

Lesson One

Ingredients of a Rock

Rocks and Minerals

Summary

We often hear the phrase rocks and minerals, or see the terms used interchangeably. Although they can look similar and have similar characteristics, rocks and minerals are different from each other. In this activity, students will begin to explore the basic differences and learn that rocks are made of minerals. Within granite, for example, the minerals quartz, feldspar, and mica can easily be identified.

In learning about rocks and minerals, students will learn about one of the basics of geology. They can then begin to explore other aspects and processes of geology, which are affected by the different characteristics of rocks and minerals. They will learn that rocks and minerals play an important role in our everyday lives. We eat rocks and minerals, such as salt on our French fries or calcite in a tablet of Tums™. We live in or visit buildings with slate blackboards, brick walls, and/or cement floors. We read in the news about conflicts over natural resources derived from rock, including coal, natural gas, and oil. In understanding the world of rocks, students will develop a better understanding of the world around them.

ENCOURAGE STUDENTS TO TAKE NOTES THROUGHOUT THIS ACTIVITY.

Objectives

Students will be able to:

1. Explain the difference between a rock and a mineral.
2. List several examples of how rocks and minerals are part of their everyday lives.

Estimated teaching time

One Class Session

Groups

The box comes with four bags of rocks and minerals.

Materials

What in the box:

For each student:

- Copy of worksheets INGREDIENTS OF A ROCK and MINERAL IDENTIFICATION

For each group:

- Bags labeled QUARTZ, FELDSPAR, MICA, HORNBLLENDE, and GRANITE
- Magnifying lens

For the whole class:

- Roll of Tums™
- Projectile point – Please remind students that it is illegal to collect human artifacts of any kind on public land. For more information see Introduction to this box.

Teacher background

See document labeled **ROCKS AND MINERALS BACKGROUND INFORMATION for ACTIVITIES**

Student background

Students do not need any background for this lesson plan.

Set up

The activity can take place in a classroom.

Introducing the activity

1. Begin by asking students about what they know about rocks and minerals.
Sample questions might include.
 - ⇒ Do you eat rocks? (They may not eat rocks but certainly eat minerals, such as salt. Show them the package of Tums™ and read the ingredients, the second item of which is calcium carbonate (or calcite), a mineral.)
 - ⇒ Have you heard about geology in the news? (Oil and gas, volcanoes, earthquakes, tsunamis)
 - ⇒ Are there any rocks in this building? (Building stone, brick, slate, marble are all possibilities)
 - ⇒ Can you think of a tool made from a rock that people have used for thousands of years? (Arrowheads, knives, and axe blades)
 - ⇒ Can they name a movie based on rocks? (*Volcano*, *Journey to the Center of the Earth*, *Jurassic Park*, etc.)
2. After showing students that rocks and minerals are part of their daily lives, ask students about what they know about rocks and minerals. What is the difference? (Students often mention that one is heavier, more valuable, shinier, or colorful than the other.) Write these down on a blackboard/whiteboard.
3. Ask students what they would need to bake a chocolate chip cookie. Tell them that baking cookies is like making a rock. While cookies are made of ingredients, rocks are made of minerals. As happens with cookies, the baking will transform the mixture of individual materials into one solid material of various types, depending upon the temperature and ingredients.
4. Review the concepts of a mineral. A mineral must meet five characteristics:
 - ⇒ Naturally occurring
 - ⇒ Solid
 - ⇒ Inorganic (depending on the level of students, they might not know what inorganic is)
 - ⇒ Definite chemical composition
 - ⇒ Ordered atomic structure.

Notes: The final two characteristics are probably a bit complicated for younger children and could be excluded from the list. The key ideas are the first three. One might argue

that these three characteristics could describe a rock, which in a way they can but the characteristics also serve to distinguish a mineral from a material such as sugar or cement.

