

# Making a Rock

## OBJECTIVES

In this activity, students make their own rocks. In a later activity, students will dissect these rocks in an attempt to identify the minerals and other components that make them up.

### The students

- ▶ discuss the Earth processes involved in rock formation
- ▶ compare and contrast the process they will use to form their rock models with the processes by which rocks form naturally in the Earth
- ▶ follow directions to make their own rocks

## SCHEDULE

About 50 minutes

## VOCABULARY

igneous  
metamorphic  
petrification  
sedimentary

## MATERIALS

### For each student

- 1 Activity Sheet 2
- 1 object to fossilize (leaf, chicken bone, or seed)\*

### For each team of four

- 1 container, 1-qt
- 1 cup, plastic

newspaper\*

- 1 tongue depressor
- 1 tray, plastic

### For the class

- 1 cont alum
- 1 bag calcite pieces
- 1 cont clay, powdered
- 1 cont gravel
- paper towels\*
- 1 pitcher\*
- 1 bag pyrite pieces
- 1 bag quartz pieces
- 1 *Rock Guide*
- 32 safety goggles
- 1 cont salt
- 1 cont sand
- 7 spoons, measuring, 1-Tbsp
- 1 cont talc
- 1 VCR and monitor\*
- 1 video, *Rocks and Minerals*
- water, tap\*

\*provided by the teacher

## PREPARATION

- 1 Make a copy of Activity Sheet 2 for each student. Have the *Rock Guide* on hand for reference.
- 2 Have each student bring to class a small object to fossilize, such as a leaf, a small chicken bone, or a seed. Tell them that the items should be organic (derived from a once-living organism). Have several extra items on hand the day of the activity for students who forget to bring them.

3 Establish a materials distribution center by placing the following items in an easily accessible place: containers, plastic trays, tongue depressors, plastic cups, and newspaper. Also set out the following rock ingredients: containers of alum, powdered clay, gravel, salt, sand, and talc; one bag each of calcite, pyrite, and quartz pieces; one pitcher of tap water (if there is no sink in the classroom); and seven measuring spoons (Tbsp-size, one per ingredient).

4 Have paper towels available in case of spills. Provide each team with enough newspaper to cover their work area.

## BACKGROUND INFORMATION

Geology is the study of the Earth and its origin, history, and structure. Geologists study the rocks and minerals that make up the Earth's crust to learn more about the Earth.

Rocks are divided into three categories according to the process by which they were formed. **Igneous** rocks are formed by the cooling and solidification, either above or below ground, of molten matter from inside the Earth. **Sedimentary** rocks, as the name suggests, are made from sediments (minerals, pieces of other rocks, and sometimes organic matter) that have been deposited in layers and pressed or cemented together over time to form a solid material. **Metamorphic** rocks are composed of minerals from igneous, sedimentary, and other metamorphic rock, which have been fused under extreme heat and pressure within the Earth.

Two of the specimens in the students' collections are examples of **petrification**, the process of converting once-living material to stone or fossils.

In this activity, the students will form their own rocks using the materials provided in the kit. Later, in Activity 9, they will act as geologists and dissect their rocks, perform tests on the rocks to identify their content, and record their findings.

### ▼ Activity Sheet 2

#### Making a Rock

Write the definition of each term below.

Sedimentary Rock: **Rock formed when layers of sediment are pressed together. Pressure and heat cement the layers into solid rock.**

Igneous Rock: **Rock formed when molten or liquid matter from inside Earth comes to the surface, cools, and hardens.**

Metamorphic Rock: **Rock formed when heat and pressure over long periods of time work to fuse together other kinds of rock.**

Petrified Rock: **Rock formed when plant or animal remains are replaced with minerals and chemicals.**

## Guiding the Activity

- 1 Review the definitions of *rock* and *mineral* with the students.

Then ask, **How do you think rocks are formed?**

Explain that the rock specimens in the kit can be categorized according to how they were formed. These three categories of rock are sedimentary, igneous, and metamorphic.

- 2 Introduce sedimentary rock formation first. Write the word *sedimentary* on the board. Tell the students that this type of rock is named after the material from which it is made: sediment. Then write the word *sediment* on the board. Ask, **What do you think sediment is?** Write the students' responses next to the word.

Explain that **sedimentary** rocks are formed when sediment accumulates in layers and is squeezed and cemented together.

- 3 Introduce igneous rock formation. Write the word *igneous* on the board. Tell students that this word means "related to fire, or fiery in origin."

Ask, **What geological phenomenon can you think of that involves fire, extreme heat, or melted (molten) rock?**

Explain that **igneous** rocks are formed when molten rock from deep within the Earth cools and hardens.

