PROPERTIES OF MINERALS

GUIDED READING

BY LANEY LEE

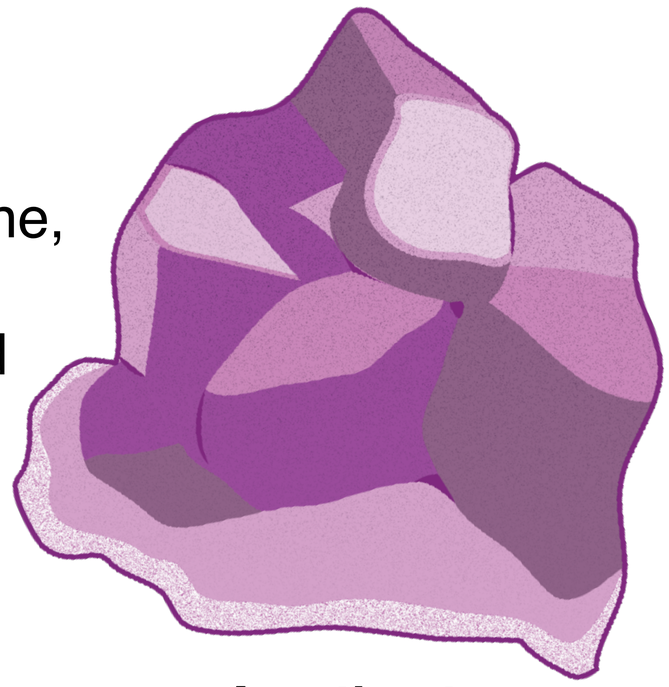
PROPERTIES OF MINERALS

Name: _____

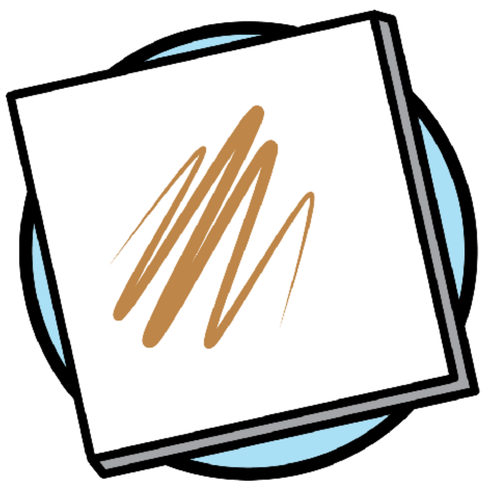
Have you ever found a cool rock in your backyard? Or was it a mineral? Was it white, brown, or grey? Was it heavy or light? Did it look like just about every other piece of debris in the area? How would you ever discover what you actually had? When geologists collect a sample, it's often not immediately apparent which mineral it actually is. Many minerals look and feel very much like each other. To solve the riddle, geologists use a series of tests to take account of all the unique properties of the sample. These tests gradually narrow down the possibilities until the mineral is accurately identified. Take a closer look at the process as you read on.

Color

The first and most obvious property of a mineral is its color. Color, however, is one of the worst identifying features of a mineral. For one, many minerals share a similar color. Additionally, if the mineral was found in a location other brightly elements present, like iron, it could be discolored by the contact. Color is a good way to begin narrowing the possibilities of a mineral sample, but it's usually not definitive enough to provide a solid identification.



Amethyst



Streak Plate

Streak

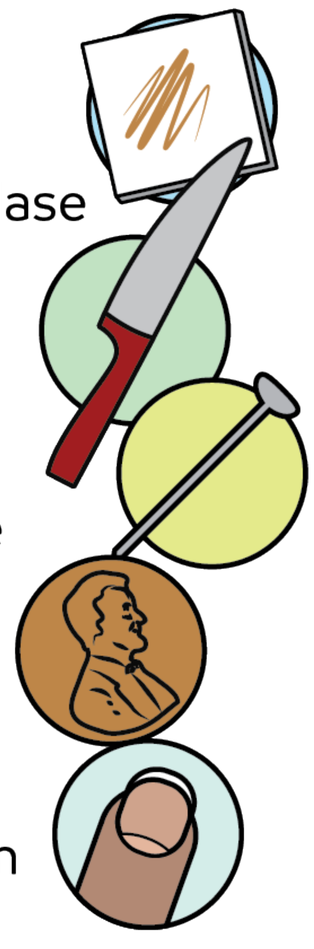
Streak is the color of a mineral in powdered form. Streak is determined by scraping the sample against a white piece of ceramic called a streak plate. This produces a chalk-like line that can be used to determine the true color of the mineral.

