

Classifying Rocks

Reading Focus

Key Concepts

- What characteristics do geologists use to identify rocks?
- What are the three main groups of rocks?

Key Terms

- rock-forming mineral
- granite
- basalt
- grains
- texture
- igneous rock
- sedimentary rock
- metamorphic rock

Target Reading Skill

Asking Questions Before you read, preview the red headings. In a graphic organizer like the one below, ask a *what* or *how* question for each heading. As you read, write answers to your questions.

Question	Answer
What does a rock's color tell about the rock?	

Lab
zone

Discover Activity

How Do Rocks Compare?

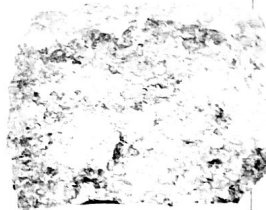
1. Look at samples of conglomerate and marble with a hand lens.
2. Describe the two rocks. What is the color and texture of each?
3. Try scratching the surface of each rock with the edge of a penny. Which rock seems harder?
4. Hold each rock in your hand. Allowing for the fact that the samples aren't exactly the same size, which rock seems denser?

Think It Over

Observing Based on your observations, how would you compare the physical properties of marble and conglomerate?



Conglomerate



Marble

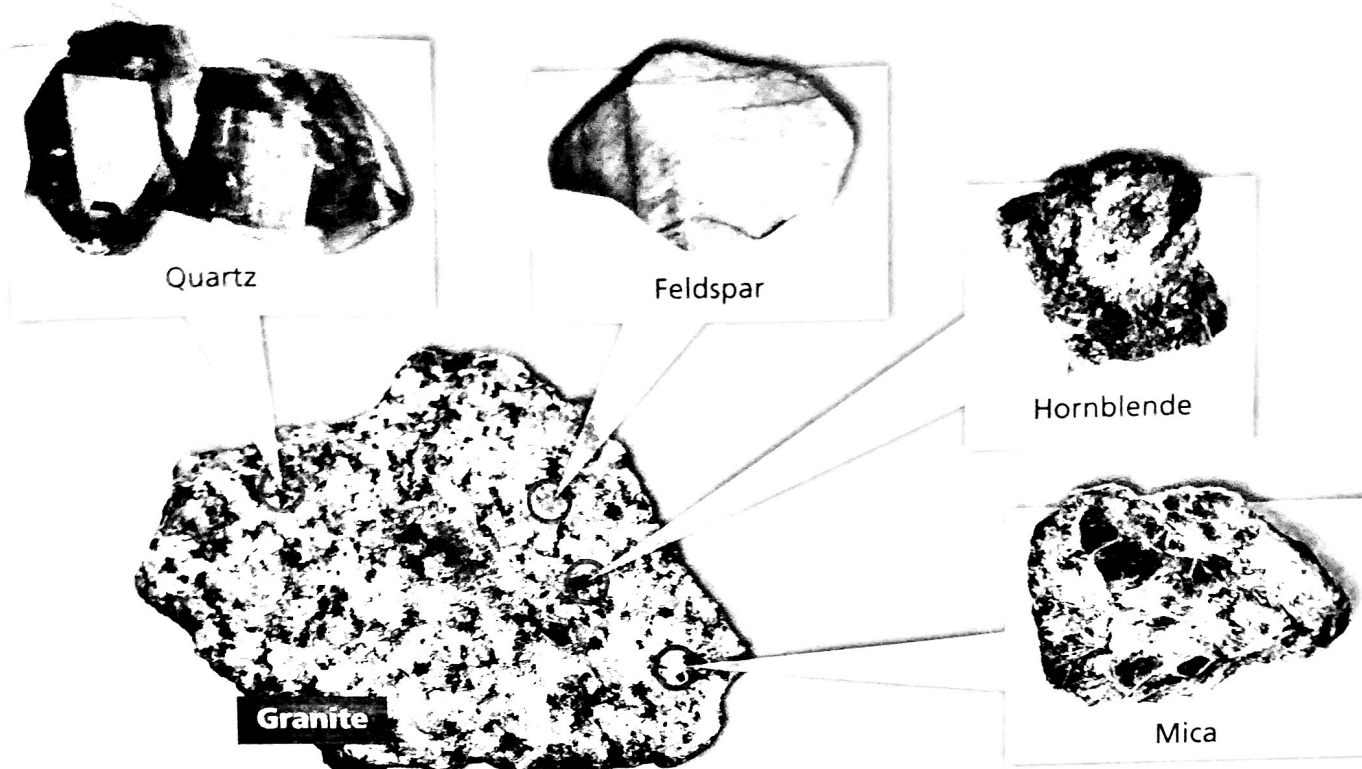
If you were a geologist, how would you examine a rock for the first time? You might use a camera or notebook to record information about the setting where the rock was found. Then, you would use a chisel or the sharp end of a rock hammer to remove samples of the rock. Finally, you would break open the samples with a hammer to examine their inside surfaces. You must look at the inside of a rock because the effects of ice, liquid water, and weather can change the outer surface of a rock.

