21st CENTURY SKILLS

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# STEAM Reading

## High Elementary

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Matthew Broadhurst
Virginia Marconi

21st CENTURY SKILLS

# STEAM Reading

## High Elementary

Science Technology Engineering Arts Math

2

Matthew Broadhurst
Virginia Marconi

# HOW TO USE THIS BOOK

STUDENT BOOK


I will learn... about electricity and how it flows.

# THE FLOW OF ELECTRICITY

Scan for Audio

**WARM-UP**

What happens when you plug in a lamp?

## KEY WORDS

**A** Look, listen, and repeat. 19

*n.* electricity

*adj.* electrical

*n.* circuit

*n.* electric current

*n.* wire

*v.* connect

*n.* conductor

*adj.* complete

**B** Listen and number the words. 20

## READING

**Listen and read.** 21

Scan for Video

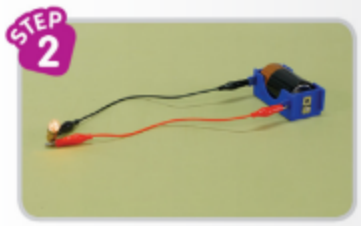
How does electricity flow? First, it needs an electrical circuit. The electricity flowing through the circuit is called an electric current.

Can we make a circuit to turn on a light bulb? Prepare a battery, wires, and a light bulb.

Let's make two different circuits.

**Circuit 1**


Get two wires. Connect one end of each wire to each pole of the battery (+/-).




Connect the other ends of the wires to the light bulb. What happens?



**1 STEAM**

Units are grouped together in pairs. Each pair of units has lessons on the same subject. Every unit focuses on one or more aspects of STEAM (Science, Technology, Engineering, Arts, Math).

**2 I WILL LEARN...**

The academic objective of the unit is introduced to get students thinking.

**3 QR CODES**

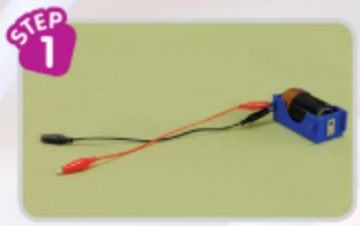
Scan the audio QR CODE to listen to the key words and reading passages. In the experiment units, scan the video QR CODE to watch a video of a real experiment.

**Video Experiments**

Live-action videos take students step-by-step through all science experiments. This visual aid enhances their learning experience and makes the topic come alive.

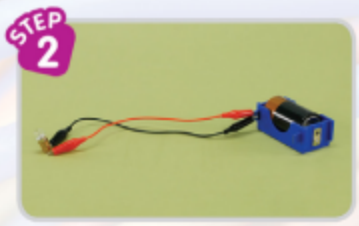
Circuit 2

STEP 1



Get two wires. Connect one end of two wires to one pole of the battery.

STEP 2



Connect the other ends of the wires to the bulb. What happens?

When did the bulb light up? It only turned on in Circuit 1.

Why do you think that was?

An electrical circuit needs certain things.

1. The battery, wires, and bulb should all be connected.
2. The electrical conductors should be connected to both poles of the battery.
3. The light bulb should be connected to both conductors.

In Circuit 2, only one pole of the battery was connected.

The bulb didn't turn on because the electrical circuit wasn't complete.

The electricity couldn't flow.

Take the battery, wires, and light bulb again. What other circuits could you make with them?

**C Read and choose.**

1. What does It mean in the reading?
   a. the bulb  b. the battery  c. the wire
2. What does complete mean in the reading?
   a. unfinished  b. complicated  c. finished



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**4 KEY WORDS**
Every unit introduces new KEY WORDS that are necessary to understand the unit's topic. All key words are found in the READING and are illustrated with a photograph.

**5 READING**
Each READING is an introduction to the topic of the unit. The first unit in a pair introduces the subject through an experiment. The experiment is illustrated and easy to follow. The second unit features an engaging short story on the same topic.

