



SCIENCE • GRADE 3

California Content Standards

Physical Sciences: 2.A

Physical Sciences: 2.B

Physical Sciences: 2.C

Physical Sciences: 2.D

Below Level

What Is Light?

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California's
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Content Standards
Covered

•
Reproducible
Student Book

•
Reproducible
English-language
Arts Activities

What Is Light?

California's Science Content Standards Met

GRADE 3 SCIENCE

PHYSICAL SCIENCES: 2—Light has a source and travels in a direction. As a basis for understanding this concept:

- a. Students know sunlight can be blocked to create shadows.
- b. Students know light is reflected from mirrors and other surfaces.
- c. Students know the color of light striking an object affects the way the object is seen.
- d. Students know an object is seen when light traveling from the object enters the eye.

GRADE 3 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

Vocabulary and Concept Development 1.7—Use a dictionary to learn the meaning and other features 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 2.5—Distinguish the main idea and supporting details in expository text.

Comprehension and Analysis of Grade-Level-Appropriate Text 2.6—Extract appropriate and significant information from the text, including problem and solution.



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Physical Sciences: 2.A

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Student Book

What Is Light?

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 Light?
**California's Science
Content Standards Met**

BL

GRADE 3 SCIENCE

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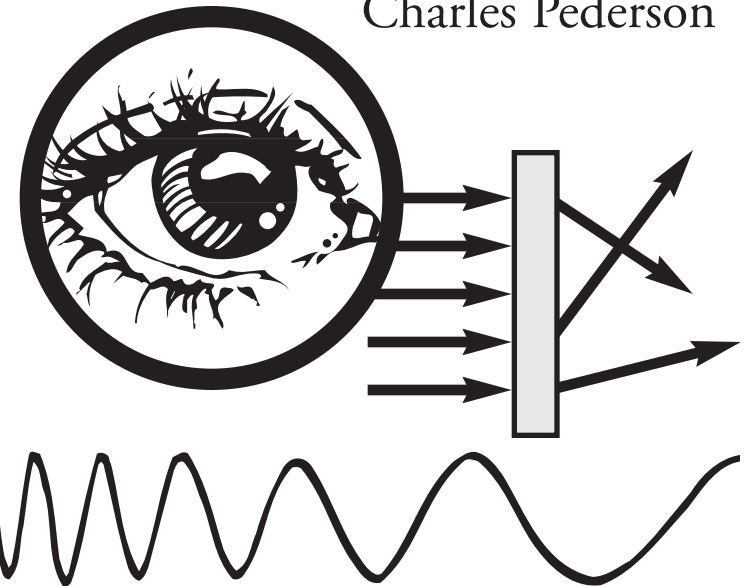
SCIENCE • GRADE 3

California Content Standards

Physical Sciences: 2.A, 2.B, 2.C, 2.D

What Is Light?

by
Charles Pederson





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INTRODUCTION

What Is Light?

Energy makes things happen. We can hear sound energy when we listen to a marching band. We can feel heat energy when we sit around a campfire. Like sound and heat, light is a form of energy.

Light is a form of energy that we can see. You can see this book because of light. Light allows us to see everything around us.



Our eyes can see things because of light.

Where Does Light Come From?

A source is where something comes from. All light comes from a source. Light sources can be **natural** or **artificial**.

The sun is a star that gives off light. Natural light comes from the sun. The sun is the biggest source of light on Earth. Other stars are also sources of natural light. Natural light comes from lightning, wildfires, and even fireflies.

Artificial light comes from things that are made by people. Electric bulbs, candle flames, streetlights, and car headlights are artificial light sources.

natural: made by nature, not by humans
artificial: made by humans, not by nature

Properties of Light

Light Travels

Light travels very fast. Nothing can travel faster than light. For example, light from the sun travels 93 million miles to reach Earth. This trip takes just 8 minutes and 20 seconds!

