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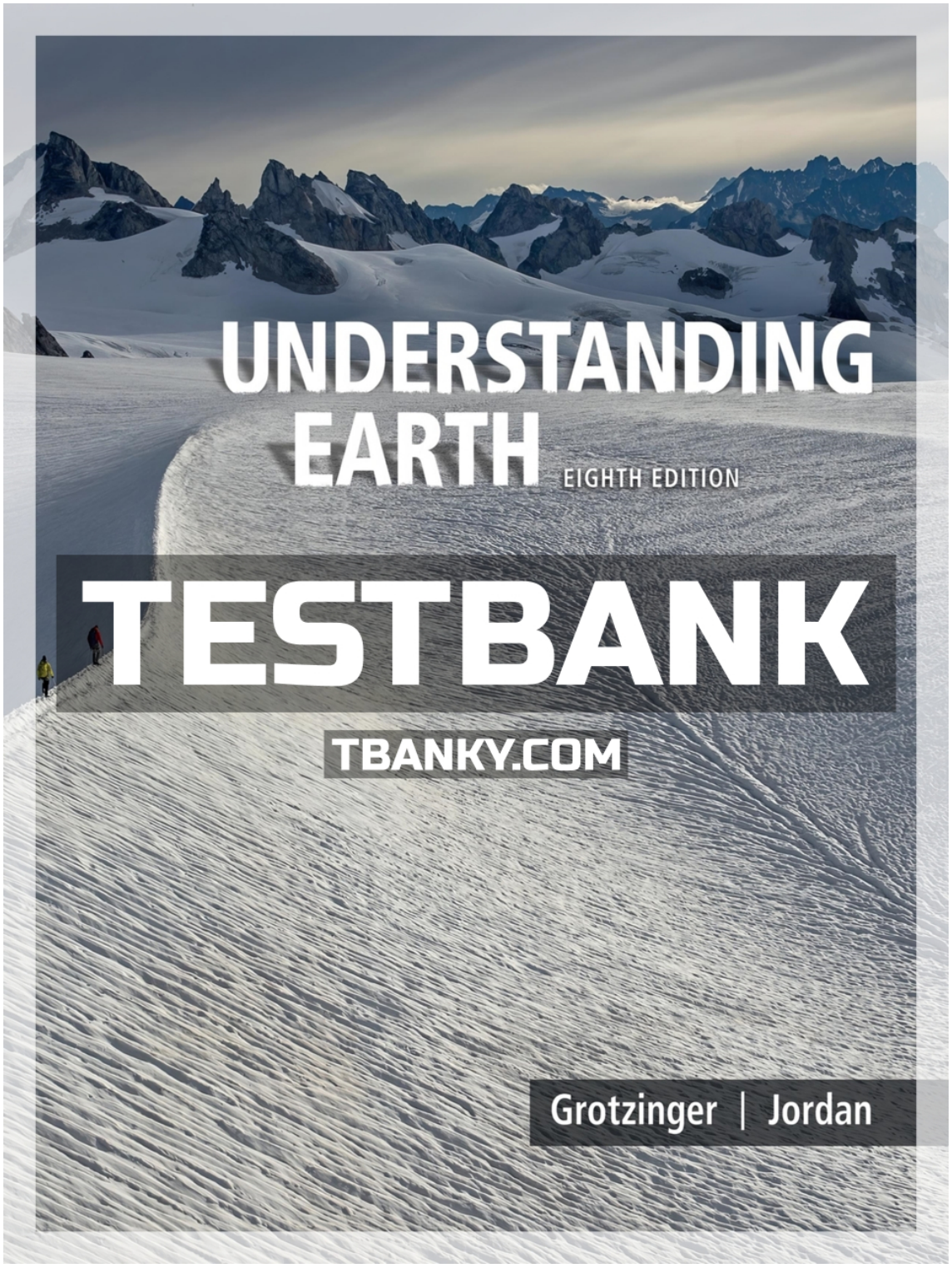

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Chapter 02: Plate Tectonics: The Unifying Theory

1. Who proposed the theory of continental drift?
   a. Charles Darwin
   b. Harry Hess
   c. Alfred Wegener
   d. J. Tuzo Wilson

ANSWER: c

2. Which one of the following concepts was developed earliest?
   a. continental drift
   b. plate tectonics
   c. seafloor spreading
   d. All three concepts were developed at approximately the same time.

