

Key.

CHAPTER 7 Plate Tectonics
SECTION 1

Inside the Earth

* Complete all parts with stars.

Earth & Space Sci. #2

BEFORE YOU READ

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

- What are the layers inside Earth?
- How do scientists study Earth's interior?

What Is Earth Made Of?

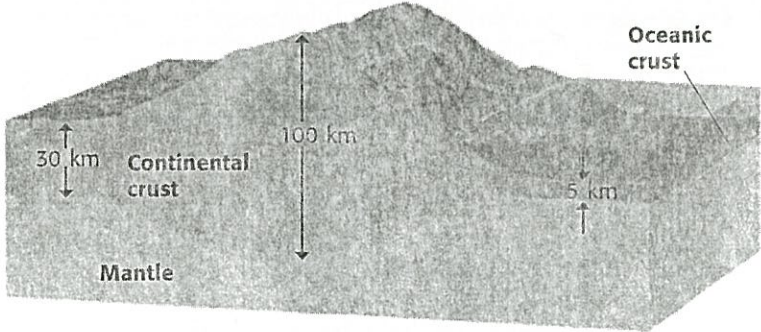
Scientists divide the Earth into three layers based on composition: the crust, the mantle, and the core. These divisions are based on the compounds that make up each layer. A *compound* is a substance composed of two or more elements. The densest elements make up the core. Less-dense compounds make up the crust and mantle.

~~STUDY TIP~~

~~Summarize~~ As you read, make a chart showing the features of Earth's layers. Include both the compositional layers and the physical layers.

THE CRUST

The thinnest, outermost layer of the Earth is the **crust**. There are two main kinds of crust: continental crust and oceanic crust. *Continental crust* forms the continents. It is thicker and less dense than oceanic crust. Continental crust can be up to 100 km thick. *Oceanic crust* is found beneath the oceans. It contains more iron than continental crust. Most oceanic crust is 5 km to 7 km thick. ✓



Oceanic crust is thinner and denser than continental crust.

~~READING CHECK~~

~~1. Compare~~ How is oceanic crust different from continental crust?

Oceanic crust is more dense than continental crust.

~~Math Focus~~

~~2. Identify~~ What fraction of the thickness of the thickest continental crust is the thickness of the oceanic crust? Give your answer as a reduced fraction.

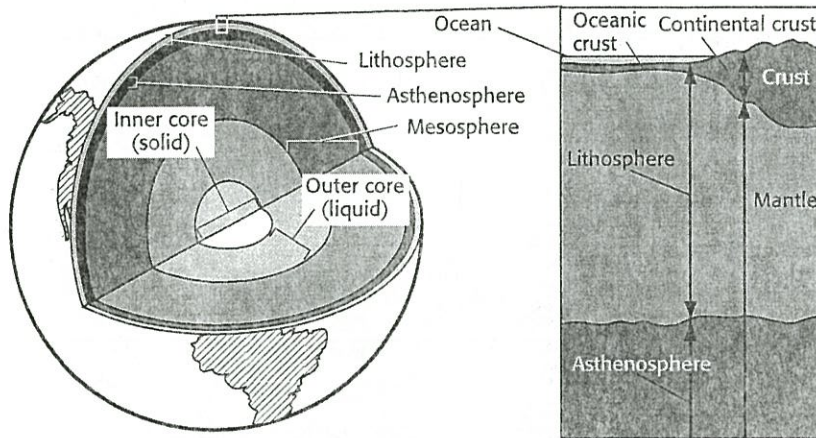
SECTION 1 Inside the Earth *continued*

EARTH'S PHYSICAL STRUCTURE

Scientists also divide Earth into five layers based on physical properties. The outer layer is the **lithosphere**. It is a cool, stiff layer that includes all of the crust and a small part of the upper mantle. The lithosphere is divided into pieces. These pieces move slowly over Earth's surface. ✓

The **asthenosphere** is the layer beneath the lithosphere. It is a layer of hot, solid rock that flows very slowly. Beneath the asthenosphere is the **mesosphere**, which is the lower part of the mantle. The mesosphere flows more slowly than the asthenosphere.

