Name_____
Period_____Assign# ____

Forces of Nature—Earthquakes

http://www.nationalgeographic.com/forcesofnature/interactive/index.html
Under "Choose a Force" click on the Earthquake Icon

Read the information in the box on the left; fill in the answers below:

1. Every year, scientific instruments detect about _____ quakes world wide. People feel only a small fraction of those.
2. How often do severe earthquakes that cause widespread damage occur? _____
3. Where and when did the deadliest earthquake in history occur?
   _____
4. On average, how many people die each year due to earthquakes? _____

Click on Tab 2 (Where do Earthquakes Occur? (at top))

5. Where is the largest "Quake Belt" on earth? _____

Click on Tab 3 (What causes earthquakes? (at top))

6. Read the information and then "fly" over the San Andreas fault. How long is this fault? _____ How deep does it extend into the crust? _____

Click on Tab 4 (Types of Faults (at top))

7. Click on each type of fault and describe it:
   i. Normal: _____
   ii. Reverse: _____
   iii. Strike-Slip: _____
   iv. Dip-Slip: _____

Click on Tab 5 (Measurement & Recording (at top))

8. What is an epicenter? _____
9. Hit **Next**. What is a seismograph? _____
   _____
10. What is the Richter Scale? _____
    _____
11. Are earthquakes preventable? _____

Click on Tab 6 (Locate an earthquake (at top))

12. Why are 3 recording stations needed when an earthquake occurs? _____
    _____
13. Hit "Trigger an Earthquake". Follow the directions; click on the triangles. Where is the epicenter of this quake? _____ What is its magnitude? _____
    _____

Click on Tab 7 (Trigger an Earthquake (at top))

14. What is one factor that must be considered by engineers when building ? _____

_____

15. Try to simulate an earthquake. Fill in the table below with your results:

	MAGNITUDE	
GROUND TYPE	LOW	HIGH
BEDROCK		
FAULT ZONE		
LANDFILL		

Click on the tab at the top right that says "Map".

1. Where are the most earthquakes in the United States?_____
2. Click on the dot that says "Loma Prieta". Discuss one specific example of damage caused by this particular earthquake: _____

   _____
3. Click on the map tab again and select the 1906 quake in San Francisco. What was the major damage from this quake caused by? _____
4. Click on the bottom to watch the newsreel of footage, comparing San Francisco before and after the earthquake. Also scroll through the other pictures. Describe what it looked like ***after*** the earthquake: _____

   _____

   _____

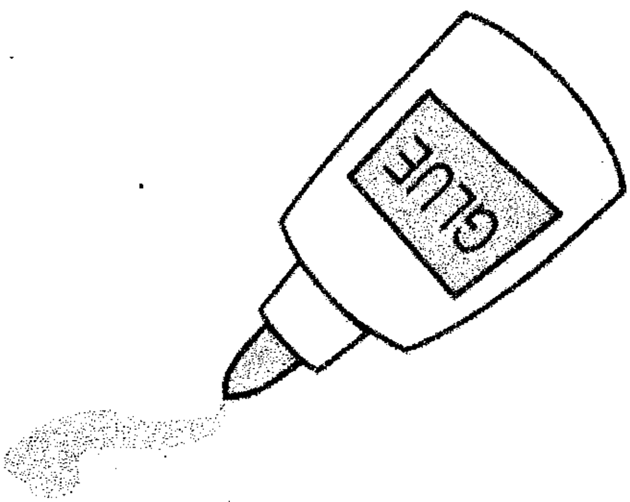
If time, try this:

Virtual Earthquake

http://nemo.sciencecourseware.org/VirtualEarthquake/VQuakeExecute.html

Earthquakes

Name: ________



Put glue on this section of the pop up book ONLY.

Earthquake Vocabulary

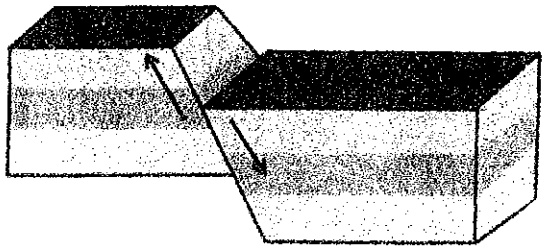
1. Fault
2. Magnitude
3. Richter Scale
4. Tsunami
5. ____________
6. ____________

What are earthquakes?

How are volcanoes and earthquakes linked to plate tectonics?

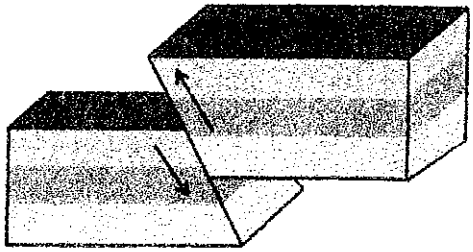
Normal Fault

Explain the type of movement that takes place at this fault.



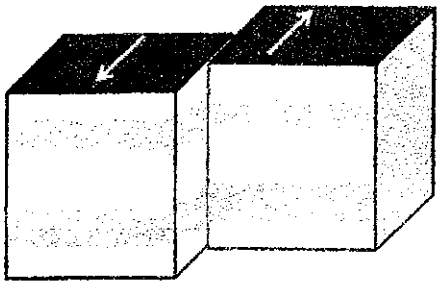
Reverse Fault

Explain the type of movement that takes place at this fault.



