BRUCE MUSEUM
One Museum Drive • Greenwich, CT 06830-7100

ROCKS AND MINERALS

Dear Teacher,

As a supplement to your field trip and/or Brucemobile visit, we are including additional information that might be useful to your lesson. Enclosed are post visit activities, and crafts that the students can make at home.

Sincerely,

Department of Education
Bruce Museum of Arts and Science

Books for the Classroom:

Blobaum, Cindy. *Geology Rocks!* : Williamson Publishing, 1999.

Chasek, Ruth. *Rocks and Minerals* : Children's Press, 2000.

Dussling, Jennifer. *Looking at Rocks* : Grosset and Dunlap, 2001.

Gans, Roma. *Let's Go Rock Collecting* : Harper Trophy, 1997.

Rocks and Minerals : DK Publishing, 2004.

Websites for more information:

http://school.discovery.com/lessonplans/programs/understanding

http://www.ivyhall.districkt96.k12.il.us/4th/kkhp/RocksandMinerals/rocks.html

http://www.rocksforkids.com

http://www.cln.org/themes/rocks_minerals.html

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Vocabulary List for *Mineral Marvels*

geology – The science that deals with the history of the earth and its life especially as recorded in rocks

geologist – Scientist who studies the history of the earth and life through rocks

igneous rock – Rocks relating to and resulting from the intrusion or extrusion of magma or volcanic activity

intrusion – The forcible entry of molten rock or magma into or between other rock formations

extrusion – The release of molten rock from within the Earth onto the surface

magma – Molten rock located beneath the surface of the Earth

lava – Molten rock that is expelled from a volcano during an eruption

tectonic plate – Areas of the Earth's crust that move in relation to each other and cause volcanic activity

transparent – An object that allows light through it to be able to see items clearly on the other side (window)

translucent – An object that allows some light through it to be able to partially see items on the other side (wax paper)

opaque – An object that blocks light, causing an inability to see items on the other side (door)

luster – The appearance of the surface of a mineral dependent upon its reflecting qualities

Rock and Mineral Activities

Grow Sugar Crystals!

The process of making sugar crystals is very similar to making salt crystals, but sugar crystals can be more fun because they're tasty treats.

Boil about 1 cup water and carefully pour the water into a glass jar. Slowly stir in three cups of sugar, about a teaspoon at a time. Don't rush this step. Continue until the sugar is no longer dissolving but is starting to collect at the bottom of the jar. Add a few drops of food coloring. Tie one end of a piece of string around the middle of a pencil and tie a paper clip to the other end. Place the pencil over the jar so that the string hangs down and the paper clip almost touches the bottom of the jar. Allow jar to sit someplace where it will be undisturbed. Check after about 24 hours, and you'll see colorful crystals forming on the paper clip.

Discussion Questions:

1. What changes occurred in the jar?

2. What shapes do crystals form? Why?

Student Activity: How hard are various minerals?

Material Needed:

About 10 different minerals or rocks, preferably quite different from one another. Have them labeled with either their names, or numbers for coding purposes, if names are unknown. Also pennies, table knife, steel file.

Method:

On Table 1 (below), list the 10 minerals or rocks in the first column. Test each rock/mineral with your fingernail, penny, knife, and file. Check with Table 2 (below) to find a "hardness number" that corresponds to the tested rock. Enter the "hardness number" on Table 1 beside the name/number of the rock just tested.

Table 1

	Mineral/Rock	Hardness Number
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Table 2

HARDNESS TEST	HARDNESS NUMBER
Can be scratched with a fingernail	1 - 2
Can be scratched with a penny	3
Can scratch a penny	4
Can be scratched with a table knife	5 - 6
Can be scratched with a steel file	7 - 8
Cannot be scratched with a steel file	9 - 10

Conclusion

What was the hardest rock you tested?

_____

What was the softest rock you tested?

