6th Grade Science

MONDAY 3/23	- The students will be asked to look through Lesson 2 again and fill-in the Lesson outline. - Read the Tectonic Plate NewsELA article and answer the questions related to the reading.
TUESDAY 3/24	- Students will be asked to complete worksheet pages 26 and 30 which is used to help reinforce the information that they have read in Lesson 2. - Continue with the Legends of Learning online games.
WEDNESDAY 3/25	- Students should complete worksheet pages 31 and 33.
THURSDAY 3/26	- Students should complete a mini-assessment on Legends of Learning to determine where each of the students level of understanding is for Lesson - 2. - If students do not have access to the internet then they will have a hard copy of the assessment.
FRIDAY 3/27	- Students will complete worksheet pages 34 and 35. - They will also be asked to continue with the Legends of Learning online games which will help to reinforce the concepts that they have read about in Lesson 2 and also the concepts we have been learning about in Lesson 1.

Name _____ Date _____ Class _____

Lesson Outline LESSON 2

Development of a Theory

A. Mapping the Ocean Floor

1. Scientists mapped the depth of the ocean floor using a device called a(n) _____.

2. In the middle of the oceans are large mountain ranges called _____.

a. Existence of these _____ was confirmed through research called echo-sounder research.

b. These underwater mountain ranges are much _____ than mountain ranges on land.

B. Seafloor Spreading

1. _____ occurs when new oceanic crust forms at a mid-ocean ridge and old crust moves away from the ridge.

a. Molten rock, or _____, rises from the mantle through cracks in the crust. It erupts as _____ from volcanic vents along the mid-ocean ridge.

b. The molten rock cools and becomes _____, the rock that forms the oceanic crust.

c. New oceanic crust forms along a mid-ocean ridge, and _____ crust moves away from the ridge.

2. The topography of the _____ includes the abyssal plain and rugged mountains.

a. The rugged mountains that make up the mid-ocean ridge can form in different ways. One way is through large amounts of _____ erupting from the center of the ridge, cooling, and building up around the ridge. Another way is through upward-moving _____ pushing on the crust above it, causing it to crack and form jagged, angular mountains on the seafloor.

b. Eventually, _____ forms on top of the oldest oceanic crust, making smooth seafloor called the _____.

3. Seafloor spreading helps explain continental drift because it shows that continents move with the oceanic _____ as it spreads away from mid-ocean ridges.

Name _____ Date _____ Class _____

Lesson Outline continued

C. Development of a Theory

1. Evidence to support seafloor spreading first came from studying the _____ of rocks on the seafloor.

2. Earth's outer core causes Earth's _____.

a. The direction of Earth's magnetic field _____ often.

b. When a magnetic field causes a magnet to point north, the magnetic field has _____.

c. A magnetic field reverses direction during a(n) _____.

d. After a magnetic reversal, a magnet points south because Earth's magnetic field has _____.

3. _____ form when iron-rich minerals in cooling lava align with the direction of Earth's magnetic field.

a. The direction of a magnetic field in minerals can be determined by using a device called a(n) _____.

b. Magnetometers show _____ magnetic stripes on either side of a mid-ocean ridge.

c. These stripes alternate normal polarity and _____, showing that each stripe was formed at the mid-ocean ridge and then moved away.

4. Sediment collected from the seafloor show that sediment farther away from a mid-ocean ridge is _____ than the sediment that is closer to the ridge.

