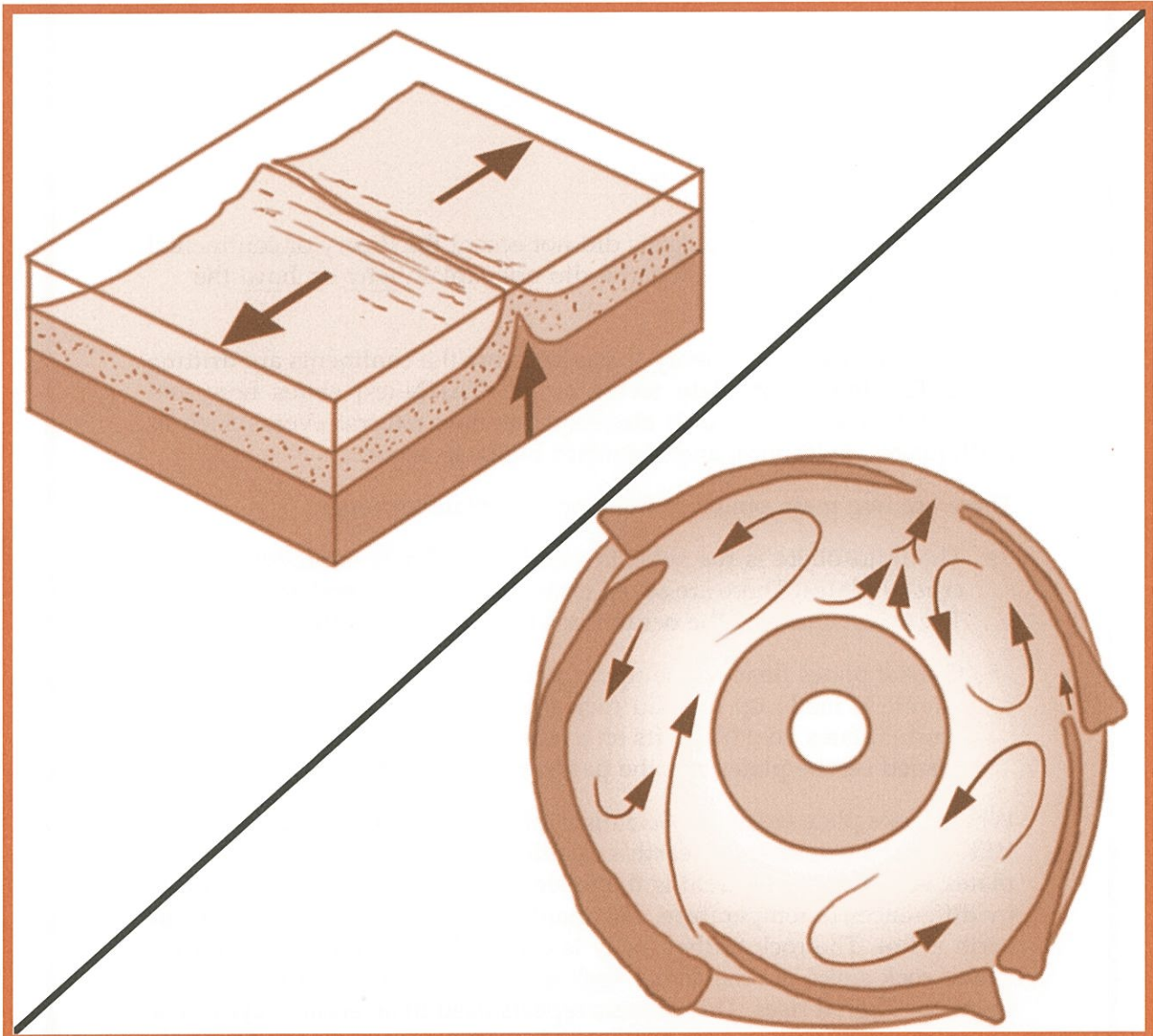


What is the theory of plate tectonics?



KEY TERMS

theory of plate tectonics: theory that states the earth's crust is broken into pieces that float on the lower mantle

crustal plates: large pieces of the solid part of the earth

convection current: circular movement of a gas or liquid caused by changes in temperature

mid-ocean ridge: underwater mountain chain

sea-floor spreading: process that forms new sea-floor

LESSON 21 | What is the theory of plate tectonics?

