

Essentials of Geology, 13e (Lutgens/Tarbuck/Tasa)

Chapter 2 Plate Tectonics: A Scientific Theory Unfolds

1) _____ was an ancient reptile that lived in South America and Africa during the late Paleozoic.

- A) Granopteris
- B) Monastarios
- C) Glossopteris
- D) Mesosaurus

Answer: D

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

2) In the early part of the twentieth century, _____ argued forcefully for continental drift.

- A) Karl Wagner
- B) Peter Rommel
- C) Alfred Wegener
- D) Bill Kohl

Answer: C

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

3) Evidence of _____ having affecting landmasses currently in subtropical and tropical regions provides evidence supporting Wegener's continental drift hypothesis.

- A) landslides
- B) earthquakes
- C) glaciation
- D) flooding

Answer: C

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

4) The late Paleozoic supercontinent is known as _____.

- A) Pandomonia
- B) Pancakea
- C) Pangaea
- D) Panatopia

Answer: C

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

5) _____ was never proposed as evidence supporting the existence of Pangaea.

- A) Geometrical fit between South America and Africa
- B) Islands of Precambrian rocks along the Mid-Atlantic Ridge
- C) Late Paleozoic glacial features
- D) Similar fossils on different continents

Answer: B

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

6) By the early Cenozoic era, Australia had separated from _____.

- A) India
- B) South America
- C) Eurasia
- D) Antarctica

Answer: D

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

7) The continental drift hypothesis was rejected primarily because Alfred Wegener could not _____.

- A) find geologic similarities on different continents
- B) disprove competing theories that were more accepted by scientists
- C) identify a mechanism capable of moving continents
- D) all of the above

Answer: C

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

8) According to the plate tectonics model, the rigid _____ moves over top of the weaker _____.

- A) lithosphere, asthenosphere
- B) asthenosphere, lithosphere
- C) crust, mantle
- D) lithosphere, mantle

Answer: A

Diff: 1

Chapter Subhead: 2.3 The Theory of Plate Tectonics

Bloom's: Remembering/Understanding

9) Which type of plate boundary occurs where two plates move apart, resulting in upwelling and partial melting of hot material from the mantle?

- A) convergent boundary
- B) divergent boundary
- C) transform boundary
- D) transition boundary

Answer: B

Diff: 1

Chapter Subhead: 2.3 The Theory of Plate Tectonics

Bloom's: Remembering/Understanding

10) Pull-apart rift zones are generally associated with _____ plate boundaries.

- A) transform
- B) divergent
- C) convergent
- D) all

Answer: B

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

11) The _____ is(are) a logical evolutionary analog of the African Rift Valleys ten million years from now.

- A) Ural Mountains
- B) San Andreas fault
- C) Peru-Chile trench
- D) Red Sea

Answer: D

Diff: 2

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Applying/Analyzing

12) A typical rate of seafloor spreading in the Atlantic Ocean is _____.

- A) 2 feet per year
- B) 0.1 inches per year
- C) 20 feet per year
- D) 2 centimeters per year

Answer: D

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

13) New oceanic crust and lithosphere are formed at _____.

- A) divergent boundaries by submarine eruptions and intrusions of rhyolitic magma
- B) convergent boundaries by submarine eruptions and intrusions of rhyolitic magma
- C) divergent boundaries by submarine eruptions and intrusions of basaltic magma
- D) convergent boundaries by submarine eruptions and intrusions of basaltic magma

Answer: C

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

14) The modern-day Red Sea is explained by plate tectonics theory because it is _____.

- A) a tiny remnant of a once immense ocean that was closed as Africa moved Asia
- B) the site of a transform fault along which Arabia is moving away from Africa
- C) a rift zone that may eventually open into a major ocean if Arabia and Africa continue to separate
- D) a rare example of a two-continent subduction zone where the African continental plate is sinking under the Arabian continental plate

Answer: C

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

15) The volcanoes and deep valleys of east Africa are related to a _____.

- A) continental rift along which parts of the African continent are beginning to slowly separate
- B) fault allowing Arabia to slip westward past east Africa and penetrate into Turkey
- C) transform fault aligned with the Red Sea carrying the Arabian and African blocks in opposite directions
- D) continental collision zone between Africa and the Zagros Mountains along the southern margin of Eurasia

Answer: A

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

16) The main reason for the elevated position of the oceanic ridge is because _____.

