

***Understanding Earth 8th edition Grotzinger Test
Bank***

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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

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- 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

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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.

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- 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

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- 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

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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

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- 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

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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 cities to increase?

- a. Los Angeles 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.

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- 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

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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