For many years, most geologists did not accept the theory of continental drift. The main reason was that it did not explain why or how the continents drifted apart.

Today, scientists have a theory to explain how the continents are drifting apart. The **theory of plate tectonics** [tek-TAHN-ics] states how and why the continents move. It also explains how natural events such as earthquakes, volcanoes, and mountain building occur.

There are two main points of the theory of plate tectonics:

- The lithosphere is the solid layer of the earth. It is broken up into **crustal plates**. There are seven main plates and several smaller ones. The continents and the ocean floor rest upon the plates.
- Crustal plates float on the upper part of the mantle. This part of the mantle is made up of solid rock that flows like a thick liquid. The crustal plates float like rafts on a lake. The continents and oceans are carried on the plates like the passengers on a raft.

What causes plate tectonics? Scientists think that giant **convection** [kuhn-VEK-shun] **currents** in the earth's mantle cause the movement of crustal plates. A convection current is the movement of a gas or a liquid caused by differences in temperature. The mantle rock close to the center of the earth is hot. The rock farther away is cooler. The hot rock rises and the cooler rock sinks. As the cooler rock gets closer to the earth's center, it heats up. Then it rises. This process repeats itself in an endless cycle. The crustal plates are carried along like packages on a moving conveyor belt.

CRUSTAL PLATES

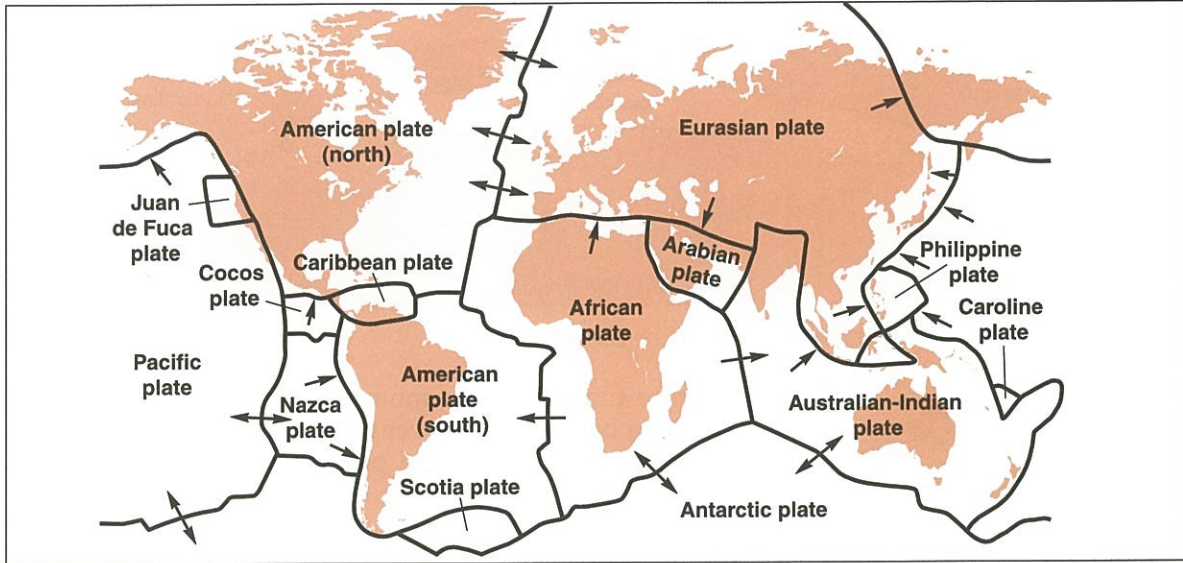


Figure A

Use Figure A and the reading material to answer the questions below.

1. What is the lithosphere? _____

2. What is the lithosphere broken into? _____
3. How many major crustal plates are there? _____
4. Name 5 crustal plates. _____

