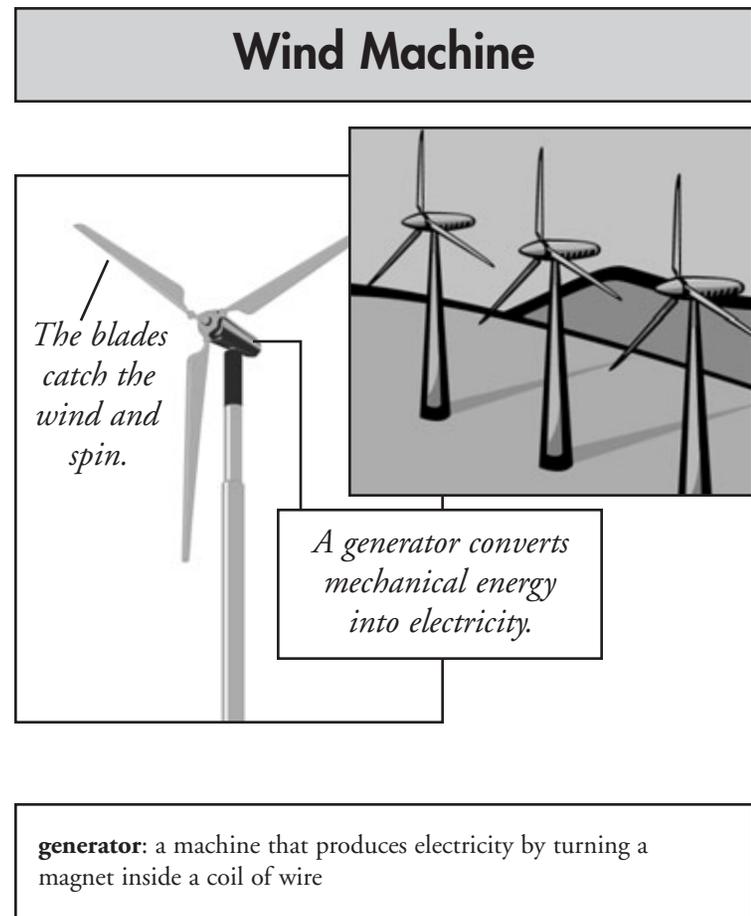
Heat Energy and Wind

People have learned to use energy from the sun and change it from one form to another. One example is using energy from the wind.

Wind is created by energy from the sun. When the sun heats Earth, the air closest to the surface of Earth warms up and rises. Then cooler air rushes in to fill the space the hot air left behind. This creates wind. We can use this energy from the wind to create electrical energy.



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.

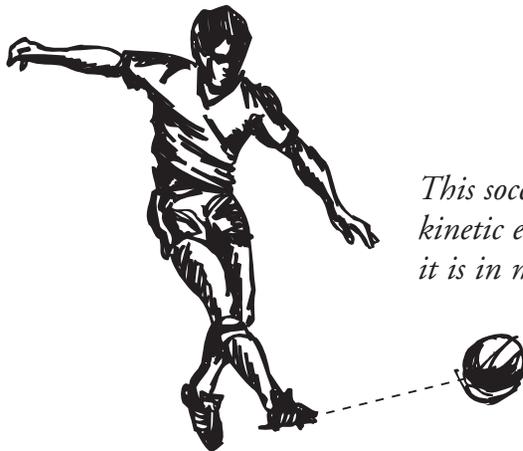


Categories of Energy

Energy can be found in different forms such as heat, light, sound, and motion. These different forms can be classified into two categories.

Kinetic Energy—Motion

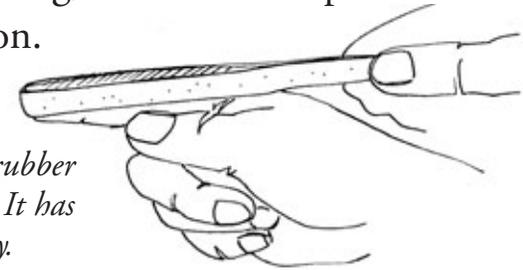
Kinetic energy is the energy of moving objects. A moving car, a runner sprinting, a waterfall, or a kicked soccer ball are all objects that have kinetic energy.