There are two physical layers in Earth's core. The outer layer is the *outer core*. It is made of liquid iron and nickel. At the center of Earth is the *inner core*, which is a ball of solid iron and nickel. The inner core is solid because it is under very high pressure.



What Are Tectonic Plates?

Pieces of the lithosphere that move around on top of the asthenosphere are called **tectonic plates**. Tectonic plates can contain different kinds of lithosphere. Some plates contain mostly oceanic lithosphere. Others contain mostly continental lithosphere. Some contain both continental and oceanic lithosphere. The figure on the top of the next page shows Earth's tectonic plates.

★ **READING CHECK**

6. Define What is the lithosphere?

Lithosphere includes all crust and a small part of the upper mantle.

★ **Critical Thinking**

7. Infer What do you think is the reason that scientists divide the Earth into two different sets of layers?

★ **TAKE A LOOK**

8. Describe What are the five layers of Earth, based on physical properties?

inner core

outer core

mesosphere

asthenosphere

lithosphere

SECTION 1 Inside the Earth *continued*

How Do Scientists Study Earth's Interior?

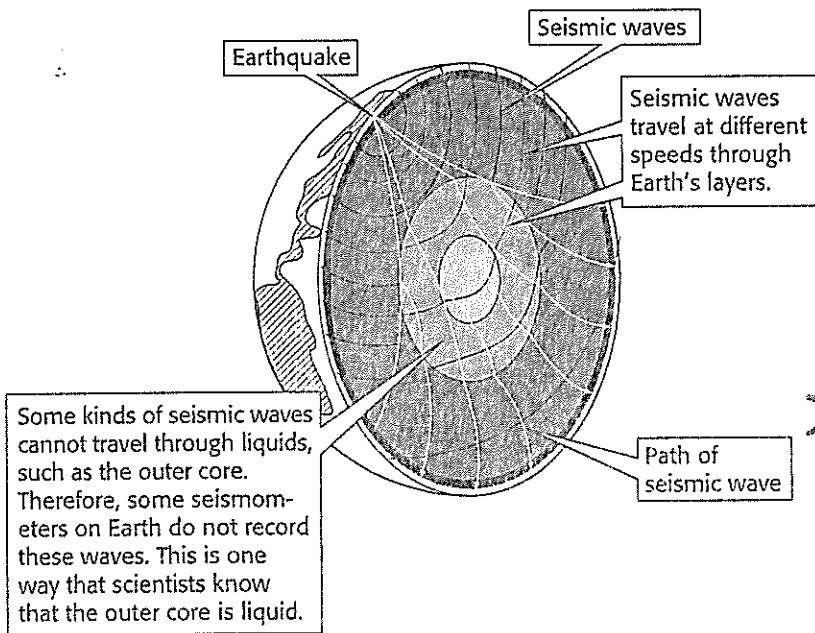
How do scientists know things about the deepest parts of the Earth? No one has ever been to these places. Scientists have never even drilled through the crust, which is only a thin layer on the surface of the Earth. So how do we know so much about the mantle and the core?

Much of what scientists know about Earth's layers comes from studying earthquakes. Earthquakes create vibrations called *seismic waves*. Seismic waves travel at different speeds through the different layers of Earth. Their speed depends on the density and composition of the material that they pass through. Therefore, scientists can learn about the layers inside the Earth by studying seismic waves. ✓

Scientists detect seismic waves using instruments called *seismometers*. Seismometers measure the times at which seismic waves arrive at different distances from an earthquake. Seismologists can use these distances and travel times to calculate the density and thickness of each physical layer of the Earth. The figure below shows how seismic waves travel through the Earth.

✓ **READING CHECK**

★ **11. Define** What are seismic waves?



★ **TAKE A LOOK**

12. Explain What is one way that scientists know the outer core is liquid?
