SCIENCE • GRADE 5

Science Content Standards
Earth Sciences: 4.A
Earth Sciences: 4.B
Earth Sciences: 4.E

Below Level

The Air Around Us

LOOK INSIDE FOR:

- California's Academic Content Standards Covered
- Reproducible Student Book
- Reproducible English-language Arts Activities

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The Air Around Us
California's Content Standards Met

GRADE 5 SCIENCE

EARTH SCIENCES: 4—Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept:

a. Students know uneven heating of Earth causes air movements (convection currents).

b. Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.

e. Students know that the Earth's atmosphere exerts a pressure that decreases with the distance above the Earth's surface and that at any point it exerts this pressure equally in all directions.

GRADE 5 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

***Vocabulary and Concept Development 1.3*—**Understand and explain frequently used synonyms, antonyms, and homographs.

***Vocabulary and Concept Development 1.4*—**Know abstract, derived roots and affixes from Greek and Latin and use this knowledge to analyze the meaning of complex words (e.g., controversial).

2.0 READING COMPREHENSION

***Structural Features of Informational Materials 2.1*—**Understand how text features (e.g., format, graphics, sequence, diagrams, illustrations, charts, maps) make information accessible and usable.

***Comprehension and Analysis of Grade-Level-Appropriate Text 2.3*—**Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.

SCIENCE • GRADE 5

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Student Book

The Air Around Us

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.

BL

The Air Around Us

California's Content Standards Met

GRADE 5 SCIENCE

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GRADE 5 ENGLISH LANGUAGE ARTS

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FOCUS ON CALIFORNIA STANDARDS

SCIENCE • GRADE 5

California Content Standards
Earth Sciences: 4.A
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Earth Sciences: 4.E

The Air Around Us

by

Caitlin Scott

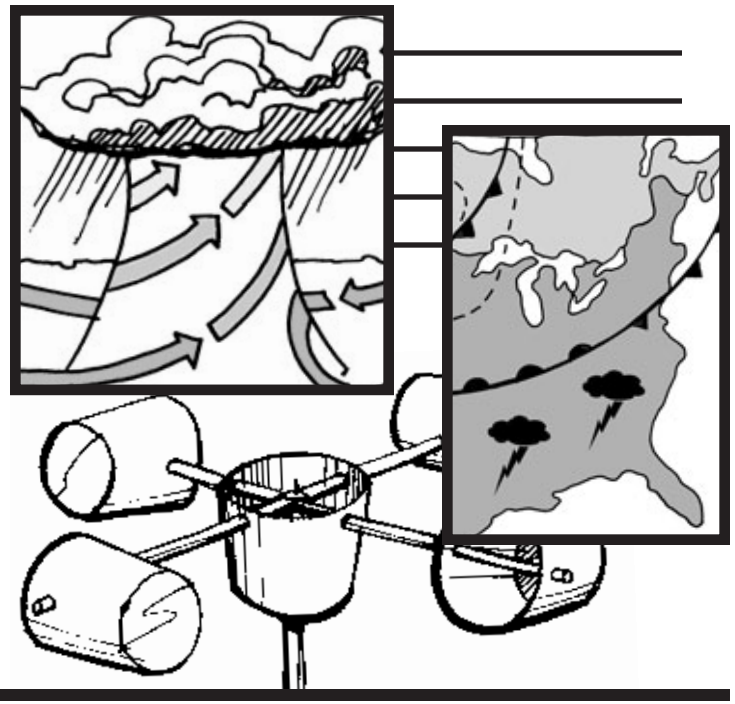

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Table of Contents

Introduction:
What Is Air? 4
Try This. 5
We Need Air to Survive. 7

Chapter 1:
Air and Weather. 8
Air Pressure Changes 10
Barometers Measure Air Pressure 13
Predicting the Weather 15

Chapter 2:
Air, Water, and Weather 16

Chapter 3:
Women in Science 20

Glossary 22
To Find Out More 23
Index 24

What do you think you will learn from this book?

INTRODUCTION

What Is Air?

It is all around you. It is totally **invisible**. But without it, you would die in minutes. What is it? We call it air.

How can we be sure that air exists? We can't see air. But, we know it exists, because it takes up space. Imagine blowing up a balloon. First, the balloon is flat and wrinkly. After you blow it up, the balloon is big and smooth. What is inside the balloon? Air.

invisible: not able to be seen

Try This

Here is an experiment you can do to prove that air exists and takes up space.