5. What is the largest crustal plate? _____
6. What things rest upon crustal plates? _____

7. On what layer do the crustal plates float? _____

8. Describe the upper part of the mantle. _____

CONVECTION CURRENTS

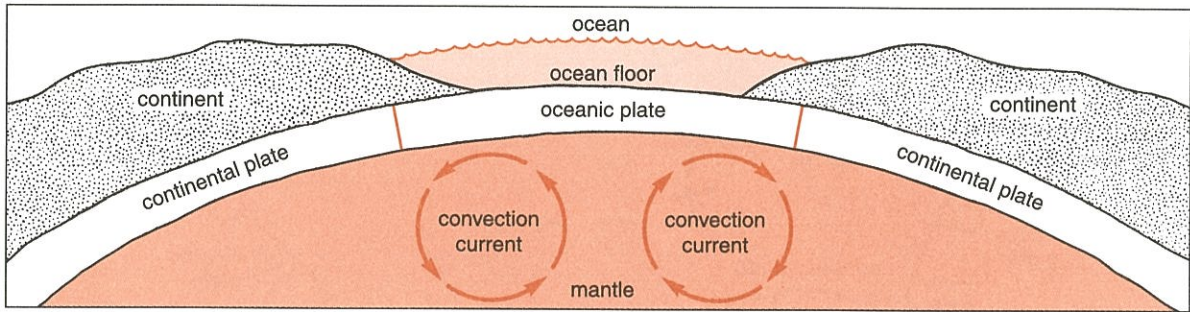


Figure B Convection current movement in the mantle

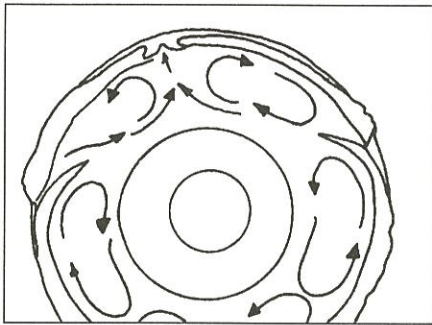


Figure C shows how some scientists believe convection currents in the upper mantle cause the crustal plates to move. The mantle rock near the earth's core is hot. The hot mantle rock rises. The cooler mantle rock sinks closer to the core and gets heated up. This cycle repeats over and over. When the heated rock rises, it causes the crustal plates to move.

Figure C

MULTIPLE CHOICE

In the space provided, write the letter of the word that best completes each statement.

- _____ 1. A convection current is caused by differences in
 - a) temperature.
 - b) mass.
 - c) air pressure.
 - d) color.
- _____ 2. Scientists think that the movement of crustal plates is caused by
 - a) conveyor belts.
 - b) pressure in the earth's core.
 - c) the core.
 - d) convection currents.
- _____ 3. The mantle rock close to the center of the earth is
 - a) cold.
 - b) hot.
 - c) frozen.
 - d) sinking.
- _____ 4. The center of the earth is called the
 - a) crust.
 - b) mantle.
 - c) core.
 - d) lithosphere.
- _____ 5. If you added cold water to a container of hot water, the cold water would
 - a) rise.
 - b) get colder.
 - c) sink.
 - d) stay on top.

CRUSTAL MOVEMENT

The crustal plates move in different ways.

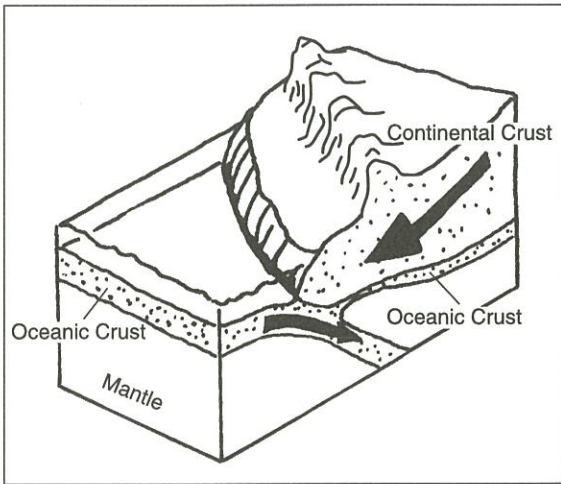


Figure D Some plates are moving toward each other. At these places, two plates hit each other. Sometimes the oceanic crust is pushed under the continent's crust.

