Name _____ Date _____ Class_____

Earth's Interior

This section explains how scientists learn about Earth's interior. The section also describes the layers that make up Earth and explains why Earth acts like a giant magnet.

Use Target Reading Skills

Before you read the passage for each heading, fill in the top box with what you know. After you have read the passage, fill in the bottom box with what you have learned.

What You Know
I. Earth's crust is made of rock. 2. 3. 4. 5.

What You Learned
I. 2. 3. 4. 5.

Exploring Inside Earth

1. What prevents geologists from directly exploring Earth's interior?

_____

_____

2. Geologists use direct evidence from _____ to learn about Earth's interior.

3. Geologists learn about Earth's interior using indirect evidence from _____.

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Earth's Interior *(continued)*

4. Is the following sentence true or false? Earth looks the same today as it did millions of years ago. _____
5. Seismic waves reveal the structure of Earth through their _____ and _____.
6. Circle the letter of each sentence that is true about Earth.
   - **a.** Indirect evidence of Earth's interior comes from studying rock samples.
   - **b.** Geologists cannot observe Earth's interior directly.
   - **c.** It is over 6,000 kilometers from the surface to the center of Earth.
   - **d.** Geologists learn about Earth's interior by drilling holes.
7. _____ waves are produced by earthquakes.

A Journey to the Center of Earth

8. How does the temperature change as you go from the surface toward the center of Earth? _____
   _____
   _____
9. How does pressure change as you go from the surface toward the center of Earth? _____
10. The three main layers that make up Earth are the _____, _____, and _____.

The Crust

11. The _____ is a layer of rock that forms Earth's outer skin.
12. Is the following sentence true or false? The crust is thinnest under high mountains. _____
13. The dark-colored rock that makes up most of the oceanic crust is _____.
14. The light-colored rock that makes up most of the continental crust is _____.

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The Mantle

Match the name of each layer of the mantle with its description.

Layer	Description
____ **15.** lower mantle	**a.** Rigid layer that includes the upper part of the mantle and the crust
____ **16.** lithosphere	**b.** Solid material beneath the asthenosphere
____ **17.** asthenosphere	**c.** Soft layer just below the lithosphere

18. Is the following sentence true or false? The asthenosphere is not considered solid because it can bend like plastic. _____

19. Is the following sentence true or false? The mantle is nearly 3,000 kilometers thick. _____

The Core

20. Circle the letter of each sentence that is true about Earth's outer core.

a. It is under low pressure.
b. It is made of solid metal.
c. It contains iron and nickel.
d. It is a solid.

21. Circle the letter of each sentence that is true about Earth's inner core.

a. It consists of molten metal.
b. It is a thick liquid.
c. It is not very dense.
d. It is under extreme pressure.

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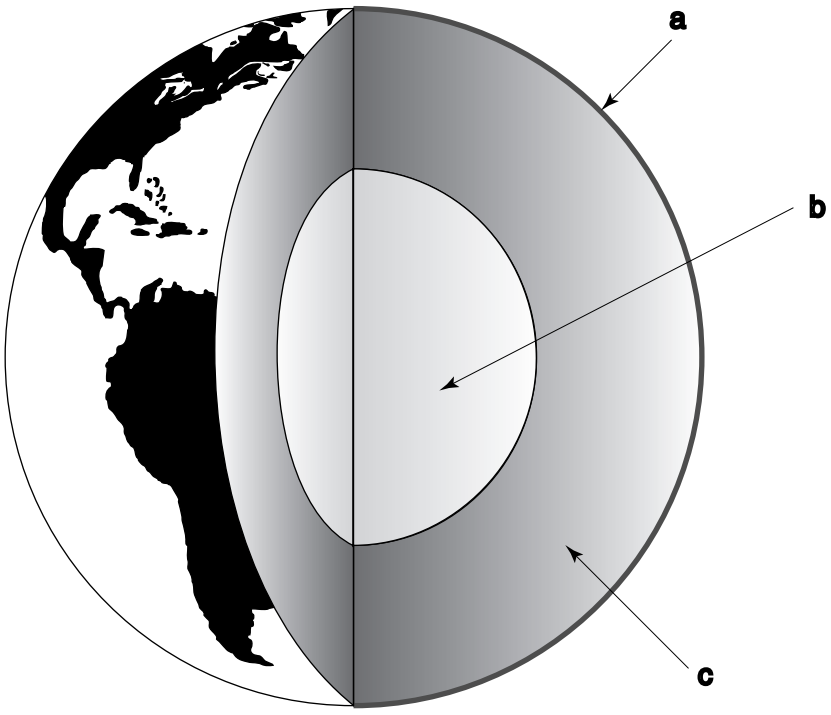
Earth's Interior *(continued)*

