



# Utah Mining Association



## Earth Science Curriculum

Developed by University of Utah Mining Engineering students for the Utah Mining Association

Piloted and refined by Alpine School District teachers

### Name That Mineral

Topic: Mineral Identification	Estimated Length: 60 minutes
<b>Standard:</b> 5, Understand that structure is used to develop classification systems.	<b>Objective:</b> 2b, Develop a classification system based on observed structural characteristics.

#### Description:

- Students will develop a classification system for minerals based on their observed physical characteristics.

#### Required Materials/Resources: "Mineral Identification"

- See Standard 5: Objective 1 for background on important minerals and their uses in society.
- 3-7 different types of minerals. (Ex. Quartz, Hornblende, Pyrite, Graphite, Garnet.)

- Mineral identification kits consisting of: Streak plate, magnet, nail, penny, and a glass microscope slide.  
<http://www.amazon.com/Geosciences-Industries-Mineral-Identification-Kit/dp/B008AK7AQE>
- Mineral Identification Table and Key worksheets. (Provided below)

### Introduction:

- Minerals are solid, inorganic substances that occur naturally and have specific structures and chemical compositions. Minerals are present in rocks and can be extracted by mining in order to make all of the things we use in our everyday lives.
- You can tell the differences between minerals by looking for certain properties. Because each mineral is unique both chemically and structurally, each has its own set of physical, optical and structural properties, which aid in its identification. Physical properties such as hardness and streak can be tested easily.
- **Color** is often the first property you notice about a mineral, but it may not be the most diagnostic feature. Often color can be misleading because some minerals have a variety of colors. Therefore, it should be used in conjunction with other characteristics.
- **Luster** is a description of the way the surface of a mineral reflects light. The easiest distinction to make is whether a mineral has metallic or non-metallic luster. Metallic minerals will have a luster similar to aluminum foil or jewelry. Non-metallic minerals can be dull or shiny, but they don't have a metallic look.
- **Streak** is the color of particulate dust left behind when a mineral is scraped across an abrasive surface. Streak color is more reliable than surface color as an indicator. The streak color will be constant, but the surface color may vary.
- **Hardness** is a measure of the mineral's resistance to scratching or abrasion. It is measured using the Mohs Hardness Scale. This is a scale that measures the hardness of minerals relative to each other. The scale ranges from 1 to 10, with 1 being the softest and 10 being the hardest. A mineral should be able to scratch any mineral with a lower hardness number and can be scratched by any mineral or material with a higher hardness number. The following simple tools with known hardness values can be used to determine mineral hardness:
  - Fingernail – hardness of 2-3
  - Copper penny – hardness of 4-5
  - Steel file/nail – hardness of 5-6
  - Glass – hardness of 5-6
- **Magnetism** identifies specific iron rich minerals. Only a few minerals such as magnetite or pyrrhotite are magnetic. This makes magnetism a very useful identifying feature in limited instances.
- These are just some of the properties used to identify minerals. Geologists use many more properties to definitively identify a mineral.

**Discussion:** (Length: 15 minutes)

- Discuss the importance of minerals in our everyday lives.
- Discuss some of the common properties of minerals that can be tested to identify a mineral. These are color, luster, streak, hardness and magnetism.
- Demonstrate how to streak a mineral and have the class tell you what color they observe.
- Demonstrate how to determine the hardness of a mineral sample

**Activity: “Mineral Identification”** (Length: 25-35 minutes)

- The objective of this activity is to identify mineral samples by testing five common properties.
- Divide the class into groups dependent on the number of mineral samples available.
- Hand out Mineral Identification Table and Key to each student or group. (Provided below)
- Hand out one mineral to each group and invite them to use the five physical characteristics to identify each mineral.
- **Color:** Look at the mineral and decide what color(s) are present on the mineral surface. Write the color(s) in the appropriate spot in the Mineral Identification Table.
- **Luster:** Observe how your mineral reflects light. Decide whether your mineral has a metallic or non-metallic luster. Does it look like a metal? If yes, then it has a metallic luster. If it is dull or shiny, but not like a metal, then it has a non-metallic luster.
- **Streak:** Hold the streak plate on the table with one hand. Grasp the mineral in your other hand, press it firmly against the streak plate and pull it towards you to make a streak. If you press too lightly, it will not streak properly. Record the color of the streak in the streak box on the Mineral Identification Table. If no streak is visible, try using different surfaces of the mineral on the streak plate. If there is still no streak visible record “no streak”.
- **Hardness:** Conduct a series of tests with hardness tools to identify the hardness range for your mineral. Begin with the softest tool, your fingernail, and proceed up to glass. Each time evaluate whether your mineral is harder or softer than the hardness tool. If the hardness tool can scratch your mineral, your mineral is softer than that tool. If the mineral can scratch the hardness tool, your mineral is harder than the tool. True scratches will not rub off with your finger. Look up the hardness values of the hardness tools (identified in the introduction) and record whether your mineral is greater than or less than those values in the Mineral Identification Table.
- **Magnetism:** Hold a bar magnet next to your mineral. Record if the mineral is magnetic.
- Use the mineral identification key to determine the mineral based on your findings.
- After 5-7 minutes rotate minerals and repeat steps until each group has identified every sample.

**Assessment:** (Length: 15 minutes)

- Lead a class discussion about each mineral's characteristics and invite students to discuss any differences in their findings.
- Discuss which properties were the most and least helpful in identifying the minerals.
- Which mineral was the easiest to identify? Why?
- What additional categories could be used to classify mineral samples?

**Real World Application:** (Length: 5 minutes)

- **Focus on Careers:** Geologist
- **What They Do:** Geologists study the Earth and the processes under which it formed.
- **Where They Work:** Federal, State and Local governments, mining companies, oil and gas companies and environmental agencies are among the many places a geologist can work.
- **Education Necessary:** A minimum of a four-year degree is needed, and a postgraduate degree can provide additional opportunities.
- **How They Use the concept of Density:** Geologists must identify minerals and their locations in order to extract them for use. Proper mineral identification is one of the first steps in the complicated process of establishing a mine.

Name \_\_\_\_\_

## Mineral Identification Table

Sample	Color	Luster	Streak	Hardness	Magnetic	Mineral Name
1						
2						
3						
4						
5						

## Mineral Identification Key

Mineral	Color	Luster	Streak	Hardness	Magnetic
Bauxite	red, brown, yellow	non-metallic	light brown, white	1-3	no
Calcite	white, colorless, brown, green-black	non-metallic	white	2.5-3	no
Chalcopyrite	yellow-gold	metallic	greenish-black	4	no
Dolomite	white, colorless, pink, brown, gray	non-metallic	white	3.5-4	no
Feldspar	pink, gray, white, red, green, blue, colorless, black	non-metallic	white	6	no
Fluorite	white, colorless, purple, pink, yellow, brown	non-metallic	white	4	no
Garnet	white to dark gray, red	Non-metallic	none	6.5	no
Hematite	red-brown, gray, black	metallic	reddish-brown	4-6	no
Hornblende	dark green, black	non-metallic	none	5-6	no
Magnetite	black	metallic	black	6	yes
Pyrite	yellow-gold	metallic	greenish-black	6	no
Pyrrhotite	yellow-gold	metallic	dark gray-black	3.5-4.5	yes
Quartz	light green, purple, yellow, colorless	non-metallic	white	7	no
Talc	gray, white	non-metallic	white	1	no