Fold mountains are the result of Earth's tectonic plate movements

By National Geographic Society on 03.28.19
Word Count **1,392**
Level **MAX**

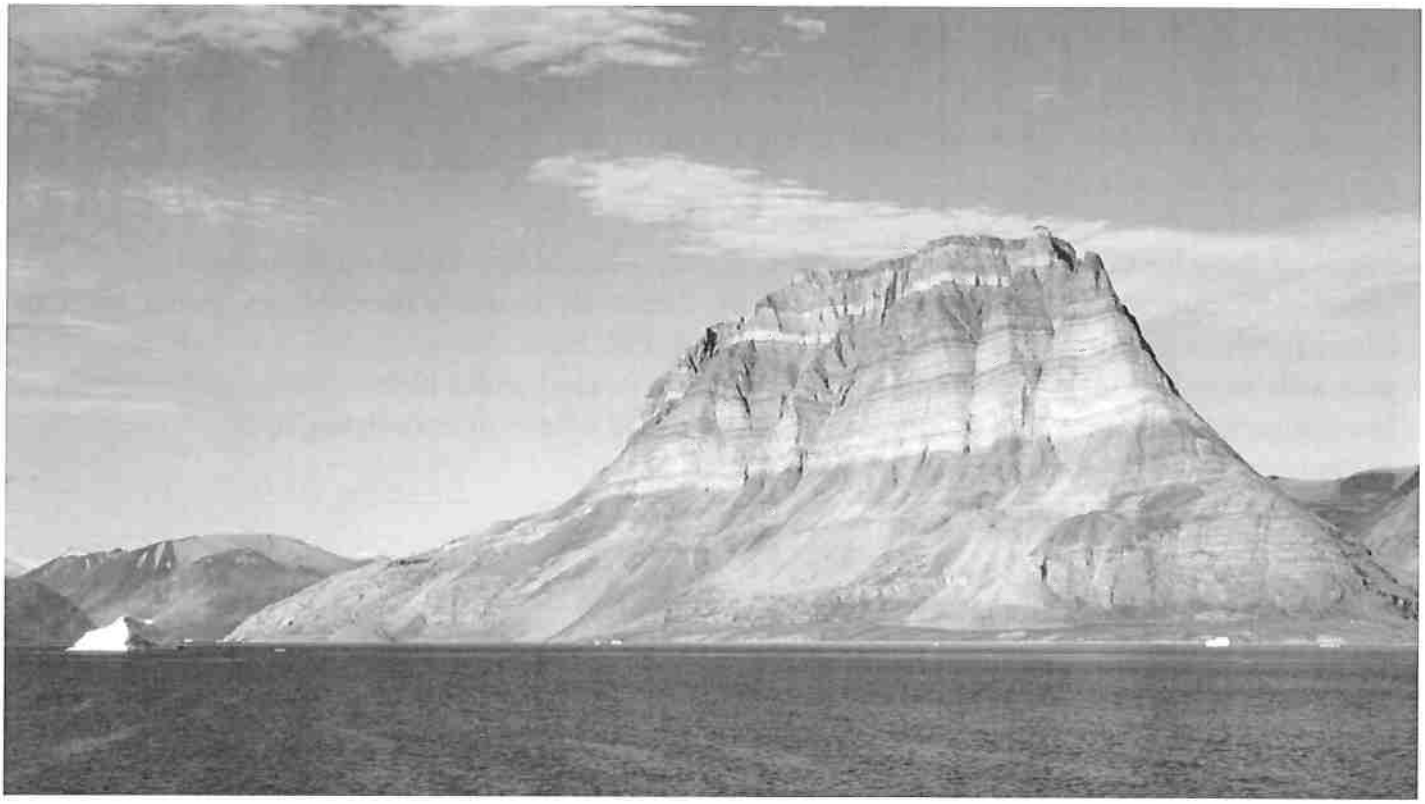


Image 1. Folded mountain and iceberg in an eastern Greenland fjord. Photo by: Delphine AURES/Gamma-Rapho via Getty Images

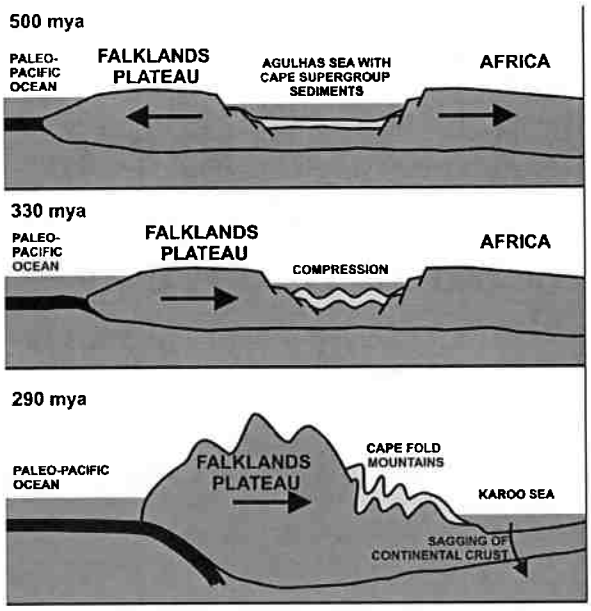
Fold mountains are created where two or more of Earth's tectonic plates are pushed together. At these colliding, compressing boundaries, rocks and debris are warped and folded into rocky outcrops, hills, mountains, and entire mountain ranges.