What You Need

- plastic bag
- large glass jar
- rubber band

What You Do First

1. Check the plastic bag to make sure there are no holes in it.
2. Fill the bag with air by blowing into it.
3. Attach the bag filled with air to the top of the jar with the rubber band. Be sure the rubber band is tight around the bag and jar so no air escapes from the bag.

4. Predict what will happen if you push the bag into the jar.

5. Try to push the bag into the jar. Be careful not to pop the bag.

6. Record your observations.

What You Do Next

1. Remove the rubber band and plastic bag from the jar.

2. Place the bag inside the jar and attach the bag to the jar with the rubber band. Again, be sure the bag is tight around the jar and that no air can escape.

3. Predict what will happen if you try to pull the bag out of the jar.

4. Try to pull the bag out of the jar. Record your observations.

Think About It

1. What was the effect of air when you pushed or pulled on the bag?

2. Does air take up space?

We Need Air to Survive

Air is made of **gases**. The air we breathe is mostly nitrogen and oxygen. You can not see these gases, but they are there. We need them to **survive**.

When we inhale, our bodies use the oxygen in the air to get energy from food we eat. When we exhale, we breathe out unused nitrogen, some oxygen, and carbon dioxide. The carbon dioxide is a waste product from the process of getting energy from food. This is called **respiration**.

Green plants need this carbon dioxide to grow and make food. Earth needs just the right balance of gases in the air, so that all plants and animals can survive.

gases: matter that has no shape; gases spread out to fill the space around them; most cannot be seen
survive: to continue to live
respiration: how living things get energy from food and oxygen

CHAPTER 1

Air and Weather

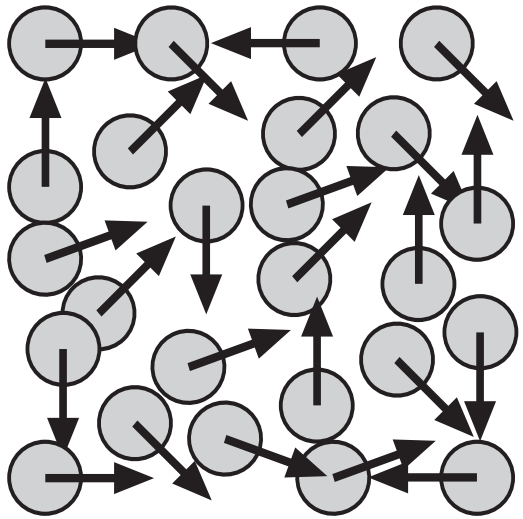
A light breeze cools you on a hot day. A strong wind is great for kites. But why do you think the wind blows? One reason is air pressure.

When your friend squeezes your arm, you feel pressure. Air pressure does the same thing. It puts pressure on you. You just don't feel air pressure the same way you feel a squeeze from your friend.

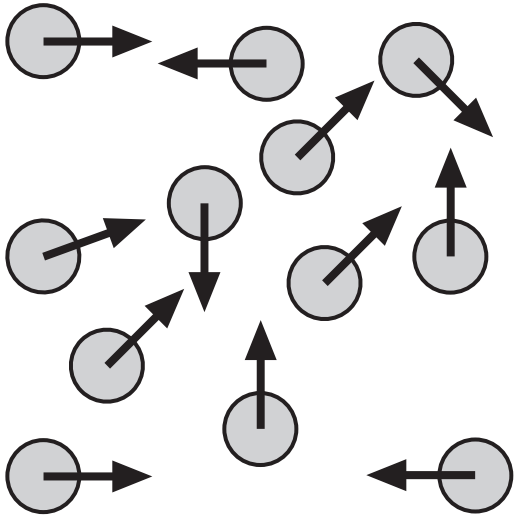
When air **molecules** are close together, they are at higher pressure. When they are spread out, they are at lower pressure. For example, the molecules inside a full balloon are close together. They are at a higher pressure than the molecules outside the balloon.