**6 SHORT ACTIVITIES**
Short activities focus attention on the KEY WORDS and check understanding.

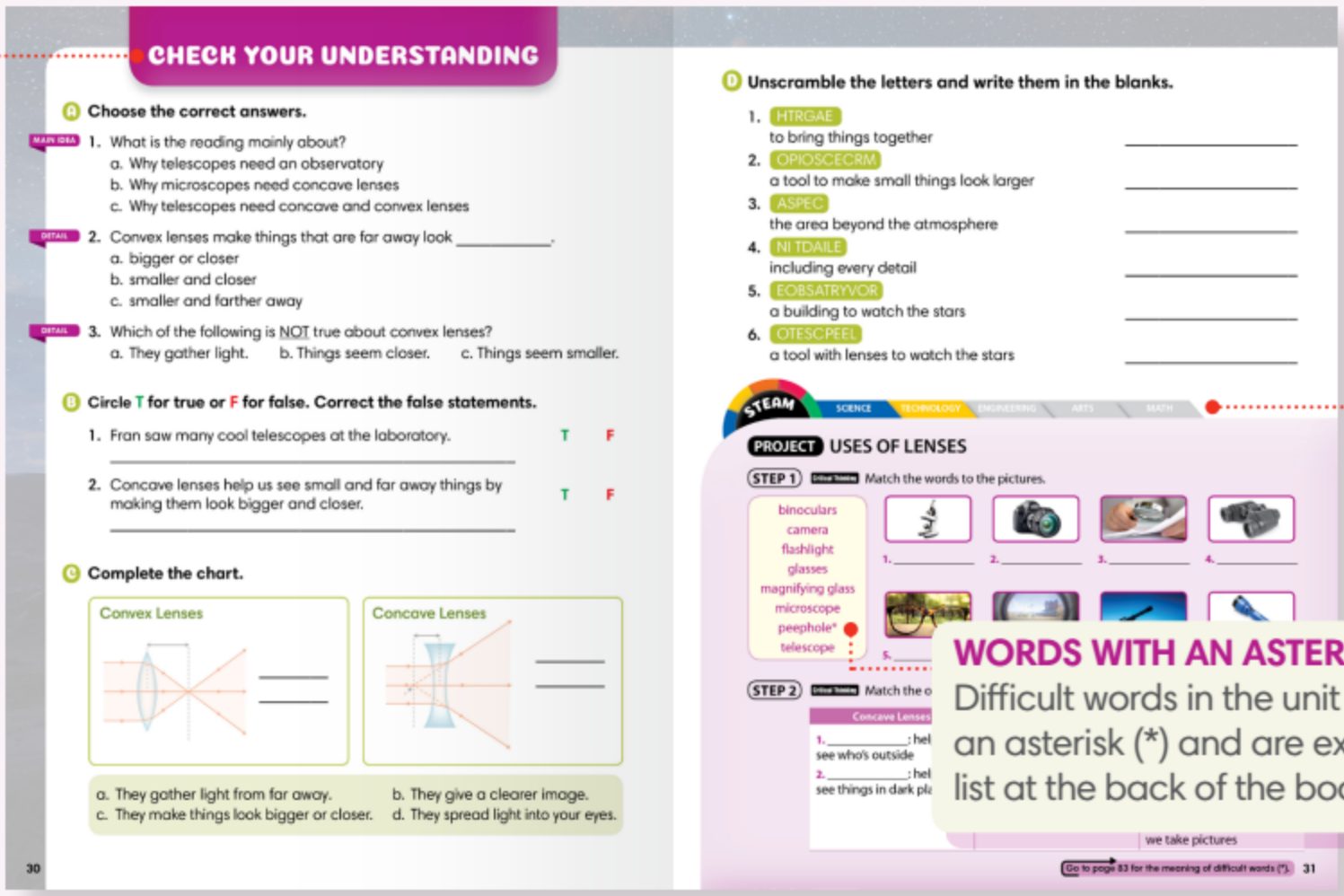
# HOW TO USE THIS BOOK

## CHECK YOUR UNDERSTANDING

This section features a range of activities to check both reading comprehension and understanding of the unit vocabulary.

## STEAM PROJECT

The STEAM PROJECT ends the unit with a fun and interactive project that encourages individual creativity as well as collaboration. Project types include experiments, math problems, and arts & crafts. Experimental projects have a video available via QR code. Further explanation for certain projects can be found in the PROJECT REFERENCE at the end of the book.



