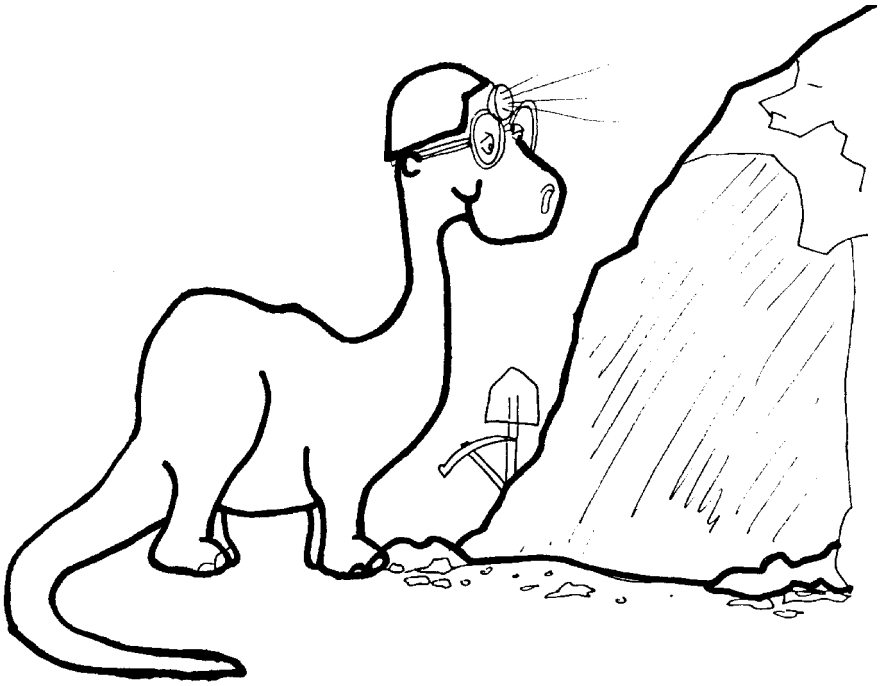
Rock Cycle

Understanding the Earth's Crust

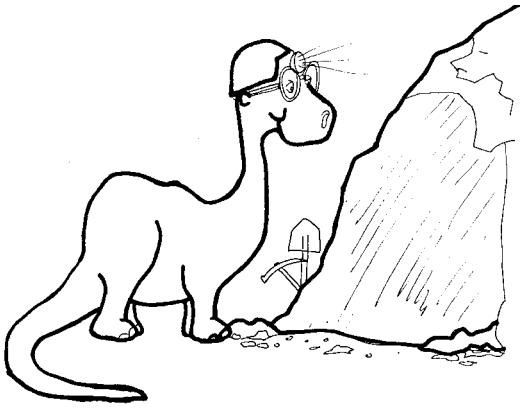
SECOND GRADE

MINERALS



2 WEEKS
LESSON PLANS AND
ACTIVITIES

ROCK CYCLE
OVERVIEW OF SECOND GRADE



CHEMISTRY

WEEK 1.
PRE: *Comparing the states of matter.*
LAB: *Observing the elements on the periodic table.*
POST: *Exploring the states of matter of the elements.*

MINERALS

WEEK 2.
PRE: *Observing "things" logically.*
LAB: *Comparing different minerals.*
POST: *Discovering rocks and minerals near school.*

WEEK 3.
PRE: *Observing the structure of crystals.*
LAB: *Exploring how minerals can grow.*
POST: *Designing a "mineral person."*

ROCKS

WEEK 4.
PRE: *Recognizing the three types of rocks.*
LAB: *Observing the three types of rocks.*
POST: *Writing a paragraph on rocks.*

PAST LIFE

WEEK 5.
PRE: *Comparing present day and fossil organisms.*
LAB: *Exploring how dinosaur footprints are formed.*
POST: *Dramatizing how different dinosaurs lived.*

WEEK 6.
PRE: *Exploring the environment of the Mesozoic.*
LAB: *Learning how fossils are made.*
POST: *Comparing how fossils appear in the literature.*

ROCK CYCLE - MINERALS (2A)

PRE LAB

Students observe a penny for information.

