

Name _____ Period _____ Date _____

Unit 3 – Dynamic Earth

1.	Latitude
2.	Longitude
3.	Contour Lines
4.	Topography
5.	Prime Meridian
6.	Equator
7.	Contour Interval
8.	Elevation
9.	Crust
10.	Mantle
11.	Outer Core
12.	Inner Core
13.	Lithosphere
14.	Continental Drift
15.	Pangaea
16.	Plate Tectonics
17.	Convection Currents
18.	Folding
19.	Fault
20.	Seismic Waves
21.	Seismogram
22.	Epicenter
23.	Focus
24.	Volcano
25.	Magma
26.	Plate Boundaries
27.	Lava
28.	Creep
29.	Sea-floor spreading
30.	Subduction
31.	Transform Boundary
32.	Convergent Boundary
33.	Divergent Boundary

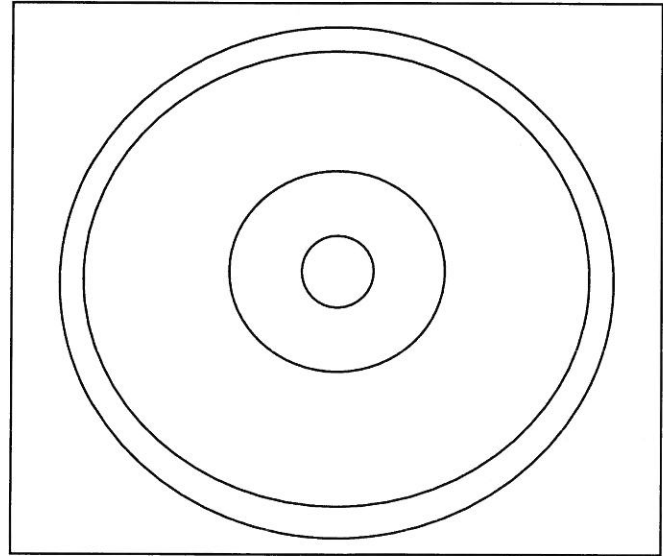
UNIT 3 DYNAMIC EARTH

EARTH'S INTERIOR NOTES

The Earth is divided into _____.

1. _____
2. _____
3. _____
4. _____

Color in each layer of the Earth



The layers formed because of their different _____. The less _____ material is found in the _____. The more _____ compounds sank to the _____ of Earth.

1. Crust - _____

2. Mantle - _____

3. Outer Core - _____

4. Inner Core - _____

EARTH'S LAYERS

- The crust is also known as the _____
- The broken sections of the crust are referred to as _____
- These plates fit together along Earth's surface like a _____
- The plates move along the surface very _____
- The upper part of the mantle acts like a plastic and is called the _____, it allows the plates to _____.

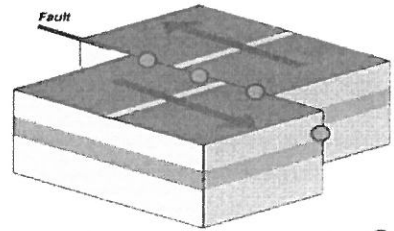
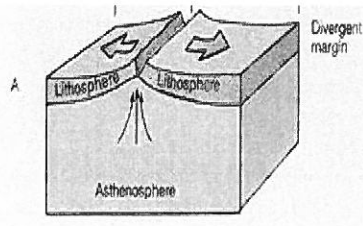
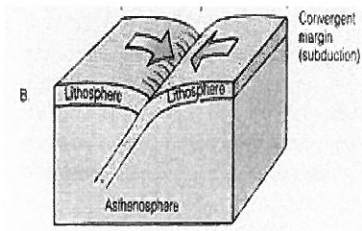
Layer	Description	Composition	Physical Properties

TECTONIC PLATES

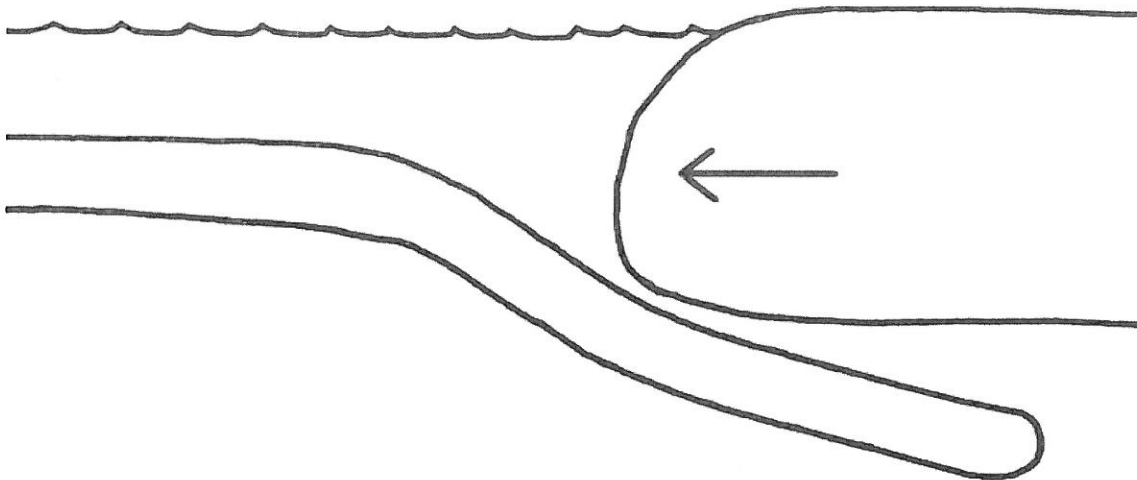
Plate tectonics is the theory that the lithosphere is divided up into _____ that move along the _____. (upper part of the mantle)

There are three types of plate boundaries:

