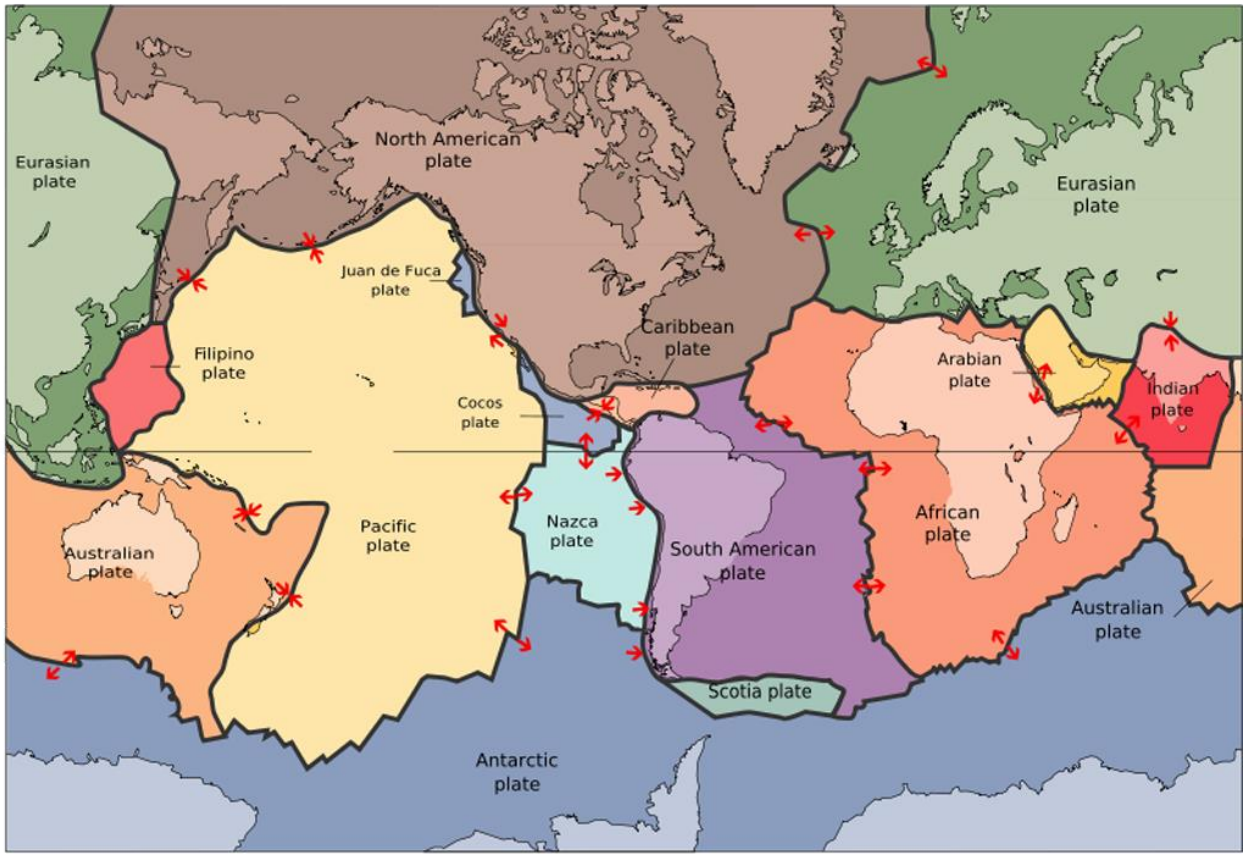
Directed Reading Packet

Geosphere Unit



Name:_____

Teacher: _____ Period: ____

Section 1.2: A View of Earth

This section explains the physical structure of Earth.

Reading Strategy

Predicting Before you read, predict the meaning of the vocabulary terms. After you read, revise your definition if your prediction was incorrect. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Vocabulary Term	Before You Read	After You Read
hydrosphere	a.	b.
atmosphere	c.	d.
geosphere	e.	f.
biosphere	g.	h.
core	i.	j.
mantle	k.	l.
crust	m.	n.

Earth's Major Spheres

1. Earth can be thought of as consisting of four major spheres: the _____, _____, _____, and _____.

Match each term to its description.

	Term	Description
_____	**2.** hydrosphere	a. all life-forms on Earth
_____	**3.** atmosphere	b. composed of the core, mantle, and crust
_____	**4.** geosphere	c. dense, heavy inner sphere of Earth
_____	**5.** biosphere	d. thin outside layer of Earth's surface
_____	**6.** core	e. the water portion of Earth
_____	**7.** mantle	f. the gaseous envelope around Earth
_____	**8.** crust	g. located between the crust and core of Earth

9. What does each letter in the diagram below represent?

A. _____
B. _____
C. _____
D. _____
E. _____
F. _____
G. _____
H. _____
I. _____
J. _____

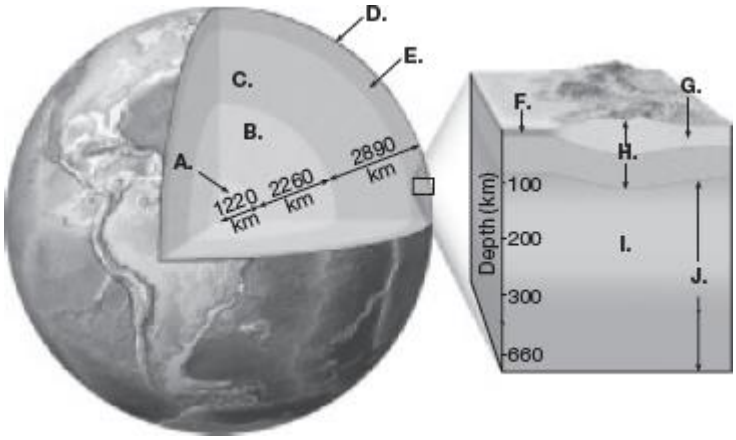


Plate Tectonics

10. Is the following sentence true or false? Forces such as weathering and erosion that work to wear away high points and flatten out Earth's surface are called constructive forces. _____

11. Circle the letter of each type of constructive force.

a. gravity
b. mountain building
c. ocean currents
d. volcanism

12. Is the following sentence true or false? Constructive forces depend on Earth's internal heat for their source of energy.

_____

13. Circle the letter of the theory that provided geologists with a model to explain how earthquakes and volcanic eruptions occur and how continents move.

a. continental drift
b. evolution
c. plate tectonics
d. Pangaea

14. Explain the principles of the plate tectonics theory. _____

Section 1.4: Earth System Science

This section describes Earth as a system of interacting parts.

Reading Strategy

Outlining As you read, make an outline of the most important ideas in this section. Begin with the section title, then list the green headings as the next step of the outline. Outline further as needed. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

I. Earth System Science
  A. What Is a System?
    1. _____
    _____
    2. _____
    _____
  B. _____
    1. _____
    _____
    2. _____
    _____

1. Earth is a(n) _____made up of numerous interacting parts, or subsystems.

What Is a System?