CHECK YOUR UNDERSTANDING

A Choose the correct answers.

MAIN IDEA 1. What is the reading mainly about?
a. Why telescopes need an observatory
b. Why microscopes need concave lenses
c. Why telescopes need concave and convex lenses

DETAIL 2. Convex lenses make things that are far away look _____.
a. bigger or closer
b. smaller and closer
c. smaller and farther away

DETAIL 3. Which of the following is NOT true about convex lenses?
a. They gather light. b. Things seem closer. c. Things seem smaller.

B Circle T for true or F for false. Correct the false statements.

1. Fran saw many cool telescopes at the laboratory. T F
_____
2. Concave lenses help us see small and far away things by making them look bigger and closer. T F
_____

C Complete the chart.

| Convex Lenses | Concave Lenses |
|---|---|
|  |  |
| _____ | _____ |
| | _____ |

a. They gather light from far away. b. They give a clearer image.
c. They make things look bigger or closer. d. They spread light into your eyes.

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D Unscramble the letters and write them in the blanks.

1. HTRGAE — to bring things together _____
2. OPIOSCECRM — a tool to make small things look larger _____
3. ASPEC — the area beyond the atmosphere _____
4. NI TDAILE — including every detail _____
5. EOBSATRYVOR — a building to watch the stars _____
6. OTESCPEEL — a tool with lenses to watch the stars _____

STEAM SCIENCE TECHNOLOGY ENGINEERING ARTS MATH

PROJECT USES OF LENSES

STEP 1 Match the words to the pictures.

binoculars
camera
flashlight
glasses
magnifying glass
microscope
peephole*
telescope

1. _____ 2. _____ 3. _____ 4. _____ 5. _____

STEP 2 Match the o

Concave Lenses

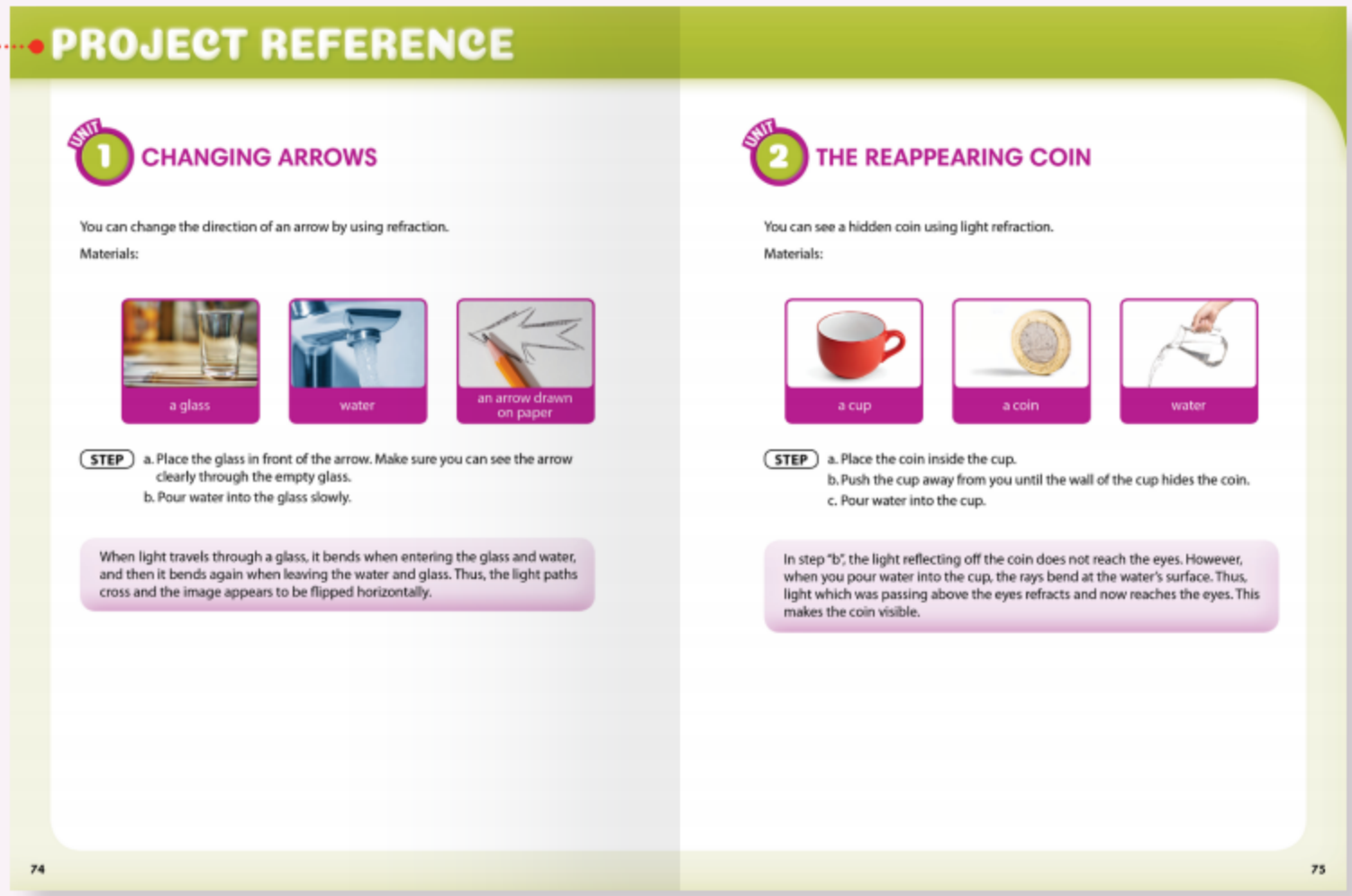
1. _____; hel
see who's outside
2. _____; hel
see things in dark pla

