MULTIPLE CHOICE

1. About ____ percent of Earth's surface is covered by water.
   a. 71
   b. 90
   c. 66
   d. 75
   e. none of these
   ANS: A     PTS: 1     REF: p. 2

2. The average depth of the ocean is about ____.
   a. 2,500 feet
   b. 3,700 meters
   c. 200 meters
   d. 4,000 feet
   e. 1,600 meters
   ANS: B     PTS: 1     REF: p. 2

4. Earth is about:
   a. 6,000 to 10,000 years old.
   b. 4.5 billion years old.
   c. 45 million years old.
   d. 40 billion years old.
   e. 4.5 million years old.
   ANS: B     PTS: 1     REF: p. 21

5. The ocean was formed about:
   a. 13 billion years ago.
   b. 2 billion years ago.
   c. 4.2 billion years ago.
   d. 20 million years ago.
   e. 4.2 million years ago.
   ANS: C     PTS: 1     REF: p. 16

7. Life on Earth most probably evolved:
   a. on land.
   b. in the ocean.
   c. in space.
   d. as part of the Big Bang.
   e. as part of divine creation.
   ANS: B     PTS: 1     REF: p. 6

9. The ocean originated from:
   a. volcanic gases.
   b. radioactive heating of the Earth's interior, and the heating of the surface by meteorites striking and melting the outer layers of the Earth.
   c. capture by the Earth's gravity of water molecules in space.
d. volcanic gases, radioactive heating of the Earth's interior, and the heating of the surface by meteorites striking and melting the outer layers of the Earth.
e. all of these

ANS: D  PTS: 1  REF: p. 6

13. Based on evidence that supports an idea regarding an ocean on Mars, which of the following statements is TRUE?
a. Mars has an ocean today.
b. Mars has an ocean, and it is probably hidden in vast caverns beneath the surface of the planet.
c. Mars may have had an ocean in ancient times, perhaps 3 billion years ago.
d. Mars may have had an ocean until very recently.
e. none of these

ANS: C  PTS: 1  REF: p. 17

18. Volcanic venting of substances including water vapor is called ____.
a. outgassing
b. fissure
c. fusion
d. condensation
e. evaporation

ANS: A  PTS: 1  REF: p. 13

Chapter 2—History

MULTIPLE CHOICE

1. Which of the following people would probably be given the title of "first ocean scientist"?
a. Matthew Maury
b. Captain James Cook
c. Christopher Columbus
d. Wyville Thompson (of the Challenger expedition)
e. Eratosthenes of Cyrene

ANS: B  PTS: 1  REF: p. 34

2. Which of the following voyages would qualify as the first 100 percent pure scientific oceanographic expedition?
a. Columbus' 1496 trip
b. the Challenger expedition
c. Benjamin Franklin's first voyage across the Atlantic to take up his post as American Ambassador to France
d. Captain Cook's voyage to Tahiti in the ship Endeavour
e. none of these

ANS: B  PTS: 1  REF: p. 36

5. Which of the following men was the first to publish a reasonably accurate chart of an ocean current, specifically the Gulf Stream?
a. Edward Forbes
b. John Harrison
c. Benjamin Franklin
6. Polynesian navigators depended on ____ for accurate navigation.
   a. stories passed on from generations before them
   b. stars, clouds, and the flight direction of birds
   c. the temperature and appearance of the seawater
   d. the direction and shape of waves that hit against the hulls of their vessels
   e. all of these

ANS: E  PTS: 1  REF: p. 27

7. Captain James Cook accomplished all of these tasks EXCEPT:
   a. first European to contact the Hawaiian Islands
   b. first to circumnavigate the world near Antarctica
   c. first European to explore the South Pacific
   d. mapped the coasts of Australia and New Zealand
   e. All of the above are accomplishments of Captain James Cook.

ANS: C  PTS: 1  REF: p. 34

9. Which of the following statements is FALSE regarding latitude and longitude?
   a. Longitude lines are drawn parallel to the equator while latitude lines are drawn from pole to pole.
   b. Latitude and longitude is a system of imaginary lines dividing the Earth's surface into a grid.
   c. The distance between the lines of longitude varies with latitude while the lines of latitude are always equidistant.
   d. Zero latitude is the equator and zero longitude is Greenwich, England, or the prime meridian.
   e. None of these are false.

