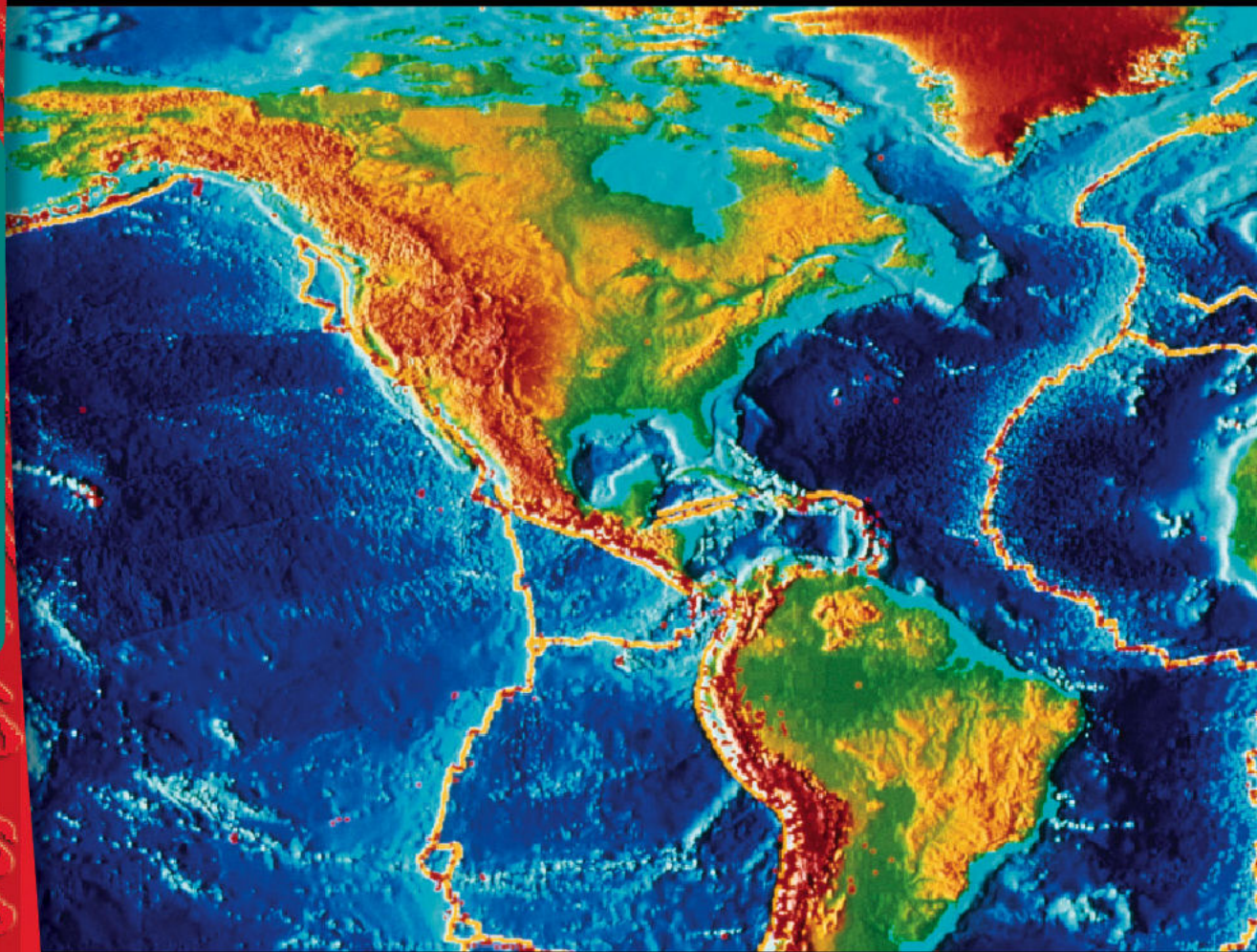


THEORY OF PLATE TECTONICS

10B Theory of Plate Tectonics



Vocabulary

lithosphere (LIH thuh sfeer) outer layer of Earth made up of the crust and the solid upper mantle

asthenosphere (as THE nuh sfeer) soft layer of Earth beneath the lithosphere

convection current (kuhn VEK shuhn KUR uhnt) up-and-down motion of heated matter

Using Science Words

1. Which layer is closest to Earth's center?
 - A. asthenosphere
 - B. lithosphere
 - C. upper mantle

1 In the early 1900s a German scientist named Alfred Wegener studied the sizes and shapes of the continents. He noticed that the continents seem to fit together like pieces of a puzzle. Wegener concluded that the continents must once have been one huge continent. He called this supercontinent *Pangaea*.

2 Wegener wanted to prove that his theory was correct. He learned of rocks in South America that were the same as rocks in parts of Africa. These rocks were evidence that the two continents had once been joined together. He also learned of fossils of the same land animals on continents that were far apart. Wegener reasoned that the animals could not have swum across large oceans. Therefore, these animals must have once lived together on the same large continent.

3 Wegener thought that Pangaea began to break apart some 200 million years ago. The pieces of Pangaea became our continents today. Over many millions of years, they slowly drifted apart. Wegener called his theory *continental drift*. He had evidence about Pangaea and continental drift, but he could not explain *how* the continents moved. He thought the movement might be caused by Earth's rotation. But this idea was proven wrong.

4 By the 1960s scientists had developed new technology to study places that humans could not visit, such as the ocean floor. SONAR and echo-sounding methods were used to map the ocean floor. Scientists gathered samples of ocean crust. They found that new ocean crust forms at tall, mid-ocean ridges. This happens when heated material within Earth is forced up through cracks in the crust. At the same time, old ocean crust is destroyed in deep trenches under the ocean. The crust melts when it is forced toward Earth's mantle.