If you want to address the final two points, tell the students that that definite chemical composition means that a mineral always has the same ingredients, with slightly minor variations. For example, the chemical formula for quartz is always written as SiO_2 . There may be variations in color, due to minute percentages of other elements, but when a chemical analysis is done, the quartz consists of Si and O, arranged in an ordered atomic structure. For the ordered atomic structure, think of this as a blueprint for mineral, that defines how the mineral grows and why it grows into a crystal.

Facilitating the activity

1. Break students into groups of three to five. Give each group, a piece of granite, feldspar, hornblende, mica, and quartz, and a magnifying lens (or 2). *Don't tell the students which mineral is which.* Give each student a copy of the INGREDIENTS OF A ROCK worksheet.
2. In small groups, have the students observe the minerals with the magnifying lens. Then observe a piece of granite. Have the students write down the descriptions of each of the five specimens, four minerals and one rock, on the back of the worksheet.
3. Give each student a copy of the MINERAL IDENTIFICATION worksheet. Have the students use it to identify each mineral within the piece of granite, as well as the piece of granite.
4. Using the INGREDIENTS OF A ROCK worksheet, draw a picture of the granite as seen through the hand lens. Label each mineral in the drawing.
5. Have students think about the answers they gave at the beginning of the lesson. Ask how their answers have changed. Ask them how their descriptions corresponded to the mineral descriptions on the worksheet. What similarities are there between a rock and a mineral? (In a way they are quite similar in that they are a naturally occurring solid, inorganic, and have a consistent chemical composition (though there is a wider range within each rock type). They also can have similar external features such as texture, hardness, and density. The main difference is that a rock is made of minerals but a mineral is not made of rocks, they are made of elements.)

Assessment

See suggestions 1, 2, and 4 below. Each one of these activities will test whether students have learned the difference between a rock and mineral. Activity 3 works well to see if students get the idea that rocks and minerals are part of their everyday lives, or at least are something that influences decisions that people make.

Going further

1. Have them collect (a) rock(s)/mineral(s) from around their home, bring it/them in, and try to determine if they have a rock or mineral. AGAIN, ENCOURAGE THEM TO TAKE

NOTES WHEN THEY COLLECT THEIR ROCK OR MINERAL. If it is rock, can they find any minerals in it? Can they identify them? (This may be hard to do depending upon the rock. For example, it is usually not possible to see individual minerals in a piece of basalt (this is because basalt cools too quickly for minerals that can be seen with the naked eye to grow). In sandstone, you can often pick out different minerals based on their color, though they are the same shape.

2. Have the students look at foods at home and see if rocks or minerals occur in the ingredients' lists. Be prepared to discuss the list in class the next day.
3. Have the students pick a mineral or rock and see if they can find information on it in the news.
4. Ask students to make a list of 5 to 10 items at home that are made of minerals. Be prepared to discuss the list in class the next day.
5. Birthstones are examples of minerals that are valued as gems. Visit the Burke Museum's Birthstone web page: www.burkemuseum.org/geology/birthstones. Ask students to identify and research their birthstone. Research can be presented to the class or in a written report.
6. For younger students: Read *Everybody Needs a Rock*. As a class, choose two or three specimens from the collection, and discuss them. Ask students what they notice about each rock. What are its individual characteristics? What makes it special?

References

Teaching standards

Science Content Standard 4. Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

Benchmark Grade 8, Number 2 - Differentiate between rocks types and minerals types and classify both by how they are formed and the utilization by humans

Glossary

- Element – A substance that cannot be decomposed into other substances except by radioactive decay.
- Mineral – A naturally occurring, solid, inorganic substance with a definite chemical composition and an ordered atomic structure.
- Rock - A naturally occurring aggregate of minerals. The Earth's crust (including the lithosphere) and mantle are formed of rock.

Lesson One
INGREDIENTS OF A ROCK WORKSHEET

Name: _____

DIRECTIONS

Make up a key for each of the four minerals in granite.

Use different colors or patterns (for example, dots, or stripes) for different minerals.

Sketch the granite in the circle.

Use the key you made to represent each mineral. Label each mineral.

