

# Section Review

---

## Earth's Structure

### USING VOCABULARY

For each pair of terms, explain how the meanings of the terms differ.

1. *crust* and *mantle*

---

---

2. *lithosphere* and *asthenosphere*

---

---

### UNDERSTANDING CONCEPTS

3. **Listing** List the layers of Earth by their chemical composition and by their physical properties.

---

---

---

---

4. **Applying** Explain how earthquakes allow scientists to study Earth's interior.

---

---

---

5. **Inferring** Describe evidence that supports the existence of Pangaea.

---

---

6. **Summarizing** Explain how continental drift explains today's position of the continents.

---

---

---

**Section Review** *continued*

---

**7. Analyzing** Explain the process by which new sea floor forms at mid-ocean ridges.

---

---

**8. Summarizing** Briefly explain how magnetic reversals provide evidence for sea-floor spreading.

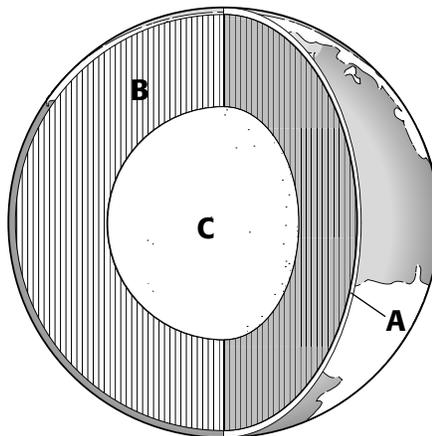
---

---

---

**INTERPRETING GRAPHICS**

Use the diagram below to answer the next two questions.



**9. Identifying** Which layer, A, B, or C, is the densest of Earth's compositional layers?

---

**10. Identifying** Which layer, A, B, or C, accounts for 67% of Earth's mass?

---

**CRITICAL THINKING**

**11. Making Comparisons** Explain how the crust differs from the lithosphere.

---

---

**Section Review** *continued*

---

**12. Analyzing Ideas** How do the physical properties of the asthenosphere support the ideas of continental drift and sea-floor spreading?

---

---

---

---

---

**13. Applying Concepts** Explain how sea-floor spreading provides a mechanism by which continents move.

---

---

---

---

---

**CHALLENGE**

**14. Applying Concepts** If rocks found in North America and rocks found in Europe are the same, what does this indicate about the North American and European continents?

---

---

---

---

---

- The color of the sky and the smell of the air probably do not indicate anything about the planet's inner structure.
- Answers may vary. Sample answer: If there are earthquakes on the planet, they could use seismometers to measure the time seismic waves take to travel various distances from an earthquake's center. They also might try to drill into the planet's surface in order to see the layers.
- Answers may vary. Sample answer: They should discuss their findings with other scientists in the field first. They should then make sure that no other hypotheses can be supported by their data.
- The compositional layers of Earth, beginning at Earth's surface, are the crust, mantle, and core. The physical layers of Earth, beginning at Earth's surface, are the lithosphere, asthenosphere, mesosphere, outer core, and inner core.
- Scientists measure the time at which seismic waves arrive at seismometers at different distances from an earthquake. They use this data to calculate the thickness and density of Earth's layers.
- The fit of the continents, the existence of the same fossils on different continents, and the locations of mountain ranges and similar types of rock on different continents support the existence of Pangaea.