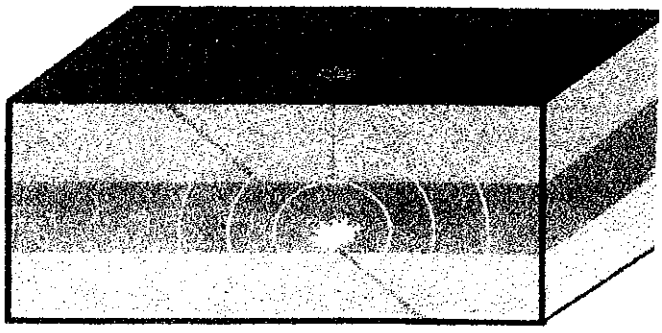
Sliding / Transform Fault

Explain the type of movement that takes place at this fault.



Focus & Epicentre

Label and explain the difference between an earthquake's focus and its epicentre.



PIECES OF A PUZZLE: CONTINENTAL DRIFT ACTIVITY

Names:

Directions: Look at the CONTINENT SHAPES page visualizing how all the shapes might have fit together like a puzzle 300 million years ago. Using the four maps pictured on the activity sheet provided establish evidence for Wegener's theory of Continental Drift. Use different colors to represent different types of evidence and a key to organize your data.

STEP 1: Color code your puzzle pieces before cutting them out. Remember to use the four maps as guides. Copy the KEY to your paper and then complete it.

KEY			
One type/age of Rock	Fossils	Glacial Deposits	Mountain Belts

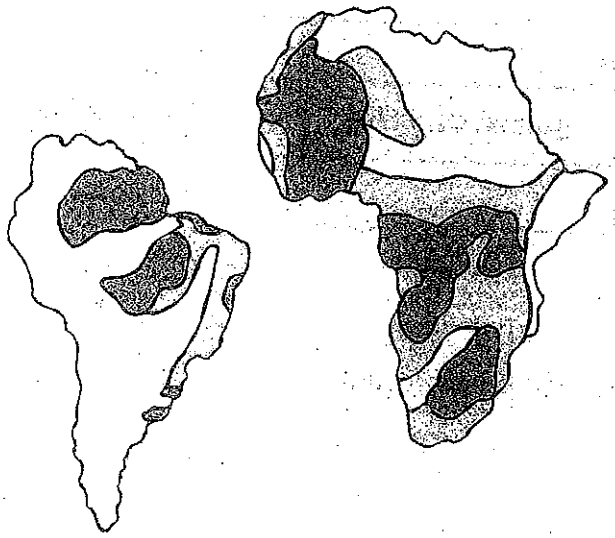
STEP 2: **Cut out** the pieces and then **match** them according to the data (colors) to form the super continent **PANGAEA**. **Glue** the pieces to the construction paper and then **answer** the following questions on your paper **(remember your name at the top of your paper and on your model)**. Use your book to discover other answers not shown by the maps. PG 156 – 158.

1. Which two continents fit together the best?
2. What three kinds of evidence support Wegener's theory that these continents were once joined?
3. What fossil was found on almost every landmass?
4. If reptiles could not swim far, how is it possible for fossilized organisms to be on different landmasses?
5. How is it possible for tropical plant fossils to be found in the Arctic, while glacial remains have been discovered in South Africa?
6. What was Wegener's first name?

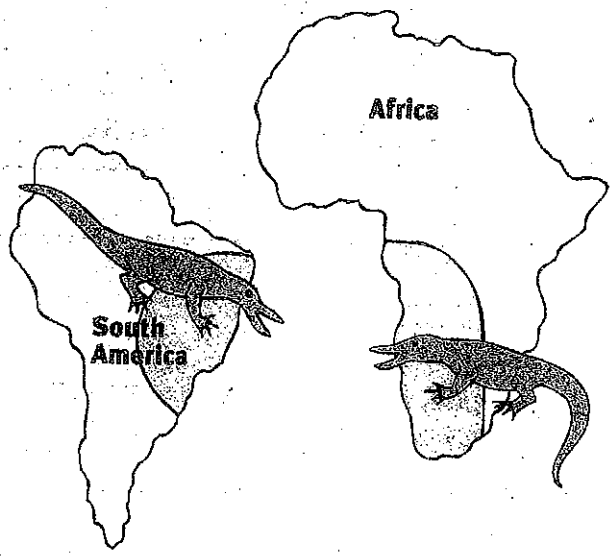
Name_____ Date_____ Activity Sheet 1, Part B

Pieces of a Puzzle

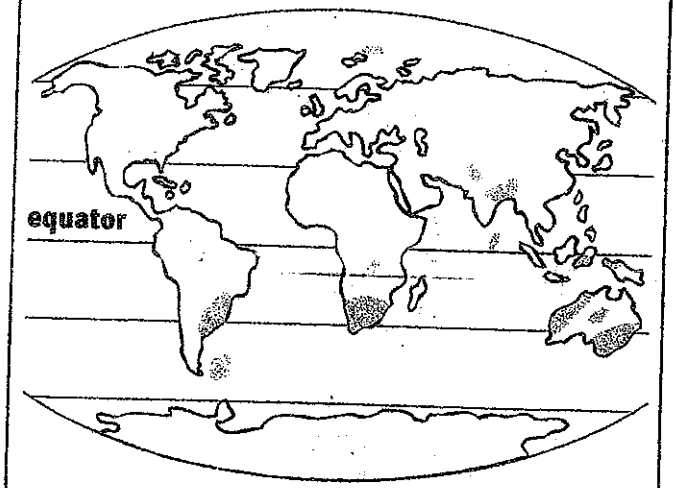
The shaded areas indicate the locations of different types and ages of rock in South America and Africa.