_____

Exploring Rocks and Minerals with Bloom's Revised Taxonomy
Remembering
Collect 10 rocks and identify where each was found. Draw a sketch of five different rocks from your local area. Make sure the color is accurately recreated.
Understanding
Explain how the following rocks were formed: igneous, metamorphic, and sedimentary.
Applying
Arrange the ten rocks from the knowledge activity in a display to share with your class. Label each rock and write a brief description of the rock's characteristics and origin.
Analyzing
Compare and contrast the importance of a rock as seen through the eyes of a geologist, a landscape designer, and a construction worker.
Evaluating
Develop a plan that you would use if you were going on a rock and mineral expedition. Include what you would take, where you would go, the tasks you would plan to accomplish, and the problems you might encounter. Establish a set of criteria to use in determining if the expedition was a success or not.
Creating

Write an obituary for a rock. Include where and how the rock was "born", the important events of the rock's "life" and how the rock "met its end".

Based on: Forte, Imogene and S. Schurr. (1997). ***The All-New Science Mind Stretchers: Interdisciplinary Units to Teach Science Concepts and Strengthen Thinking Skills***. Cheltenham

Is It a Mineral?

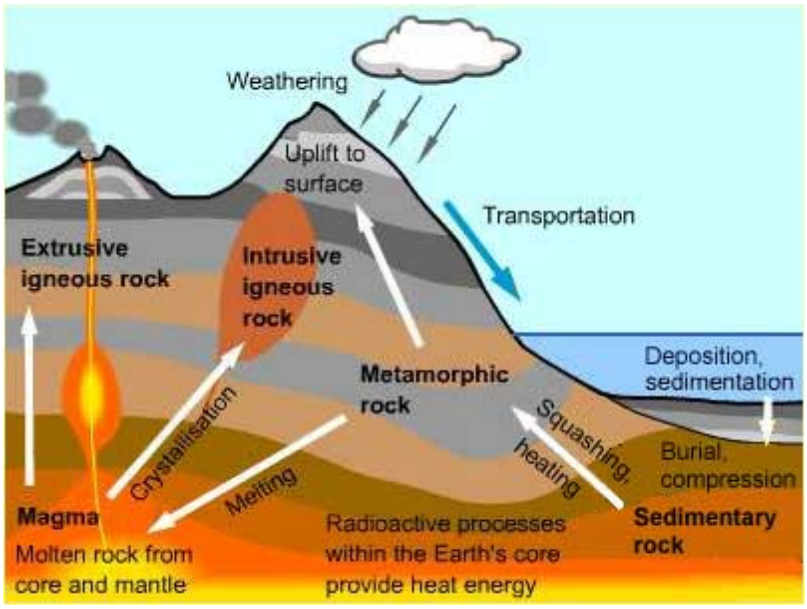
Answers: Ice, pencil lead (graphite), gold, olivine, diamond, pyroxene, sulfur, table salt (halite), and plagioclase are minerals. Water, steam, carbon dioxide, and mercury are not solid. Teflon, stainless steel, and plastic are man-made materials. Pearl, chlorophyll, and coal are organic. Volcanic glass lacks a regular internal crystal structure.

Is It a Mineral?

Indicate whether the substances listed in the left column are minerals (yes or no) and why or why not. An example is provided.

Substance	Mineral?	Why or Why Not?
window glass	no	no regular internal structure
ice	____	_____
water	____	_____
Teflon	____	_____
stainless steel	____	_____
pencil lead	____	_____
gold	____	_____
pearl	____	_____
olivine	____	_____
plastic	____	_____
diamond	____	_____
chlorophyll	____	_____
steam	____	_____
coal	____	_____
carbon dioxide	____	_____
pyroxene	____	_____

sulphur	____	_____
table salt	____	_____
volcanic glass	____	_____
mercury	____	_____
plagioclase	____	_____



The rock cycle

1. Existing mountain ranges are worn down by **weathering** and **erosion**, and the pieces of eroded rock may eventually be deposited and form **sedimentary** rocks.