molecule: the smallest part of a substance

Air Molecules Under High Pressure



Air Molecules Under Low Pressure

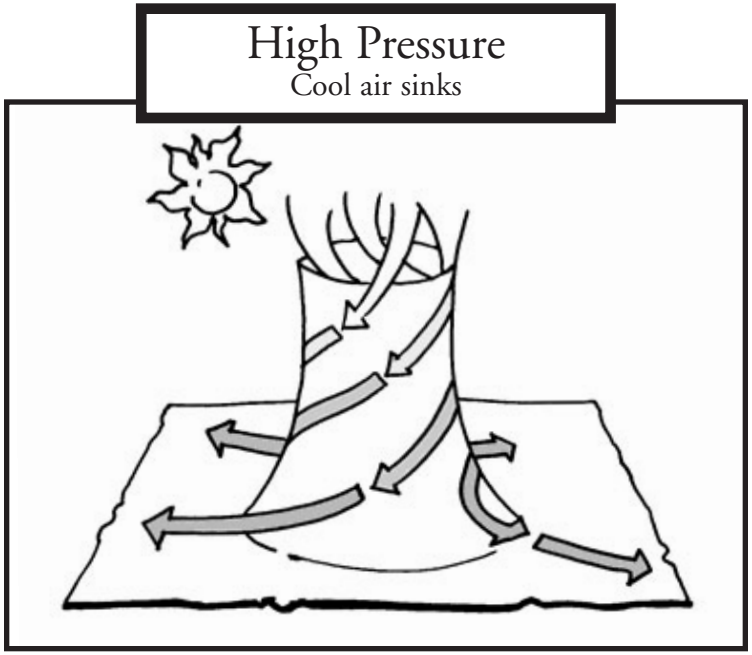


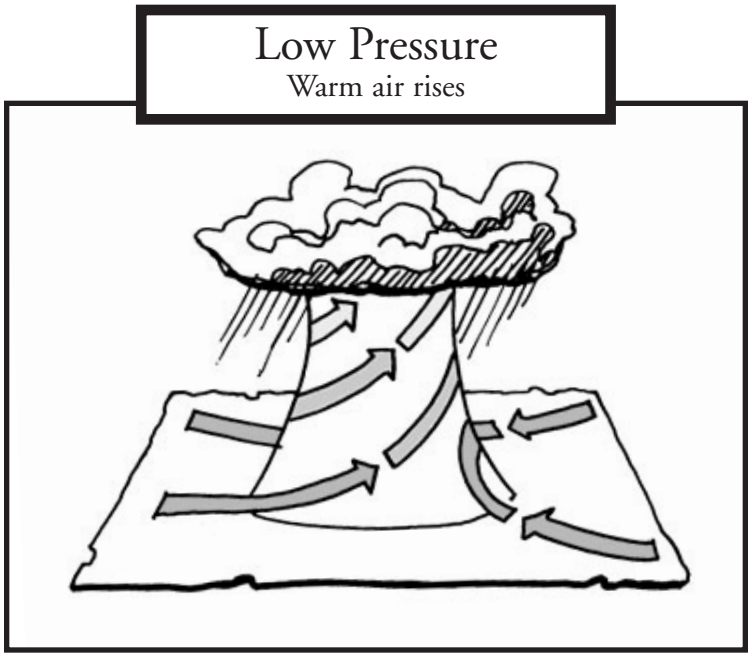
Air Pressure Changes

Air pressure often changes when the weather changes. Falling air pressure could mean bad weather. Rising air pressure often means good weather.

