

4TH GRADE MINERALS AND ROCKS

Summary: Students explore the differences between minerals and rocks. They sort and identify 9 minerals based on their characteristics. After learning the differences between sedimentary, igneous and metamorphic rocks; students classify 12 common rocks found in Utah. Students learn uses for these common rocks and look at pictures of their formations found in Utah. Finally, students learn about the rock cycle and understand how rocks can change over time.

Intended Learning Outcomes for 4th Grade:

- 1a. Observe simple objects and patterns and report their observations.
- 1b. Sort and sequence data according to a given criterion.
- 1c. Make simple predictions and inferences based upon observations.
- 1d. Compare things and events.
- 3a. Know science information specified for their grade level.

Utah State Core Curriculum Tie:

Standard 3 Objective 1:

- a. Describe the differences between minerals and rocks.
- c. Sort rocks by appearance according to the three basic types: sedimentary, igneous and metamorphic.
- d. Classify common rocks found in Utah as sedimentary, metamorphic and igneous.

Preparation time: 40 min to assemble bags the first time, then 20 min

Lesson time: 1 hour

Small group size: works best with one adult for every 5 students

Materials: For a class of 30 students, 6 groups of minerals and rocks are necessary. Smaller classes need fewer groups of minerals and rocks.

Minerals: Most schools have a supply of many of these minerals or they may be purchased from different companies. Unless noted these are from Carolina.com.

Calcite, wardsci.com, 49V1600, single piece, \$4.95

Quartz, GEO3498B, pack of 10, \$8.00

Halite, enasco.com, SB10604M, pack of 10, \$11.50

Talc, GEO3520B, pack of 10, \$8.45

Muscovite, GEO3482B, pack of 10, \$13.95

Pyrite, GEO3486B, pack of 10, \$19.95

Magnetite, GEO3476B, pack of 10, \$16.75

Galena, minimegeology.com, 6 pieces, \$22.50

Graphite, GEO3452B, pack of 10, \$21.25

Rocks: Most schools have a supply of many of these rocks or they may be purchased from different companies. Unless noted these are from Carolina.com.

Sandstone, GEO2010B, pack of 10, \$7.60

Conglomerate, GEO1194B, pack of 10, \$7.60

Shale, GEO2020B, pack of 10, \$7.60

Basalt, GEO1012B, pack of 10, \$7.60

Obsidian, wardsci.com, 47V5742, pack of 10, \$8.75

Pumice, GEO1130B, pack of 10, \$7.60

Granite, GEO1080B, pack of 10, \$7.60

Marble, GEO2054B, pack of 10, \$7.60

Gneiss, GEO 2046B, pack of 10, \$7.60

Schist, wardsci.com, 47V0297, pack of 10, \$13.95

Slate, GEO2084B, pack of 10, \$7.60

Limestone, GEO1198B, pack of 10, \$10.10

Magnifying lenses

Magnets

Sand

Cup

Glass or mirror pieces

Poster of the rock cycle

Background information:

Minerals are naturally occurring pure substances. No matter how tiny of a piece of mineral you have it is identical to all other pieces of that same mineral. Minerals have a very orderly structure that is usually, but not always, seen as crystals. There are more than 3000 known minerals on Earth. Combinations of different minerals make up all the rocks on earth.

Geologists tell minerals apart based on nine properties: color, luster, density, crystal form, cleavage (smooth, flat surface pattern when a mineral is broken), fracture (irregular pieces formed when broken), tenacity (toughness), hardness (ability to scratch or be scratched), and transparency. Minerals have many different uses that are usually dependent on their properties.