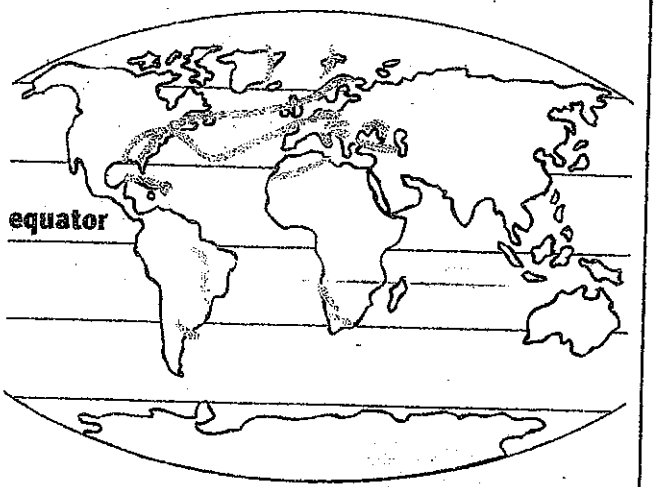
Matching fossil remains of a reptile that lived on land and in freshwater were found on two continents now separated by ocean.



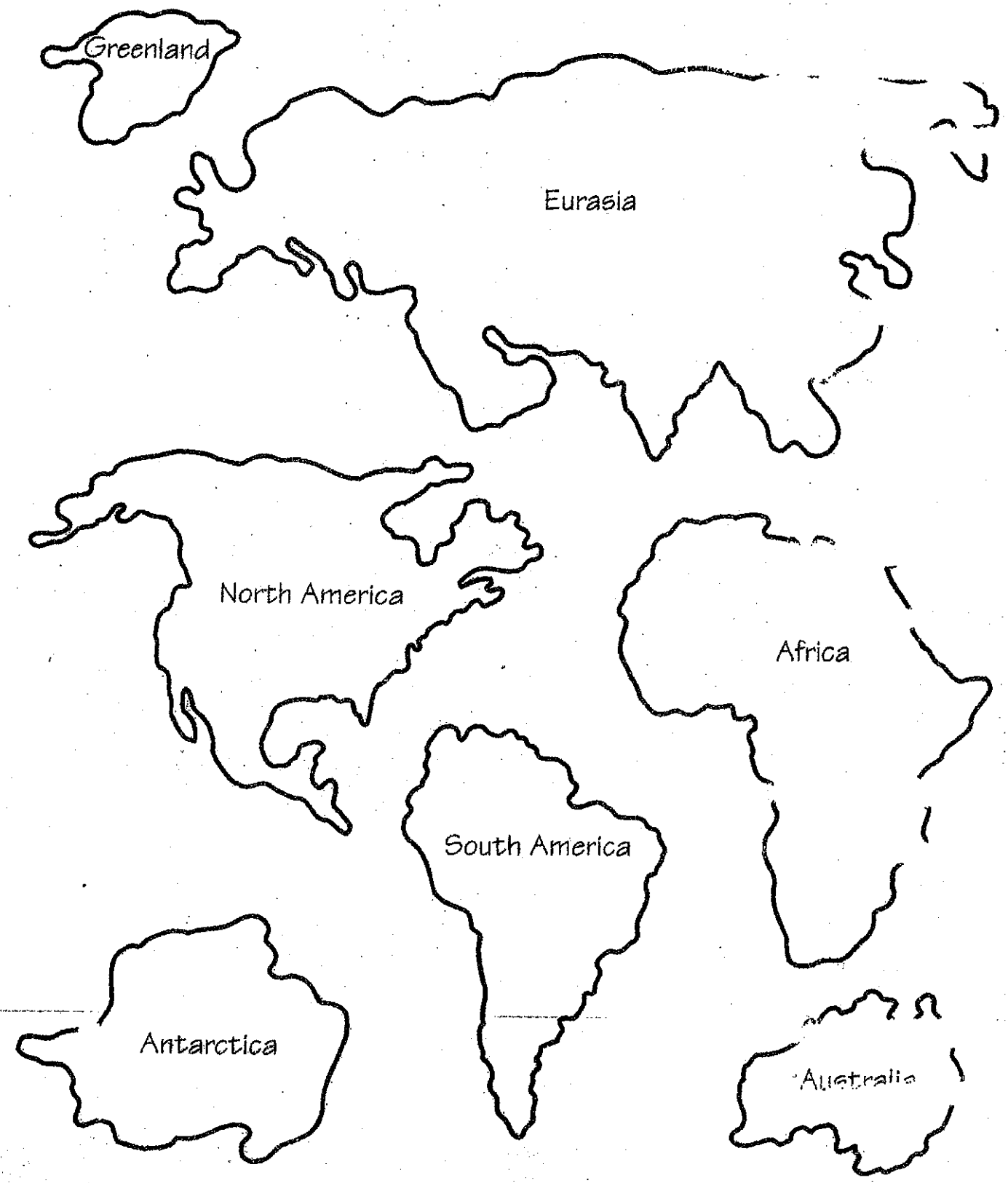
The shaded areas indicate the locations of glacial deposits of the same age and type.



