

4th Grade: Rocks and Minerals

Objective:

Students will learn about the different properties of various rocks and minerals by testing their properties.

Docent Lab Guidelines:

1. Docent(s) should plan to arrive early to set up before the class arrives. The set up for this lab is minimal. If you plan to do the demonstration then it will take a little extra time to set up.
 2. Input the day and time into the Science Lab Master Schedule. Allow at least 1 hour minimum for this lab.
 3. Safety glasses and aprons are not needed for this lab.
 4. Give a brief 5-10 minute overview of rocks and minerals.
 5. During the hands-on portion of the lab students will try to identify small samples of rocks and minerals. Each student will have their own kit and will test out the samples. Most students do not finish testing all the samples during the session.
 6. The last 5-10 minutes of class review with the students the answers to on their worksheets and see if they correctly identified the rock and mineral samples.
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Rocks and Minerals: For Docent's Reference Only

There are slides saved on the Photo Gallery of the iPad which go along with the information provided below. They can be used during the discussion portion of this lab session.

You may not realize it but rocks can be found all over our planet. Our continents are covered in vast areas of stone with mountains covering 1/5 of the land area. Oceans are dotted with islands and the oceans are covered with rocky bottoms. Rocks are a connection to our past. They tell us about the history of our planet Earth.

Rocks can be millions of years old but also new rocks are being formed every day,

Of the 8 planets there are only 4 containing rocky material: Earth, Venus, Mercury and Mars. The other four: Jupiter, Saturn, Uranus and Neptune are made mostly of gas. But of the 4 rocky planets only earth is covered with signs of life: oceans, grasslands, lakes and forests.

Rocks and minerals may on the surface seem like a boring subject but think about this.... we utilize rocks and minerals everyday....from minerals in the food we eat, medicines, computers, tools, pencils, anything made of metal, jewelry and even in the builds we use every day.

Ancient man used rocks to make primitive tools and build fire. The ancient Egyptian and Mayan Pyramids were built by cutting and moving stone. While the ancient Petra in

Jordon was literally carved into the sandstone cliffs around 312 BC. ([Slides of the Pyramids and Petra on iPad Photo Gallery](#)).

What is a Mineral?

To meet the definition of "mineral" used by most geologists a substance must meet these requirements:

- **naturally occurring** – people did not make it
- **inorganic** – not made from a living organism like pearls
- **solid** – not a liquid or a gas at standard temperature or pressure
- **structured in different crystal patterns**
- **ordered internal structure** - atoms in a mineral are arranged in a systematic and repeating pattern

Minerals Properties:

- Crystal formation- each type of mineral has a specific crystal shape.
- Cleavage – how a mineral breaks into pieces
- Hardness – describes the hardness of a mineral on the Mohr scale of 1 to 10. How easy is it to scratch a mineral? Talc is soft and has a hardness factor of 1 while a diamond is the hardest with a factor of 10.
- Luster – how light reflects off the surface of the mineral. Does it look glassy, dull, metallic, waxy, pearly, diamond like
- Streak – the color of a mineral with it is rubbed on a white streak tile or crushed into a powder.
- Specific Gravity – measure of density of a mineral compared to the density of an equal volume of water

There are 4000 different types of minerals but only about 30 types are commonly found on the earth's crust. Minerals are the building blocks of rocks.

Geologist - a scientist who studies rocks, layers of soil, etc., in order to learn about the history of the Earth and its life

What is a Rock?

Rocks are usually defined as a mixture of common minerals. Much like the many types of recipes for cookies, there are numerous recipes for rocks.

Cookies are created from an energy source which causes a chemical reaction. What is the energy sources that creates rocks? Heat & pressure!

Rocks can be hard or soft, as small as a grain or as large as a building. There are many kinds of rock, and they can be classified in a number of ways. However, geologists classify rocks based on how the rocks were formed. The three classes are:

Igneous Rocks – to ignite

Rocks **forged in fire** from heat energy deep inside the earth. These rocks are created from liquid rock called: MAGMA. Magma can break through the earth's surface and spew out as lava. Cooled down lava and magma forms igneous rocks. ([Slide of a volcano on IPad Photo Gallery](#)).

Examples of Igneous rocks are granite and obsidian. They do not look alike. Obsidian forms when lava cools quickly and granite forms when magma underground cools very, very slowly over millions of years. The super slow cooling process allows minerals to form in the granite. Granite is the main bedrock on all continents. ([Slide of a granite and obsidian on IPad Photo Gallery](#)).

