

## Identifying Minerals

**BEFORE YOU READ**

After you read this section, you should be able to answer these questions:

- What seven properties can be used to identify a mineral?
- What are some special properties of minerals?

**How Can You Identify Minerals?**

If you close your eyes and taste different foods, you can usually figure out what the foods are. You can identify foods by noting their properties, such as texture and flavor. Minerals also have properties that you can use to identify them.

**COLOR**

The same mineral can have many different colors. For example, the mineral quartz can be clear, white, pink, or purple. Minerals can also change colors when they react with air or water. For example, pyrite ("fool's gold") has a golden color. If pyrite is exposed to air and water, it can turn brown or black. Because the color of a mineral can vary a lot, color is not the best way to identify a mineral. ✓

**LUSTER**

The way a surface reflects light is called **luster**. When you say that something looks shiny, you are describing its luster. A mineral can have a metallic, submetallic, or non-metallic luster. The table below gives some examples of different kinds of luster.

Luster	Description	Examples
<b>Metallic</b>	bright and shiny, like metal	gold, copper wire
<b>Submetallic</b>	dull, but reflective	graphite (pencil "lead")
<b>Nonmetallic</b>		
Vitreous	glassy, brilliant	glass, quartz
Waxy	greasy, oily	wax, halite
Silky	looks like light is reflecting off long fibers	satin fabric, asbestos
Pearly	creamy	pearls, talc
Resinous	looks like plastic	plastic, sulfur
Earthy	rough, dull	concrete, clay

**STUDY TIP**

**Reading Organizer** As you read this section, create an outline of the section. Use the properties of minerals to form the headings of your outline.

**READING CHECK**

**1. Explain** How can the color of a mineral change?

impurities  
reacts with air or water

**Say It**

**Apply Ideas** In a small group, think of a list of 10 to 15 everyday materials. Together, try to describe the luster of each material using the terms in the table.

**SECTION 2** Identifying Minerals *continued*

**STREAK**

The color of a mineral in powdered form is called its **streak**. You can find a mineral's streak by rubbing the mineral against a piece of unglazed porcelain. The piece of unglazed porcelain is called a *streak plate*. The mark left on the streak plate is the streak.

Streak is a more useful property than color for identifying minerals. This is because the color of a mineral's streak is always the same. For example, the color of the mineral hematite may vary, but its streak will always be red-brown. ✓

**READING CHECK**

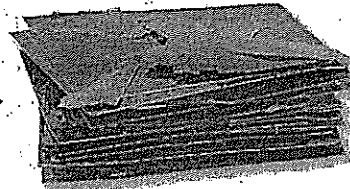
**2. Explain** Why is streak more useful than color in identifying a mineral?

minerals have the same color when they are powdered. It is consistent

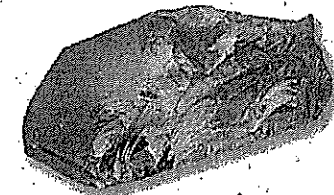
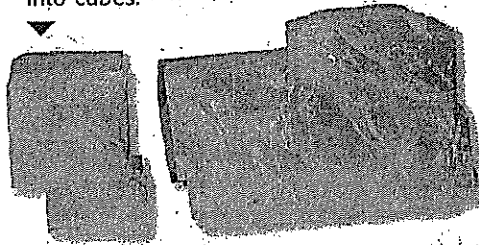
**CLEAVAGE AND FRACTURE**

Different minerals break in different ways. The way that a mineral breaks depends on how its atoms are arranged. When some minerals break, the surfaces that form are smooth and flat. These minerals show the property of **cleavage**. Other minerals break unevenly, along curved or rough surfaces. These minerals show the property of **fracture**.

The mineral biotite, a type of mica, shows the property of cleavage. It breaks easily into thin, flat sheets.



The mineral halite also shows the property of cleavage. Its crystals break into cubes.



The mineral quartz shows the property of fracture. It breaks along a curved surface. This kind of fracture is called *conchoidal* fracture.

**TAKE A LOOK**

**3. Identify** What kind of fracture does quartz show?

Conchoidal

**DENSITY**

**Density** is a measure of how much matter is in a given amount of space. Density is usually measured in grams per cubic centimeter ( $\text{g}/\text{cm}^3$ ). For example, the density of water is  $1 \text{ g}/\text{cm}^3$ .