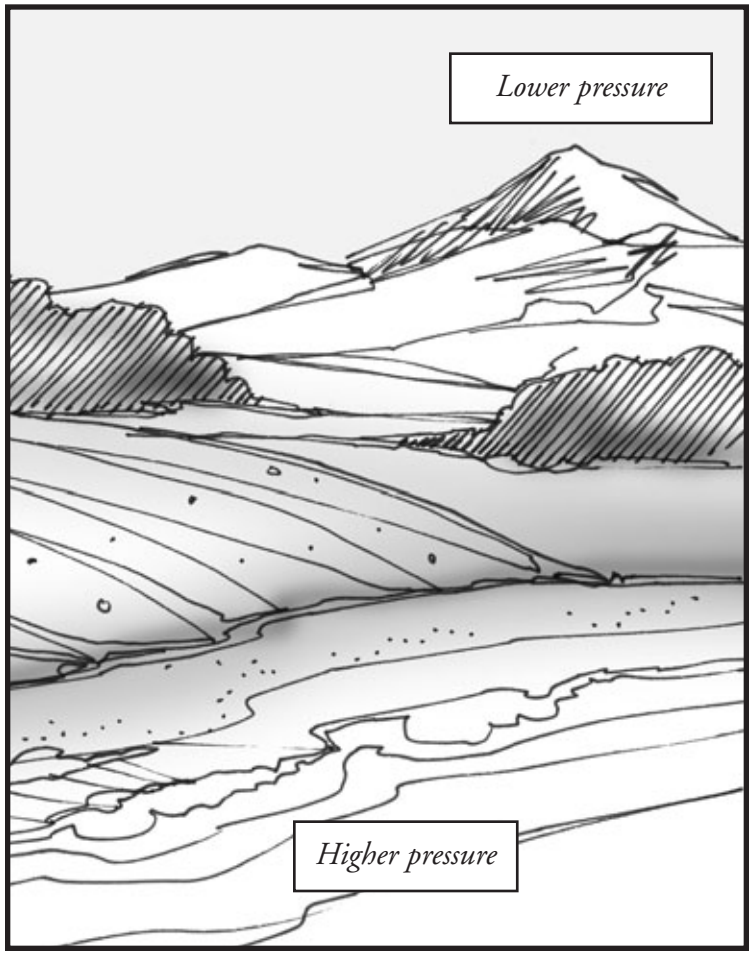
The column of air is higher and heavier in a high pressure area. This causes the air to move downward. As the air becomes more tightly packed together, it warms up. This warm air spreads out, usually bringing nice weather.

The column of air is lower in a low pressure area compared to a high pressure area. Air moving in from a high pressure area moves in and pushes air up in a low pressure area. The rising warm air may also pick up moisture from Earth. When the warm, moist air hits cooler air higher up, it forms clouds. This is why low pressure can sometimes bring rain.





Air pressure is all around. But, it gets weaker the further the air is from the Earth's surface. That is why air pressure is higher over the ocean or in a valley than it is at the top of a high mountain.



Barometers Measure Air Pressure

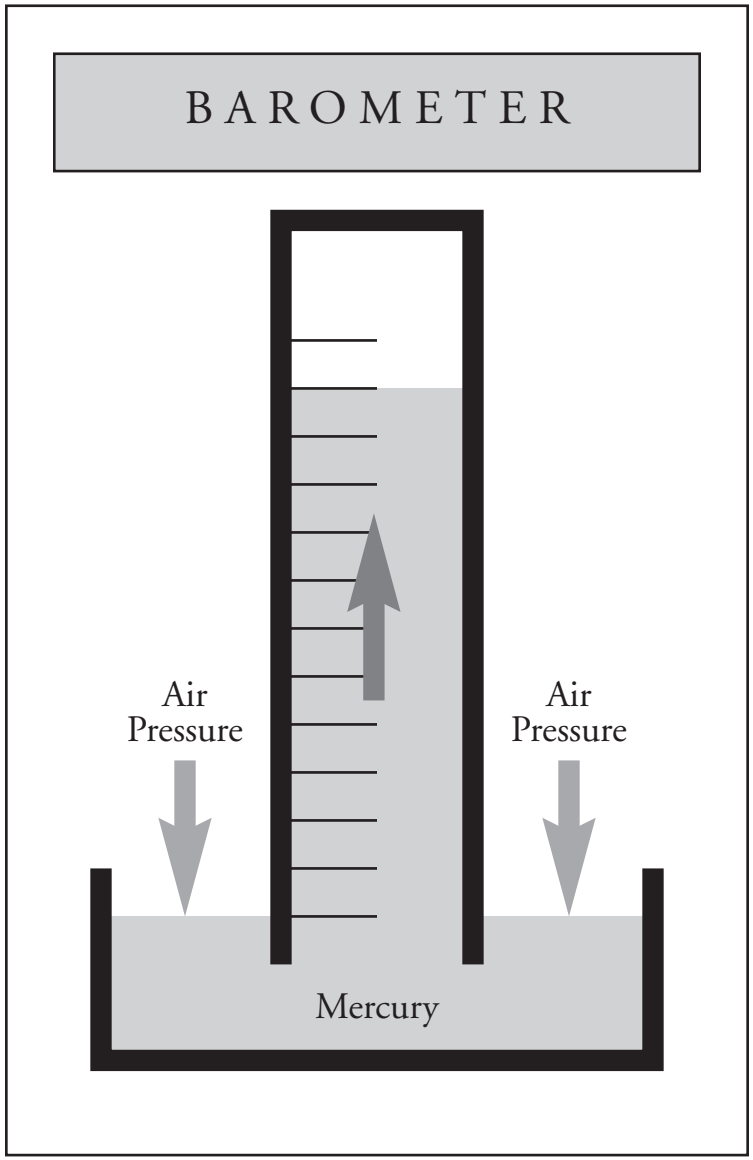
A barometer is a special tool. It was invented by Evangelista Torricelli. He was an Italian scientist. This was in 1643.

