

# Chapter 9

# Earth's Changing Surface

## Introduction

Chapter 9 reviews the dynamic nature of Earth's **crust**. **Soil** formation and the characteristics of **minerals** and **rocks** are discussed. Minerals can be identified by their **physical** and **chemical properties**. Rocks can be identified by their physical characteristics and their mineral content. **Igneous rocks** are formed from volcanic activity, **sedimentary rocks** are formed usually from particles settling in water, and **metamorphic rocks** are pre-existing rocks that have been changed by great heat and/or pressure. The rock cycle shows various pathways rocks can take when changing among *igneous*, *metamorphic*, and *sedimentary* phases. **Fossils** are remains or traces of ancient life found in some sedimentary rocks. Scientists study rocks and fossils to reconstruct Earth's history by uncovering clues about past geologic and biologic events.

**Maps**, and their use, are also discussed in this chapter. Maps can be very useful tools for navigation, predicting areas of geologic interest, and aiding in weather forecasting. **Topographic maps** show the shape of the land surface.

## Students Should Understand the Following Concepts

- Minerals can be identified by their chemical and physical properties. Some properties of minerals are hardness, streak color, cleavage, luster, and reactivity to acid.
- The three types of rock are igneous, sedimentary, and metamorphic. Rocks are classified by their method of formation.
- The rock cycle illustrates how one form of rock can be transformed into any other form of rock by Earth processes such as weathering and erosion, volcanic activity, and burial.

- Fossils are the remains or traces of ancient life and are found in sedimentary rock.
- The history of Earth's crust can be determined by studying local rock formations and fossils.
- Topographical maps show the shape and contour of the land surface. **Contour lines** on topographic maps indicate different elevations.
- A grid system consisting of lines of **longitude** (north-south lines) and **latitude** (east-west lines) provides reference points on Earth's surface.

## Activities to Develop the Topic

Use one or more of the following activities to help review this topic with your students.

Obtain hand-sized rock and mineral specimens and let students study the specimens with a magnifying glass. Ask students what structures they can observe in the rocks and what type of particles do the rocks contain. Let students determine the physical and chemical characteristics of some rocks and minerals. Let students bring rocks and minerals into class and try to identify them. If a variety of rocks and minerals are available in your area encourage students to organize a rock and mineral collection. Larger specimens can be displayed in showcases throughout the school.

Fossils are also discussed in this chapter. Obtain some fossils and let students draw, study, and identify the fossils. If fossils are available in rocks in your area, have students make a fossil collection, or organize a class collection or museum display.

Work some map-reading skills into your lesson plans, focusing on topographic maps. Obtain USGS topographic maps of your area and other areas of interest. Give students a question work-

sheet and let them learn about landforms on the map. There are a number of topographic map activities available in Earth Science textbooks and workbooks that can be used to design your work-

sheet. The following Internet sites might be of value for you and your students:

<http://terraserver-usa.com/> and

<http://www.topozone.com/viewmaps.asp>.

