

Cave of the Winds
Activity Eleven: Global
Building Blocks

Lesson for Grades 9-12
One lab of about 50 minutes

Satisfies Colorado
Model Content Standard
for Science, Standard 4,
Benchmark #1 for grades
9-12: The earth's interior has
a composition and a structure.

*Prerequisite: knowledge of
elements*

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Global Building Blocks: Rocks and Mineral Identification

Objectives

The learner will:

1. Learn about mineral composition and identification.
2. Understand the rock cycle and identify some common rocks in each group.

Vocabulary

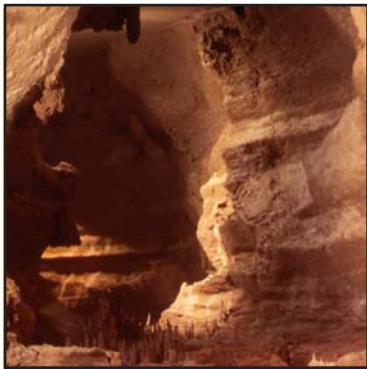
Mineral, rock, crystal structure, chemical composition, hardness, luster, cleavage, carbonates, rock cycle, igneous rock, metamorphic rock, sediment, clast, chemical sedimentary rock, biochemical sedimentary rock, siliciclastic sedimentary rock, sedimentary rock, parent rock, metamorphism, magma, crystallization, cementation, evaporite, metallic, nonmetallic, striations, rhombus, transparent, translucent, physical weathering, chemical weathering, erosion, rock cycle, basalt, granite, trona, limestone, conglomerate, sandstone, shale, coquina, coal, gneiss, schist, marble, slate, mafic, felsic, foliated, crystalline, texture, vesicular, ooids, pebbles, sand, gravel, grain size, clay, organic material, ultraviolet light, hydrochloric acid, effervescence, streak, calcite, dolomite, gypsum, halite, sulfur, pyrite, muscovite mica, orthoclase feldspar, quartz.

Background Information

The Earth's building blocks are rocks and minerals. Minerals, of which rocks are composed, are defined by standard criteria: 1) specific chemical composition, 2) inorganic, 3) regular crystalline structure, and 4) naturally occurring. While it is tempting to use color to determine the type of mineral, many of the same minerals come in a variety of colors so other characteristics must be used. Diagnostic tests for identifying minerals are: hardness (on a scale from one being the softest mineral, talc, to ten, a diamond, the hardest mineral found), streak (on a porcelain plate), cleavage (the ways a mineral naturally breaks), effervescence (reaction of mineral to weak HCl, hydrochloric acid), magnetism (attracted to magnets or not), taste (however some minerals are toxic, so you don't want to lick them all) and fluorescence (fluorescence when exposed to an ultraviolet light or not).

Rocks, in turn, are composed of minerals. There are three types of rocks: 1) igneous rocks where the interlocking minerals crystallize out of molten material, 2) sedimentary rocks composed of cemented physically-weathered sediments derived from other rocks or chemically precipitated from saturated solutions, and finally 3) metamorphic rocks, which are pressure and temperature "cooked" versions of any of these three types of rock. The most common rock in the area is limestone, which is composed of the mineral calcite.

Identification of rocks and minerals allows geologists to produce geologic maps. This knowledge can aid in the understanding of the paleoenvironment and time period in which the rocks and minerals formed. This activity will introduce common rocks and minerals. Identification of samples will also enhance students' observational and classification skills. Once the students have identified the rocks and minerals, they will be able to understand a geologic map.



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Pre-activity Thought Questions

What is the Earth made of? What is the difference between a rock and a mineral? What types of rocks and minerals are found in our region?

Assessments

1. List of identified minerals
2. Venn Diagram of several local minerals
3. List of identified rocks

Activity: Minerals

Materials needed:

1. Mineral kit including: quartz, calcite, muscovite mica, gypsum, dolomite, sulfur, halite, pyrite, orthoclase feldspar
2. Mineral identification kit including: penny, glass plate, porcelain tile, weak HCl acid (10%), hand lens
3. Mineral identification flow-chart. See Student Resource Sheet in this lesson.
4. Venn Diagram. See Student Resource Sheet in this lesson.

The teacher will:

1. Explain that the Earth is composed of rocks, which are composed of minerals. Define each.
2. Define the properties of minerals and explain that these characteristics may be examined and tested on hand samples.
3. Pass out the mineral samples to identify with the testing kits and the flow chart. Explain that these are just a few minerals and that there are many more in the world!
4. Let the students work together to identify the different minerals using the standard tests and have them record the names and some characteristics in their notebooks.
5. After checking students' answers, have students complete a Venn diagram for common minerals in our region.

Follow-up Questions

What are some diagnostic properties of each mineral? Is color a reliable characteristic to use when trying to identify minerals? How can the different rock types be deciphered? What does the type of rock say about the environment in which it formed?

