

Key

Earth's Interior (pp. 80-87)

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
<ol style="list-style-type: none"> 1. Earth's crust is made of rock. 2. Earth is very hot near the center. 3. Dry land is part of the crust. 4. The mantle is very hot. 5. The core has iron in it.

What You Learned
<ol style="list-style-type: none"> 1. Geologists use seismic waves to study Earth's interior. 2. Radioactive substances heat the interior of Earth. 3. The crust is thickest under high mountains. 4. The mantle is solid. 5. Movements in the outer core create Earth's magnetic field.

Exploring Inside Earth (pp. 81-82)

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

extreme conditions

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

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

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Earth's Interior (continued)

4. Is the following sentence true or false? Earth ^{does not} look the same today as it did millions of years ago. false
5. Seismic waves reveal the structure of Earth through their speed and the paths they travel.
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. Seismic waves are produced by earthquakes.

A Journey to the Center of Earth (p. 83)

8. How does the temperature change as you go from the surface toward the center of Earth? The temperature gets cooler from the surface to about 20 meters down. After that, the temperature rises rapidly for several tens of kilometers. Then the temperature increases more slowly, but steadily.
9. How does pressure change as you go from the surface toward the center of Earth? The deeper you go, the greater the pressure.
10. The three main layers that make up Earth are the crust, mantle, and core.

The Crust (p. 84)

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

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The Mantle (p. 85)

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

Layer

Description

b 15. lower mantle

a 16. lithosphere

c 17. asthenosphere

a. Rigid layer that includes the upper part of the mantle and the crust

b. Solid material beneath the 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. true

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

The Core (pp. 86–87)

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.

foldable

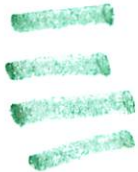
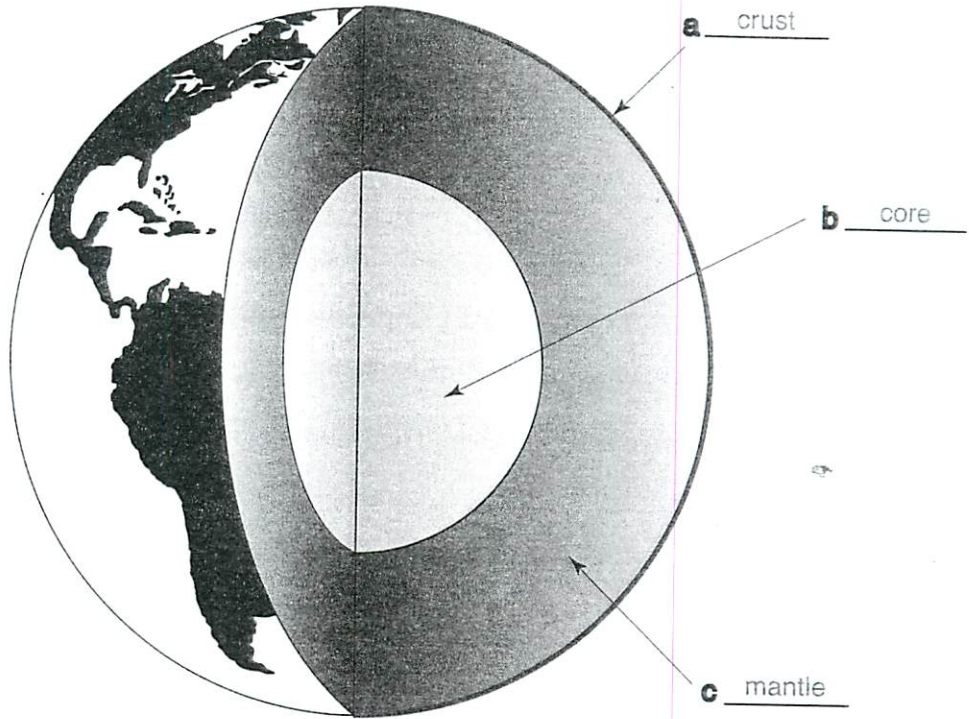


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Earth's Interior *(continued)*

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



23. Describe how a compass needle aligns itself. It aligns with the lines of force in Earth's magnetic field.

24. What creates Earth's magnetic field? movements in the liquid outer core

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Convection and the Mantle (pp. 88–91)

This section describes how heat is transferred from Earth's hot core through the mantle.