Geologists often use specific gravity to describe the density of a mineral. A mineral's *specific gravity* is the density of the mineral divided by the density of water. For example, gold has a density of  $19 \text{ g}/\text{cm}^3$ . Its specific gravity is  $19 \text{ g}/\text{cm}^3 \div 1 \text{ g}/\text{cm}^3 = 19$ .

**Math Focus**

**4. Calculate** How many times denser is gold than water?

19

**HARDNESS**

A mineral's resistance to being scratched is its **hardness**. Scientists use the *Mohs hardness scale* to describe the hardness of minerals. The harder a mineral is to scratch, the higher its rating on the Mohs scale. Talc, one of the softest minerals, has a rating of 1. Diamond, the hardest mineral, has a rating of 10. ✓

Scientists use reference minerals to find the hardness of unknown minerals. They try to scratch the surface of the unknown mineral with the edge of a reference mineral. If the reference mineral scratches the unknown mineral, the reference mineral is harder than the unknown mineral.







You probably don't have pieces of these reference minerals. However, you can find the hardness of a mineral using common objects. For example, your fingernail has a hardness of about 2 on the Mohs scale. A piece of window glass has a hardness of about 5.5.

Hardness	Mineral	Hardness	Mineral
1	Talc	6	Orthoclase
2	Gypsum	7	Quartz
3	Calcite	8	Topaz
4	Fluorite	9	Corundum
5	Apatite	10	Diamond

**SPECIAL PROPERTIES**

Some minerals have special properties. These properties can be useful in identifying the minerals.

**Special Properties of Some Minerals**

 <p>Calcite and fluorite show the property of <i>fluorescence</i>. This means that they glow under ultraviolet light.</p>	 <p>Calcite produces a <i>chemical reaction</i> when a drop of weak acid is placed on it. It fizzes and produces gas bubbles.</p>	 <p>Some minerals, such as this calcite, show <i>optical properties</i>. Images look doubled when they are viewed through calcite.</p>
 <p>Magnetite shows the property of <i>magnetism</i>. It is a natural magnet.</p>	 <p>Halite has a <i>salty taste</i>. You should not taste a mineral unless your teacher tells you to.</p>	 <p>Minerals that contain radioactive elements may show the property of <i>radioactivity</i>. The radiation they give off can be detected by a Geiger counter.</p>

✓ **READING CHECK**

5. Define What is hardness?

How resistant to scratching a mineral is.

*Critical Thinking*

6. Apply Concepts A scientist tries to scratch a sample of orthoclase with a sample of apatite. Will he be able to scratch the orthoclase? Explain your answer.

No, the apatite is too soft.

**TAKE A LOOK**

7. Describe Under ultraviolet light, what happens to minerals that show the property of fluorescence?

They glow

# Section 2 Review

## SECTION VOCABULARY

<p><b>cleavage</b> in geology, the tendency of a mineral to split along specific planes of weakness to form smooth, flat surfaces</p> <p><b>density</b> the ratio of the mass of a substance to the volume of the substance</p> <p><b>fracture</b> the manner in which a mineral breaks along either curved or irregular surfaces</p>	<p><b>hardness</b> a measure of the ability of a mineral to resist scratching</p> <p><b>luster</b> the way in which a mineral reflects light</p> <p><b>streak</b> the color of a mineral in powdered form</p>
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1. **Compare** How are cleavage and fracture different?

Mineral breaks along flat surfaces if it has cleavage  
 Mineral breaks along curved or irregular surfaces if it exhibits fracture

2. **Explain** Why is color not the best property to use to identify a mineral?

Color can vary (especially light colored minerals)

3. **Identify** Give five properties that you can use to identify a mineral.

- Hardness
- Specific Gravity
- Streak
- Cleavage
- Luster
- Fracture
- Density
- Color

4. **Apply Concepts** A geologist has found an unknown mineral. She finds that a sample of calcite will not scratch the unknown mineral. She also finds that a sample of apatite will scratch the unknown mineral. About what is the unknown mineral's hardness? Explain your answer.

The hardness is about 4.  
 Between 3 (hardness of Calcite) and 5 (hardness of Apatite)

5. **Calculate** The density of a mineral is 2.6 g/cm<sup>3</sup>. What is its specific gravity?

$2.6 \text{ g/cm}^3 \div 1 \text{ g/cm}^3 = 2.6$  ← No Units