([Slide OF The GIANT CASEWAY in Northern Ireland on IPad – made from igneous rock called Basalt about 50 million years ago.](#))

([Slide of YOSEMITE on IPad– walls of granite thousands of feet high, peek out of the earth's surface.](#))

Sedimentary Rocks (formed by eroded materials from other rocks)

Sedimentary rocks are formed from the broken down pieces of other rocks or debris cemented together by intense pressure and minerals deposited by water. There are many kinds of sedimentary rocks. These include: sandstone, mudstone and siltstone to name a few. One example of this type of rock is in the Grand Canyon. The sedimentary rock at the bottom of the Grand Canyon is 500 million years old. ([Slide of the Grand Canyon on the IPad Photo Gallery](#))

Sandstone - Piles of sand are piled up by water or wind and over time the piles get so heavy the sand is pressed together and cemented by minerals found in ground water. There are some interesting things that can be found in sandstone. Fossils are often found in sandstone. Sometimes sand dunes will become so large they harden into rock preserving the hump shape of the sand dune. There is a very famous fossil that was found in China in one of these preserved sand dunes. The fossil is called the "fighting dinosaurs." Paleontologists think a velociraptor and protoceratops were fighting and were trapped by a collapsing sand dune. ([Slide of these fossils on the IPad Photo Gallery](#))

Metamorphic Rocks (formed by direct alteration of existing rocks)

Root word is metamorphosis – to change....like a butterfly

Metamorphic rocks forms deep within the Earth when heat and pressure are applied to either igneous rocks or sedimentary rocks. This heat and pressure in essence cooks the rocks, changing their structure substantially.

What is a stalagmite and Stalactite?

Stalagmites and Stalactites are elongated forms of various minerals deposited from solution of slowly dripping water. A stalactite hangs like an icicle from the ceiling. A stalagmite appears like an inverted stalactite, rising from the floor of a cavern. They are

usually formed from a super saturated solution of the mineral calcite mixed with clay or other soils or minerals. They take thousands of years to form....growing at less than 1 inch a year. (Slide of calcite & stalagmites on the iPad Photo Gallery)

Stalagmite Demonstration

Set-up time takes about 20 minutes

Actually hands-on time is about 3 minutes

Fun video showing sodium acetate set to music

<https://www.youtube.com/watch?v=mxO9rtVjoR4>

Materials:

- Sodium Acetate Trihydrate crystals
- 2 glass large flasks
- Small plastic or glass flasks to use as a cover for larger flasks
- Glass plate or petri dish
- Gloves

Instructions

1. Prepare sodium acetate according to package instructions.
2. It will be heated in the microwave and then the solution needs to be cooled so you will need to plan accordingly. Either prepare before class and show this demonstration at the start of class or show it at the end while it cools.

Experiment: Rock and Mineral Identification

Materials:

- Rock and Mineral Kits
- Magnifying glasses
- Worksheets
- pencils

Preparation:

1. Set out mineral kits and magnifying glasses. One for each students at the tables.
2. Set out worksheets and Mineral's Clue handout.

Instructions:

- Students are only allowed to take out one sample at a time. After they are done testing the sample put it back in the box and take out the next. If all the rocks are taken out at one time they could be mixed up with a neighbor's rocks. Putting the kits back together is time consuming.

- Students are not allowed to peel the numbered labels off the samples.
- Each kit includes 16 samples, a porcelain streak tile and a nail.
- Students are to test each sample using the clues on the handout. Try to identify each sample by name.
- Each sample has a number on it which corresponds to the number on the worksheet. Remind the students of this or their answer will not be correct.
- Students are to fill out the worksheet. The tests they are to perform are listed on the worksheet. They are to test for:
 1. Color: Write down the color of the sample
 2. Luster: Is the sample metallic or non-metallic?
 3. Can your finger nail scratch the sample: Yes or no
 4. Can the nail scratch the sample: Yes or no
 5. Does it leave a streak on the tile? What color?
 6. Estimated hardness from 1-10?
 7. Cleavage: Is the sample smooth or rough? Describe
 8. Name: Try to identify the name of the rock or mineral by reviewing the test results and referring back to the Mineral's Clue Handout. Write the name down.
- Allow 5 minutes at the end of class to review the answers.
- Make sure students put all the pieces back into the kits.