Use Target Reading Skills

As you read about heat transfer, complete the outline to show the relationships among the headings.

Convection and the Mantle	
I.	Types of Heat Transfer
A.	Radiation
B.	Conduction
C.	Convection
II.	Convection Currents
III.	Convection in Earth's Mantle

Types of Heat Transfer (pp. 89–90)

1. The movement of energy from a warmer object to a cooler object is called heat transfer.
2. List the three types of heat transfer.
a. radiation b. conduction c. convection
3. What is radiation? the transfer of energy through space
4. What are two forms of radiation? sunlight and the heat you feel around a flame or open fire
5. What is conduction? heat transfer within a material or between materials that are touching
6. What is an example of conduction? A spoon sitting in a pot of hot soup will heat up.

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Convection and the Mantle (continued)

7. What is convection? _____ heat transfer by the movement of currents within a fluid

8. Heat transfer by convection is caused by differences of _____ temperature
and density within a fluid. ~~_____~~
9. A measure of how much mass there is in a volume of a substance is
_____ density _____.
10. Circle the letter of the sentence that describes what happens to a fluid
when its temperature increases.
- a. Its particles occupy less space.
 - b. Its density decreases.
 - c. Its particles move more slowly.
 - d. Its particles settle together more closely.

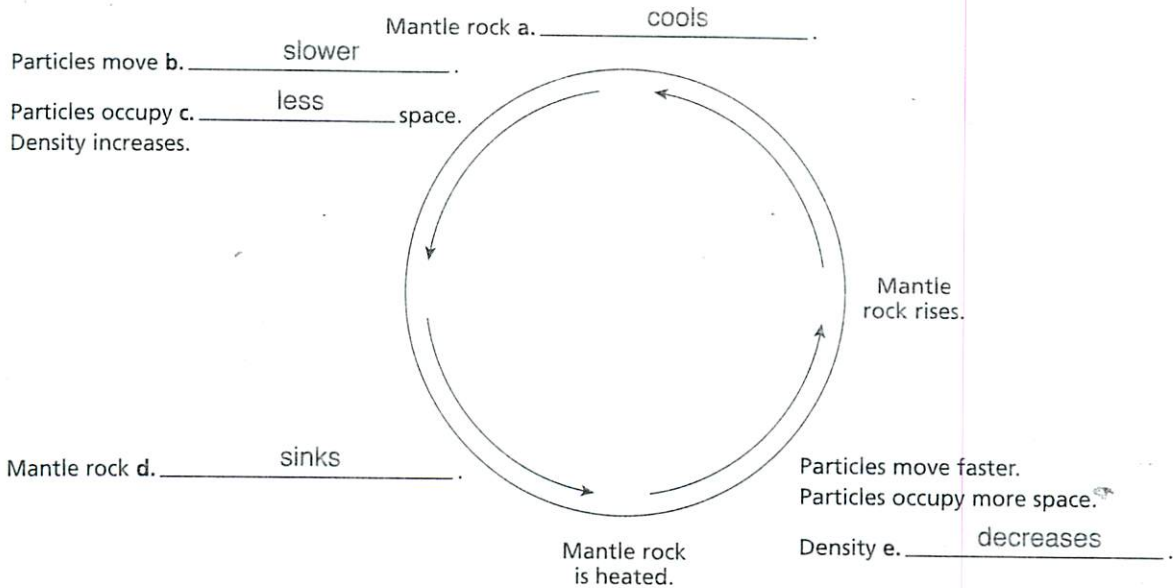
Convection Currents (p. 90)

11. What three factors set convection currents in motion? The heating and cooling of
the fluid, changes in the fluid's density, and the force of gravity
12. What happens to convection currents when the liquid or gas is no longer
heated? They eventually stop.