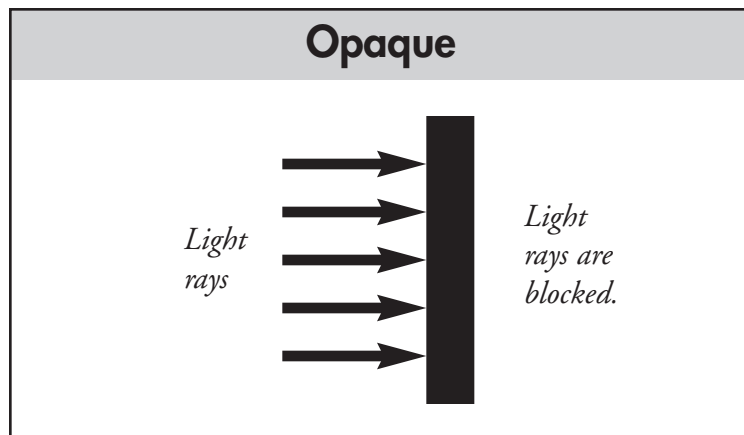
Light travels in a straight line. The rays of light coming through a window are straight. At night, car headlights light up things in front of the car. The headlight beams do not shine on things around a bend. The light rays are straight. Turn on a flashlight in a dark room. Notice that the rays of light are straight.

What are the two main ideas on this page?

Light Can Be Blocked

You know that light travels in a straight line. What happens when light reaches an object?

Some objects block light. Objects that block light are **opaque**. Light rays cannot go through opaque objects. You cannot see through things that are opaque. Opaque materials include wood and steel.



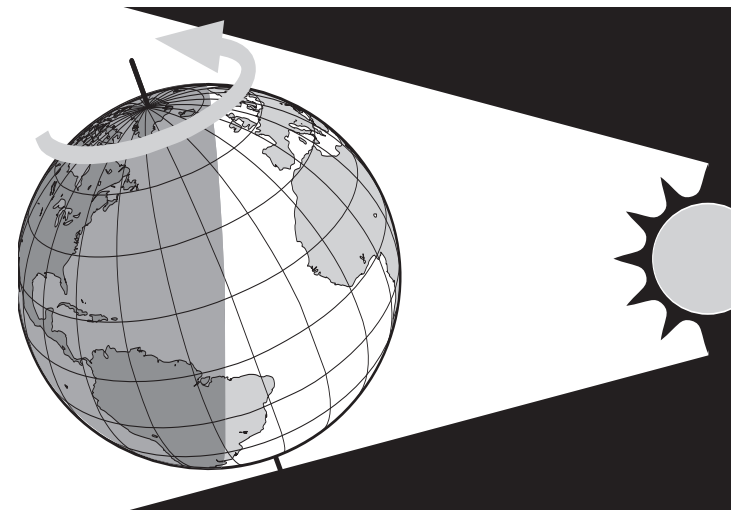
Name some objects that are opaque.

opaque: blocking or reflecting all light

Shadows

When light hits an opaque object, the object blocks the light on the other side. A shadow is formed. You are opaque. The sun cannot shine through you. Your body blocks the rays and makes a shadow.

Earth is also an opaque object. It blocks sunlight. When the sun lights one side of Earth, the other side is in a giant shadow.



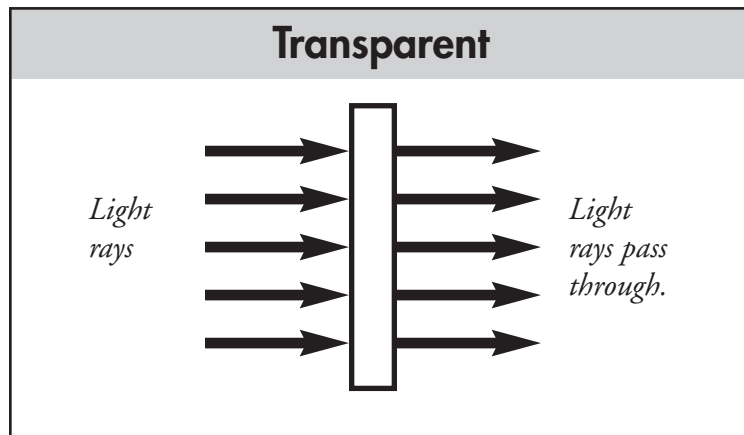
*In which part of Earth is it nighttime?
How can you tell?*

Light Can Pass Through

Most things are opaque. They block light and make a shadow. However, some materials let light through. These materials are transparent or translucent.

