Activity–Crystals

Standard III
Students will understand the basic properties of rocks, the processes involved in the formation of soils, and the needs of plants provided by soil.

Objective 1
Identify basic properties of minerals and rocks.

Intended Learning Outcomes
1. Use science process and thinking skills.
3. Understand science concepts and principles.

Standard III

Objective 1

Connections

Background

A mineral is a naturally formed solid substance with a crystal structure that was not formed from living things. A mineral has a crystal structure even if it does not have a crystal shape that you can see.

A crystal is a solid substance with a regular shape. It has flat sides that are at specific angles to each other. The shape is determined by the pattern into which the atoms of a mineral have arranged themselves. There are only six main groups, or "crystal systems," into which all naturally occurring crystals can be placed. The particular shape of its crystal is one property that allows us to distinguish one mineral from another.

Crystals that form by evaporation will develop at different rates. Salt crystals forming in a warm, sunny window will generally form faster and have smaller crystals. Those grown in a refrigerator will grow more slowly and have larger crystals.

Preparation: Several days prior to the lesson

1. Mix 1 teaspoon of liquid detergent into a cup of water until it is mixed thoroughly. Dip the 5 petri dishes or plates into the soapy water so the surface is completely covered. Let the soap film dry.
2. Pour 2 tablespoons of Epsom salts into a glass measuring cup. Add 3 tablespoons of boiling water and stir to dissolve the salt. Pour just enough of this solution onto 3 of the dishes to just cover the bottom.
3. Place one on the overhead and turn the light on. Leave it on until the water has evaporated. Place another dish in the room and the third dish in a dark closet.
4. Just before lab, mix up a small batch of table salt and Epsom salt solution. Barely cover the bottom of the other two petri dishes – one with the salt solution and the other with the Epsom salt solution.

Invitation to Learn

Show students a sample of a salt crystal. Tell them they will be able to identify what kind of crystal this is by the end of this lab. Also explain that while they are examining and learning about crystals, they will be watching crystals grow before their very eyes on the overhead projector. (Place the prepared petri dish on the overhead and turn it on.)

Instructional Procedures

Materials

- ❑ Liquid detergent
- ❑ Measuring cups and spoons
- ❑ Glass measuring cup
- ❑ 5 Petri dishes (or 3 small, clear plastic plates, or 3 blank transparencies)
- ❑ Epsom salts (could also use alum, washing soda)
- ❑ Table salt
- ❑ Coarse sand
- ❑ Dark construction (blue or black) paper cut into small rectangles (1 for each student)
- ❑ Hand lenses
- ❑ Hot plate
- ❑ Chart of crystal systems
- ❑ One clear glass for each group of students
- ❑ One piece of string for each group
- ❑ Samples of minerals and rocks with clearly identifiable crystals
- ❑ Large salt crystal

A. Examining crystal shapes

1. Give each student a few grains of table salt, Epsom salt, a hand lens, a crystal system chart, and a student log.
2. Instruct students to carefully examine both kinds of salts. Discuss the difference in their shapes. Refer them to their crystal system chart and ask them to decide which shape their two kinds of salts appear to belong to. Use geometric terminology to discuss the shapes: faces, edges, right, obtuse and acute angles (find examples in the class), cylinders, rectangular prisms, squares, cubes, and rhombus.
3. Have them sketch the two crystals on their log and write a sentence describing the shape of each.
4. Give students a sample of coarse sand. Tell them that quartz is the most common of all minerals. It is made up of silicon (sand) and oxygen. Show them a picture of a quartz crystal. See if they can find some in their sand sample.
5. Observe the crystals growing on the overhead. Describe their appearances. (The Epsom salt dish looks like frost and has finger-like projections radiating from the center. The salt has squares with Xs in the middle.)
6. Have the students examine the crystals grown in the class and in the refrigerator. They should notice the difference in the size of the crystals. (The cold crystals should be the largest.)
7. Hold up the salt crystal sample and ask the class if they can now identify what kind it is.

B. Growing crystals

1. Give each group a clear plastic cup (easier to watch crystal growth).
2. Have them pour 1/3 cup hot water into their cup.
3. Stir in one teaspoon of a mineral (salt, Epson salt, alum, washing

soda). (Each group could choose a different mineral. Some groups could experiment with combining two minerals). They should stir until the salt dissolves.