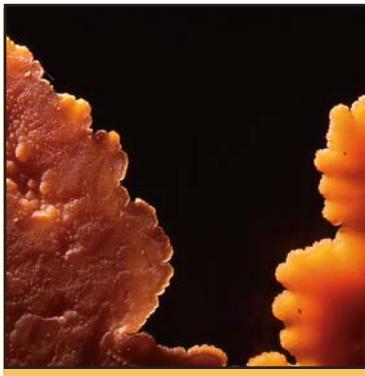
Alternative Assessments

1. Have students draw a schematic diagram of the backreef, reef, and forereef area. Label the different units and minerals found in each environment.
2. Students should list different environments where each type of sedimentary rock is found (i.e. sandstone may be formed in rivers, beaches, mountains, deltas, etc.) to show the complexity of paleoenvironmental reconstructions using only rock types.
3. Have students identify minerals used in everyday products (i.e. drywall, toothpaste, lipstick, milkshakes, vitamins, etc.).

Bibliography

Beaubouef, R.T., Rossen, C., Zelt, F.B., Sullivan, M.D., Mohrig D.C. and D.C. Jeanette. 1999. *Deep-Water Sandstones, Brushy Canyon Formation, West Texas*. AAPG Field Guide #40.
Marshak, S. 2001. *Earth, Portrait of a Planet*. New York: W.W. Norton & Co.

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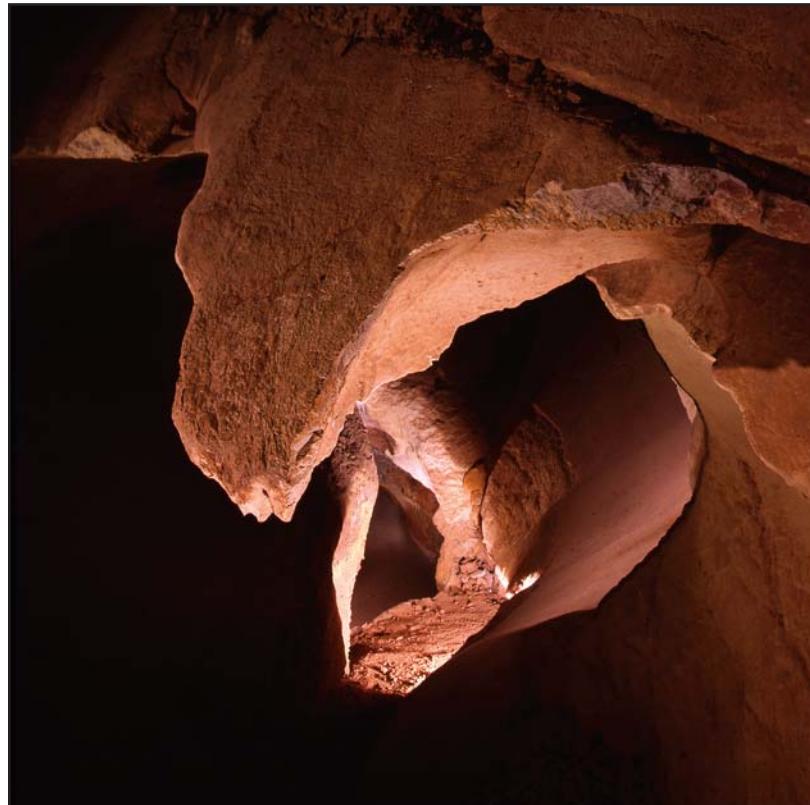
USGS Learning Web, Rocks and minerals web page:

http://interactive2.usgs.gov/learningweb/explorer/topic_rocks.htm

Additional Reading and Other Resources

Amethyst Galleries Inc. Mineral Gallery web page: <http://mineral.galleries.com/>

USGS Rocks and Minerals web page: <http://geology.er.usgs.gov/eastern/rocks.html>