OBJECTIVES:

1. Illustrating qualitative observation.
2. Observing "things" logically.

VOCABULARY:

observation

MATERIAL:

one penny per student

BACKGROUND:

Scientists must use their powers of observation to find answers to scientific questions. Part of this process is the ability to observe and describe something carefully and in detail. This skill must be taught to students.

We naturally observe the world with all of our senses. However, the ability to observe in detail does not seem to be innate; it must be learned through practice. This is especially true of children. They feel that they should know how to describe an item if they are familiar with it, but quickly discover that what they know is superficial.

Students can be taught good observational skills through detailed examination of everyday objects. The example in this exercise can be extended to many other items.

PROCEDURE:

1. Tell the students that they are going to act like scientists. They are going to look at something carefully, just like scientists do, in order to find out new things about it.

2. Give each student a penny and have them examine it for a minute. Afterwards, have the students hide their pennies in their hands, and warn them not

to look at the penny while you are asking the questions. They are to rely only on their memory of what they have observed.

3. Ask students the following questions about the pennies. Once again remind them that they cannot look at the penny for the answers.

a. Who is the man on the penny?
b. What is on the other side of the penny?
c. Draw what you see on the other side.
(Have them help you draw the buildings).
d. Which side has letters but no numbers?
e. Which side has both numbers and letters?

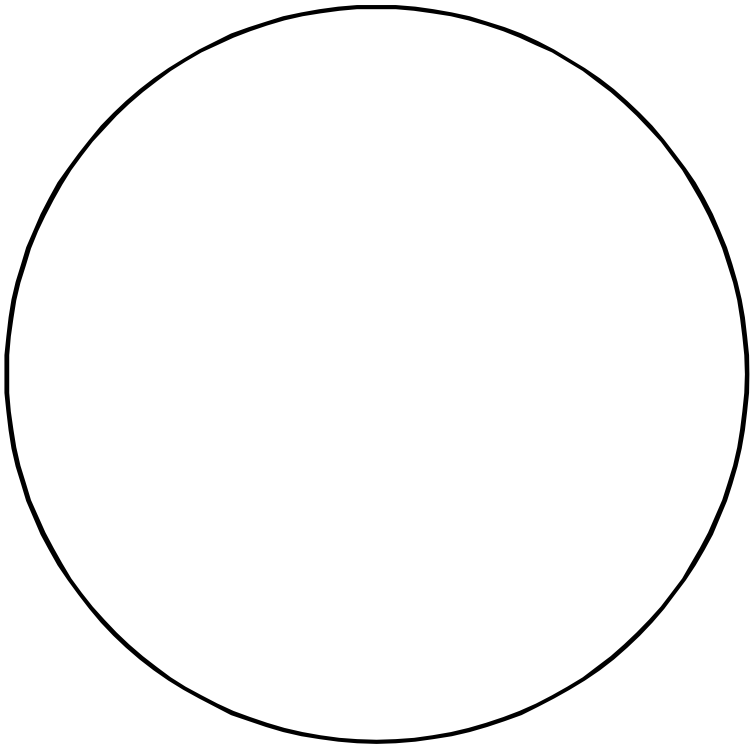
4. Allow students to examine the penny for another 30 seconds and then ask:
Does Lincoln have a bow tie or long tie on?

5. Conclude that a penny makes "sense" (pun with cents) because Abraham Lincoln is on one side and on the other side is the monument that honors him. Lincoln could not be wearing a long tie, because people in those times wore bow ties.

