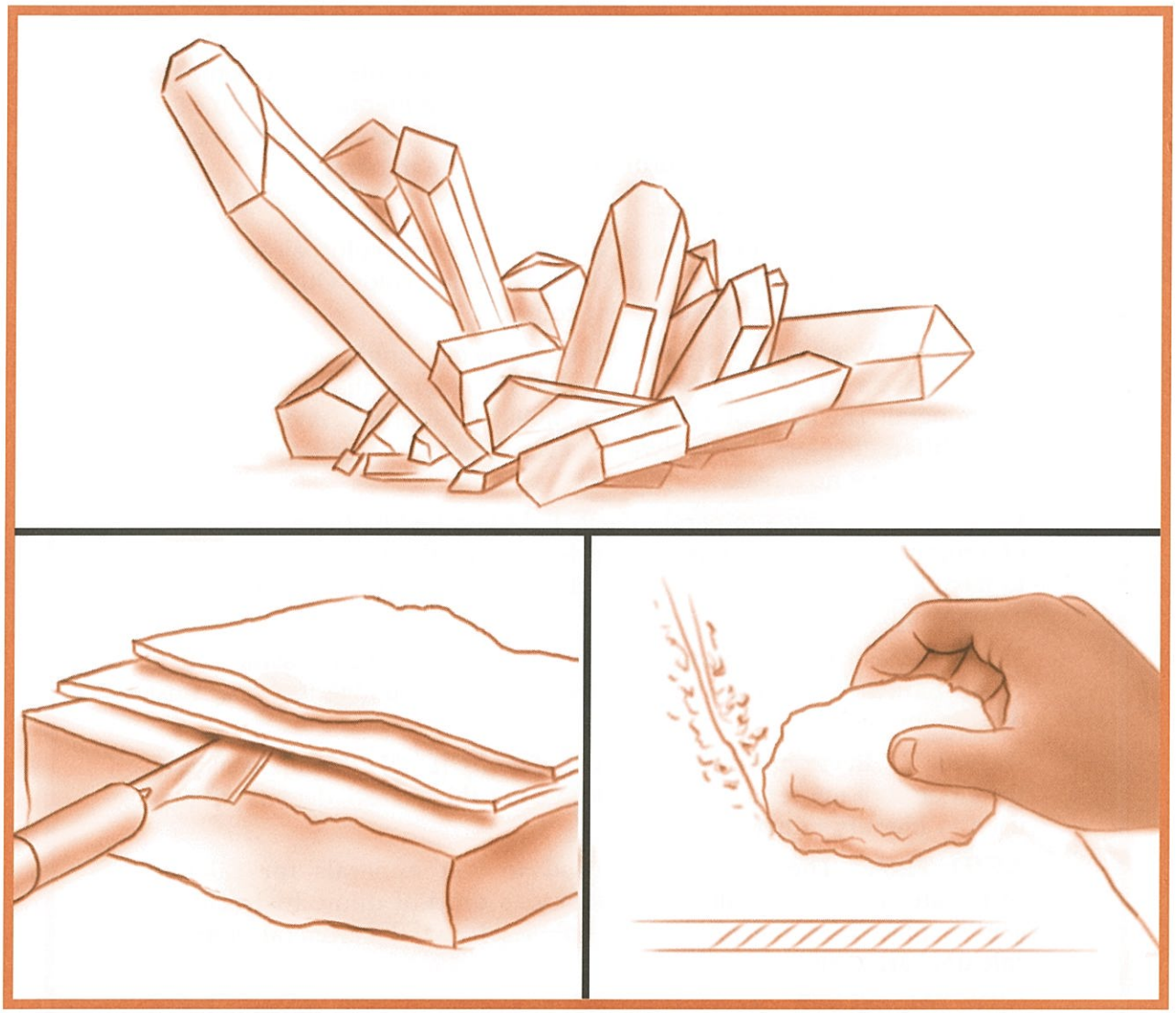
What properties are used to identify minerals?