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

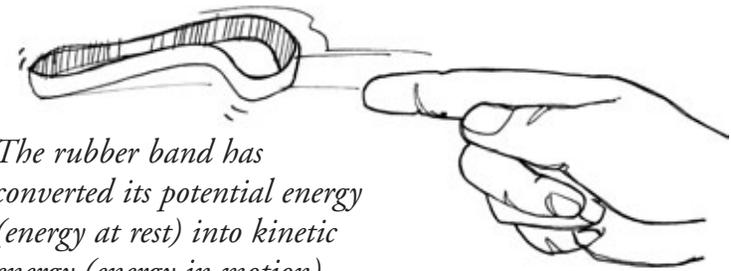
Potential Energy—Stored

Potential energy is the amount of useable energy within something at rest. It is energy that has potential to change into kinetic energy and do work. For example, a stretched rubber band has potential energy. It is not moving, but it has the potential to create motion.



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

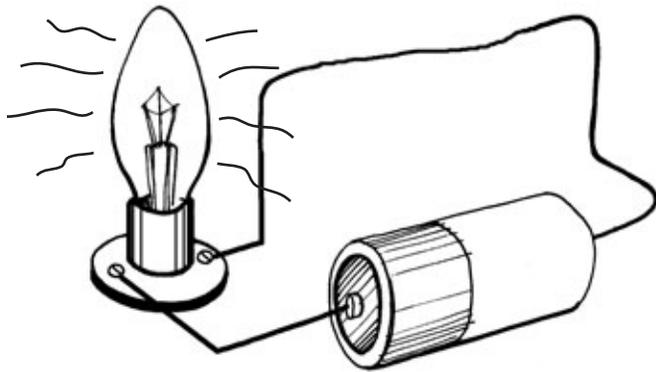
When you release one end of the rubber band, it springs forward. The potential energy of the rubber band is converted into motion or kinetic energy.



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

Potential energy can be stored in different types of matter. You have already read how plants use energy from the sun to create food. We use the stored energy from plants to help us survive. Batteries are another example of something with potential energy.

Batteries store energy. When used in a flashlight, the stored electrical energy in a battery is released and converted into light energy.

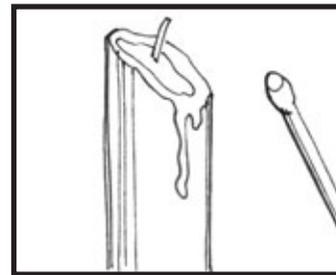


The potential energy in this battery is released and converted to light energy. What other form of energy is converted from the battery?

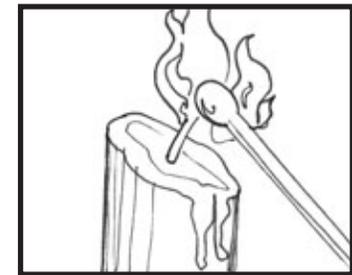
Converting Stored Energy into Heat

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

A matchstick resting in a box is cold, but it has potential energy. When you strike the match, it burns. You can use the burning matchstick to light a candle. The potential energy in the match and the candle is now 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

People have also learned how to convert stored energy into motion. For example, we can release the potential energy in gasoline and air to make a car move. When gasoline and air are mixed together and **ignited** in a car's engine, the potential energy stored in the gas and air is converted into kinetic energy.

Our bodies do the same thing. Some of the food we eat is carried to our muscles. The stored energy in the food is then released enabling our muscles to move. The potential energy in the food is converted to kinetic energy.

ignite: to set fire to something

CHAPTER 3

Transfer of Energy

You now know how important energy is to us, and you also know that it changes forms in many ways. What are some other ways that energy can be transferred from one form to another?

