

On Level



SCIENCE • GRADE 3

California Content Standards
Physical Sciences: 1.E
Physical Sciences: 1.F
Physical Sciences: 1.G
Physical Sciences: 1.H
Physical Sciences: 1.I

What Is Matter?

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•
Reproducible
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English-language
Arts Activities

What Is Matter?

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:

- e. Students know matter has three forms: solid, liquid, and gas.
- f. Students know evaporation and melting are changes that occur when the objects are heated.
- g. Students know that when two or more substances are combined, a new substance may be formed with properties that are different from those of the original materials.
- h. Students know all matter is made of small particles called atoms, too small to see with the naked eye.
- i. Students know people once thought that earth, wind, fire, and water were the basic elements that made up all matter. Science experiments show that there are more than 100 different types of atoms, which are presented on the periodic table of the elements.

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 1.6—Use sentence or word context to find the meaning of unknown words.

2.0 READING COMPREHENSION

Structural Features of Informational Materials 2.1—Use titles, tables of contents, chapter headings, glossaries, and indexes to locate information in text.

On Level



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Physical Sciences: 1.E

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Student Book

What Is Matter?

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.)

Fourth—Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages.

[Art: flipping the stack over to the opposite side.]

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

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GRADE 3 SCIENCE

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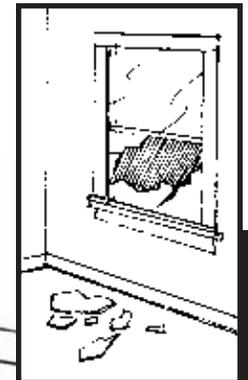
SCIENCE • GRADE 3

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What Is Matter?

by Charles Pederson





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

INTRODUCTION

What Is Matter?

You use your senses to understand the world around you. You can feel a soft shirt. A delicious meal smells and tastes wonderful. You can see fluffy clouds. You can see many of the things in our world. However, there are also things you can't see. They still exist, though. For example, you can't see air. But you can feel it when a gentle breeze hits you.

All these things have something in common. They are made of matter. What do you think matter is? Ancient peoples had some ideas about it. They thought matter was earth, air, water, and fire. These were the things they could see.

matter: anything with mass that takes up space

Today, we know that matter is anything with mass that takes up space. Mass is the amount of matter in an object. Matter is in everything, including gases we can't see.

People describe the **properties** of matter in many ways such as size, shape, color, texture, and **volume**. People also describe matter by the types of the material from which they are made.

Types of Materials

Paper	notebooks, cardboard boxes, newspaper, toilet paper, paper towels, photographs, books, bags
Glass	bottles, windows, sculptures, TV screens, pots, light bulbs
Plastic	keyboards, ski boots, CDs, brushes, soda bottles, bags, garbage cans
Metal	keys, doorknobs, belt buckles, wire, coat hangers, jewelry, knives, bolts

properties: qualities that something has
volume: the amount of space something occupies or takes up

Phases of Matter

Matter usually exists in one of three forms, or phases—liquid, solid, and gas.

Solids

Matter that is solid has a certain size and shape. It does not change its size or shape unless something causes it to change.

A block of wood is a solid.

Liquids

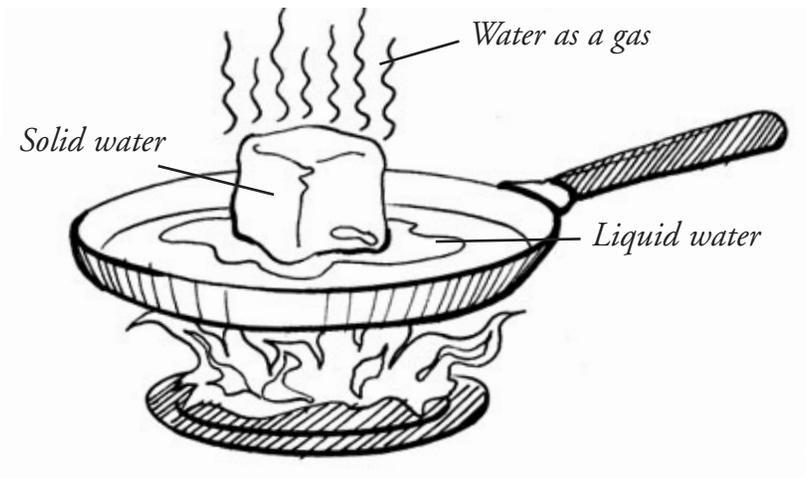
Milk is a liquid. Milk has size and volume. Milk does not have a particular shape, though. It takes the shape of its container.