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Convection Currents in Earth (p. 91)

13. Complete the graphic organizer to show the relationships among heat, movement, and density in mantle rock.



f. Why is this relationship shown as a cycle? A cycle means that an event occurs over and over. In this cycle, each event in the cycle causes the next event to occur.

g. In the cycle shown, where would mantle rock be the densest? _____
 _____ where it sinks and starts to be heated again

14. Is the following sentence true or false? The heat source for the convection currents in the mantle is the ~~sun~~. false True
core

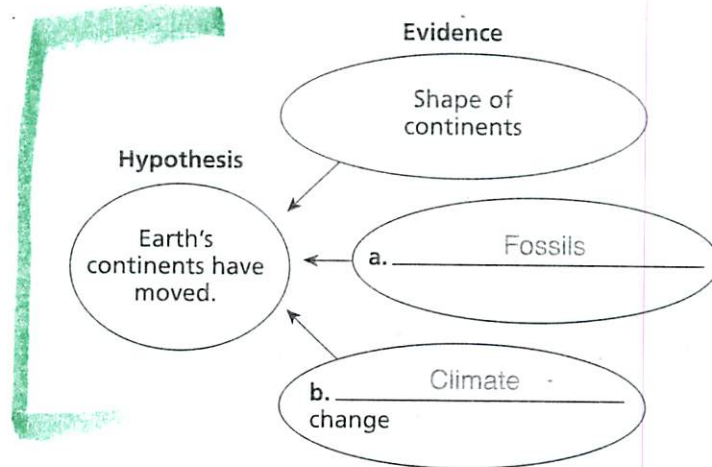
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Drifting Continents (pp. 92–96)

This section describes a theory of how the continents came to be located where they are today. The section also gives evidence for the theory and explains why the theory was not accepted for many years.

Use Target Reading Skills

As you read about the evidence that supports the theory of continental drift, complete the graphic organizer.



Continental Drift (pp. 93–95)

1. State Alfred Wegener's hypothesis about how Earth's continents have moved.

All the continents were once joined together in a single landmass and have since drifted apart.

2. Wegener named his supercontinent Pangaea.

3. What did Wegener think had happened to this supercontinent?

Over tens of millions of years, Pangaea began to break apart. The pieces of Pangaea slowly moved toward their present-day locations, becoming the continents as they are today.

4. Wegener's idea that the continents slowly moved over Earth's surface became known as continental drift.

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5. Circle the letter of each sentence that supports Wegener's hypothesis.

- a. Some continents match up like jigsaw puzzle pieces.
- b. Different rock structures are found on different continents.
- c. Fossils of tropical plants are found near the equator.
- d. Continental glaciers once covered South Africa.

6. Give an example of evidence from land features that supported

Wegener's idea of continental drift. Any one: If maps of Africa and South America are pieced together, mountain ranges on both continents line up. European coal fields match up with similar coal fields in North America.

7. Any trace of an ancient organism preserved in rock is called a(n)

fossil.

8. How did Wegener explain similar fossils on different continents?

The organisms lived on a single landmass that has since split apart.

9. Is the following sentence true or false? Wegener believed that continental drift explained fossils of tropical plants found in places that today have a polar climate. true

Wegener's Hypothesis Rejected (p. 96)

10. How did Wegener think that mountains formed? He proposed that when continents collide, their edges crumple and fold. The folding continents push up huge mountains.

11. How do the locations of mountains support Wegener's idea about how mountains form? Mountains sometimes occur in narrow bands along the edges of continents where continents could collide.

