

Minerals, Rocks, and Fossils

Red Edition

Grade 3–4
reading level

Purple Edition

Grade 4–5
reading level

Objectives

- Discuss substances found in nature called minerals.
- List properties that can be used to identify minerals.
- Explore the three main types of rocks, and describe how they form.
- Understand the rock cycle.
- Explain why minerals and rocks are important to people.
- Compare types of fossils.
- Understand what fossils show about Earth's history.

Reading Comprehension Skills

Preview the Book ♦ How to Read Diagrams

Main Idea and Details ♦ Compare and Contrast

Skillbuilders are available for this title.

Supporting English Learners

Set Objectives Motivate English Learners, and help them work toward clearly defined goals. Determine both content and language goals for students. Identify what they should know about minerals, rocks, and fossils. Discuss the Find Out About statements before reading each section. Read the statements slowly and clearly to help students connect spelling with pronunciation. Review academic vocabulary, such as *properties*, to ensure that the goals are understood.

Summary

In the Delta Science Content Reader *Minerals, Rocks, and Fossils*, students learn what minerals are and how they can be identified by observing their properties. Students discover processes that lead to the formation of rocks and trace how rocks are transformed into other types of rock in the rock cycle. They are also introduced to the importance of minerals and rocks as resources for jewelry, building materials, and other goods. The book concludes with a discussion of how fossils form and what they reveal about Earth's history.

Science Background

Minerals are naturally occurring solids that were not formed by living things. Like all substances, minerals are composed of atoms. Minerals have a definite chemical makeup and an orderly internal structure. Some minerals, such as gold and sulfur, are formed entirely of one element. Most minerals, however, are compounds, formed from two or more elements.

Several tests are used to identify minerals. The results of these tests distinguish the physical properties of the minerals. These properties include color, streak, cleavage, fracture, and hardness.

Rocks are aggregates, or mixtures, of minerals. Rocks are divided into three classes, according to how they form. Igneous rocks form when molten rock cools and hardens. Sedimentary rocks form through the consolidation of sediment (small pieces of minerals and rocks). Metamorphic rocks form from existing rocks that have been exposed to extreme heat and pressure.

Most fossils—ancient preserved remains of living things—are found in sedimentary rock. Rocks thus contain clues to the history of life as well as the history of Earth. Fossils provide evidence about organisms that lived long ago and the nature of the environment at that time. For example, evidence from the fossil record links dinosaurs with modern birds and indicates that Earth's continents were once joined together as one massive supercontinent.



What Are Minerals?

(pages 2–7)

Before Reading

Discuss the Cover

Cover Image Discuss the photograph on the cover of *Minerals, Rocks, and Fossils*. Use the information on the inside front cover to support the discussion.

Science Statement Discuss the science statement. Ask: *Why do you think different rocks have different colors?* (Possible answer: They are made of different minerals.)

Build Reading Skills (page 2)

Preview the Book Use Build Reading Skills on page 2 to review how to preview the book. Discuss the steps. Then model previewing the headings.

Think Aloud *What can I learn from the headings? On page 5, I see the red heading “Identifying Minerals.” This must be the main topic. The next six headings, on pages 5 and 6, are smaller and blue. These headings must break down ideas about identifying minerals into smaller parts. I think they might tell different ways that minerals can be identified.*

Guide students as they finish previewing *Minerals, Rocks, and Fossils*. Focus on nonfiction text features.

- Prompt them to look at the headings, photographs, captions, and diagrams. Ask questions such as *Why do you think that feature is there? How will it help you understand what you read?*
- Prompt them to look at the bold Vocabulary words. Guide the class in looking up a Vocabulary word in the Glossary.

Students can apply the skill in the Reflect on Reading activity on page 7.

K-W-L Chart Have students begin a K-W-L chart. They should add to it after each section.

What I Know	What I Want to Learn	What I Learned
Some fossils are dinosaur bones.	How do fossils form?	

