

For Creative Minds

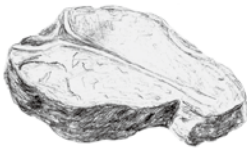
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You may not have seen a quartz crystal like the one that Julie found in this story, but you've probably seen quartz. Tan beach sand is mostly quartz that has weathered into tiny bits.

Quartz is one of the most common minerals on earth. A mineral is a natural solid that has its own chemical makeup and crystal structure. Minerals are the "building blocks" of our world. They can be metal ores like silver and gold, or they can be crystals like the quartz that Julie found. The salt you put on your food is a mineral too.

Plant, animal, or mineral? A matching activity

Minerals are combined together to make different things, both in nature (rocks) and by humans. Which of these things come from or are made from plants, animals, or minerals?



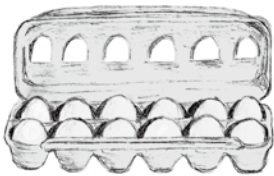
steak



chalk



tan beach sand



eggs



salad



cotton t-shirt



orange juice



wool sweater



jewelry

Plants: salad, orange juice, cotton t-shirt
Animals: steak, egg, wool sweater
Minerals: chalk, tan beach sand, jewelry



Become a rockhound!

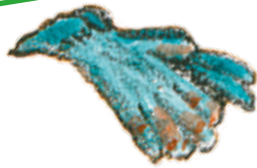
Searching for rocks and minerals can be lots of fun. However, you should get permission from the person who owns the land where you will be searching. It's very unusual to find a quartz crystal sticking up out of the ground. You won't find them in grassy areas. Like Julie, you might find them in rocky areas that have been disturbed.

Where:

- at construction sites where there has been digging (get permission and be careful)
- in dried-up river or creek beds
- in woods or areas where tree roots have pushed rocks out of the ground
- on rocky cliff sides (with an adult)

Make sure that you are dressed properly:

- old jeans or long, sturdy pants that can get dirty or stained
- heavy shoes or sneakers—no sandals or flip-flops
- sun hat and sunscreen if you are out in a sunny area
- leather or heavy garden gloves
- a hard hat if you are digging out of a wall or cliff above your head
- safety glasses if you are using a hammer or chisel



Basic tools (depending on where you are digging):

- garden claw
- shovel or trowel
- chisel, rock hammer, or sledgehammer



Other items you might want to have with you:

- lots of water and some snacks
- bug spray
- first aid kit
- cushion to sit or kneel on
- plastic sandwich bags or heavy paper to wrap rocks
- marker to identify where you found each rock
- magnifying glass to study your rocks and minerals

Once you have decided where you will dig for rocks, determine which tools you'll need. If you are digging in the ground, you might want to use a trowel, shovel, or garden claw. If you are digging in a rocky area, you may need a rock hammer or sledgehammer, but only use these with an adult's help.

When you find a neat looking rock or mineral, dig around it to get it out. Wrap or place it in a plastic bag and identify where you found it and the date. That will help you with your collection later on.

Rocks and minerals found outdoors will probably be covered with clay and dirt; you can wash them with an old toothbrush. If there is a lot of clay, try leaving them outside for a few days. Once the clay has dried, it should be easier to wash off.

Use a guide to help you identify your crystals or rocks, and make labels. You have started a rock collection!



Rocks and how they are formed

ALL rocks are made of minerals; it just depends on how they are put together. There are **THREE** types of rocks, each made a little differently:

Sedimentary Rocks: Sediments are particles such as sand, mud, minerals, shells or even pieces of decaying matter from plants or animals. Sediment builds up over the years, like on a beach. Over a long time, the pressure of all the layers presses the sediment into rock. Limestone, sandstone, and shale are all sedimentary rocks. Cement is a man-made sedimentary rock.

Igneous Rocks: These rocks are made from hot, liquid rock (called "magma" when it is below the earth's surface and "lava" when it is above the surface) that has cooled into a solid. If igneous rock is formed from magma below the earth's surface, then it cools into a rock with grains/minerals you can see (like the granite in countertops). If the hot, liquid rock reached the earth's surface through a volcanic eruption, then the lava cools into volcanic glass (obsidian), or rocks with lots and lots of holes (like pumice).

Metamorphic Rocks: Heat and/or pressure can change sedimentary or igneous rocks into a new type of rock: metamorphic. The word metamorphic means "to change." Limestone, for example, can be changed into marble by pressure.