4. Drape a piece of string over the edges of the cup. The middle should hang down into the solution. Use paper clips or clothespins to attach ends of string to edge of cup.
5. Over the next few days, observe crystal growth.
6. Have students examine and compare the crystal shapes. Record findings in their journals by drawing and writing descriptions. Their descriptions should include geometric vocabulary (faces, edges, rectangular prisms, cubes, etc.).

Curriculum Integration

Math/Science—Describe, identify, and analyze characteristics and properties of geometric shapes.

Possible Extensions/Adaptations/Integration

Have students experiment with crystal growth. Each group could manipulate a different variable (e.g., room temperature, adding color to the crystal growing solution, amount of material stirred into water). Have class brainstorm other possible variations.

Take photos of crystals grown in class as well as those from sample and categorize them according to crystal systems.

Assessment Suggestion

Give students samples of rocks and minerals. Have them identify crystal structures

Have students explain how they can identify a crystal (faces, edges, etc.)

Pioneer Online Library pioneer.uen.org/ Go to Digital Curriculum. Enter "Crystal" in the search box. Contains many excellent photos.

Additional Resources

SURWEB www.surweb.org/ Go to Image Collections and type in Crystals

Video: *They're Habit-Forming Crystals.* Excellent! Series in 3-2-1 Classroom Contact.Childrens Television Workshop, 1991.Salts, sugars, and snowflakes are crystals. Crystals are solid made up of molecules joined together in regular patterns. Crystals grow and have regular shapes, called habits. Every crystal is unique.

Name_____

What is a Crystal?

Question: What is a crystal?

Background

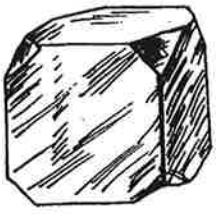
All things are made up of atoms, which are so small you can't see them – even with the most powerful microscope. There are different kinds of atoms. Atoms like to stick to other atoms. When they do this they form a molecule.

When molten (melted) rock from inside the earth cools, the minerals in the rock may form crystals that have a definite geometric shape. This happens when the atoms form themselves into a pattern. The way the atoms or molecules come together in a mineral determines the shape of the crystals. Crystals can be large or small depending on whether they formed slowly or rapidly. Crystals that form slowly will generally be larger than those that formed more rapidly.

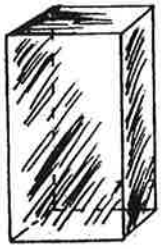
Mineral collectors are often able to look at the crystal form of a mineral and identify that mineral by the shape of its crystal.

Quartz is the most common of all minerals. It is made up of silicon (sand) and oxygen. You can usually find quartz crystals just by walking along a gravel road or studying a sample of sand.

Crystals have flat sides and sharp edges and angles. There are six major types of geometric shapes that all naturally occurring crystals usually form. As you examine different samples of crystals, see how many of these shapes you can find.

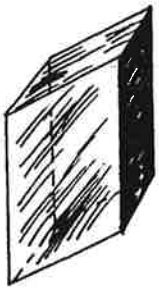


Cubic
(galena)



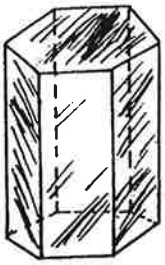
Tetragonal
(nickel sulfate)

Orthorhombic
(sulfur)



Monoclinic
(gypsum)

Triclinic
(copper sulfate)



Hexagonal
(Quartz)

Examining Crystals

Materials: table salt (sodium chloride), Epsom salt (magnesium sulfate), quartz (found in sand), alum

Place a few grains of these minerals on a square of dark paper and examine with a hand lens.

Draw the shapes you see. Can you name the shape? Write a sentence to describe each crystal.

Sample 1 _____ Sample 2 _____ Sample 3 _____

1. _____

_____

2. _____

_____

3. _____

_____

Growing Crystals

Materials: salt, Epsom salt, washing soda, clear glasses or jars, hot water, spoons

There are different ways you can grow crystals. Here is one easy way.

1. Put 1/2 cup very hot water into a clear jar or glass.
2. Stir in a spoonful of one of the materials listed above. Keep adding and stirring in more spoonfuls until no more will dissolve and it starts staying on the bottom.
3. Leave the spoon in the jar.
4. Place the jar in a sunny window.

Results: Draw pictures and describe what the crystals look like.

Another question: Does temperature affect the growth of crystals? Size, shape, speed of growth? Repeat the above experiment. This time place jars in the refrigerator and in the room away from the sun. Compare the results.