- A) it is hot, and therefore less dense than the cooler rocks surrounding it
- B) it is the result of the collision of two tectonic plates, which pushes up the ridge
- C) oceanic crust is less dense than continental crust
- D) as one oceanic plate is submerged beneath another, the ridge is pushed up

Answer: A

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

17) Cooler, older, oceanic lithosphere sinks into the mantle at _____.

- A) subduction zones along convergent plate boundaries
- B) transform fault zones along divergent plate boundaries
- C) rift zones along mid-ocean ridges
- D) sites of long-lived, hot spot volcanism in the ocean basins

Answer: A

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

18) At subduction zones, _____ portions of oceanic crust descend into the mantle.

- A) younger
- B) older
- C) less dense
- D) melted

Answer: B

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

19) The Aleutian Islands occur at a _____.

- A) convergent boundary on a volcanic arc above a northward-subducting Pacific plate
- B) transform boundary where North America has moved towards Alaska
- C) divergent boundary where shield volcanoes are forming
- D) convergent, continental margin with uplifted fault blocks, much like those of the Basin and Range Province

Answer: A

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

20) Deep-oceanic trenches are most abundant around the rim of the _____ Ocean Basin.

- A) Atlantic
- B) Indian
- C) Arctic
- D) Pacific

Answer: D

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

- 21) Deep ocean trenches are surficial evidence for _____.
A) rifting beneath a continental plate and the beginning of continental drift
B) sinking of oceanic lithosphere into the mantle at a subduction zone
C) rising of hot asthenosphere from deep in the mantle
D) transform faulting between an oceanic plate and a continental plate

Answer: B

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

- 22) The _____ is an example of an active, continent-continent collision.
A) Arabian Peninsula slamming into North Africa under the Red Sea
B) westward movement of the South American plate over the Nazca plate
C) northern movement of Baja California and a sliver of Western California toward the Hawaiian Islands
D) northward movement of India into Eurasia

Answer: D

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

- 23) Which of the following convergent boundary types will NOT result in a deep-ocean trench forming?
A) oceanic-oceanic collision
B) oceanic-continental collision
C) continental-continental collision
D) All of these boundary types result in the formation of a deep-ocean trench.

Answer: C

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

- 24) A transform plate boundary is characterized by _____.
A) stratovolcanoes on the edge of a plate and shield volcanoes on the adjacent plate
B) two converging oceanic plates meeting head-on and piling up into a mid-ocean ridge
C) a divergent boundary where the continental plate changes to an oceanic plate
D) a deep, vertical fault along which two plates slide past one another in opposite directions

Answer: D

Diff: 1

Chapter Subhead: 2.6 Transform Plate Boundaries

Bloom's: Remembering/Understanding

25) The San Andreas fault in California is a good example of a _____ plate boundary.

- A) convergent
- B) divergent
- C) transform
- D) The San Andreas fault is not a plate boundary.

Answer: C

Diff: 1

Chapter Subhead: 2.6 Transform Plate Boundaries

Bloom's: Remembering/Understanding

26) Most transform faults are found _____.

- A) in the center of continents
- B) along the edges of continents
- C) along the oceanic ridge system
- D) adjacent to subduction zones

Answer: C

Diff: 1

Chapter Subhead: 2.6 Transform Plate Boundaries

Bloom's: Remembering/Understanding

27) Which of the following is NOT a result of plate tectonics?

- A) The diameter of Earth is slowly increasing.
- B) The size and shape of plates are constantly changing.
- C) Plate boundaries migrate over time.
- D) Plates are constantly being created and destroyed.

Answer: A

Diff: 1

Chapter Subhead: 2.7 How Do Plates and Plate Boundaries Change?

Bloom's: Remembering/Understanding

28) Which of the following places the events related to the breakup of Pangaea in the proper order?

- A) separation of North America and Africa; separation of Africa, India, and Antarctica; collision of India and Eurasia
- B) collision of India and Eurasia; separation of North America and Africa; separation of Africa, India, and Antarctica
- C) separation of Africa, India, and Antarctica; collision of India and Eurasia; separation of North America and Africa
- D) separation of Africa, India, and Antarctica; separation of North America and Africa; collision of India and Eurasia

Answer: A

Diff: 1

Chapter Subhead: 2.7 How Do Plates and Plate Boundaries Change?

