UNIT OVERVIEW

Earth is made up various living and nonliving materials. In the Minerals, Rocks, and Soil unit, students learn about the properties, classification, and uses for many nonliving Earth materials. Elements form minerals, and minerals form rocks. Different rock types—igneous, sedimentary, and metamorphic—can transform through the rock cycle. Through the processes of weathering and erosion, rocks change, break, and move. Minerals mix with organic material to form the soil on which plants and animals rely. People use Earth resources by mining, drilling, and refining raw materials and have become dependent on them for many purposes.

Certain reading resources are provided at three reading levels within the unit to support differentiated instruction. Other resources are provided as a set, with different titles offered at each reading level. Dots on student resources indicate the reading level as follows:

- low reading level
- middle reading level
- high reading level

THE BIG IDEA

Minerals, rocks, and soil—along with air, sunlight, and water—are the nonliving portions of Earth's ecosystems. The interaction of living and nonliving components defines an ecosystem and allows for great biodiversity.

By learning about minerals, rocks, and soil, students will come to understand the processes by which they are formed, how they change through time, and their importance to Earth and its inhabitants. Nutrient-rich soil is home to many organisms and provides the foundation for much of the life on Earth. Humans have come to rely on Earth's resources for many purposes, including building materials, electronic components, household items, car parts, cosmetics, and energy sources. While seemingly abundant, Earth's resources are limited and must be preserved for future generations.

Other topics

This unit also addresses topics such as: mining, moon rocks, fossils, quicksand, and special uses of minerals, including gold.

SPARK

The spark is designed to get students thinking about the unit's topics and to generate curiosity and discussion.

Materials

- cupful of playground sand
- paper plate
- hand lens
- strong magnet

Activity

Place students in pairs or small groups. Have them pour a cupful of playground sand onto a paper plate. Ask students to examine the sand using a hand lens and to discuss their observations with their partner. Encourage them to describe the sand in as many ways as they can, including how it feels. Students may also run the magnet through the sand and observe whether anything within the sand is attracted to it. Invite a volunteer from each group to share observations with the class.

Below are questions to spark discussion.

What is sand?

Where does sand come from?

Do all grains of sand look the same? Why do you think this is so?

Why are some grains of sand smaller than others?

Did the magnet pick up anything from the sand? Why do you think this is so?

Where are you most likely to find sand in nature? Why?

Use this activity to begin an introductory discussion about minerals, rocks, and soil. Explain that sand is an Earth resource that results from the breaking down of rocks. Over time, large rocks are broken down into smaller and smaller pieces, eventually forming sand and soil. Sand also contains minerals, sometimes including one called *magnetite.* This mineral is highly magnetic and therefore is attracted to a magnet. Throughout the unit, students will learn more about minerals, rocks, and soil.

Many of the unit's vocabulary terms are related to the spark activity and can be introduced during the spark. For vocabulary work, see the Vocabulary section in this *Unit Guide*.

PRIOR KNOWLEDGE

Invite students to explain their understanding of what minerals, rocks, and soil each are. Ask them to explain how all three are related, if at all.

Probing Questions to Think About

Use the following questions to have students begin thinking of what they know about minerals, rocks, and soil.

- What is the difference between a rock and a mineral?
- What are rocks and minerals made of?
- Are all rocks the same? How do they differ?

- Why are there so many different sizes of rocks?
- Why are only some rocks worth a lot of money?
- Is soil the same wherever you go? Why or why not?
- What do a mountain and a pebble have in common?
- Can weather affect the land? If so, how?
- Are minerals, rocks, and soil important for plants and animals? Explain.
- How do people use minerals, rocks, and soil?

Tell students they will learn more about these topics soon.

UNIT MATERIALS

Each unit provides a wide variety of resources related to the unit topic. Students may read books and other passages, work in groups to complete hands-on experiments and investigations, discuss science ideas as a class, watch videos, complete writing tasks, and take assessments.

Resources are available for printing or projecting, and many student resources are also available for students to access digitally on Kids A–Z.

Selected unit resources are available in more than one language.

For a complete list of materials provided with the unit, see the Minerals, Rocks, and Soil unit page on the Science A–Z website.

VOCABULARY

Use the terms below for vocabulary development throughout the unit. They can be found in boldface in the *Nonfiction Book*, the *Quick Reads*, and/or other unit resources. These terms and definitions are available on *Vocabulary Cards* for student practice. Additional vocabulary lists are provided in the teaching tips for *Investigation Packs* and *FOCUS Books*.

