

Earth Science

Rocks, Minerals, and Soil

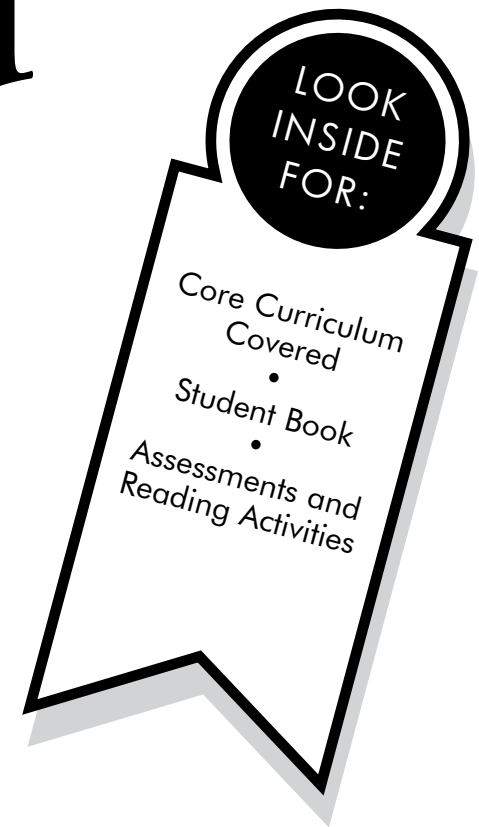
On Level

Rocks and Minerals

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Rocks and Minerals

What materials make up the Earth?

CORE CURRICULUM STATEMENTS

Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses.

Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light.

Measurements can be made with standard metric units and nonstandard units.

The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders.

Objects and/or materials can be sorted or classified according to their properties.

Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. For example:

- temperature - hot or cold
- lighting - shadows, color
- moisture - wet or dry



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Student Book

Rocks and Minerals

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Rocks and Minerals

What materials make up the Earth?

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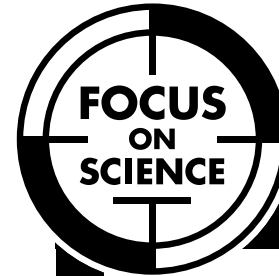
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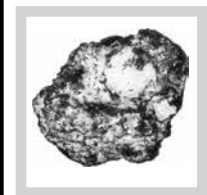
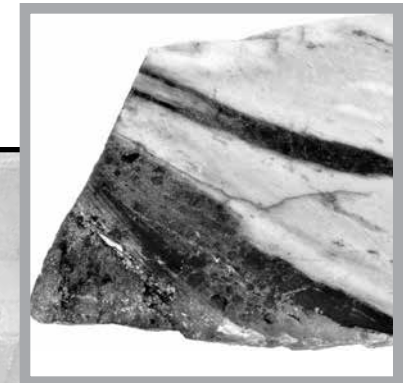
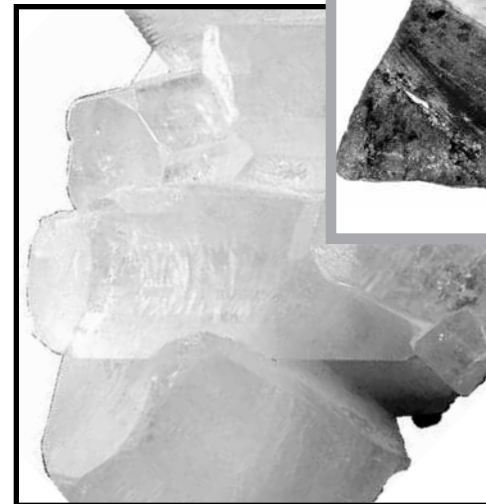


Earth Science

Rocks, Minerals, and Soil

Rocks and Minerals

by Caitlin Scott





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INTRODUCTION

What Are Rocks and Minerals?

Rocks are everywhere. Some are big and some are small. If you look closely at rocks, you can see that they are made up of smaller parts. These parts are called minerals.

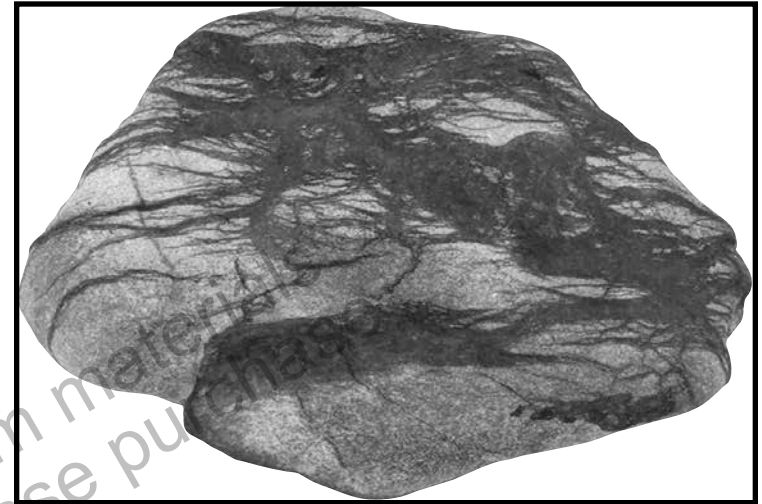
How can you tell if something is a mineral? All minerals have these properties:

- They are **natural**. They are not made by people.
- They are not alive.
- They have a regular shape.