2. A system can be any size group of interacting parts that form a complex _____.

3. What is a closed system? _____

_____

_____

_____

4. What is an open system? _____

_____

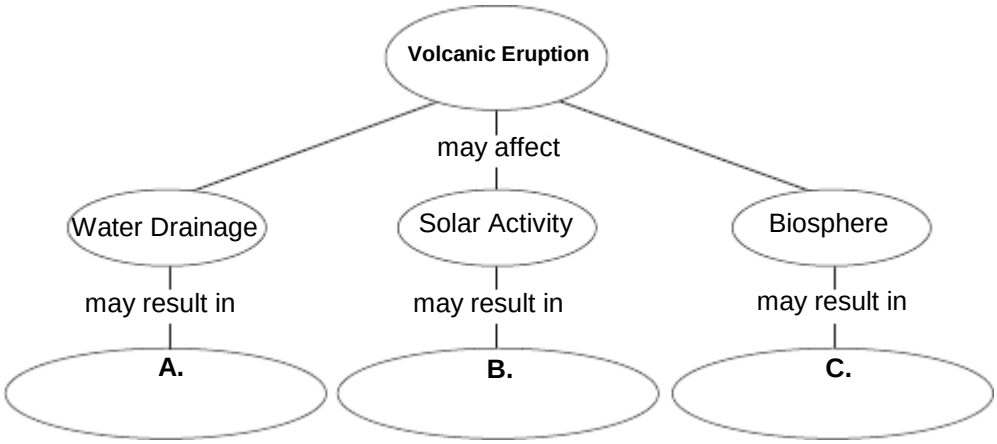
_____

Earth as a System

5. Is the following sentence true or false? The Earth system is powered by energy from the sun and Earth's exterior.

6. he following sentence true or false? The sun drives external processes that occur in the atmosphere, hydrosphere, and at Earth's surface. _____

7. Complete the concept map below.



People and the Environment

8. Circle the letter of each statement that is true about nonliving things that make up the environment.

a. Water and air are nonliving things that make up the environment.
b. Plants, animals, and microscopic organisms are nonliving things that make up the environment.
c. Temperature, humidity, and sunlight are conditions that make up the environment.
d. Soil and rock are nonliving things that make up the environment.

9. What are renewable resources?

10. Circle the letter of each item that is a nonrenewable resource.

a. iron
b. petroleum
c. aluminum
d. natural fibers

Environmental Problems

11. Significant threats to the environment include _____, _____, _____,and _____.

Section 3.1: The Rock Cycle

This section explains the different types of rocks found on Earth and in the rock cycle.

Reading Strategy

Building Vocabulary As you read, write down the definition for each term. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Term	Definition
rock	a.
igneous rock	b.
sedimentary rock	c.
metamorphic rock	d.
rock cycle	e.
magma	f.
lava	g.
weathering	h.
sediment	i.

Rocks

1. A(n) _____ is any solid mass of mineral or mineral-like matter that occurs naturally as part of Earth.

2. Most rocks, such as granite, occur as a solid mixture of _____.

3. Is the following sentence true or false? A characteristic of rock is that each of the component minerals retains its properties in the mixture._____

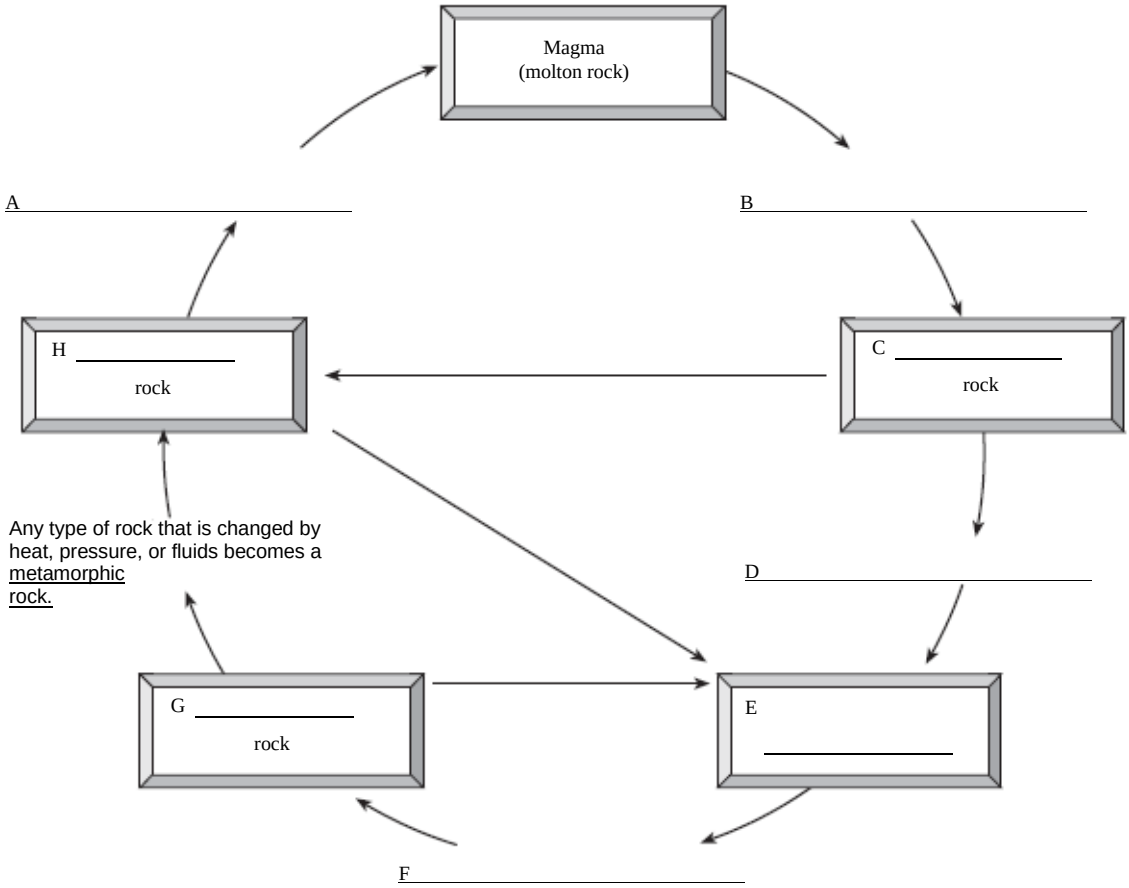
4. Describe a few rocks that are composed of nonmineral matter.

5. Circle the letters that identify a type of rock.

a. igneous
b. sedimentary
c. metamorphic
d. crystalline

The Rock Cycle

6. Fill in the blanks below in the illustration of the rock cycle.



Alternate Paths

7. Give an example of an alternate path in the rock cycle.

_____

_____

_____

_____

Section 5.1: Weathering

This section describes different types of weathering in rocks.

Reading Strategy

Building Vocabulary As you read the section, define each vocabulary term. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Vocabulary Term	Definition
Mechanical weathering	a.
Frost wedging	b.
Talus	c.
Exfoliation	d.
Chemical weathering	e.

Mechanical Weathering

1. List and describe three types of mechanical weathering.

_____

_____

_____

_____

2. Is the following sentence true or false? In nature, three physical processes are especially important causes of mechanical weathering: chemical reactions, spheroidal weathering, and the presence of water. _____

3. Circle the letter of each sentence that is true about mechanical weathering.

a. Each piece of broken rock has the same characteristics as the original rock.

b. In nature, three physical processes are especially important causes of mechanical weathering: frost wedging, unloading, and biological activity.

c. When a rock is broken apart, less surface area is exposed to chemical weathering.

d. Mechanical weathering is the transformation of rock into new compounds.

Chemical Weathering

4. Circle the letter of each sentence that is true about chemical weathering.

a Water is the most important agent in chemical weathering.

b Chemical weathering converts granite to clay minerals and quartz grains.

c Chemical weathering can change the shape of a rock and its chemical composition.

d Spheroidal weathering is a form of chemical weathering.

5. Describe the weathering process that the rocks in the photograph are undergoing.

_____

_____

6. The weathering process shown in the photograph is called _____.

Rate of Weathering

7. Is the following sentence true or false? Factors that affect rate of weathering are surface area, rock characteristics, and climate.

_____

8. Two characteristics that affect rate of weathering are _____and _____.

9. What are three ways that the climatic factors of temperature and moisture affect rate of weathering?

a. _____

b. _____

c. _____

10. What are two factors that cause differential weathering?

Section 5.3: Mass Movements

This section describes situations in which large amounts of soil are moved naturally.

Reading Strategy

Previewing As you read the section, rewrite the green topic headings as *what* questions. Then write an answer to each question. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Question	Answer
a.	b.
c.	d.