The lines represent matching mountain belts on both sides of the Atlantic Ocean.



Continent Shapes



Continent Shapes
192-0412

Model of Fault Activity

Answer the Questions (help on pg 182-183) **and Complete the Activity**

NF - Normal Faults
TF - Thrust Faults (Reverse Faults)
SF - Strike-slip Faults

1. What faults are often associated with divergent (tensional) boundaries?
2. What faults are often associated with convergent (compressional) boundaries?
3. What faults are often associated with transform (sliding) boundaries?
4. What kind of faults would you expect to find in the Himalaya Mountains?
5. What kind of faults would you expect to find along the Mid-Atlantic Ridge?
6. What kind of fault is the San Andreas Fault? Is California likely to "fall off into the Pacific Ocean"?

Fault Model

Color the fault model according to the key below.

- Glue the fault model onto a piece of construction paper.
- Cut out the fault model and fold each side down to form a box with the drawn features on top.
- Glue the corners together. This box is a three dimensional model of the top layers of the Earth's crust.
- Cut along the dashed lines.

Coloring Key

- Rock Layer X - green
- Rock Layer Y - yellow
- Rock Layer Z - red
- River - blue
- Road - black
- Railroad tracks - brown
- Grass - green

A. The dashed lines on your model represent a _____.

Normal Fault DIVERGENT

Locate points A and B on your model. Move point B so that it is next to Point A. Observe your model from the side (its cross-section). Draw the model on your answer sheet and label "normal fault".

B. Which way did point B move relative to point A?
C. What happened to rock layers X, Y and Z?
D. Are the rock layers still continuous?
E. What likely happened to the river? the road? the railroad tracks?
F. Is this type of fault caused by tension, compression or shearing?

Many normal faults are found in Nevada. This is because Nevada is located in a region called the Basin and Range Province where the lithosphere is stretching.

Thrust Fault (Reverse Fault) CONVERGENT

Locate points C and D on your model. Move Point C next to point D. Observe the cross-section of your model. Draw the model on your answer sheet and label "thrust fault".

G. Which way did point D move relative to point C?
H. What happened to rock layers X, Y and Z?
I. Are the rock layers still continuous?
J. What likely happened to the river? the road? the railroad tracks?
K. Is this type of fault caused by tension, compression or shearing?

An example of a thrust fault is the fault in which the Northridge earthquake occurred. The thrusting movement raised the mountains in the area by as much as 70 cm.

Strike-slip Fault TRANSFORM

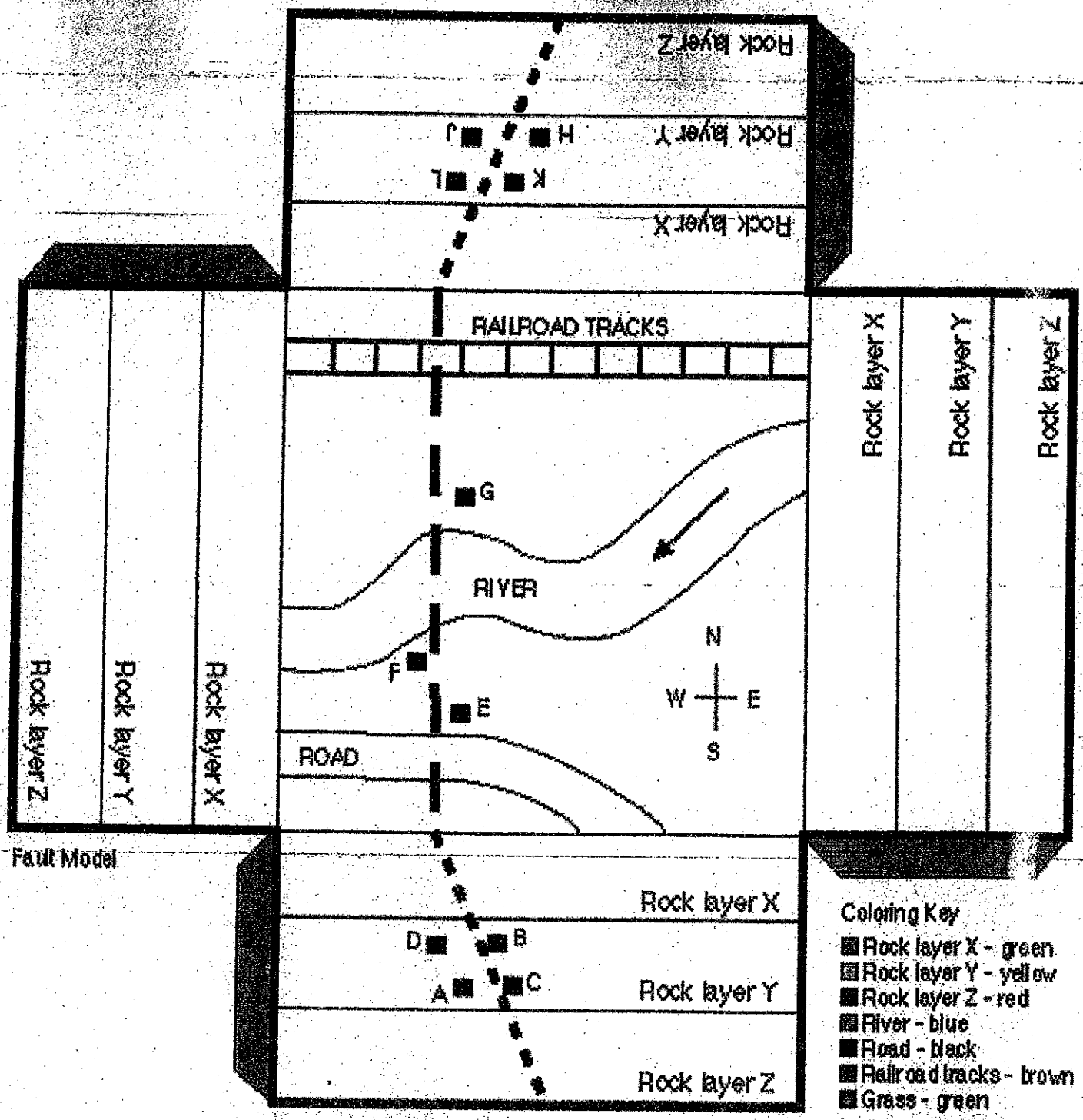
Locate points F and G on your model. Move the pieces of the model so that point F is next to point G. Draw an overhead view of the surface as it looks after movement along the fault and label "strike-slip fault".