Transparent Materials

If an object is transparent, most of the light rays will pass through it. Clear water and glass are transparent.

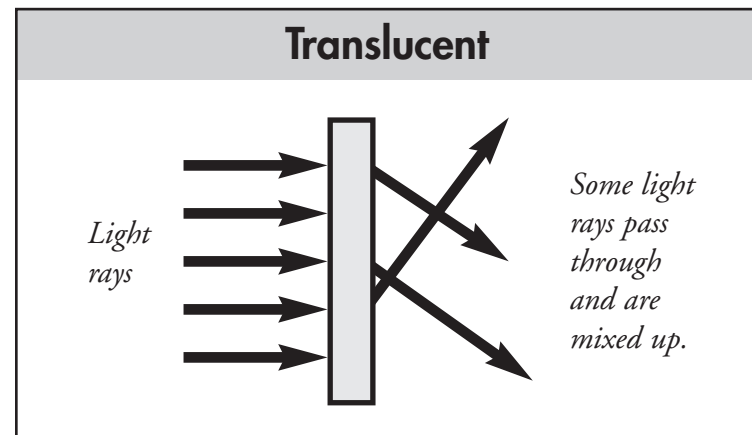


transparent: allowing light to pass through without mixing

Translucent Materials

Translucent materials allow some light to pass through them. They also mix up the light rays. This makes objects look blurry.

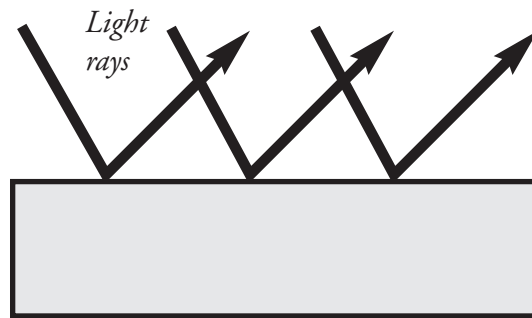
Waxed paper is a translucent material. Ice, some fabrics, and frosted and stained glass are translucent. Window blinds and sunglasses are often made of translucent material.



translucent: allowing light to pass through with mixing

Reflection

Light travels in a straight line until it hits an object. Then light may bounce off an object. This is called reflection.



Reflection

Some objects reflect light better than others. Dark-colored, rough surfaces do not reflect light as well as light-colored, smooth surfaces. For example, coal does not reflect much light, but snow is a good reflector of light. Smooth water and shiny metals are good reflectors of light, too.

The surface of a mirror is very smooth. It reflects light in a way that makes an almost perfect reflection.

Seeing

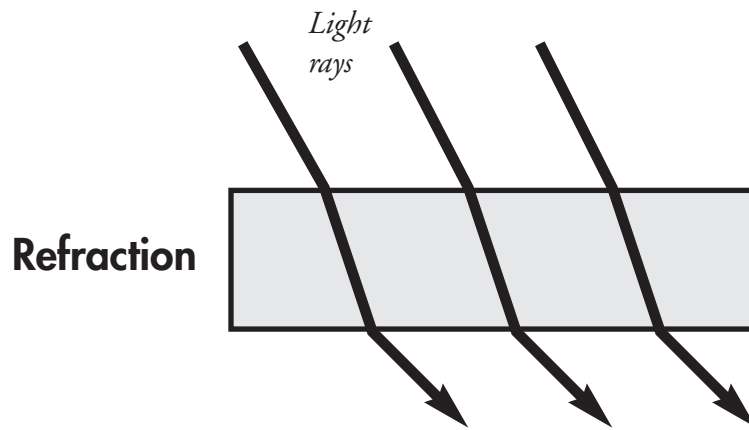
We see things because light rays coming from a source go into our eyes. A light bulb is a light source. We see a light bulb because light rays from it go straight into our eyes. Look up into the night sky. You see stars because they make their own light. This light goes straight to your eyes.

What happens when an object is not a light source? How can you see it?

When this happens, light is reflected off the object and into your eyes. You see most things because light is reflected off the objects and into your eyes.