ANSWER: a

3. How old are the fossils of the reptile *Mesosaurus* found in Africa and South America that suggest the two continents were once together?
   a. approximately 100 million years
   b. approximately 1.0 billion years
   c. approximately 300 million years
   d. approximately 3.0 billion years

ANSWER: c

4. When was the theory of plate tectonics developed?
   a. 1860s
   b. 1920s
   c. 1940s
   d. 1960s

ANSWER: d

5. New lithosphere is created
   a. in deep-sea trenches.
   b. in subduction zones.
   c. at mid-ocean ridges.
   d. along transform faults.

ANSWER: c

6. In which ocean are most of the world's convergent plate margins located?
   a. Arctic Ocean
   b. Atlantic Ocean
   c. Indian Ocean
   d. Pacific Ocean

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ANSWER: d

7. The east coast of North America is
   a. a convergent plate boundary.
   b. a transform plate boundary.
   c. a divergent plate boundary.
   d. not a plate boundary.

ANSWER: d

8. Which of the following is associated with a divergent plate boundary?
   a. earthquakes
   b. volcanism
   c. rifting
   d. all of the above

ANSWER: d

9. Which one of the following is a divergent plate boundary?
   a. the Andes Mountains
   b. the Mid-Atlantic Ridge
   c. the Himalayan Mountains
   d. the San Andreas fault

ANSWER: b

10. At what type of plate boundary do the deepest earthquakes occur?
   a. convergent
   b. divergent
   c. transform
   d. All types of plate boundaries have deep earthquakes.

ANSWER: a

11. Approximately how deep (below sea level) are the deepest deep-sea trenches?
   a. 3 km
   b. 10 km
   c. 30 km
   d. 100 km

ANSWER: b

12. Which one of the following is not associated with convergent plate boundaries?
   a. earthquakes
   b. deep-sea trenches
   c. spreading centers

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d. volcanoes

ANSWER: c

13. Which one of the following occurs at a convergent plate boundary?
    a. rifting
    b. seafloor spreading
    c. adding seafloor
    d. subduction

ANSWER: d

14. Which one of the following mountain ranges formed as a result of ocean-continent convergence?
    a. the Andes
    b. the Appalachians
    c. the Himalayas
    d. the Urals

ANSWER: a

15. When a deep-sea trench is located next to a continent, where would you expect to find active volcanoes?
    a. on the ocean side of the trench
    b. in the deep-sea trench
    c. on the continent side of the trench
    d. on both the ocean side and continent side of the trench

ANSWER: c

16. What plate is subducting beneath southwestern Canada and the northwestern United States?
    a. the Cocos Plate
    b. the Nazca Plate
    c. the Juan de Fuca Plate
    d. the Pacific Plate

ANSWER: c

17. The west coast of South America is
    a. a convergent plate boundary.
    b. a transform-fault boundary.
    c. a divergent plate boundary.
    d. not a plate boundary.