NATIONAL GEOGRAPHIC

Fold mountains are created through a process called orogeny. An orogenic event takes millions of years to create a fold mountain, but you can mimic it in seconds. Cover a table with a tablecloth, or place a rug flat on the floor. Now push the edge of the tablecloth or rug — wrinkles will develop and fold on top of each other.

The vocabulary of fold mountains owes something to this simple tablecloth experiment. Some of the key structures in fold mountains are nappes. Nappes are common, dramatic folded rocks or rock formations. "Nappe" is French for "tablecloth" and it is believed the formations were named after the tabletop experiment.

The huge difference between the rock folds and cloth folds is that in the tabletop experiment, the table itself does not fold. In the creation of fold mountains, Earth's crust itself is warped into folded forms.



Fold mountains are often associated with continental crust. They are created at convergent plate boundaries, sometimes called continental collision zones or compression zones. Convergent plate boundaries are sites of collisions, where tectonic plates crash into each other. Compression describes a set of stresses directed at one point in a rock or rock formation.

At a compression zone, tectonic activity forces crustal compression at the leading edge of the crust formation. For this reason, most fold mountains are found on the edge or former edge of continental plate boundaries. Rocks on the edge of continental crust are often weaker and less stable than rocks found in the continental interior. This can make them more susceptible to folding and warping. Most fold mountains are composed primarily of sedimentary rock and metamorphic rock formed under high pressure and relatively low temperatures. Many fold mountains are also formed where an underlying layer of ductile minerals, such as salt, is present.

Young And Old, High And Low

Fold mountains are the most common type of mountain in the world. The rugged, soaring heights of the Himalayas, Andes, and Alps are all active fold mountains.

The Himalayas stretch through the borders of China, Bhutan, Nepal, India and Pakistan. The crust beneath the Himalaya, the most towering mountain range on Earth, is still the process of being compressed. Here, the Indian plate is colliding northward with the Eurasian plate. The sedimentary rocks of the Himalayas include shale and limestone. Metamorphic rocks of the region include schist and gneiss. Dikes of igneous rock also intrude throughout the rock formations of the Himalayas.

The Andes are the world's longest mountain chain. They stretch along the entire west coast of South America, from Colombia in the north and through Ecuador, Peru, Bolivia, Chile, and Argentina to the south. Here, the dense oceanic crust of the Nazca plate is subducting beneath the less-dense continental crust of the South American plate. The Andes are mostly being folded and uplifted from the thicker, less-dense rocks of the South American plate. The sedimentary and metamorphic rocks of the Andes are dotted by active and dormant volcanoes.

The Alps roughly mark the top of the "boot" of the Italian Peninsula. The Alps stretch across Italy, Slovenia, Austria, Germany, Switzerland, Lichtenstein, Monaco, and France. Here, the tiny Adriatic microplate is colliding with the much larger Eurasian plate to the north. The J-shaped Adriatic microplate is a remnant of the African plate to the south, and today it carries the eastern Italian Peninsula as well as the entire Adriatic Sea. Alpine geology includes sedimentary and metamorphic rock, as well as igneous rocks that once were part of the ocean floor and were later uplifted in the process of folding.

Not all fold mountains are soaring peaks. The Appalachians, stretching along North America's East Coast, are generally low-lying, gentle slopes. Millions of years ago, the Appalachians were taller than the Himalayas! Millions of years of erosion, however, have taken their toll. Today, some of the highest peaks of the Appalachians are less than a third of the height of Everest.

The crust that is now the Appalachians began folding over 300 million years ago, when the North American and African continental plates collided. Plate tectonics created this ancient mountain range, then called the Central Pangean Mountains, and plate tectonics tore it apart. As tectonic activity ripped apart the ancient supercontinent Pangea, the African, Eurasian, and North American plates drifted apart.