You can find interesting rocks almost anywhere. The rock of Earth's crust forms mountains, hills, valleys, beaches, even the ocean floor. **When studying a rock sample, geologists observe the rock's mineral composition, color, and texture.**



FIGURE 1
Inspecting a Rock

This geologist is using a hand lens to observe a piece of shale.



Mineral Composition and Color

Rocks are made of mixtures of minerals and other materials. Some rocks contain only a single mineral. Others contain several minerals. For example, the granite in Figure 2 is made up of the minerals quartz, feldspar, hornblende, and mica. About 20 minerals make up most of the rocks of Earth's crust. These minerals are known as **rock-forming minerals**. Appendix B at the back of this book lists some of the most common rock-forming minerals.

A rock's color provides clues to the rock's mineral composition. For example, **granite** is generally a light-colored rock that has high silica content. **Basalt**, shown in Figure 3, is a dark-colored rock that is low in silica. But as with minerals, color alone does not provide enough information to identify a rock.

Geologists observe the shape and color of crystals in a rock to identify the minerals that the rock contains. In identifying rocks, geologists also use some of the tests that are used to identify minerals. For example, testing the surface of a rock with acid determines whether the rock includes minerals made of compounds called carbonates.

FIGURE 2

Minerals in Granite

Granite is made up of quartz, feldspar, hornblende, and mica. It may also contain other minerals. **Observing** Which mineral seems most abundant in the sample of granite shown?



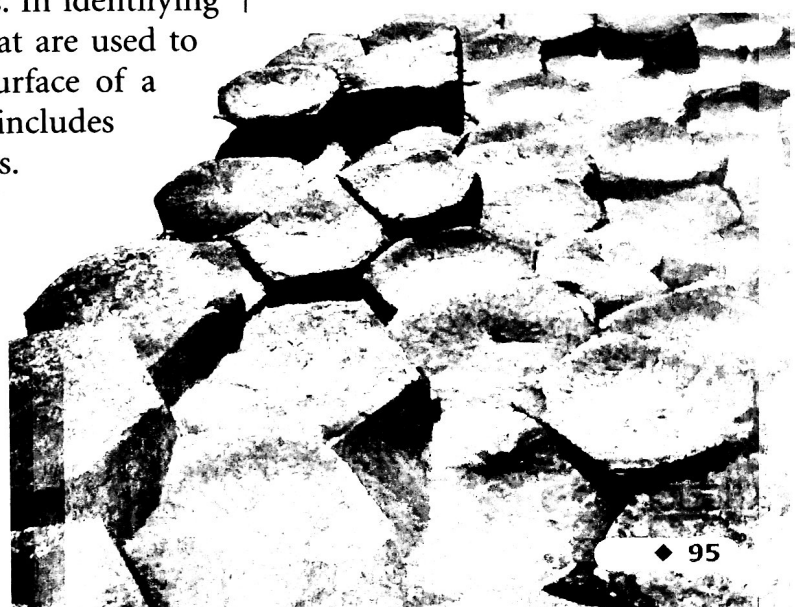
Reading
Checkpoint

How would you define "rock-forming mineral"?

FIGURE 3

Basalt

Basalt is a dark-colored rock that has low silica content. Unlike granite, basalt has mineral crystals that are too small to be seen without a hand lens.



Texture

As with minerals, color alone does not provide enough information to identify a rock. But a rock's texture is very useful in identifying a rock. Most rocks are made up of particles of minerals or other rocks, which geologists call **grains**. Grains give the rock its texture. To a geologist, a rock's **texture** is the look and feel of the rock's surface. Some rocks are smooth and glassy. Others are rough or chalky. To describe a rock's texture, geologists use terms based on the size, shape, and pattern of the grains.