Motion is one way. Rub your hands together rapidly. What happens? Your hands generate 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? Can you describe the transfers of energy? Take a moment and write them down on a piece of paper. Then continue reading.

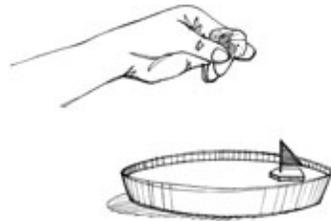
friction: rubbing of one thing against another

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.

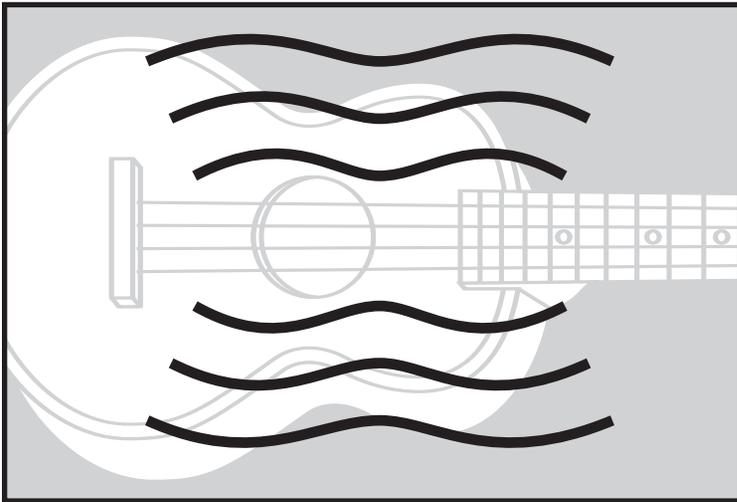


6. The waves would cause the toy boat to bob up and down and back and forth. But the toy boat would stay at the same place in the water.

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 moves back and forth. As the string **vibrates**, it hits tiny particles in the air causing them to move back and forth. The vibrations of these moving air particles produce a sound wave—a surge of energy that travels through the air.



When a guitar string vibrates back and forth, it hits tiny particles of air creating a sound wave.

vibrate: to cause a back and forth motion

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.

Fossil fuels such as coal are burned in power plants to generate electricity. Dams can be built to convert the energy of flowing water into electricity. The electrical energy is then carried through wires to our communities. At home, we convert the electrical energy into heat, light, sound, motion, and other forms of energy.

It All Starts with the Sun

Even though there are many forms of energy, the major source of energy on Earth is the sun. Without energy, there would be no life on Earth. Next time you are enjoying a nice sunny day, think about all the ways the sun transfers its energy for us to use.

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>

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ENGLISH-LANGUAGE ARTS • GRADE 3

California Content Standards
Vocabulary and Concept Development: 1.4
Vocabulary and Concept Development: 1.7
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.4
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.5

On Level

English-language Arts Activities

What Is Energy?

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

Summarize

TRY THE SKILL

Summarizing means retelling the main ideas and key details of something you have read using as few words as you can. Summarizing helps you understand what you read. Read this paragraph.

A matchstick resting in a box is cold, but it has potential energy. When you strike the match, it burns. You can use the burning matchstick to light a candle. The potential energy in the match and the candle is now released and converted into heat and light energy.

Is this sentence a good summary of this paragraph?

A matchstick has potential energy.

No! This sentence only tells part of the story.

A matchstick and a candle have potential energy which can be converted to heat and light energy when they are burned.

Yes! This is a good summary of the paragraph.

Read the paragraphs. Shade the circle next to the best summary.