Gases

Gases are matter that have no shape or size. The air around you is a mixture of gases.

phase: a state of matter, usually liquid, solid, or gas

Water clearly shows the three forms of matter. Liquid water takes the shape of any container that holds it. Solid water is ice. It holds its own shape. Water as a gas can be seen as steam. Water as a gas can also be **invisible** in the air.



When a solid is heated, it begins to melt. If heated enough, the melted liquid turns into gas.

invisible: not able to be seen

Atoms and Elements

Thousands of years ago, people had different ideas about matter. One idea ancient people had was that there were four elements. These were earth, air, water, and fire. The belief was based on what people could see. These four things seemed to make up everything.

The ancient Greeks had a different idea. They thought all matter was made of tiny particles. They called these particles atoms. In the Greek language, *atom* means “uncuttable.”

The ancient Greeks were right that atoms make up everything. They are the basic building blocks of everything. Think of a brick wall. The wall is made up of many smaller bricks. Atoms are a little like the bricks. They build all matter.

Imagine a piece of gold. If you cut it in half, both halves are still gold. Now imagine cutting the gold in smaller and smaller pieces. The new pieces are still gold. At some point, there must a tiny piece that you cannot cut if it is still to be gold. That tiniest particle is an atom.

Each type of atom is called an **element**. Elements are substances that cannot be separated into simpler parts by ordinary means. Any element is made of atoms that are all alike. Gold, for example, is made only of gold atoms. No matter how small the piece of gold is, it is still gold. Scientists continue to discover new elements of previously unknown atoms.

element: a substance that cannot be separated into simpler parts by ordinary means

Scientists get to choose names for elements. Einsteinium, for example, is named after Albert Einstein. One element, berkelium, is named after the city where it was discovered—Berkeley, California. Below is part of a table that lists the elements.

The Periodic Table of Elements

The image shows a partial periodic table of elements. Two elements are highlighted with callouts:

- 97 Bk Berkelium**: Located in the bottom left of the highlighted section.
- 99 Es Einsteinium**: Located in the bottom right of the highlighted section.

The atoms of the different elements are arranged in a table. This Periodic Table of Elements help scientists keep track of them.

The Periodic Table of Elements is arranged from simpler to more complex elements. Each element has a name and a symbol of one or two letters. For example, oxygen's symbol is *O*. Sodium's is *Na*.

8 O oxygen	11 NA Sodium
-------------------------	---------------------------

Oxygen's symbol is O. It is listed eighth on the periodic table. Sodium's symbol is Na. It is listed eleventh.

Molecules

You know that matter is made of atoms. Atoms are the basic building blocks of everything. Atoms join in groups to create molecules. Molecules are made of different atoms grouped in specific patterns.

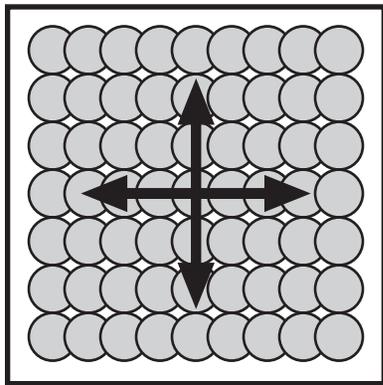
Molecules are a little like words, and atoms are like the alphabet letters. The same letters can be rearranged in patterns to form words. If you change the pattern, you get a new word. For example, the letters *d-e-n* arranged one way mean “a place where animals live.” Rearranged as *e-n-d*, they mean something else.

Molecules, too, form different substances when they are put in particular patterns. Two kinds of atoms, hydrogen and oxygen, for example, join to create water.

Molecules move faster or slower depending on a substance’s state. The molecules of a solid can move only a little. They are tightly packed in place, providing shape and hardness. When the solid is heated, the molecules begin to move faster. They start to break away from their places. At the temperature where the solid melts, it becomes a liquid. This temperature is called the melting point. Different kinds of solids have different melting points.