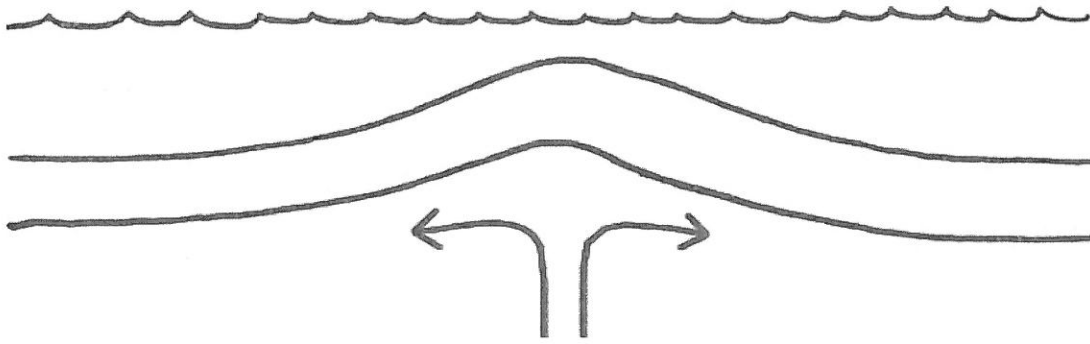
1. _____ - where two plates are colliding
2. _____ - where two plates are separating
3. _____ - where two plates slide against each other



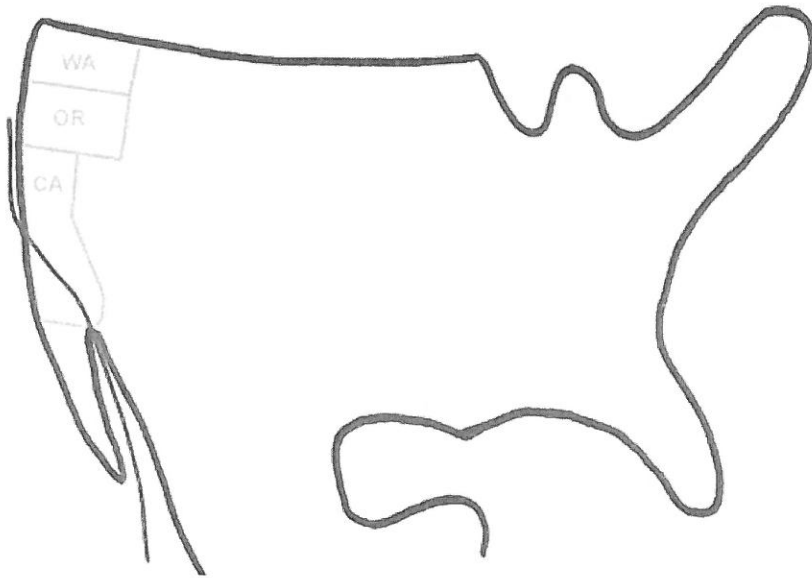
Convergent Boundary:



Divergent Boundary – ex. Mid-Atlantic Ridge (new crust forming)



Transform Boundary:



WEGENER'S HYPOTHESIS OF CONTINENTAL DRIFT

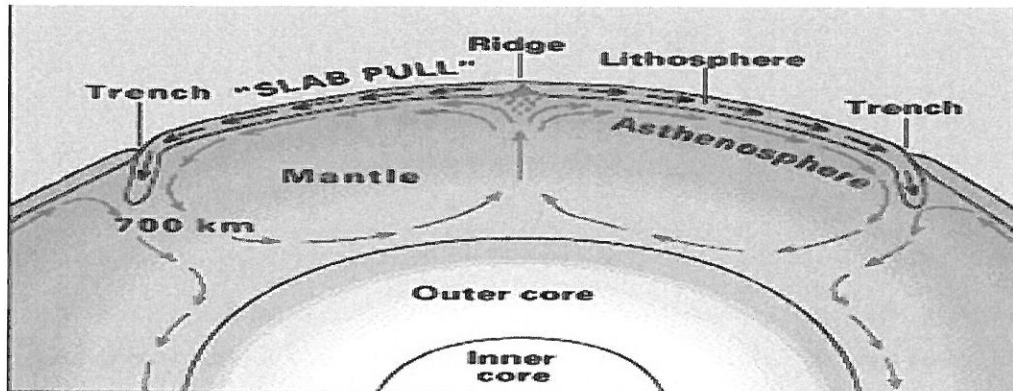
Continental Drift – is the hypothesis that states that the continents once formed a single _____ called _____. This continent broke up and the pieces have _____ to their present locations.

Evidence that helps supports continental drift:

- _____
 - _____
 - _____
- All found on opposite sides of the Atlantic Ocean

What causes the tectonic plates to move? _____

Convection – the movement of _____ through a fluid



Hottest magma _____
(rises, sinks)

Cooler magma _____
(rises, sinks)

FORCES THAT MOVE TECTONIC PLATES

Type of Force	Force Description
Ridge Push	
Convection	
Slab Pull	

DEFORMATION THE EARTH'S CRUST

Deformation - _____

Compression - _____

Tension - _____

Types of stress that deform rock:

1. _____ - the bending of rock layers

2. _____ - the surface along which rocks break and slide past each other

EARTHQUAKE NOTES

An earthquake is _____.