L. If you were standing at point F and looking across the fault, which way did the block on the opposite side move?
M. What happened to rock layers X, Y, and Z?
N. Are the rock layers still continuous?
O. What likely happened to the river? the road? the railroad tracks?
P. Is this type of fault caused by tension, compression or shearing?

A strike-slip fault can be described as having right or left-lateral movement. If you look directly across the fault, the direction that the opposite side moved defines whether the movement is left-lateral or right-lateral. The San Andreas Fault in California is a right-lateral strike-slip fault.

*Make sure your name is on your answer sheet and on your model!

Model


Rock layer Z
Rock layer Y
Rock layer X
H
J
K
L
RAILROAD TRACKS
G
RIVER
F
E
ROAD
N
W
E
S
Rock layer X
Rock layer Y
Rock layer Z
Rock layer Z
Rock layer Y
Rock layer X
Fault Model
Rock layer X
D
B
A
C
Rock layer Y
Rock layer Z
Coloring Key
Rock layer X - green
Rock layer Y - yellow
Rock layer Z - red
River - blue
Road - black
Railroad tracks - brown
Grass - green

Name _____

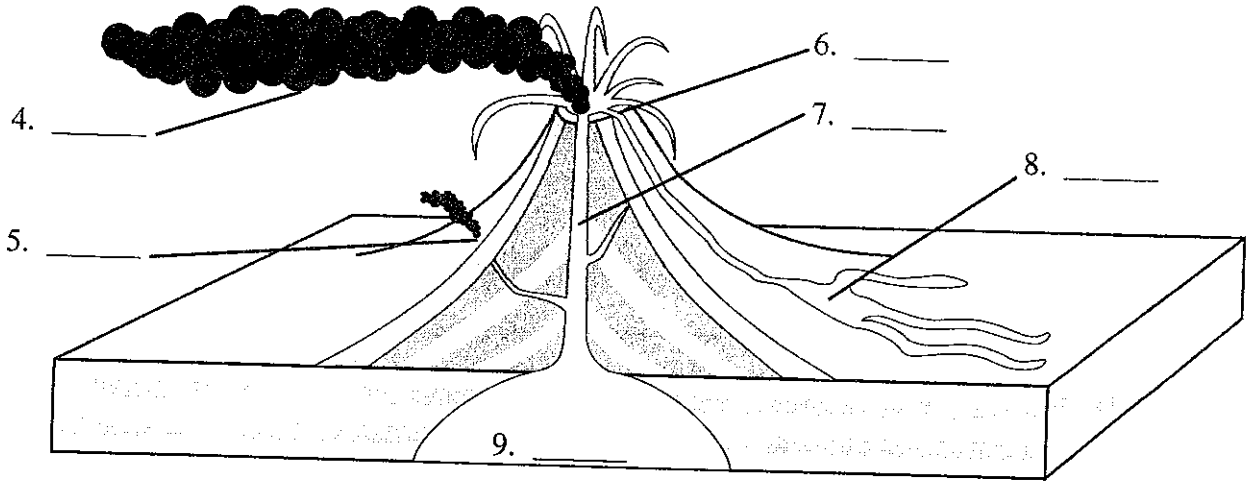
Volcanoes

In each box below make a simple sketch of that type of volcano. Be sure your sketch shows how each type of volcano is different from the others.

1. cinder cone
2. shield
3. composite

Write letters in the blanks to label the parts of the volcano below.

A. vent	**B.** ash cloud	**C.** crater	**D.** magma chamber	**E.** conduit	**F.** lava



10. What is the difference between magma and lava?

_____

_____

11. Why do most volcanoes occur along plate boundaries?

_____

_____

_____

12. The word *volcano* comes from *Vulcan*, the name of the Roman god of fire, especially destructive fire. Why is *volcano* a good name for these formations?