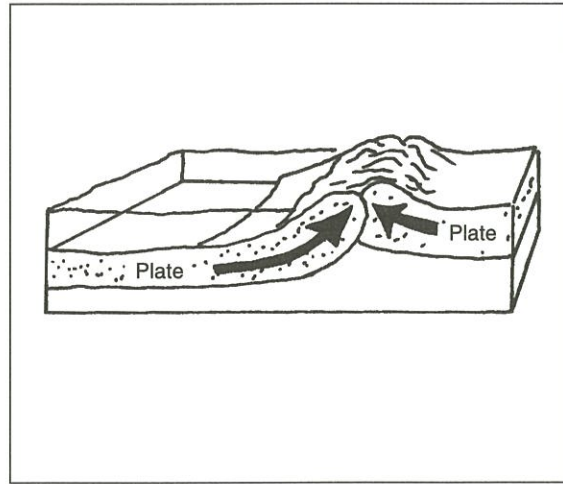


Figure E Sometimes two plates carrying continents crumple upward when plates collide.

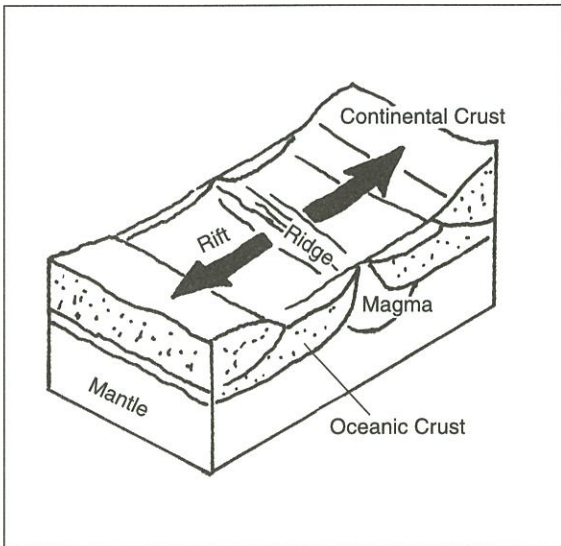


Figure F Some plates are moving apart.

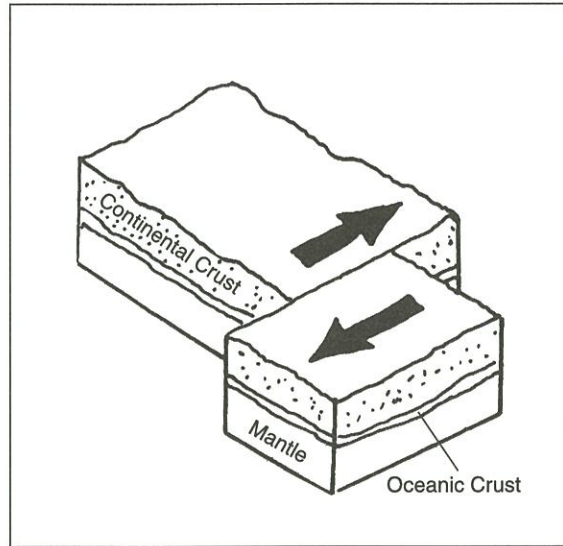


Figure G Some plates slide past each other.

- The movement of crustal plates causes changes on the earth's surface.
- In some areas where crustal plates slide past each other, the movement causes earthquakes.
- When oceanic crust is pushed down under continental crust, the continental crust crumples. It is pushed upward to form new mountains.
- When two crustal plates carrying continents collide, the continents buckle upward and form mountains. The Himalaya mountains were formed in this way when the plate carrying India collided with the Eurasian plate.

On each diagram, draw arrows to show the different ways in which crustal plates move.

