Study guides must be signed by a parent and returned the day of the test. As a reminder, study guides are general guidelines as to what will be on the test and are not test specific.

Chapter 4 Plate Tectonics Study Guide
Test on Wednesday, December 17

Terms:

Continental Drift
Pangaea
Fossil
Plate
Fault
Mid-Ocean Ridge
Sea-Floor Spreading
Deep-Ocean Trench
Subduction
Rift Valley
Divergent Boundary
Convergent Boundary
Transform Boundary
Fault

Concepts:

Know Wegener's hypothesis about the continents.
Know what mid-ocean ridges are and what they form.
Know where sea-floor spreading begins.
Know what happens at deep-ocean trenches.
Know the theory of plate tectonics.
Know what continent/country moved the most from its position in Pangaea.
Know what the prefixes di, con, and trans mean.
Know what type of boundary creates mountains.
Know what type of boundary does not get created nor destroyed.
Know what type of boundary occurs along the mid-ocean ridge.
Know why old oceanic crust is more dense than new oceanic crust.

Skills:

Be able to identify diagrams of divergent, convergent, and transform boundaries.
Be able to identify what continents fit together using Wegener's theory.
Be able to identify imagines of deep-sea trench, mid-ocean ridge, and subduction zone.

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This study guide must be signed by a parent and returned the day of the test. Please remember to review what you highlighted in class in the text, worksheets, and use the study guide found in the text on page 134.

Student Name: _____

Dear Parents/Guardians,

Please verify the amount of time your student studied for our Ch. 4 Test.

Date: _____	Amount of time studied: _____
Date: _____	Amount of time studied: _____
Date: _____	Amount of time studied: _____
Date: _____	Amount of time studied: _____
Date: _____	Amount of time studied: _____

Parent Signature: _____

Name: _____

Chapter 4 Vocabulary

continental drift -

Pangaea -

fossil -

mid-ocean ridge -

sea-floor spreading -

deep-ocean trench -

subduction -

plate - Earth's lithosphere is broken into these pieces, separated by cracks

divergent boundary -

convergent boundary -

transform boundary -

plate tectonics -

fault -

rift valley -

Name _____ Date _____ Class _____

Review and Reinforce

Drifting Continents-Ch.4, Sec.1

Understanding Main Ideas

Answer the following questions in the spaces provided. Use a separate sheet of paper if you need more room.

1. State the hypothesis of continental drift.

2. Describe the land features that provided evidence for Wegener's hypothesis.

3. What role did the fossil *Glossopteris* play in Wegener's hypothesis?

4. How did Wegener use climate evidence to support his hypothesis?

5. Why did most scientists reject Wegener's theory for nearly half a century?

Building Vocabulary

Fill in the blank to complete each statement.

6. All the continents were joined together in a supercontinent that Wegener called _____.

7. A(n) _____ is any trace of an ancient organism preserved in rock.

8. Wegener's idea that the continents slowly moved over Earth's surface became known as _____.

Name _____ Date _____ Class _____

Key Concept Summary

Drifting Continents - Ch. 4, Sec. 1

What Was Wegener's Hypothesis About the Continents?

In 1910, a German scientist named Alfred Wegener became curious about why some continents look as though they could fit together. **Wegener's hypothesis was that all the continents were once joined together in a single landmass and have since drifted apart.** Wegener's idea that the continents slowly moved over Earth's surface became known as **continental drift.**

According to Wegener, the continents were joined together in a supercontinent, or single landmass, about 300 million years ago. Wegener called the supercontinent **Pangaea.** Over tens of millions of years, Pangaea began to break apart. The pieces of Pangaea slowly moved toward their present-day locations. These pieces became the continents as formed today.

Land features on the continents such as mountain ranges and coal fields provided Wegener with evidence for his hypothesis. Wegener also used fossils to support his hypothesis for continental drift. A **fossil** is any trace of an ancient organism that has been preserved in rock. Wegener also used evidence of climate change to support his hypothesis.

Wegener could not provide a satisfactory explanation for the force that pushes or pulls the continents. Because he could not identify the cause of continental drift, most geologists of his time rejected his idea.

~~On a separate sheet of paper,~~ identify the three forms of evidence that Wegener used to support his idea of continental drift.