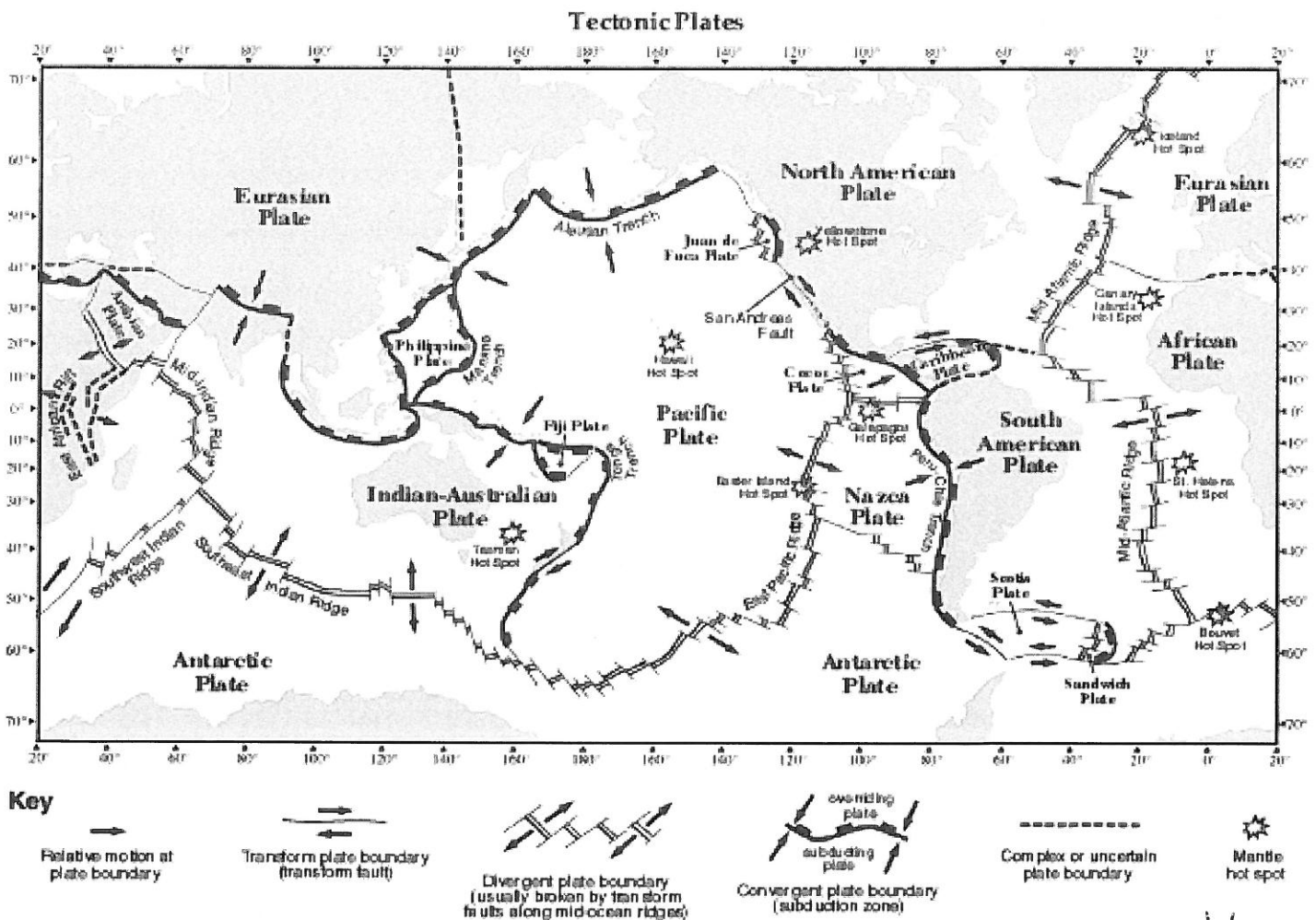
The study of earthquakes is called _____.

The instrument used to measure an earthquakes magnitude (strength) is a _____.

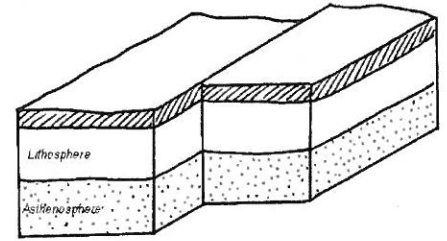
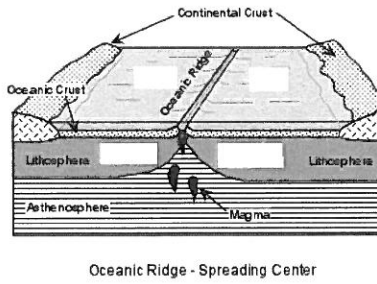
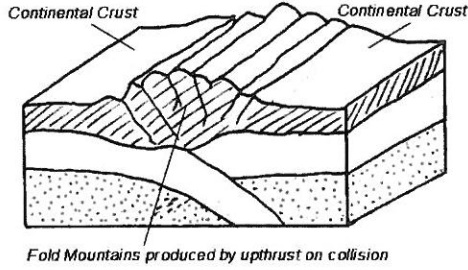
WHERE DO EARTHQUAKES OCCUR?

Earthquakes occur along _____.

The most active earthquake zone is _____, also known as _____.



THREE TYPES OF PLATE BOUNDARIES



This motion creates:

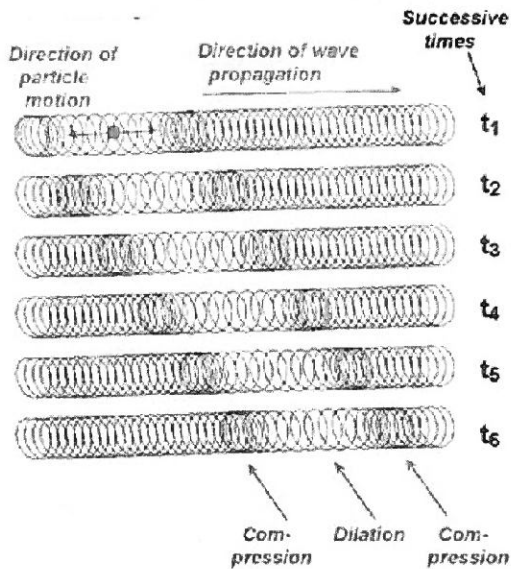
SEISMIC WAVES

When an earthquake occurs it produces _____, also known as _____.

Seismic waves are the reason we know the _____ of the Earth.