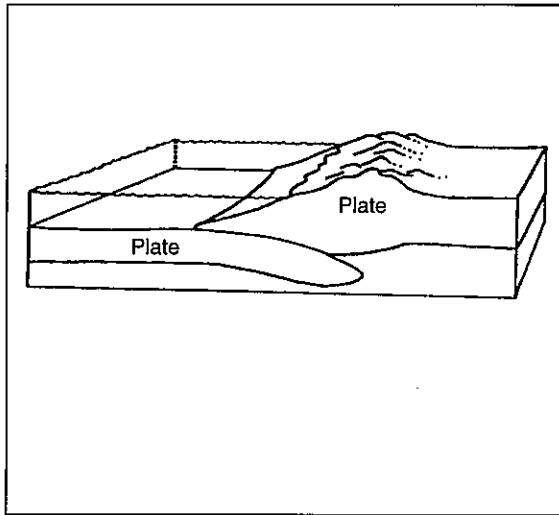


Figure H

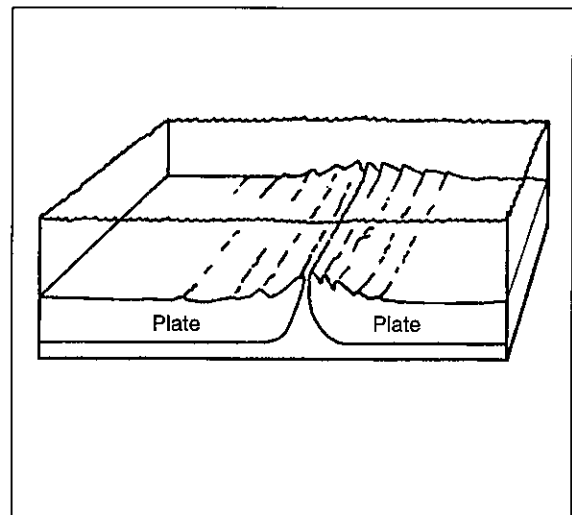


Figure I

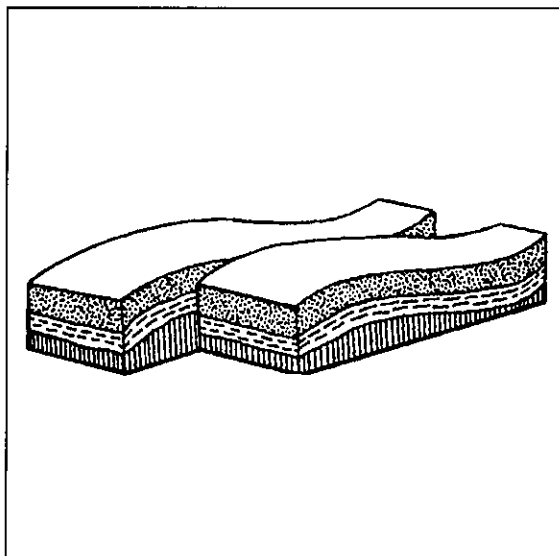


Figure J

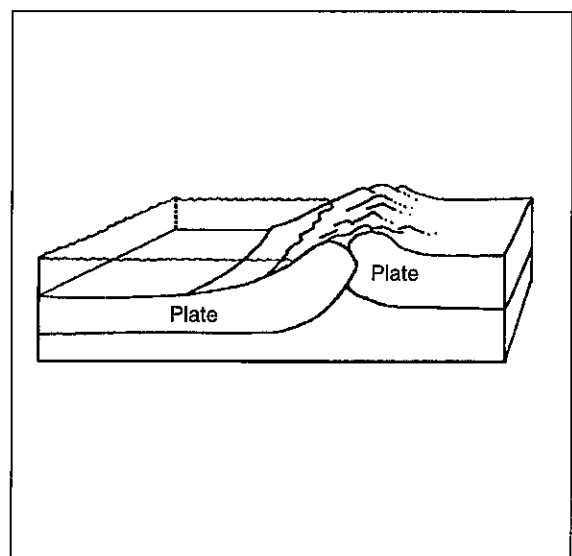


Figure K

Answer the following.

5. The movement of crustal plates sliding past each other causes _____ .
earthquakes, mountain building
6. Sometimes when two plates collide _____ crust is pushed down under
the _____ crust.
continental, oceanic
7. When this happens _____ occurs.
earthquakes, mountain building
8. When two plates carrying continents collide, the continents buckle _____.
upward, downward
9. This causes _____.
an earthquake, mountain building

SEA-FLOOR SPREADING

You may think that the ocean floor is flat. Does it surprise you that some of the largest mountain ranges and tallest mountains are under the ocean? They are! The mountain chain under the ocean is called the **mid-ocean ridge**.

At the mid-ocean ridge, magma was rising through the crust. As the magma cooled, it hardened and formed new crust on both sides of the ridge. The sea-floor was spreading apart at the ridges. New oceanic crust was being formed, and pushed out the older crust next to it. Older crust is pushed into deep ocean valleys. Scientists call this process **sea-floor spreading**. Sea-floor spreading supports plate tectonics.