—Recall—

*Remember these properties of minerals.
Read them to yourself several times.*

natural: not caused by people



*This rock is made up of several different minerals.
It has an irregular shape.*



This is the mineral quartz. It has a crystal shape.

Identifying Rocks and Minerals

Go outside and gather several different rocks. Then look closely at each one. How are they alike? How are they different?

Some rocks you find might be small pebbles or stones. They do not feel very heavy. Some may be large and might feel much heavier. Put each rock on a scale and record the weight of each one.

Look at the color of your rocks. Then soak them in water overnight. Do the rocks look different when they are wet? Did they change color?

Next, wipe off the water from the rocks. Weigh them again. Did the weight change?

Sort your rocks into categories. Put all the rocks that feel rough in one group. Put the rocks that feel smooth in another.

How else can you describe what each rock looks like? Are any of them clear? Do any of them sparkle? Are some dull or shiny? Sort your rocks by how they look.

Are your rocks hard or soft? Scratch each rock with something hard, such as a spoon. Did anything come off the rock? Drop your rocks on the sidewalk. Did any of the rocks break?

All of these activities help you learn about the properties of rocks and minerals. Scientists do similar activities to help identify the minerals in rocks.

Scientists who study minerals are called mineralogists. They use hardness, luster, cleavage, color, streak, specific gravity, and other properties to tell minerals apart. You can also use these traits to identify minerals.

Hardness

Friedrich Mohs was a mineralogist. He created the Mohs Scale of Hardness. This scale ranks how hard minerals are.

The softest mineral is talc. The hardest mineral is diamond. A diamond can scratch glass. Other minerals can scratch glass, too. In fact, any mineral with a rank greater than 6 can scratch glass.

Mohs Scale of Hardness

Mohs Scale of Hardness	Mineral
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase
7	Quartz
8	Topaz
9	Corundum
10	Diamond

*–Apply–
Will topaz cut glass? Will gypsum?*

Luster

Luster is how shiny a mineral is. Some minerals shine like metals, such as a new penny or a nickel. These minerals are called **metallic** minerals. Some shine just a little. They might look like an old, dull penny.

Other minerals do not shine at all. These are called **nonmetallic** minerals. Some look greasy, as if they are covered in oil. Some look pearly. Some are clear. You can see right through them. A diamond is an example of a clear, nonmetallic mineral. So is some quartz.

metallic: something that looks like metal

nonmetallic: something that does not look like metal

Cleavage

Cleavage is how a mineral breaks. Some break in just one direction. Others break in two directions. Some break into many pieces.

Some minerals always break the same way. Scientists say these have “perfect” cleavage. Breaking these minerals can help you tell which is which.

Color

Color may be the first thing you see when you look at a mineral. Some are just one color. If so, then color is a good clue to the mineral’s identity.

Some minerals can be many colors. Sometimes color will help you identify a mineral, but sometimes it won’t.

Streak

When you rub some minerals on a special plate, they leave a mark. This mark is called a streak. All minerals with a hardness of 6 or less leave a streak. This helps people identify these softer minerals.