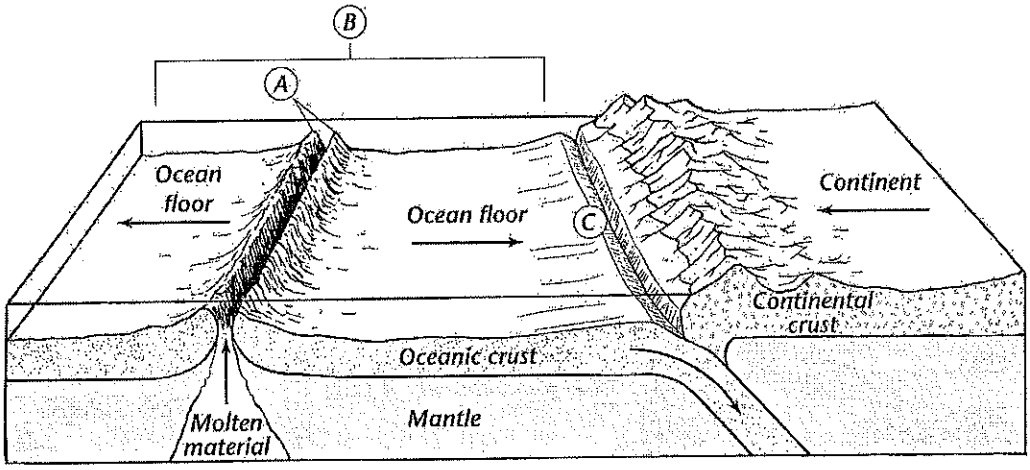
Name _____ Date _____ Class _____

Review and Reinforce

Sea-Floor Spreading (m) Ch. 4, Sec. 2

Understanding Main Ideas

Use the diagram below to answer Questions 1–5 on a separate sheet of paper.



1. Name ~~and describe~~ the feature of the ocean floor shown at A. _____
2. Name the process occurring at B, ~~and explain what results from it~~. _____
3. What happens to old oceanic crust as new molten material rises from the mantle? It is pushed _____ from the deep ocean ridge.
4. The arrows on the diagram show the ocean floor spreading from the ridge. What are three kinds of evidence scientists have found to support this idea?
   1. _____
   2. _____
   3. _____
5. What process is shown occurring at C, ~~and why does it occur~~? _____

Building Vocabulary

Fill in the blank to complete each statement.

Word Bank

Mid Ocean Ridge
Sea Floor Spreading
Subduction
Deep ocean trench

6. A canyon on the ocean floor at which the crust bends downward is called a(n) _____.
7. The process that continually adds new material to the ocean floor is called _____.
8. The process by which the ocean floor sinks into the mantle is known as _____.
9. A chain of underwater mountains along which sea-floor spreading occurs is a(n) _____.

Name _____ Date _____ Class _____

Key Concept Summaries

Sea-Floor Spreading

What Are Mid-Ocean Ridges?

In certain places, the floor of the ocean appears to be stitched together like the seams of a baseball. Scientists found that the seams formed mountain ranges that ran along the middle of some ocean floors. Scientists called these mountain ranges **mid-ocean ridges. Mid-ocean ridges form long chains of mountains that rise up from the ocean floor.**

What Is Sea-Floor Spreading?

Mid-ocean ridges continually add new material to the ocean floor in a process called **sea-floor spreading. Sea-floor spreading adds more crust to the ocean floor. At the same time, older strips of rock move outward from either side of the ridge.**

What Happens at Deep-Ocean Trenches?

The ocean floor eventually plunges into deep underwater canyons called **deep-ocean trenches.** At a deep-ocean trench, the oceanic crust bends downward. **In a process taking tens of millions of years, part of the ocean floor sinks back into the mantle at deep-ocean trenches.**

The process by which the ocean floor sinks beneath a deep-ocean trench and back into the mantle again is called **subduction.** As subduction occurs, crust closer to a mid-ocean ridge moves away from the ridge and toward a deep-ocean trench.

The processes of subduction and sea-floor spreading can change the size and shape of the oceans. An ocean surrounded by many trenches may shrink. An ocean that contains more ridges than trenches will probably grow larger.

~~On a separate sheet of paper~~, explain how the size and shape of oceans are continuously changing.