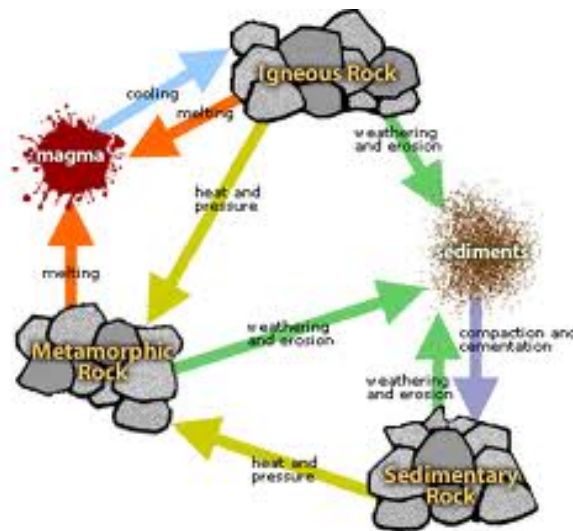
Rocks are made up of more than one kind of mineral. Rocks belong to one of three groups: sedimentary, igneous or metamorphic. Sedimentary rocks make up about $\frac{3}{4}$ of the rocks at the Earth's surface. They form when sand, mud, organic materials, and other types of sediment collect. When this sediment is pressed together, due to the weight of water or Earth, it forms fairly soft rocks. Many times layers and pieces of sediment can be seen in sedimentary rock. Fossils are found in sedimentary rock.

Igneous rocks begin as hot, fluid material that comes from deep under the Earth's surface. Intrusive igneous rock is formed from magma under ground. Intrusive igneous rocks cool slowly and many times the individual mineral crystals can be seen. Extrusive igneous rock is formed from lava above ground.

Extrusive rocks cool very quickly and minerals are generally not seen leaving a glassy shiny rock or one with air bubbles trapped inside.

Metamorphic rocks occur when sedimentary and igneous rocks change due to temperature and pressure underground. Many times wavy ribbon-like layers with shiny crystals can be seen in metamorphic rocks. For example, marble is formed when limestone is stressed by very high pressures or temperatures and these stressors change the rock characteristics from limestone to marble.

The rock cycle is a scientific concept that describes how rocks change through time. Rock components are never created nor destroyed but are constantly recycled into new rocks. When rocks come close to the surface of the Earth they can be weathered, eroded and compacted into sedimentary rocks. When liquid magma cools either below or above the surface of the Earth it becomes igneous rock. When rocks get forced back down into the Earth they can be heated, pressed and melted into metamorphic rocks. Therefore, rocks can be changed into one form or another depending on the Earth's forces that are acting upon them.



Pre-lab discussion: Hold up a mineral and a rock. Have the students if they can predict which is the mineral and which is the rock. From this prediction, explain the differences between minerals and rocks. Ask if any students know the three types of rocks and go over their differences. Finally, ask the students if a rock can change from one type to another over time. Use a poster of the rock cycle to explain how rocks can change over time.

Instructional procedure:

I. Mineral Identification – In this activity, students will identify 9 minerals based on their characteristics.

1. Separate the nine minerals by color into three piles.
 - a. light-colored or see through (5 of them)
 - b. golden (1)
 - c. dark-colored (3)
2. The golden mineral is **pyrite** or 'fools gold'. Pyrite contains iron and sulfur.
3. Test the dark-colored minerals with the magnet and identify the magnetic one. This mineral is called magnetite. We obtain iron from **magnetite**.
4. Test the remaining two dark-colored minerals and find the denser one. This is **galena**. We obtain lead from galena. The lighter one is **graphite**. Graphite is found in pencils. Try and write with graphite. Graphite is also very slick and is used as a lubricant.
5. Look at the light colored minerals. The one that is rhombic shaped is **calcite**. Hold calcite over a line or words. See that it doubles all the objects when you look through it. Calcite is used in concrete and in the production of lime. The mineral that is flat and consists of thin plates is called **muscovite** or mica. Mica is used as an insulator because it is resistant to melting.
6. Test the last three light-colored minerals to see which can streak glass. The mineral that is harder than glass, and scratches it, is **quartz**. Quartz is found in glass and sand.
7. For the final two minerals, take a finger, lick it and touch it to the mineral and then lick it again. The mineral that is salty is **halite**. We obtain salt for cooking from halite. The final mineral is **talc**. Scrape off some powder with a spatula or your fingernails. Rub the powder between your fingers and feel how slick it is. We use talc in powder.

II. Common Rocks found in Utah – In this activity, students will be given a bag of 12 rocks. They should study them with a magnifying lens. First, students can make their predictions as to the identification of each rock. Place the rocks on the prediction page where the students think they belong. Secondly, using the notes on the different rocks below, they should try and identify all the individual rocks and determine if their predictions were correct. After all the rocks have been correctly identified, look at the pictures of rock formations found in Utah.