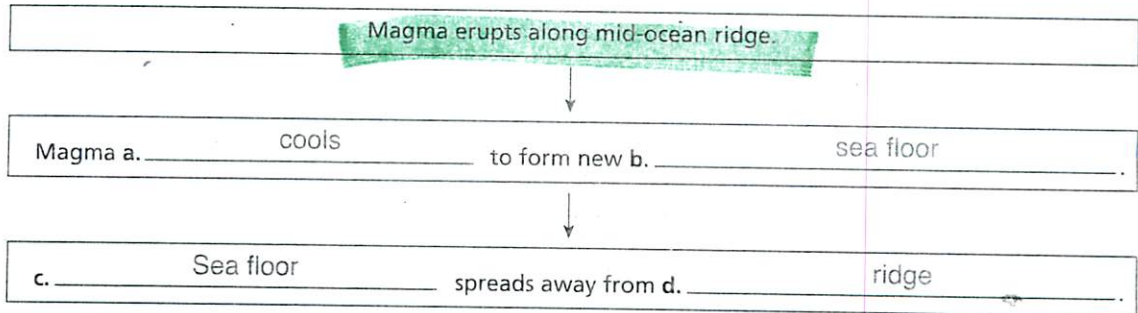
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Sea-Floor Spreading (pp. 97–103)

This section explains sea-floor spreading and describes evidence that it happens. The section also explains subduction and describes how subduction affects Earth's oceans.

Use Target Reading Skills

As you read about sea-floor spreading, fill in the flowchart to show the sequence of events.



Mid-Ocean Ridges (p. 98)

1. Circle the letter of each sentence that is true about mid-ocean ridges.

- a. The mid-ocean ridges were mapped using sonar.
- b. The mid-ocean ridges are found only below the Pacific Ocean.
- c. The mid-ocean ridges are completely under water.
- d. The tops of some mid-ocean ridges are split by a steep-sided valley.

2. A device that bounces sound waves off underwater objects is called _____ sonar _____.

3. What is sonar used for? _____ to determine distance to an object _____

What Is Sea-Floor Spreading? (p. 99)

4. The process that continually adds new material to the ocean floor is called _____ sea-floor spreading _____.

5. In sea-floor spreading, where does new crust come from? _____ molten material that erupts and cools _____

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Evidence for Sea-Floor Spreading (pp. 100–101)

6. List three types of evidence for sea-floor spreading.

- a. _____ molten material _____
- b. _____ magnetic strips _____
- c. _____ drilling samples _____

7. Circle the letter of each sentence that is true about Earth's magnetism.

- (a) At times in the past, a compass needle on Earth would have pointed south.
- (b) Rock that makes up the ocean floor lies in a pattern of magnetized stripes.
- c. The pattern of stripes is different on both sides of mid-ocean ridges.
- d. The magnetic memory of rock on the ocean floor changes over time.

8. How did drilling samples show that sea-floor spreading really has taken place?

_____ The farther away from the ridge the samples were taken, the older the rocks were.

_____ The youngest rocks were always in the center of the ridges.

Subduction at Trenches (pp. 102–103)

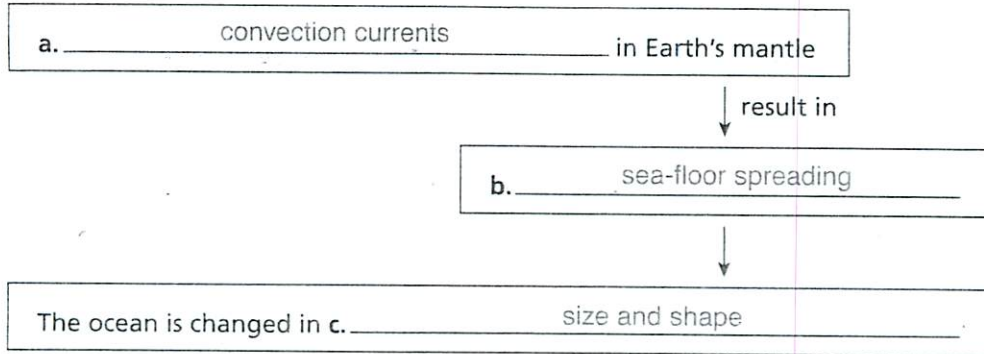
9. A long, narrow and very deep canyon where the ocean floor bends down toward the mantle is called a _____ deep-ocean trench _____.