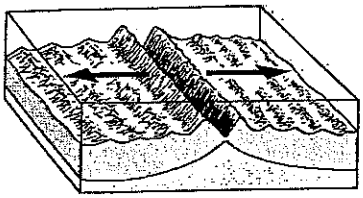
Name _____ Date _____ Class _____

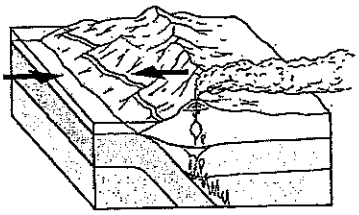
Review and Reinforce

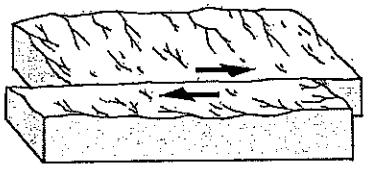
The Theory of Plate Tectonics-Ch.4,Sec.3

Understanding Main Ideas

Label each diagram by writing the type of plate boundary it shows.







1. _____ 2. _____ 3. _____

Answer the following questions on a separate sheet of paper.

4. Describe what happens when (a) two plates carrying oceanic crust collide, (b) two plates carrying continental crust collide, and (c) a plate carrying oceanic crust collides with a plate carrying continental crust.
5. Explain what force caused the movement of the continents from one supercontinent to their present positions.

Building Vocabulary

Fill in the blank to complete each statement.

6. At a(n) _____, plates come together.
7. Breaks in Earth's crust where rocks have slipped past each other are called _____.
8. The lithosphere is broken into separate sections called _____.
9. A(n) _____ is a deep valley on land that forms along a divergent boundary.
10. The geological theory that states that pieces of Earth's crust are in constant, slow motion is called _____.
11. At a(n) _____, plates slip past each other.
12. Plates move apart along a(n) _____.

Name _____ Date _____ Class _____

Key Concept Summary

The Theory of Plate Tectonics Ch. 4, Sec. 3

What Is the Theory of Plate Tectonics?

Earth's lithosphere, its solid outer shell, is like an eggshell broken into pieces separated by cracks. These pieces are called **plates.** Earth's plates meet at boundaries. Plates move apart, or diverge, from each other at a **divergent boundary.** Plates come together, or converge, at a **convergent boundary.** Plates slip past each other along a **transform boundary.**

In the mid-1960s, geologists combined what they knew about sea-floor spreading, Earth's plates, and plate motions into a single theory called **plate tectonics. The theory of plate tectonics states that Earth's plates are in slow, constant motion, driven by convection currents in the mantle.**

Earth's plates move because they are the top part of the large convection currents in Earth's mantle. During subduction, gravity pulls denser plate edges downward, into the mantle. Plates move very slowly—from about 1 to 12 centimeters per year. Earth's plates can carry ocean floor, continents, or continents and oceans together. So the movement of Earth's plates has greatly changed the location of Earth's continents, landmasses, and oceans.

Faults—breaks in Earth's crust where rocks have slipped past each other—form along plate boundaries. Plate movements produce changes in Earth's surface and on the ocean floor. These changes include the formation of volcanoes, mountain ranges, and deep-ocean trenches.

Most divergent boundaries occur along mid-ocean ridges. Where pieces of Earth's crust diverge on land, many deep valleys called **rift valleys** have formed.

Where two plates carrying oceanic crust meet at a trench, the plate that is denser sinks under the less dense plate. When two plates carrying continental crust collide, the collision squeezes the crust into high mountain ranges. Earthquakes often occur when two plates suddenly slip along a transform boundary.

~~On a separate sheet of paper,~~ summarize the changes to Earth's surface that occur as a result of plate movements.

Name: _____ Date: _____ Class Period: _____

Chapter 4 Virtual Lab

Background: Scientists hypothesize that Earth's seven continents were once connected as a single landmass called a supercontinent. The land mass began to separate about 200 million years ago. Over time, the continents have slowly shifted to their present locations in a process called continental drift. Alfred Wegener, an early proponent of the theory of continental drift named the former supercontinent Pangaea, meaning "all land".