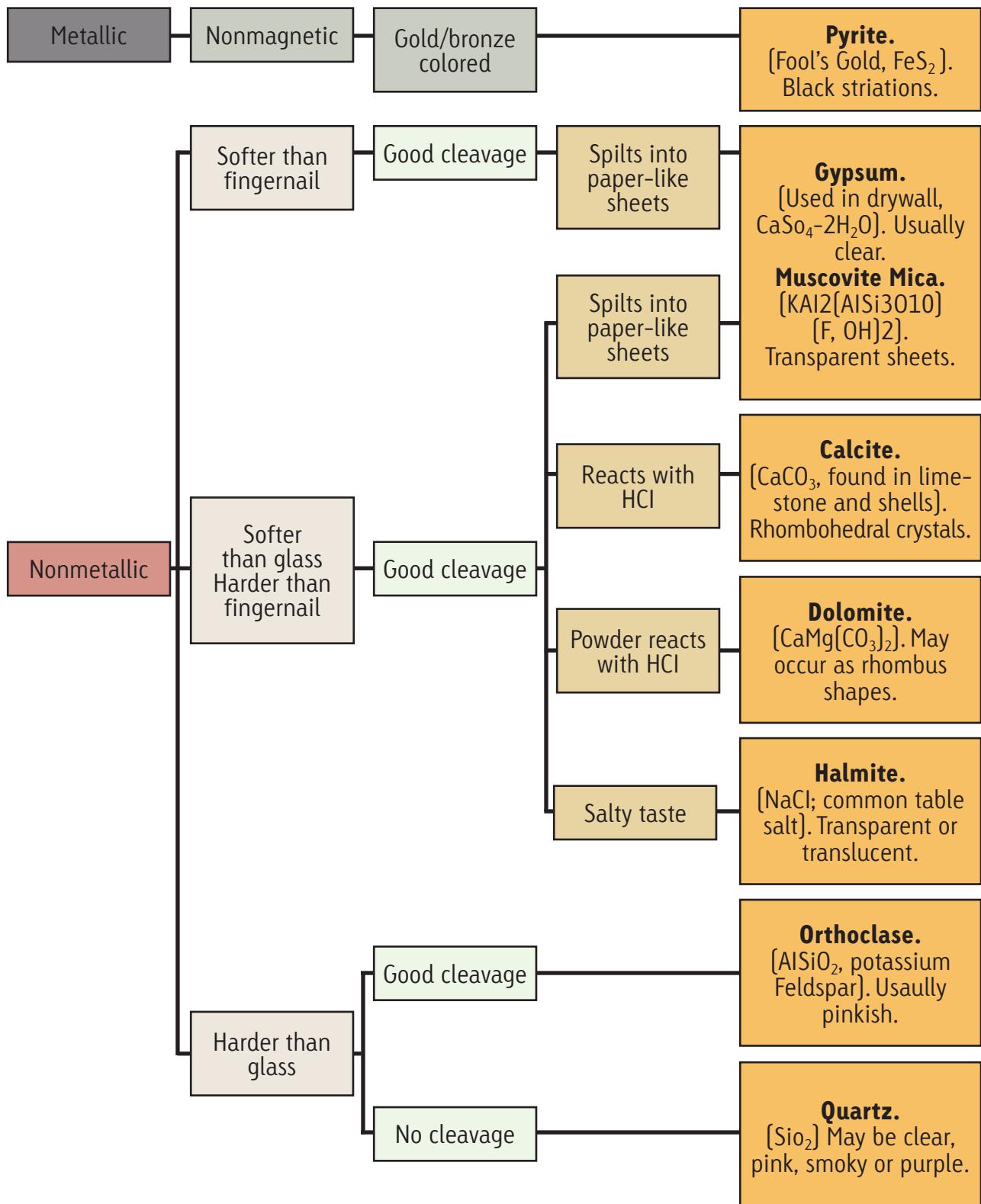
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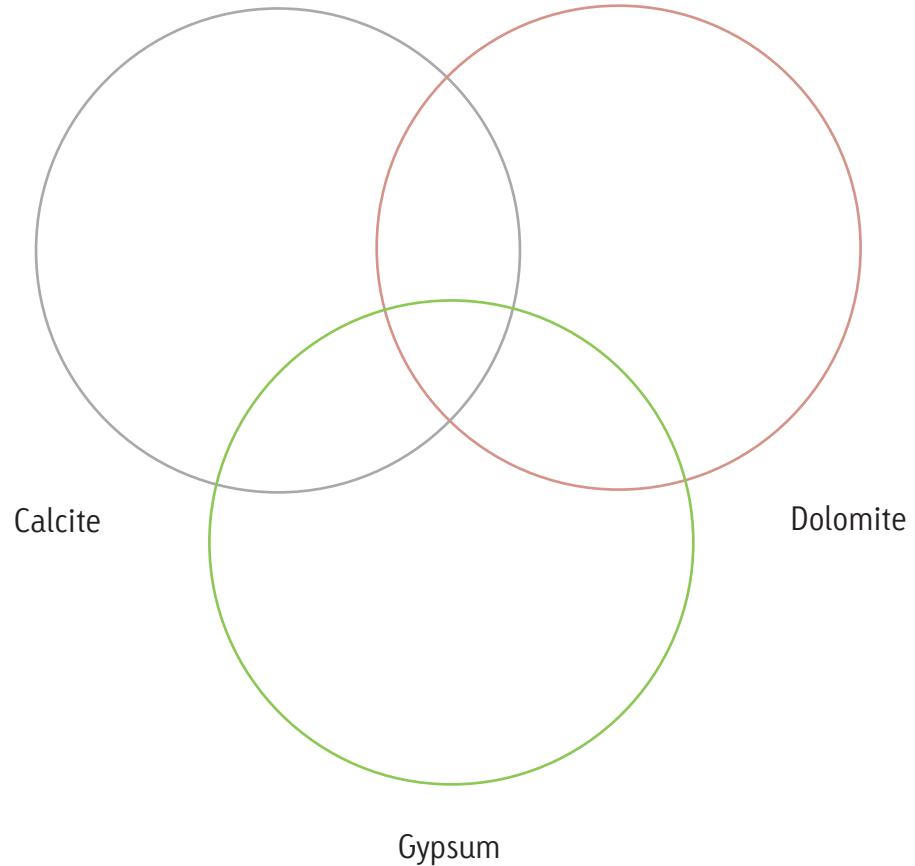
Mineral Identification Chart

Initial Characteristics

Mineral Names and Other Features



Venn Diagram for Minerals



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