The Appalachians are just one remnant of the Central Pangean Mountains. The Appalachians stretch from the province of Newfoundland, in southeastern Canada, through the Southern state of Alabama in the U.S. They are related to the gentle fold mountains of the Scottish Highlands (Europe) and the Little Atlas Mountains (Morocco, Africa) — their orogenic sisters from the Central Pangean Mountains.

A Questionable Shape

Fold mountains are defined by complex, vital geologic forms known as folds. There are many, many different types of folds. Geologists primarily categorize folds by their shape — do they have sharp turns or gentle curves? Are the folds convex or concave?

A fold mountain usually displays more than one type of fold. Anticlines and synclines are the most common up-and-down folds that result from compression. An anticline is shaped like a question mark, with the oldest rocks in the center of the fold. A syncline is a U-shape, with the youngest rocks in the center of the fold.

Domes and basins are often considered types of folds. A dome is a series of symmetrical anticlines, roughly shaped like half a sphere. Like an anticline, the oldest rocks in a dome are found in the center. A basin is a depression, or dip, in the Earth's surface. Like a syncline, a basin has its youngest rocks in its center.

Other types of fold include:

Monoclines. A monocline is a type of fold in which all rock layers incline, or dip, in the same direction.

Chevron. A chevron is a sharp, straight fold where rock layers look like zig-zags.

Slump. A slump fold is a result of slope failure (a type of mass wasting or landslide). The slope failure happened when sediments were soft, before they became a single mass of rock. As the sediments lithified, they became a slump.

Ptygmatic. Ptygmatic folds are a type of slump fold created where the folding material is much more viscous than the material surrounding it. Many ptygmatic folds are created as metamorphic rock melts and intrudes into another rock layer, forming a dike.

Disharmonic. Disharmonic folds describe rock formations in which different rock layers have different fold shapes.

Fast Facts:

Foreland Basins

Fold mountains sometimes are characterized by foreland basins, depressions that run parallel to the mountain range. The Ebro Basin, in northern Spain, is a foreland basin that formed with the Pyrenees, a fold mountain chain created by the continental collision of the microcontinent of Iberia with the massive Eurasian plate. The Persian Gulf is a foreland basin that formed with the Zagros Mountains, a fold mountain chain created by the continental collision of the Arabian and Iranian tectonic plates.

Quiz

1 Read the selection from the introduction [paragraphs 1-6].

Rocks on the edge of continental crust are often weaker and less stable than rocks found in the continental interior. This can make them more susceptible to folding and warping.

Which option is the BEST definition of the word "susceptible" as used in the selection above?

(A) vulnerable

(B) sensitive

(C) manageable

(D) efficient

2 Read the selection from the section "Young And Old, High And Low."

Not all fold mountains are soaring peaks. The Appalachians, stretching along North America's East Coast, are generally low-lying, gentle slopes. Millions of years ago, the Appalachians were taller than the Himalayas!

Why did the author use the word "gentle"?

(A) to convey the amount of time it took for the mountain ranges to form

(B) to convey the length and width of North America's East Coast mountains

(C) to convey the rounded and smooth appearance of the Appalachians

(D) to convey the contrast with the force of most mountains' formation

3 Which sentence from the article is BEST supported by Image 3?

(A) Many fold mountains are also formed where an underlying layer of ductile minerals, such as salt, is present.

(B) The rugged, soaring heights of the Himalayas, Andes, and Alps are all active fold mountains.

(C) Here, the dense oceanic crust of the Nazca plate is subducting beneath the less-dense continental crust of the South American plate.

(D) A slump fold is a result of slope failure (a type of mass wasting or landslide).

4 Which option accurately compares and contrasts how each image impacts the reader's understanding of fold mountains?

(A) Image 1 illustrates the clear layers sometimes visible on fold mountains, while the other images show specific features of synclines and anticlines.

(B) Image 2 illustrates how plate movement forms fold mountains, while the other images show that fold mountains take different geologic forms.

(C) Image 4 illustrates the rounded sloping of a monocline, while the other images suggest that most fold mountains are jagged and rocky.

(D) Image 5 illustrates the formation of foreland basins alongside some fold mountains, while the other images suggest that water is often absent.