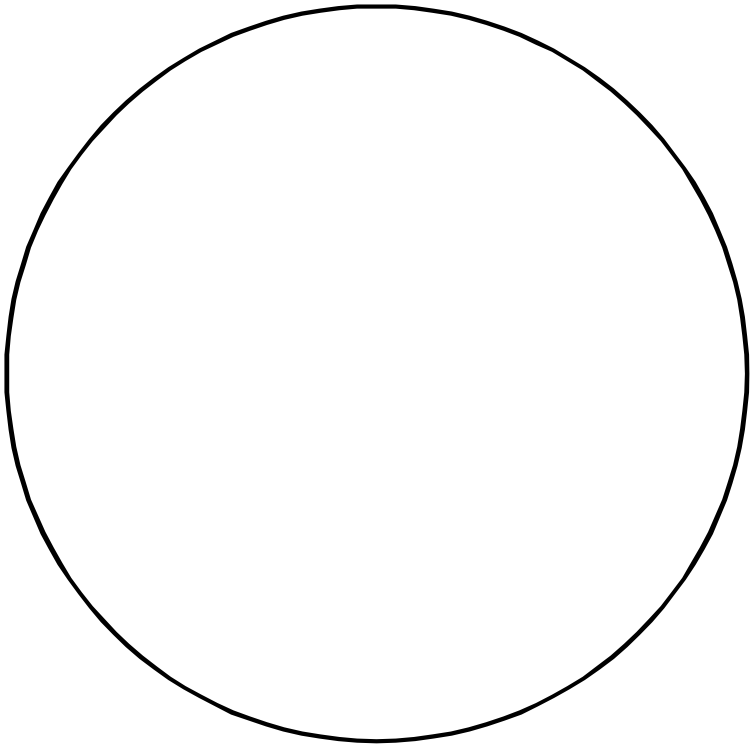
6. Have the students make a detailed drawing of each side of the penny. Use the templates on the next page, or create your own templates (plastic lids work well).

ROCK CYCLE - MINERALS (2A) - PRE LAB

Front of penny



Back of penny



ROCK CYCLE - MINERALS (2A)

LAB

Students use magnifying glasses to compare different minerals.

OBJECTIVES:

1. Reviewing how to use a magnifying glass.
2. Comparing different minerals.

VOCABULARY:

dull
scratch
shiny

MATERIALS:

Rock Cycle - Minerals (2A)
set of magnifiers
periodic table placemats

BACKGROUND:

A mineral is a crystalline, inorganic, naturally occurring combination of one or more elements. Observation is a key skill in identifying minerals. This ability involves developing logical thought processes. Learning minerals and mineral identification properties is very difficult without hands-on activities, but is very easy when children can explore and touch minerals. This lab helps students develop those skills. Identifying minerals is important because minerals make up rocks.

The observational lesson prior to this lab can help students use their senses to become familiar with the different minerals. Some minerals like halite (salt) can be identified by their taste, while others are identified by their hardness (quartz). The more students see and feel minerals, the easier it is to remember them.

PROCEDURE:

1. Demonstrate how to use a magnifying glass. The students should hold the magnifying glass close to their face with one hand, and then move the specimen back and forth with the other hand until in comes into focus. Allow the students to experiment briefly, looking at their hands or any other available objects.

2. Explain to the students that today they will be looking at minerals and trying to determine some of their characteristics. Review the different characteristics that the

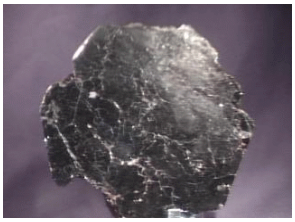
students may see when they examine the minerals. These properties include: color, hardness, luster (glassy or metallic), crystal shape (see examples below) or unusual properties (ulexite and calcite).

Have the students examine each of the specimens. They should use the magnifying glass to look at each specimen closely, as well as their other senses. Stress with students that learning about minerals includes both examining and thinking.

3. As the students examine each specimen, they should circle the characteristic that is most like the mineral in the workbook. Review the correct answers after the students complete their lab. Use the following information to help guide your remarks.

QUARTZ is made up of silicon and oxygen. You might want to point silicon and oxygen on the periodic table. Quartz makes crystals that are hexagonal prisms. Quartz can come in any color, but the key characteristic is that quartz is very hard. It is so hard that a steel knife cannot scratch it.

GYPSUM is made of calcium, sulfur and oxygen. Unlike quartz, it is very soft; a gypsum crystal can be scratched by a fingernail. Gypsum is used in making plaster board, which is used to make walls in houses.