1. Sedimentary – These rocks are formed from sediments produced by weathering and erosion. Sedimentary rocks consist of very small pieces of rocks

or organic matter that have been buried and cemented together in flat-lying layers. Sedimentary rocks many times contain round edged minerals.

Sandstone – Sandstone is made from sand grains cemented together by pressure squeezing the layers together. Try and rub some sand off of the sandstone rock. Sandstone occurs in different colors based on the sand it was formed from. Sandstone can be used in landscaping, concrete, and some ancient buildings were even made of sandstone. Sandstone is the main sedimentary rock found in Arches and Zion National Park.

Conglomerate – This rock is made of well-rounded gravel that is cemented together with sand and clay. As this mixture was pressed together, the sedimentary rock was formed. This rock looks like a mixture of many different rocks all stuck together. Conglomerate can be used in construction and flooring. Conglomerate formations can be found near Price, Utah.

Shale – Shale is made up of very small particles of gray colored mud or clay. Layers are many times evident in shale. Shale can be used as filler in paint, plastic and roofing materials. Oil shale is used as a source for oil. Many trilobite fossils are found in shale near Price, Utah.

Limestone – Limestone is made mostly of calcite, which came from ancient seabeds filled with sea animal shells. Limestone is used to make concrete and to produce lime, which is an important chemical used in steel production and water purification. Limestone can be found in the Oquirrh Mountains and Parley's Canyon.

2. Igneous – These rocks are formed from the cooling of hot molten rock. This is either magma, which is molten rock underground (intrusive igneous rocks); or lava, which is the molten rock once it comes through the Earth's surface (extrusive igneous rocks). Igneous rocks do not appear to have layers. Some igneous rocks have crystals, air holes, or some are glasslike.

Basalt – This rock cooled very rapidly above ground. Crystals are not formed when the rock cools rapidly. This rock is dense, black and forms large formations. Basalt is used in asphalt and concrete. It can be found in the Black Rock Desert of Western Utah.

Obsidian – Obsidian cools very rapidly above ground. No crystals are visible. When the rock forms it becomes a black glassy rock. This rock is used in jewelry and in making arrowheads because it is very strong and sharp on its edges. Found in the Black Rock Desert of Western Utah.

Pumice – Pumice cools very rapidly above ground from a frothy volcanic mixture. Since the mixture was frothy and it cooled quickly, this rock has many small air holes and individual crystals cannot be seen. This rock normally floats in water (try it) and has an abrasive quality. Pumice can be used in cleaners and concrete. Also found in the Black Rock Desert of Western Utah.

Granite – This rock cooled slowly below ground. Since it cooled slowly, crystals had time to form. Most granite is made up of 3 different mineral crystals. This is many times used in homes for countertops and building materials. Granite can be found throughout Utah.

3. Metamorphic – These rocks used to be igneous or sedimentary rocks that were put under great pressure or heat underneath the Earth's surface and became a new type of rock. They differ from each other due to the sedimentary or igneous rock they formed from. You can usually see characteristics of the former rock in the final metamorphic rock.

Marble – Marble rock formed from the sedimentary rock limestone. Look for the calcite crystals and lines in the marble. Marble is used in homes and sculptures. Marble is a dense, crystalline rock that can be found in Big Cottonwood Canyon.

Gneiss – Gneiss was formed from high heat and pressure on layers of different mineral crystals. Gneiss many times has a banded look due to its different mineral composition that can include mica and quartz. Gneiss is used to make statues, ornamental stones and flooring. Gneiss can be found in Farmington Canyon and Antelope State Park.

Schist – This rock is formed from a high crystal muscovite content of sedimentary rock. This gives the rock a satiny sheen and many times layers can be seen. Schist is used to make beautiful structures for decoration because it is not very strong for building. This rock is found in Little Cottonwood Canyon.

Slate – This rock is formed from the metamorphosis of the sedimentary rock shale. Slate is fine grained, dense and brittle. We can use slate for chalkboards, counters and flooring. This rock can be found in Box Elder County.