Refraction

Light rays can bend. This is called refraction. Light rays bend when they change speed. Light rays change speed when they move from one transparent material to another.



For example, light rays slow down and bend when they pass from air into water. Think about standing on the side of a swimming pool. Why might the bottom look closer to you than it really is? It is because the light rays from above bend when they meet the water.

Try This

1. Put a pencil in a glass of water.
2. Write a sentence to describe what the pencil looks like.
3. Write to tell why the pencil looks this way.

Try This with a Friend

1. Get a small cup that you cannot see through.
2. Place a coin in the bottom of the cup.
3. Ask a friend to stand just far enough away so that the coin can no longer be seen.
4. Pour water slowly into the cup.
5. Watch what happens to the coin.
6. Talk with your friend. Try to figure out what made this happen.

Light and Color

The light that comes from the sun or light bulbs looks white. It is called white light. In fact, white light is really made up of many different colors of light called a spectrum. A spectrum is a band of light that has the colors red, orange, yellow, green, blue, indigo, and violet.

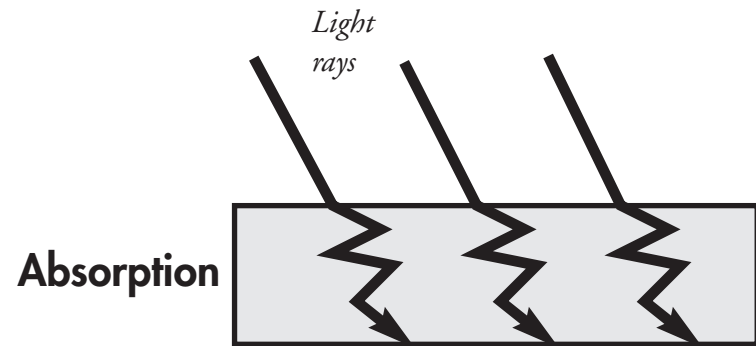
Rainbows

One example of the color spectrum is a rainbow. The seven spectrum colors are the colors of a rainbow. Have you ever wondered where rainbows come from?

After a rainstorm, the air is filled with water droplets. Rainbows happen when sunlight shines through these water droplets. The water droplets refract and split the light into all the colors of the spectrum. Then, you see the colors of a rainbow in the sky!

Absorption

You know that objects can reflect or bend light. Objects can also soak up, or absorb light.



Why do things have a certain color? When white light hits a banana, all of the colors of the spectrum are absorbed—except yellow. Yellow is reflected. This makes the banana look yellow.

Why does grass look green? Explain why to a friend.

Using Light

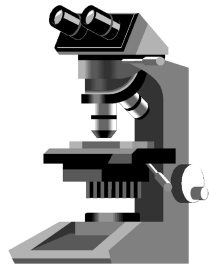
Telescopes

Telescopes bend light so people can see faraway objects. Scientists use telescopes to study the planets and the stars.



Microscopes

Look at the drawing of the microscope. Microscopes bend light so that people can see very small objects.



*How might you use a telescope?
Who might use a microscope?*

Lasers

Lasers are very thin beams of light. Lasers have many uses. In stores, lasers scan bar codes to show the product name and the price. In hospitals, lasers can be used like very sharp blades to cut into the eye and other body parts. In factories, lasers can cut through thick sheets of steel.

Optical Fibers

Light can travel through glass threads called optical fibers. Optical fibers are used to make telephones, televisions, and computers work.

Solar Energy

Solar panels on buildings collect sunlight and change it into electricity. The electricity is used to power things.

Fun with Light

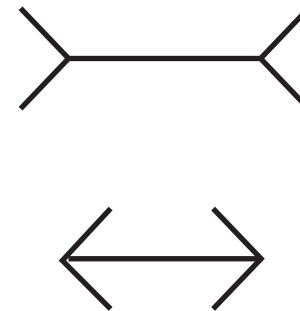
How far away is a rainstorm? Start counting slowly when you see a flash of lightning. When you hear thunder, stop. The storm is about one mile away for every count of five.

Look at your own shadow on the sidewalk. Ask a friend to use chalk to draw around your shadow. How is the shadow like the shape of your body? How is it different?