The simplest barometer is a glass tube. The tube stands in a dish of **mercury**. As air pressure increases, it presses down on the mercury. This pushes the mercury up the tube.

Weaker air pressure does not press down as much. So, the mercury is lower.

The tube has lines. These lines measure the height of the mercury. This measures the air pressure.

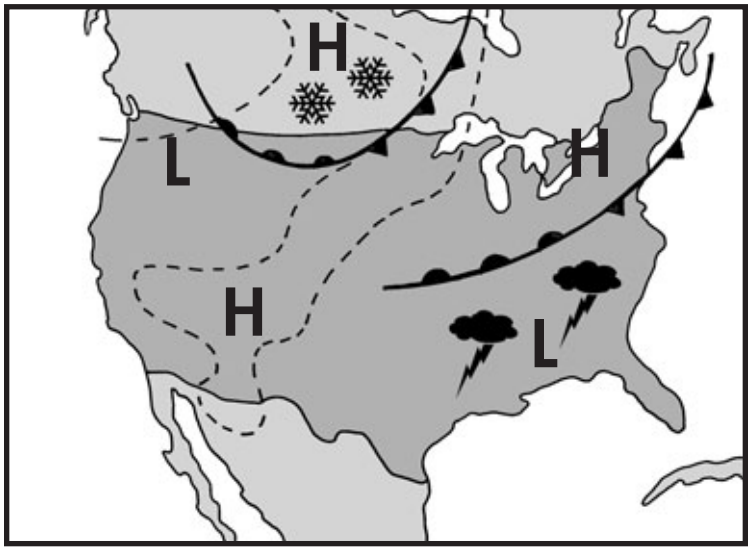
mercury: a silver-white metal; it is a liquid at room temperature



This barometer measures air pressure.
For fair weather, should the air pressure be low or high?

Predicting the Weather

Scientists use many tools to help them predict the weather. Next time you watch the weather report on TV, notice the weather maps. The symbols on the map, such as the *H*'s and *L*'s represent measurements. The *H* is for a "high pressure" area. The *L* is for a "low pressure" area.



What do you think the weather is like in the southeast?

