

# Lesson Outline for Teaching

## Lesson 1: Minerals

### A. What is a mineral?

1. A naturally occurring, inorganic solid with a definite chemical composition and a crystal structure is a(n) mineral.
  - a. Substances that are made by people are not minerals because they do not form naturally.
  - b. Materials that contain carbon and once were alive are organic, whereas minerals are not organic and cannot have once been alive.
  - c. No minerals are liquid because, by definition, minerals are always solid.
  - d. All minerals have a(n) crystal structure, which means the atoms are arranged in an orderly, repeating pattern; this causes minerals to often have sharp edges and smooth faces.
  - e. A mineral is always made of specific amounts of specific elements; therefore, minerals always have a(n) chemical formula.
2. Minerals form from atoms that have been part of a(n) liquid. The atoms form an orderly, repeating pattern by the process of crystallization, which can happen in two main ways.
  - a. Minerals can crystallize from magma, which is melted rock.
  - b. Substances that dissolve in water can reform crystals when the water evaporates or cools.

### B. Mineral Identification

1. Each mineral has a unique set of physical properties, or characteristics, that can be used to identify the mineral.
2. If you have two mineral samples of the same size, the mineral with the higher density will feel heavier than the mineral with the lower density.
3. You can measure the hardness of a mineral by observing how easily the mineral scratches or is scratched by other minerals.
  - a. The Mohs hardness scale ranks minerals from 1 to 10.
  - b. The hardest mineral is diamond, which measures 10 on Mohs hardness scale; the softest mineral is talc, which measures 1 on Mohs hardness scale.

## Lesson Outline continued

4. Each mineral has a unique streak, which is the color of the mineral's powder.
  - a. A mineral's streak can be observed by scratching the mineral across a tile of unglazed porcelain.
  - b. A mineral's color and its streak sometimes differ.
5. The way the surface of a mineral reflects light is called the mineral's luster.
6. A mineral displays cleavage if it breaks along smooth, flat surfaces.
7. A mineral's crystal shape is determined by its atomic structure; large crystals can be useful for identifying a mineral.
8. Some minerals have unusual properties, such as magnetism (the ability to attract iron and steel), electrical conductivity, double refraction, or fluorescence (the ability to glow under ultraviolet light).
9. Many common items are made of metals, which combine with other elements and form minerals; these minerals are usually processed from ores, which are deposits of metallic or nonmetallic minerals that be processed for a profit.

### Discussion Question

Summarize the two ways that crystals often form. For each method of crystallization, brainstorm different places that it is likely to occur.

Crystals can form when melted rock cools. This might occur inside a volcano or after a volcano erupts; it also might occur deep underground, where rocks melt due to high heat and/or pressure. Crystals also form when minerals that have been dissolved in water and the water evaporates or cools. This could occur near hot springs, near the shores of any body of water, in caves, or near water that pools underground in the water table.