MICA has complicated crystal structure and a range of compositions, but, its main components are aluminum, iron, silicon, and oxygen. Mica breaks in flakes. Mica is fire proof. Ask students where they think mica could be used. Examples include toasters, old time stoves, or fire proofing.

CALCITE is made up of calcium, carbon, and oxygen. It is a very commonly used mineral in the cement business. The calcite the students have will make an image appear double when placed on top of it. This is because the way the molecules are arranged.

ULEXITE is made up of boron and oxygen. Ulexite crystals are fibrous (needle-like) in shape. This gives the mineral a special property; for complex optical reasons, images can travel along the fibrous crystals with little distortion. For this reason, ulexite is often called "TV rock," although it is a mineral. Ulexite is used to make some detergents, especially for washing clothes.

PYRITE is commonly called "fool's gold," because many inexperienced miners thought pyrite *was* gold. Pyrite is actually made of iron and sulfur. Pyrite crystals have cubic shapes, and a brassy color. Real gold is yellower than pyrite.

ROCK CYCLE - MINERALS (2A) LAB

MINERAL	CIRCLE THE CORRECT ANSWER
QUARTZ	1. crystal or non- crystalline 2. clear or white 3. glassy or metal 4. scratched by fingernail or not scratched
GYPSUM	1. crystal or non-crystalline 2. shiny or dull 3. white or gray 4. scratched by fingernail
MICA	1. crystal or non-crystalline 2. yellow or black 3. bends or doesn't bend 4. dull or shiny
CALCITE	1. cube or diamond shaped 2. clear or white 3. double image or single image 4. glassy or dull
ULEXITE	1. crystal or non-crystalline 2. clear image or nothing 3. white or clear 4. dull or glassy
PYRITE	1. crystal or non-crystalline 2. yellow or gold 3. glassy or metal 4. scratched by fingernail or not scratched

ROCK CYCLE - MINERALS (2A)

POST LAB:

Students look at rocks that are near their homes or school.

OBJECTIVES:

1. Discovering rocks or minerals near school.
2. Exploring a variety of rocks.

VOCABULARY:

asphalt
gravel
mineral
rock
stone

MATERIALS:

rock specimens from school or home

BACKGROUND:

We have found that when you do units on rocks and minerals, students will naturally bring specimens to class that they have found at home or in their neighborhoods. This assignment extends this opportunity.

Most of the samples that children find are landscape or building rocks. These materials may have a variety of names that may reflect historical usage, geography, or commercial appeal more than their scientific classification. It is important that students observe the world around them. In addition, the samples may be from local bedrock, or "imported" from other areas. For background, you may wish to consult a geologic map of your local area. A local landscaping store may be able to tell you some of the common rocks in your area. If you have trouble identifying some of the specimens, you may wish to contact the geology department of a local college.

PROCEDURE:

1. Ask students to collect some rock specimens from their home or near school. Remind the students not to take large or valuable samples. You may want parents to help the students search for rocks. Have the students record where they found the samples, i.e., on the street, in the garden, or from the ground.

2. Have the students bring their samples to class. On the board make a list of

samples where they were found. Classify the rocks as accurately as you can, but do not be afraid to call an unidentifiable rock "a rock." You can use the locations of the samples as clues to their origins. Again, what is important at this point is getting the students to observe the world around them. Specific names are merely aids to communication.

3. You can conduct this session as a "show and tell." The students will likely bring in a wide range of specimens. Some will pick up asphalt, cement, or gravel. Remember that a rock must be naturally made. Asphalt and other hardened substances are not considered rocks but are "man-made" rocks. Make sure your students understand the difference. Some students may bring real specimens that their parents have at home; these provide a good opportunity to teach students the correct names of minerals.

4. If your school has a rock landscape, go outside and have the students observe the rocks around the building. Remember that “concrete” is actually a man-made rock, so many schools are just one big man-made rock!

ROCK CYCLE - MINERALS (2B)

PRE LAB

Students use math manipulatives to explore the internal shapes of minerals.