How is a CD like a rainbow? Turn and tilt the back side of a CD to find out.

Optical Illusions

Optical illusions are fun. They trick the eye. Optical illusions show the difference between what your brain expects and what your eyes see. Look at the two straight lines below. Which one do you think is longer?



Now use a ruler to measure the straight lines. What do you find out about the length of the lines?

Glossary

artificial—made by humans, not by nature

natural—made by nature, not by humans

opaque—blocking or reflecting all light

translucent—allowing light to pass through with mixing

transparent—allowing light to pass through without mixing

To Find Out More . . .

Want to learn more about light?

Try these books

Light by Darlene R Stille. Child's World, 2005.

Light: From Sun to Bulbs by Christopher Cooper. Heinemann, 2003.

Access these Web sites

See the Light

<http://library.thinkquest.org/13405/index.html>

Optical Research Associates

Optics for Kids: The Science and Engineering Behind It

http://www.opticalres.com/kidoptx_f.html

Write for more information

The Exploratorium

3601 Lyon Street

San Francisco, CA 94123

415-397-5673

Museum of Science and Industry

57th Street and Lake Shore Drive

Chicago, IL 60637-2093

773-684-1414

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ENGLISH-LANGUAGE ARTS • GRADE 3

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Vocabulary and Concept Development: 1.8
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.5
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Below Level

English-language Arts Activities

What Is Light?

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

Main Ideas

TRY THE SKILL

The main idea is the most important point of a paragraph. All paragraphs should have a main idea.

Read these paragraphs. Try to identify the main idea.

The sun is a star that gives off light. Natural light comes from the sun. The sun is the biggest source of light on Earth. Other stars are also sources of natural light. Natural light comes from lightning, wildfires, and even fireflies.

What is the main idea?

The sun and stars are sources of natural light.

Try another one. What is the main idea?

Light travels very fast. Nothing can travel faster than light. For example, light from the sun travels 93 million miles to reach Earth. This trip takes just 8 minutes and 20 seconds!

What is the main idea?

Light travels very fast.

To practice determining the main idea, read the following paragraph. Then write the main idea in your own words.

When light hits an opaque object, the object blocks the light on the other side. A shadow is formed. You are opaque. The sun cannot shine through you. Your body blocks the rays and makes a shadow.

What is the main idea of this paragraph?

Roots and Prefixes

TRY THE SKILL

In this book, you learned the meanings of several new words. You can use that knowledge to figure out the meanings of even more words. For example, study these prefixes and root words:

trans- is a prefix meaning “across”

Examples: translucent, transparent

e- is a prefix meaning “out or away”

Examples: emit, erupt

re- is a prefix meaning “again or back”

Examples: refract, reflect

vis and *vid* are roots meaning “see”

Examples: visible, video

opt is a root meaning “eye”

Example: optical

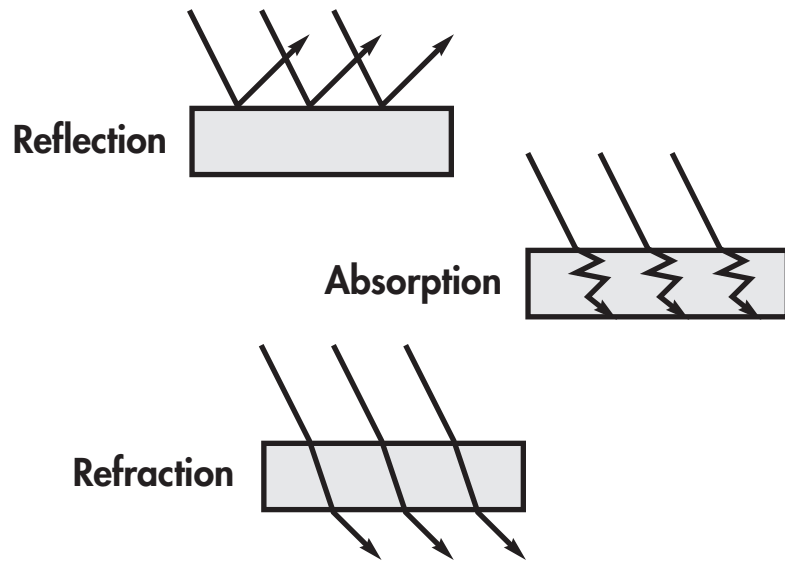
Choose the word that best matches the definition.