1. Describe what the rock looks like.

2. Which minerals show up the most?

3. Which minerals are light in color?

4. Which minerals are dark in color?

5. How do minerals differ from rocks?

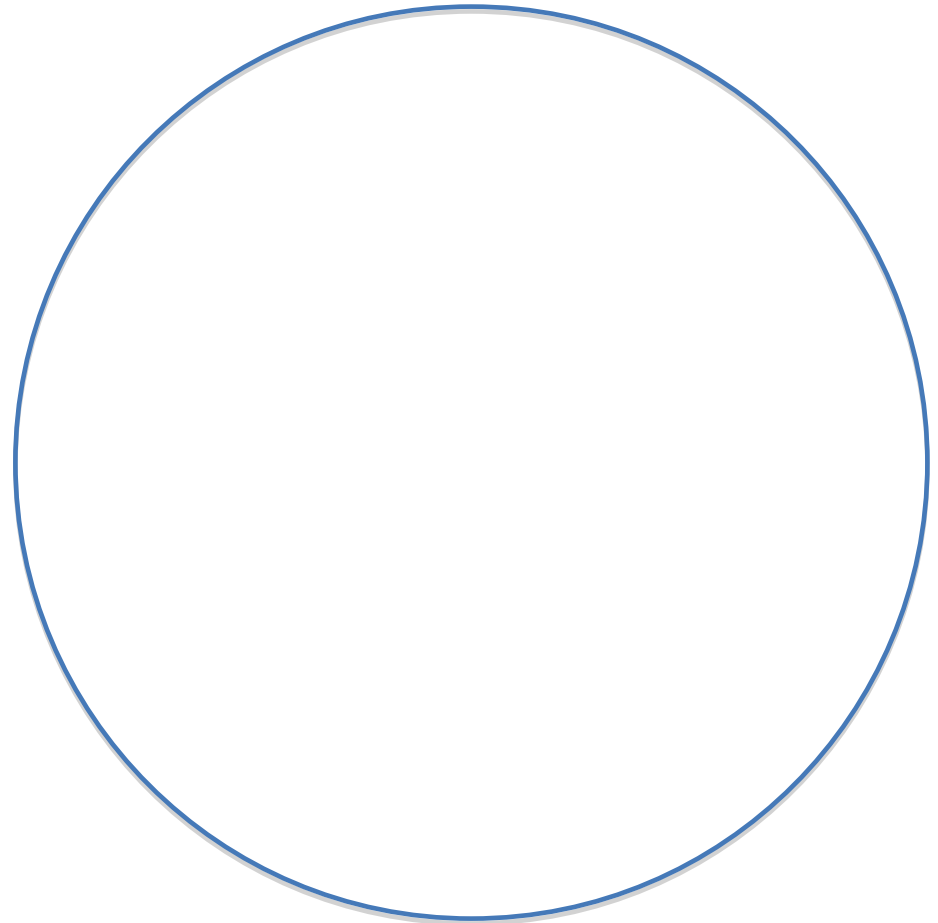
Quartz

Feldspar

Mica

Hornblende

Draw your granite below.



Lesson One

MINERAL IDENTIFICATION WORKSHEET

Feldspar

Feldspar is a chunky, pearly mineral, which is commonly white or pink.

There are several varieties and colors of feldspar. It is one of the most common minerals on Earth.

Put the mineral that you think is feldspar here.

Mica

Mica is a shiny, glass mineral that can be split into thin, flexible sheets. It is usually black or clear.

Mica is used to make heatproof shades and parts in electrical equipment.

Put the mineral that you think is mica here.

Quartz

Quartz crystals are six-sided with a hard glassy surface. They can be clear, milky, white, yellowish, or pink.

Quartz is used to make glass and to make digital watches run accurately.

Put the mineral that you think is quartz here.

Hornblende

Hornblende is a shiny greenish black or black mineral with slightly glass luster, though it can also be a bit dull.

Hornblende rarely forms good crystals. It is very common in igneous rocks.

Put the mineral that you think is hornblende here.

The object left over is granite. It is a rock, not a mineral. Rocks are made of minerals. The four minerals above are the most abundant minerals in granite.