KEY TERMS

streak: color of the powder left by a mineral
luster: way a mineral reflects light from its surface
hardness: property of a mineral to resist being scratched
density: amount of matter in a given volume
fracture: splitting of a mineral into pieces with uneven surfaces
cleavage: splitting of a mineral into pieces with smooth, flat surfaces

LESSON 8 | What properties are used to identify minerals?

Have you ever heard of "fool's gold"? It looks like gold, but it is another mineral. It is worth far less than gold. Many people have been fooled by it.

Many minerals have "look-alikes." That is why scientists have come up with different properties and tests to identify minerals. Sometimes, a mineral can be identified by only one property. However, usually several properties must be tested in order to identify the mineral.

The properties of minerals are:

COLOR Most minerals cannot be identified by color alone. Many minerals, such as gold and pyrite, have the same color. Other minerals, such as quartz, have many different colors.

STREAK When you rub a mineral on a piece of unglazed ceramic tile, it may leave a **streak** of powder. Streak is the color of the powder left by the mineral. The color of a mineral's streak is important. A mineral may have different colors, but it always leaves the same color streak. Some minerals leave no streak.

LUSTER The way a mineral reflects light is called its **luster.** The luster of a mineral can be shiny, glassy, or dull. A mineral that is shiny is said to have a metallic luster. A mineral that is glassy or dull is said to have a nonmetallic luster.

HARDNESS The property of a mineral to resist being scratched is called **hardness.** To find out how hard a mineral is, we test it against other minerals.

DENSITY Every mineral has its own **density** [DEN-sih-tee]. Density is the amount of matter in a given volume. For this reason, density often is used to identify minerals.

ACID TEST The acid test is used to test minerals for calcium carbonate. To test for calcium carbonate, a drop of dilute hydrochloric acid is placed on the mineral. If bubbles form, the mineral contains calcium carbonate.

CRYSTAL SHAPE As you learned in Lesson 6, each mineral has a specific shape. Crystal shape can help identify some minerals.

FRACTURE AND CLEAVAGE The way a mineral splits can also be used to identify the mineral. Some minerals split into smooth, flat pieces. These minerals are said to have **cleavage** [KLEE-vij]. Other minerals split into pieces with uneven surfaces. These minerals are said to have **fracture** [FRAK-chur].

TESTING MINERALS

HARDNESS The Moh's scale of hardness shows the ten minerals that we test other materials against. When a material is tested for hardness, it is given a number to show how hard it is. A material with a hardness of 2.5 would be harder than gypsum, but softer than calcite. A mineral can scratch something softer, but not something harder.

	Hardness	Mineral
Softest	1.	talc
	2.	gypsum
	3.	calcite
	4.	fluorite
	5.	apatite
	6.	feldspar
	7.	quartz
	8.	topaz
	9.	corundum
Hardest	10.	diamond

1. Which mineral cannot scratch any mineral by itself?

   _____

2. Which is harder, calcite or topaz?

   _____

3. Copper can scratch talc and gypsum, but it cannot scratch fluorite. What is its hardness?

   _____

4. Graphite has a hardness of 1.5. What mineral could graphite scratch?

   _____

5. Quartz has a hardness of 7.5-8. Name two minerals that can easily scratch quartz.

   _____

DENSITY All matter has mass and volume. Matter also has density. Every mineral has its own density. Therefore, density can be used to help identify minerals.

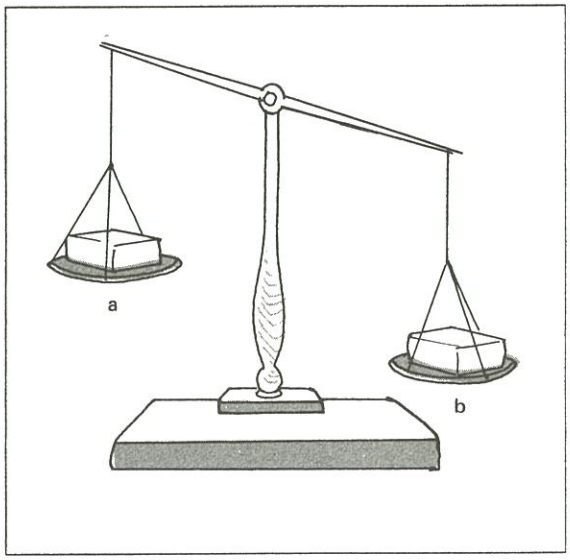


Figure A

Study Figure A and answer these questions.