Hardness

Hardness is a measure of how easily a sample can be scratched. In order to test for hardness, geologists have devised a chart of items of varying hardness to use as a scale. Here's how it works: A harder object can scratch a softer object. Geologists keep a couple items on hand to help them test the minerals they find. A human fingernail has a hardness of just above a 2. If a geologist finds a mineral that can be scratched by their fingernail, they know it's hardness must be less than 2. A steel knife has a hardness of 5.5. If a geologist discovers a sample that *can* be scratched by the knife, but not their fingernail, then that mineral's hardness must be between 3 and 5. If the mineral *can't* be scraped by the knife, then it's hardness must be 6 or above. The hardest known mineral is diamond. Nothing can scratch it. The softest is talc. Talc is a main ingredient in a lot of makeup.

MOHS SCALE OF HARDNESS

10	diamond
9	corundum
8	topaz
7	quartz
6	orthoclase
5	apatite
4	fluorite
3	calcite
2	gypsum
1	talc



PROPERTIES OF MINERALS

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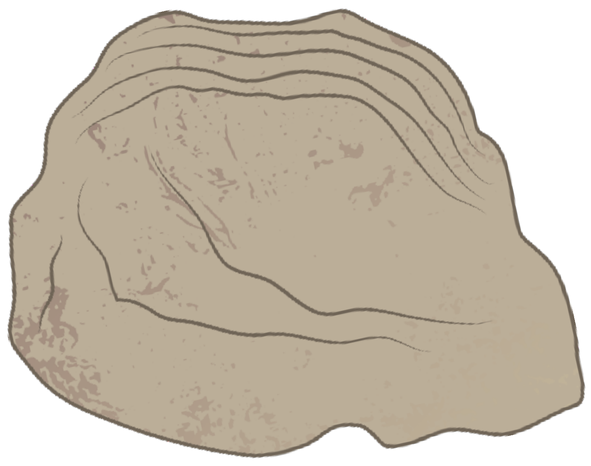
Cleavage & Fracture



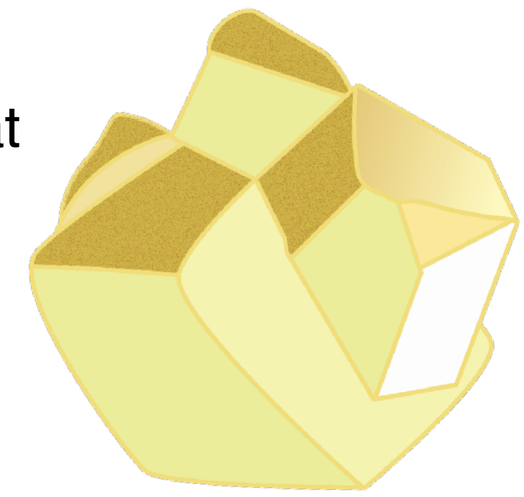
Mica

The next step in identifying an unknown mineral is to strike it and see how it breaks. **Cleavage** is the tendency of a mineral to break along straight lines. Mica is a mineral that famously breaks in flat sheets. The way mica cleaves actually tells scientists more than you would think. Like anything, a mineral breaks where it is weakest. A mineral that cleaves reveals areas of weaker and stronger atomic bonds in its structure.

If a mineral does not break in any regular way, it's called **fracture**. Minerals that fracture do not have any obvious weak points in their atomic structure.

Luster

Luster is the way a mineral reflects light. There are several adjectives that can be used to describe a mineral's luster. If a mineral is shiny like metal its luster is called "metallic." If it's like glass it's called "vitreous." Luster can also be pearly, waxy, and resinous. Pyrite has a famous luster, because it shines exactly like gold. That's why it's often called "Fool's Gold."