OBJECTIVES:

1. Observing the structure of crystals.
2. Exploring crystal structures.

VOCABULARY:

amorphous
crystal
crystalline
mineral

MATERIALS:

geoboard
crayons
Googolplex or Zometool
worksheet

crystals of olivine

BACKGROUND:

A crystalline solid is a material with an internal atomic structure that is organized in a regular, repeating pattern. Some solids are noncrystalline which are are termed "amorphous solids." All native metals and minerals are crystalline, while glasses and plastics are amorphous. A crystal is a single piece of crystalline matter that shows the internal structure of a compound. Crystals can be composed of a wide variety of elements. They thus have a wide variety of internal structures.

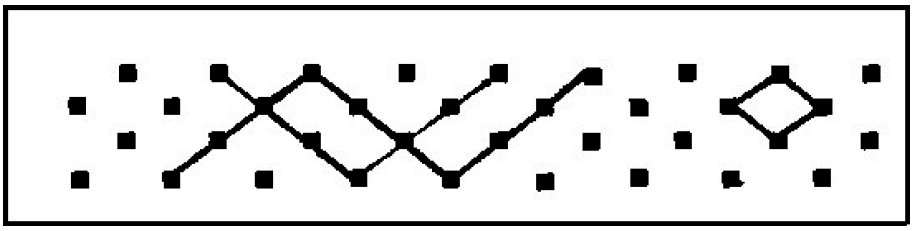
The concept of crystal structure is difficult for young students. It is important to emphasize that the atomic structure cannot be seen by the naked eye, but can be seen by scientists using high-powered microscopes. However, the atom structure controls what the crystal looks like, so when students look at mineral specimens, they can make accurate observations about crystal structure.

PROCEDURE:

1. If desired, construct three-dimensional counterparts to the two-dimensional structures that the students will create using the geoboard. You may wish to create pyramids, squares, diamonds, and rhombohedra.

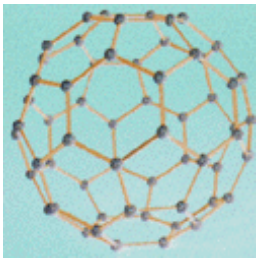
2. Using the geoboard, have the students make a repeating crystalline pattern. The dots on the geoboard correspond to the internal arrangement of atoms and molecules in the crystal. By connecting the dots, the students will create analogues to crystal structures. For example, a diamond-shaped pattern would create a mineral crystal that has dipyramidal shape.

3. Using the worksheet, have the students create their own patterns. In mathematical terms, these patterns would be called tessellations (polygons that are repeated in a pattern.) The figure below shows a few examples of patterns that the children can make.



4. Have students identify the shapes that they make with Googolplex or Zometool. Emphasize that the shapes are two dimensional, but that they correspond to three-dimensional structures. Compare them with the three dimensional models. You may also want to point out different two and three-dimensional shapes in the classroom.

5. After the students have learned to identify the shapes, have them use Googolplex to make patterns. Students can use the connectors or not, depending on their abilities. Have them place the pieces in different patterns or repeatable arrangements. The number of possible patterns is infinite. Many patterns can include more than one shape.



Zometool

Googoplex

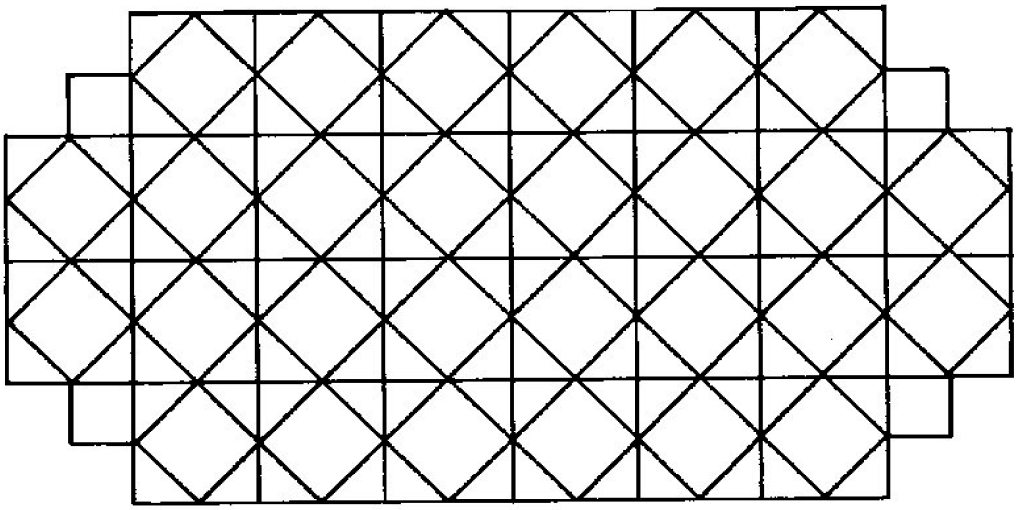
You may want the students to draw their patterns after they assemble them. You may want to have students share their patterns with classmates. Ask them to connect the patterns with connectors before moving them. Have them try to combine patterns. This will result in more complex designs.