5 The theory of seafloor spreading explains how new crust is created and old ocean crust is destroyed. Seafloor spreading shows that the oceans spread apart at ridges. Think about what would happen if you squeezed toothpaste through a slit in a sheet of paper. The two sides of the paper would push apart.

6 Seafloor spreading helps explain continental drift, which is the moving apart of continents. Scientists believe that Earth's **lithosphere**, which includes the hard crust and solid upper mantle, is broken into huge pieces. These pieces are called tectonic plates. These plates fit together. The continents are part of these plates. When the ocean floor spreads, the continental plates are also moved.

7 Seafloor spreading explains *how* tectonic plates move. But it does not explain *why* they move. Scientists proposed the theory of plate tectonics to describe *why* tectonic plates move. The layer beneath the lithosphere is like a soft plastic. This soft layer is called the **asthenosphere**. The matter in this layer can flow like a liquid. Heated material from deep inside Earth rises toward the lithosphere. There, it cools and sinks toward the core, where it is heated again. This up-and-down motion of heated matter forms a **convection current**.

8 Tectonic plates sit on top of the asthenosphere. Convection currents in the asthenosphere cause the plates to move. They move like big, heavy rafts on a thick fluid. Tectonic plates move only a few centimeters each year. But these small movements cause big changes over time.

9 Tectonic plates can interact in several ways. They can collide, or run into one another. They can spread apart. They can slide past one another. The movement of tectonic plates can cause earthquakes and volcanoes. This movement can even build mountains. These things happen where tectonic plates come together or pull apart.

Comprehension

Write **T** if the statement is true, based on the reading. Write **F** if the statement is false.

2. Tectonic plates move only a few centimeters each year.
3. Alfred Wegener proposed the theory of seafloor spreading.
4. Tectonic plates are made of Earth's asthenosphere.
5. Old ocean crust is destroyed in deep ocean trenches.
6. Convection currents cause tectonic plates to move.

Word Study

Context Clues You can often tell the meaning of a term by reading the words around it. Look in other sentences for clues about the meaning.

Look at each number in parentheses. Find the paragraph in the reading with the same number. Then find the term that fits the given meaning. Write the term.

7. decided (1)
8. show something is true (2)
9. floated (3)
10. changes from a solid to a liquid (4)
11. run into something (9)

Word Usage One good way to learn words is to use them in sentences.

Look at each number in parentheses. Find the paragraph with the same number. Then find the best term to fill the blank. Write the term.

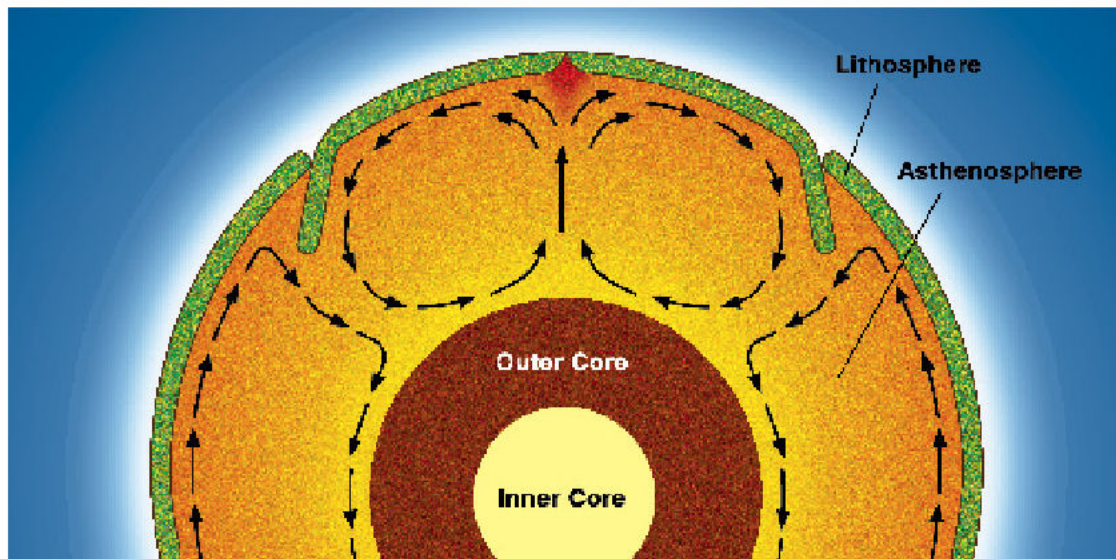
12. Wegener _____ that the continents had moved. (1)
13. Continental drift is a _____ about the break up of Pangaea. (3)
14. Ocean crust _____ near the mantle. (4)
15. Tectonic plates move a few _____ in a year. (8)
16. The _____ of plates can create mountains. (9)

Standardized Test Practice

Test Tip

Diagrams First read the title, and then quickly review the diagram. Refer back to the diagram as you answer each question.

Tectonic Forces



Multiple Choice Use the diagram to answer the questions.

17. Which word best describes the pattern of movement of the heated matter?
 - A. circular
 - B. vertical
 - C. horizontal
 - D. diagonal
18. What causes the matter to rise and then sink?
 - A. tectonics
 - B. ocean floor spreading
 - C. convection currents
 - D. colliding plates
19. What do the arrows represent?
 - A. the location of tectonic plates
 - B. the movement of matter
 - C. a type of energy
 - D. the changing shape of the seafloor

Using Science Words

1. A

Comprehension

2. T
3. F
4. F
5. T
6. T

Word Study

7. concluded
8. prove
9. drifted
10. melts
11. collide
12. concluded
13. theory
14. melts
15. centimeters
16. movement

Standardized Test Practice

17. A
18. C
19. B

Writing About Science

If you were to make a model of the lithosphere and the asthenosphere, what materials would you use for each? Explain your choices.