ANS: A  PTS: 1  REF: p. 25

13. Glomar Challenger is known mainly for:
   a. being the first modern scientific survey ship to circumnavigate the globe.
   b. being the first nuclear powered scientific research vessel.
   c. being owned and operated simultaneously by four governmental agencies.
   d. taking the first complete cores of deep-sea sediments.
   e. none of these

ANS: D  PTS: 1  REF: p. 43

15. Why did the Chinese abandon ocean exploration in 1433?
   a. They were too slow in developing ships that would allow them to stay at sea for long periods of time.
   b. They were distracted by the Dark Ages.
   c. They were not interested in showing the wealth or power of the Ming Dynasty to other peoples of the world.
   d. Political winds changed, and the cost of the exercise was deemed too great.
   e. all of these

ANS: D  PTS: 1  REF: p. 30
16. Contributions by early Chinese scientists and philosophers include:
   a. developing seagoing methods that allowed them to stay at sea for nearly four months.
   b. retrofitting their ships with multi-masts to sail more efficiently with changing winds.
   c. suggesting that the Earth was very old.
   d. designing and developing rudders and watertight compartments.
   e. all of these
   ANS: E  PTS:  1    REF:  p. 29

17. Which of the following statements is true about Christopher Columbus and his explorations?
   a. His goal was to discover new lands.
   b. Like many early explorers, Columbus thought the Earth was flat.
   c. One of Columbus' biggest mistakes is that he estimated the Earth to be only about half of its true size.
   d. He was the first explorer to see the mainland of North America.
   e. none of these
   ANS: C  PTS:  1    REF:  p. 32

23. Polar oceanography began with:
   a. Forbes.
   b. Wilkes.
   c. Thompson.
   d. Nansen.
   e. none of these
   ANS: D  PTS:  1    REF:  p. 41

25. Current technologies used in modern marine science include:
   a. SCUBA.
   b. deep diving manned submersibles.
   c. echo sounders.
   d. oceanographic satellites.
   e. all of these
   ANS: E  PTS:  1    REF:  p. 41-45

26. Information about the ocean that satellites can provide to scientists include all of the following EXCEPT:
   a. sea surface height.
   b. sea surface temperature.
   c. wave height.
   d. sea floor sedimentation rate.
   e. none of these
   ANS: D  PTS:  1    REF:  p. 44-45

Chapter 3—Earth Structure and Plate Tectonics

MULTIPLE CHOICE

1. As early as the 1700s, scientists and explorers notice a remarkable coincidence of shape of the Atlantic coasts of Africa and which continent?
   a. North America
   b. Australia
c. Asia
d. South America
e. Antarctica

ANS: D  PTS: 1  REF: p. 50

2. The outermost solid layer of the Earth that comprises both continental and oceanic crust is called the:
   a. hydrosphere.
   b. lithosphere.
   c. asthenosphere.
   d. outer core.
   e. none of these

ANS: B  PTS: 1  REF: p. 53

4. Earlier than 200 million years ago, the continents were joined into one supercontinent called:
   a. Pangaea.
   b. Panthalassa.
   c. Oceanus.
   d. Tethys.
   e. none of these

ANS: A  PTS: 1  REF: p. 50

6. A boundary in which crustal plates move past one another is called a:
   a. transform fault.
   b. convergent zone.
   c. divergent zone.
   d. rift valley.
   e. none of these

ANS: A  PTS: 1  REF: p. 62

7. One cubic meter of which of these would weigh the most?
   a. seawater
   b. granite rock
   c. basaltic rock
   d. mantle
   e. none of these

ANS: D  PTS: 1  REF: p. 53

8. The Hawaiian Islands formed as they pass over a hot spot in the middle of the:
   a. Mid-Atlantic ridge.
   b. Nazca Plate.
   c. Mariana Trench.
   d. Pacific Plate.
   e. none of these

ANS: D  PTS: 1  REF: p. 69

9. A cross section of Earth reveals a layered structure that has different thicknesses and densities. How do geologists know this?
   a. From drilling and digging down into the various layers.
   b. From observing the characteristics of lava and gas issuing from volcanic vents.
   c. From observing the transit times through the Earth of waves generated by large
earthquakes.
d. From comparisons with drill cores taken by robot spacecraft on Mars and Venus.
e. none of these
ANS: C         PTS: 1         REF: p. 52

12. When a substance is resting in buoyant equilibrium, moving neither up nor down:
a. it weighs less than the water surrounding it.
b. it displaces a volume of water equal in weight to its own weight.
c. it displaces a volume of water which weighs slightly more than its own weight.
d. it displaces a volume of water which weighs slightly less than its own weight.
e. it weighs more than the water surrounding it.
ANS: B         PTS: 1         REF: p. 55