Alfred Wegener used evidence such as

1. The shape of the continents appearing to fit together like pieces of a jigsaw puzzle
2. Fossils of organisms
    a. Fossils of Mesosaurus, a type of reptile, are found in both South America and Africa. Mesosaurus lived in freshwater and on land, so it is improbable that it could swim the great distance between them.
    b. Fossils of Glossopteris, a fossil fern, that flourished in warm climates was found in Africa, Australia, India, South America and Antarctica. It is unlikely it would have originated independently in so many places/.
3. Rock Structures
    a. Mountain Ranges are similar, for example, the age and formations of the Appalachian Mountains are very similar to mountains in Greenland and Western Europe.
    b. Folded rock belts in South America match folded rock belts on the southwestern coast of Africa.
    c. Glacial deposits and grooved bedrock in Southern parts of South America, Africa, India and Australia suggest that they were once connected and covered by glaciers.

Objective: To reconstruct Pangaea by examining rock, fossil and glacial evidence and by manipulating shape and orientation of the continents.

Procedure:

1. Click on the right and left arrows to see each of the seven continents.
2. Click on the puzzle piece to see the 3 versions of each continent. The different versions appear in random order and represent the continents shape 250 million years ago, 66 million years ago and today.
3. Determine which version shows the continents shape 250 million years ago.
4. Click on each type of evidence in the Legend to show the geologic clues. These will show up on the continent. NOTE: During the existence of Pangaea, continents fit together like pieces of a jigsaw puzzle!
5. Using the information about the shape and geology of the continents, drag each of the seven continents to the map to reconstruct Pangaea.

6. Click on the Check button. If you dragged a continent from the wrong time period or the wrong location on the map, it will be highlighted in yellow. Drag it to the puzzle box and try again.
7. When all of the continents of the correct age are in the correct position on the map, click the Present Day button to see an animation of continental drift.

Questions:

1. Which clues were most helpful in the reconstruction of Pangaea?

2. What types of geologic evidence support the existence of Pangaea?

3. Which type of geologic evidence provides the greatest support for the hypothesis that the eastern coast of North America was once joined to the western coast of Europe?

4. How do you think Wegener's background as a climatologies contributed to his hypothesis that the continents were once joined?

This lab can be found at:
http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES11/ES11.html

Convergent Boundary

Define:

What happens during a collision of....

Oceanic Crust vs. Oceanic Crust?

Landform:

Oceanic vs. Continental Crust?

Landform:

Continental vs. Continental crust?

Landform:

Divergent Boundary

Define:

What landform is created when a divergent boundary occurs on land?

What landform is created when a divergent boundary occurs in the ocean?

Transform Boundary

Define:

What event occurs when plates suddenly slip past one another?

At a transform boundary, crust is neither _____ or _____.

Example:

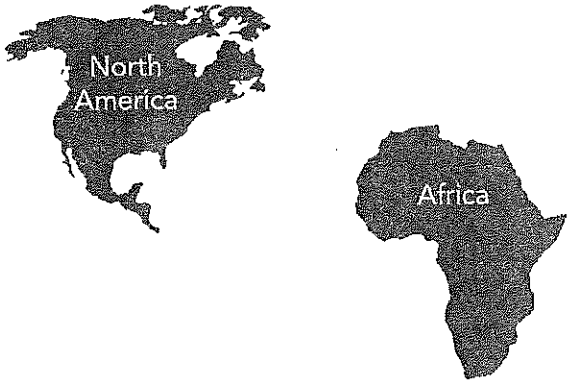
Review and Assessment

LESSON 1 Drifting Continents

1. What did Wegener think happens during continental drift?
   - **a.** Continents move.
   - **b.** Continents freeze.
   - **c.** The mantle warms.
   - **d.** Convection stops.

2. Wegener thought that all the continents were once joined together in a supercontinent that he called _____.

3. **Draw** The drawing shows North America and Africa. Circle the parts of the coastlines of the two continents that were joined in Pangaea.



4. **Make Judgments** Wegener proposed that mountains form when continents collide, crumpling up their edges. Was Wegener's idea about how mountains form consistent with his hypothesis of continental drift? Explain.

_____

_____

_____

_____

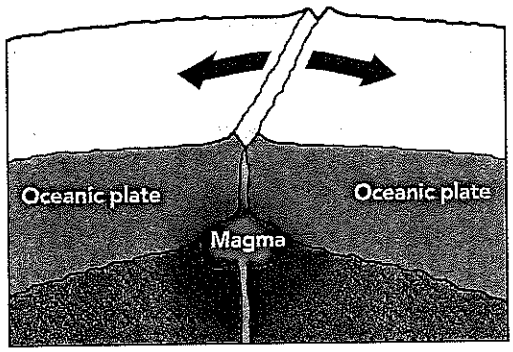
5. **Write About It** Michelle is a scientist working in Antarctica. She learns that fossils of *Glossopteris* have been found on Antarctica. Her colleague Joe, working in India, has also found *Glossopteris* fossils. Write a letter from Michelle to her colleague explaining how these fossils could be found in both places. Define *continental drift* in your answer and discuss how it explains the fossil findings.