_____

_____

GEOBLOX®

Earthquake

Instructions:

1. For best results, copy this pattern onto cardstock.
2. Color the model before cutting out the parts.
3. Cut along solid lines, fold along dashed lines, and glue along dotted lines.
4. Assemble the *Base*.
5. See image of completed model below.

Base

Glue tab to inside of model

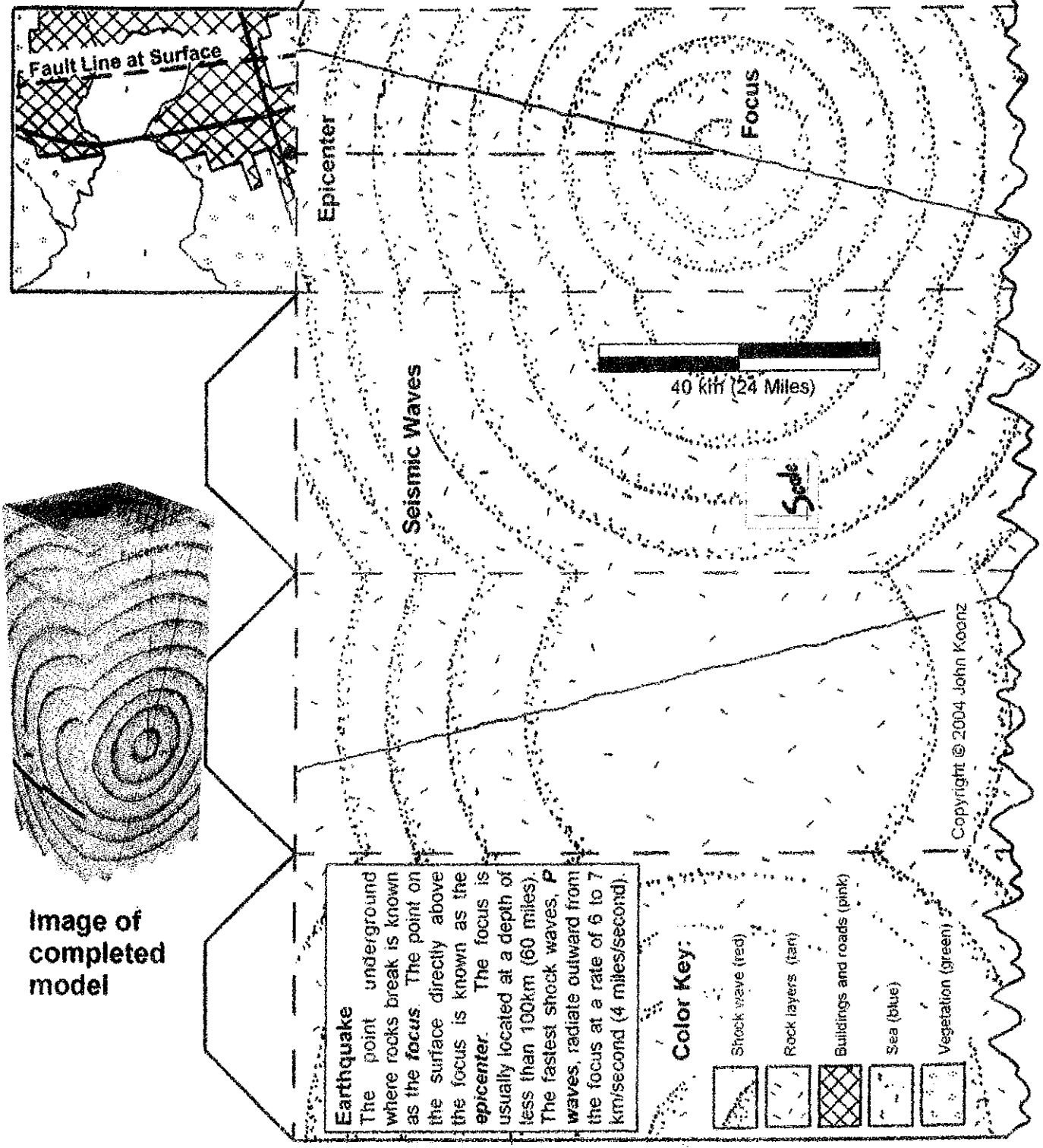
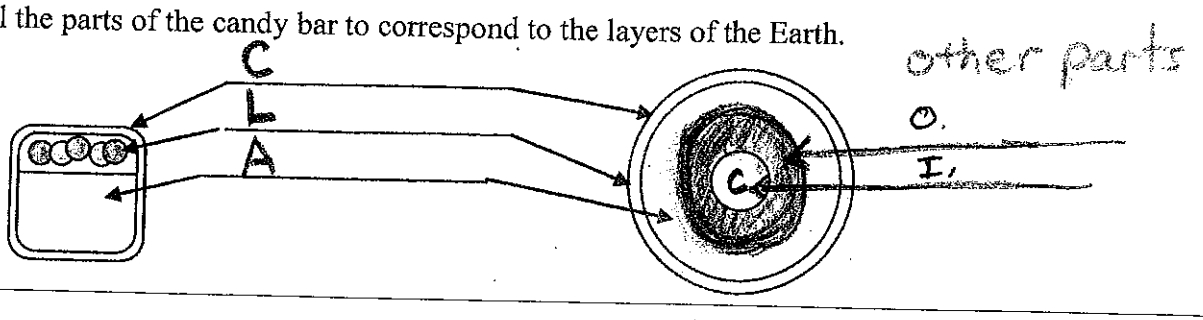


Image of completed model

Candy Bar Tectonics Name _____

1. Label the parts of the candy bar to correspond to the layers of the Earth.



2. Use your fingernail to make small cracks in the surface of your "Earth" or candy bar.

   ? What do we call the cracks in the Earth's surface? _____

   ? What do we call the large pieces of Earth's crust? _____

3. **Tension** is a force that pulls on the plates of Earth's crust causing them to move apart.

