

## **Earth Science**

### **Chapter 10 - Plate Tectonics**

#### **Section 2 - The Theory of Plate Tectonics**

***E.Q.: Explain the theory of plate tectonics and describe the three types of plate boundaries and the causes of plate movement.***

#### **STANDARDS:**

**SES2. Students will understand how plate tectonics creates certain geologic features, materials, and hazards.**

- a. Distinguish among types of plate tectonic settings produced by plates diverging, converging, and sliding past each other.**
- b. Relate modern and ancient geologic features to each kind of plate tectonic setting.**
- e. Explain how plate tectonics creates and destroys sedimentary basins through time.**

**SES5. Students will investigate the interaction of insolation and Earth systems to produce weather and climate.**

- f. Relate changes in global climate to variation in Earth/Sun relationships and to natural and anthropogenic modification of atmospheric composition.**

**SES6. Students will explain how life on Earth responds to and shapes Earth systems.**

- d. Describe how fossils provide a record of shared ancestry, evolution, and extinction that is best explained by the mechanism of natural selection.**

#### **Objectives:**

- Summarize the theory of plate tectonics.**
- Identify and describe the three types of plate boundaries.**
- List and describe three causes of plate movement.**

## How Continents Move

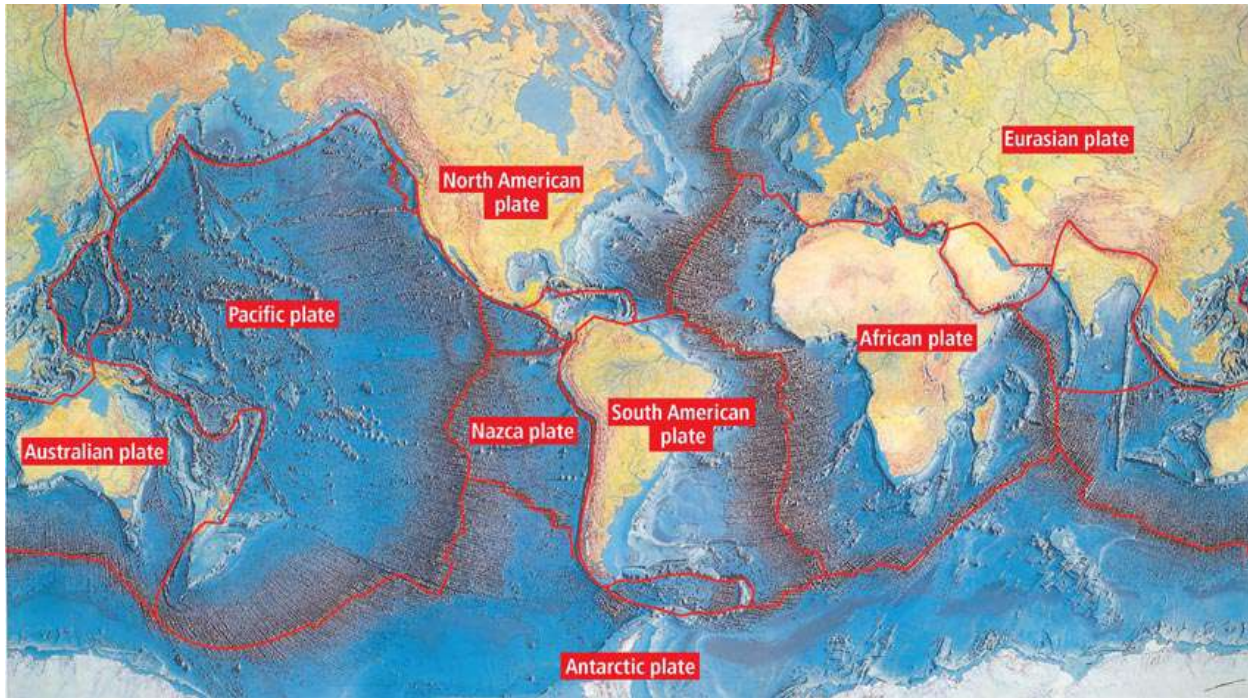
- **plate tectonics** the theory that explains how large pieces of the lithosphere, called *plates*, move and change shape
- **lithosphere** the solid, outer layer of Earth that consists of the crust and the rigid upper part of the mantle
- **asthenosphere** the solid, plastic layer of the mantle beneath the lithosphere; made of mantle rock that flows very slowly, which allows tectonic plates to move on top of it
- The lithosphere forms the thin outer shell of Earth and is broken into several blocks or *tectonic plates*.
- The tectonic plates ride on the asthenosphere in much the same way that blocks of wood float on water.
- Tectonic plates can include continental crust, oceanic crust, or both.
- Continents and oceans are carried along on the moving tectonic plates in the same way that passengers are carried by a bus.