LESSON 2 Sea-Floor Spreading

6. In which areas does subduction of the ocean floor take place?
   - **a.** rift valleys
   - **b.** the lower mantle
   - **c.** mid-ocean ridges
   - **d.** deep-ocean trenches

7. A mid-ocean ridge is a _____ _____ that rises up from the ocean floor.

8. **Compare and Contrast** Look at the diagram. Label the area where new crust forms.



9. **Apply Concepts** Why are the oldest parts of the ocean floor no older than about 200 million years?

_____

_____

_____

10. **Sequence** Place the following steps of sea-floor spreading in their correct sequence.
    - **A.** The molten material cools and hardens, forming a strip of rock along the ocean floor.
    - **B.** The strip of rock moves away from the ridge.
    - **C.** Molten material from inside Earth rises to the ocean floor at a mid-ocean ridge.

_____

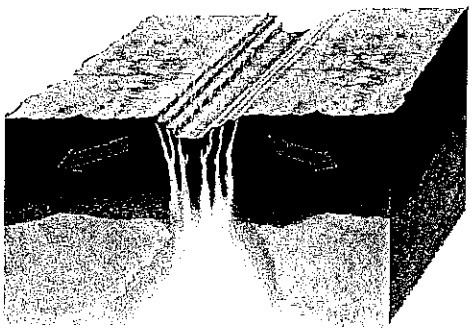
11. **Write About It** How is pillow lava evidence of sea-floor spreading?

Ohio Benchmark Practice

Multiple Choice

Circle the letter of the best answer.

1. The diagram shows a process in Earth's crust.



Which statement best describes the process in the diagram?

- **A** Converging plates form mountains.
- **B** Converging plates form volcanoes.
- **C** Diverging plates form mountains.
- **D** Diverging plates form a rift valley.

2. What is one piece of evidence that caused Wegener to think that continents moved?

- **A** He found an old map of the world that showed movement.
- **B** He found similar fossils on different continents that are separated by oceans.
- **C** He proved his hypothesis with an experiment that measured movement.
- **D** He observed the continents moving with his own eyes.

3. Which of the following is evidence for sea-floor spreading?

- **A** matching patterns of magnetic stripes found in the crust of the ocean floor
- **B** new rock found farther from mid-ocean ridges than older rock
- **C** pieces of different crust found on different continents
- **D** changes in climate on the continent of Africa

4. What happens to new oceanic crust at a mid-ocean ridge?

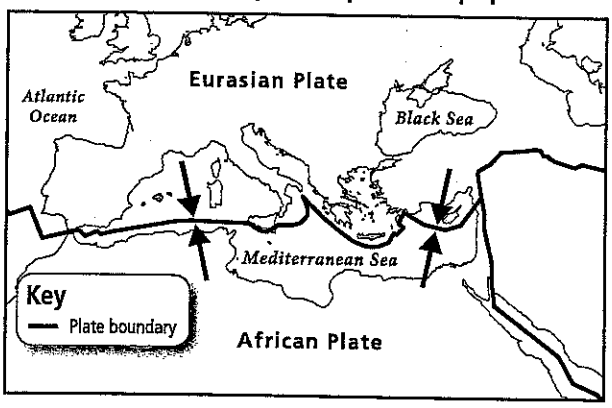
- **A** It forms new mountains under the water.
- **B** It climbs up the mantle to form a trench.
- **C** It gets hotter and sinks into a trench.
- **D** It is so dense that gravity pulls it into a deep-ocean trench.

5. What force causes the movement of Earth's plates?

- **A** convection currents
- **B** pressure
- **C** sound waves
- **D** cooling

Extended Response

Use the map below and your knowledge of science to help you answer Question 6. Write your answer on a separate piece of paper.



6. The African plate is moving toward the Eurasian plate at a rate of a few centimeters per year. How will this area change in 100 million years? In your answer, consider how the continents will change and how the Mediterranean Sea will change.