Name _____ Date _____ Class _____

Content Vocabulary LESSON 2

Development of a Theory

Directions: *Explain the relationship between the terms in each pair on the lines provided. Use complete sentences.*

1. mid-ocean ridge; seafloor spreading

2. normal polarity; reversed polarity

3. magnetic reversal; reversed polarity

4. normal; normal polarity

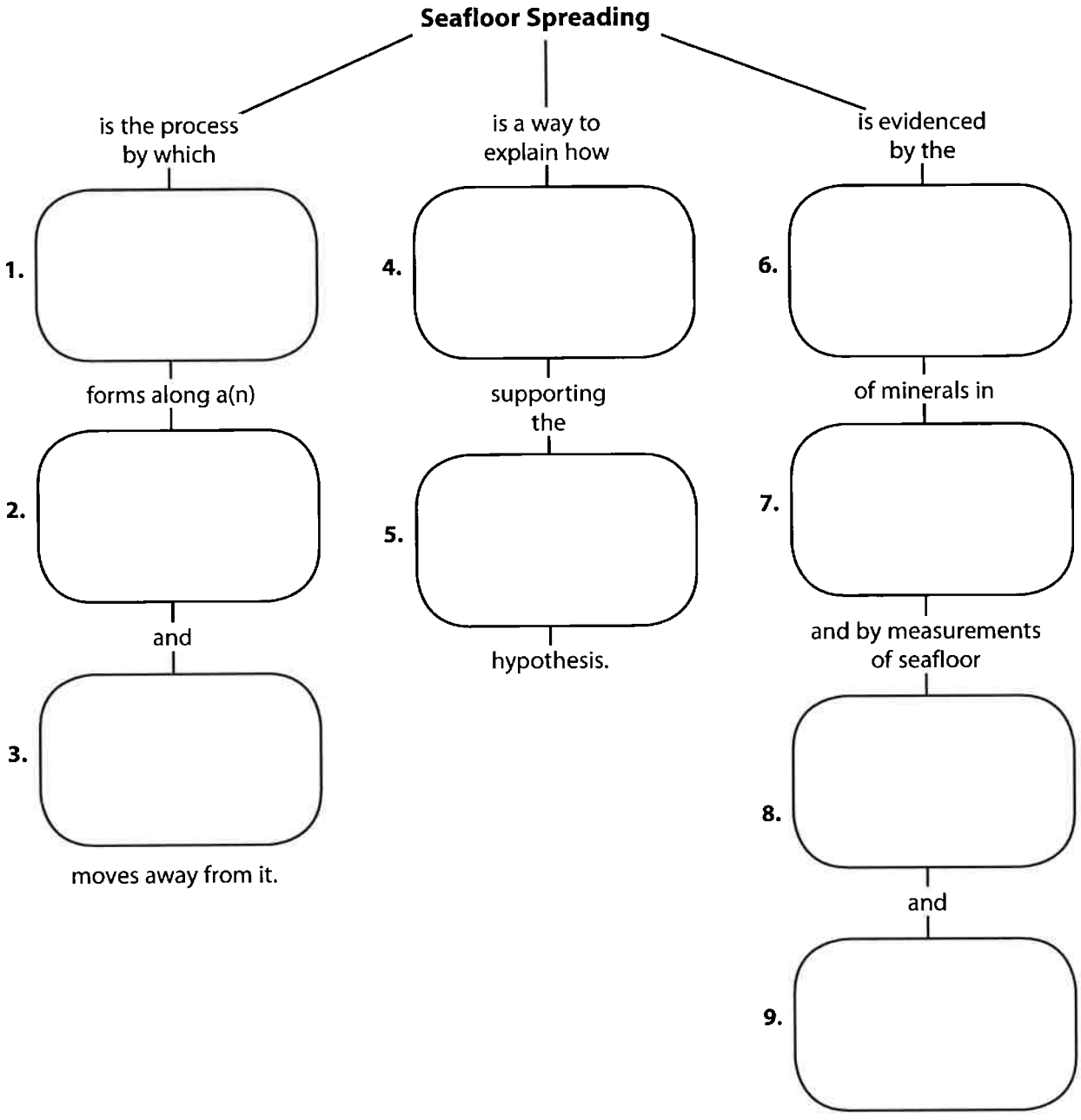
Name _____ Date _____ Class _____

Content Practice A **LESSON 2**

Development of a Theory

Directions: *Complete this concept map by choosing terms from the word bank and writing them in the correct spaces.*

continental drift	**continents move**	**magnetic signatures**
mid-ocean ridge	**new oceanic crust**	**older oceanic crust**
rocks	**sediment**	**temperature**



Name _____ Date _____ Class _____

Content Practice B **LESSON 2**

Development of a Theory

Directions: *On each line, write the term that correctly completes each sentence.*

1. _____ are mountain ranges in the oceans, where the crust is young and there is almost no sediment.