ANSWER: a

18. Which of the following is an example of a transform plate boundary?
    a. the East African Rift
    b. the Mid-Atlantic Ridge

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c. the Marianas Trench
d. the San Andreas Fault

ANSWER: d

19. What type of plate boundary is parallel to the direction of plate movement?
a. convergent plate boundary
b. transform-fault plate boundary
c. divergent plate boundary
d. all of the above

ANSWER: b

20. Which one of the following mountain ranges is the product of continent-continent convergence?
a. the Andes
b. the Cascade Range
c. the Himalayas
d. the Japanese islands

ANSWER: c

21. The North American Plate is bounded by _____ plate boundaries.
a. convergent
b. transform
c. divergent
d. convergent, divergent, and transform

ANSWER: d

22. Which of the following is used to determine the past rates of plate motion?
a. astronomical position of the center of the lithospheric plate
b. seafloor magnetic anomalies across the lithospheric plate
c. global positioning system used to determine the location of the center of the lithospheric plate
d. all of the above

ANSWER: b

23. Modern seafloor spreading rates range from
a. 0.2 to 1.5 millimeters per year.
b. 2 to 15 meters per year.
c. 2 to 15 centimeters per year.
d. 2 to 15 kilometers per year.

ANSWER: c

24. What two scientists related the positive and negative magnetic bands on the seafloor to seafloor spreading?
a. Charles Darwin and James Hutton

b. F. J. Vine and D. H. Mathews
c. Harry Hess and Robert Dietz
d. Alfred Wegener and Arthur Holmes

ANSWER: b

25. Which one of the following is commonly used to determine the age of seafloor samples recovered by the deep-sea drilling project?
a. geodetic measurements
b. foraminifera fossils
c. chemical composition
d. gravity measurements

ANSWER: b

26. Which one of the following plates is moving the fastest?
a. the African Plate
b. the North American Plate
c. the Eurasian Plate
d. the Pacific Plate

ANSWER: d

27. On a map of the seafloor, the boundaries between normally magnetized oceanic crust and reversely magnetized oceanic crust are called
a. dipoles.
b. isochrons.
c. isograds.
d. sutures.

ANSWER: b

28. When was the supercontinent of Pangaea assembled?
a. approximately 100 million years ago
b. approximately 1.0 billion years ago
c. approximately 250 million years ago
d. approximately 2.5 billion years ago

ANSWER: c

29. How old are the oldest rocks on the ocean floor?
a. approximately 20 million years old
b. approximately 600 million years old
c. approximately 200 million years old
d. approximately 4.0 billion years old

ANSWER: c

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30. The oldest continental rocks are _____ than the oldest oceanic rocks.
    a. much older
    b. slightly older
    c. slightly younger
    d. much younger

ANSWER: a

31. Isochrons on the seafloor are roughly _____ the ridge axis along which they were created.
    a. parallel to and symmetric about
    b. perpendicular to and symmetric about
    c. parallel to, but not symmetric about
    d. perpendicular to, but not symmetric about

ANSWER: a

32. Why are isochrons on the Pacific seafloor more widely spaced than isochrons on the Atlantic seafloor?
    a. The Pacific seafloor formed at a faster spreading rate than the Atlantic seafloor.
    b. The Pacific seafloor formed at a slower spreading rate than the Atlantic seafloor.
    c. The Pacific seafloor is older than the Atlantic seafloor.
    d. The Pacific seafloor is younger than the Atlantic seafloor.

ANSWER: a

33. What ocean used to lie between Africa and Eurasia and was the ancestor to today's Mediterranean Sea?
    a. Gondwana
    b. Panthalassa
    c. Rodinia
    d. Tethys

ANSWER: d

34. When did the supercontinent Pangaea begin to break apart?
    a. approximately 65 million years ago
    b. approximately 570 million years ago
    c. approximately 200 million years ago
    d. approximately 1.5 billion years ago

ANSWER: c

35. Pangaea split into two continents: Laurasia, made up of the northern continents, and _____, made up of the southern continents.
    a. Tethys
    b. Panthalassa
    c. Gondwana

d. Cascadia

ANSWER: c

36. When did India begin to collide with Asia to form the Himalayas?
a. approximately 50 million years ago
b. approximately 500 million years ago
c. approximately 200 million years ago
d. approximately 2.0 billion years ago

ANSWER: a

37. Compared with slower moving plates, faster moving plates are bounded by a greater proportion of
a. continent collision zones.
b. subduction zones.
c. mid-ocean ridges.
d. transform faults.