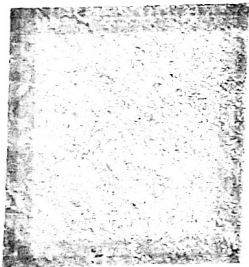
FIGURE 4

Rock Textures

Texture helps classify rocks. Comparing and Contrasting *How would you compare the texture of diorite with the texture of gneiss?*

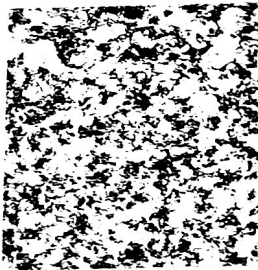
Grain Size

Fine grain



Slate

Coarse grain



Diorite

No visible grain



Flint

Grain Size Often, the grains in a rock are large and easy to see. Such rocks are said to be coarse-grained. In other rocks, the grains are so small that they can only be seen with a microscope. These rocks are said to be fine-grained. Notice the difference in texture between the fine-grained slate and the coarse-grained diorite in Figure 4 at left. Some rocks have no visible grain even when they are examined under a microscope.

Grain Shape

Rounded grain



Conglomerate

Jagged grain



Breccia

Grain Shape The grains in a rock vary widely in shape. Some grains look like tiny particles of sand. Others look like small seeds or exploding stars. In some rocks, such as granite, the grain results from the shapes of the crystals that form the rock. In other rocks, the grain shape results from fragments of several rocks. These fragments can be smooth and rounded or they can be jagged.

Grain Pattern

Nonbanded



Quartzite

Banded



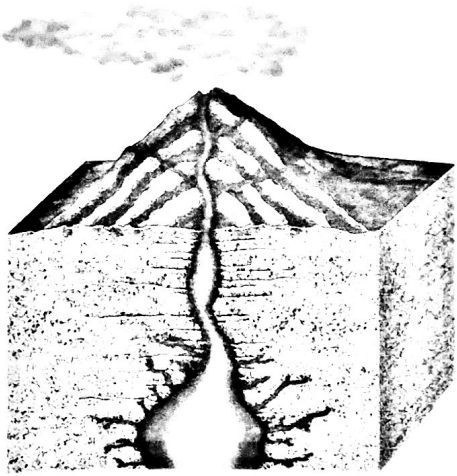
Gneiss

Grain Pattern The grains in a rock often form patterns. Some grains lie in flat layers that look like a stack of pancakes. Other grains form swirling patterns. Some rocks have grains of different colors in bands, like the gneiss (NYS) in Figure 4. In other rocks, the grains occur randomly throughout.

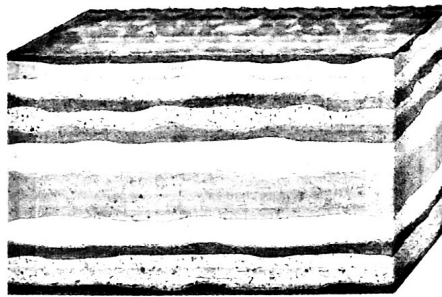


Reading
Checkpoint

What does it mean to say that a rock is coarse-grained?



Igneous Rock forms when magma or lava cools and hardens.



Sedimentary Rock forms when pieces of rock are pressed and cemented together.



Metamorphic Rock forms from other rocks that are changed by heat and pressure.

How Rocks Form

Using color, texture, and mineral composition, geologists can classify a rock according to its origin. A rock's origin is how the rock formed. **Geologists classify rocks into three major groups: igneous rock, sedimentary rock, and metamorphic rock.**

Each of these groups of rocks forms in a different way. **Igneous rock** (IG nee us) forms from the cooling of magma or lava. Most **sedimentary rock** (sed uh MEN tur ee) forms when particles of other rocks or the remains of plants and animals are pressed and cemented together. Sedimentary rock forms in layers that are buried below the surface. **Metamorphic rock** (met uh MAWR fik) forms when an existing rock is changed by heat, pressure, or chemical reactions. Most metamorphic rock forms deep underground.

FIGURE 5

Kinds of Rocks

Rocks can be igneous, sedimentary, or metamorphic, depending on how the rock formed.

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Section 1 Assessment

Target Reading Skill Asking Questions Work with a partner to check the answers in your graphic organizer about the section headings.

Reviewing Key Concepts

1. **a. Naming** What three characteristics do geologists use to identify rocks?
- b. Defining** What are the grains of a rock?
- c. Comparing and Contrasting** In your own words, compare the grain size, shape, and pattern of the conglomerate and breccia in Figure 4.
2. **a. Reviewing** What are the three main groups of rocks?
- b. Explaining** How do igneous rocks form?
- c. Classifying** Gneiss is a kind of rock that forms when heat and pressure inside Earth change granite. To what group of rocks does gneiss belong?

Writing in Science

Wanted Poster Write a paragraph for a wanted poster in which you describe the characteristics of granite. In your wanted poster, be sure to describe granite's mineral composition, color, and texture. Also mention the group of rocks to which granite belongs.