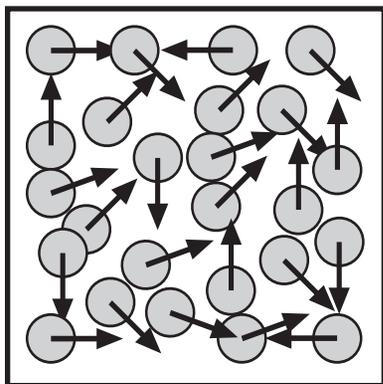
If heating continues, more molecules gain enough energy to break away from the liquid. They move into the surrounding space. This is called **evaporation**. If enough heat is added, the matter begin to bubble and escape as a gas. This is called boiling.

evaporation: to change from a liquid to a gas



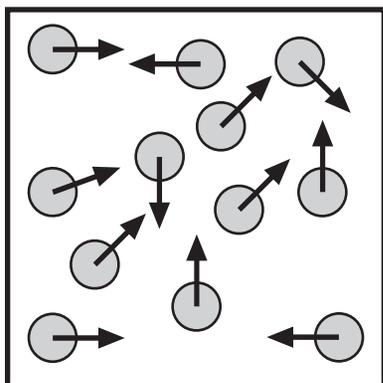
Solids

Solids have packed molecules. They can move very little and make a substance hard.



Liquids

The molecules in liquids are able to move more.

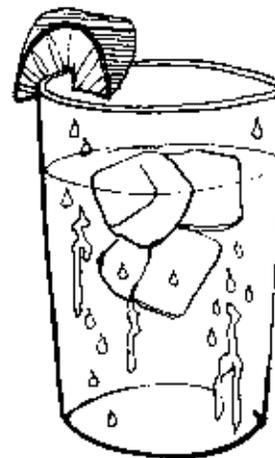


Gases

In gases, molecules are furthest apart. They can move in all directions.

Subtracting thermal energy, or cooling, will also change the state of matter. If a gas cools enough, it **condenses**. If you have ever had a cold drink on a hot day, you have seen condensation. It is what forms the little water drops on the outside of your glass. The water vapor in the air condenses on the cold surface of the glass.

Continue to subtract thermal energy, and the liquid becomes a solid. For water, this is the point at which it becomes ice.



Water condenses on the outside of a cold glass.

condense: change from a gas to a liquid

Changes In Matter

Physical Changes

Matter is always changing. One type of change is physical change. Physical change occurs when objects or substances change their forms, or states, of matter or **energy**.

For example, when heat is added or removed, the three states of matter may change. If heat is added, a solid may melt. Then it becomes a liquid. If that liquid is then heated, it may become a gas. If a gas is cooled, it may become a liquid or solid.

Think about steel. It is a hard metal. But if you add enough heat, it will melt. It becomes a liquid. The liquid is still steel, even though its color, temperature, and shape have changed.

physical: having to do with things that can be seen or measured
energy: the ability to change something

Chemical Changes

Chemical changes may occur when two or more substances are combined. Chemical changes are usually **permanent**. They change the substances into something completely new. They change the way matter looks, feels, smells, or tastes. For example, if you burn wood, it turns to ash. You cannot turn the ash back into wood. This is a chemical change.

Telling the Difference

Sometimes, seeing the difference between physical and chemical change is easy. Physical changes are usually easy to undo. Chemical changes are usually permanent.

For example, a box may be filled with paper and plastic to protect the contents. When the box is unpacked, the plastic is easily separated from the paper again. This is a physical change.

permanent: unchanging

In some physical changes, the properties of a substance change. The substance may change size, shape, or state.

For example, a solid may melt or a gas may condense to become a liquid. This is not a chemical change, though. Physical changes do not produce or create a new substance, as chemical changes do.