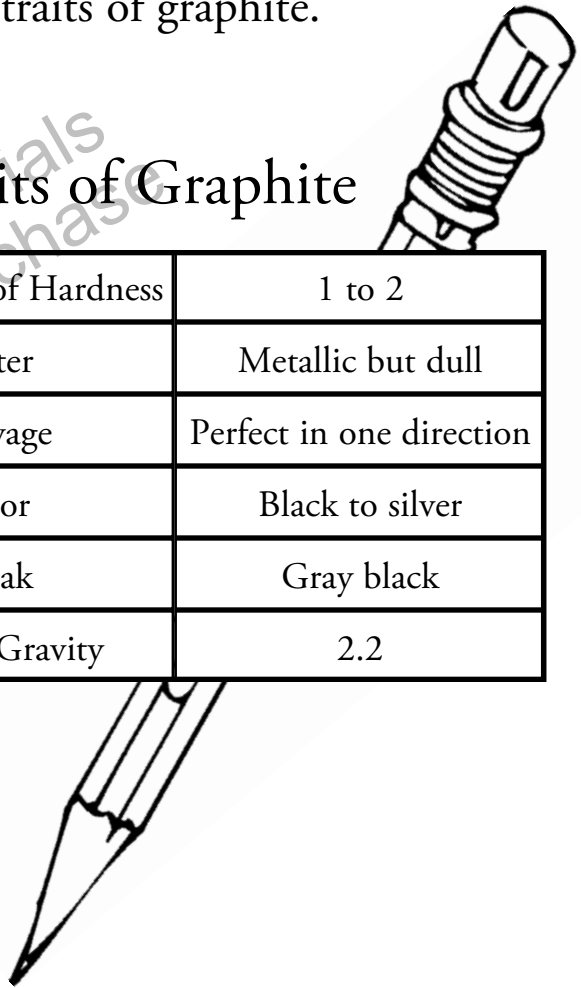
Specific Gravity

Two minerals can be the same size but have different weights. They can have the same weight and different sizes. Specific gravity measures size and weight of a mineral.

Each mineral has its own specific gravity value. A mineral with a high specific gravity is heavier than a mineral that is the same size with a lower specific gravity. Measuring specific gravity can help people identify many minerals.

The lead in your pencil is made of the mineral graphite. The table below shows the traits of graphite.

Traits of Graphite



Mohs Scale of Hardness	1 to 2
Luster	Metallic but dull
Cleavage	Perfect in one direction
Color	Black to silver
Streak	Gray black
Specific Gravity	2.2

Weathering

As you have learned, there are many ways to classify rocks and minerals. Here is one way you may not have thought of.

Fossils

Did you know that fossils are rocks? When a plant or animal died long ago, mud and soil covered it. Over millions of years the mud and soil turned into rock. As water flowed through cracks in the rock, it **dissolved** the plant or animal. Left behind was an empty space in the rock. This space had the same shape as the plant or animal.

In time, minerals from the soil filled up the empty space. The minerals hardened and formed a rock in the shape of the plant or animal.

dissolved: changed from a solid to a liquid

You might think rocks last forever. But, they don't. Over thousands of years, they slowly wear away.

This natural process of wearing away is called weathering. Wind, water, and ice are all forces that cause weathering. It happens so slowly, we cannot see it happening.

Imagine waves in the ocean crashing into a rocky cliff on Long Island. Strong winds also hit the cliff. Rain beats down on the rocks, and ice may form in winter. All these forces slowly break up the rock. This process can take hundreds, even thousands of years.

Wind

Wind is a force that can weather rock over a long period of time. The deserts in Utah and Arizona have rock formations that were carved out by the wind.



Water

Like wind, water can also wear down rocks very slowly.

For example, rain on a rocky cliff can wear down the rock over many years. Water can slowly wear down rocks in a riverbed. Waves on a lake or ocean can also cause rocks to wear away.

Ice

Ice doesn't weather rocks in quite the same way as wind and water do.

When water freezes, it **expands** rapidly. When the water freezes around rocks, it expands and causes pressure in the crack. As the pressure increases, the crack widens and breaks the rock apart.

Plants

Plants can weather rocks and minerals in a similar way. Plant roots grow into cracks. They slowly wedge the rock apart as the roots grow larger.

expands: gets bigger

Glossary

dissolved—changed from a solid to a liquid

expands—gets bigger

geologist—someone who studies rocks

metallic—something that looks like metal

natural—not caused by people

nonmetallic—something that does not look like metal

To Find Out More . . .

Want to learn more about rocks and minerals?

Try these books

The Best Book of Fossils, Rocks, and Minerals by Chris Perrault. King Fisher, 2000.

The Rock Factory: A Story about the Rock Cycle by Jacqui Bailey. Picture Window Books, 2006.

Access these Web sites

Mineralogy 4 Kids

http://www.minsocam.org/MSA/K12/K_12.html

The Mineral and Gemstone Kingdom

<http://www.minerals.net/index.htm>

Write for more information

Mineralogical Society of America
3635 Concorde Pkwy Suite 500
Chantilly, VA 20151-1125

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Assessments

Rocks and Minerals

Print pages 18–20 of this PDF for the assessments.

Check Understanding

Shade the circle next to the correct answer.

1. Which statement is true of all minerals?

- Ⓐ They are metallic.
- Ⓑ They come from fossils.
- Ⓒ They have the same specific gravity.
- Ⓓ They are natural.

2. A rock breaks into many pieces. This is an example of which property?

- Ⓐ luster
- Ⓑ streak
- Ⓒ cleavage
- Ⓓ specific gravity

3. The chart below shows traits of the mineral graphite.

Traits of Graphite

Mohs Scale of Hardness	1 to 2
Luster	Metallic but dull
Cleavage	Perfect in one direction
Color	Black to silver
Streak	Gray black
Specific Gravity	2.2

What is graphite's streak?