ANSWER: b

38. What drives plate tectonics?
a. magnetic reversals
b. mantle convection
c. solar energy
d. volcanism

ANSWER: b

39. Which one of the following forces is important in driving plate tectonics?
a. the pulling force of a sinking lithospheric slab
b. the pushing force of a plate sliding off a mid-ocean ridge
c. the suction force of a retreating subduction zone
d. all of the above

ANSWER: d

40. How deep are plates subducted?
a. 100 km
b. 700 km
c. 2900 km
d. 6400 km

ANSWER: c

41. Regions of intense localized volcanism, such as Hawaii, form above plumes of fast-rising material that originate in the
a. crust.

b. deep mantle.
c. lithosphere.
d. outer core.

ANSWER: b

42. The Hawaiian volcanoes are
a. located at a convergent plate boundary.
b. located at a divergent plate boundary.
c. located at a transform plate boundary.
d. in the middle of a tectonic plate.

ANSWER: d

43. New oceanic crust is created at
a. subduction zones.
b. deep-sea trenches.
c. mid-ocean ridges.
d. transform boundaries.

ANSWER: c

44. Shallow focus earthquakes are associated with which type of plate boundary?
a. divergent
b. convergent
c. transform
d. all of the above

ANSWER: d

45. Mid-ocean ridges are also referred to as
a. spreading centers.
b. hot spots.
c. island arcs.
d. trench zones.

ANSWER: a

46. An island arc forms when there is _____ convergence.
a. ocean-continent
b. ocean-ocean
c. continent-continent
d. island-continent

ANSWER: b

47. The convergence of the North American Plate with the Juan de Fuca Plate forms the _____ subduction

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zone.

a. Marianas
b. Andean
c. Aleutian
d. Cascadia

ANSWER: d

48. Mount St. Helens is part of the

a. Andes Mountains.
b. Mid-Atlantic Ridge.
c. Himalayan Mountains.
d. Cascade Range.

ANSWER: d

49. The Great Rift Valley of East Africa is a

a. convergent boundary.
b. divergent boundary.
c. transform boundary.
d. deep-sea trench.

ANSWER: b

50. The Appalachian Mountains formed from an ancient _____ plate boundary.

a. convergent
b. transform
c. divergent
d. converform

ANSWER: a

51. Oceanic crust that records negative magnetic anomalies formed when the Earth's magnetic field was

a. the same as it is today.
b. the same as today, except weaker.
c. reversed from what it is today.
d. the same as today, except stronger.

ANSWER: c

52. Geodetic positioning measures points on the Earth's surface relative to

a. the position of Mars.
b. the position of known comets.
c. the position of the Moon.
d. the position of fixed stars.

ANSWER: d

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53. If the position between antennas on two plates moving away from each other changes by 5 mm/yr, then each plate is moving at approximately
    a. 5 mm/yr.
    b. 2.5 mm/yr.
    c. 10 mm/yr.
    d. 1 mm/yr.

ANSWER: b

54. Rodinia is a supercontinent that formed
    a. after Pangea.
    b. at the same time as Pangea.
    c. before Pangea.
    d. Geoscientists have no idea when Rodinia was formed.

ANSWER: c

55. Geoscientists predict the east coast of North America will be _____ 50 million years in the future.
    a. a divergent plate boundary
    b. a transform plate boundary
    c. a convergent plate boundary
    d. the same as it is today

ANSWER: c

56. The main type of plate boundaries are (proper names only):
    a. transform, sliding-past, scissor.
    b. convergent, colliding, crumbling.
    c. divergent, pull-apart, spreading.
    d. convergent, transform, divergent.