   ➢ Slowly pull on the ends of your candy bar.

   ? What happens? List two things you observed.

4. **Compression** is a force that pushes on the plates of Earth's crust causing them to move together.

   ➢ Slowly push on the ends of your candy bar.

   ? What happens? List two things you observed.

5. **Shearing** is a force that pushes on the plates of Earth's crust causing one to move in one direction and the other plate in the opposite direction.

   ➢ Slowly push one way on one end of your candy bar and push the opposite direction on the other end.

   ? What happens? List two things you observed.

Name: _____ Date: _____

Oreo Cookies and Plate Tectonics

Amateur geologists can simulate how plates move on the Earth's surface.

The term **tectonics** originates from the Greek word "tektõn," referring to a builder or architect. **Plate tectonics** suggests that large features on Earth's surface, such as continents, ocean basins, and mountain ranges, result from interactions along the edges of large plates of Earth's outer shell. This outer shell is called the **lithosphere** from the Greek "lithos," meaning hard rock. The plates, composed of Earth's crust and uppermost mantle, ride on a warmer, softer layer of the mantle, called the **asthenosphere.**

In our experiment, the upper cookie will represent the **lithosphere**, the creamy filling the **asthenosphere**, and the lower cookie the **lower mantle**.

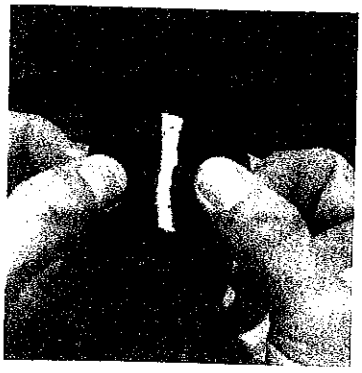
Plates move in <u>three basic ways</u>. Let's look at them one by one.

Choose a cookie. Don't eat it...yet!

1. First, carefully remove the upper cookie (a "twisting" motion is required).
2. Slide the upper cookie over the creamy filling. This motion simulates the movement of a rigid lithospheric plate over the softer asthenosphere.
3. Next, break the upper cookie in half. As you do so, listen to the sound it makes.

What sound do you hear? _____

What does that breaking represent? _____



4. Let's look at **<u>divergent plate boundaries.</u>** Divergent means _____.

5. Now push down on the two broken cookie halves and slide them apart. What happens to the creamy filling?

_____

6. Now let's look at **convergent plate boundaries.**
Convergent means _____

7. Take the two cookie halves and slowly push them toward each other. What happens to the filling as the plates slide together?_____
_____

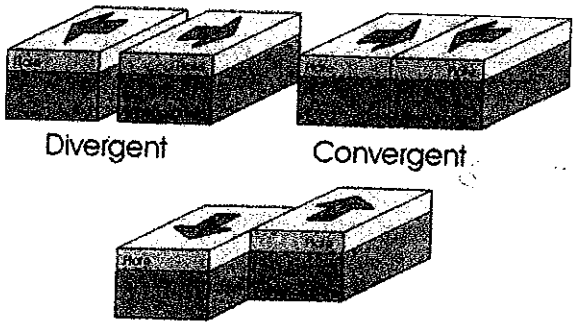
What happens to the cookies as they push against each other?_____

8. Now let's look at a **transform plate boundary.** Try sliding the two cookie pieces laterally past one another, over the creamy filling. What do you notice about the cookie edges?

_____
_____

(You can feel and hear that the "plates" do not slide smoothly past one another, but rather stick then let go, stick then let go. The cracking sound you hear each time is like an earthquake occurring along the San Andreas Fault in California.)

9. Some of Earth's landforms are created by **hotspots** where a plate rides over a fixed "plume" of hot mantle, creating a line of volcanoes. Imagine if a piece of hot, glowing coal were imbedded in the creamy filling – a chain of "volcanoes" would be burned into the overriding cookie.



BONUS

1. What does the theory of Plate Tectonics suggest?

2. Why is the word " tectonics" used as part of the name of the theory?

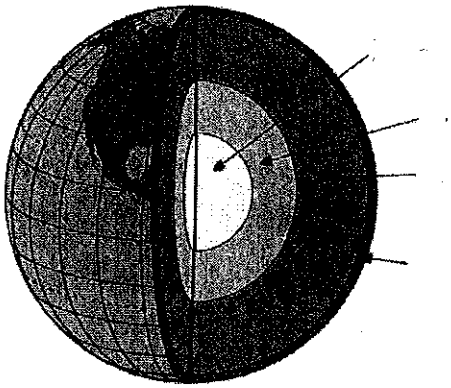
Interactives – Dynamic Earth

http://www.learner.org/interactives/dynamicearth/index.html

The Earth – Think it's solid as a rock?

