

EARTH ROCKS

ELECTIVE ADVENTURE



SNAPSHOT OF ADVENTURE



Rocks and minerals are more than just things that lie in the ground. Yes, they help form our planet, but people also use them to create things that make our lives easier. In this Adventure, you'll dig into the world of rocks and minerals and discover some surprises about the science of geology — like how the ground beneath your feet is constantly on the move.

REQUIREMENTS

Approved by _____

1. Examine the three types of rocks: sedimentary, igneous, and metamorphic. _____
2. Find a rock, safely break it apart, and examine it. _____
3. Make a mineral test kit and test minerals according to the Mohs scale of mineral hardness. Using the rock cycle chart or one like it, discuss how hardness determines which materials can be used in homes, in landscapes, or for recreation. _____
4. Grow a crystal. _____



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REQUIREMENT 1

**Examine the three types of rocks:
sedimentary, igneous, and metamorphic.**

Everywhere you look, there are rocks and minerals. They are part of your world every day. Some rocks are small pebbles, and some are gigantic mountains. Your own backyard and neighborhood are good places to begin collecting rocks. Think about how these rocks were formed and how they ended up where you found them.

COLLECTING SPECIMENS

One way to begin a collection of geologic specimens is to visit a business that sells building or landscaping stones. These businesses might have small scraps of marble, granite, sandstone, limestone, pumice, shale, or slate they will give you. A nearby science museum might also have rock specimens for sale.

You can also go on a field trip. If possible, go with a rockhound (a collector who knows a lot about rocks). A rockhound will know which rocks contain useful materials. Look for minerals in gravel or sand pits, road cuts, diggings, mountains, hills, and stream banks. Keep your rock samples small. Small ones are easier to carry and easier to care for. Safety is very important when on a rock hunt. Always have an adult with you. Stay away from dangerous areas like cliffs, quarries, mines, and mine dump heaps. Be careful when climbing on rocks. And watch out for snakes. They may live under rocks, so always poke around a rock with a long stick before reaching under it.

Collecting rocks is not allowed in national parks and in many state parks. Ask permission before you collect anywhere. If you aren't permitted to collect rock samples, take pictures of your findings to use in a display.

KINDS OF ROCKS

All rocks belong to one of the three main groups that make up the Earth's crust. They are igneous, sedimentary, and metamorphic rocks.

Igneous Rock

Igneous rock is any rock made by cooling magma (hot, molten material that flows under the Earth's surface) or lava (molten rock that comes out of a volcano). Examples of igneous rock include basalt, granite, and obsidian.



Basalt



Granite



Obsidian

Sedimentary Rock

Sediment is gravel, sand, clay, or soil that settles and hardens out of water in riverbeds, ponds, lakes, and oceans. Sediment may contain shells and skeletons. Sedimentary rock is formed in layers, like a giant cake, after sediment has been under great pressure for millions of years. If the sediment was originally sand, it becomes sandstone. Clay turns into shale. Shells and skeletons make limestone. Small pebbles and sand form conglomerate.



Sandstone



Shale



Limestone

Metamorphic Rock

Metamorphic rock has been through a process much like baking. (Meta means "changed," and morphic means "form.") The change is caused by intense heat and great pressure deep in the Earth. Under these conditions, sedimentary limestone becomes marble. Sedimentary sandstone turns into quartzite. Igneous granite changes into gneiss (pronounced "nice").



Marble



Quartzite



Gneiss



REQUIREMENT 2

Find a rock, safely break it apart,
and examine it.

Geologist's Equipment

- ▶ Written or verbal permission to collect rocks.
- ▶ Safety glasses to protect your eyes.
- ▶ A pocket magnifier for seeing things up close.
- ▶ A geologist's hammer for pulling rocks out of hillsides and breaking them open.
- ▶ A cold chisel, half-an-inch to 1-inch wide, for chipping stone with a hammer and for digging things loose.
- ▶ Clear plastic food storage bags; write the number of the rock sample on paper and slip it into the bag with the rock sample.
- ▶ A small notebook and pencil for recording where and when you found a sample; number each sample in the notebook.
- ▶ Heavy gloves for rough work.
- ▶ A small daypack for carrying equipment and rocks.

Using appropriate safety gear, wrap a rock in a rag to hold it in place. Use a hammer and chisel to try to break the rock apart. With a magnifying glass, take a close look at the pieces. Determine any difference between pieces.



REQUIREMENT 3

Make a mineral test kit and test minerals according to the Mohs scale of mineral hardness. Using the rock cycle chart or one like it, discuss how hardness determines which materials can be used in homes, in landscapes, or for recreation.

Using a guide to rocks and minerals, identify what you have collected or taken pictures of. With a magnifying glass, take a closer look at your collection. Do you see anything different when looking closely? Share what you see with your family or den.

Geologists use the following tests to identify minerals.

- ▶ Color test — Scratch the specimen on a plate of unglazed porcelain or the back of a piece of tile. The color that appears helps to identify it.
- ▶ Luster test — How does the specimen look when light is reflected from it? Is it shiny, dull, or greasy?
- ▶ Cleavage test — How does it split or break up? Does it turn into powder or split in layers? If it breaks into crystals, how many sides does a crystal have?
- ▶ Chemical test — Does it contain limestone? If a drop of vinegar bubbles on it, the answer is yes.
- ▶ Hardness test — How hard is it?

USEFUL MINERALS

The Earth contains many useful minerals. Some, like silica (sand), are easy to see and collect. Others, like iron and zinc, are found in rocks. They must be removed from the rock by a process called smelting or refining.

There are three categories of useful minerals: metals, nonmetallic minerals, and fuels.