22. In the drawing, label the three main layers of Earth.



23. Describe how a compass needle aligns itself. _____

_____

24. What creates Earth's magnetic field? _____

_____

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Name _____ Date _____ Class_____

Earth's Interior

Key Concepts

- How have geologists learned about Earth's inner structure?
- What are the characteristics of Earth's crust, mantle, and core?

Earth's surface is constantly changing. Earth looks different today from the way it did millions of years ago. People wonder, "What's inside Earth?" The extreme conditions in Earth's interior prevent exploration far below the surface. **Geologists have used two main types of evidence to learn about Earth's interior: direct evidence from rock samples and indirect evidence from seismic waves.**

Rocks from inside Earth give geologists clues about Earth's structure. Geologists can make inferences about conditions deep inside Earth where these rocks formed. Using data from **seismic waves** produced by earthquakes, geologists have learned that Earth's interior is made up of several layers.

The three main layers of Earth are the crust, the mantle, and the core. These layers vary greatly in size, composition, temperature, and pressure. Beneath the surface, the temperature decreases for about 20 meters, then increases until the center of Earth is reached. **Pressure** results from a force pressing on an area. Pressure inside Earth increases as you go deeper.

The **crust** is the layer of rock that forms Earth's outer skin. The **crust is a layer of solid rock that includes both dry land and the ocean floor.** Oceanic crust consists mostly of rocks such as **basalt,** dark rock with a fine texture. Continental crust, the crust that forms the continents, consists mainly of rocks such as granite. **Granite** is a rock that usually is a light color and has a coarse texture.

Below a boundary 40 kilometers beneath the surface is the solid material of the **mantle,** a layer of hot rock. **Earth's mantle is made up of rock that is very hot, but solid. Scientists divide the mantle into layers based on the physical characteristics of those layers.** The uppermost part of the mantle and the crust together form a rigid layer called the **lithosphere.** Below the lithosphere is a soft layer called the asthenosphere. Beneath the **asthenosphere,** the mantle is solid. This solid material, called the lower mantle, extends all the way to Earth's core.

The core is made mostly of the metals iron and nickel. It consists of two parts—a liquid outer core and a solid inner core. The **outer core** is a layer of molten metal that surrounds the inner core. The **inner core** is a dense ball of solid metal.

Scientists think that movements in the liquid outer core create Earth's magnetic field. Because Earth has a magnetic field, the planet acts like a giant bar magnet.

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Earth's Interior

Understanding Main Ideas

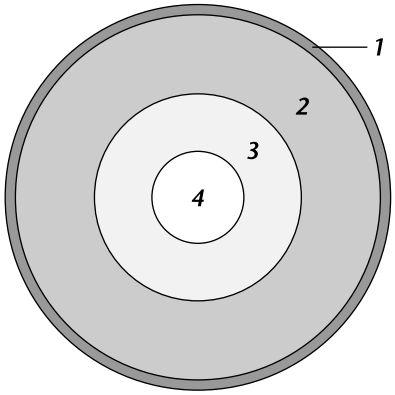
Label the layers of Earth by writing the name of the layer in the blank.

1. _____

2. _____

3. _____

4. _____



Earth's layers

Answer the following questions on a separate sheet of paper.

5. What are two types of evidence geologists use to learn about Earth's interior?

6. Compare and contrast the asthenosphere with the lithosphere.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term in the left column.