P – Waves:

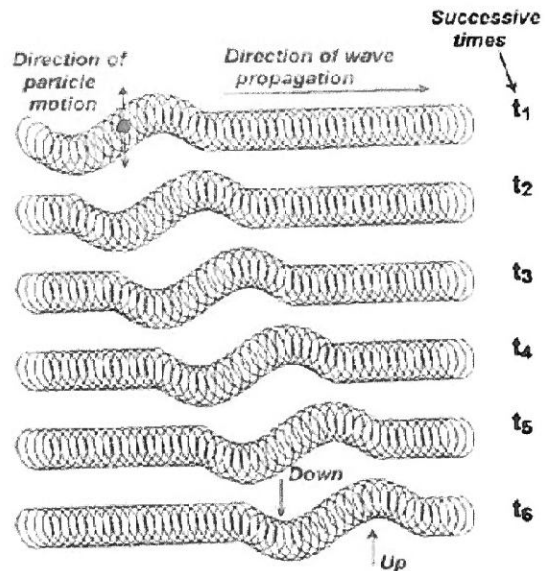
Compressional (P) Wave Propagation



Speed: _____

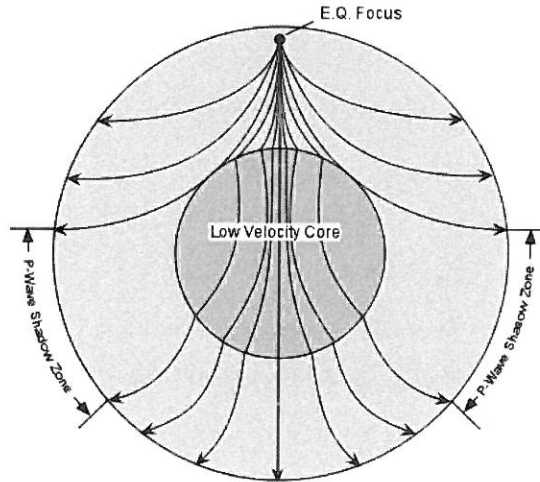
S – Waves:

Shear (S) Wave Propagation



Speed: _____

SHADOW ZONES



MEASURING EARTHQUAKES

Richter Scale -

_____.

Mercalli Scale -

_____.

EARTHQUAKE SAFETY

Before the shaking:

During the shaking:

After the shaking:

1. _____

1. _____

1. _____

2. _____

2. _____

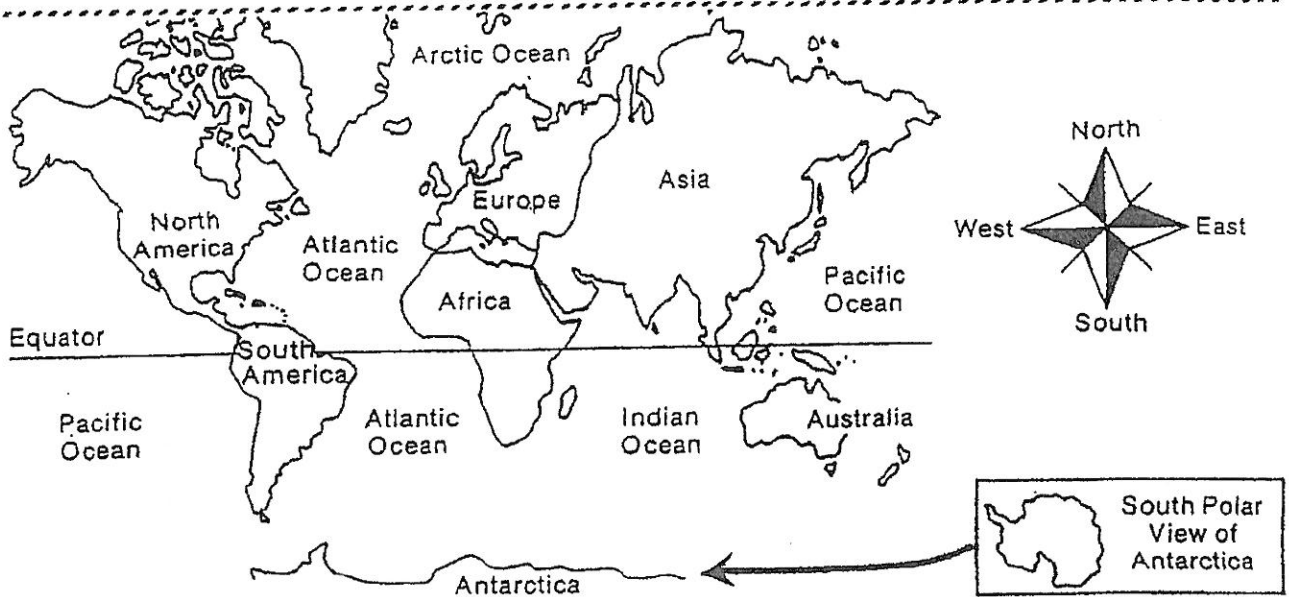
2. _____

3. _____

3. _____

3. _____

Continents and Oceans

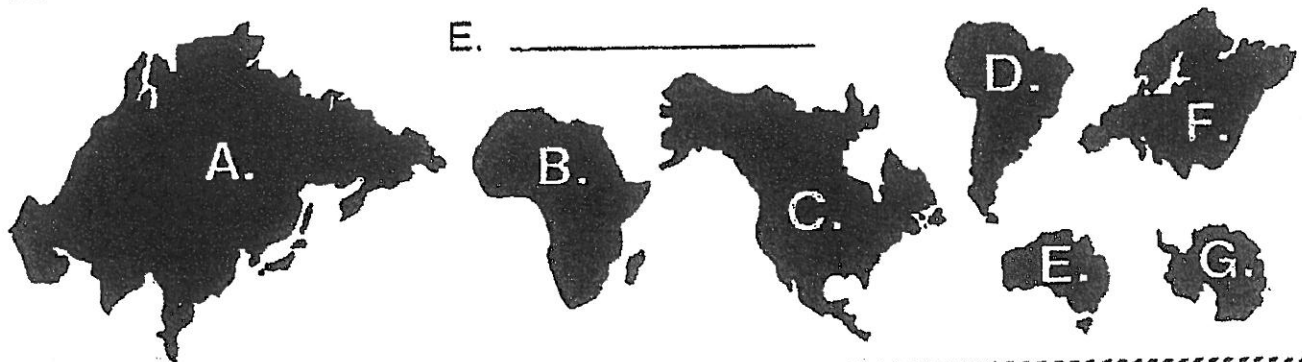


Write **north, south, east or west**.