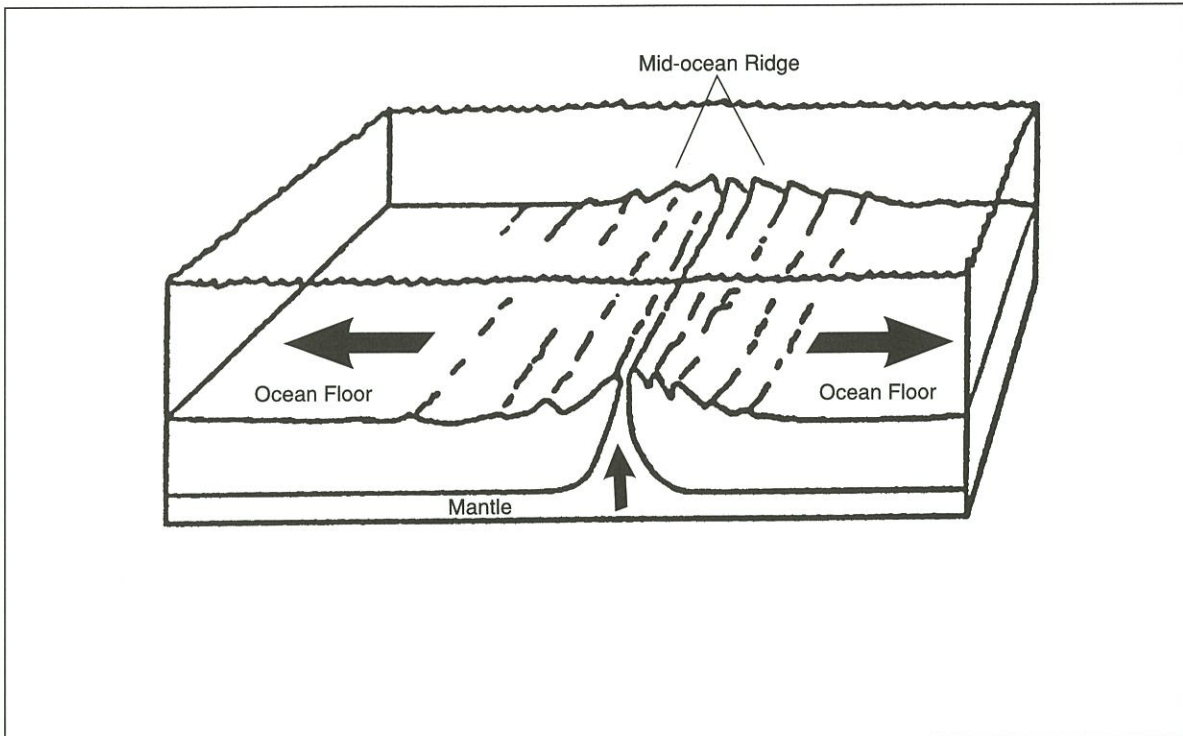


Figure L

TRUE OR FALSE

In the space provided, write "true" if the sentence is true. Write "false" if the sentence is false.

- _____ 1. Mountains are found only on the continents.
- _____ 2. The underwater mountain chain is called the mid-ocean ridge.
- _____ 3. New oceanic crust is formed at the mid-ocean ridge.
- _____ 4. Oceanic crust near a mid-ocean ridge is older than crust far away.
- _____ 5. Sea-floor spreading supports plate tectonics.

FILL IN THE BLANK

Complete each statement using a term or terms from the list below. Write your answers in the spaces provided.

collide
continents
convection currents
crustal plates

flows
mantle
move
ocean floor

plate tectonics
rises
sinks
solid

1. The idea that explains how and why continents drift is called the theory of _____ .
2. The lithosphere is made up of large moving sections called _____ .
3. The lithosphere is _____ .
4. Crustal plates float on the upper layer of the _____ .
5. Giant _____ in the earth's mantle cause the crustal plates to move.
6. The upper layer of the mantle is solid rock that _____ like a thick liquid.
7. Crustal plates carry the _____ and _____ .
8. Mountains may form where plates _____ .
9. Hot rock in the mantle _____ while cooler rock _____ .
10. Scientists believe that the continents, along with the ocean floor, will continue to _____ .

REACHING OUT

Upon which plate is each of the following places located? Check an atlas or encyclopedia and Figure A.

- | Plate | Plate |
|---------------------|--------------------|
| 1. Canada _____ | 6. Brazil _____ |
| 2. France _____ | 7. Nigeria _____ |
| 3. Hawaii _____ | 8. Australia _____ |
| 4. Russia _____ | 9. Panama _____ |
| 5. South Pole _____ | 10. YOU! _____ |