

What Is a Mineral?

BEFORE YOU READ

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

- What are minerals?
- What determines the shape of a mineral?
- What are two main groups of minerals?

What Are Minerals?

A **mineral** is a naturally formed, inorganic solid that forms crystals and is always made of the same elements. The figure below shows four questions that you can ask in order to learn whether something is a mineral.



You might not be familiar with the term “crystalline structure.” To understand what crystalline structure is, you need to know a little about how elements form minerals. **Elements** are pure substances that cannot be broken down into simpler substances. Oxygen, chlorine, carbon, and iron are examples of elements. Elements can come together in certain ways to form new substances, such as minerals. All minerals are made of one or more elements.

STUDY TIP

Learn New Words As you read, underline words you don't understand. When you figure out what they mean, write the words and their definitions in your notebook.

TAKE A LOOK

1. Explain Why are diamonds that are made by people not considered minerals?

Critical Thinking

2. Apply Concepts Coal is made from the remains of dead plants. Is coal a mineral? Explain your answer.

SECTION 1 What Is a Mineral? *continued*

COMPOUNDS AND ATOMS

Most minerals are made of compounds of several different elements. A **compound** is a substance made of two or more elements that are chemically bonded. For example, the mineral halite is a compound of sodium, Na, and chlorine, Cl. A few minerals, such as gold and silver, are made of only one element. A mineral that is made of only one element is called a *native element*. ✓

Each element is made of only one kind of atom. An *atom* is the smallest part of an element that has the properties of that element. Like other compounds, minerals are made up of atoms of one or more elements.

✓ **READING CHECK**

3. Define What is a compound?

✓ **READING CHECK**

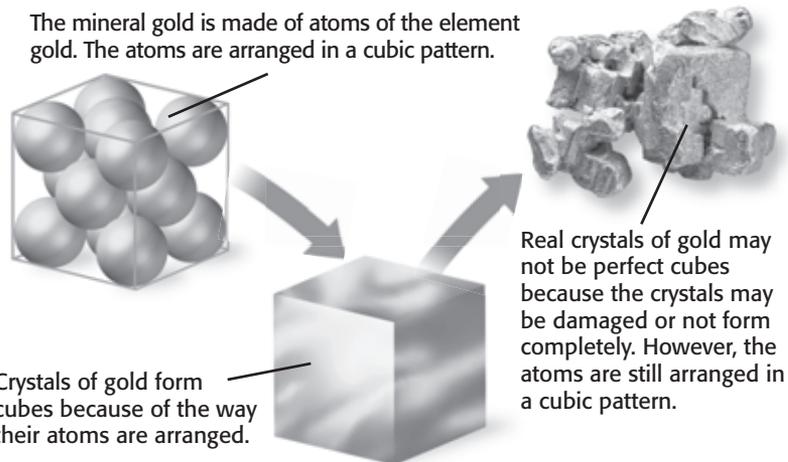
4. Explain What causes minerals to form crystals?

CRYSTALS

Remember that minerals have a definite crystalline structure. This means that the atoms in the mineral line up in a regular pattern. The regular pattern of the atoms in a mineral causes the mineral to form crystals. **Crystals** are solid, geometric forms of minerals that are formed by repeating a pattern of atoms. ✓

The shape of a crystal depends on how the atoms in it are arranged. The atoms that make up each mineral are different. However, there are only a few ways that atoms can be arranged. Therefore, the crystals of different minerals can have similar shapes.

Although different minerals may form similar shapes, each mineral forms only one shape of crystal. Therefore, geologists say that a mineral has a definite crystalline structure. This means that crystals of a certain mineral always form the same shape.



TAKE A LOOK

5. Identify What shape are gold crystals?

SECTION 1 What Is a Mineral? *continued*

How Do Geologists Classify Minerals?

Geologists classify minerals based on the elements or compounds in the minerals. Two main groups of minerals are silicate minerals and nonsilicate minerals.

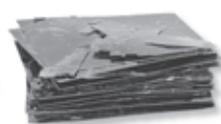
SILICATE MINERALS

Silicon and oxygen are two of the most common elements in the Earth’s crust. Minerals that contain compounds of silicon and oxygen are called **silicate minerals**. Silicate minerals make up more than 90% of the Earth’s crust. Most silicate minerals also contain elements other than silicon and oxygen, such as aluminum, iron, or magnesium.

Common Silicate Minerals



Quartz is a mineral that is found in many rocks of the Earth’s crust.



Mica breaks into sheets easily.



Feldspar is also common in the rocks of the Earth’s crust. Feldspar can contain many elements other than silicon and oxygen, such as potassium or sodium.

TAKE A LOOK

6. Identify What two elements are found in all of the minerals in the figure? Explain your answer.

NONSILICATE MINERALS

Minerals that do not contain compounds of silicon and oxygen are called **nonsilicate minerals**. Some of these minerals are made of elements such as carbon, oxygen, fluorine, and sulfur.

Types of Nonsilicate Minerals

Native elements are minerals that are made of only one element. Copper, gold, silver, and diamonds are native elements.



Copper

Oxides are minerals that contain compounds of oxygen and another element, such as iron or aluminum. Rubies and sapphires are forms of the mineral corundum, which is an oxide mineral.



Corundum

Carbonates are minerals that contain compounds of carbon and oxygen. Calcite is a carbonate mineral.



Calcite

Sulfates are minerals that contain compounds of oxygen and sulfur. Gypsum is a sulfate mineral.



Gypsum

Halides are minerals that contain the elements fluorine, chlorine, iodine, or bromine. Fluorite and halite are halide minerals.



Fluorite

Sulfides are minerals that contain compounds of sulfur and an element other than oxygen, such as lead, iron, or nickel. Galena and pyrite (“fool’s gold”) are sulfide minerals.



Galena

TAKE A LOOK

7. Compare How are sulfate minerals different from sulfide minerals?

Section 1 Review

SECTION VOCABULARY

compound a substance made up of atoms of two or more different elements joined by chemical bonds

crystal a solid whose atoms, ions, or molecules are arranged in a regular, repeating pattern

element a substance that cannot be separated or broken down into simpler substances by chemical means

mineral a naturally formed, inorganic solid that has a definite chemical structure

nonsilicate mineral a mineral that does not contain compounds of silicon and oxygen

silicate mineral a mineral that contains a combination of silicon and oxygen and that may also contain one or more metals

1. Identify What are four features of a mineral?

2. Compare What is the difference between an atom and an element?

3. Infer What determines the shape of a crystal?

4. Apply Concepts Why is the ice in a glacier considered a mineral, but the water in a river is not considered a mineral?

5. Describe What are the features of the two major groups of minerals?

6. List Give four types of nonsilicate minerals.