ROCK CYCLE - MINERALS (2B)

PRE LAB

UNIT CELLS AND PATTERNS

1. Name the individual design that is repeated. This is called a "unit cell."

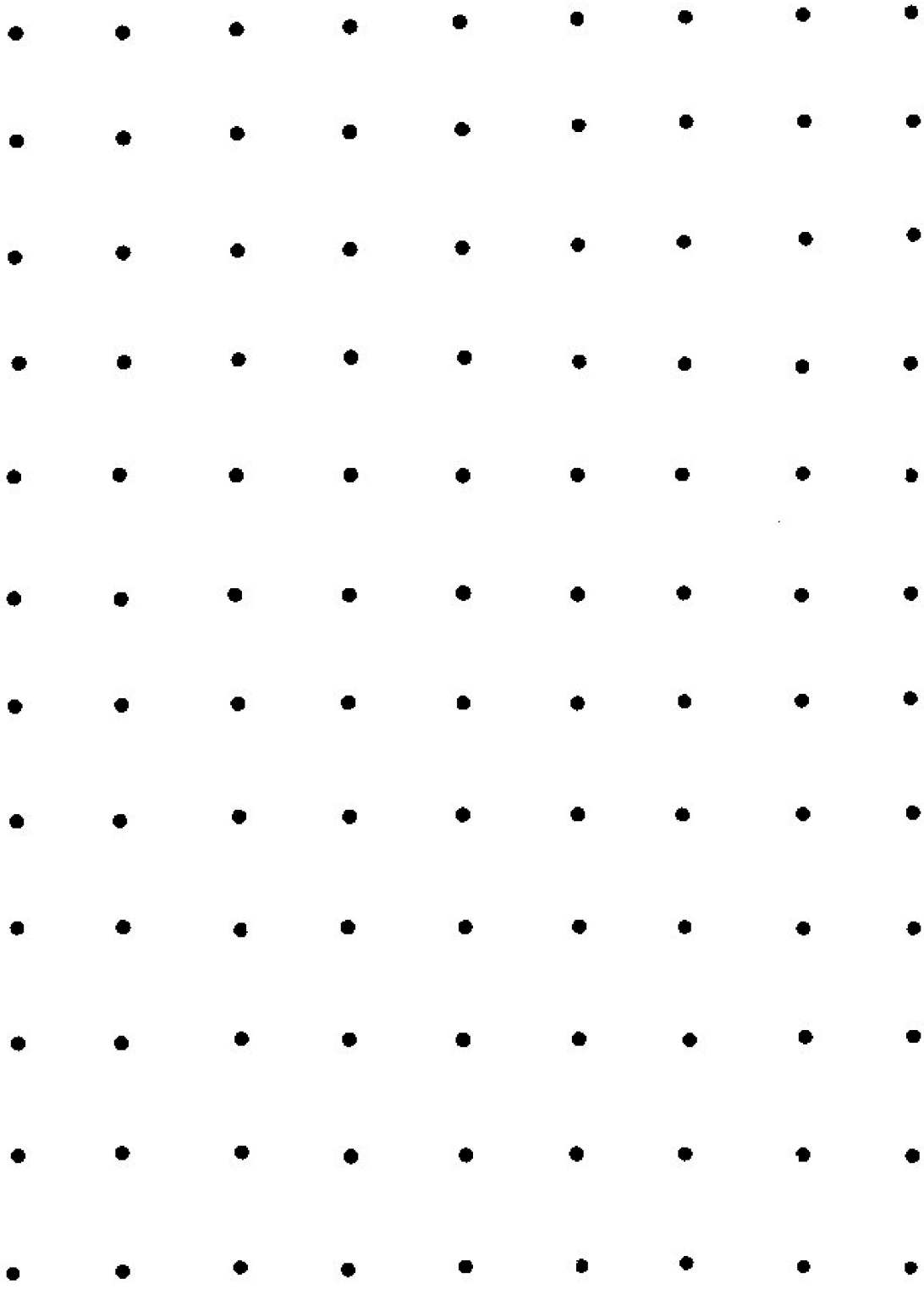


2. Use the GOOGOLPLEX shapes and connectors and make two different patterns. Draw the pattern in space provided below.

FIRST SECOND

ROCK CYCLE - MINERALS (2B) PRE LAB

GEOBOARD



ROCK CYCLE - MINERALS (2B)

LAB

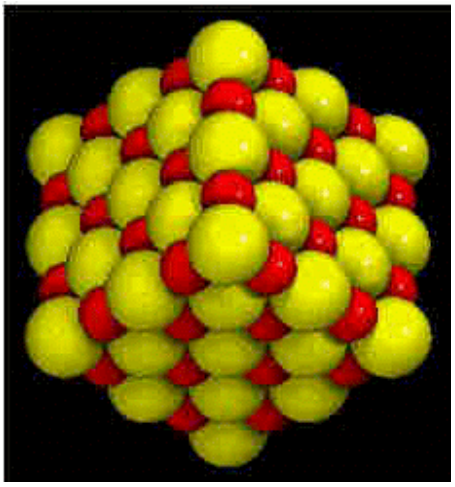
Students make a crystal garden.

OBJECTIVES:

1. Exploring how minerals can grow.
2. Observing and recording mineral growth.

VOCABULARY:

crystal
mineral


internal structure of halite

MATERIALS:

clean baby food jars
masking tape, crayons, water, ammonia
laundry bluing
salt
white porous rock or other porous material (charcoal works well)

BACKGROUND:

Minerals are naturally occurring, inorganic combinations of one or more elements. Minerals are crystalline, which means they have an internal atomic structure organized in a regular, repeating pattern. Organic substances can also form crystals, however, these are not minerals.


halite

The natural growth (shape) of a mineral is called its crystal form. This shape is based on the internal arrangement of atoms although not visible to the eye, is reflected by the mineral's appearance. For example, halite (salt) occurs in cubic crystals because the sodium and chloride atoms which compose halite are organized in a cubic structure. Minerals show recognizable crystal forms only when they have open space to grow. This is uncommon; most minerals form in confined spaces, and take on the shape available to them.

PROCEDURE:

1. Remind the students that minerals grow as crystals. Tell them that today they are going to grow crystals.

2. In this experiment, students will make a solution that will grow into a “garden” of crystals. Note that not all crystals are minerals. For example, solid sugar is crystalline, but is organic, so it is not a mineral.

Use the following recipe for the crystal solution. Make the appropriate amount for your classroom if you do not want your students to mix their own solutions. WARNING: The use of ammonia can be dangerous around children. Per student, mix:

5 ml water
5 ml ammonia
5 ml laundry bluing
5 ml salt

3. Have the students carefully place several small pieces of sponge, porous rock or broken brick in their jars. We prefer white porous rocks (available at nurseries), because they make the garden look attractive. Make sure the rocks are no more than 1cm. high.

4. Pour enough of the mixture into the jar to almost cover the rocks. Leave a 5 mm air pocket at the top of the jar.

5. Add a few drops of food coloring to make it “pretty.” Students can put one drop of red, one drop of blue on the rocks. Do not put 2 different color drops on each other. Do not add more than 4-5 drops.