1. The transfer of rock and soil downslope due to _____ is called mass movement.

Triggers of Mass Movements

2. What are the factors that commonly trigger mass movements?

_____

_____

_____

3. Circle the letter of each sentence that is true about water triggering mass movements.

a Heavy rains and rapid melting of snow can trigger mass movements by saturating surface materials with water.

b When the pores in sediment become filled with water, the particles slide past one another more easily.

c If there is sufficient water, sand grains will ooze downhill.

d Saturation of the ground with water makes slopes more susceptible to the force of gravity.

4. Is the following sentence true or false? If the steepness of a slope exceeds the stable angle, mass movements become more likely.

_____

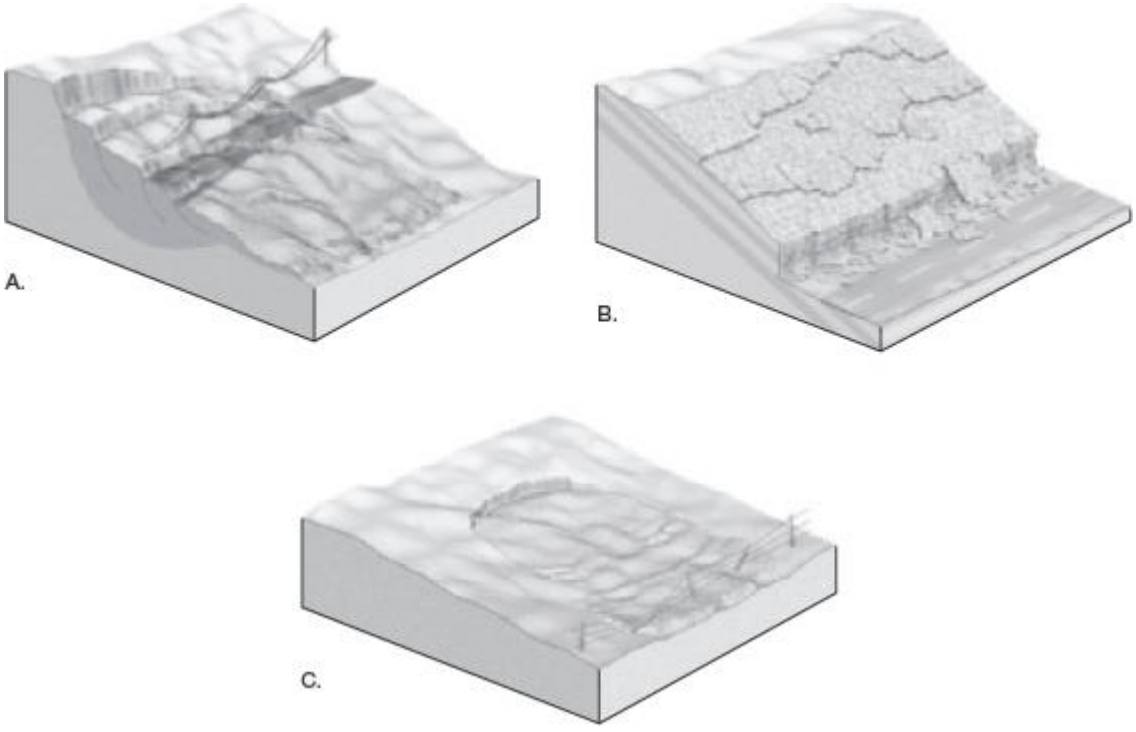
5. What are three possible causes of oversteepened slopes?

Types of Mass Movements

Match each description with its term.

	Description	Term
_____	**6.** a flow that moves relatively slowly—from about a millimeter per day to several meters per day	a. rockfall
_____	**7.** the downward movement of a block of material along a curved surface	b. rockslide
_____	**8.** a quickly moving mass of material that contains large amounts of water	c. slump
_____	**9.** when rock or rock fragments fall freely through the air	d. mudflow
_____	**10.** slides that include bedrock that move suddenly along a flat, inclined surface	e. earthflow

11. Identify each of the forms of mass wasting illustrated in the figures below by writing the name of the process on the lines provided. Choose *earthflow, slump,* or *rockslide.*



A. _____

B. _____

C. _____

Section 6.2: The Work of Streams

This section discusses streams and explains how they help shape Earth's surface.

Reading Strategy

Comparing and Contrasting Preview the Key Concepts, topic headings, vocabulary, and figures in this section. List things you expect to learn about each. After reading, state what you learned about each item you listed. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

What I Expect to Learn	What I Learned

Erosion

1. How do streams erode their channels?

_____

_____

Sediment Transport

2. Circle the letter of the name for the material a stream carries in solution.

a. bed load
b. suspended load
c. dissolved load
d. mineral load

3. Circle the letter of what the large, solid material a stream carries along its bed is called.

a. bed load
b. suspended load
c. dissolved load
d. maximum load

4. Is the following sentence true or false? As a stream's velocity decreases, its competence increases._____

5. A stream's _____ is the maximum load it can carry.

6. Is the following sentence true or false? Most streams carry the largest part of their load in suspension. _____

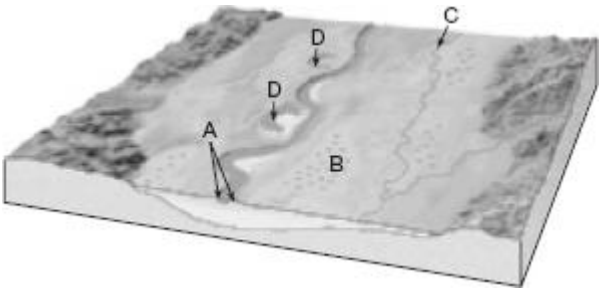
Deposition

7. When stream flow decreases to below the critical settling velocity of a certain size particle, _____ occurs.

8. How does a delta form?

9. Circle the letter that represents natural levees in the figure below.

A B C D



Stream Valleys

10. Circle the letter that represents an oxbow lake in the figure above.

A B C D

11. What shape will a stream valley have if its primary work has been downward erosion cutting toward base level?

_____

12. A stream's _____ is the flat valley floor onto which it overflows its banks during flooding.

Floods and Flood Control

Match each description with its term.

	Description	Term
_____	**13.** earthen mounds built on river banks	a. artificial levees
_____	**14.** structures that store floodwater and let it out slowly	b. floods
_____	**15.** mostly caused by rapid snowmelt and storms	c. flood-control dams

Drainage Basins

16. A(n) _____ is an imaginary line separating different drainage basins.

17. The land area that contributes water to a stream is known as a(n)

_____

Section 4.1: Energy and Mineral Resources

This section discusses different types of resources, including renewable, nonrenewable, energy, and mineral resources.

Reading Strategy

Monitoring Your Understanding List what you know about energy and mineral resources in the first column and what you'd like to know in the second column. After you read, list what you have learned in the last column. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Energy and Mineral Resources		
What I Know	**What I Would Like to Know**	**What I Learned**
a.	c.	e.
b.	d.	f.

Renewable and Nonrenewable Resources

1. Is the following sentence true or false? Renewable resources can be replenished over fairly short time spans. _____

2. A(n) _____ resource takes millions of years to form and accumulate.

3. Circle the letter of the nonrenewable resource.

a. trees
b. sunlight
c. wind energy
d. natural gas

Fossil Fuels

4. What are three examples of fossil fuels? _____

_____

5. Circle the letter of the last stage of coal development.

a. anthracite b. bituminous
c. lignite d. peat

6. Is the following sentence true or false? Natural gas forms from the buried remains of animals and plants._____

Match each description with its fuel source.

	Description	Fuel Source
_____	**7.** World supplies are expected to dwindle in the future.	a. petroleum
_____	**8.** mixture of bitumen, water, clay, and sand	b. oil shale
_____	**9.** rock containing kerogen	c. tar sands

Formation of Mineral Deposits

10. Complete the table below.

Mineral Deposits		
Type	**How Forms**	**Mineral Examples**
Magma deposit		chromite, platinum
		gold, silver, mercury
	Eroded heavy minerals settle from moving water.	