Make a Connection (page 3)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about minerals. (Possible answer: These bits of salt look like tiny white rocks. Maybe minerals are like rocks.)

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Minerals* in the center. Have students add words and information to the web as they read.

During Reading

About Minerals (page 4)

- Ask: *Is wood an example of a mineral? (no) Why or why not?* (Possible answer: Wood is from a tree and a tree is a living thing. A mineral is nonliving.)
- Discuss the photographs on page 4. Ask: *How are the piece of gold and the gold bracelet alike?* (Possible answers: same color, shiny) *What part of the pencil looks like graphite?* (the tip)
- ✓ **Checkpoint** (page 4) (A mineral is a solid, nonliving material found in nature.)

Identifying Minerals (page 5)

- Ask: *What is a physical property?* (something that can be observed or measured)
- Point to a student’s desk. Ask: *What are some physical properties of this desk?* (Possible answers: It is hard, silver and brown, and made of metal.)
- Discuss the photograph of hematite on page 5. Ask: *What is streak?* (the color of a mineral’s powdered form) *What is hematite’s streak?* (reddish brown) *Is hematite’s streak the same as its color?* (no)
- Discuss the photograph of quartz on page 5. Ask: *Quartz comes in many different colors, but it always has the same luster. How would you describe quartz’s luster?* (glassy)

- Discuss the Mohs hardness scale on page 6. Ask: *Can topaz scratch fluorite? Explain.* (Yes. A harder mineral or object will scratch a softer one. Topaz is 8 in hardness and fluorite is 4.)
- Discuss the chart on page 7. Ask: *Which minerals in the chart have cleavage?* (calcite, feldspar, hornblende, mica) *If you had a dark green mineral with cleavage, which of these minerals would you expect it to be?* (hornblende)

✔ **Checkpoint** (page 6) (Possible answers: color, streak, luster, cleavage, fracture, hardness)

After Reading

Reflect on Reading (page 7) Before students complete the activity, have them review the pictures and other book features on pages 2–7. (Possible answer: The pictures on pages 4–6 helped me understand the different properties of minerals.)

Apply Science Concepts (page 7) This activity applies a concept from Find Out About on page 3. Assist students in using the table as needed. (quartz, because it is the only mineral in the chart with all of these properties)

What Are Rocks?

(pages 8–13)

Before Reading

Build Reading Skills (page 8)

How to Read Diagrams Use Build Reading Skills on page 8 to review how to read diagrams. Discuss the tips. Discuss with students that arrows, numbers, keys, legends, symbols, and color coding can be important features of diagrams. Then model reading the diagram of the rock cycle on page 13.

Think Aloud *First, I read the title, “The Rock Cycle.” Next, I look at the pictures and labels. One of the pictures is labeled “lava or magma.” Lava and magma must have something to do with rocks. All the arrows pointing to this picture are red and are labeled “melting.” Each one comes from a different rock. Lava and magma must be what rock turns into when it melts.*

Guide students as they continue reading the diagram. Students can apply the skill in the Reflect on Reading activity on page 13.

Make a Connection (page 9)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about rocks. (Possible answer: I know granite is a kind of rock used to make kitchen countertops.) The icicle-shaped structures in the photograph are called stalactites. They form when water containing dissolved minerals drips from the roof of a limestone cave. As the water drips, it leaves behind minerals, which build up over time to form stalactites. Water may also deposit minerals on the cave floor. This forms similar structures called stalagmites.

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Rocks* in the center. Have students add information about kinds of rocks as they read.

During Reading

Kinds of Rocks (page 10)

- Ask: *What is the difference between magma and lava?* (Magma: melted rock material that is below Earth’s surface; Lava: magma that has reached Earth’s surface)
 - Ask: *How is the sediment in a rock such as shale made?* (minerals and rocks are broken down, or weathered, by things such as water, temperature changes, wind, and plant roots) *What happens as newer sediment is eroded and then deposited on top of older sediment?* (The top layers of sediment press down, or compact, the bottom layers. The layers are squeezed together.) *What joins the sediment into rock?* (Water deposits other minerals in the sediment. The minerals join the sediment together like cement.)
 - Ask: *Does rock melt when metamorphic rock forms? Explain.* (No, pressure makes the temperature of the rock go up. The rock does not melt. But the way the rock looks changes.)
- ✔ **Checkpoint** (page 12) (A rock is a natural solid that is made of one or more minerals; igneous rocks, sedimentary rocks, metamorphic rocks.)

