USGS
science for a changing world

Ores to Minerals

Lesson 1
Rocks Versus Minerals

LESSON PLAN

Standards Alignment, Learning Objectives, Materials List,
Step-by-Step Instructions, Teacher Key, Vocabulary Bank, Differentiation Suggestions

Standards

AP® Environmental Science Standard: 5.9 Impacts of Mining - LEARNING OBJECTIVE-EIN-2.K: Describe natural resource extraction through mining.

Next Generation Science Standard: HS-ESS3-1 - Construct an explanation based on evidence for how the availability of natural resources [and/or the] occurrence of natural hazards...have influenced human activity.

Learning Objective

Differentiate between rocks and minerals by comparing (images of) aggregated rock, such as granite, basalt, limestone, and sandstone, and comparing them to minerals, such as quartz, pyrite, and calcite.

Materials

1 Samples of rocks possible:

- Granite
- Basalt
- Limestone
- Sandstone
- Pumice
- Obsidian
- Coal
- Slate
- Marble

2 Samples of minerals possible:

Native elements:
- Gold (Au)
- Silver (Ag)
- Copper (Cu)
- Sulfur (S)
- Diamond (C)

Compounds:
- Quartz (SiO_2)
- Pyrite (FeS_2)
- Calcite ($CaCO_3$)
- Hematite (Fe_2O_3)
- Fluorite (CaF_2)
- Gypsum ($CaSO_4 \cdot 2H_2O$)
- Apatite ($Ca_5(PO_4)$)
- Malachite ($Cu_2CO_3(OH)_2$)
- Galena (PbS)
- Talc ($Mg_3Si_4O_{10}(OH)_2$)

3 Student Slides

4 Student Worksheet

Step-by-Step Instructions

1. Prepare rock and mineral samples. If no physical samples are available, students will use the images provided in the slides.
2. Project the Student Slides and introduce the guiding questions, definitions, and instructions.
3. Allow students to examine the samples, and/or view the slides that contain images of rocks and minerals. This can be done in stations.
4. Since this is an engagement activity, it is okay if students do not get the correct answers. Tell students they will find out which samples are rocks and which are minerals later.
5. Instruct students to complete the Rocks Versus Minerals Lesson 1 Student Worksheet, stating which samples they believe to be rocks and which they believe to be minerals.

Teacher Key to Student Worksheet

Formation	Rock (R) or Mineral (M)?	Formation	Rock (R) or Mineral (M)?
(Native) Gold	M	Pumice	R
Basalt	R	Obsidian	R
Granite	R	(Native) Silver	M
Quartz	M	Gypsum	M
Pyrite	M	Malachite	M
Limestone	R	Galena	M
(Native) Copper	M	(Native) Sulfur	M
Calcite	M	Slate	R
Sandstone	R	Marble	R
Hematite	M	(Native) Diamond	M
Fluorite	M	Talc	M

Conclusion Questions

- What are native elements? Minerals that are found as pure, or nearly pure, elements in Earth's crust.
- How can you tell a rock from a mineral? By looking at physical characteristics such as color and structure and also by testing to see if it has a consistent hardness, fracture, and streak.
- How have you encountered any of these rocks or minerals in your life? Possible answers: I have encountered talc when I used talcum powder. I have marble countertops in my kitchen. I wear gold and silver jewelry.

Vocabulary Bank

- **Mineral** - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form, and physical properties
- **Native element** - An element that occurs in pure or nearly pure form as a mineral
- **Rock** - A naturally occurring and coherent aggregate of one or more minerals that is found in Earth's crust and may be igneous, sedimentary, or metamorphic in type

Differentiation Suggestions

- Adjust Amount: Reduce the number of rocks and minerals.
- Scaffold Support: Provide or allow aids, like additional text or images, as reference resources.
- Reduce Cognitive Load: Limit the amount of text you include in each slide.
- Role Assignments: Assign varying slides to each member of a group.
- Group Composition: Form heterogeneous groups to ensure a mix of abilities and skills, fostering peer support and collaboration.
- Ongoing Check-Ins: Regularly check in with groups to provide feedback and support, ensuring all students participate and understand the task.
- Use extra visual materials showing additional examples.
- Use translation technology or a bilingual dictionary.
- Read the text aloud.
- Model the activity.