Nonmetallic Mineral Resources

11. Circle the letter of the nonmetallic mineral resource.

a. limestone
b. gold
c. chromite
d. petroleum

12. Is the following sentence true or false? Nonmetallic mineral resources are used as a source of energy. _____

Section 8.1: What Is an Earthquake?

This section explains what earthquakes and faults are and what causes earthquakes.

Reading Strategy

Building Vocabulary As you read this section, write a definition for each vocabulary term in your own words. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Vocabulary	Definition
earthquake	a.
fault	b.
focus	c.
epicenter	d.

1. Circle the letter of the approximate number of major earthquakes that take place each year.

a. about 50 b. about 75

c. about 3000 d. about 30,000

Earthquakes

Match each description with its earthquake feature.

Description

_____ **2.** Earth vibration caused by rapid energy release

_____ **3.** energy that radiates in all directions from the earthquake origin

_____ **4.** fracture where movement has occurred

_____ **5.** surface location directly above where an earthquake originates

_____ **6.** location within Earth where an earthquake originates

Earthquake Feature

a. epicenter

b. focus

c. seismic wave

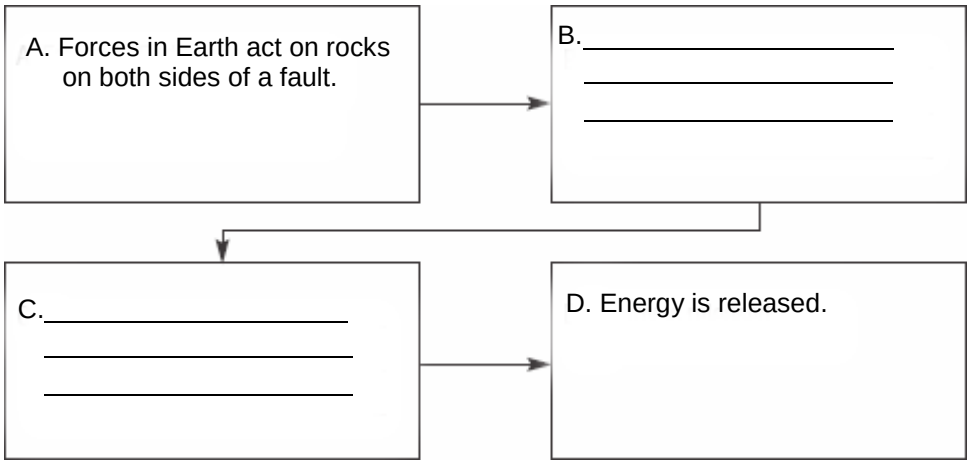
d. fault

e. earthquake

The Cause of Earthquakes

7. Is the following sentence true or false? It was not until after the 1906 San Francisco earthquake was studied that the actual cause of earthquakes was understood._____

8. Complete the flowchart to show the sequence of events that occur when rocks are deformed along a fault.



9. The _____ hypothesis states that when rocks are deformed, they bend and then break, releasing stored energy.

10. What causes most earthquakes? _____

_____

_____

_____

_____

11. Is the following sentence true or false? Most earthquakes occur along existing faults._____

12. Circle the letter of small Earth movements that occur following a major earthquake.

a. foreshocks
b. slippage
c. aftershocks
d. foci

13. The _____ is one of the most studied fault systems in the world.

14. What is fault creep?

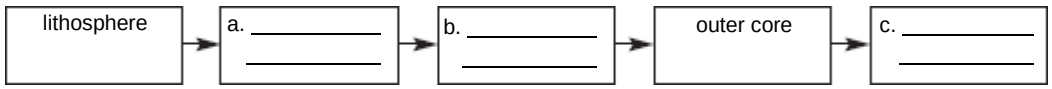
Section 8.4: Earth's Layered Structure

This section describes Earth's layers and their composition.

Reading Strategy

Sequencing After you read, complete the sequence of layers in Earth's interior. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Earth's Internal Structure



Layers Defined by Composition

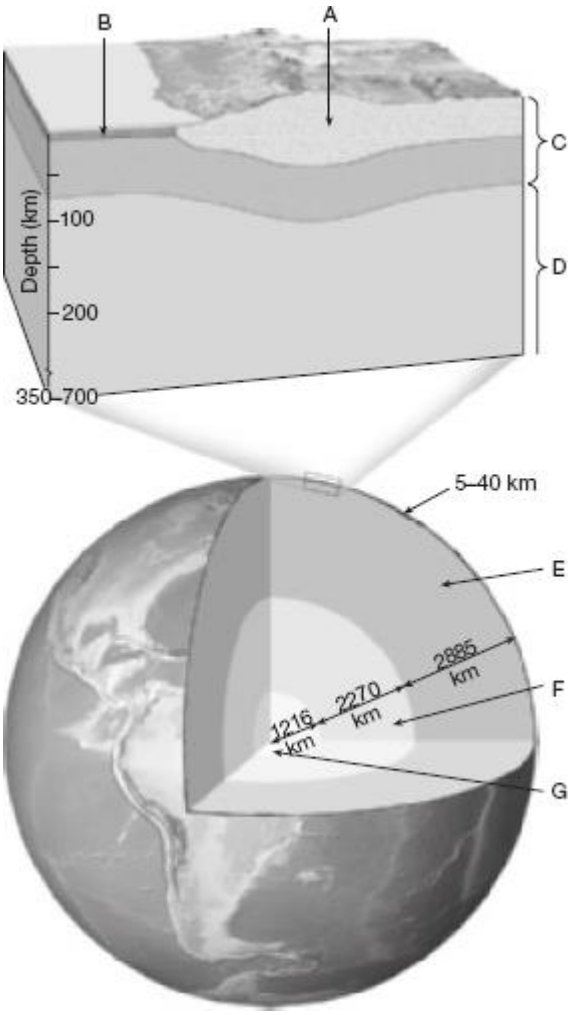
1. Use the figure of Earth's structure to write the letter(s) that represents each of the following layers.

mantle _____

continental crust _____

oceanic crust _____

core _____



Layers Defined by Physical Properties

2. Use the figure of Earth's structure on the previous page to write the letter that represents each of the following layers.

inner core _____

asthenosphere _____

outer core _____

lithosphere _____

Match each description with its Earth layer.

	Description	Earth Layer
_____	**3.** soft, weak rock near its melting point	a. asthenosphere
_____	**4.** liquid iron-nickel alloy that generates Earth's magnetic field	b. inner core
_____	**5.** cool, rigid crust and uppermost mantle	c. outer core
_____	**6.** solid iron-nickel alloy	d. lithosphere

Discovering Earth's Layers

7. The boundary called the _____ separates the crust from the mantle.

8. Is the following sentence true or false? Geologists concluded that the outer core was liquid because P waves could not travel through it. _____

9. Why do P waves bend when they travel into the outer core from the mantle? _____

_____

_____

Discovering Earth's Composition

Match each composition with its Earth layer.

	Composition	Earth Layer
_____	**10.** basaltic rock	a. continental crust
_____	**11.** granitic rock	b. oceanic crust
_____	**12.** similar to stony meteorites	c. core
_____	**13.** similar to metallic meteorites	d. mantle

14. _____ that collide with Earth provide evidence of Earth's inner composition.

15. Is the following sentence true or false? Until the late 1960s, scientists had only seismic evidence they could use to determine the composition of oceanic crust. _____

Section 9.1: Continental Drift

This section explains the hypothesis of continental drift and the evidence supporting it.

Reading Strategy

Summarizing Fill in the table as you read to summarize the evidence of continental drift. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Hypothesis	Evidence
Continental Drift	a. continental puzzle
	b.
	c.
	d.

The Continental Puzzle

1. Wegener called Earth's ancient supercontinent _____.

Evidence for Continental Drift

Match each example of continental drift with the type of evidence it is.