Name \_\_\_\_\_ Date \_\_\_\_\_

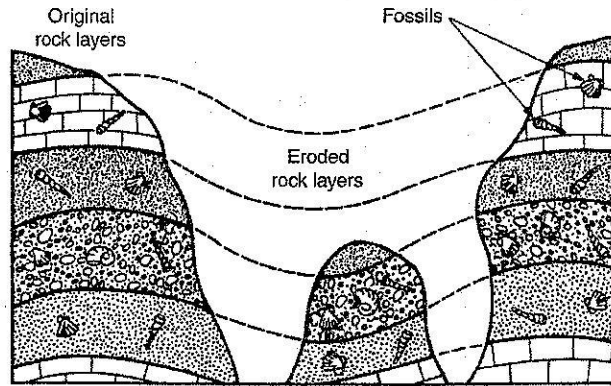
Class \_\_\_\_\_

## Review of Chapter 9

1. Earth's crust consists of all of the following *except*
  - (1) hydrogen gas
  - (2) rock fragments
  - (3) bedrock
  - (4) soil
2. Soil consists of all the following substances *except*
  - (1) air
  - (2) rock fragments
  - (3) organic material
  - (4) magma
3. According to Mohs' hardness scale, quartz has a hardness of 7. A piece of quartz would scratch
  - (1) garnet (hardness 7.5)
  - (2) diamond (hardness 10)
  - (3) calcite (hardness 3)
  - (4) jasper (hardness 7)
4. A chemical property of a mineral can be identified by
  - (1) observing how light reflects from its surface
  - (2) placing a drop of hydrochloric acid on its surface
  - (3) observing the color of the mineral
  - (4) observing how the mineral breaks
5. Sedimentary rocks are commonly formed by
  - (1) layers of small particles
  - (2) cooling and hardening of magma
  - (3) large crystals
  - (4) glass
6. Metamorphic rocks are commonly produced by
  - (1) solidification of liquid rock
  - (2) heat and moisture
  - (3) moisture and particles
  - (4) pressure and heat
7. A common location where sedimentary rocks form is
  - (1) at the mouths of rivers
  - (2) deep inside the earth
  - (3) on the sides of volcanoes
  - (4) where two tectonic plates meet

8. The difference between lava and magma is that
- (1) lava exists at a much higher temperature than magma
  - (2) lava forms rocks with large crystals and magma forms rocks with small crystals
  - (3) lava is magma that has poured out onto Earth's surface
  - (4) lava is solid and magma is liquid
9. Grain size in igneous rocks is determined by the
- (1) type of minerals present
  - (2) cooling rate
  - (3) amount of quartz in the rock
  - (4) amount of air present
10. An organism that can contribute calcium carbonate to the formation of limestone is
- |            |                   |
|------------|-------------------|
| (1) a bird | (3) a marsh plant |
| (2) a fish | (4) a clam        |
11. The mineral that is soft; will produce a black, dark green, or gray streak; and breaks into metallic, silver cubes is
- |              |             |
|--------------|-------------|
| (1) galena   | (3) bauxite |
| (2) graphite | (4) calcite |
12. The type of rock formed by the gradual deposition of clay, silt, sand, and/or pebbles is
- (1) metamorphic
  - (2) igneous
  - (3) sedimentary
  - (4) tectonic
13. Some sedimentary rocks can help us learn about past environments if they contain
- (1) large crystals
  - (2) fossils
  - (3) trapped air pockets
  - (4) small crystals
14. Fossils provide clues to
- (1) ancient environments only
  - (2) biologic history of an area only
  - (3) climatic history of an area only
  - (4) ancient environments, including biologic and climatic history

Base your answers to questions 15 and 16 on the accompanying diagram.



15. The oldest fossils are found
- (1) in the lowest rock layer
  - (2) in the highest rock layer
  - (3) you cannot tell since too much erosion has taken place
  - (4) in the igneous rock
16. What could have caused the erosion of the rock layers?
- (1) animals
  - (2) earthquakes
  - (3) water
  - (4) lava
17. Scientists use radioactive dating to determine
- (1) how a rock formed
  - (2) the age of a rock
  - (3) the type of rock
  - (4) the amount of water in a rock
18. The type of map that shows the shape of the land is the
- (1) weather map
  - (2) road map
  - (3) geologic map
  - (4) topographic map
19. The scale ratio 1:62,500 on a topographic map means
- (1) 1 cm on the map equals 62,500 cm on Earth's surface
  - (2) 62,500 cm on the map equals 1 cm on Earth's surface
  - (3) 1 cm on the map equals 62,500 m on Earth's surface
  - (4) 1 cm on the map equals 62,500 miles on Earth's surface
20. Closely spaced contour lines on a topographic map mean a
- (1) gentle or nearly flat area
  - (2) wide, deeply eroded valley
  - (3) steep slope
  - (4) stream