2. _____ draws dense rock away from mid-ocean ridges.

3. _____ polarity means magnets orient themselves to point north, whereas _____ polarity refers to magnets pointing south.

4. As crust _____, it records the direction and orientation of Earth's magnetic field.

5. The movement of the ocean's crust is confirmed by Earth's magnetic _____.

6. Magnetic data from the ocean crust support seafloor _____.

7. _____ move with the ocean crust as the seafloor spreads.

Name _____ Date _____ Class _____

Key Concept Builder **LESSON 2**

Development of a Theory

Key Concept What is seafloor spreading?

Directions: *Answer each question or respond to each statement on the lines provided.*

1. What happens to magma that rises through cracks on the seafloor?

2. What structures are formed by rapidly cooling lava in the ocean?

3. Where is the new rock located?

4. What happens to the rock as the seafloor spreads?

5. Use your answers to help you explain seafloor spreading.

Name _____ Date _____ Class _____

Key Concept Builder **LESSON 2**

Development of a Theory

Key Concept What is seafloor spreading?

Directions: *Answer each question on the lines provided.*

What is known about seafloor spreading	How this supports continental drift
1. What forms basalt? _____ _____ **2.** Which type of rock forms oceanic crust? _____	**3.** What happens to old oceanic crust as new oceanic crust forms? _____ _____
4. What happens to the density of rock as it cools? _____ _____ _____	**5.** Where does the crust move as it becomes denser? _____ **6.** Which force draws the cooler, denser crust downward and away from the mid-ocean ridge? _____
7. What is formed when lava cools and crystallizes on top of the oceanic crust? _____ **8.** Where is seafloor sediment thickest? _____ _____ _____	**9.** What shape does the seafloor take where the sediment is the thickest? _____ _____ **10.** What is this area of the seafloor called? _____ _____
11. What is the ocean crust always doing? _____	**12.** What happens as the ocean crust spreads? _____
13. What does the crust record as it cools? _____ _____ _____ **14.** What does basalt contain that makes this possible? _____ _____	**15.** What forms when Earth's magnetic field changes direction? _____ _____ **16.** What do magnetic stripes confirm? _____ _____ _____ _____

Name _____ Date _____ Class _____

Key Concept Builder LESSON 2

Development of a Theory

Key Concept What evidence is used to support seafloor spreading?

Directions: *Write the word or phrase that correctly completes each sentence on the lines provided.*

What has echo-sounder technology shown about the topography of the seafloor?

1. The topography is not _____.
2. Mountain ranges stretch _____
_____.
3. Mountain ranges are located _____
_____
_____.
4. Ocean mountain ranges are longer _____
_____.

What has the magnetometer shown about the magnetic signature of the seafloor?

5. Parallel magnetic stripes are located _____
_____
_____.
6. Each stripe has _____
_____.
7. Magnetic stripes represent _____
_____
_____.

What have temperature measurements beneath the seafloor surface revealed?

8. More thermal energy leaves _____
_____.
9. Less thermal energy leaves _____
_____.

What has dating of sediment that was taken from just above the ocean crust revealed?

10. The sediment that is closest to the mid-ocean ridge is _____ than the sediment that is farther away from the ridge.

Name _____ Date _____ Class _____

Key Concept Builder LESSON 2

Development of a Theory

Key Concept What evidence is used to support seafloor spreading?

Directions: *Answer each question on the lines provided. Use complete sentences.*

1. What does *normal polarity* mean?

2. What does *reversed polarity* mean?

3. How can scientists tell when changes occur in Earth's magnetic field?

4. How often do magnetic reversals occur?

5. What do Earth's magnetic stripes indicate about ocean crust?

6. How do Earth's magnetic signatures support the idea that continents move?