Example

_____ **2.** Similar mountain chains run through eastern North America and the British Isles.

_____ **3.** Land areas that show evidence of ancient glaciation are now located near the equator.

_____ **4.** The Atlantic coastlines of South America and Africa fit together.

_____ **5.** Remains of *Mesosaurus* are limited to eastern South America and southern Africa.

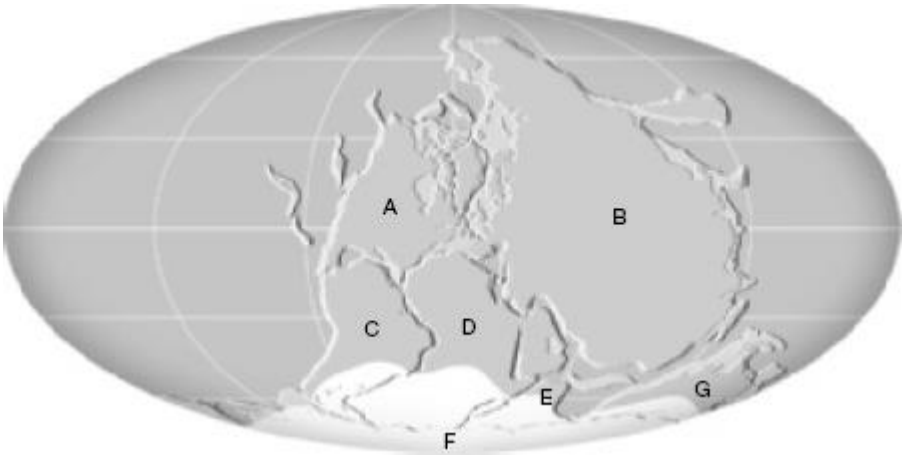
Evidence for Continental Drift

a. rock types and structures
b. matching fossils
c. continental puzzle
d. ancient climates

6. _____evidence for continental drift includes several fossil organisms found on different landmasses.

7. Is the following sentence true or false? If the continents existed as Pangaea, the rocks found in a particular region on one continent should closely match in age and type those in adjacent positions on the adjoining continent. _____

8. The figure shows Earth's ancient supercontinent as it appeared about 300 million years ago, according to Alfred Wegener. Write the letter that represents each of the following present-day continents.



_____ Antarctica
_____ Europe and Asia
_____ South America
_____ India
_____ North America
_____ Africa
_____ Australia

Rejection of Wegener's Hypothesis

9. Circle the letter of an example of one objection that critics had about Wegener's continental drift hypothesis.

a. Wegener could not provide any evidence to support continental drift.
b. Wegener could not propose a mechanism capable of moving the continents.
c. Wegener's idea of the mechanism capable of moving the continents was physically impossible.
d. Wegener's fossil evidence was not accurate.

10. Is the following sentence true or false? Most scientists in Wegener's time supported his continental drift hypothesis. _____

11. Is the following sentence true or false? Wegener proposed that during continental drift, larger continents broke through the oceanic crust. _____

12. By 1968, data collected about the ocean floor, earthquake activity, and the magnetic field led to a new theory called _____.

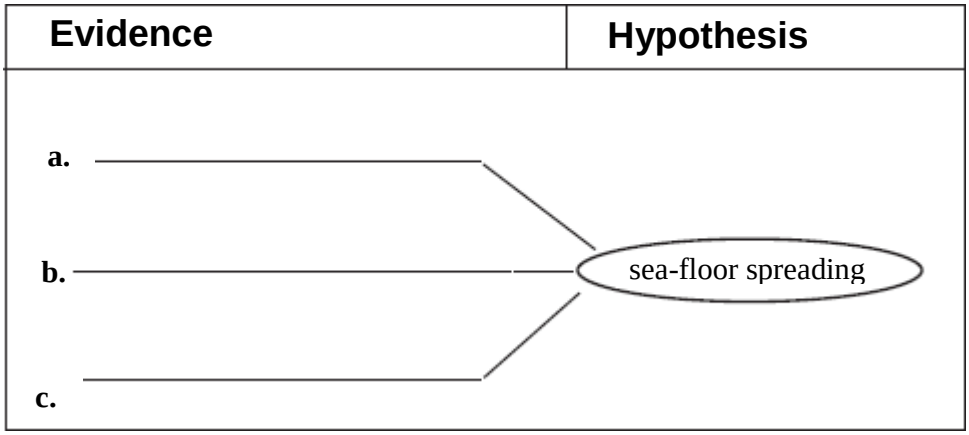
13. The new theory that replaced Wegener's hypothesis explained most geologic processes, including the formation of _____.

Section 9.2: Sea-Floor Spreading

This section discusses sea-floor spreading and subduction zones, and evidence for sea-floor spreading.

Reading Strategy

Identifying Supporting Evidence Copy the graphic organizer. After you read, complete it to show the types of evidence that supported the hypothesis of sea-floor spreading. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



Exploring the Ocean Floor

Match each definition with its term.

Definition

_____ **1.** system that uses sound waves to calculate the distance to an object

_____ **2.** deep faulted structure found along a divergent boundary

_____ **3.** elevated seafloor along a divergent boundary

Term

a. sonar

b. rift valley

c. oceanic ridge

The Process of Sea-Floor Spreading

4. Circle the letter of the description of a subduction zone.

a. where an oceanic plate is forced beneath a second plate

b. where an oceanic plate grinds past a second plate

c. where a continental plate grinds past a second plate

d. where an oceanic plate moves away from a second plate

Evidence for Sea-Floor Spreading

5. _____ has occurred when rocks formed millions of years ago show the location of the magnetic poles at the time of their formation.

6. Is the following sentence true or false? When magnetic mineral grains in a rock form, they become magnetized in the direction parallel to Earth's existing magnetic field._____

7. Circle the letter of the statement representing some of the strongest evidence of sea-floor spreading.

a. Similar fossils are found in North America and Europe.

b. Earth's magnetic field periodically reverses polarity.

c. Strips of alternating polarity lie as mirror images across the ocean ridges.

d. Evidence of glaciation occurs on land in tropical and subtropical regions.

8. Circle the letter of the definition of reverse polarity.

a. the loss of magnetism by iron-rich mineral grains when heated

b. the gain of magnetism by iron-rich mineral grains when cooled

c. what rocks that show the same magnetism as the present magnetic field have

d. what rocks that show the opposite magnetism as the present magnetic field have

9. Is the following sentence true or false? Deep-focus earthquakes occur away from ocean trenches within the slab of lithosphere descending into the mantle._____

10. Where do shallow-focus earthquakes occur relative to ocean trenches? _____

_____

11. Circle the letter of the location of the oldest oceanic crust, according to ocean drilling data.

a. near the edges of continents

b. at the ridge crest

c. between the continental margins and ridge crest

d. deep in the asthenosphere

12. Circle the letter of the location of the youngest oceanic crust, according to ocean drilling data.

a. at the continental margins

b. at the ridge crest

c. between the continental margins and ridge crest

d. deep in the asthenosphere

Section 9.3: Theory of Plate Tectonics

This section discusses plate tectonics, including lithospheric plates and types of plate boundaries.