6. Which has more mass, mineral a or b? _____

7. The chunks of minerals a and b are of _____ sizes.
   (the same, different)

8. Mineral b is _____ dense than mineral a.
   (more, less)

COLOR Most minerals cannot be identified by their color alone.

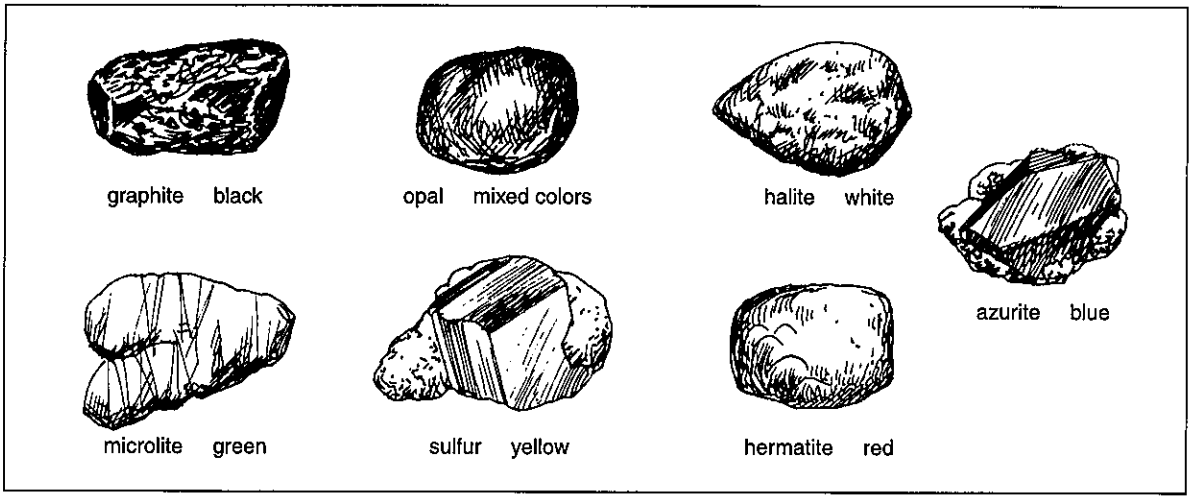


Figure B *Common minerals and their colors*

LUSTER Luster is divided into two classes, metallic and nonmetallic. Minerals that do not shine like metal have nonmetallic luster.

STREAK Streaking is done by rubbing a mineral on an unglazed ceramic tile. The streak is the color of the mineral's powder. Some minerals streak the same color as the mineral. Some minerals streak a different color than the mineral. Since the streak plate itself has a hardness of 7, harder minerals will not leave a streak on the plate. Instead, they will scratch the plate.