we take pictures

Go to page 83 for the meaning of difficult words (*). 31

## WORDS WITH AN ASTERISK (*)

Difficult words in the unit are marked with an asterisk (*) and are explained in a word list at the back of the book.



PROJECT REFERENCE

UNIT 1 CHANGING ARROWS

You can change the direction of an arrow by using refraction.

Materials:


a glass


water


an arrow drawn on paper

STEP a. Place the glass in front of the arrow. Make sure you can see the arrow clearly through the empty glass.
b. Pour water into the glass slowly.

When light travels through a glass, it bends when entering the glass and water, and then it bends again when leaving the water and glass. Thus, the light paths cross and the image appears to be flipped horizontally.

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UNIT 2 THE REAPPEARING COIN

You can see a hidden coin using light refraction.

Materials:


a cup


a coin


water

STEP a. Place the coin inside the cup.
b. Push the cup away from you until the wall of the cup hides the coin.
c. Pour water into the cup.

In step "b", the light reflecting off the coin does not reach the eyes. However, when you pour water into the cup, the rays bend at the water's surface. Thus, light which was passing above the eyes refracts and now reaches the eyes. This makes the coin visible.

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## PROJECT REFERENCE

PROJECT REFERENCE pages go into further detail of the concepts behind the project.

# WORKBOOK

**VOCABULARY PRACTICE**
This checks students' understanding of the key words introduced in the Student Book unit.

**COMPREHENSION PRACTICE**
These questions focus on a passage from the reading and check students' understanding of the text.

## 2 TALL BOY, SHORT LEGS

### VOCABULARY PRACTICE

**A Circle the correct words.**

1. 
Because of refraction / instruction / reflection, objects appear different when you look at them through water.

2. 
You have to use your strength / brain / legs to solve this math problem.

3. 
The boy is drawing lines / pools / legs on the road using colorful chalk.

4. 
The children were swimming in the lawn / classroom / swimming pool because it was hot outside.

**B Choose the correct words.**

1. Betty is our school champion. She can _____ from a 15-meter platform.
   a. dive  b. refract  c. walk
2. It's _____ that Fred's wearing his left shoe on his right foot.
   a. in advance  b. late  c. funny
3. The _____ class passed the test, so their teacher is very happy.
   a. part  b. entire  c. no one
4. _____, please. Dr. White is waiting for you.
   a. Come in  b. Open the window  c. Go out

### COMPREHENSION PRACTICE

**Read the following passage and choose the correct answers.**

① Amy said, "It's because of light (a)_____. Light goes into the water and slows down. It changes (b)_____." ② "The light from the sun bounces off your legs in the water. Our brain only sees light as a straight line. It doesn't know the light has been refracted. So your legs look curved and strange." ③

