

## **Mineral Identification, Uses for Minerals, and Minerals in Rocks:**

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| <b>Grade Level</b>         | 4 <sup>th</sup> , but can be adapted to higher levels  |
| <b>Subject Areas</b>       | Geoscience, general science (making observations)  |
| <b>Skills</b>              | Observation and classification of rocks, writing skills, drawing, oral presentation, group work  |
| <b>Duration</b>            | 3- 60 minute class periods (varies depending on number of minerals to ID)  |
| <b>Setting</b>             | classroom  |
| <b>Vocabulary</b>          | Mineral classification and identification  |
| <b>Standards Addressed</b> | MT 2.2 – classify objects based on physical characteristics  |
| <b>Objectives</b>          | <b>Students will:</b> <ul style="list-style-type: none"><li>● <b>Use techniques that geologists commonly use to identify common minerals</b></li><li>● <b>Learn about uses of some minerals in common items</b></li></ul>  |
| <b>Materials</b>           | <ul style="list-style-type: none"><li>● <b>A group of at least 10, no more than 20 common minerals in hand sample (kids will be split up into groups no larger than 7, so have enough of each mineral to swap between groups or so each group will have one) – common minerals used include halite, calcite, gypsum, quartz, fluorite, muscovite and biotite mica, graphite, magnetite, hematite, talc, garnet, galena, potassium feldspar, copper, sulfur...</b></li><li>● <b>Hand lens or magnifying glass</b></li><li>● <b>Glass plate</b></li><li>● <b>Magnet</b></li><li>● <b>Ceramic streak plate</b></li><li>● <b>Nail</b></li><li>● <b>Photos of minerals used in activity</b></li><li>● <b>Worksheet (provided) for students to fill out</b></li><li>● <b>Dilute HCl (for teacher to use only)</b></li><li>● <b>Mineral identification book</b></li></ul> |
| <b>Background</b>          | <p>This activity allows students to use common techniques to identify minerals in hand sample</p> <p>Take photos of minerals before class and print them out so each student has a set. These will be glued to the mineral data sheet (see below) where students will record other observations they make from the other diagnostic tests.</p>   |

## Procedure

Write the following on the board and go through them with students. It may help to demonstrate how each piece of equipment is used when they are in a large group too:

Well, today we're going to deeper into these and other ways we can identify minerals.

~**Color:** Color alone makes it tricky to identify minerals, since there are lots of minerals that have the same color and lots of minerals that can occur in different colors. For instance (amethyst and fluorite; halite and quartz)

~**Hardness:** For instance, most rocks feel hard in our hands, but they may actually be harder than a nail, but weaker than glass. So, you are going to use a nail and glass to see just how hard minerals are.

~**Streak:** We can also identify minerals by looking at the color of the streak they make on this ceramic plate. Some minerals have a different color streak than they do their color as a whole.

~**Luster:** Whether or not a mineral looks like a shiny metal can help us identify it. Some minerals are shiny and others look dull. Some look like glass or resin (anyone play violin or cello?) or even pearly.

~**Cleavage/Fracture:** The shape of crystals and how they break can tell us about a mineral. Some minerals break along a plane or a flat surface, while others break jaggedly or without a flat surface. We will not be breaking minerals, but we can look at some broken surfaces.

~**Density:** Some minerals feel heavy for their size—some small rocks are heavier than larger rocks. The heavier the rock is for its size, the denser it is.

~**Smell:** Some minerals smell when we scratch or scrape them, which helps us to identify them.

~**Taste:** We shouldn't taste the minerals we have today because we don't know where they've been, but taste can be a way geologists use to identify minerals.

~**Magnetism:** We can identify minerals by whether a magnet sticks to them or not.

~**Acid Test:** One other cool way we can identify minerals is if they fizz when they have acid dropped on them. There is a special kind of mineral, called a carbonate, which reacts with acid in a neat way, which you will see today.

Give each group of no more than 7 students a glass plate, nail, streak plate, magnet, and set of minerals to identify (minerals should be placed in numbered bags to organize them). Have them use the nail and glass plate to test the hardness of the mineral (will it scratch glass or will a nail scratch it? – also, will your finger nail scratch it?), determine the streak color using the ceramic plate (scratch mineral against the plate), and test to see if the mineral is magnetic.

You may also have students smell the mineral after scratching it against the ceramic plate (some minerals have distinct smells, such as those containing sulfur); DO NOT have students taste their mineral, but they may lick their fingers after touching them (e.g. halite will taste salty). You may want to do the acid test as a large group – have each group pick 1-2 minerals they want to drop acid on – make sure you show them calcite, as it should be the only mineral to fizz with acid (unless dolomite is powdered and used).