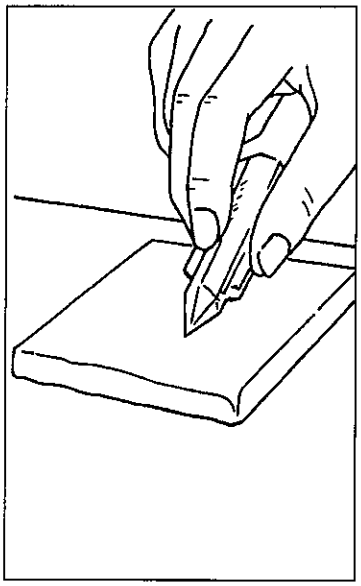


Figure C *The mineral quartz leaves no streak.*

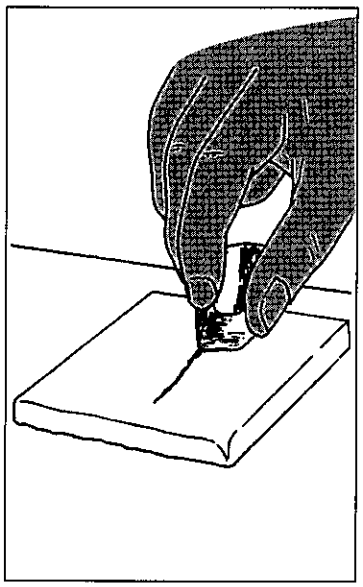


Figure D *The mineral iron pyrite is yellow, but it streaks greenish-black.*

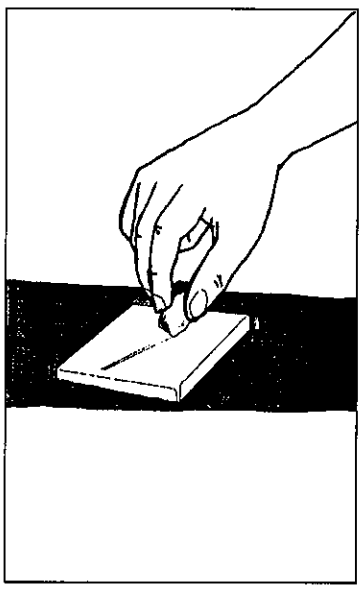


Figure E *Gold streaks its own color.*

CLEAVAGE There are many kinds of cleavage. However, the cleavage of a mineral is always the same for that mineral. Cleavage can be used to identify a mineral. Here are three examples of cleavage.

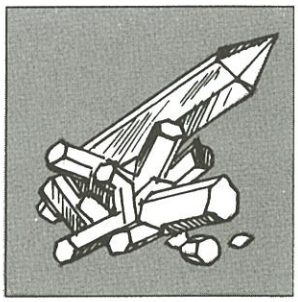


Figure F *Quartz shows no definite cleavage. Quartz shows fracture.*

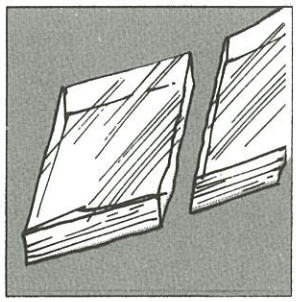


Figure G *Calcite cleaves in a very definite pattern.*

Figure H *Mica cleaves easily in thin sheets.*

THE ACID TEST The Acid test is used to test minerals for calcium carbonate ($CaCO_3$). Calcite, dolomite, and malachite are three minerals that contain calcium carbonate.

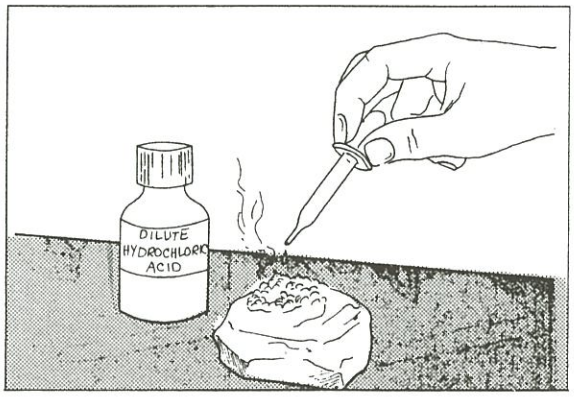


Figure I *Bubbles are given off if calcite is present.*

What acid do you use for the acid test?

_____

What does the acid test tell you about a mineral?

_____

What happens to the surface of a mineral if the acid test is positive?