Bloom's: Remembering/Understanding

29) All of the following are evidence supporting the theory of plate tectonics EXCEPT for _____.

- A) changes in the Moon's orbit due to shifting plates
- B) ocean floor drilling
- C) hot spots
- D) paleomagnetism

Answer: A

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

30) The temperature below which magnetic material can retain a permanent magnetization is called the _____.

- A) Darcy temperature
- B) Vine temperature
- C) Bullard point
- D) Curie point

Answer: D

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

31) A very long-lived magma source located deep in the mantle is called a _____.

- A) magma welt
- B) basalt spout
- C) melt well
- D) hot spot

Answer: D

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

32) Which one of the following most accurately describes the volcanoes of the Hawaiian Islands?

- A) They are associated with subduction and a convergent plate boundary.
- B) They are fed by a long-lived hot spot below the Pacific lithospheric plate.
- C) They are associated with a mid-Pacific ridge and spreading center.
- D) They are associated with a mid-Pacific transform fault.

Answer: B

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

33) _____ first related the symmetrical magnetic patterns in seafloor basalts to seafloor spreading at a mid-ocean ridge.

- A) Evans and Novak
- B) Vine and Matthews
- C) Matthews and Marks
- D) Wegener and Wilson

Answer: B

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

34) Early results of the Deep Sea Drilling Project clearly justified the conclusion that _____.

- A) the oceans have not always contained most of Earth's water
- B) the ocean basins are relatively young; most ocean basin rocks and sediments are Cretaceous or younger in age
- C) Proterozoic rocks are found only as seamounts in the deepest parts of the ocean basins
- D) the youngest sediments were deposited directly on the oldest seafloor basalts

Answer: B

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

35) Linear, magnetic patterns associated with mid-ocean ridges are configured as _____.

- A) concentric circles about a rising plume of hot mantle rocks and magma
- B) reversed magnetizations along the rift valleys and normal magnetizations along the ridge
- C) normal and reversed magnetized strips roughly parallel to the ridge
- D) normal and reversed magnetized strips roughly perpendicular to the ridge axis

Answer: C

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

36) Which of the following is true of the rocks of the seafloor?

- A) The oldest rocks of the seafloor are older than the oldest rocks on the continents.
- B) The oldest rocks of the seafloor are younger than the oldest rocks on the continents.
- C) The youngest rocks of the seafloor are older than the oldest rocks on the continents.
- D) The rocks of the seafloor are generally the same age as the rocks on the continents.

Answer: B

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding

37) How do transform faults provide information about the direction of plate motion?

- A) They are aligned perpendicular to the direction of spreading.
- B) They are aligned parallel to the direction of spreading.
- C) They create new seafloor that can be dated and analyzed.
- D) Transform faults do not provide information about the direction of plate motion.

Answer: B

Diff: 2

Chapter Subhead: 2.9 How is Plate Motion Measured?

Bloom's: Applying/Analyzing

38) Which of the following energy sources is thought to drive the lateral motions of Earth's lithospheric plates?

- A) gravitational attractive forces of the Sun and Moon
- B) electrical and magnetic fields localized in the inner core
- C) export of heat from deep in the mantle to the top of the asthenosphere
- D) swirling movements of the molten iron particles in the outer core

Answer: C

Diff: 1

Chapter Subhead: 2.10 What Drives Plate Motions

Bloom's: Remembering/Understanding

39) The subduction of cold, dense oceanic lithosphere—a major driving force of plate motion—is known as _____.

- A) convection
- B) ridge push
- C) slab pull
- D) convective flow

Answer: C

Diff: 1

Chapter Subhead: 2.10 What Drives Plate Motions

Bloom's: Remembering/Understanding

Match the plate boundary with the appropriate phrase.