- Ⓐ metallic but dull
- Ⓑ perfect in one direction
- Ⓒ black to silver
- Ⓓ gray black

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

Note that question 4 has only three choices.

4. A student finds a rock in the shape of a plant.

This rock is most likely a

- Ⓐ fossil
- Ⓑ diamond
- Ⓒ pebble

5. A diamond can scratch glass. This statement suggests that a

- Ⓐ diamond is a hard mineral
- Ⓑ diamond is a soft mineral
- Ⓒ diamond has a high specific gravity
- Ⓓ diamond has a low specific gravity

6. The picture below shows an example of weathering.



Identify the force that caused this weathering.

(1) _____

Assessment Scoring Guidelines

1. Answer D is correct.
2. Answer C is correct.
3. Answer D is correct.
4. Answer A is correct.
5. Answer A is correct.
6. Wind

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English Language Arts Activities

Rocks and Minerals

Print pages 22–26 of this PDF for the reading activities.

Main Idea and Supporting Details

TRY THE SKILL

The main idea is the author's main point. A supporting detail tells more about the main idea.

Here is a paragraph from *Rocks and Minerals*. The graphic shows the main idea and supporting details.

Scientists who study minerals are called mineralogists. They use hardness, luster, cleavage, color, streak, specific gravity, and other properties to tell minerals apart.

Main Idea

Scientists who study minerals are called mineralogists.

Supporting Details

They use hardness, luster, cleavage, color, streak, specific gravity, and other properties to tell minerals apart.

Read this paragraph from *Rocks and Minerals*.

Cleavage is how a mineral breaks. Some break in just one direction. Others break in two directions. Some break into many pieces.

Now complete this graphic.

Main Idea

Supporting Details

Use the Table of Contents

TRY THE SKILL

The table of contents tells you what is in the book. It also tells the page number.

Read the beginning of the Table of Contents from *Rocks and Minerals*.

Introduction:	
What Are Rocks and Minerals?.....	4
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Hardness.....	8
Luster.....	10
Cleavage.....	11
Color.....	11
Streak.....	12
Specific Gravity.....	12
Fossils.....	14

On what page would you find information about specific gravity?

On page 12

Read the beginning of the table of contents from *Rocks and Minerals*. Answer the questions.

1. On what page would you find information about the color of minerals?
Ⓐ page 4
Ⓑ page 6
Ⓒ page 11
2. On what page would you find information about what rocks are?
Ⓐ page 4
Ⓑ page 8
Ⓒ page 14
3. On what page would you find information about fossils?
Ⓐ page 6
Ⓑ page 12
Ⓒ page 14

Antonyms

TRY THE SKILL

Words that mean the opposite, such as *close* and *open*, are antonyms. Here are some more examples of antonyms:

short and *tall*

fast and *slow*

wide and *narrow*

Read this paragraph. What antonyms can you find?

Sort your rocks into categories. Put all the rocks that feel rough in one group. Put the rocks that feel smooth in another.

The words *rough* and *smooth* are antonyms. They have opposite meanings.

Read this paragraph. Then, write the antonyms on the lines below.

Luster is how shiny a mineral is. Some minerals shine like metals, such as a new penny or a nickel. These minerals are called metallic minerals. Some shine just a little. They might look like an old, dull penny.

1. _____
2. _____

Steps in a Process

TRY THE SKILL

Understanding the steps in a process helps you understand what you read.

Name the steps in a process with the words *first*, *then*, *next*, and *finally*.

When a plant or animal died long ago, mud and soil covered it. Over millions of years the mud and soil turned into rock. As water flowed through cracks in the rock, it dissolved the plant or animal.

These are the steps in the process.

Step 1	First, a plant or animal died.
Step 2	Then, mud and soil covered it.
Step 3	Next, the mud and soil turned to rock.
Step 4	Finally, water dissolved the plant or animal.

Read this paragraph.

When water freezes around rocks, it expands and causes pressure in the crack. As the pressure increases, the crack widens and breaks the rock apart.

Name the steps in the process.

Step 1	
Step 2	
Step 3	
Step 4	

Answer Key

Main Idea and Supporting Details

Main Idea:

Cleavage is how a mineral breaks.

Supporting Details:

- Some break in just one direction.
- Some break in two directions.
- Some break into many pieces.

Use the Table of Contents

1. C
2. A
3. C

Antonyms

1. shiny, dull
2. new, old

Steps in a Process

Step 1: First, water freezes around rocks.

Step 2: Then, it expands and causes pressure in the crack.

Step 3: Next, the pressure increases and the crack widens.

Step 4: Finally, the pressure breaks the rock apart.