CHAPTER 2

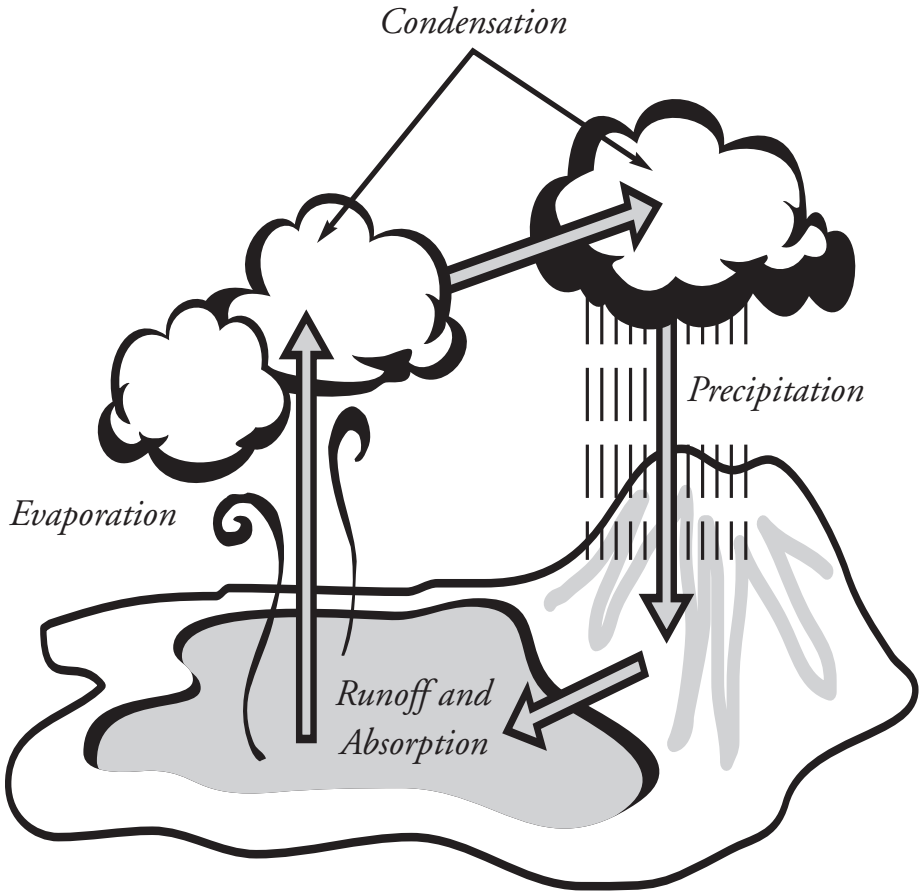
Air, Water, and Weather

Air and water also affect air currents. Water from the ocean or a large lake heats in the sun. Then, it **evaporates** and rises. As the water vapor rises it cools. Tiny water droplets form. When these droplets are packed closely together, they become a cloud. The clouds move toward the warmer air over the land.

Finally, the clouds condense and bring rain or other forms of precipitation to the land. This process is called the water cycle.

evaporates: changes from a liquid to a gas

Water Cycle

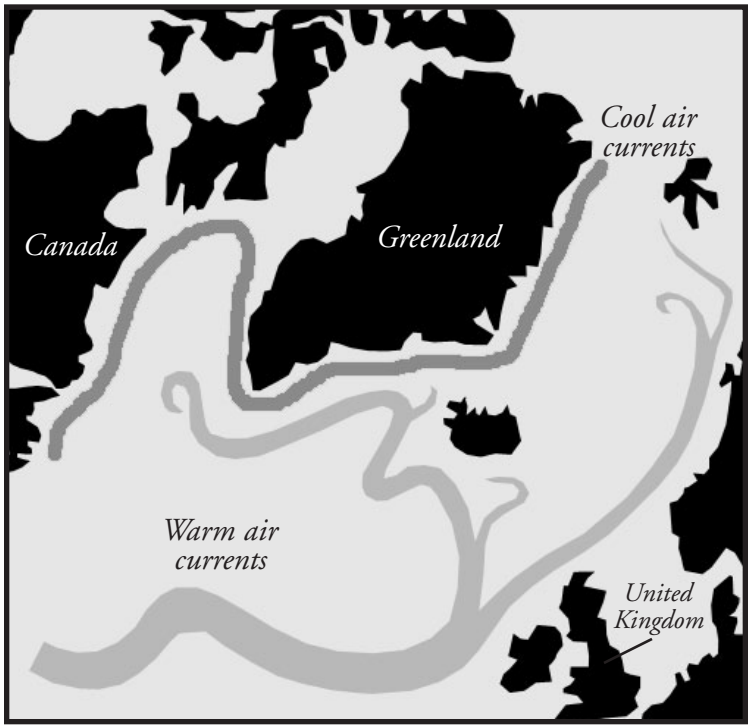


The air and water on our planet are always heating and cooling. These changes affect the air pressure. They create **convection currents** and even change the weather. Some of these changes are predictable.

Scientists know that the oceans play an important role in cooling and heating Earth. The oceans are warmest at the equator where the sun strikes Earth most directly. Wind carries the warmer air north. This warms the land along the coasts.

Finally, the air starts cooling off. When the air reaches the poles, it is very cold. The cold air sinks and moves back toward the equator. At the equator, the sunlight heats the water again. The process starts over.

convection currents: currents in air and water created by temperature changes



Warm air above the ocean moves north. When it gets to Greenland and beyond, the air cools and flows south again.

CHAPTER 3

Women in Science

At weather stations, people study weather. They record information about the **atmosphere**. This helps them predict the weather.

Sarah Whiting started a weather station in the United States. She was born in 1847 in Wyoming, New York. At that time, most girls did not go to school, but she wanted to learn. So, her father taught her math and science.