Core Science Terms

These terms are crucial to understanding the unit.

crystal	a mineral that forms in regular, tight patterns
deposit	to set down one or more layers of material in a new place, as water or wind can do to sediment
elements	pure substances; the building blocks of everything on Earth
erosion	the process of transporting and wearing away rocks or soil as loose particles are moved by water, wind, ice, or gravity
fossil	the remains of a plant or animal that turned to stone over a long period of time
igneous rock	rock formed by the cooling and hardening of hot magma or lava

metal	a material, usually hard and shiny, that allows electricity and heat to move through it
metamorphic rock	rock formed when any type of rock goes through changes caused by extreme heat and pressure
mineral	a solid, natural material that does not come from a living thing
resources	supplies of things that are valuable or very useful to people
rock	a hard, solid material that is made of minerals and is found in nature
rock cycle	the series of changes that rock undergoes as it shifts between different types
sedimentary rock	rock formed when sediment is pressed together over time
soil	the top layer of the ground, in which plants grow; dirt
weathering	the process of wearing away or otherwise changing Earth's surface, caused by natural forces

Other Key Science Terms

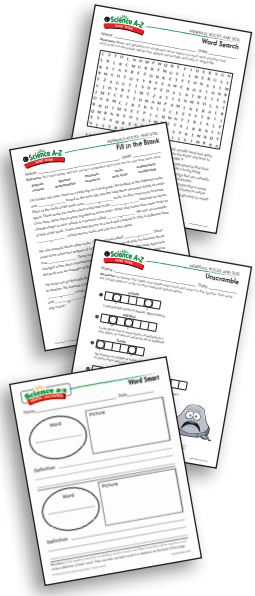
The following vocabulary is not essential for comprehending the unit but may enrich students' vocabulary.

alloy	a metal that is a combination of two or more metals, often making the metal stronger
bedrock	the solid rock underneath soil or loose rocks; the lowest of three main layers of soil
drill	to use a tool to make a hole, such as to get materials from underground
energy resources	supplies of materials that can be used by people to do work and to supply power
humus	the organic component of soil that is composed of plant decay
inorganic	not having to do with or coming from living organisms
lava	melted, liquid rock that reaches Earth's surface
magma	melted, liquid rock beneath Earth's surface
matter	anything that takes up space and has weight
mine	to take minerals from the ground by digging or blasting
ore	a rock that has useful metals or other minerals inside it

organic	having to do with or coming from living organisms
process	to cause something to go through steps that will change or improve it
raw material	a substance in its natural form
refine	to remove unwanted materials from a substance
subsoil	the middle layer of soil, which contains more rocks than topsoil
topsoil	the top layer of soil, in which most plants have their roots

Vocabulary Activities

You may choose to introduce all the terms that will be encountered in the unit before assigning any of the reading components. *Vocabulary Cards* with the key science terms and definitions are provided. Dots on the cards indicate the reading levels of the *Nonfiction Book* or the *Quick Reads* in which each term can be found. If all level dots appear, the term may come from another resource in the unit. Students can use these cards to review and practice the terms in small groups or pairs. The cards can also be used for center activity games such as Concentration.



The *Word Work* activity sheets offer fun puzzles and practice with key vocabulary terms from the unit. For further vocabulary practice and reinforcement, you can choose from the vocabulary *Graphic Organizers*. To build customized vocabulary lessons with terms related to the topic, see Vocabulary A-Z.

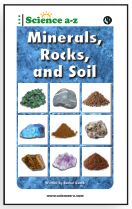
Students can use the *Word Smart* vocabulary *Graphic Organizer* to organize information on the science terms. You may want to assign each student one to three words to share his or her *Word Smart* knowledge with classmates. Students who have the same word should first compare their *Word Smart* sheets with each other and then report to the larger group.

The science terms can be used in oral practice. Have students use each term in a spoken sentence.

As students read, encourage them to create a science dictionary by recording new vocabulary terms and definitions in their *SAZ Journal*.

BACKGROUND AND MISCONCEPTIONS

Use this section as a resource for more background knowledge on unit content and to clarify the content for students if misconceptions arise. Refer to Using the Internet below for more ways to extend the learning.



Q: *Are rocks and minerals the same things?*

A: No. Minerals are made from individual elements or combinations of elements. Almost all rocks are made up of minerals (some contain organic material), and they usually contain more than one type of mineral. A rock's unique composition and the process by which it is formed determine its type.

Q: *Can people make rocks and minerals?*

A: No, not in the scientific sense. Rocks and minerals are natural, limited Earth resources. They are formed over millions of years through natural processes. While companies may sell synthetic stone products, these are not true rocks.

Q: *Do rocks last forever?*

A: Yes and no. While they seem hard and unyielding, rocks change and break down over time through the processes of weathering and erosion. Even large mountains are eventually weathered away. However, the material that makes up rocks is never lost. Small parts or particles of rocks can undergo changes through the rock cycle, and form new rocks.