## Additional Information

*Students should recall that minerals are made of only one material, while rocks are made of a mixture of minerals and possibly other material.*

*Listen to all of the students' responses, then tell them that rocks can be formed by several different processes.*

*Although the Classes of Rock chart is not used until later in this module, you may display it now. The chart will help to summarize the discussion of the different types of rock.*

*Students will probably know that sediment is the particles that settle to the bottom of a liquid.*

*Students may suggest that volcanoes and vents (large cracks) in the Earth may expose molten rock. Some students may also mention that the word igneous sounds like the word ignite, which means "to set on fire."*

## Guiding the Activity

### Additional Information

- 4 Introduce metamorphic rock formation. Write the word *metamorphic* on the board. Tell the students that this name implies what has happened to these rocks. Explain that *meta* means “change” and that *morph* means “form.” Ask, **What does the name metamorphic tell you about this type of rock?**

Explain that **metamorphic** rocks are formed when sedimentary and igneous (and even other metamorphic) rocks are subjected to extremely high temperature and pressure within the Earth.

*Metamorphic rocks have undergone changes before arriving at their present form.*

- 5 Introduce the process of petrification now. Write the word *petrification* on the board. Tell the students that this word means “to become petrified or fossilized.”

Explain that during the **petrification** process, the remains of plants or animals are replaced with minerals and other chemicals. The form of the original material (for example, the rings of a tree trunk or the ridges of a scallop shell) can still be seen.

*Point out that the results of the petrification process are sometimes described as petrified.*

- 6 Distribute a copy of **Activity Sheet 2** to each student. Instruct them to write the definition next to each term.

- 7 Explain that students cannot re-create in the classroom the Earth processes that form rocks naturally, but they can use some of the same materials found in rocks to simulate the formation of a rock.

Tell students that in this activity, they will use minerals and other natural materials to make a rock, but that instead of applying extreme heat and pressure over thousands of years, they will add an ingredient to their mixture that will cause the other ingredients in the mixture to cement together. Then they will mold the “rock dough” with their hands and set it aside for several days while it hardens.

## Guiding the Activity

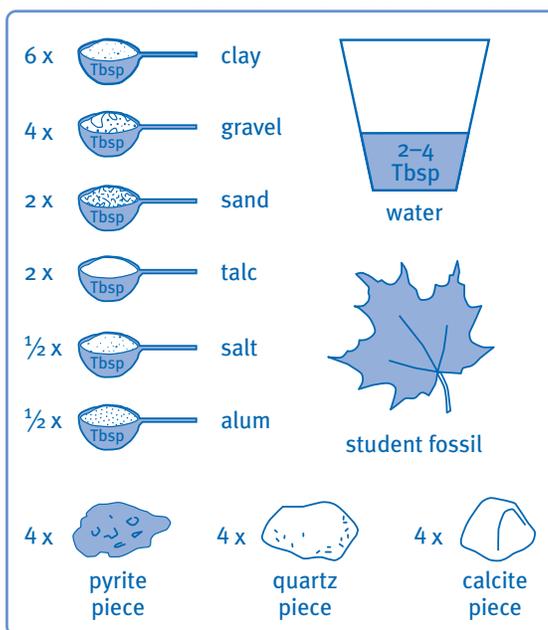
8 Without actually combining the ingredients yourself, walk the students through the rock formation process. First, make sure all of the ingredients at the distribution center—except the three minerals—are identified clearly and that students know how much of each ingredient to use. (Tell them to estimate any  $\frac{1}{2}$ -Tbsp amounts.)

Each group of four students will need the following: one container, one plastic tray, one tongue depressor,  $\frac{1}{2}$  Tbsp alum,  $\frac{1}{2}$  Tbsp salt, 6 Tbsp powdered clay, 4 Tbsp gravel, 2 Tbsp sand, 2 Tbsp talc, 2–4 Tbsp water in a plastic cup, and 4 pieces each of calcite, pyrite, and quartz. Write on the board the amount needed by each team (see Figure 2-1). Do not label the bags of minerals, as students will conduct tests in a later activity to determine their identity.

Explain how to stir the mixture with a tongue depressor, adding just enough water to make a stiff dough. When the right consistency has been achieved, the dough should be removed from the container and divided into four equal-size pieces, one for each member of the team. At this point, students should bury their fossil item and one piece of each of the three mystery minerals in their hunk of dough, then roll the dough into spheres. Four spheres should be placed on a plastic tray and flattened into slabs  $\frac{1}{2}$  in. thick.