She liked science very much. She went to college to study science. She became a teacher at Wellesley College. This was a college just for women.

atmosphere: the layer of gases surrounding Earth

Sarah wanted to help women learn about science. She thought they would learn best if they worked like real scientists. So, she set up a weather station. Her students observed and recorded the weather.

The U.S. Weather Bureau noticed the work of the students. There were no other weather stations nearby. So, they asked to use students' records.

Sarah helped many other women become scientists.

Sarah Whiting

Glossary

atmosphere—the layer of gases surrounding Earth

convection currents—currents in air and water created by temperature changes

evaporates—changes from a liquid to a gas

gases—matter that has no shape; gases spread out to fill the space around them; most cannot be seen

invisible—not able to be seen

mercury—a silver-white metal; it is a liquid at room temperature

molecule—the smallest part of a substance

mysterious—not known or hard to explain

respiration—how living things get energy from food and oxygen

survive—to continue to live

To Find Out More . . .

Want to learn more about the air around us?

Try these books

Air Is All Around You by Franklyn Branley. Harper Colins, 2006.

The Science Book of Air by Neil Ardley. Harcourt Brace Science, 1991.

Access these Web sites

The U.S. Department of Energy, Wind Energy and Hydro Power
http://www1.eere.energy.gov/windandhydro/

The National Weather Service
http://www.nws.noaa.gov/

The National Renewable Energy Laboratory
http://www.nrel.gov/

The Environmental Protection Agency, Office of Transportation and Air Quality
http://www.epa.gov/otaq/

Write for more information

The National Weather Service
1325 East West Highway
Silver Spring, MD 20910

National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO 80401-3393

Index

air, 4–7
air pressure, 8–12
barometers, 13–14
gases, 7
molecules, 8–9
weather maps, 15
weather station, 20–21

ENGLISH-LANGUAGE ARTS • GRADE 5

Below Level

California Content Standards
Vocabulary and Concept Development: 1.3
Vocabulary and Concept Development: 1.4
Structural Features of Informational Materials: 2.1
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.3

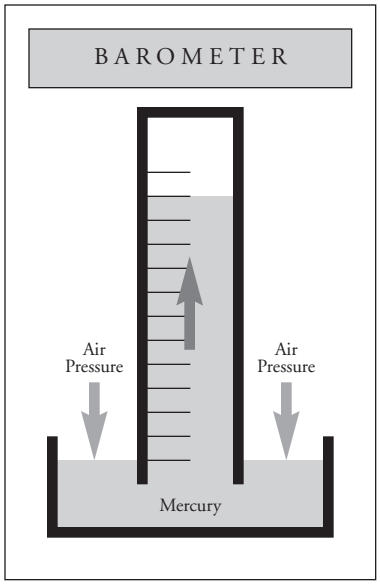
English-language Arts Activities

The Air Around Us

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

Interpret Graphics

Graphics can help explain how or why things happen. This book includes a number of graphics to help explain changes in the weather. For example, study this graphic of a barometer.



Which statement is true?

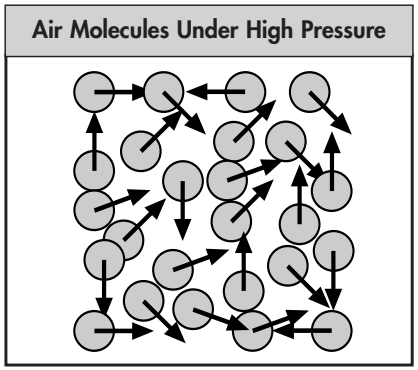
A. When the air pressure increases, it pushes down on the mercury in the dish around the center tube. Then the mercury inside the tube rises.

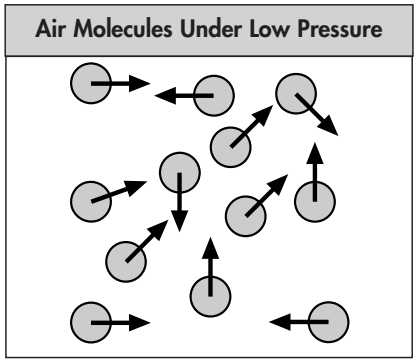
B. As the mercury rises in the tube, it causes the mercury in the dish to move down.

C. When the air pushes the mercury down on one side of the dish, the mercury moves up on the other side. It's like a seesaw on a playground.