ANSWER: d

57. What kind of plate boundary defines the eastern edge of the plate we live on in the United States?
    a. deep sea trench
    b. mid-ocean rift
    c. continental spreading center
    d. transform fault

ANSWER: b

58. How do we determine absolute direction of plate movement over millions of years?
    a. with astronomical positioning
    b. with the global positioning system (GPS)
    c. with seafloor isochrons

d. by looking at the alignment of mountain ranges on the continents

ANSWER: c

59. _____ are the most extensive mountain ranges on Earth today.
    a. The Alps
    b. The Himalayas
    c. The Rockies
    d. Mid-oceanic ridges

ANSWER: d

60. Who first described world tectonics in terms of rigid plates?
    a. Alfred Wegener
    b. Harry Hess
    c. Tuzo Wilson
    d. Robert Dietz

ANSWER: c

61. Who first proposed the three different kinds of plate boundaries widely accepted today?
    a. Tuzo Wilson
    b. Alfred Wegener
    c. Robert Dietz
    d. Harry Hess

ANSWER: a

62. Which of the following locations is least likely to have active volcanoes?
    a. mid-oceanic ridge
    b. continental rift valley
    c. transform fault
    d. island arc

ANSWER: c

63. How many major plates cover the Earth's surface?
    a. 2
    b. 5
    c. 13
    d. 30

ANSWER: c

64. Which of the following plates is the largest?
    a. Cocos Plate
    b. Indian Plate

c. North American Plate
d. Pacific Plate

ANSWER: d

65. Which of the following plates contains only oceanic crust?
a. North Atlantic Plate
b. Australian Plate
c. Nazca Plate
d. African Plate

ANSWER: c

66. Who first suggested that the Earth's surface might be a fragile shell resting on fluid?
a. Alfred Wegener
b. Harry Hess
c. Benjamin Franklin
d. Arthur Holmes

ANSWER: c

67. _____ was the first Earth scientist to propose a rudimentary form of seafloor spreading.
a. Arthur Holmes
b. Harry Hess
c. Alfred Wegener
d. Tuzo Wilson

ANSWER: a

68. Which scientist was the first to suggest the existence of so-called "supercontinents"?
a. German Alfred Wegner
b. Austrian Eduard Suess
c. Canadian Tuzo Wilson
d. British Arthur Holmes

ANSWER: b

69. Roughly when did most Earth scientists accept plate tectonics as a theory?
a. 1960
b. 1970
c. 1980
d. 1990

ANSWER: b

70. Compared with oceanic crust the continental crust is generally lighter, ____ and _____.
a. weaker; thinner

b. stronger; thinner
c. weaker; thicker
d. stronger; thicker

ANSWER: c

71. Compared with oceanic rifts, the continental rifts generally lack
a. rift valleys.
b. earthquakes.
c. volcanic activity.
d. transform faults.

ANSWER: d

72. Where is the best place to explore the mid-ocean ridge as it comes on land?
a. Ireland
b. Iceland
c. Norway
d. Africa

ANSWER: b

73. Most transform-fault boundaries are typically associated with
a. subduction zones.
b. continental rifts.
c. oceanic rifts.
d. mountain ranges.

ANSWER: c

74. The North American Plate is bounded on the west with _____ boundaries and the east with ___ boundaries.
a. convergent and transform; divergent
b. divergent; convergent and transform
c. transform; convergent
d. divergent; transform

ANSWER: a

75. Deep focus earthquakes are typically associated with which type of plate boundary?
a. divergent
b. convergent
c. transform
d. all of the boundaries

ANSWER: b

76. Which type of measurements initially led to determining the rate of plate movement with a high degree of

accuracy?

a. geodesy
b. astronomical positioning
c. radio telescopes
d. GPS

ANSWER: c

77. Which type of measurements are currently used to determine the rate of plate movement with a high degree of accuracy?

a. geodesy
b. astronomical positioning
c. radio telescopes
d. GPS

ANSWER: d

78. The width of seafloor isochrons is directly related to

a. their distance from a mid-ocean ridge.
b. their age.
c. spreading rate.
d. the frequency of magnetic reversals.