6. Place the jar in a warm (but not hot) area, such as the sunny part of a windowsill. Crystal growth rate depends on temperature. The lower the heat, the slower the crystals will grow. However, slow growing crystals will become larger than fast-growing crystals. You many want your students to experiment by putting some jars in warm parts of the classroom and some in the cool parts.

7. Crystals will form and become visible within a week. If the sponges or rocks dry out, you can get the crystals to further grow by adding a mixture of equal parts water and ammonia to the fluid around the rocks. Add the mixture carefully, a little at a time.

8. The crystals formed are very delicate, so do not let the children move the jars until the assignment is completed. If the children bring the jars home, tell them to carry them very carefully.

9. Ask the students to observe the jars each day. They should record what they see by drawing pictures in the boxes on their worksheet.

10. If the students put different types of rocks on the bottom of their jars, the class can also observe and discuss what type of base makes the best crystals. Likewise, if the

jars were placed in different parts of the classroom, the class can observe and discuss why some crystals grew better or larger than others.

ROCK CYCLE - MINERALS (2B) LAB

PROBLEM: How do crystals grow?

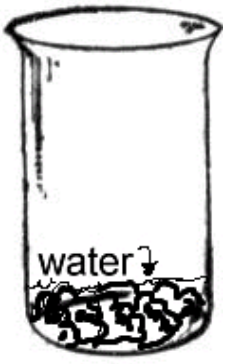
PREDICTION: _____

MATERIALS: salt, laundry bluing, ammonia, water, baby food jars

PROCEDURE:

Step 1. Take one clean baby food jar. Take a piece of masking tape and write your name on it with a crayon. Tape it to the lower side of your jar.

Step 2. Add rocks to your jar until it is 1/3 full. Add 5 ml salt. Add 5 ml of water. Add 4-6 drops of food coloring. You get to choose which color you want!



Step 3. Now have your teacher add 5 ml each of ammonia and laundry bluing. Carefully carry your crystal garden to the place your teacher has selected. Over the next week or so you will be able to see your garden grow! Keep a record of what you see by drawing a picture of your garden every day.

CONCLUSION: Describe what happened to your crystals after a week.

_____

_____

ROCK CYCLE - MINERALS (2B)

POST LAB

Students create a mineral person from the different mineral shapes.

OBJECTIVES:

1. Designing a "mineral person”
2. Comparing different geometric shapes

VOCABULARY:

geometry
mineral

MATERIALS:

worksheet
crayons
paste
scissors
Googolplex

pink crystals of corundum in granite

BACKGROUND:

The objective of this lesson is to learn that minerals have many shapes. Students will create a mineral person and can then tell stories about their mineral person.

The worksheet lists examples of minerals that show the illustrated crystal shapes. Sphalerite is zinc sulfide, which is an important ore of zinc. Gypsum is calcium sulfate which is used in the production of wall board, plaster of Paris, and fertilizer. Quartz, which is silicon dioxide is one of the most widely used minerals with such applications as glass making, jewelry, porcelain, and sand paper. Pyrite is iron sulfide and is commonly referred to as "fool's gold." Pyrite is mined for its sulfur and in some cases for its iron. Galena is lead sulfide and is an important source for lead ore. Orthoclase feldspar is composed of potassium, aluminum, silicon, and oxygen and is used in the manufacture of porcelain.

PROCEDURE:

1. Have the students look at the minerals shapes page on their worksheet. Tell the students some of the above background information about each of them. Remind your class that minerals grow in many different shapes.

2. Ask students to color and cut out the mineral shapes. Give them suggestions for colors. Sphalerite is usually a yellowish-brown color. Gypsum is white to clear. Quartz

can be just about any color, from purple to striped. Pyrite is gold colored. Galena is silver or gray. Orthoclase is usually pinkish orange.

3. Ask the students to arrange their cutouts into the shapes of either a man or a woman, or any other organism of their choosing.

4. Allow the students time to share their stories about their mineral people. This lab can be extended into a writing lesson by having them write a few sentences telling about their person.

ROCK CYCLE - MINERALS (2B) POST LAB

MAKE A MINERAL PERSON