## Tectonic Plates

- Scientists have identified about 15 major tectonic plates.
- Scientists identify plate boundaries primarily by studying data from earthquakes.
- The locations of volcanoes can also help identify the locations of plate boundaries.

The boundaries of tectonic plates do not always match the outlines of continents.



## **Reading Check**

How do scientists identify locations of plate boundaries?

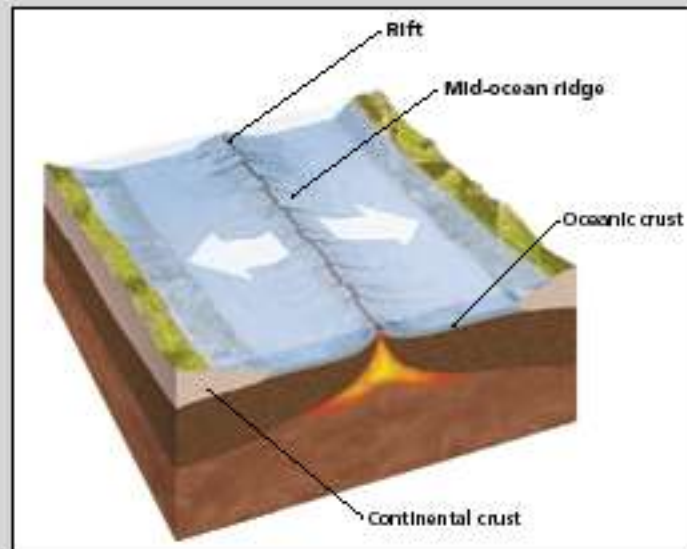
***Scientists use the locations of earthquakes, volcanoes, trenches, and mid-ocean ridges to outline tectonic plates.***

## **Types of Plate Boundaries**

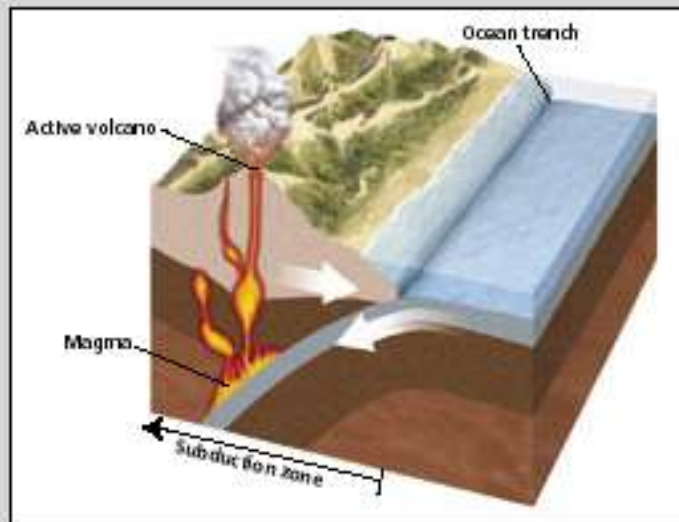
- Tectonic plate boundaries may be in the middle of the ocean floor, around the edges of continents, or even within continents.
- The three types of plate boundaries are divergent boundaries, convergent boundaries, and transform boundaries.
- Each plate boundary is associated with a characteristic type of geologic activity.

# Types of Plate Boundaries

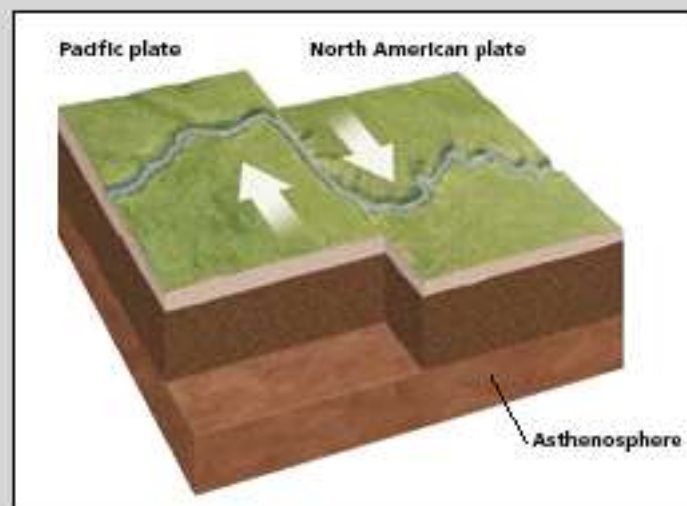
## Divergent Boundary



## Convergent Boundary



## Transform Boundary



## **Causes of Plate Motion**

- Many scientists think that the movement of tectonic plates is partly due to convection.
- *Convection* is the movement of heated material due to differences in density that are caused by differences in temperatures.
- The convection process can be modeled by boiling water in a pot on the stove. As the water at the bottom of the pot is heated, the water at the bottom expands and becomes less dense than the cooler water above it.
- The cooler, denser water sinks, and the warmer water rises to the surface to create a cycle called a *convection cell*.

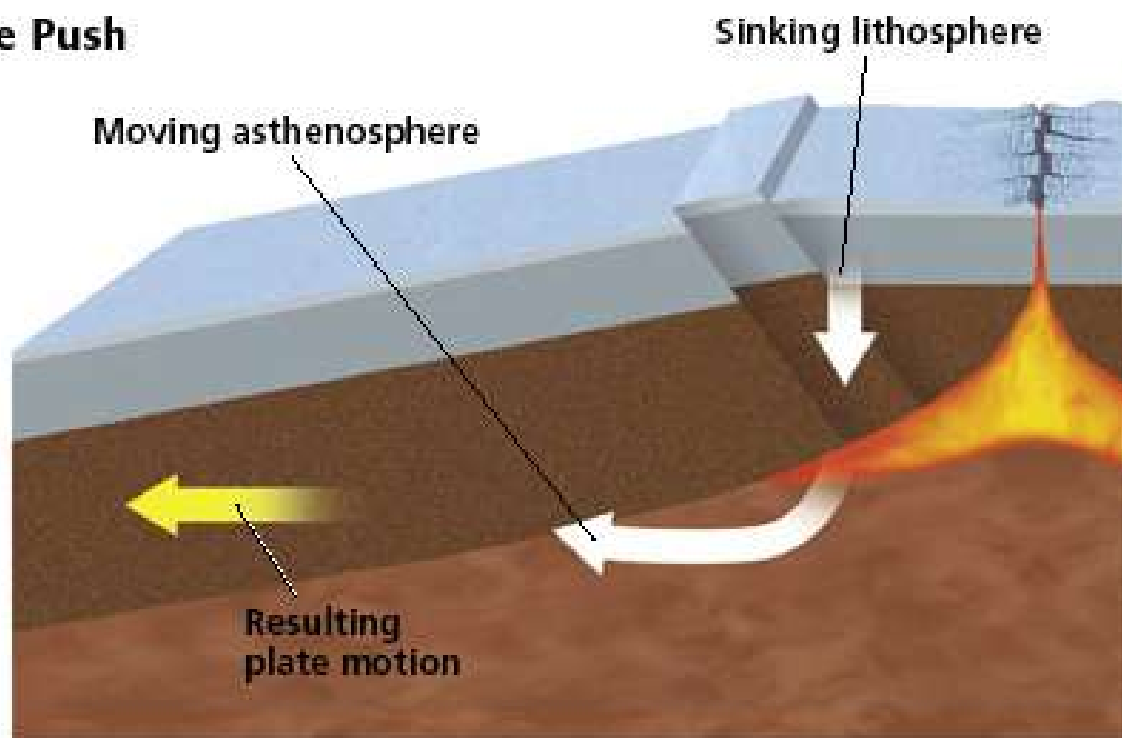
## **Mantle Convection**

- Scientists think that tectonic plates are part of a convection system.
- Energy generated by Earth's core and radioactivity within the mantle heat the mantle. This heated material rises through the cooler, denser material around it.
- As the hot material rises, the cooler, denser material flows away from the hot material and sinks into the mantle to replace the rising material.
- As the mantle material moves, it drags the overlying tectonic plates along with it.
- As the hot material rises, the cooler, denser material flows away from the hot material and sinks into the mantle to replace the rising material.
- As the mantle material moves, it drags the overlying tectonic plates along with it.



# Causes of Plate Motion

## Ridge Push



## Slab Pull