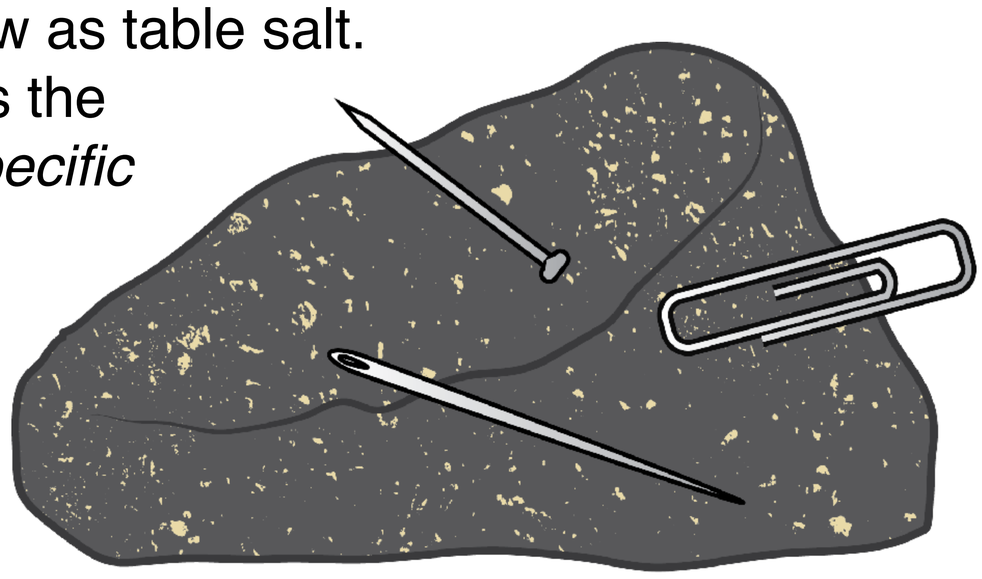
Pyrite

Density

Density is a measure of how much mass is packed into a certain amount of space. Things like lead are very dense, and they feel heavy even if you are only holding a small amount. Things like styrofoam are not dense at all, and even a large piece of styrofoam would not feel very heavy. Scientists determine the density of a sample by dividing the mass of an object by its volume. Gold has a density of 17.65 grams (mass) per cubic centimeter (volume). Whether you have a large or small sample of gold, the mass divided by the volume of that sample will always be 17.65 For that reason, density is a very reliable way to determine the identity of an unknown mineral.

Other Qualities

There are several other qualities that geologists use to help them identify an unknown sample. They may test for *magnetism*, or whether or not the sample is magnetic, with small pieces of metal from their pockets. Certain minerals, such as magnetite, are known to be magnetic. A geologist may test for this first, as it would be a strong indication that his sample is, in fact, magnetite. Other unique properties some minerals have are *taste* and *odor*. For example, halite is a common mineral that you may know as table salt. It can easily be identified by its unique taste. *Tenacity* is the measure of how strongly a mineral resists breaking. *Specific gravity* is a measure of how the weight of a mineral compares to an equal amount of water. *Transparency* is a measure of how easily light passes through. Geologists may also use microscopes to determine the exact arrangement of the atoms in a mineral. This arrangement is its *crystalline structure*. With so many useful ways to examine a sample, geologists are sure to identify even the most mysterious minerals!



Magnetism of Magnetite

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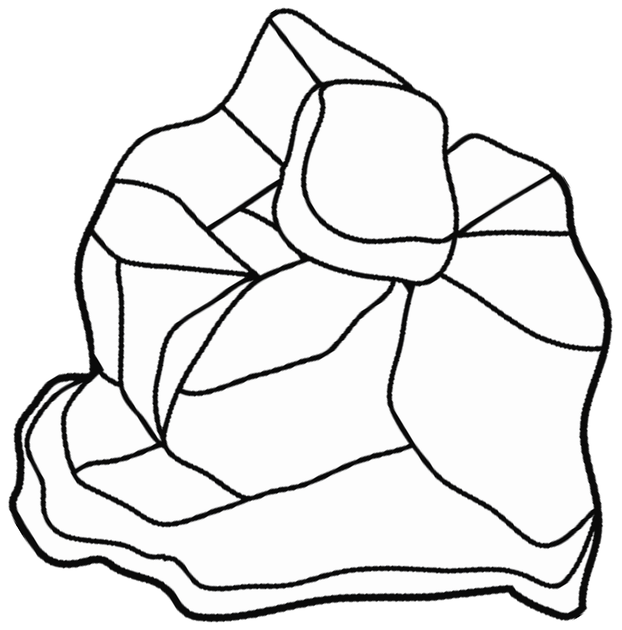

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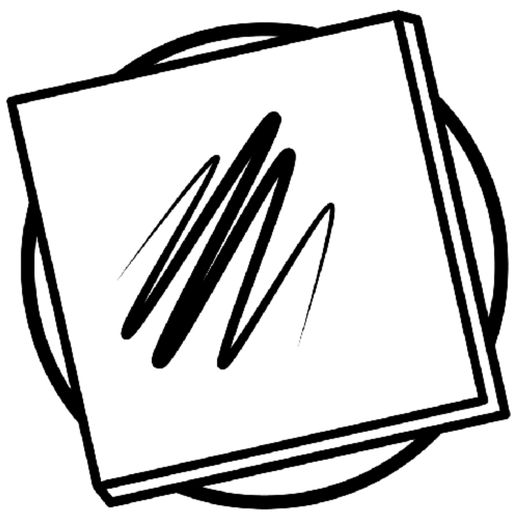