1. The Arctic Ocean is _____ of Africa.
2. The Indian Ocean is _____ of Asia.
3. Asia is _____ of the Pacific.
4. Europe is _____ of Africa.
5. Antarctica is _____ of all the continents.
6. The Atlantic Ocean is _____ of North America.
7. Australia is _____ of South America.
8. North America is _____ of Europe.

Label the continents.

- | | | |
|----------|----------|----------|
| A. _____ | C. _____ | F. _____ |
| B. _____ | D. _____ | G. _____ |
| | E. _____ | |

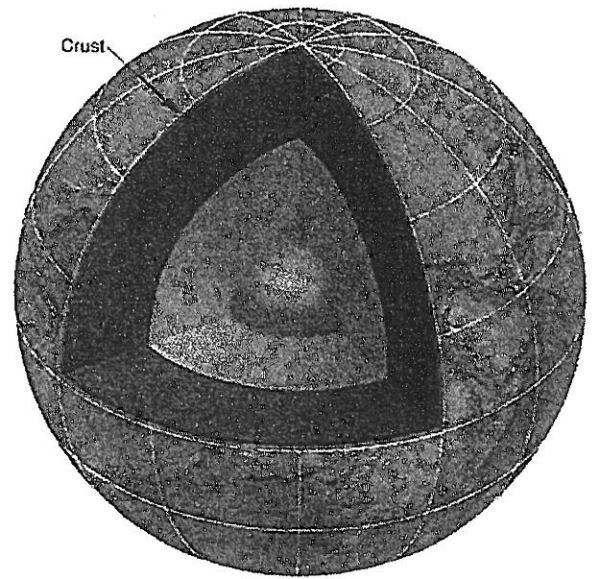


Try This! Write a riddle about a continent. Ask a friend to solve it. 14

Bill Nye The Science Guy Earth's Crust

****Circle or fill in the blank to correctly complete the sentences below****

1. Bill Nye The Science Guy, "Earth's Crust" is brought to you by _____.
2. You and I live on the Earth's (**crust, mantle, core**) a thin layer of solid rock that's all around the Earth.
3. The core is solid (**dirt, ice, iron**).
4. Earth's core is around (**500, 1500, 5000**) degrees Celsius.
5. Earth's mantle is around (**2000, 1000, 1200**) degrees Celsius.
6. Volcanoes give us a _____ to what's underneath the Earth's crust.
7. Scientists believe that Earth's crust is made of tectonic _____.
8. The plates are floating on the Earth's (**crust, mantle, core**).
9. Scientists believed that at one time all the plates of the Earth's crust were one piece called _____.
10. Where the tectonic plates are spreading apart we get (**volcanoes, lakes, mountains**).
11. Where the plates are coming together we get (**volcanoes, lakes, mountains**).
12. North America is moving away from Europe at about _____ every year.
13. Shifting tectonic plates cause _____.
14. Earth's core is about (**1200, 2800, 3600**) km. across.
15. Earth's _____ is the thinnest part of the planet.



Name _____

Date _____

Quiz **Earth's Crust**

True or False? Circle T or F

1. The Earth is made up of the following layers: crust, mantle and core. T or F
2. All the layers of the inner Earth are hot; only the Earth's crust is cool. T or F
3. The Earth's crust is made up of one giant plate that does not move. T or F
4. Scientists have determined that the Earth's core is a liquid by studying earthquakes. T or F
5. Scientists think that the Earth's core is solid because, when an earthquake occurs, people directly across from the epicenter do not feel the vibrations. T or F

Multiple Choice: Circle the letter of the best answer.

6. Which of the following constructive forces erupts with boiling water and steam instead of lava?
 - A Geyser
 - B Volcano
 - C Earthquake
 - D All of the above
7. When the Earth's plates come together we find:
 - A Volcanoes
 - B Geysers
 - C Mountains
 - D All of the above
8. Which of the following is a true statement about the Earth's tectonic plates?
 - A Plate movement is the same today as it was in the past.
 - B Plates move much slower today than in the past.
 - C The plates have moved very little since the time of Pangaea.
 - D None of the above.

NAME:

PER.:

DATE:

Earth Quest



Hall of Fame



The last photo ever taken of Alfred Wegener, before he made his final visit to Greenland.

Alfred Wegener: a Man Ahead of his Time

Alfred Wegener was a German geophysicist whose theory of continental drift was to revolutionize the science of geology. He was born in Berlin, the son of an orphanage director.

He gained a doctorate in astronomy in 1905, and for much of his career Wegener worked in meteorology. The following year he joined a Danish expedition to Greenland to study polar air circulation. He spent two years there, and made a further three journeys to Greenland during his lifetime.

Wegener joined the German army at the outbreak of the First World War, but was injured shortly afterward. During a long period of convalescence, his attention focused on an issue which had interested him for several years - the origins of the Earth's continents. Like other scientists before him, Wegener was intrigued how the coastlines of eastern South America and western Africa might fit together if the two continents were juxtaposed.

He speculated that the two continents were once joined; furthermore, he proposed that all of the present-day continents originally formed one landmass, which he called Pangaea (meaning 'all lands' in Greek). Wegener believed that the supercontinent began to break into smaller continents around 200 million years ago.