The Rock Cycle (page 13)

- Discuss the rock cycle diagram. Ask: *How do the colors of the arrows help you understand the diagram?* (Possible answer: Each color shows a different way rocks can be changed.) *Why do you think some pictures in the diagram are ovals and some are rectangles?* (Ovals: kinds of rock; Rectangles: rock material—lava, magma, sediment)

✓ **Checkpoint** (page 13) (all the ways rocks can be changed)

After Reading

Reflect on Reading (page 13) Remind students to pay attention to colors and labels to help them follow the steps in the rock cycle diagram. (Possible answer: Sedimentary rock can be changed into metamorphic rock by heat and pressure. It can be changed into igneous rock by melting into lava or magma and then cooling and hardening.)

Apply Science Concepts (page 13) This activity applies a concept from Find Out About on page 9. Assist students in finding and using resources from the library to identify the types of rocks in the collection, as needed. If no students have rock collections, you may wish to consider obtaining a rock kit in order to start a class rock collection.

How Do We Use Minerals and Rocks?

(pages 14–17)

Before Reading

Build Reading Skills (page 14)

Main Idea and Details Use Build Reading Skills on page 14 to review how to identify main idea and details. Discuss the tips. Then model identifying the main idea in the first paragraph on page 16.

Think Aloud *What is this paragraph mostly about? I know that the main idea is often at the beginning of a paragraph. This paragraph begins by explaining that resources are things that we use to meet our needs. I think this must be the main idea.*

Guide students as they identify details in the paragraph that support the main idea. Students can

apply the skill in the Reflect on Reading activity on page 17.

Make a Connection (page 15)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about how we use minerals and rocks. (Possible answer: People mine gold for jewelry and marble for statues.)

Find Out About Read the statement to help students set a reading purpose. Explain that this is the important topic that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a T-chart on the board for examples of *ores* and *gemstones*. Have students suggest examples as they read.

During Reading

Minerals and Rocks as Resources

(page 16)

- Ask: *Look around the classroom. What things made from minerals or rocks do you see?* (Possible answers: chalk, graphite in pencils, metal legs on furniture, quartz for window glass)

✓ **Checkpoint** (page 17) (Minerals and rocks are called resources because we use them to meet our needs.)

After Reading

Reflect on Reading (page 17) (Possible answers: Main Idea: Minerals and rocks are important resources. Details: Some minerals called ores are mined for the valuable materials, such as metals, that are in them. Other minerals called gemstones are mined to be cut and polished for jewelry. Table salt is made from the mineral halite. Some sedimentary rocks are used to make cement, bricks, and drywall.)

Apply Science Concepts (page 17) This activity applies the concept from Find Out About on page 15. Assist students in conducting research on their chosen ore, as needed. The United States Geological Survey (USGS) Web site is an important source of information about minerals, rocks, and fossils. Remind students to find out where their ore is found and some interesting facts about it, such as what it is used for and how it is mined.

What Are Fossils?

(pages 18–23)

Before Reading

Build Reading Skills (page 18)

Compare and Contrast Use Build Reading Skills on page 18 to review how to compare and contrast. Discuss the tips. Then use the information on page 20 to model comparing and contrasting fossils and living things.

Think Aloud *How are fossils and living things alike? Fossils are the remains or traces of living things from long ago. Fossils can give clues about what organisms looked like. I think this means a fossil can have a shape that is like the shape of part of the living organism. How are fossils and living things different? Fossils are not alive, but living things are.*

Guide students as they compare and contrast the maps of Earth’s continents on page 23. Students can apply the skill in the Reflect on Reading activity on page 23.