- A) divergent
- B) transform
- C) convergent

40) plates are moving apart from one another

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

41) the Mid-Atlantic Ridge

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

42) where lithosphere is sinking into the mantle

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

43) characterized by seafloor spreading

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

44) characterized by volcanic arcs and deep-ocean trenches

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

45) where subduction zones occur

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

46) the San Andreas fault

Diff: 1

Chapter Subhead: 2.6 Transform Plate Boundaries

Bloom's: Remembering/Understanding

47) plates are sliding past one another horizontally

Diff: 1

Chapter Subhead: 2.6 Transform Plate Boundaries

Bloom's: Remembering/Understanding

48) this boundary is normally devoid of volcanism

Diff: 1

Chapter Subhead: 2.6 Transform Plate Boundaries

Bloom's: Remembering/Understanding

Answers: 40) A 41) A 42) C 43) A 44) C 45) C 46) B 47) B 48) B

49) Examine the words and/or phrases below and determine the relationship among the majority of words/phrases. Choose the option that does not fit the pattern.

A) fossil evidence

B) fit of the continents

C) mantle plumes

D) paleoclimates

Answer: C

Diff: 1

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Remembering/Understanding

50) Examine the words and/or phrases below and determine the relationship among the majority of words/phrases. Choose the option that does not fit the pattern.

A) oceanic ridge

B) seafloor spreading

C) arc volcanoes

D) divergent

Answer: C

Diff: 1

Chapter Subhead: 2.4 Divergent Plate Boundaries and Seafloor Spreading

Bloom's: Remembering/Understanding

51) Examine the words and/or phrases below and determine the relationship among the majority of words/phrases. Choose the option that does not fit the pattern.

A) midocean ridge

B) island arc

C) volcanic arc

D) subduction

Answer: A

Diff: 1

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Remembering/Understanding

52) Examine the words and/or phrases below and determine the relationship among the majority of words/phrases. Choose the option that does not fit the pattern.

- A) slab pull
- B) paleomagnetism
- C) ridge push
- D) slab suction

Answer: B

Diff: 1

Chapter Subhead: 2.10 What Drives Plate Motions

Bloom's: Remembering/Understanding

Critical thinking and discussion questions. Use complete sentences, correct spelling, and the information presented in chapter 2 to answer the questions below.

53) Although Alfred Wegener presented compelling evidence for his continental drift hypothesis (despite lacking a mechanism), why was the true nature of plate boundaries not determined until the 1960s?

Answer: It was only after WWII that oceanographers began exploring the ocean floor. Many features were discovered such as the Mid-Atlantic Ocean Ridge and the "stripe" signatures of normal and reverse polarity in the oceanic floor.

Diff: 3

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Evaluating/Creating

54) If you could time travel back to the 1920s and meet Alfred Wegener, who was the original proponent of the continental drift hypothesis, what could you tell him about our modern idea of plate tectonics? What would you tell him regarding the structure of the Earth's interior, what evidence exists for plate tectonics, what is the relationship between volcanoes and earthquakes to plate tectonics (specifics), and what are some (if any) of the problems we still have in explaining certain features of plate tectonics?

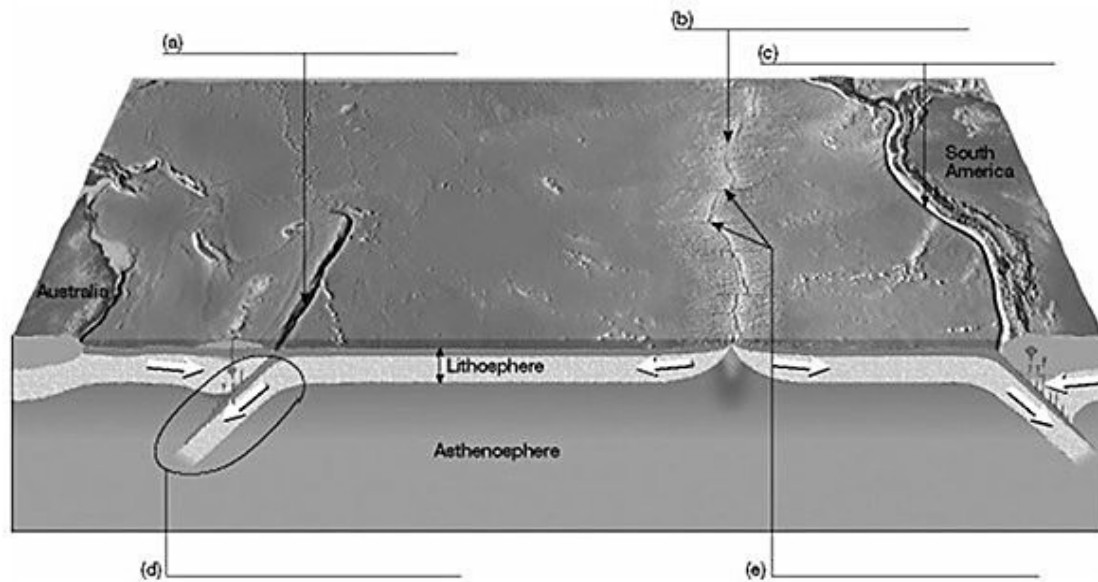
Answer: The Earth is divided into different layers. The outermost rocky layer (the lithosphere) is broken into plates of various sizes. There are multiple lines of evidence that support plate tectonics such as the ages of the seafloor proportional to the distance from the ridge, magnetic stripes of the oceanic floor parallel to oceanic ridges, and hotspots. The plate boundaries and earthquakes are closely linked. For instance, the region around the Peru-Chile trend experiences great earthquakes. Convection in the mantle is a process that still needs to be fully understood.