***A* is true, but *B* is not. First, air pressure pushes down on the mercury in the dish, and then the mercury rises in the tube. *C* is not true either. Air pressure pushes down on all of the mercury in dish at the same time, in the same way.**

TRY THE SKILL





Shade the circle next to each correct answer.

1. What do the graphics above show?

Ⓐ Fewer molecules are under low pressure.

Ⓑ Molecules under high pressure hold still.

Ⓒ Molecules under low pressure hold still.

Ⓓ Molecules under low pressure are farther apart.

2. What do the small arrows in the graphics mean?

Ⓐ Each molecule of air has a tiny arrow coming from it.

Ⓑ Molecules are always moving.

Ⓒ Molecules under high pressure move in the same direction.

Ⓓ Molecules under low pressure move in different directions.

Antonyms

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

night and *day*

up and *down*

inside and *outside*

left and *right*

Read the paragraph. Look for the antonyms.

The air is always rising and falling. Air that is falling is in a "high pressure area." Air that is rising is in a "low pressure area."

What are the antonyms?

Rising and *falling* are antonyms. *High* and *low* are antonyms, too.

TRY THE SKILL

Read the paragraphs. Underline the antonyms.

Air pressure often changes when the weather changes. Falling air pressure could mean bad weather. Rising air pressure often means good weather.

When air cools, it pushes down. It sinks to Earth. This causes higher air pressure. As the air becomes more packed together, it warms up. This warm air spreads out. It often brings nice weather.

Think of other antonyms that have to do with weather. Write them in the space below.

_____

_____

_____

_____

_____

Roots and Suffixes

Suffixes are short syllables at the end of words. They change the meaning of the word. Knowing suffixes can help you learn new words.

The table below shows the meaning of two suffixes. We use these suffixes to make comparisons.

Suffix	Meaning	Example
-er	"more"	A stream is big, but a river is bigger.
-est	"the most"	A river is bigger than a stream, but the ocean is biggest.

Use suffixes with the word *high* to complete the sentence.

The air pressure is _____ over hills than it is at the top of a mountain, but it is _____ at sea level.

Yes, *higher* goes in the first blank and *highest* goes in the second.

TRY THE SKILL

Read this passage from *The Air Around Us*. Find two more words that use the suffix *-er* or *-est*. Write the words on the lines below. Then write a few more words that use *-er* and *-est*.

The column of air is higher and heavier in a high pressure area. This causes the air to move downward. As the air becomes more tightly packed together, it warms up. This warm air spreads out, usually bringing nice weather. The column of air is lower in a low pressure area compared to a high pressure area. The highest air pressure is at sea level.

_____

_____

_____

_____

_____

_____

Main Idea

The main idea is the most important thing the author is trying to tell the reader.

Read this paragraph from *The Air Around Us* and try to find the main idea.

How can we be sure that air exists? We can't see air. But, we know it exists, because it takes up space. Imagine blowing up a balloon. First, the balloon is flat and wrinkly. After you blow it up, the balloon is big and smooth. What is inside the balloon? Air.

Is this the main idea?

First, the balloon is flat and wrinkly.

No! This statement is too specific and does not tell the main idea. How about the one below? Is this the main idea?

We know it exists, because it takes up space.

Yes! This is the main idea of the paragraph.

TRY THE SKILL

Read the paragraphs. Shade the circle next to the main idea.

1. At weather stations, people study weather. They record information about the air. This helps them predict the weather.

   Ⓐ People record information about the air.
   Ⓑ Scientists can predict the weather.
   Ⓒ At weather stations, people study weather.

2. Scientists know that the oceans play an important role in the cooling and heating of Earth. The oceans are warmest at the equator where the sun strikes Earth most directly. Wind carries the warmer air north. This warms the land along the coasts.

   Ⓐ Wind can warm the air along the coast lines.
   Ⓑ Oceans play an important role in the cooling and heating of Earth.
   Ⓒ Lakes can also change the weather if they are big enough.

Answer Key

Interpret Graphics

1. D

2. B

Antonyms

1. *falling* and *rising*, *good* and *bad*

2. *down* and *up*, *cools* and *warms*

3. Possible answers: *hot* and *cold*, *windy* and *calm*, *cloudy* and *sunny*.

Suffixes

higher

heavier

highest

Main Idea

1. C

2. B