In 1915, Wegener published his hypothesis in a book entitled *The Origin of Continents and Oceans*. The idea that the continents might have moved over the course of time was not new: the Dutch cartographer Abraham Ortelius had come to this conclusion in 1596, suggesting that the continents had been ripped apart by earthquakes and floods. However, Wegener's theory was supported by scientific evidence, such as the discovery of fossilized tropical plants beneath the Greenland icecap, and the fact that there were glaciated

landscapes in the tropics of Africa -

Unfortunately, Wegener's book met with considerable hostility. Contemporary scientists held the view that continents and oceans held permanent positions on the globe. The key question which Wegener's theory had not addressed convincingly was to account for a force that was sufficiently powerful to move huge masses of rock over enormous distances. The English geophysicist Harold Jeffreys argued, quite correctly, that a mass of solid rock would simply break up if it plowed through the ocean floor.

Despite the rejection of his theory by his peers, Wegener continued to search tenaciously for further evidence to support his ideas until the end of his life. After the First World War, he worked in Hamburg on meteorological research for the German government. In 1924, he fulfilled one of his lifetime's ambitions: after a long and seemingly fruitless search, he gained an academic post as professor of meteorology and geophysics at Graz university in Austria.

In September 1930, Wegener made a final expedition to Greenland, to help establish a weather station to study the jet stream. Despite appalling weather, Wegener insisted on getting to the station, he knew that the researchers working there were in desperate need of supplies. After five weeks, Wegener succeeded in reaching the station. Unfortunately he froze to death on his return journey to base camp, the body only being recovered the following summer.

A year before Wegener's death, the English geologist Arthur Holmes speculated that convection currents in the Earth's mantle might account for continental movement. After the war, Wegener's work gradually gained credence, following studies of the Earth's magnetic field and the discovery of the phenomenon of seafloor spreading. Full acceptance came in the mid-60s, when the theory of plate tectonics provided a mechanism that would account for the movement of the continents.

last

Go to the previous Famous Scientist

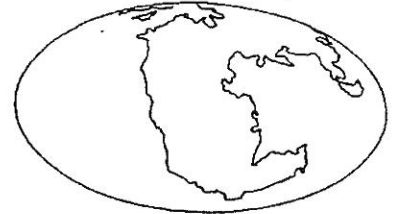
Go to the next Famous Scientist



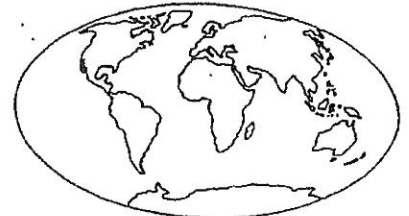
For more information, go back to the Earthquest CD-ROM and look up: Continental Drift and Plate Tectonics.

Continental Drift

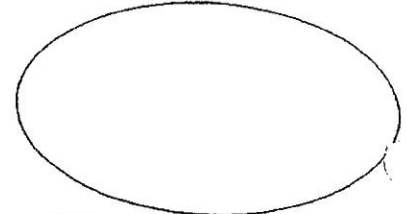
Scientists believe that all the continents were once connected, forming one large land mass called Pangaea. About 200 million years ago, Pangaea began to split into pieces. Slowly, over millions of years, the land masses drifted apart.



Pangaea



the continents today



200 million years from now

A theory called plate tectonics attempts to explain continental drift, or the moving of land masses. The theory states that the earth's crust and upper mantle consist of several enormous, irregularly shaped plates. These plates rest on an extremely hot semi-solid layer of rock that moves them slowly, from $\frac{1}{2}$ inch to 4 inches per year. As these plates move, they carry the continents and the ocean floor with them. Today, of course, we have seven continents.

In the oval to the right, draw what you think the world might look like 200 million years from now. Use the above information as a guide.

1. Why do you think that in the future the world will look as you have drawn it above?

2. Plate tectonics is a theory. Explain the difference between a theory and a fact.

3. A continent is a huge land mass. Look carefully at the middle map above. Some people claim that the continents of Europe and Asia make up a single continent called Eurasia. Do you agree or disagree? Why?

4. When the earth consisted of a single large land mass called Pangaea, there was only one giant ocean, Panthalassa. List the names of the three major oceans labeled on world maps today.

Why could it still be said that there is only one giant ocean today?

Do Now!

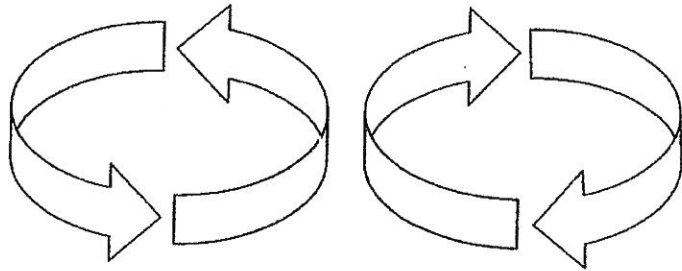
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- 1) NAME THE TYPE OF PLATE BOUNDARY THAT OCCURS WHEN TWO LITHOSPHERIC PLATES ARE MOVING **TOWARD** EACHOTHER AND CRUST IS BEING DESTROYED.

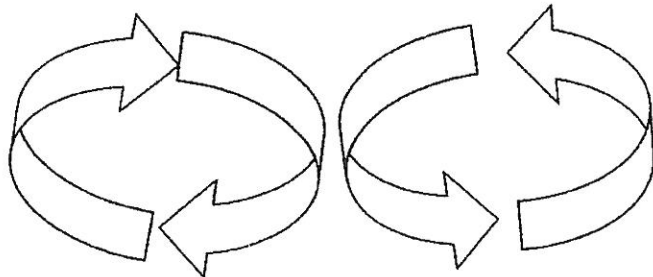
- 2) NAME THE TYPE OF PLATE BOUNDARY THAT OCCURS WHEN TWO LITHOSPHERIC PLATES ARE MOVING **AWAY** FROM EACHOTHER AND CRUST IS BEING FORMED.