Reading Strategy

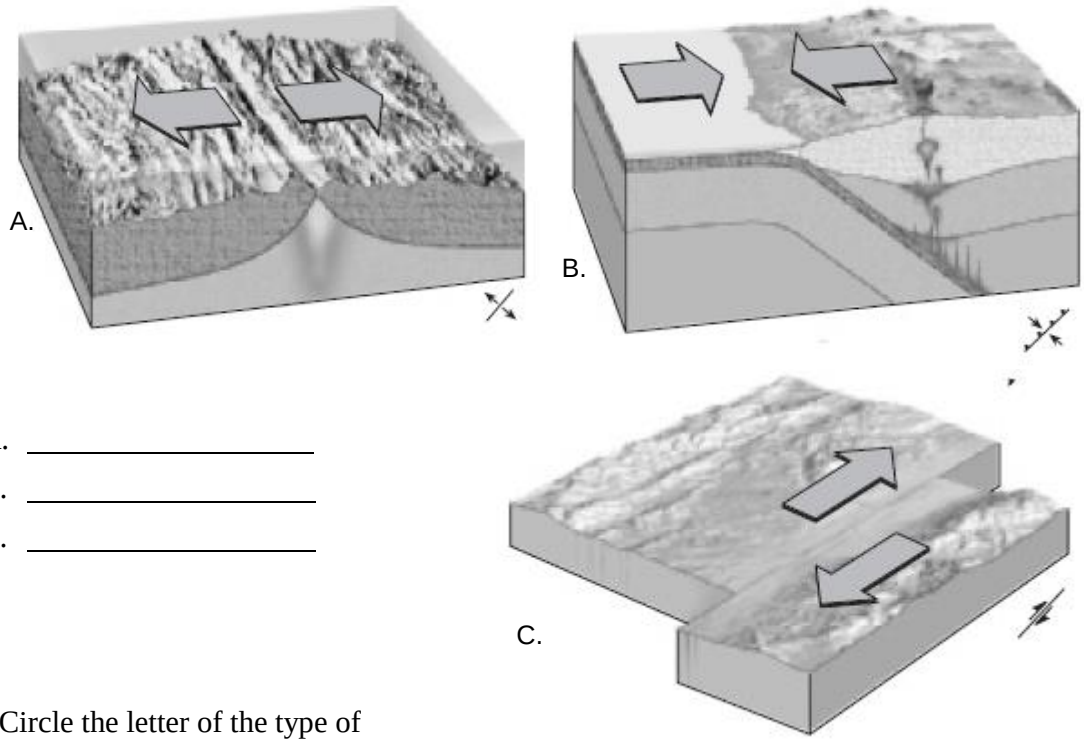
Comparing and Contrasting After you read, compare the three types of plate boundaries by completing the table. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Boundary Type	Relative Plate Motion
convergent	a.
divergent	b.
transform fault	c.

Earth's Moving Plates

1. Is the following sentence true or false? The lithospheric plates move at about 5 km per year. _____

2. Identify each type of plate boundary shown in the figure.



A. _____

B. _____

C. _____

3. Circle the letter of the type of plate boundary that occurs when two plates move together.

a. divergent

b. spreading center

c. convergent

d. transform fault

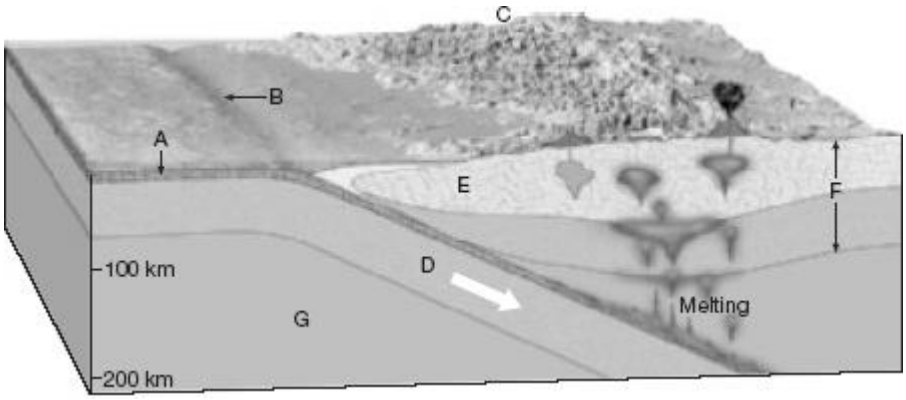
Divergent Boundaries

4. Is the following sentence true or false? Oceanic lithosphere is created at divergent boundaries. _____

5. Is the following sentence true or false? Divergent boundaries only occur on the ocean floor. _____

Convergent Boundaries

6. Select the appropriate letter in the figure that identifies each of the following features.



_____ Subducting oceanic lithosphere

_____ Oceanic crust

_____ Trench

_____ Continental volcanic arc

_____ Continental lithosphere

_____ Continental crust

_____ Asthenosphere

7. Newly formed land consisting of an arc-shaped island chain iscalled a(n) _____

8. Is the following sentence true or false? Mountains form as a result of a collision between two continental plates. _____

Transform Fault Boundaries

9. What happens at a transform fault boundary? _____

_____

_____

10. Circle the letter of the example of a transform fault boundary that is NOT located in an ocean basin.

a. the San Andreas Fault
b. the Aleutian Trench
c. the Himalayan mountains
d. the Nazca plate

Section 9.4: Mechanisms of Plate Motions

This section explains what causes plate motion and the role played by unequal distribution of heat within Earth.

Reading Strategy

Identifying Main Ideas As you read, write the main ideas for each topic. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Topic	Main Idea
Slab-pull	a.
Ridge-push	b.
Mantle convection	c.

What Causes Plate Motions?

1. Circle the letter of the basic force that drives plate tectonics.

a. Earth's magnetic field
b. convection in the mantle
c. tidal influence of the moon
d. radiation from the sun

2. What happens to the material involved during convection?

_____

_____

3. A _____ is the continuous flow that occurs in a heated fluid becuse of differences of temperature and density.

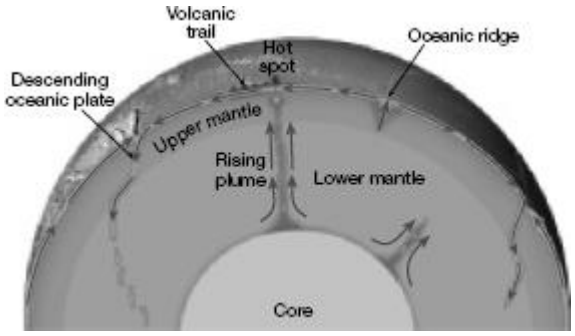
4. The mechanism called _____ causes oceanic lithosphere to slide down the sides of the oceanic ridge.

5. The mechanism that is the main downward component of mantle convection is _____.

6. Is the following sentence true or false? The upward flow of material in mantle convection consists of mantle plumes of rising hot rock. _____

7. The feature in the diagram where rock is coolest and most dense is the

a. lower mantle
b. descending oceanic plate
c. rising plume
d. oceanic ridge



8. Circle the letter of the statement that best describes the whole-mantle convection model.

a. Rock magnetism changes as rock layers melt under heat and pressure.
b. Hot oceanic lithosphere descends into the mantle, and cold mantle plumes move heat toward the surface.
c. Hot mantle plumes move heat toward the surface.
d. Convection in Earth's molten outer core transfers heat directly to the lithosphere.

9. What causes thermal convection in the mantle?

Section 10.1 Volcanoes and Plate Tectonics

This section explains how magma forms and discusses the relationship between plate boundaries and igneous activity.

Reading Strategy

Outlining After you read, complete the outline of the most important ideas in the section. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

I. Origin of Magma

A. Heat

B. _____

C. _____

II. Volcanoes and Plate Boundaries

A. _____

B. _____

C. _____

Origin of Magma

1. Is the following sentence true or false? Magma forms when solid rock in the crust and upper mantle partially melts.

_____

2. How is decompression melting of rocks triggered? _____

_____

3. _____ rock buried at depth has a much lower melting temperature than does _____ rock of the same composition and under the same pressure.

