# Classifying Rocks and Minerals

## Summary

Students identify rock types by observing key characteristics.

## Time Frame

1 class periods of 45 minutes each

## Group Size

Small Groups

## Materials

For each group of 4-5 students:

- Samples of as many igneous, sedimentary, and metamorphic rocks as possible
- Magnifying glass

## Background for Teachers

Utah Rocks and Minerals - Background Information

Minerals occur in nature. Minerals can be pure substances (elements) or combination of substances (compound). Minerals are the raw materials of rocks. Rock types are characterized by the types of minerals present in their relative proportions, and the processes by which the rocks were formed. Of these processes, heat, pressure, and time are the most important.

The variety of Utah rocks and minerals is greatly valued because of the many geological occurrences of the past. Minerals have definite chemical compositions and physical properties. Some common minerals are feldspar, quartz, calcite, mica, and hornblend. Some minerals are valuable enough to be mined. Some of theses are the metal ores from which we obtain iron, lead, copper, aluminum, zinc, gold, and silver.

Minerals make different rocks look different. A granite rock, for example, has different minerals than a basalt rock. However, even rocks with the same minerals may look different due to variations in the relative amounts of minerals and the processes by which they are formed.

Some rocks may contain minerals in the form of crystals. Crystals have a regular geometric shape. Crystals can be small or large. Large crystals can be seen in some rocks (granite). In other rocks, such as obsidian, the crystal formation is microscopic. The size of the crystals in a rock depend on how fast the rock cooled. The faster the rock was cooled, the smaller the crystal formation: the slower the rock was cooled, the larger the crystals.

Igneous rocks are formed from minerals that have melted deep within the Earth. These melted minerals are called magma. As magma is pushed to the surface of the Earth, the minerals begin to cool and harden. Different igneous rocks are formed depending on the presence of different minerals and how fast the magma cools. Some igneous rocks include pumice, obsidian, and basalt. The rapid separation of the gases from lava produces pumice, a rock with large air spaces in it, similar to a sponge. The rapid cooling of lava produces obsidian and fine-grained rocks such as basalt.

Sedimentary rocks are formed as particles settle to the bottom of oceans and lakes. These materials (known as sediment) consist of sand, mud, bodies of animals, shells, and other materials. Over millions of years, these sediments are covered by other particles and the layers are pressed down by the weight of the sediments and water above. Gradually, the sediments are hardened into sedimentary rock. Scientists determine the age of a sedimentary rock by its thickness, the mineral layers, and the plant and animal remains it may contain.

Nearly 75 percent of the land area of the Earth is covered with sedimentary rock. The mouth of the

Mississippi River, in the Gulf of Mexico, has layers of sedimentary rock that measure 12,000 meters thick. The sediments there were carried by the Mississippi River and its tributaries from the interior of North America. The bluffs above the Jordan River are made of chalky limestone formed from fossil remains. Utah has large amounts of sedimentary rock. Most of it was formed at the bottom of different prehistoric lakes that covered parts of the state. Sedimentary rocks include limestone, shale, sandstone, and breccia.

Metamorphic rocks are formed from igneous, sedimentary, or other metamorphic rocks which contain minerals that have been changed by heat, pressure, or chemical action. Strong heat and pressure inside the Earth can cause minerals in rocks to change. For example, when shale is changed to slate, the fine quartz crystals of the shale become broken, flattened, and reoriented. The clay particles of shale recrystallize to form tiny flakes of mica. This realignment of the bits of quartz and mica result in a rock that splits easily into fine, thin sheets with smooth surfaces. This property makes slate ideal for chalkboards, roofing tiles, and paving tiles.

## Intended Learning Outcomes

- Observe objects.
- Use a classification system.
- Know science information.

## Instructional Procedures

- As a class, discuss the difference between rocks and minerals.(Rocks are made of minerals. See background information.)
- In their science journals, have each student describe the differences between minerals and rocks.
- Assign the students to groups.
- Give each group a collection of rock samples. The collection should include several examples of each of the three types of rocks; igneous, metamorphic, and sedimentary.
- Instruct students to observe the rocks using a magnifying glass and draw the shapes and colors of the minerals.
- As a class, discuss the three different types of rocks. Identify each type of rock and describe its characteristics.
  - Sedimentary
    - Rounded-appearing mineral and rock particles that are cemented together
    - Often in layers
  - Igneous
    - With or without observable crystals
    - Not in layers
    - With or without air holes
    - Could be glass-like
  - Metamorphic
    - Crystals/minerals lined up (aligned)
    - Often in layers, sheet-like
- Instruct students to sort rocks by appearance according to the three basic types: sedimentary, igneous and metamorphic. Examples of Utah rocks include the following:
  - Sedimentary: sandstone, conglomerate, shale
  - Igneous: basalt, granite, obsidian, pumice
  - Metamorphic: marble, gneiss, schist
- Suggest that the group classifying the most samples correctly in 20 minutes will be the winners.
- Put the students to work. Move among the groups answering questions but do not identify

samples.
After 20 minutes, correct the groups' classifications as a class.

## Assessment Plan

Separate the groups so that each individual is working alone. Get six different rock samples the students have not yet seen. Label the rock samples 1-6. Pass the samples around and ask the students to identify the samples as either igneous, metamorphic, or sedimentary.

## Authors

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