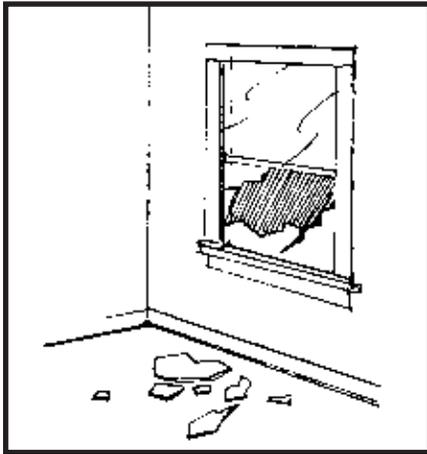


Fog swirling around a bridge is condensed water vapor. When the air temperature is cool enough, fog forms near the ground. This is a physical change. The water changes state, but it is still water, not a different substance.

To help you decide if a change is physical or chemical, ask yourself two questions. If you can answer yes to either question, then it is a physical change. If you answer no to both questions, it is a chemical change.

- 1. Are the physical properties the same after the change?** For example, you bend a piece of wire. The shape has changed, but it is still wire. The answer is, *yes*.
- 2. Can the substance go back to the way it was? Is the change reversible?** If sugar is dissolved in water, the sugar seems to disappear. However, you can still taste the sugar in the water. If the cup is left in the sun, the water will **evaporate**. The sugar will remain behind. The answer here also is, *yes*.

evaporate: to change into a gas or vapor



*Glass scatters when a window breaks.
Is this a physical change or chemical change?*



*Poor snowman! The sun is beginning to melt him.
Is this a physical change or chemical change?*

Identify the characteristics of a simple physical change.

Matter is all around us. It makes the world we can see. It even makes things we can't see.

Matter is always changing. Some changes are physical. Some are chemical. Without those changes, think how boring life would be. Nothing would be able to move. We couldn't eat hamburgers or yawn or play video games. Nothing would grow. The world would not turn. There would be no seasons. Everything would be as though it were frozen.

Without matter, nothing would exist. With matter, everything exists! Maybe you can grow up to be a scientist and discover something new about matter.

Write several paragraphs that summarize the main ideas in this book.

Glossary

- condense**—change from a gas to a liquid
- element**—a substance that cannot be separated into simpler parts by ordinary means
- energy**—the ability to change something
- evaporate**—to change from a liquid to a gas
- invisible**—not able to be seen
- matter**—anything with mass that takes up space
- permanent**—unchanging
- phase**—a state of matter, usually liquid, solid, or gas
- physical**—having to do with things that can be seen or measured
- properties**—qualities that something has
- volume**—the amount of space something occupies or takes up

To Find Out More . . .

Want to learn more about physical changes?

Try these books

- Physical Changes* by Darlene R Stille.
Compass Point, 2006.
- States of Matter* by Robert Snedden. Reed
Educational and Professional Publishing, 2001.
- Solids, Liquids, and Gases* by Carol Ballard.
Heinemann, 2004.

Access these Web sites

- Chem4Kids.com
http://www.chem4kids.com/files/matter_intro.html
- Change Is Cool
[http://www.usoe.k12.ut.us/curr/
Science/sciber00/8th/matter/sciber/physchg.htm](http://www.usoe.k12.ut.us/curr/Science/sciber00/8th/matter/sciber/physchg.htm)

Write for more information

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Chicago, IL 60637-2093

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On Level



ENGLISH-LANGUAGE ARTS • GRADE 3

California Content Standards
Vocabulary and Concept Development: 1.4
Vocabulary and Concept Development: 1.6
Structural Features of Informational Materials: 2.1
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English-language Arts Activities

What Is Matter?

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

Use Context Clues

TRY THE SKILL

Some words have more than one meaning. Context clues, or the nearby words, can help you figure out the meaning in a sentence. For example, the word *rose* can mean “went up” or “a type of flower.” Look at the sentence below.

Mary smelled the red rose growing in the garden.

You can tell that this is a type of flower because the sentence mentions something growing in a garden. The sentence does not say anything about going up somewhere.

Look at each word below. Then look at the two sentences after each word. Decide which meaning of the word is correct for each sentence. Circle the correct meaning. Only one meaning will be correct for each sentence.

1. change

- A. Jose saw he did not have enough [small coins, become different] to buy the trading cards.
- B. Some substances [small coins, become different] through physical means.

2. states

- A. Liquids, gases, and solids are three [parts of America, forms] of matter.
- B. On their trip, Jan’s family drove through the [parts of America, forms] named Ohio and Pennsylvania.