1. Find the words that best fit in the blanks.
   a. (a) refraction  (b) density
   b. (a) energy  (b) direction
   c. (a) refraction  (b) direction
2. What is the best place for the sentence below?
   "Why does that make my legs look strange?"
   a. ①  b. ②  c. ③
3. What does It mean in the passage?
   a. sun  b. light  c. brain

### SUMMARY

**Complete the summary. One word is not used.**

brains  come in  curved  dive  funny  refraction  swimming pool  tallest

Rick, Ted, and Amy went to the 1. _____ because it was very hot. When they arrived, Rick was the first to 2. _____ into the water. He looked at his legs and was surprised. They looked really 3. _____! Rick was the 4. _____ boy in the entire school. But his legs looked short and wide. Amy explained that this was because of light 5. _____. She said that as light goes into the water, it slows down and changes direction. Our 6. _____ don't understand this. This is why Rick's legs looked 7. _____ and shorter than they really were.




**SUMMARY**
This is a recap of the unit's reading passage. Students are able to check their understanding of the ideas introduced in the unit.

# TABLE OF CONTENTS

| UNIT / PAGE | STEAM | DETAILS | |
|---|---|---|---|
| 9 Page 40 | S | Title | MORE BATTERIES / WC: 133 |
| | T | Academic Objective | Learn more about electrical circuits and batteries |
| | E | Vocabulary | series, connection, parallel, remaining, brightness, voltage, strong, last |
| | A | STEAM Project | How Can We Make Holiday Lights? |
| | M | | **21st Century Skills:** Critical Thinking, Communication |
| 10 Page 44 | S | Title | ELECTRICITY EVERYWHERE / WC: 169 |
| | T | Academic Objective | Learn more about things that use electricity |
| | E | Vocabulary | heater, run, plug, outlet, throw, grocery store, electronics, overheat |
| | A | STEAM Project | Why and How Should We Save Electricity? |
| | M | | **21st Century Skills:** Critical Thinking, Creativity, Communication |
| 11 Page 48 | S | Title | SEA BREEZE AND LAND BREEZE / WC: 181 |
| | T | Academic Objective | Learn about the difference between a land breeze and a sea breeze |
| | E | Vocabulary | daytime, sea breeze, land breeze, lamp, heated, movement, heat up, create |
| | A | STEAM Project | Flowing Air |
| | M | | **21st Century Skills:** Critical Thinking |
| 12 Page 52 | S | Title | FLYING A KITE / WC: 172 |
| | T | Academic Objective | Learn more about a land breeze and a sea breeze |
| | E | Vocabulary | take a trip, kite, above, from A to B, check out, dinner, go out, flow |
| | A | STEAM Project | Make a Kite |
| | M | | **21st Century Skills:** Creativity, Communication |
| 13 Page 56 | S | Title | THE HEIGHT OF THE SUN / WC: 156 |
| | T | Academic Objective | Learn about the height of the sun and the seasons |
| | E | Vocabulary | differ, season, steep, angle, shallow, once, heat energy, rise |
| | A | STEAM Project | The Sun and The Seasons |
| | M | | **21st Century Skills:** Critical Thinking, Communication |
| 14 Page 60 | S | Title | THE LENGTH OF THE DAY / WC: 166 |
| | T | Academic Objective | Learn about solar altitude |
| | E | Vocabulary | set, bright, solar altitude, during, at an angle, revolve, maximum, minimum |
| | A | STEAM Project | How to Read a Climate Graph |
| | M | | **21st Century Skills:** Critical Thinking |
| 15 Page 64 | S | Title | ELECTRICITY FROM THE SUN / WC: 159 |
| | T | Academic Objective | Learn about changing sunlight into electricity |
| | E | Vocabulary | imagine, coal, climate change, solar, effective, plan, implement, essential |
| | A | STEAM Project | How Solar Panels Work |
| | M | | **21st Century Skills:** Critical Thinking, Communication |
| 16 Page 68 | S | Title | WEB DEVELOPER / WC: 158 |
| | T | Academic Objective | Learn about developing a website |
| | E | Vocabulary | website, crash, manage, scroll, sell out, annoying, technical, load |
| | A | STEAM Project | What Can You Do on the Internet? |
| | M | | **21st Century Skills:** Critical Thinking, Creativity, Communication |

• Project Reference / Page 74 • Word List / Page 80

STEAM 1

I will learn... about light refraction.