Volcanoes and Plate Boundaries

4. Is the following sentence true or false? When solid mantle rock rises during seafloor spreading, magma is produced as a result of decompression melting._____

5. Circle the letter of the change that allows rock melting to begin at convergent plate boundaries.

a. decreasing pressure

b. decreasing temperature

c. water reducing the melting point

d. water raising the melting point

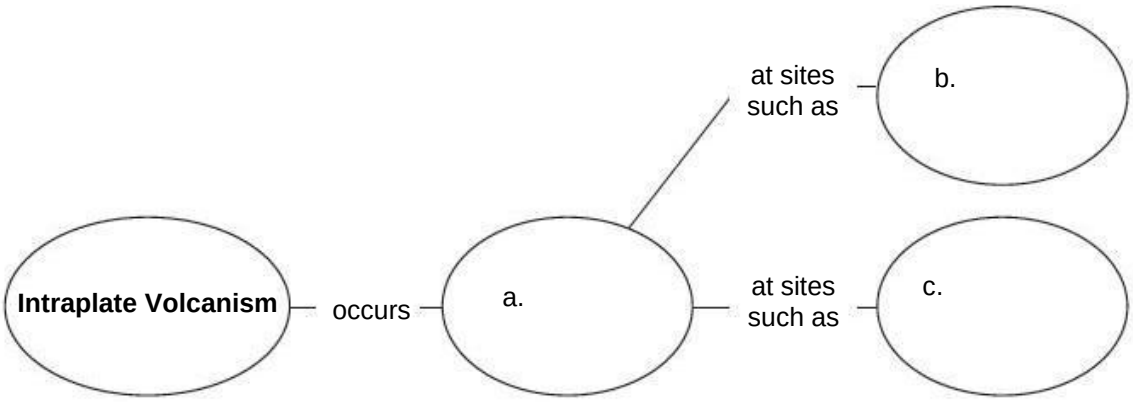
6. What landforms develop as a result of the volcanic activity that occurs where one oceanic plate descends beneath another oceanic plate?

7. Circle the letter of the answer that correctly completes the following sentence. At a convergent plate boundary, the fluids reduce the melting point of hot mantle rock enough for melting to begin when a sinking slab reaches a depth of about

a. 100 to 150 km. b. 500 to 550 km.

c. 700 to 750 km. d. 1000 to 1500 km.

8. Complete the concept map showing where intraplate volcanism occurs.



9. Circle the letter of the time most intraplate volcanism occurs.

a. when oceanic crust sinks into the mantle and melts

b. when a mantle plume rises to the surface

c. when oceanic plates separate and magma rises to fill the rift

d. when continental crust sinks into the mantle and melts

10. The result of a magma plume rising and decompression melting occurring may be the formation of a small volcanic region called a(n) _____.

11. Circle the letter of the number of years most hot spots have lasted.

a. hundreds of years b. thousands of years

c. millions of years d. billions of years

Section 11.3: Mountains and Plates

This section explains how mountains are formed at plate boundaries.

Reading Strategy

Outlining As you read, make an outline of the important ideas in this section. Use the green topic headings as the main topics and the blue headings as subtopics. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

I. **Mountains and Plates**
  A. Convergent Boundary Mountains
    1. Ocean-Ocean Convergence
    2. _____
    3. _____
  B. Divergent Boundary Mountains
  C. _____
  D. _____
    1. _____
    2. _____

Convergent Boundary Mountains

1. Is the following sentence true or false? Most mountain building occurs at convergent plate boundaries. _____

2. _____ provide the compressional forces that fold, fault, and metamorphose the thick layers of sediment deposited at the edges of landmasses.

3. Circle the letter of each true statement about ocean-ocean convergence.

a. Ocean-ocean convergence occurs when an oceanic plate converges with a continental plate.

b. The converging plates can lead to the growth of a volcanic island arc on the ocean floor.

c. An example of an island arc formed by ocean-ocean convergence is Japan.

d. Ocean-ocean convergence mainly produces volcanic mountains.

4. Is the following sentence true or false? The types of mountains formed by ocean-continental convergence are volcanic mountains and folded mountains. _____

5. The figure illustrates mountain building along an Andean-type subduction zone. Select the appropriate letter in the figure that identifies each of the following features.

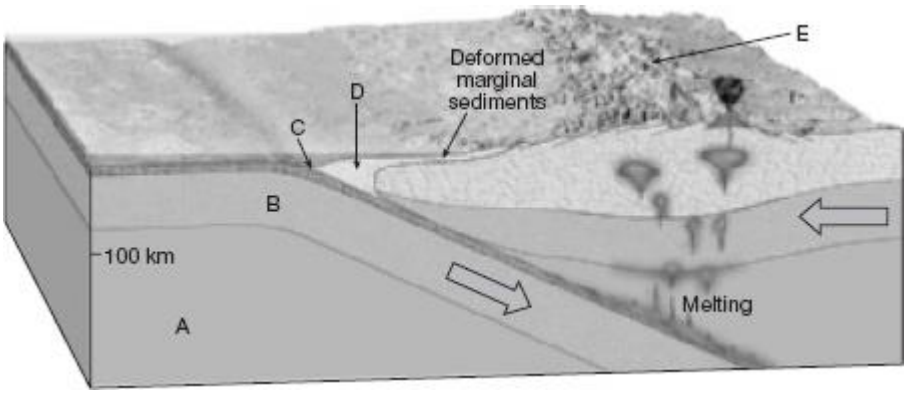
_____ ocean trench

_____ asthenosphere

_____ continental volcanic arc

_____ accretionary wedge

_____ subducting oceanic lithosphere



6. Is the following sentence true or false? At a convergent boundary, a collision between two plates carrying continental crust will result in the formation of folded mountains.

_____

Divergent Boundary Mountains

7. _____ mountains are formed along ocean ridges at divergent plate boundaries.

Non-Boundary Mountains

8. Why are some mountains forming at non-plate boundaries?

Continental Accretion

9. When crustal fragments called _____ collide with a continental plate, they become stuck to or embedded into the continent in a process called _____.

Section 12.1: Discovering Earth's History

This section explains how geologists use rocks to interpret Earth's history.

Reading Strategy

Identifying Main Ideas As you read, fill in the first column of the table with a main idea and add details that support it in the second column. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Main Idea	Details
1.	
2.	
3.	
4.	
5.	

Studying Earth's History

1. What information about Earth's history do rocks record?

_____

_____

2. Is the following sentence true or false? By examining the rock record, we have learned that Earth is much younger than it was previously thought to be. _____

3. The concept that the processes at work on Earth today were also at work long ago is known as the principle of _____.

Relative Dating—Key Principles

4. Is the following sentence true or false? Scientists use relative dating to tell how long ago events occurred on Earth. _____

5. What is the principle of original horizontality? _____

_____

_____

6. Use the following figure to complete each sentence comparing the relative ages of the features. Where indicated, identify the law or principle you used to arrive at your answer.

a. Dike B is _____ than fault B.

Law or principle: _____

b. The shale is _____ than the sandstone.

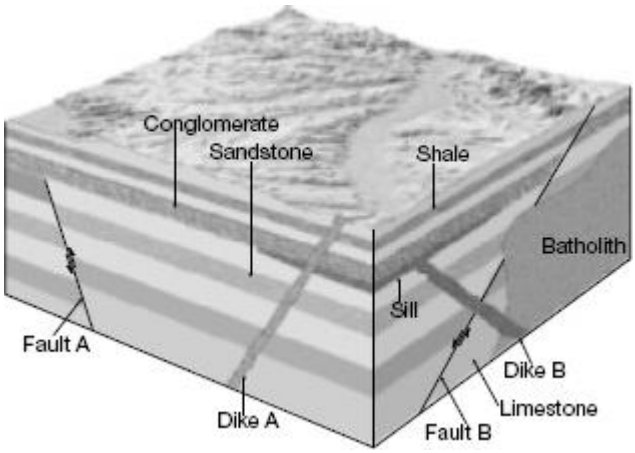
Law or principle: _____

c. Dike B is_____ than the batholith.

Law or principle: _____

d. The sandstone is _____ than Dike A.

e. The conglomerate is _____ than the shale.



Reading the Rock Record

Match each description with its term.

Description

_____ **7.** represents a long period when deposition stopped, erosion occurred, and deposition resumed

_____ **8.** two sedimentary rock layers separated by an erosional surface

_____ **9.** represents a period when deformation and erosion occurred

Term

a. angular unconformity

b. disconformity

c. unconformity

10. Circle the letter of the task of matching up rocks of similar age in different regions.

a. correlation

b. superposition

c. uniformitarianism

d. unconformity

Section 12.2: Fossils

This section discusses how fossils form and how they are used to correlate rock layers.