10. What is subduction? _____
_____ the process by which ocean floor sinks beneath a deep-ocean trench and back into the mantle _____

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Sea-Floor Spreading (continued)

11. Complete the cause, events, and effect graphic organizer to show the relationships among the processes of convection currents, subduction, and sea-floor spreading.



- d. What process in Earth's interior causes subduction and sea-floor spreading? _____ convection currents _____
- e. What effect do those two events have on Earth's surface? The ocean is changed in size and shape.
12. Is the following sentence true or false? At deep-ocean trenches, conduction allows oceanic crust to sink back into the mantle.
true
13. Is the following statement true or false? The Pacific Ocean is shrinking.
true
14. Why is the Atlantic Ocean expanding? The Atlantic Ocean has only a few short trenches. The spreading ocean floor has nowhere to go.

The Theory of Plate Tectonics

- Diverge means to move in different directions from a common point. Two plates move apart from a common point at a divergent boundary.
- Converge means to come together toward one point. Two plates come together at a convergent boundary.
- Transform means to change in form or appearance. Two plates slip past each other in a transform boundary.

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The Theory of Plate Tectonics (continued)

Introduction (p. 106)

- The lithosphere is broken into separate sections called _____ plates.
- Is the following sentence true or false? Plates can carry continents or parts of the ocean floor ^{or} ~~but not~~ both. _____ false

How Plates Move (p. 107)

- What is a scientific theory? _____
a well-tested concept that explains a wide range of observations
- State the theory of plate tectonics. Pieces of Earth's lithosphere are in slow, constant motion, driven by convection currents in the mantle.
- Is the following sentence true or false? The theory of plate tectonics explains the formation, movement, and subduction of Earth's plates.
_____ true

Plate Boundaries (pp. 108–109)

Match the term with its definition.

Layer

- b 6. plate boundary
- c 7. fault
- a 8. rift valley

Description

- a Deep valley that forms where two plates pull apart
- b Line where the edges of Earth's plates meet
- c Break in Earth's crust where rocks have slipped past each other

- Complete the compare/contrast table to show how plates move at the different types of plate boundaries.




Plate Movement	
Type of Plate Boundary	How Plates Move
Divergent boundary	a. Two of Earth's plates slide apart. 
Convergent boundary	b. Two plates come together. 
Transform boundary	c. Two plates slip past each other. 

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d. How are the movement of plates at divergent boundaries and at transform boundaries similar?

Near the plate boundary, both types of plates move horizontally.

10. Is the following sentence true or false? Crust is neither created nor destroyed along a transform boundary. true

11. Most divergent boundaries occur along mid-ocean ridges .

12. When two plates converge, the result is called a(n) collision .

13. When two plates collide, what determines which plate comes out on top? the density of the plates

14. Circle the letter of each sentence that is true about convergent boundaries.

a. Where two plates carrying oceanic crust meet, subduction does not take place.

b. An oceanic plate sinks beneath a continental plate when the two plates collide.

c. Where two plates meet, the one that is more dense sinks under the other.

d. Mountain ranges form where two plates carrying continental crust collide.

15. Was Pangaea the only supercontinent to have existed? Explain your answer.

No; geologists have evidence that before Pangaea existed, other supercontinents formed and split apart over billions of years.

16. Is the following sentence true or false? The pieces of the supercontinent Pangaea began to drift apart about 225 million years ago.

 true

Types of Boundaries

Motion

Effect on Crust

1. Divergent
← →

← →

- Rift Valley
- Mid-ocean ridge
- subduction-trench
- mountains

2. convergent or convergent
← →

→ ←

3. Transform
↑ ↓

↓ ↑ or ↑ ↓

- Earthquake

