

Plate Tectonics ▪ *Guided Reading and Study*

The Theory of Plate Tectonics

This section explains how the lithosphere is broken into separate sections that move.

Use Target Reading Skills

Before reading the section, write simple definitions for the words *diverge*, *converge*, and *transform*. You may use a dictionary. After reading the passages that contain the key terms *divergent boundary*, *convergent boundary*, and *transform boundary*, explain how your definitions relate to these terms.

Write a definition of each Key Term in your own words below:

plate: _____

scientific theory: _____

plate tectonics: _____

fault: _____

divergent boundary: _____

rift valley: _____

convergent boundary: _____

transform boundary: _____

Plate Tectonics ▪ *Section Summary*

The Theory of Plate Tectonics

Key Concepts

- What is the theory of plate tectonics?
- What are the three types of plate boundaries?

Earth's lithosphere is broken into separate sections called **plates**. The plates fit closely together along cracks in the crust. They carry the continents, or parts of the ocean floor, or both. **Plate tectonics** is the geological theory that states that pieces of Earth's lithosphere are in constant, slow motion, driven by convection currents in the mantle. A **scientific theory** is a well-tested concept that explains a wide range of observations. **The theory of plate tectonics explains the formation, movement, and subduction of Earth's plates.**

The plates float on top of the asthenosphere. Convection currents rise in the asthenosphere and spread out beneath the lithosphere, causing the movement of Earth's plates. As the plates move, they produce changes in Earth's surface, including volcanoes, mountain ranges, and deep-ocean trenches. The edges of different pieces of the lithosphere meet at lines called plate boundaries. **Faults**—breaks in Earth's crust where rocks have slipped past each other—form along these boundaries.

There are three types of plate boundaries: transform boundaries, divergent boundaries, and convergent boundaries. The plates move at amazingly slow rates, from about 1 to 24 centimeters per year. They have been moving for tens of millions of years. A **transform boundary** is a place where two plates slip past each other, moving in opposite directions. Earthquakes occur frequently along these boundaries. The place where two plates move apart, or diverge, is called a **divergent boundary**. Most divergent boundaries occur at the mid-ocean ridge. When a divergent boundary develops on land, two slabs of Earth's crust slide apart. A deep valley called a **rift valley** forms along the divergent boundary. The place where two plates come together, or converge, is a **convergent boundary**. When two plates converge, the result is called a collision. When two plates collide, the density of the plates determines which one comes out on top. Oceanic crust is more dense than continental crust.

When two plates carrying oceanic crust meet at a trench, the plate that is less dense dives under the other plate and returns to the mantle. This is the process of subduction. When a plate carrying oceanic crust collides with a plate carrying continental crust, the more dense oceanic plate plunges beneath the continental plate through the process of subduction. When two plates carrying continental crust collide, subduction does not take place because both plates are mostly low-density granite rock. Instead, the plates crash head-on. The collision squeezes the crust into mighty mountain ranges.

About 260 million years ago, the continents were joined together in the supercontinent Pangaea. About 225 million years ago, Pangaea began to break apart. Since then, the continents have moved to their present locations.

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The Theory of Plate Tectonics *(continued)*

Introduction

1. The lithosphere is broken into separate sections called _____.
2. Is the following sentence true or false? Plates can carry continents or parts of the ocean floor but not both. _____

How Plates Move

3. What is a scientific theory? _____

4. State the theory of plate tectonics. _____

5. Is the following sentence true or false? The theory of plate tectonics explains the formation, movement, and subduction of Earth's plates.

Plate Boundaries

Match the term with its definition.

Layer

- ___ 6. plate boundary
- ___ 7. fault
- ___ 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

9. 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.
Convergent boundary	b.
Transform boundary	c.

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

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

11. Most divergent boundaries occur along _____.

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

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

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.

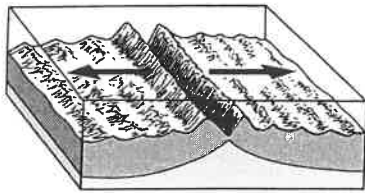
16. Is the following sentence true or false? The pieces of the supercontinent Pangaea began to drift apart about 225 million years ago.