____ **7.** basalt

____ **8.** asthenosphere

____ **9.** crust

____ **10.** outer core

____ **11.** lithosphere

____ **12.** granite

____ **13.** pressure

____ **14.** seismic wave

a. a rock that makes up much of the ocean floor

b. the force pushing on a surface or area

c. the layer made up of liquid iron and nickel

d. the uppermost part of the mantle

e. a rock that makes up the core of the continents

f. outer rind of rock

g. a wave produced by an earthquake

h. soft layer of rock in the mantle

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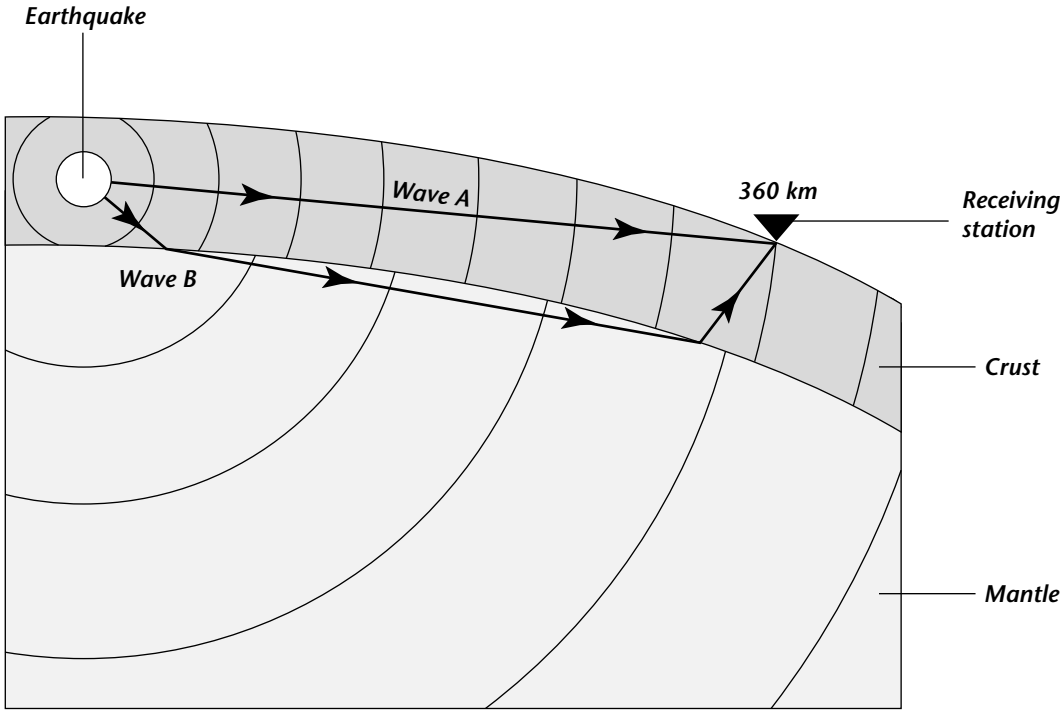
Differences in Arrival Time

Geologists have learned a great deal about Earth's interior by carefully studying the waves created by earthquakes, called seismic waves. Like light waves and sound waves, seismic waves travel through different kinds of materials at different rates. For example, a type of seismic wave called a P wave travels through crust material at an average speed of 6 km/sec. But through the uppermost mantle material, P waves travel at an average speed of 8 km/sec. Geologists use their knowledge of this difference in speeds to explore the interior of Earth. They have set up thousands of receiving stations to record the arrival of seismic waves. Computers then help in analyzing the data and creating a picture of Earth's interior.

The figure below shows two P waves from an earthquake whose travel times are recorded by a receiving station. Use the figure to answer the questions that follow.



Answer the following questions on a separate sheet of paper.

1. How far away from the earthquake is the receiving station?
2. Which P wave takes a more direct route to the receiving station, Wave A or Wave B?
3. How long does Wave A take to reach the station?
4. Wave B took 51 seconds to arrive at the station. What accounts for the difference in arrival times between Wave A and Wave B?
5. Can you infer why P waves travel faster through the upper mantle than they do through the crust?

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