14. A "mystery" in our understanding of plate tectonics has been, until recently, the nature of the power source capable of moving the plates and the continents embedded within them. Recent evidence indicates the power source to be:
a. the readjustment of the surface to continual shrinking of the whole Earth.
b. convection currents within the Earth's mantle is moving the plates.
c. the action of ocean currents is dragging along the seafloor, causing the seafloor and the continents to move.
d. the continual vibration from earthquakes and volcanoes slowly moves the continents equatorward under the influence of centrifugal force.
e. all of these
ANS: B         PTS: 1         REF: p. 57

16. Land-based evidence for plate tectonics can be seen in:
a. the distribution of Glossopteris flora and fauna.
b. evidence of ancient glaciation.
c. the lineation of mountain ranges.
d. the correlation of rocks in now widely separated continents.
e. all of these
ANS: E         PTS: 1         REF: p. 50

17. The youngest seafloor rocks are found:
a. nearest the continental slopes.
b. near the rift valleys of the mid-ocean ridges.
c. beneath the deep sea trenches.
d. evenly distributed over the ocean basins.
e. none of these
ANS: B         PTS: 1         REF: p. 56

20. New crust is being generated:
a. in the deep trenches.
b. in submarine canyons.
c. in the rift valleys of the mid-ocean ridges.
d. at the centers of large continents.
e. none of these
ANS: C         PTS: 1         REF: p. 57

21. Geologists believe that a new ocean basin is forming:
22. Oceanographers believe the breakup of Pangaea occurred about:
   a. 1 million years ago.
   b. 10 to 25 million years ago.
   c. 180 to 200 million years ago.
   d. 750 million years ago.
   e. 18 to 25 billion years ago.
   
   ANS: C      PTS: 1      REF: p. 64

24. The mid-ocean ridges are:
   a. subduction zones.
   b. transform or lateral plate boundaries.
   c. divergent plate boundaries.
   d. convergent plate boundaries.
   e. none of these

   ANS: C      PTS: 1      REF: p. 60

25. Roughly how fast do most lithospheric plates move?
   a. about 3 kilometers per hour
   b. about 3 kilometers per thousand years
   c. about 3 centimeters per hour
   d. about 3 centimeters per year
   e. about 3 meters per year

   ANS: D      PTS: 1      REF: p. 57

Chapter 4—Ocean Basins

MULTIPLE CHOICE

1. How can a satellite sense the contours of the ocean bottom from space?
   a. By shining a laser through the ocean to see the bottom.
   b. By using radar to sense the height of the sea surface over submerged features.
   c. By using sonar to measure ocean bottom contours directly.
   d. By sensing changes in gravity as it flies over trenches and mountain ranges.
   e. none of these

   ANS: B      PTS: 1      REF: p. 78-80

3. World-wide, the average width of the continental shelves is about ____ kilometers (____ miles).
   a. 16 (10)
   b. 35 (22)
   c. 67 (42)
   d. 100 (160)
   e. none of these
4. Submarine canyons occur:
   a. at the part of an ocean basin nearest the poles.
   b. at the part of an ocean basin nearest the equator.
   c. near the edges of ocean basins associated with continental shelves and slopes.
   d. at the center of an ocean basin, at the edges of the mid-ocean ridge.
   e. none of these

ANS: C    PTS: 1    REF: p. 87

5. The deep-ocean basin includes all of the following features *EXCEPT*:
   a. continental shelf.
   b. continental rise.
   c. abyssal plains.
   d. mid-ocean ridges.
   e. none of these

ANS: A    PTS: 1    REF: p. 83

6. The continental shelf:
   a. is a narrow strip on the East Coast of the United States.
   b. is a steeply dipping zone dropping off to the deep seafloor.
   c. is a featureless plain unlike the neighboring continent.
   d. is a gently sloping platform with a variable landscape.
   e. all of these

ANS: D    PTS: 1    REF: p. 84

8. The transition between the shelf and the deep seafloor is:
   a. the littoral zone.
   b. the continental slope and rise.
   c. the abyssal plain.
   d. the mid-ocean ridge.
   e. none of these

ANS: B    PTS: 1    REF: p. 86-87

9. Submarine canyons are:
   a. found worldwide, on all kinds of shelves.
   b. steep-walled and narrow.
   c. cut into firm rock.
   d. cut into the shelf and may extend almost to the shore.
   e. all of these