- **Start your exploration with Earth's Structure……**

Label the diagram of Earth's Interior



What are the vibrations generated by earthquakes called? _____

	INNER CORE	OUTER CORE	MANTLE	CRUST
SOLID/LIQUID				
MADE OF……				
THICKNESS				
FUN FACT				

- **PLATE TECTONICS**

What is the difference between the two pictures of the Earth?

_____

_____

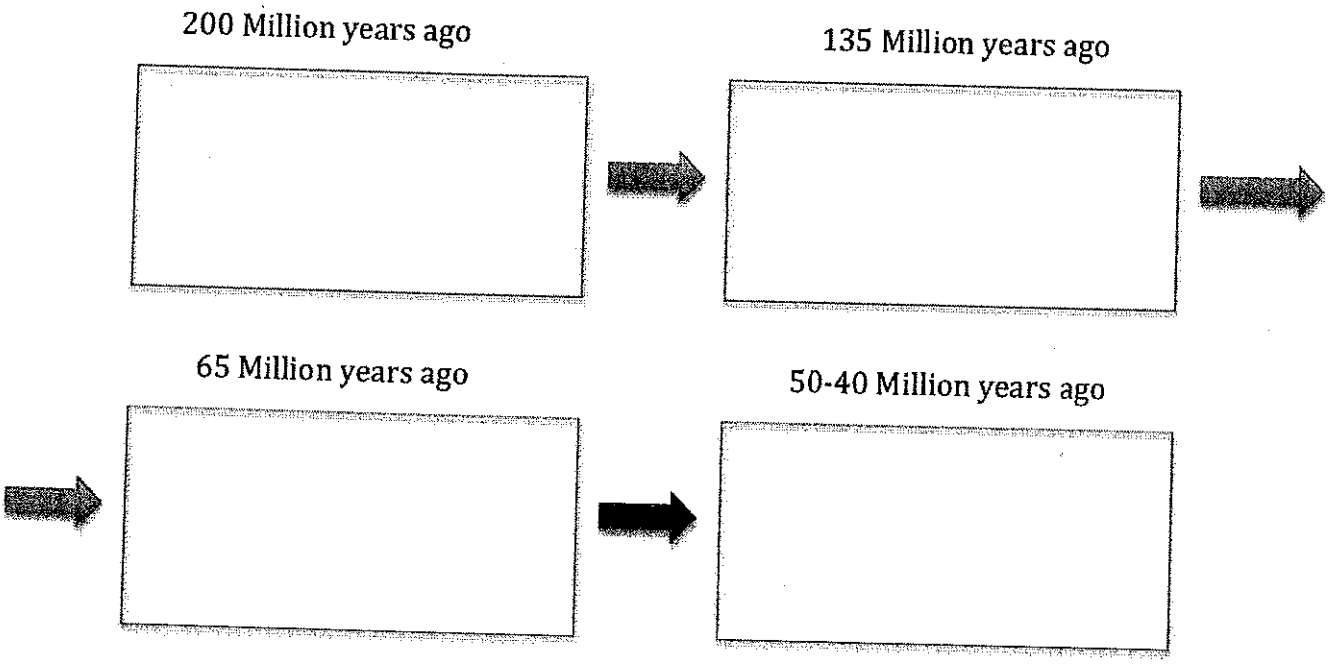
How many years ago did the continents look like the picture on the left?

_____

Which German Scientist suggested that Earth's continents were one joined together in one large mass? _____

What did he call this original landmass? _____

➢ CONTINENTS ON THE MOVE



The Earth's outer layer is broken into several large slabs called

_____

What explains how and why earthquakes, volcanoes, and other geologic events occur?

_____

TRY THE "CONTINENTS OVER TIME" ACTIVITY. HOW DID YOU DO?

➢ PLATES AND BOUNDARIES

How many major tectonic plates are there? _____

The type of crust that underlies the continents is called _____

The type of crust that underlies the oceans is called _____

Which crust is thicker? _____

What is a boundary? _____

DRAW EACH TYPE OF BOUNDARY

CONVERGENT	DIVERGENT	TRANSFORM

List one place each type of boundary is found;

CONVERGENT:

DIVERGENT:

TRANSFORM:

Use the map to locate each type of boundary and try the Plates and Boundaries Challenge. How did you do?

SLIP, SLIDE , AND COLLIDE

Subduction Zones and Volcanoes:

Roll the mouse over all the terms in the picture. Write down any that you need to study.

What is the Ring of Fire? _____

COLLISION ZONES AND MOUNTAINS:
What happens when two continental plates collide?

Which mountain range was formed by the collision of the Indian and Eurasian plates?

DIVERGENT BOUNDARIES:
What is sea-floor spreading?

What is a rift?

What do TRANSFORM BOUNDARIES result in?

Describe a strike-slip fault.

Take the Plate Interactions Challenge.

CLICK ON TEST SKILLS AT THE TOP OF THE PAGE. TAKE 30 QUESTION MULTIPLE CHOICE TEST. HOW DID YOU DO?

NOTES ON QUESTIONS YOU GOT WRONG: