Name Date

Topic 4.2 Summary

# What are tectonic plates and how is their movement linked to geological processes?

*Use with textbook pages 288–295.*

## Earth's Tectonic Plates

The lithosphere (Earth's crust and upper mantle) is broken into pieces called **tectonic plates**. They float on a part of the mantle called the asthenosphere, which can flow. Some tectonic plates are made up of oceanic crust. Most are made up of both oceanic crust and continental crust.

*Reading Check*

What are the differences between the lithosphere and asthenosphere?

Lithosphere is apart of Earth's layers. (solid) Asthenosphere is only apart of the mantle. Also it flows.

## Plate Movement

When magma rises from an ocean ridge, the magma produces new crust, which pushes the plates apart. As these plates are pushed apart, other plates are pushed together. Movement along any plate boundary results in changes at other boundaries.

**Plate Movements**

| Plate Boundary | Motion of Plates | Activity and Features at Boundary |
|---|---|---|
| Convergent | • plates move toward each other | • subduction (denser crust moves below less dense crust)<br>• deep ocean trenches • volcanoes<br>• mountains • earthquakes |
| Divergent | • plates move apart | • formation of new oceanic crust • sea floor spreading<br>• mid-ocean ridges • continental rifting |
| Transform | • plates slide past each other | • earthquakes |

Technologies such as the Global Positioning System (GPS) measure the rate at which tectonic plates move. Different plates move at rates that vary from 1 to 15 cm per year.

## Mantle Convection

When partially melted mantle material is heated by Earth's core, it rises toward Earth's surface. Cooler, denser mantle material sinks away from the surface. This sets up large **convection currents** within the mantle. This **mantle convection** is thought to move tectonic plates. Two processes that result from mantle convection and contribute to tectonic plate movement are **ridge push** and **slab pull**. Ridge push occurs as rising material pushes plates apart. Slab pull occurs when a subducting plate pulls the rest of a plate down.

Name Date

Communicating
Topic 4.2

## The Lithosphere and Asthenosphere

*Use with textbook page 290.*

1. Describe how the following terms are related:

   a) lithosphere and crust

   The crust is part of the lithosphere.

   b) lithosphere and mantle

   The upper mantle is also part of the lithosphere.

   c) asthenosphere and mantle

   The asthenosphere is part of the mantle.

2. What is the key role of the asthenosphere in the theory of plate tectonics?

   The asthenosphere flows like toothpaste or tar and enables Earth's tectonic plates to move.

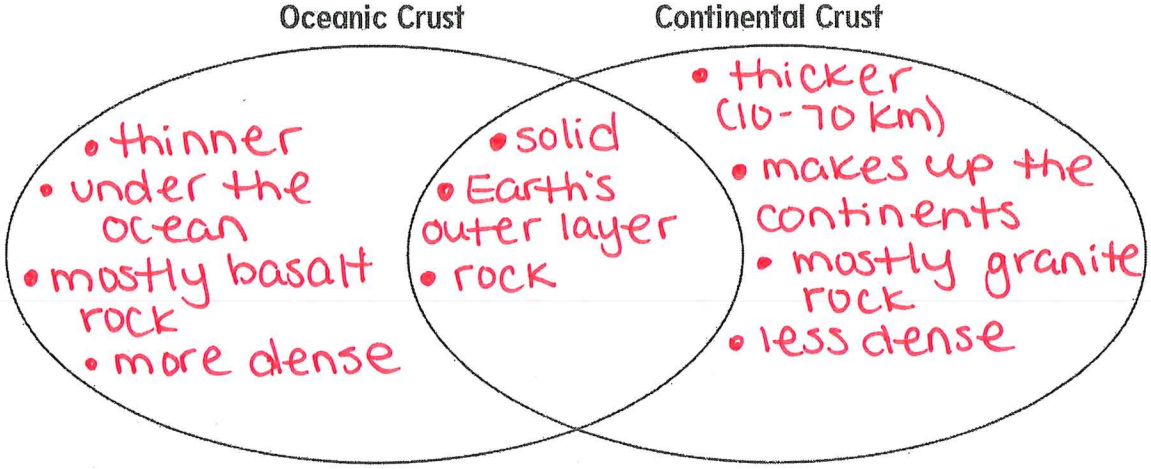
3. What characteristics of the asthenosphere make it suitable for moving Earth's tectonic plates?

   The asthenosphere is solid, but behaves like a plastic material so Earth's tectonic plates "float" on the asthenosphere.

4. One analogy compares the asthenosphere to toothpaste or melted tar. Come up with your own analogy to describe the asthenosphere.

   Examples: warm silly putty, warm toffee, almost melted butter.

5. Use the Venn diagram to compare and contrast continental and oceanic crust.



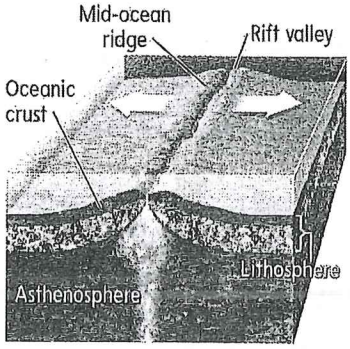
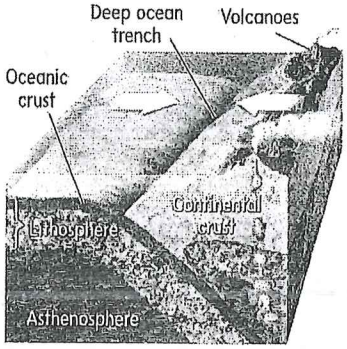
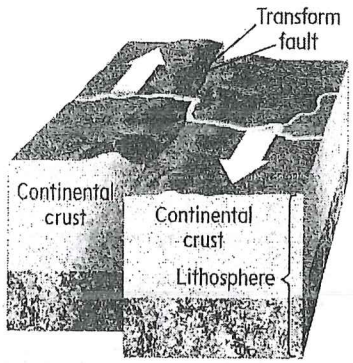
Name _____ Date _____

Processing and Analyzing
Topic 4.2

## Plate Boundaries

*Use with textbook pages 291–292.*

1. Identify each type of plate boundary shown in the table, and describe the type of geological activity that occurs at that boundary.

| Plate Boundary: Divergent | Plate Boundary: Convergent | Plate Boundary: Transform |
|---|---|---|
|  |  |  |
| Geological Activity<br>• volcanoes<br>• earthquakes<br>• sea floor spreading | Geological Activity<br>• volcanoes<br>• earthquakes<br>• mountain building<br>• subduction | Geological Activity<br>• earthquakes |

2. Use your understanding of divergent and convergent plate boundaries to explain why the surface of Earth is not getting any larger or smaller.

New crust is formed at divergent boundaries, but crust is subducted and melted at convergent boundaries, so the surface of Earth does not grow or shrink.

## Mantle Convection

*Use with textbook page 294.*

1. What two sources supply the heat energy that drives mantle convection?

radioactive decay of Earth's elements in Earth's interior; energy from the core.

2. How could you use a hot plate, a large beaker, water, and food colouring to model mantle convection? Draw a diagram to show what your model would look like, and explain how your model represents convection in Earth's mantle.

Fill the beaker with water, and use a dropper to put a drop of food colouring in the water (not on the surface) Place the beaker on the hot plate. As the water heats the food colouring will spread by convection.