Make a Connection (page 19)

Make a Connection Discuss the Make a Connection question. Use this discussion to build background and activate prior knowledge about fossils. (Possible answers: We might learn its size, what kinds of things it ate, or how it moved.)

Find Out About Read each statement to help students set a reading purpose. Explain that these are the important topics that they will learn about in this section.

Vocabulary Read the Vocabulary words aloud. Explain to students that they will see these words in bold in this section. Start a word web on the board with *Fossils* in the center. Have students add words and information to the web as they read.

During Reading

About Fossils (page 20)

- Ask: *What are some clues fossils can give us about organisms that lived long ago?* (Possible answers: what organisms looked like, how they acted, how they moved, what they ate)

- Emphasize that a petrified fossil is not made of the material that originally composed the organism’s body. For example, when a bone petrifies, the original material is slowly replaced by minerals carried in water. This effectively turns the bone to rock while maintaining the structure of the original bone.

- ✓ **Checkpoint** (page 21) (Fossils are the remains or traces of living things from long ago. Most fossils are found in sedimentary rock.)

Fossils and Earth’s History (page 22)

- Ask: *What are some things about Earth’s history that the fossil record shows us?* (Possible answers: shows that most kinds of organisms that lived in the past are extinct, ways extinct and living organisms are alike and different, conditions surrounding organisms in the past, how Earth’s land has changed over time)

- ✓ **Checkpoint** (page 23) (The fossil record is all the fossils on Earth.)

After Reading

Reflect on Reading (page 23) (Possible answer: Fossil imprint: forms when an organism makes marks in mud, then the mud hardens into rock; Fossil mold: forms when a dead organism is buried in sediment—as the sediment turns to rock, groundwater dissolves the organism’s body and a hollow space, or mold, in the shape of the organism is left in the rock; Both: are fossils, form in sediment, show the shape of an organism or part of an organism)

Apply Science Concepts (page 23) This activity applies a concept from Find Out About on page 19. (Possible answer: The fossil record shows that Earth’s land has changed over time. Ocean animals could not have swum up a mountain, so the scientist might think that the mountain was once covered by an ocean.)

 **Continued on last page**

Name: _____

Date: _____

Test: Minerals, Rocks, and Fossils

Part A: Vocabulary

fossil	gemstone	igneous rock	luster
metamorphic rock	mineral	rock cycle	sedimentary rock

Choose the correct vocabulary word for each sentence. Write the word on the line.

1. One property that helps identify talc is its nonmetallic _____.
2. A rock is a natural solid that is made of at least one _____.
3. The _____ basalt forms when lava cools and hardens.
4. Before _____ can form, rocks must be broken down into smaller pieces.
5. The _____ slate forms when shale is changed by heat and pressure.
6. All the ways rocks can be changed from one kind to another make up the _____.
7. Ruby is one _____ that is cut and polished for jewelry.
8. Scientists learned about what an extinct fish ate by studying the _____ of its teeth.

Part B: Science Concepts

Mark the best answer to each question.

9. One way to tell pyrite from gold is to rub it on a special tile to see its _____.

(A) cleavage	(C) fracture
(B) hardness	(D) streak
10. Which pair of steps helps form most sedimentary rock?

(A) heat and pressure	(C) weathering and erosion
(B) cooling and hardening	(D) melting and cementing

Test: Minerals, Rocks, and Fossils (continued)

11. The mineral hematite has the metal iron in it. We mine hematite to get iron to make steel. What is a mineral such as hematite called?

- (A) magma
- (B) ore
- (C) gemstone
- (D) rock

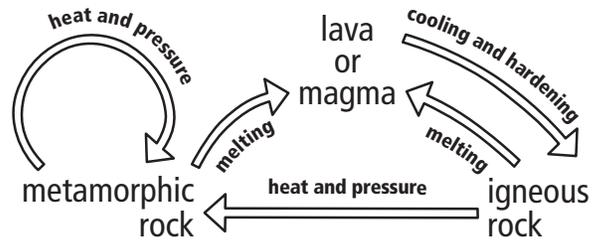
12. Which kind of fossil looks like a hollow space in the shape of the organism?