TESTING MINERALS

A long time ago, a geologist named Friedrich Mohs figured out that you can test the hardness of minerals by seeing whether they can scratch other materials or whether other materials can scratch them. He created a scale that gives different minerals hardness values from 1 to 10.

Mohs Hardness Scale		
Scale No.	Mineral Example	Scratch Test
1	Talc	Scratches easily with fingernail
2	Gypsum	Barely scratches with fingernail
3	Calcite	Barely scratches with copper penny
4	Fluorite	Scratches easily with file or knife blade
5	Apatite	Barely scratches with file or knife blade
6	Feldspar	Doesn't scratch with file or knife blade, scratches easily with glass
7	Quartz	Easily marks steel and hard glass
8	Topaz	Is harder than common minerals
9	Corundum	Scratches topaz
10	Diamond	Scratches corundum; hardest mineral

MAKE A MINERAL TEST KIT

Many experienced rock collectors carry a mineral testing kit on their rock-hunting trips to test hardness and other mineral characteristics. Knowing the hardness of a mineral won't always tell you its identity, but it will help rule out some possibilities. You can buy a mineral test kit, but it's more fun to make one yourself using materials you can find around your home or buy cheaply.

Here's what you need:

- ▶ Penny
- ▶ Small piece of glass
- ▶ Piece of unglazed tile
- ▶ File or pocketknife
- ▶ Small bottle of vinegar
- ▶ Eyedropper
- ▶ Minerals



Here's how to use your kit:

1. Scratch the tile with your mineral to determine the "streak" of the mineral. The streak is the color of the resulting powder. It's usually a more consistent color than the apparent color of the mineral. You can refer to a mineral identification chart to find out what minerals have this streak.
2. Use the eyedropper to put a drop of vinegar on the mineral. If the vinegar fizzes, that means the mineral contains calcium carbonate.

3. Test the hardness of the mineral by trying to scratch it, in order, with your fingernail, the penny, and the file or knife. Then, try to scratch the file or knife and the glass with the mineral. Refer to the chart to determine the mineral's hardness. For example, if you can scratch the mineral with your fingernail, it measures 1 or 2 on the scale. If the mineral can scratch the file or knife, it measures at least 7 on the scale.



REQUIREMENT 4

Grow a crystal.

CRYSTALS

A crystal is a group of atoms that come together in a certain way to form a molecule. Each kind of crystal has special and unique characteristics and shapes. For example, sugar crystals are oval-shaped and slanted at the ends, while salt crystals are in the shape of little cubes. Crystals can be used in many ways: for eating (like sugar and salt) or as jewelry. Diamonds, rubies, sapphires, and emeralds are all different kinds of crystals, formed by different elements and atoms.

Rock Candy

This is one of the simplest sugar candies you can make. All you need is sugar and water and a few basic materials. While you should start to see changes within the first few hours, it may take three to seven days for the rock candy to form.

Keep in mind that the exact quantity of sugar syrup you will need depends on the size of the jars you're using and how many candies you want. For example, the recipe's measurements work for four 12-ounce jars or one quart-sized Mason jar. You can easily double or triple the recipe and make more rock candy at once.

Ingredients

- ▶ 2 cups water
- ▶ 6 cups granulated sugar
- ▶ 2 to 3 drops food coloring, optional
- ▶ ½ to 1 teaspoon flavoring extract or oil, optional



Materials

- ▶ Glass jar
- ▶ Wooden skewer or string
- ▶ Clothes pins

Instructions

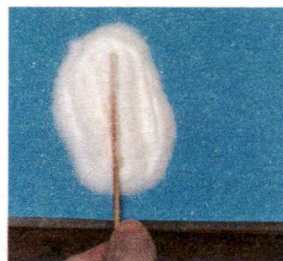
Prepare Your Materials

1. Clean the glass jars thoroughly with hot water.
2. For each jar, use a wooden skewer or string that hangs about 1 inch from the bottom of the jar. Use clothespins that are balanced across the top of the jar to hold the skewer in place.

Make Your Rock Candy

Gather the ingredients.

1. Wet each wooden skewer or string with water and roll it in granulated sugar. This base layer gives the sugar crystals something to grab when they start forming. Set these aside to dry while you prepare the sugar syrup.



2. Place the 2 cups of water in a medium-sized pan and bring it to a boil. Begin adding the sugar, 1 cup at a time, stirring after each addition. You'll notice that it takes longer for the sugar to dissolve after each cup you add. Continue to stir and boil the syrup until all of the sugar has been added and it's completely dissolved. Remove the pan from the heat.



3. If you're using colors or flavorings, add 2 to 3 drops of food coloring and stir it in to ensure an even, smooth color. When using an extract, add 1 teaspoon of the extract; for flavoring oils, only add $\frac{1}{2}$ teaspoon. Make sure you don't stand right in front of the pan because the scent can be very strong as it rises in the steam.



4. Allow the sugar syrup to cool for 20 to 30 minutes.

5. Pour the syrup into the clean, prepared jars.



6. Lower one sugared skewer or string into each jar until it hangs about 1 inch from the bottom.

7. Carefully place your jar in a cool place, away from harsh lights, where it can sit undisturbed. Cover the top loosely with plastic wrap or a paper towel.



8. You should start to see sugar crystals forming within two to four hours. If you see no change after 24 hours, try boiling the sugar syrup again and dissolve another cup of sugar into it. Then pour it back into the jar and insert the skewer or string again.



9. Allow the rock candy to grow until it is the size you want. Don't let it grow too large; otherwise, it might start growing onto the sides of your jar.



10. Note that a top layer of crystal will form. This is OK. Once the candy has reached the desired size, break that top layer of crystal up with a fork before removing the candy.



11. Transfer the rock candy to an empty jar or glass (keep the clothespins to balance it) and allow it to dry for one to two hours.