9 Divide the class into teams of four. Invite one member from each team to come up to the distribution center and measure the ingredients into a container. That team member can then pick up a tongue depressor, four pieces of each of the three mystery minerals, and a plastic tray, and return to his or her team's work area. Have another member from each team spoon 2–4 Tbsp of water into a plastic cup and bring it back to his or her team's work area. Tell team members to share the mixing with other team members. Provide assistance as required.

## Additional Information



▲ Figure 2-1. Materials for each group of four.

**Safety Note:** Have students wear safety goggles when mixing their “rock dough.” Have them wash their hands thoroughly afterward.

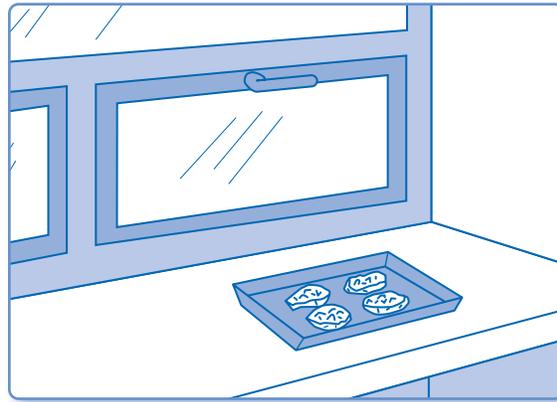
## Guiding the Activity

- 10** After the teams have mixed, molded, and placed their rocks on trays, instruct them to place the trays where the rocks can be observed but not disturbed. A warm, well-ventilated area is best (see Figure 2-2).

The rocks will harden in about three to five days. Students will investigate their rocks in Activity 9. Even if the rocks dry quickly, do not begin Activity 9 until Session I of Activity 8 has been completed.

- 11** Part One of the *Rocks and Minerals* video is titled “The Origins of Rocks and Minerals.” Show Part One to the class after students have finished making their rock models.

## Additional Information



▲ Figure 2-2. Drying the rock models.

## REINFORCEMENT

Ask students to name the three kinds of rock and to describe how each is formed.

## SCIENCE JOURNALS

Have students place their completed activity sheets in their science journals.

## CLEANUP

Return all unused ingredients to the kit. Discard any soiled newspaper, and save the rest for use in Activity 3. Rinse and air dry the containers, tongue depressors, and measuring spoons, and return them to the kit. The containers will be used again in Activity 8. Return the video to the kit.

## SCIENCE AT HOME

How many rocks made by humans can the students find at home? Are there stepping stones leading to the door? Is brick used in or around the house or yard? What about the sidewalk and street?

## Connections

### Science Extension

Continue adding to the bulletin board display that you began in Activity 1.

- *Mica* is composed of the elements silicon, oxygen, aluminum, potassium, and hydrogen. Mica has a wide variety of industrial applications, including use as an electrical insulator and as a lubricant. Thin sheets of mica, called “isinglass,” were once used as windows in stove doors. Shredded mica has been used to make artificial snow for movies and window displays.
- *Calcite* consists of the elements calcium, carbon, and oxygen in the form of a compound called calcium carbonate. Calcite is found mainly in limestone, a sedimentary rock, and in marble, a metamorphic rock formed from limestone. Calcite is used to make lime for industrial and gardening purposes, cement, and fertilizers. Calcium carbonate is the major component of stalactites and stalagmites.

### Science and the Arts

Many cultures have used small pieces of stone in mosaics to decorate walls and floors. Ask students to research this art form. Students could demonstrate how mosaics are made by using cut pieces of construction paper to represent the stones.

### Science and Careers

Geologists are scientists concerned primarily with the origin and composition of the earth. By using mathematics and the other sciences (biology, chemistry, and physics), geologists can predict, among other things, where valuable minerals can be found beneath the Earth’s surface. Ask interested students to investigate the job of a geologist. What else might a geologist be able to predict? How might a geologist contribute to earthquake preparedness?

### Science and Language Arts

Have students compile a list of terms related to various geological fields of study, such as *geology*, *petrology*, *geomorphology*, *seismology*, and so forth. Ask students to use a dictionary to find the derivation and meaning of each term. Examples are given below.

*geology*:  
*geo-* (“earth”) +  
*-ology* (“study of”) =  
the study of Earth

*petrology*:  
*petro-* (“rock” or “stone”) +  
*-ology* (“study of”) =  
the study of rocks—their origin, composition,  
and structure

*geomorphology*:  
*geo-* (“earth”) +  
*-morph-* (“shape” or “form”) +  
*-ology* (“study of”) =  
the study of the shape and development of  
land forms

*seismology*:  
*seismo-* (“shock” or “earthquake”) +  
*-ology* (“study of”) =  
the study of the causes and effects of  
earthquakes