1. Potential energy is the amount of useable energy within something at rest. It is energy that has potential to change into kinetic energy and do work. For example, a stretched rubber band has potential energy. It is not moving, but it has the potential to create motion.
 - Ⓐ A stretched rubber band has potential energy.
 - Ⓑ A stretched rubber band can create motion.
 - Ⓒ Potential energy is the amount of useable energy within something at rest.
 - Ⓓ Kinetic energy is the ability to do work.
2. Wind is created by energy from the sun. When the sun heats Earth, the air closest to the surface of Earth warms up and rises. Then cooler air rushes in to fill the space the hot air left behind. This creates wind. We can use this energy from the wind to create electrical energy.
 - Ⓐ Wind can be used to create electricity.
 - Ⓑ When air is warmed, it rises.
 - Ⓒ The sun warms the surface of Earth.
 - Ⓓ Wind is created by energy from the sun.

Antonyms

TRY THE SKILL

Antonyms are words that have opposite meanings. Some examples of antonyms are:

chilly and *warm*

find and *lose*

huge and *tiny*

strong and *weak*

Read the paragraph from *What is Energy?* Look for the antonyms.

Heat energy from the sun also provides us with freshwater. When water is warmed by the sun, it evaporates and rises. As water vapor rises it cools, and tiny water droplets form. When these droplets are packed closely together, they become visible and form a cloud. Clouds are moved over by wind. When too much water collects in a cloud, the cloud can no longer contain all the water, and it falls.

What are the antonyms?

Warmed and *cools* are antonyms. *Rises* and *falls* are antonyms, too.

Think of some antonyms that have to do with energy. Write them in the chart below. Start by looking back through the book.

Words	Antonyms

Identify Main Ideas and Details

TRY THE SKILL

A paragraph may have one or two important ideas. It may also have details that tell about each main idea. For example, read this paragraph from *What is Energy?*

Potential energy is the amount of useable energy within something at rest. It is energy that has potential to change into kinetic energy and do work. For example, a stretched rubber band has potential energy. It is not moving, but it has the potential to create motion.

What is the main idea of this paragraph?

This paragraph has two closely related main ideas: Potential energy is the amount of useable energy within something at rest. It is energy that has potential to change into kinetic energy and do work. The paragraph also includes details about these main ideas. It provides an example to help clarify the main idea.

Read this paragraph. Then answer the questions.

Plants not only use the sun's energy to help them grow, plants also store energy from the sun. Most plants make seeds. Some of these seeds grow into new plants. Other seeds are used by humans and animals for food. For example, we use wheat seeds to make bread. When we eat the bread, we get the energy from the seeds to help us survive.

1. What is the main idea in this paragraph?

- Ⓐ Most plants make seeds.
- Ⓑ Plants store energy from the sun.
- Ⓒ Plants use energy from the sun to grow.
- Ⓓ Humans and animals eat seeds from plants.

2. Write two details from this paragraph.

a. _____

b. _____

Use a Glossary

TRY THE SKILL

What should you do if you don't know what a word means? You can look in the glossary. The glossary is usually in the back of a book.

Read these words from *What Is Energy?* Draw a line to match each word with its meaning. If you don't know the meaning look in the glossary on page 22.

Words

1	generator
2	evaporate
3	matter
4	vibrate
5	capacity
6	friction
7	ignite
8	vapor
9	detect

Meanings

A	to cause rapid motion back and forth
B	a gas formed from something that was a liquid
C	the ability to do something
D	a machine that produces electricity
E	to set fire to something
F	the process of changing from a liquid to a gas
G	to notice or discover something
H	anything that takes up space or has weight
I	rubbing of one thing against another

Answer Key

Summarize

1. C
2. D

Antonyms

Words and antonyms may include: *work/rest, changes/remains, store/release, heats/cool, kinetic/potential, motion/rest, convert/remain, vibrate/still, transfer/stay*

Identify Main Ideas and Details

1. B
2. a. Some stored energy in plant seeds creates new plants.
b. Some stored energy in plant seeds is used to help people and animals grow.

Use a Glossary

1. D
2. F
3. H
4. A
5. C
6. I
7. E
8. B
9. G