Food Rocks!

The recipes below may serve as models to understand how rocks are formed.

Sedimentary Rocks: Take one slice of white bread and one slice of wheat/rye bread and remove the crusts. Spread a layer of margarine on the top side of one slice of bread. Make a sandwich by adding a slice of yellow cheese and a slice of ham or turkey as the filling. Pretend that each of these layers is made of particles like some of the sediments we talked about earlier. Can you see the layers you might see in a sedimentary rock? Some are very thin (like the margarine), some are medium (like the meat & cheese), and some are thicker (like the bread).

Given the right circumstances, any kind of rock can be changed to another. Now we can model changing a sedimentary rock to a metamorphic one by adding heat and pressure (remember the word **Metamorphic** means **Changed!**).

Metamorphic Rocks: Get an adult to help you with the waffle iron or the stove! Put your "sedimentary sandwich" onto a hot waffle iron or flat frying pan. Close the sides of the waffle/sandwich iron or press down with a spatula to apply both heat and pressure. After a minute or two, take out your grilled cheese sandwich. How have the layers changed? Like a metamorphic rock, it was changed by heat and pressure into a (delicious) new form.

Igneous Rocks: With an adult's help, melt chocolate chips over a double boiler. Place a cookie pan on a table, but lean one end of the pan on a stack of napkins to create a tilt. Pretend the heated chocolate is lava and pour some onto the sheet pan. Watch it flow down the surface, just as though it had poured out of the top of the volcano. Can you see how it cools and hardens quickly? This is how some igneous rocks form. Now turn off the burner and allow the rest of the chocolate "magma" in the pot to cool. Because it is such a thick layer, it will harden and cool more slowly. This is how some igneous rocks (like the granite in countertops) form.



Sorting it all out – classifying minerals

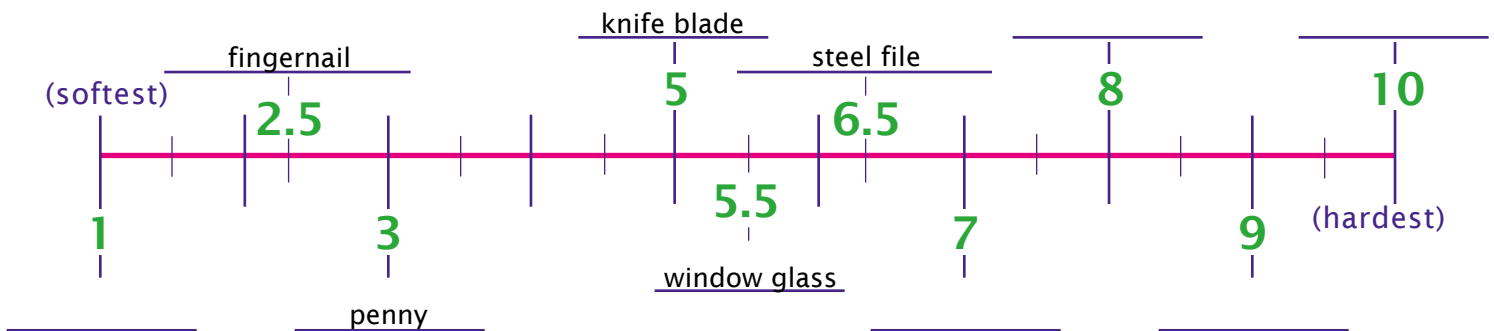
Geologists do some basic tests when they want to identify minerals in the field. These tests help scientists compare some of the minerals' physical properties. Scientists will look at the color, the shape of the crystal, the luster (if it is shiny or dull), whether the mineral leaves a streak, and how hard it is. Even if you have different samples, the same mineral will show the same properties. No one individual property is enough to identify a mineral.

One of the best tests is for hardness. On a scale of one to ten (Moh's Hardness Scale) the harder the mineral is, the higher the number. If a mineral scratches another mineral, it is harder than the one it scratched.

See if you can match the mineral to its number on the Moh's Hardness Scale. Tools that geologist use to test the hardness of the minerals are given. Put the minerals in order from softest to hardest using the scale below:

A **diamond** scratches everything
Quartz scratches steel
Topaz scratches **quartz**
A **sapphire** (corundum) scratches **topaz**
Everything scratches **talc**

Moh's Hardness Scale



Answers: 1-talc, 7-quartz, 8-topaz, 9-sapphire, 10-diamond