Have students record observations and match the observations they make to the sheet provided (amend to fit the hand samples you use in class). At the end of the activity, go over all samples as a large group.

**Assessment**

Students should have a mineral identification booklet once they have successfully completed this activity – this includes a photo of the mineral, its name, its characteristics, and other notes such as its uses.

You may pair this activity with an economic geology match game where students match each mineral to a common item (e.g. match quartz to a watch; copper to a penny; talc to baby powder; sulfur to matches; muscovite mica to toothpaste and make-up, etc.) See below for example of this activity.

Economic Geology – Mineral Match Game (example):

**Name:** \_\_\_\_\_

**Match the following minerals with the product we make out of them by drawing a line between the mineral and the product. There should only be one line between each mineral and product. Fold your paper in half and put it in the basket when you are finished.**

**MINERAL**

Bauxite

Sulfur

Kaolinite

Quartz

Graphite

Quartz sand

Muscovite Mica

Talc

Copper

Halite

Gypsum

**PRODUCT**

Matches

Watch

Sparkles in toothpaste and make-up

Aluminum can and foil

Makes magazine paper glossy (shiny)

Dry wall (building material)

Glass jar

Wires and pennies

Pencil “lead”

Table salt

Baby powder

Handouts:

**Mineral List (with some clues):**

**Augite** – a greenish-black mineral that is found in many rocks.

**Biotite Mica** – black mineral that breaks off into sheets that can bend.

**Calcite** – usually colorless carbonate mineral that fizzes with acid.

**Copper** – copper-colored metallic mineral.

**Dolomite** – carbonate mineral that fizzes in powder form (when scratched).

**Fluorite** – purple, clear, green, or white mineral that is softer than glass.

**Galena** – dense silver metallic mineral.

**Garnet** – dark red mineral that is very hard.

**Graphite** – soft metallic mineral used to make your pencil.

**Gypsum** – colorless or white soft mineral with sometimes with lines on its surface.

**Halite** – the mineral from which we make table salt.

**Hematite** – iron-rich mineral that is sometimes magnetic and may be rusty colored with a red-brown streak.

**Hornblende** – a hard black mineral that is found in many rocks.

**Kaolinite** – a very soft and powdery clay mineral.

**Magnetite** – a magnetic, dense mineral with a gray-black streak.

**Muscovite Mica** – light colored mineral that breaks off into sheets that bend.

**Potassium Feldspar** – a light colored mineral (pinkish or off-white) that is found in many rocks.

**Pyrite** – “fools gold.”

**Quartz** – a mineral that can be many different colors, but is harder than glass.

**Talc** – a soft mineral that feels “silky” smooth and may leave powder on your hands.

## Some Methods Geologists Use To Identify Minerals:

- **Color:** Color alone makes it tricky to identify minerals, since there are lots of minerals that have the same color and lots of minerals that can be different colors. For instance, quartz, halite, and calcite can be colorless; amethyst quartz and fluorite can be purple.
- **Hardness:** For instance, most rocks feel hard in our hands, but they may actually be harder than a nail, but weaker than glass. So, you are going to use a nail and glass to see just how hard minerals are by trying to scratch your minerals with a nail and using your mineral to scratch glass plates. Some minerals are so soft that you can scratch them with your fingernail! While geologists use a special scale for hardness, called Moh's Hardness Scale, we will classify hardness by whether we can scratch it with a fingernail or penny (soft), we can scratch it with a nail (medium), or if the mineral can scratch glass (hard).
- **Streak:** We can also identify minerals by looking at the color of the streak they make on a ceramic plate. Some minerals have a different color streak than they do their color as a whole.
- **Luster:** Whether or not a mineral looks like a shiny metal can help us identify it. Some minerals are shiny and others look dull. Some look like glass or resin (does anyone play violin or cello?) or even pearly.
- **Cleavage/Fracture:** The shape of crystals and how they break can tell us about a mineral. Some minerals break along a plane or a flat surface (called cleavage), while others break jaggedly or without a flat surface (called fracture). We will not be breaking minerals, but we can look at some broken surfaces.
- **Density:** Some minerals feel heavy for their size—some small rocks are heavier than larger rocks. The heavier the rock is for its size, the denser it is.
- **Smell:** Some minerals smell when we scratch or scrape them, which helps us to identify them.
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- **Magnetism:** We can identify some minerals by whether a magnet sticks to them or not.
- **Acid Test:** One other cool way we can identify minerals is if they fizz when they have acid dropped on them. There is a special kind of mineral, called a *carbonate mineral*, which reacts with acid in a neat way, which you will see today.