- 3) LABEL THE **CONVECTION CURRENTS** WITH THE PLATE BOUNDARY THAT THEY WOULD FORM IF THIS WAS OCCURING IN THE **MANTLE** BELOW.

A. _____



B. _____





Reinforcement

Theory of Plate Tectonics

Directions: Use the following words to fill in the blanks below.

asthenosphere

lithosphere

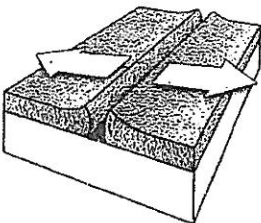
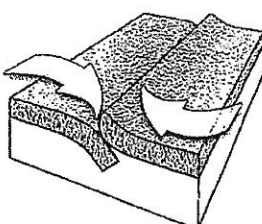
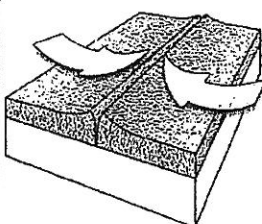
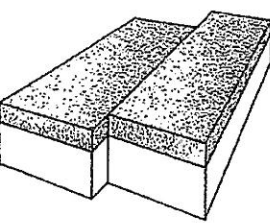
plate tectonics

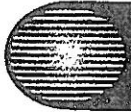
convection

plates

- The theory of _____ states that Earth's crust and upper mantle are broken into sections.
- These sections, called _____, are composed of the crust and a part of the upper mantle.
- The crust and upper mantle together are called the _____.
- Beneath this layer is the plasticlike _____.
- Scientists suggest that differences in density cause hot, plasticlike rock to be forced upward toward the surface, cool, and sink. This cycle is called a _____ current.

Directions: Four diagrams are shown in the table below. Label and describe each diagram in the space provided in order to complete the table.

Diagram	Type of boundary and motion at boundary	Diagram	Type of boundary and motion at boundary
6. 		8. 	
7. 		9. 	



Directed Reading for
Content Mastery

Key Terms Plate Tectonics

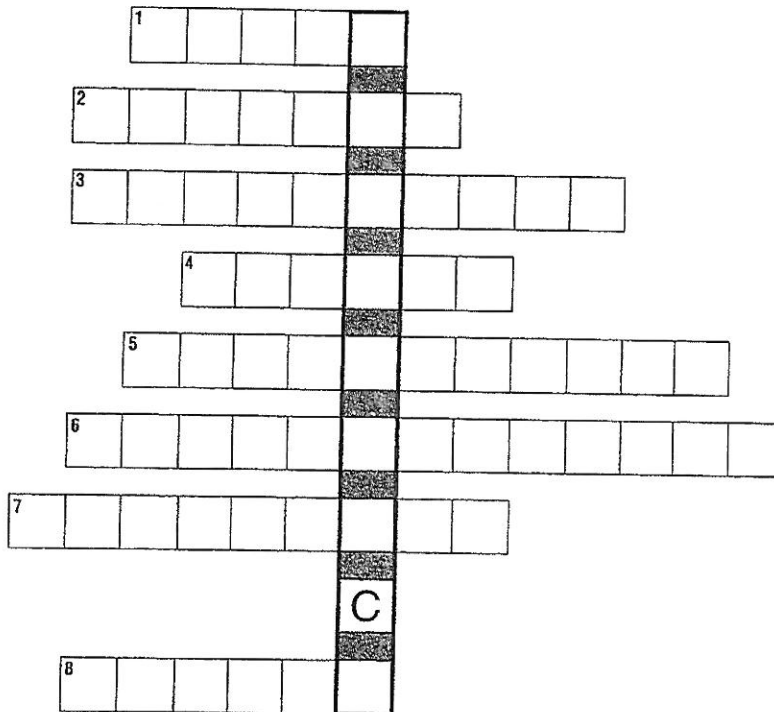
Directions: Use the following terms to complete the puzzle below. The letters in the darker, vertical box complete question 9.

Pangaea
convection

mantle
plates

spreading
drift

lithosphere
asthenosphere



1. The hypothesis that continents move slowly is called continental _____.
2. All continents once might have been connected in a large landmass called _____.
3. The cycle of heating, rising, cooling, and sinking is a _____ current.
4. Just below Earth's crust is the _____.
5. The crust and part of the upper mantle are known as the _____.
6. Continental plates move on the plasticlike layer of Earth's surface called the _____.
7. Hot magma forced upward at mid-ocean ridges produces seafloor _____.
8. Sections of Earth's crust and part of the upper mantle are called _____.
9. The theory that Earth's crust and upper mantle are in sections that move is called plate _____.