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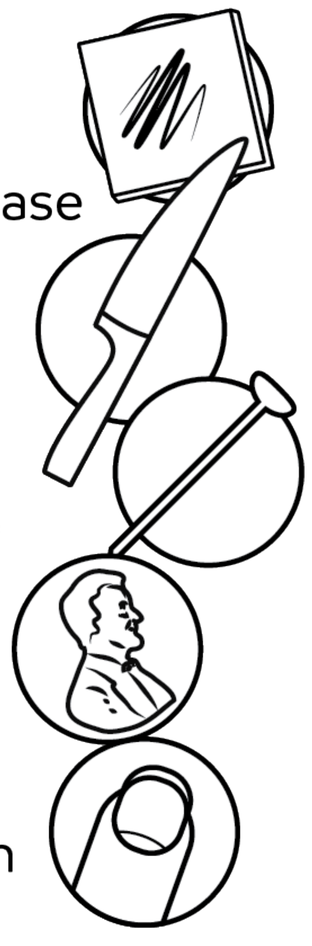

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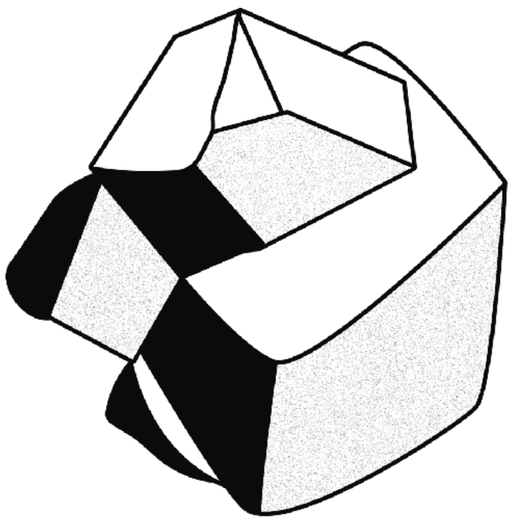

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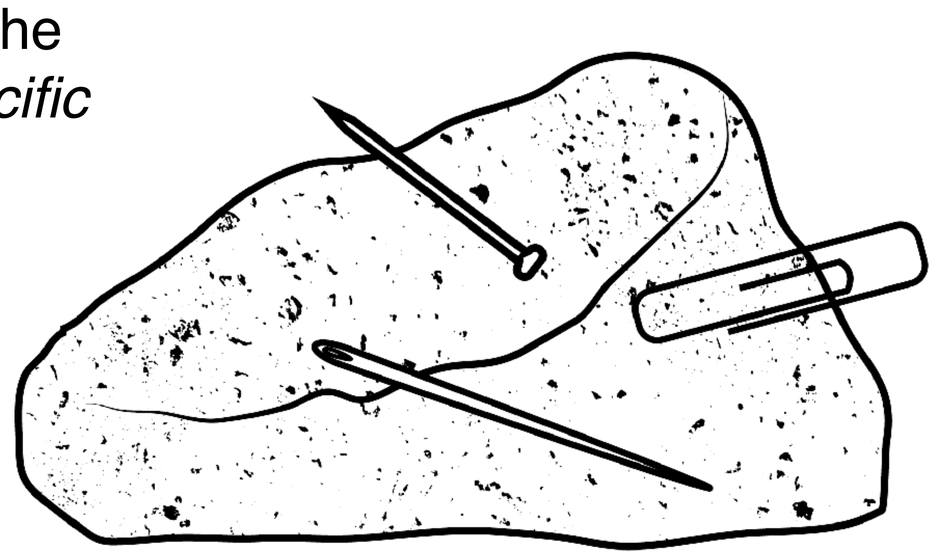

Magnetism of Magnetite

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Fill in the table using the information you read.

Property	How Geologists Use it to Identify Minerals
COLOR	
STREAK	
HARDNESS	
CLEAVAGE AND FRACTURE	
LUSTER	
DENSITY	

1. Choose 2 of the above terms. Tell how they are alike and how they are different.

2. Why would cleavage be important to gem cutters, who cut and shape gems to use in jewelry?

3. Imagine that you work at a jeweler's shop and a customer brings in some gold nuggets for sale. You're not sure if the nuggets are real gold. Which properties would you test to determine if it is real or fake?