Q: *Rocks seem very strong. Can wind, water, and ice really break them and wear them down?*

A: Absolutely! Wind, water, and ice are erosional forces that can have a dramatic effect on rocks and soil, particularly over great expanses of time. Even minute, imperceptible changes can become enormous changes when they continue over millions of years. Weathering, erosion, and deposition are forces that constantly change and reshape Earth's surface.

Q: *Once a rock is made, can it ever change?*

A: Yes. Through the rock cycle, each of the major rock groups—igneous, sedimentary, and metamorphic—can be transformed into any other type. Sediments from the weathering of any of these three kinds of rock can be compressed to form sedimentary rocks. Igneous rock is made from magma that once might have been any of the three rock types. Finally, both sedimentary and igneous rocks can be transformed into metamorphic rock, and existing metamorphic rock can undergo further changes when exposed to intense heat and pressure under Earth's surface.

Q: *Are rocks always heavy and hard to break?*

A: No. A small piece of rock will weigh less than a larger piece of rock of the same type. A rock's characteristics depend on the minerals that make it up and how the rock was formed. For example, a rock may contain quartz crystals, which are very hard, while calcite or mica in the same rock may be softer and easy to scratch or peel away. Some rocks, such as pumice, are very light and can often float on water. Pumice is made when frothy lava cools quickly on Earth's surface. Rocks that are formed below the ground under high pressure and heat, such as marble, are very dense and heavy.

Q: *Does soil turn into rock, or does rock turn into soil?*

A: Both processes occur as part of the rock cycle. Weathering causes large rocks to break apart into smaller and smaller pieces that eventually become sediment and part of soil. Erosion moves rocks and soil to areas where layers of sediment build up. When these layers of sediment are subjected to pressure over a long period of time, sedimentary rock forms.

Q: *Rocks and minerals may look pretty, but are they actually important?*

A: Yes, they are. Rocks, minerals, and soil are extremely important to all plants and animals, including humans. Plants and some animals live and grow in soil and depend upon minerals in the soil for growth and development. Many animals, including humans, eat plants that have grown in soil. Humans also rely on rocks, minerals, and soil for many things. Almost every product in your daily life requires some kind of mined mineral. For example, aluminum is used to make bicycles, fluorite is used to make the fluoride found in toothpaste, iron and steel are used to make pots and pans used for cooking, clay is used in floor tiles, and so on.

Q: *So what is everything made of—elements or atoms?*

A: Both! For all intents and purposes, elements are the building blocks of all matter, both living and nonliving. Elements are basic substances that combine (in compounds) to make up all matter. Each element is made of only one kind of atom and cannot be broken down into other substances. Each atom of a particular element has a specific combination of subatomic particles that distinguishes it from atoms of any other element.

EXTENSION ACTIVITIES

Using the Internet

Most search engines will yield many results when the term *minerals, rocks,* or *soil* is entered. You can also perform a more specific search, such as *how igneous rock forms.* Be aware that some sites may not be educational or intended for the elementary classroom. More specific inquiries are recommended, such as:

- geology for kids
- soil composition diagram
- mineral identification
- careers in geosciences
- rocks and minerals of Minnesota
- interactive rock cycle
- weathering vs. erosion
- local gem and mineral museums

Projects and Activities

- **Field Trip:** Bring students to a rock museum, mineral museum, or science center that has an extensive rock collection. Have students keep a science journal to record drawings and observations of all their favorite specimens.
- **Project:** Have students survey the classroom looking for items that contain rocks and minerals. Students might be surprised to find that most things contain some form of nonliving Earth resource.
- **Arts/Project:** Have students make a paperweight by decorating a rock found in their neighborhood.
- **Project/Home Connection:** Have students collect rocks around their home and neighborhood. Challenge them to build an organized rock collection by sorting and identifying rocks.
- **Research:** Ask each student to bring in one interesting rock. Using a rock and mineral guide, help students identify each rock and its mineral composition. Create a labeled class collection.
- **Writing:** Invite students to write a first-person narrative from the perspective of a rock going through the rock cycle. Instruct them to describe at least two transitions or changes that occurred during the "life" of the rock. For extensive writing instruction, including how to write a personal narrative, see Writing A-Z.
- **Guest:** Invite a geologist or a mineralogist to the classroom to explain the distinction between minerals and rocks, and to put into perspective the passage of geologic time.
- **Technology:** Have students conduct a supervised Internet search to find out what nonliving materials are in familiar objects, such as cell phones or tennis rackets.

- **Community Service/Field Trip:** Bring students to a local natural or developed area to search for examples of human-caused erosion. For example, clear-cutting a forest hillside may cause soil erosion with the next heavy rainfall. Runoff from a parking lot may be eroding nearby soil. Brainstorm ways in which students can slow harmful erosion in their community.
- **Research/Home Connection:** Students can conduct research as a family/home project or in the library/media center to extend the learning about a topic in one of the *Quick Reads* or other unit resources.