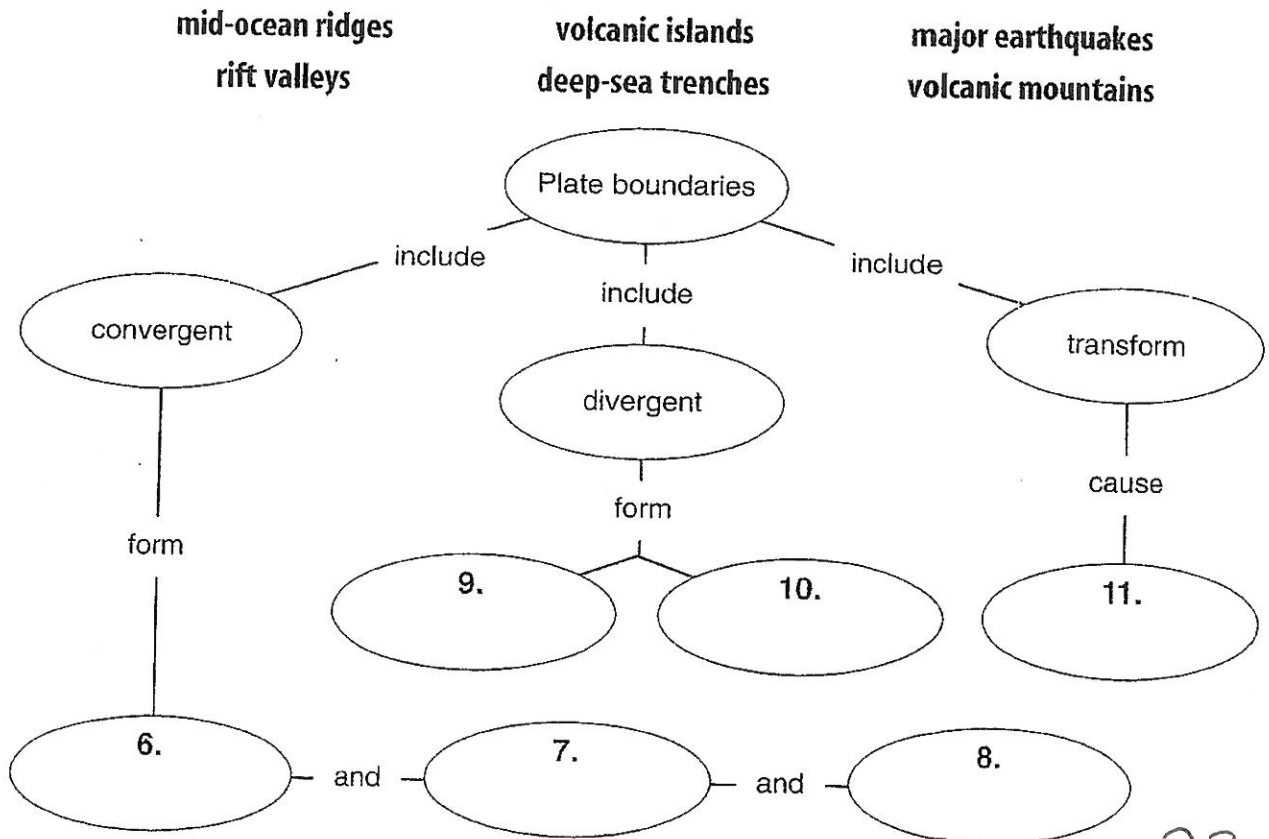


Section 3 ■ Theory of Plate Tectonics

Directions: In the blank at the left, write the letter of the term that best completes the sentence.

- _____ 1. Earth's crust and upper mantle are broken into sections called _____.
 a. lava. b. plates.
- _____ 2. The collision of one continental plate with another may produce _____.
 a. oceans. b. mountains.
- _____ 3. New ocean crust is formed at a _____.
 a. rift valley. b. mid-ocean ridge.
- _____ 4. A rift valley can form where two continental plates are _____.
 a. moving apart. b. colliding.
- _____ 5. Where Earth's plates move, they may slide alongside one another, pull apart, or _____.
 a. collide. b. divide.

Directions: Complete the concept map using the terms in the list below.





Chapter Review

Plate Tectonics

Part A. Vocabulary Review

Directions: Write the term that matches each description below in the spaces provided. Then unscramble the letters in the boxes to reveal the mystery phrase.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

1. plasticlike layer of Earth's surface below the lithosphere
2. cycle of heating, rising, cooling, and sinking
3. theory that states that Earth's crust and upper mantle are broken into sections, which move around on a special layer of the mantle
4. area where an oceanic plate goes down into the mantle
5. plate boundary that occurs when two plates slide past one another
6. place where two plates move together
7. rigid layer of Earth's surface made up of the crust and a part of the upper mantle
8. sensing device that detects magnetic fields, helping to confirm seafloor spreading
9. one large landmass hypothesized to have broken apart about 200 million years ago into continents
10. hypothesis that the continents have moved slowly to their current locations
11. boundary between two plates that are moving apart
12. sections of Earth's crust and upper mantle
13. largest layer of Earth's surface, composed mostly of silicon, oxygen, magnesium, and iron
14. outermost layer of Earth's surface
15. where rocks on opposite sides of a fault move in opposite directions or in the same direction at different rates
16. Mystery phrase: _____

SECTION



Reinforcement

Continental Drift

Directions: Match the descriptions in Column I with the terms in Column II. Write the letter of the correct term in the blank at the left.

Column I

- _____ 1. reptile fossil found in South America and Africa
- _____ 2. fossil plant found in Africa, Australia, India, South America, and Antarctica
- _____ 3. clues that support continental drift
- _____ 4. mountains similar to those in Greenland and western Europe
- _____ 5. Wegener's name for one large landmass
- _____ 6. slow movement of continents
- _____ 7. evidence that Africa was once cold

Column II

- a. Pangaea
- b. Appalachians
- c. continental drift
- d. glacial deposits
- e. *Glossopteris*
- f. *Mesosaurus*
- g. fossil, climate, and rock

Directions: Answer the following questions on the lines provided.

8. How did the discovery of *Glossopteris* support Wegener's continental drift hypothesis?

9. Why was Wegener's hypothesis of continental drift not widely accepted at the time it was proposed? What do scientists now think might be a possible cause of continental drift?

Bill Nye: Earthquakes

Name _____ Date _____ Period _____

1. Earthquakes happen when the Earth's _____ move around.
2. The Earth's surface is _____ on molten rock.
3. The Earth's surface is broken into _____ plates.
4. The cracks in the plates are called _____.
5. Scientists measure movement of the Earth's surface with a device called a _____.
6. When you record the movement of the Earth's surface on paper, it's called a _____.
7. When anything is heated up, the molecules move _____.
8. Where the plates move apart, we get _____.
9. Where the plates move together, we get _____.
10. The center of the earthquake is the _____.
11. Name 3 items you need in an earthquake kit.
 - a.
 - b.
 - c.
12. The _____ is the way to compare the size of one earthquake to the size of another.
13. Each magnitude of the Richter Scale has _____ times more energy than the next smaller magnitude.