Reading Strategy

Monitoring Your Understanding Complete the chart. After you finish this section, correct and add details as needed. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Fossils	How Fossils Form	How Fossils Are Used
a.	b.	c.

1. What are fossils?

2. Is the following sentence true or false? An extinct organism is one that is still found on Earth._____

Types of Fossils

3. Casts are a common type of _____.

4. Circle the letter of the type of fossil formed when an organism is buried in sediment and then dissolved by underground water.

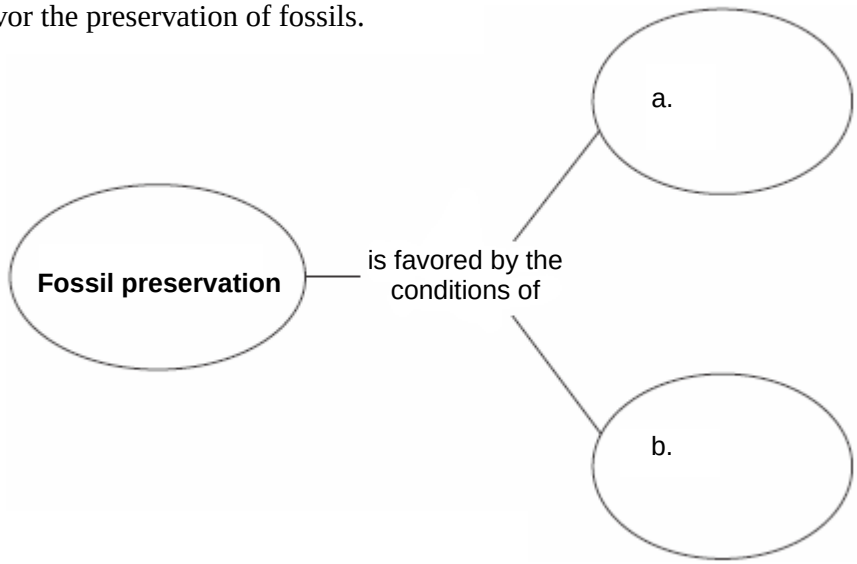
a. coprolite
b. trace fossil
c. cast
d. mold

Match each example with its type of fossil. Some types will be used more than once.

	Example	Type of Fossil
_____	**5.** frozen mammoth	a. preserved remains
_____	**6.** animal footprint	b. trace fossil
_____	**7.** fly in amber	

Conditions for Fossilization

8. Complete the following concept map showing conditions that favor the preservation of fossils.



Fossils and the History of Life

9. Fossil organisms succeed each other in an order that is definite and determinable according to the principle of _____.

10. According to Darwin's theory of evolution, one species can evolve into another through the process of _____.

Interpreting the Fossil Record

11. What are index fossils?

12. Is the following sentence true or false? Scientists use fossils to interpret and describe ancient environments._____

Section 12.3: Dating With Radioactivity

This section explains how radioactivity is used to determine the age of rocks.

Reading Strategy

Monitoring Your Understanding Preview the key concepts, topics, headings, vocabulary, and figures in this section. List two things you expect to learn about each. After reading, state what you learned about each item you listed. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

What I expect to learn	What I learned
1.	
2.	

What Is Radioactivity?

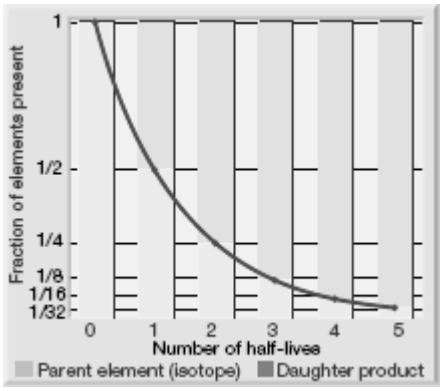
1. Is the following sentence true or false? Isotopes of the same element have different numbers of neutrons. _____

2. The process by which unstable nuclei spontaneously decay is known as _____

3. Circle the letter of the final result of radioactive decay.
   a. parent element
   b. radioactive isotope
   c. stable daughter product
   d. unstable daughter product

4. Circle the letter of what decays first during radioactive decay.
   a. parent element
   b. stable isotope
   c. stable daughter product
   d. unstable daughter product

Use the graph to answer the following three questions.



5. After one half-life, what fraction of the parent element has decayed to a daughter product? _____

6. After three half-lives, what fraction of the daughter product has formed?

_____

7. How many half-lives must pass before only 1/32 of the parent element remains undecayed to a daughter product? _____

Radiometric Dating

8. The procedure called _____ provides a way to determine the ages of rocks that contain certain radioactive isotopes.

9. Is the following sentence true or false? A radioactive isotope decays at a varying rate from the time it forms. _____

10. What begins to happen to radioactive uranium as soon as a mineral containing it crystallizes from magma?

11. What conditions are needed for an accurate radiometric date to be obtained from a mineral sample?

Dating with Carbon-14

12. Circle the letter of the ratio of two substances that is compared in a sample of a dead organism during radiocarbon dating.

a. carbon-12 to uranium 238
b. carbon-14 to carbon-12
c. uranium-238 to lead-206
d. uranium-238 to carbon-12

13. Is the following sentence true or false? Radiometric dating is rarely used to determine the age of sedimentary rocks.

_____

Section 12.4: The Geologic Time Scale

This section discusses the geologic time scale and difficulties with constructing it.

Reading Strategy

Outlining As you read, complete the outline of the important ideas in this section. Use the green headings as the main topics and fill in details from the remainder of the text. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

I. Structure of the Time Scale

A. _____

a. geologic time scale: _____

_____

b. eon: _____

c. Precambrian time: _____

B. _____

d. era: _____

C. _____

e. period: _____

f. epoch: _____

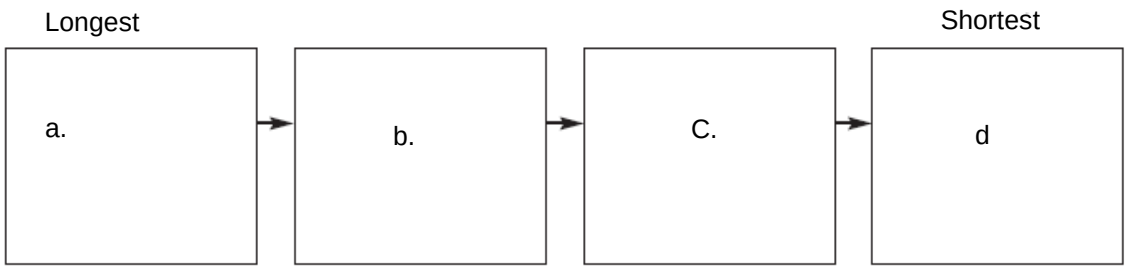
1. What is the geologic time scale? _____

_____

_____

Structure of the Time Scale

2. Complete the following flowchart with the types of subdivisions of the geologic time scale, from longest to shortest expanse of time.



3. Is the following sentence true or false? The Precambrian represents a much longer part of Earth's history than the Phanerozoic.

_____

4. Why do geologists know so little about Precambrian history?

_____

_____

_____

5. The Precambrian time starts at _____ and continues until the start of the _____ period over 4 billion years later.

6. Circle the approximate percentage of the geologic time scale that Precambrian time comprises.

a. 44 percent
b. 50 percent
c. 73 percent
d. 88 percent

7. The eon called the _____ began about 540 million years ago.

8. Circle the letter of the eras into which the Phanerozoic is divided.

a. epoch, period, eon
b. Proterozoic, Archean, Hadean
c. Triassic, Jurassic, Cretaceous
d. Paleozoic, Mesozoic, Cenozoic

9. Is the following sentence true or false? Periods such as the Tertiary are characterized by more profound life-form changes than those of eras. _____