ANS: E    PTS: 1    REF: p. 87

10. The origin of deltas is related to:
    a. glacial deposition and the formation of moraines.
    b. river deposition of sediments eroded from continents.
    c. glacial erosion and the formation of troughs and fjords.
    d. volcanic activity in coastal regions.
    e. none of these

ANS: B    PTS: 1    REF: p. 97
11. The great heaps of unconsolidated sediment at the base of the continental slope are known as:
a. the continental rise.
b. the abyssal hills.
c. the abyssal plains.
d. the mid-ocean mountains.
e. none of these

ANS: A  PTS: 1  REF: p. 88

14. Active continental margins are located:
a. along the east coast of the United States.
b. along the east coast of South America.
c. on the west coasts of both North and South America.
d. all around Africa.
e. on the east coast of Asia.

ANS: C  PTS: 1  REF: p. 83-84

15. The landscape of the seafloor could best be described as:
a. a featureless plain.
b. a smooth descent with the deepest portions farthest from land.
c. similar in rock type, sediment thickness, and erosional processes to those found on the land.
d. huge abyssal plains containing ridges, trenches, seamounts.
e. none of these

ANS: D  PTS: 1  REF: p. 84

16. The characteristics of deep trenches indicate:
a. they are submerged erosional features.
b. they are elongated downfolds in the oceanic crust.
c. they are glacial troughs dating back to the Ice Age.
d. they are erosional canyons cut by turbidity currents.
e. all of these

ANS: B  PTS: 1  REF: p. 94

17. The mid-ocean mountains, such as the ridges and rises:
a. are similar in origin to the Alps, the Rockies, and the Appalachians.
b. are composed of folded and faulted marine sedimentary rocks.
c. are constructed of volcanic basalt.
d. are similar in size and features to most continental mountains.
e. all of these

ANS: C  PTS: 1  REF: p. 88

18. Which of the following statements is true regarding the islands bordering deep-sea trenches?
a. They are the result of a series of quiet, continuous basaltic eruptions.
b. They are accumulations of sediments on the margins of the trenches.
c. They are formed from the activities of coral and other organisms.
d. They are explosive volcanoes and are called island arcs.
e. none of these

ANS: D  PTS: 1  REF: p. 94
19. The deepest parts of the Pacific Basin are located:
   a. in the center of the Pacific Ocean near the Hawaiian Islands.
   b. in the eastern part of the basin, off North America.
   c. in the rift valley of the East Pacific Rise.
   d. near the margins of South America, Japan, and the Marianas Islands.
   e. none of these
   ANS: D   PTS: 1   REF: p. 96

20. Hydrothermal vents are located near:
   a. passive continental margins.
   b. active areas of seafloor spreading.
   c. the edges of the deep sea trenches.
   d. the margins of the Hawaiian chain.
   e. none of these
   ANS: B   PTS: 1   REF: p. 91

21. A feature that rises out of the ocean floor and are flat-topped seamounts are called:
   a. ridges.
   b. island arcs.
   c. guyots.
   d. abyssal hills.
   e. none of these
   ANS: C   PTS: 1   REF: p. 94

22. The deepest part of the ocean is called the:
   a. Peru-Chile Trench.
   b. Mid-Atlantic Ridge.
   c. the Challenger Deep.
   d. abyssal plains.
   e. none of these
   ANS: C   PTS: 1   REF: p. 96

24. An example of a very wide continental shelf is:
   a. the eastern edge of the Florida coast.
   b. the western edge of South America.
   c. the margin surrounding the Hawaiian Islands.
   d. the Emperor Seamounts.
   e. none of these
   ANS: A   PTS: 1   REF: p. 99

Chapter 5—Sediments

MULTIPLE CHOICE

1. The biogenic ooze on the seafloor mostly consist of:
   a. boulders and cobbles from glaciers oozing off the land.
   b. bones and teeth of bottom-dwelling fishes.
   c. fine muds washed down the continental slope to the seafloor.
   d. microscopic hard parts of single-celled surface living organisms.
   e. none of these
2. Which of the following metals is not usually found in manganese nodules?
   a. iron
   b. uranium
   c. nickel
   d. cobalt
   e. none of these

   ANS: B    PTS: 1    REF: p. 113

3. Underlying the unconsolidated sediments of the seafloor are:
   a. basalt pillows and basement rocks.
   b. granite crust.
   c. glacial deposits left from the Ice Age.
   d. ancient remnants of continental crust.
   e. none of these