_____

MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

	Column A	Column B
_____	1. streak	**a)** minerals splitting along definite planes or lines
_____	2. cleavage	**b)** property of a mineral to resist being scratched
_____	3. luster	**c)** color of a mineral's powder
_____	4. hardness	**d)** mineral's natural shape
_____	5. crystal	**e)** way a mineral reflects light

FILL IN THE BLANK

Complete each statement using a term or terms from the list below. Write your answers in the spaces provided.

ten	splits	share
luster	density	talc
powder	crystal	calcium carbonate
diamond		

1. There are _____ minerals on the hardness scale.
2. The hardest mineral is _____.
3. The softest mineral is _____.
4. Metallic and nonmetallic are kinds of _____.
5. The natural shape of a mineral is called its _____.
6. Cleavage is shown when a mineral _____ along a line.
7. Streak is the color of a mineral's _____.
8. The mass of a mineral compared to its volume is called its _____.
9. Dilute hydrochloric acid tests for _____.
10. Often, several minerals _____ some properties.

TRUE OR FALSE

In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.

_____ **1.** All minerals have the same hardness.

_____ **2.** Minerals come in many different colors.

_____ **3.** Every mineral has a color.

_____ **4.** Every mineral has a crystal form.

_____ **5.** A mineral may have a crystal form but no cleavage.

_____ **6.** Some minerals leave no streak.

_____ **7.** A mineral's streak is always the same color as the mineral.

_____ **8.** Hydrochloric acid makes calcium carbonate bubble.

_____ **9.** In the Moh's scale, a mineral with a high number can scratch any mineral with a lower number.

_____ **10.** All minerals have the same cleavage.

HOW CAN MINERALS BE TESTED IN CLASS

What You Need (Materials)

quartz
pyrite
calcite
galena
hematite
dilute hydrochloric acid
unglazed ceramic tile
medicine dropper

How To Do The Experiment (Procedure)

1. Examine the samples of quartz, pyrite, calcite, galena, and hematite. What color are they? Record your observations in Table 1.
2. Examine the samples of quartz, pyrite, calcite, galena, and hematite. What kind of luster do they have? Record your observations in Table 1.
3. Rub a piece of quartz along the ceramic tile. Does it leave a streak? If so, what color? Record your observations in Table 1.
4. Repeat Step 3 for the pyrite, calcite, galena, and hematite.
5. Using the medicine dropper, place a few drops of the dilute hydrochloric acid on the quartz. What happens? Record your observations in Table 1.
6. Repeat Step 5 for the pyrite, calcite, galena, and hematite.

What You Learned (Observations)

Table 1

		Quartz	Pyrite	Calcite	Galena	Hematite
1.	Color of mineral					
2.	Kind of luster (metallic or nonmetallic)					
3.	Does it streak?					
4.	Streak color?					
5.	Does it react with hydro-chloric acid?					

Something To Think About (Conclusions)

1. Why can color alone not be used to identify minerals?

   _____

   _____

2. What conclusion can you make about the chemical makeup of calcite based upon its

   reaction to the acid test? _____

WORD SEARCH

The list on the left contains words that you have used in this Lesson. Find and circle each word where it appears in the box. The spellings may go in any direction: up, down, left, right, or diagonally.

QUARTZ
DIAMOND
GYPSUM
DENSITY
CLEAVAGE
STREAK
LUSTER
HARDNESS
ACID
CRYSTAL

Q	T	D	S	L	L	R	A	D	E	C	R	Q
C	U	I	G	U	U	T	R	G	A	U	Y	Y
R	R	A	Z	Y	I	S	A	U	K	N	T	D
Y	A	M	R	R	P	V	T	A	Q	I	I	D
S	N	O	E	T	A	S	E	E	S	R	U	I
T	I	N	A	E	Z	R	U	N	R	M	P	N
A	U	D	L	C	T	G	E	M	P	N	U	A
L	M	C	Y	S	I	D	C	A	I	D	M	O
I	R	A	H	A	R	D	N	E	S	S	S	M

REACHING OUT

Iron pyrite is sometimes known as "fool's gold." If you had a yellow mineral, what would be one test you could use to see if it were real gold or iron pyrite?

_____

_____