## SciLinks Activity

- Answers may vary. Sample answer: African plate, South American plate, Eurasian plate, Nazca plate
- The Mid-Atlantic Ridge, also called the (global) Mid-Ocean Ridge, is an underwater mountain chain in the central Atlantic that zig-zags between the continents, winding its way around the globe like the seam on a baseball. This immense mountain range is more than 50,000 kilometers (km) long and, in places, more than 800 km across.
- Answers may vary. Sample answer: The Mediterranean Sea will disappear, connecting Africa and Europe; India will continue pushing into the southern Asian continent, pushing the Himalayas higher; Los Angeles will move north to join with San Francisco; the Atlantic Ocean will continue to expand, while the Pacific Ocean will shrink.
- At mid-ocean ridges, magma rises through a series of fractures to the ocean floor. The magma cools and forms new rock. As this new rock forms, older rock is pushed away from the mid-ocean ridge.
- Magnetic reversals show that new lithosphere is forming at mid-ocean ridges and that, at the same time, older lithosphere is being pushed away from mid-ocean ridges.
- C
- B
- The crust is the outermost compositional layer of Earth. The lithosphere is the outermost physical layer of Earth and consists of the crust and the rigid upper part of the mantle.
- The asthenosphere is made of rock that flows very slowly. The tectonic plates are carried along as the asthenosphere moves.
- As new sea floor forms at midocean ridges, older rock is pushed away from the mid-ocean ridge. As the sea floor moves, it carries continents along with it.

## Section Review

### SECTION: EARTH'S STRUCTURE

- Sample answer: The crust is the thin, outermost compositional layer of Earth. The mantle is the dense, thick, middle compositional layer of Earth.
- Sample answer: The lithosphere is the outermost physical layer of Earth. The asthenosphere is the physical layer beneath the lithosphere.

14. This evidence would indicate that North America and Europe were once joined.

### SECTION: THE THEORY OF PLATE TECTONICS

1. Sample answer: Plate tectonics is the theory that states that Earth's lithosphere is divided into tectonic plates that move around. A tectonic plate is a piece of lithosphere that moves around on top of the asthenosphere.
2. The theory of plate tectonics is the theory that explains how tectonic plates move and change shape.
3. A tectonic plate is a piece of Earth's lithosphere that can consist of oceanic crust and continental crust, as well as the upper part of the mantle.
4. At convergent plate boundaries, tectonic plates collide. At divergent boundaries, tectonic plates separate. At transform boundaries, two plates slide past each other horizontally.
5. During convection, rock in Earth's interior is heated, expands, becomes less dense, and rises toward the surface of Earth.
6. The three mechanisms that may drive plate tectonics are mantle convection, ridge push, and slab pull.
7. Tectonic plates move a few centimeters per year. The average rate of movement is between 2.5 cm/y and 15 cm/y.
8. During convection, cool rock material sinks because it is denser than hot rock material is. Hot rock is less dense and rises.
9. Oceanic lithosphere subducts beneath continental lithosphere because oceanic lithosphere is denser than continental lithosphere is.
10. The continents are carried along as passengers on the moving tectonic plates.
11. Volcanoes form at convergent and divergent plate boundaries. Mountains form where two plates of continental lithosphere collide.
12.  $125 \text{ cm} \div 25 \text{ y} = 5 \text{ cm/y}$

13. In the processes of both ridge push and slab pull, cooler, denser material flows away from the hot, rising material at the mid-ocean ridge and sinks into the mantle.

### SECTION: DEFORMING EARTH'S CRUST

1. Folding is the bending of rock layers in Earth's crust. A fault is a surface along which rocks break and slide past one another.
2. Rocks deform when stress is placed on them.
3. Two ways in which rocks deform are by bending and by breaking.
4. Faults form when so much stress is placed on rock layers that they break.
5. a reverse fault
6. a convergent plate boundary
7. Normal faults form when tension causes rocks to pull apart and break. Reverse faults form when compression pushes rocks together and causes the rock to break. Strike-slip faults form when shear stress causes rocks to break and to be pushed in different directions.
8. Folded mountains occur at convergent plate boundaries, where compression folds and uplifts rock. Fault-block mountains occur where divergent plate motion causes Earth's crust to break into a series of normal faults. Volcanic mountains occur at convergent plate boundaries, where subduction causes the surrounding mantle rock to melt and magma to rise to the surface.
9. Reverse faults are likely to form in an area where rock layers have folded because compression causes both folding and the formation of reverse faults.
10. You would not expect to see a folded mountain range at a mid-ocean ridge. Mid-ocean ridges form at divergent boundaries where tectonic forces cause tension. Folded mountains form at convergent boundaries where tectonic forces cause compression.