2. Sedimentary rocks may become buried and compressed, or alternatively uplifted by large scale movements of the Earth's crust. If they are subjected to heat and pressure, they may be transformed into **metamorphic** rocks.

3. The metamorphic rocks may continue to be uplifted to form mountain ranges. Alternatively, they may sink deeper into the hot **mantle**, and melt to form **magma**.

4. Molten magma is pushed up towards the crust by pressure and convection, eventually cooling and solidifying to form **igneous** rock. If the magma is extruded from the crust by volcanic activity it will form **extrusive igneous rock** on the surface. If it cools below the surface it will crystallize into **intrusive igneous rock**.

5. Rocks of any type may eventually reach the surface as a result of mantle or crust movements, and themselves become subject to weathering and erosion - thus beginning the cycle again.

The Absorbency of Rocks

To perform this experiment, you will need:

A porous rock. Pumice is a good choice and is available in the foot care section of many pharmacies. Chalk is also excellent for this experiment.

A scale or balance that can weigh in units of one gram or less.

A container of water that is big enough to hold the stone submerged in water.

The Experiment

Weigh the dry rock and record your result on a printout of the form below or in your own notebook.

Put the rock in water and leave it there for at least an hour.

Take the rock out and shake off the excess water. Weigh it again and record your result.

Weigh and record several more times at one hour intervals.

Leave the rock in water overnight. Weigh and record again.

What do your results show?

Student/Group	
Time	**Weight of Rock**
Day 1	
Dry weight of rock	grams
Time	grams

Time	grams
Time	grams
Time	grams
Time	grams
Day 2	
Time	grams

Follow-up Discussion

The rock should increase in weight. It may take a day or more to reach its maximum.

When we tried it the dry rock weighed 34 grams. After a day it had increased to 37 grams. After two days it was still at 37 grams. This means that there were three grams, or 3 cubic centimeters, of water in the stone. Is this a lot or very little? How much liquid can rock hold? We can determine this by measuring the **volume** of the rock and comparing it to the volume of the water it can hold.

We can measure the volume of the rock using the **displacement** method. Just like **Archimedes** in his bathtub, we can determine an object's volume by measuring how much water is displaced when it is submerged. We measured the volume of our rock by filling a mesuring cup to the 150 ml mark and submerging the stone. The water level rose to 175 ml, so we know that the volume of the stone is 25 ml, or 25 cc. Since the stone absorbed a total of 3 cc, we can calculate that the stone was able to hold water equivalent to 12% of it's volume. This can be expressed with the following formula:

$$\frac{\text{Volume of Water Absorbed}}{\text{Volume of Stone}} = \frac{3\text{ cc}}{25\text{ cc}} = \frac{x}{100} = 12\%$$

This experiment could be repeated with different stones and with oil instead of water. Keep in mind that since oil is lighter than water 1 gram of oil occupies more than 1 cc of space. The exact amount depends upon the kind of oil.

We also did the experiment using a piece of chalk. It weighed 10 grams when dry. After soaking in water for 5 minutes the weight had increased to 11g. After 10 minutes it was 12g. It didn't increase any more than that, but after 30 minutes it had become soft and was starting to fall apart.

The piece of chalk held 2g, or 2 cc of water. To calculate the volume of the chalk we could have used the displacement method, but we did it differently. Since the piece of chalk was a cylinder we decided to measure it and use the formula for the volume of a cylinder. It's length was exactly 8 cm and the diameter of the face on each end was 1cm. So

$$\text{Volume} = \pi r^2 (L)$$
$$= 3.14\ (.5)^2\ (8)$$
$$= 3.14\ (.25)\ (8)$$
$$= 3.14\ (2)$$
$$= 6.28\ \text{cc}$$

Then we calculated how much water the chalk could contain as a percentage of its total volume:

$$\frac{\text{Volume of Water Absorbed}}{\text{Volume of Chalk}} = \frac{2\ \text{cc}}{6.28\ \text{cc}} = .3184 = 32\%$$