- a doctor who helps people see
Ⓐ evidence Ⓒ emigrant
Ⓑ optician Ⓓ revision
- a person who leaves his or her homeland
Ⓐ evidence
Ⓑ optician
Ⓒ emigrant
Ⓓ transcribe
- to change something from one language to another
Ⓐ evidence
Ⓑ optician
Ⓒ emigrant
Ⓓ transcribe
- clues found by a detective
Ⓐ evidence
Ⓑ rebate
Ⓒ revision
Ⓓ transcribe
- to get money back after you buy something
Ⓐ evidence
Ⓑ rebate
Ⓒ emigrant
Ⓓ revision

Interpret Graphics

TRY THE SKILL

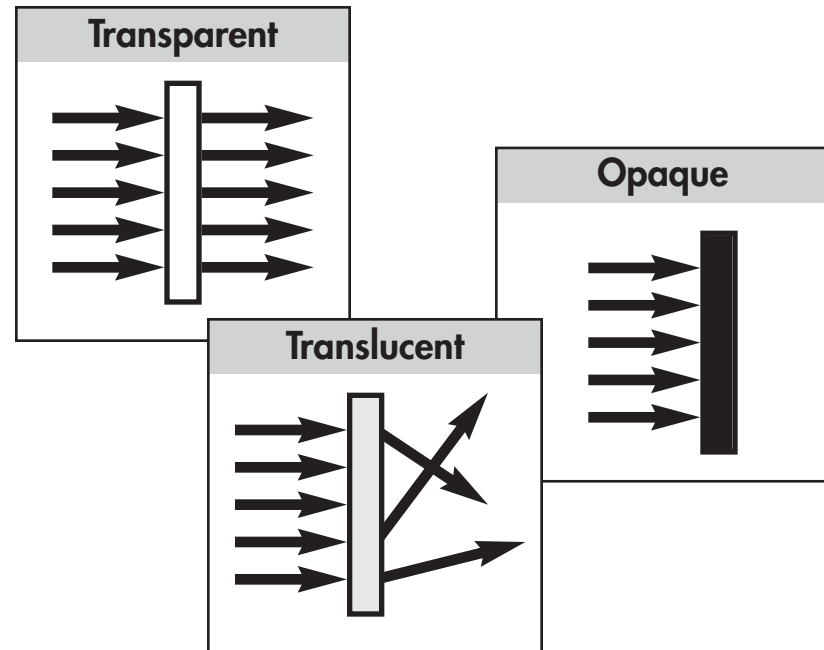
Graphics can give you information quickly and help you understand how something works. Look at this graphic showing what happens when light hits different objects.



What does this graphic show you about light?

- Light can reflect or bounce off an object.
- Light can be absorbed and not pass through an object.
- Light can refract, or bend, when passing through an object.

Study this graphic from *Light Is Energy*. What does it tell you about different types of materials? Write about it.



Use a Dictionary

TRY THE SKILL

What should you do if you don't know what a word means or if you do not know how to pronounce a word? You can look in the dictionary.

Read these words from *Light Is Energy*? Draw a line to match each word with its meaning. If you don't know the meaning, look the word up in a dictionary.

Words

1	emit
2	opaque
3	theory
4	refract
5	translucent
6	reflect
7	transparent

Meanings

A	to bounce off a surface
B	an explanation that can be confirmed
C	allowing light to pass through with mixing
E	to bend
F	allowing light to pass through without mixing
H	to send out
I	blocking or reflecting all light

Answer Key

Main Ideas

Shadows form when light hits an opaque surface.

Roots and Prefixes

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

Interpret Graphics

Transparent materials let light pass through them with mixing light rays

Translucent materials let light pass through them but mix up the light rays.

Opaque materials block or reflect all light.

Use a Dictionary

1. H
2. I
3. B
4. E
5. C
6. A
7. F