# BROKEN CHOPSTICK

Scan for Audio

## WARM-UP

What does it look like when you put a pencil in a glass of water?

## KEY WORDS

**A** Look, listen, and repeat. 01

*n.* lawn

*v.* pass


*phr.* slow down

*v.* enter

*v.* refract

*adv.* slightly

*n.* position

*adj.* focused

**B** Listen and number the words. 02

## READING

**Listen and read.** 03

Scan for Video

A car is driving along the road. What happens if it drives onto someone's lawn?

The speed of the car changes. The road and the lawn are made of different things. The car turns, too.

What about light? It's the same for light.

Light passes through many materials. They change its speed.

Water is denser than air. Because of this, light slows down when it enters water. It refracts the light. The light changes direction.

When we look at an object inside water, it looks different. Light refraction changes how it looks.


Prepare a solid cup and a chopstick.

Put the chopstick into the empty cup. You can see the straight chopstick.

Now, fill the cup with water and put in the chopstick. What does it look like now?

Did the chopstick look straight when it was inside the water?

No, it didn't. It looked bent. It looked like the chopstick was broken. The chopstick in the water also looked slightly wider.

Why is this? Light changed direction when it entered the water. When the light reflected from the chopstick hit our eyes, it looked like the chopstick was in a different position. Refracted light is focused. It makes things look bigger. So the chopstick looked wider, too.

## C Read and choose.

1. Which is the opposite of slow down?
   a. speed up  b. sit down  c. fall down

2. What does It mean in the reading?
   a. the water  b. the air  c. the chopstick

# CHECK YOUR UNDERSTANDING

## A Choose the correct answers.

MAIN IDEA

1. What is the main purpose of the reading?
   a. To explain how light reflects as it goes through air
   b. To explain how light refracts as it goes through water
   c. To explain how light doesn't change when it goes through water

DETAIL

2. The chopstick looks bent because _____.
   a. refracted air looks bigger
   b. refracted air changes its position
   c. light changed direction when it entered water

DETAIL

3. Which of the following does light NOT do when it passes through water?
   a. Refract  b. Boil  c. Slow down

## B Circle T for true or F for false. Correct the false statements.

1. Light slows down when it enters air because it is denser than water. T F

   _____

2. When you put a chopstick in water, it looks bent and slightly narrower. T F

   _____

## C Number the pictures in the correct order.

The chopstick looks broken and slightly wider.

Fill the cup with water.



Now, put the chopstick in the cup with water.

Put a chopstick into an empty cup. The chopstick is straight.

## D Unscramble the letters and write them in the blanks.

1. SPSA
   to move past something _____
2. LWOS NODW
   to move slower than before _____
3. RETNE
   to go into a place _____
4. WNAL
   ground covered with grass _____
5. YSIGHLTL
   only a little _____
6. TRERFAC
   to change direction after hitting water _____

STEAM — SCIENCE | TECHNOLOGY | ENGINEERING | ARTS | MATH

## PROJECT CHANGING ARROWS

Scan for Video

To do this experiment, you will need:

a glass

water

an arrow drawn on paper

**STEP 1** Critical Thinking

a. Place the glass in front of the arrow. Make sure you can see the arrow clearly through the empty glass.

b. Pour water into the glass slowly.

Q. What happens?

A. The arrow **changes** / **doesn't change** direction.

**STEP 2** Critical Thinking Why does this happen?

Refraction is the bending of light as it **stays** / **passes** from one transparent substance into another. When light **enters** / **comes out of** the water in the glass, it bends. It bends again when it leaves the water and the glass. As a result, the light paths cross and the image appears to be flipped **horizontally** / **vertically**.

**STEP 3** Critical Thinking Communication Creativity Draw more arrows on paper and repeat the experiment with your friend. What do you see?

Go to page 74 to see the Project Reference.