   ANS: A    PTS: 1    REF: p. 101

4. Large volumes of bottom sediments may be transported long distances by:
   a. storm waves.
   b. icebergs.
   c. tidal action.
   d. turbidity currents.
   e. all of these

   ANS: D    PTS: 1    REF: p. 108

5. Carbonate sediments are rare in deep sea sediments because:
   a. the organisms providing shells do not live in the deep sea.
   b. the abundance of muds and clays cover the carbonate shells.
   c. the carbonate shells dissolve in deep water.
   d. the organisms do not live beyond the edge of the continental shelf.
   e. none of these

   ANS: C    PTS: 1    REF: p. 111

6. Most of the floor of the North Pacific Ocean is covered with:
   a. foraminiferan ooze.
   b. biogenous oozes.
   c. red and brown clays.
   d. diatom ooze.
   e. seaweed.

   ANS: C    PTS: 1    REF: p. 102

9. Which of the following sediments cover the greatest area of seabed?
   a. terrigenous sediments
   b. biogenous sediments
   c. hydrogenous (or authigenic) sediments
   d. cosmogenous sediments
   e. none of these

   ANS: B    PTS: 1    REF: p. 110
10. Which of the following is the most abundant sediment by volume in the ocean?
   a. terrigenous sediments
   b. biogenous sediments
   c. hydrogenous (or authigenic) sediments
   d. cosmogenous sediments
   e. none of these
   ANS: A  PTS:  1  REF:  p. 104

11. Which of the following is generated in place, on the spot where we find them?
   a. terrigenous sediments
   b. biogenous sediments
   c. hydrogenous (or authigenic) sediments
   d. cosmogenous sediments
   e. none of these
   ANS: C  PTS:  1  REF:  p. 106

12. Which of the following is of organic origin; i.e., made by organisms?
   a. terrigenous sediments
   b. biogenous sediments
   c. hydrogenous (or authigenic) sediments
   d. cosmogenous sediments
   e. none of these
   ANS: B  PTS:  1  REF:  p. 110

13. Which of the following arrive in the ocean from continents via rivers?
   a. terrigenous sediments
   b. biogenous sediments
   c. hydrogenous (or authigenic) sediments
   d. cosmogenous sediments
   e. none of these
   ANS: A  PTS:  1  REF:  p. 104

16. Select the finest particles in this list.
   a. sand
   b. silt
   c. clay
   d. granules
   e. none of these
   ANS: C  PTS:  1  REF:  p. 110

17. Scientists can derive information about ____ from observing deep ocean cores.
   a. basin age
   b. mineral resources
   c. water temperature in years past
   d. the history of life in the upper layers of water
   e. all of these
   ANS: E  PTS:  1  REF:  p. 114

18. Radiolarians and diatoms are both examples of:
a. multicellular organisms.
b. are both single-celled animals.
c. provide shells that form siliceous oozes.
d. calcareous oozes in the deepest parts of the ocean.
e. none of these

ANS: C  PTS: 1  REF: p. 111

19. Which of the following are hydrogenous sediments?
a. manganese nodules
b. evaporites
c. salt precipitates such as calcium sulfate
d. all of these
e. none of these

ANS: D  PTS: 1  REF: p. 106

20. Which statement characterizes sediments of the North Pacific?
a. The sediments of the North Pacific are primarily composed of radiolarian deposits.
b. The sediments of the North Pacific are thicker than the sediments of the Atlantic.
c. The sediments of the deep North Pacific are mainly pelagic clays.
d. The sediments of the North Pacific are mostly calcareous oozes.
e. none of these

ANS: C  PTS: 1  REF: p. 108

22. Neritic sediments are found on the:
a. deep ocean floor mostly in the Atlantic Ocean.
b. continental shelf.
c. continental rise.
d. abyssal plains.
e. deep ocean floor mostly in the Pacific Ocean.

ANS: B  PTS: 1  REF: p. 107

24. The age of most marine sediments is:
a. no older than about 10,000 years old.
b. about 1 million years old island arcs.
c. very recent, since the last ice age.
d. rarely older than about 180 million years old.
e. not possible to determine.

ANS: D  PTS: 1  REF: p. 101

26. Sources of terrigenous sediments includes all of the following EXCEPT:
a. rivers.
b. wind transporting sand and dust.
c. volcanic ash.
d. erosion.
e. all of these

ANS: E  PTS: 1  REF: p. 104-105