- (A) mold
- (B) cast
- (C) amber
- (D) sediment

Write the answer.

13. Suppose you have two minerals that are white and dull. Describe some properties you could use to tell the two minerals apart.

14. Look at this part of the rock cycle. Explain how igneous rock can form from metamorphic rock. Then explain how metamorphic rock can form from igneous rock.



15. Explain what the fossil record shows about Earth's land.

Let's Review

(inside back cover)

Have students complete their K-W-L charts before answering these questions. Possible answers are shown.

- 1. Cover Connection** (A mineral is a solid, nonliving material found in nature. Gold and graphite are minerals. A rock is a natural solid made of one or more minerals. We can sort rocks into three main groups—igneous rocks, sedimentary rocks, and metamorphic rocks—based on how they formed. Most fossils are found in sedimentary rock.)
- 2.** (Streak is the color of a mineral's powdered form. Luster is the way light bounces off a mineral.)
- 3.** (Igneous rocks form when very hot, melted rock material cools and hardens. Many sedimentary rocks form when layers of sediment are squeezed together and cemented. Metamorphic rocks form when rocks are changed by heat and pressure.)
- 4.** (They take a long time to form. So they cannot be replaced easily if they are used up.)
- 5.** (The fossil record is all the fossils on Earth. It shows that most kinds of organisms that lived in the past are extinct, ways extinct and living organisms are alike and different, conditions surrounding organisms in the past, and how Earth's land has changed over time.)
- 6. Compare and Contrast** (Alike: form when very hot, melted rock material cools and hardens; Different: Rocks from magma: form below surface, magma cools and hardens slowly, large mineral crystals;

Rocks from lava: form on Earth's surface, lava cools and hardens quickly, small mineral crystals)

- 7. Write** (Paragraphs will vary but should mention which part of the organism's body became a fossil, what type of fossil it is, and what clues the fossil gives about the organism.)

Try It! Assist students in researching birthstones as needed. Have them find a photograph of each birthstone to photocopy or print for the poster.

Science at Home Have students do this activity at home with a family member. Encourage them to explain to their family members what scientists can learn from fossils.

Answers to Test

(Teacher's Guide pages 6–7)

1. luster **2.** mineral **3.** igneous rock **4.** sedimentary rock **5.** metamorphic rock **6.** rock cycle **7.** gemstone **8.** fossil **9.** D **10.** C **11.** B **12.** A **13.** Streak: the color of a mineral's powdered form; Cleavage: breaks into pieces with smooth, flat sides; Fracture: breaks into pieces that have uneven or curved sides; Hardness: how easy or difficult it is to scratch **14.** Igneous rock can form from metamorphic rock when metamorphic rock melts into lava or magma. Then the lava or magma cools and hardens into igneous rock. Metamorphic rock can form from igneous rock when igneous rock is changed by heat and pressure. **15.** The fossil record shows that Earth's land has changed over time. Scientists found the same kinds of fossils on different continents. Those continents are now separated by oceans. The organisms that left the fossils could not have swum that far. Scientists concluded that Earth's continents were once joined together.

ADDITIONAL ASSESSMENT OPPORTUNITIES Use the Checkpoints, Reflect on Reading, and Apply Science Concepts features and Let's Review questions as additional assessment opportunities.

Delta Science Content Readers are 24-page nonfiction student books with informative, engaging text and full-color photos and illustrations. The readers present key science content and vocabulary found on state tests, present key reading skills and strategies useful for reading informational text, support and extend the experiences and content of hands-on activities, promote scientific inquiry, and serve as a home-school link. They are available in two editions: Red Edition for Grades 3–4 and Purple Edition for Grades 4–5.

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