Plate Tectonics ▪ *Review and Reinforce*

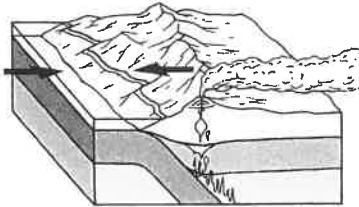
The Theory of Plate Tectonics

Understanding Main Ideas

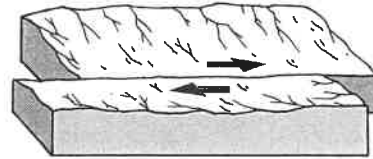
Label each figure by writing the type of plate boundary it shows.



1. _____



2. _____



3. _____

Answer the following questions on a separate sheet of paper.

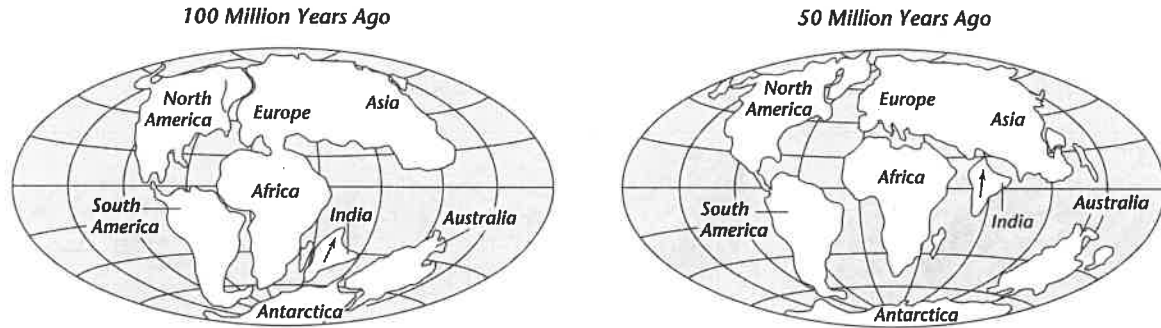
- Describe what happens when a. two plates carrying oceanic crust collide, b. two plates carrying continental crust collide, and c. a plate carrying oceanic crust collides with a plate carrying continental crust.
- Explain what force caused the movement of the continents from one supercontinent to their present positions.

Building Vocabulary

Fill in the blank to complete each statement.

- A scientific _____ is a well-tested concept that explains a wide range of observations.
- Breaks in Earth's crust where rocks have slipped past each other are called _____.
- The lithosphere is broken into separate sections called _____.
- A(n) _____ is a deep valley on land that forms along a divergent boundary.
- The geological theory that states that pieces of Earth's crust are in constant, slow motion is called _____.

Plate Tectonics ▪ Enrich

The Birth of the Himalayas

The greatest challenge for mountain climbers is Mt. Everest, whose peak rises 8,872 meters above sea level. This is the highest mountain in the world, though many mountains around it are almost as high. Mt. Everest is in the Himalayas, a series of massive ranges that extends 2,500 kilometers across South Asia north of India. The Himalayas cover all or part of the countries of Tibet, Nepal, and Bhutan.

A climber on the high slopes of Mt. Everest would probably be surprised to learn that the region was relatively flat about 40 million years ago. It was then that two continental plates collided. The plate carrying India had been moving northward for millions of years. The oceanic crust in front of it was slowly subducted under the Eurasian plate. But when the two continents collided, subduction stopped because India could not sink into the mantle. Instead, it pushed crust upward and downward. The Himalayas were one result. Thus, the Himalayas are actually pieces of plates broken and lifted up because of the collision. Another result of this collision was the movement of China eastward, as the movement of India northward pushed the Eurasian plate in front of it. The collision is still occurring today. In fact, the Himalayas are growing in elevation at a rate of about 1 centimeter per year.

Answer the following questions on a separate sheet of paper.

1. Where are the Himalayas?
2. What was the area of the Himalayas like 40 million years ago?
3. How did the movement of plates create the Himalayas?
4. What else resulted from the collision of those plates?
5. What type of plate boundary exists today along the Himalayas?
6. If the Himalayas continue to grow in elevation at their present rate, how tall will Mt. Everest be in one million years?