Diff: 3

Chapter Subhead: 2.2 Continental Drift: An Idea Before Its Time

Bloom's: Evaluating/Creating

55) Fill in the blanks with the correct name of the feature that is labeled.



Answer: (a) oceanic trench

(b) oceanic ridge

(c) oceanic trench

(d) subduction zone

(e) transform faults

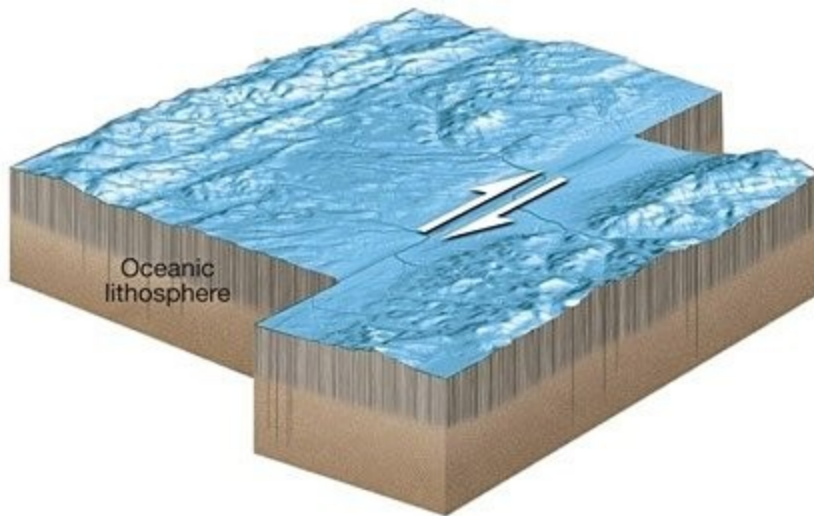
Diff: 1

Chapter Subhead: Multiple

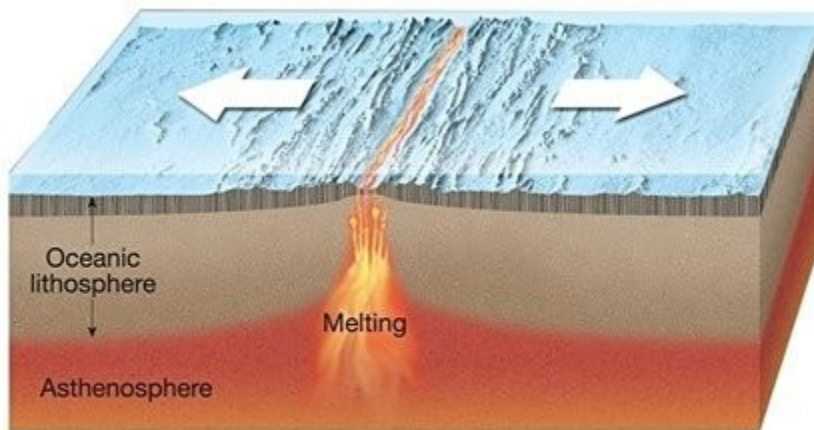
Bloom's: Remembering/Understanding

56) In the diagram below, match the letter of each illustration to the correct type of plate boundary.