ANSWER: c

79. Given the current plate configuration, we would expect the distance between which of the following cites to increase?

a. Los Angles and New York
b. New York and London
c. London and Moscow
d. Honolulu and Tokyo

ANSWER: b

80. Roughly how long has the North American Plate been around?

a. 6 thousand years
b. 6 million years
c. 60 million years
d. 600 million years

ANSWER: c

81. Assuming that the direction and rates of plate movement will remain constant for the next 50 million years, how will the distance between London and New York change?

a. It will remain the same.
b. It will decrease.

c. It will increase.
d. It is impossible to predict.

ANSWER: c

82. What is not possible to explain with the theory of plate tectonics?
a. where volcanoes erupt
b. where earthquakes occur
c. the phases of the moon
d. the locations of mountains

ANSWER: c

83. What was not used by Wegner to propose the existence of Pangea?
a. the distribution of Mesosaurus
b. seafloor spreading
c. matching rock assemblages
d. the close fit of the continents

ANSWER: b

84. Marie Tharp contributed to the revolutionary theory of plate tectonics by
a. mapping the seafloor.
b. showing that the ocean floor is made mostly of basalt.
c. showing that the ocean floor is made mostly of granite.
d. describing the process of seafloor spreading.

ANSWER: a

85. What is the Ring of Fire?
a. a region of intense volcanic activity around the Pacific Ocean
b. a region of earthquake activity around the Pacific Ocean
c. the heating of Antarctica due to the creation of the ozone hole
d. evidence that the seafloor is being recycled

ANSWER: d

86. A reasonable rate of motion of across the western boundary of the South American Plate is
a. 73 mm/y.
b. 73 in/y.
c. 73 ft /y.
d. 73 km/y.

ANSWER: a

87. Any given plate has the same kind of plate boundary (divergent, convergent, or transform) all around it.
a. True

b. False

ANSWER: False

88. A volcanic arc is associated with subduction
a. of a mid-ocean ridge.
b. at a rift zone.
c. at an ocean-ocean convergent plate boundary.
d. at an ocean-continental convergent plate boundary.

ANSWER: d

89. The breakup of Pangea was likely begun with the formation of a
a. a mid-ocean ridge.
b. a rift valley.
c. an island arc.
d. a subduction zone.

ANSWER: b

90. The magnetic time scale shows geologists that
a. the North magnetic pole has always been at the North Pole.
b. the South magnetic pole has shifted to the North magnetic pole only over the last 5 million years.
c. the Earth's magnetic field changes about every 200,000 years.
d. volcanoes have erupted every 200,000 years.

ANSWER: c

91. Seafloor spreading was explained by
a. measuring the increasing width of the ocean basins.
b. measuring the age of the seafloor at various known locations.
c. recording high and low magnetic field strength variations in the rocks on the seafloor.
d. observing mantle plumes, like Hawaii.

ANSWER: b

92. What are the two pieces of information needed to determine the age of the seafloor?
a. the magnetic field anomaly and the kind of the nearest plate tectonic boundary
b. the magnetic field anomaly and the geodetic position of the plate
c. the precise location of the center of the lithospheric plate and the kind of the nearest plate tectonic boundary
d. the magnetic field anomaly and the geologic ages of several known places on the seafloor

ANSWER: d

93. The ocean floor age, as shown by isochrons, is only as old as Pangea because during the rest of the history of the Earth going back to 4.6 billion years,

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a. the ocean floor was consumed at subduction zones.
b. the ocean floor was only created at subduction zones.
c. the rest of the ocean floor was metamorphosed to mountain chains.
d. geodetic measurements of the ocean floor only extend to 280 million years.

ANSWER: a

94. Isochrons on the seafloor are parallel to
a. magnetic anomalies on the seafloor.
b. hot-spot trails on the seafloor.
c. transform plate boundaries.
d. rift zones on the continent.

ANSWER: a

95. What is not possible to interpret, using plate tectonics?
a. global warming
b. climate change
c. rock formation
d. mountain building

ANSWER: a