3. matter

- A. The [substance, is important] was hard and sticky on Jeff’s fingers.
- B. Visiting the library [substance, is important] to Jeff.

4. shows

- A. Nguyen’s clay statue [productions, points out] his talent.
- B. Nguyen enjoys going to the theater to see stage [productions, points out].

5. shape

- A. The picture Milla drew had the [to form, visible form] of her aunt.
- B. Milla likes [to form, visible form] patterns with numbers.

Use a Table of Contents

TRY THE SKILL

The table of contents tells the reader what is in a book. It also tells the page number. Read the table of contents from the book *What Is Matter?*

Introduction:	
What Is Matter?	4
Chapter 1:	
Phases of Matter	5
Chapter 2:	
Atoms and Elements	8
Chapter 3:	
Molecules	13
Chapter 4:	
Changes in Matter.	17
Glossary	22
To Find Out More	23
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Which page has information about atoms?

Page 8, because the chapter title talks about atoms.

Which chapter would you read to find out about states of matter?

Chapter 1, because that is the chapter's title.

Use the table of contents from *What Is Matter?* to answer the questions below. Shade in the circle next to the correct answer.

1. Which page would you begin reading to find out about molecules?
 A 4
 B 13
 C 23
2. On which page does the index start?
 A 22
 B 23
 C 24
3. If you wanted to find out about how matter changes, which chapter would you read?
 A Chapter 2
 B Chapter 3
 C Chapter 4
4. What is the title of the Introduction?
 A What Is Matter?
 B The Atom Connection
 C Glossary

Use a Glossary

TRY THE SKILL

A **glossary** is part of a book. It is usually found near the back of the book. It lists words that readers might not understand. It tells what those words mean, or defines them. The words in a glossary are listed alphabetically.

Look at the glossary from *What Is Matter?* Then answer the questions.

Glossary

condense—change from a gas to a liquid

element—a substance that cannot be separated into simpler parts by ordinary means

energy—the ability to change something

evaporate—to change into a gas or vapor

matter—anything with mass that takes up space

permanent—unchanging

phase—a state of matter, usually liquid, solid, or gas

physical—having to do with things that can be seen or measured

properties—qualities that something has

volume—the amount of space something occupies or takes up

1. What does the word *permanent* mean?
 - (A) to change a gas or vapor
 - (B) change from a gas to a liquid
 - (C) unchanging
2. Which word has to do with taking up space?
 - (A) condense
 - (B) volume
 - (C) evaporate
3. Which word means “a change from a gas to a liquid”?
 - (A) element
 - (B) energy
 - (C) condense
4. Imagine the word *drip* were added to the glossary. Which two words would it come between?
 - (A) physical and properties
 - (B) matter and permanent
 - (C) condense and element

Homophones

TRY THE SKILL

Some words sound alike but are spelled differently and mean different things. These kinds of words are called homophones.

Look at the following homophones and their meanings:

fur and *fir*

Notice that they sound the same but are spelled differently.

The girl rubbed her cat's fur.

Fur means an animal's hair.

The fir tree in the yard looked like a Christmas tree.

Fir is a type of evergreen tree.

Now look at the following pair of homophones:

seen and *scene*.

Lucille had not seen her sweater since last week.

Seen describes seeing something in the past.

Marcel enjoyed scene two of the stage play.

A scene is part of a theater production.

Read each sentence and each pair of spellings below it. Then on the blank line, write the letter of the correct spelling. Check a dictionary for correct definitions if you need to.

1. What _____ the states of matter?
A. are
B. our
2. A wooden _____ is made of millions of molecules..
A. board
B. bored
3. Elements with a higher atomic number are heavier, so they must have more _____.
A. wait
B. weight
4. How _____ physical changes occur?
A. due
B. do
5. Ancient peoples did not know _____ there only four, or even more, elements.
A. whether
B. weather

Answer Key

Use Context Clues

1. change
 - A. small coins
 - B. become different
2. states
 - A. forms
 - B. parts of America
3. matter
 - A. substance
 - B. is important
4. shows
 - A. points out
 - B. productions
5. shape
 - A. visible form
 - B. to form

Use a Table of Contents

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

Use a Glossary

1. C
2. B
3. C

Homophones

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