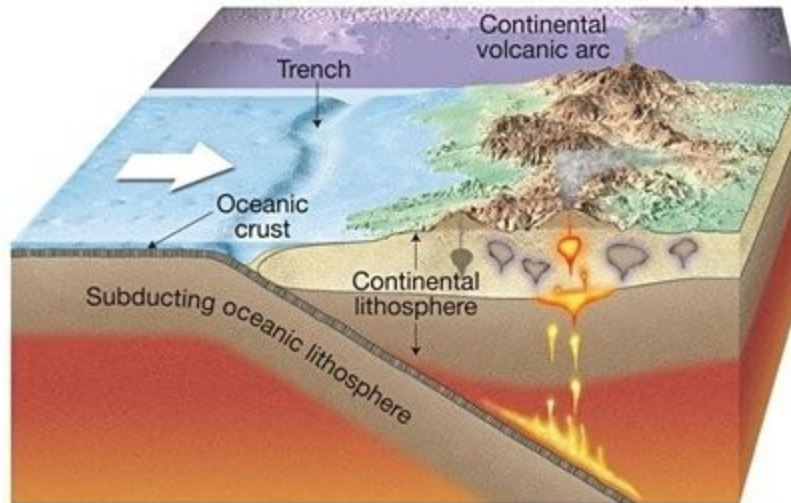
(A) convergent (B) transform (C) divergent



(a) _____



(b) _____



(c)

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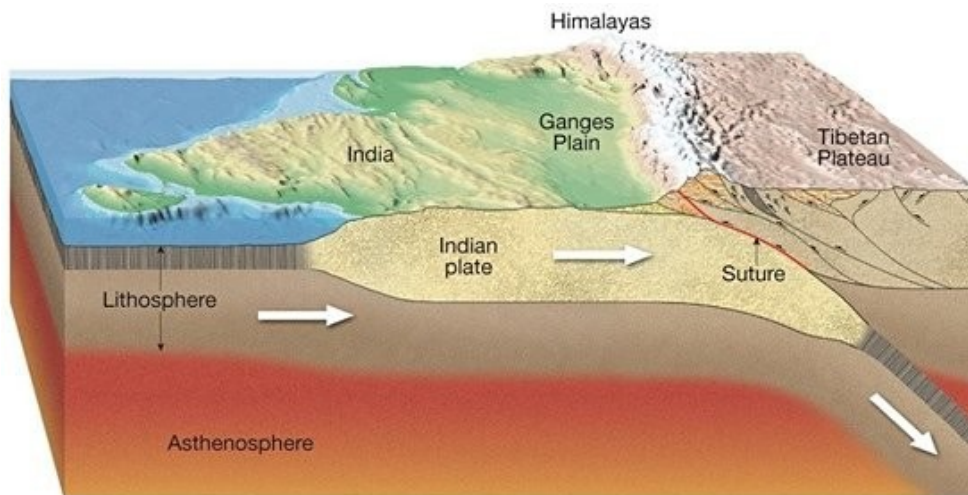
Answer: (a) B, (b) C, (c) A

Diff: 1

Chapter Subhead: Multiple

Bloom's: Remembering/Understanding

57) Describe exactly what type of plate boundary is illustrated below and explain your answer by providing additional information about this type of boundary and the resultant features.



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Answer: This is an example of a continental-to-continental convergent plate boundary. The continental lithosphere is too buoyant for subduction to occur; therefore, the two plates collide and the crust is buckled, fractured, and thickened. Major mountain systems including the Alps, Himalayas, Appalachians, and the Urals formed during continental collisions.

Diff: 2

Chapter Subhead: 2.5 Convergent Plate Boundaries and Subduction

Bloom's: Applying/Analyzing

58) Study the image below. What is depicted, and what information can it provide to geologists?



- A) record of magnetism of the seafloor, evidence of seafloor spreading
- B) record of magnetism of the seafloor, measure of density of oceanic crust
- C) carbon-dates for ages of seafloor rocks, age of the seafloor
- D) layers of magma erupting from a mid-ocean ridge, evidence of transform faults

Answer: A

Diff: 1

Chapter Subhead: 2.8 Testing the Plate Tectonics Model

Bloom's: Remembering/Understanding