Name: _____ Class: _____ Date: _____

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1. Living organisms have been on Earth for _____ of Earth's history.
   a. less than 1%
   b. about 20%
   c. about 50%
   d. about 80%

ANSWER: d

2. Which of the following statements about the scientific method is false?
   a. A scientific theory is never considered finally proved.
   b. Data used to generate a hypothesis may come from observations, experiments, and chance findings.
   c. A theory that has accumulated a substantial body of experimental support is called a hypothesis.
   d. A scientific model represents some aspect of nature based on a set of hypotheses and theories.

ANSWER: c

3. How old is the Earth?
   a. approximately 4.5 thousand years old
   b. approximately 4.5 billion years old
   c. approximately 4.5 million years old
   d. approximately 4.5 trillion years old

ANSWER: b

4. A _____ aims to predict the complex behavior of Earth systems.
   a. scientific hypothesis
   b. scientific observation
   c. scientific plan
   d. scientific model

ANSWER: d

5. A scientific hypothesis that stands repeated testing can be elevated to a scientific ____.
   a. model
   b. fact
   c. theory
   d. idea

ANSWER: c

6. Which of the following statements about the scientific method is not true?
   a. A tentative explanation of a body of data is called a hypothesis.
   b. Theories are less likely than hypotheses to be correct.
   c. A hypothesis is strengthened if it successfully predicts the outcomes of new experiments.

ANSWER: b

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7. According to the principle of uniformitarianism, _____ .
   a. geologic processes we observe today have operated in the past
   b. animals evolved at a uniform rate
   c. all of the planets formed from a uniform solar nebula
   d. early Earth was covered by a uniform magma ocean

ANSWER: a

8. The ___ is the information preserved in rocks formed at various times throughout Earth history.
   a. geologic data
   b. geologic record
   c. geodynamic information

ANSWER: b

9. Which of the following is "a tentative explanation based on observational data and experiments"?
   a. scientific theory
   b. scientific hypothesis
   c. scientific model
   d. scientific thesis

ANSWER: b

10. Complete the following sentence: A _____ is a representation of how a natural process operates or how a natural system behaves.
   a. scientific theory
   b. scientific hypothesis
   c. scientific model
   d. scientific thesis

ANSWER: c

11. Scientific knowledge that has been elevated to the status of a scientific theory is no longer subject to change.
   a. True
   b. False

ANSWER: False

12. Complete the following sentence: Scientific hypotheses should always be_____.
   a. testable
   b. correct
   c. complex
   d. simple

ANSWER: b

13. Change in the ground elevation of the Earth's surface is called _____.

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a. geodesy
b. topography
c. uniformitarianism
d. none of the above

ANSWER: b

14. Elevation of the ground surface is measured relative to _____.
a. Mt. Everest
b. the equator
c. sea level
d. the North Pole

ANSWER: c

15. The typical elevation of the land surface occurs within a range of _____ above sea level.
a. 0–20 km
b. 0–1 km
c. 0–10 km
d. 0–5 km

ANSWER: b

16. The typical depth of ocean basins are _____.
a. 1–2 km
b. 10–12 km
c. 4–5 km
d. 8–10 km

ANSWER: c

17. The highest topographic point above sea level on Earth is at _____.
a. Mount Himalaya
b. Mount Mauna Loa
c. Mount Marianas
d. Mount Everest

ANSWER: d

18. The vertical distance above sea level is called the _____.
a. elevation
b. contour
c. relief
d. topography

ANSWER: a

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19. How high is Mount Everest, the highest mountain in the world?
    a. approximately 3000 meters
    b. approximately 6000 meters
    c. approximately 9000 meters
    d. approximately 12,000 meters

ANSWER: c

20. The shape of the Earth is best described as
    a. a perfect sphere.
    b. near spherical with flattening at the equator and bulging at the poles.
    c. near spherical with bulging at the equator and flattening at the poles.

ANSWER: c

21. Which of the following techniques are used by geologists in their research?
    a. creating computer models
    b. laboratory experiments
    c. observing the natural environment
    d. all of these

ANSWER: d

22. Geologic phenomena cannot be directly observed because geologic processes all operate over timescales much longer than a human lifespan.
    a. True
    b. False

ANSWER: False

23. Which of the following phrases was used by James Hutton to summarize the Principle of Uniformitarianism?
    a. Earth processes are uniform through time.
    b. The present is the key to the past.
    c. The laws of nature are unchangeable.
    d. None of these.

ANSWER: b

24. The Earth's core is made up primarily of _____ .
    a. iron
    b. lead
    c. oxygen
    d. silicon

ANSWER: a

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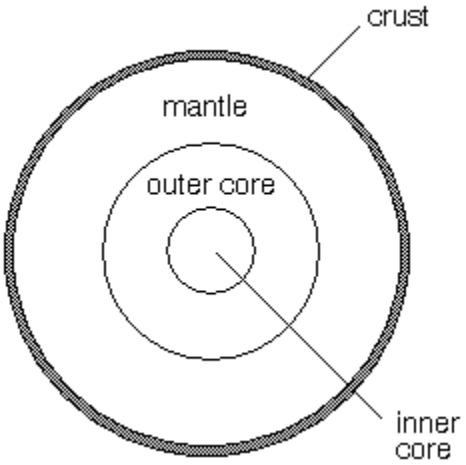

25. Which part of the Earth depicted in the figure above is molten?

a. crust
b. mantle
c. outer core
d. inner core

ANSWER: c

26. Which of the following makes up the bulk of the Earth?

a. crust
b. inner core
c. mantle
d. outer core

ANSWER: c

27. Ninety percent of the Earth is made up of which four elements?

a. iron, oxygen, silicon, and magnesium
b. oxygen, nitrogen, hydrogen, and silicon
c. magnesium, aluminum, silicon, and oxygen
d. silicon, calcium, aluminum, and iron

ANSWER: a

28. Approximately 50% of the Earth's crust is made up of which element?

a. aluminum
b. iron
c. oxygen
d. silicon

ANSWER: c

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29. Stony meteorites are similar in composition to the Earth's _____.

a. mantle
b. crust
c. inner core
d. outer core

ANSWER: a

30. The group of meteorites that are similar in composition to the Earth's core are _____.

a. stony meteorites
b. high-density meteorites
c. iron-nickel meteorites
d. none of the above

ANSWER: c

31. The Mohorovicic discontinuity coincides with the _____ boundary.

a. mantle-core
b. crust-mantle
c. lithosphere-mantle
d. inner core-outer core

ANSWER: b

32. Continental crust is _____ oceanic crust.

a. less dense than
b. the same density as
c. more dense than
d. Geoscientists have no idea.

ANSWER: a

33. The Earth's major layers include (from outermost to innermost) _____.

a. inner core, outer core, mantle, crust
b. outer core, inner core, mantle, crust
c. crust, mantle, outer core, inner core
d. crust, outer core, inner core, mantle

ANSWER: c

34. The average density of continental crust is _____ g/cm^3.

a. 2.8
b. 3.4
c. 3.0
d. 4.0

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ANSWER: a

35. Continents float high because they are _____.
    a. denser than the mantle
    b. less dense than the mantle
    c. the same density as the mantle
    d. thicker than the mantle

ANSWER: b

36. The two most common elements in the Earth's crust are _____.
    a. calcium and carbon
    b. iron and sulfur
    c. chlorine and sodium
    d. oxygen and silicon

ANSWER: d

37. How thick is the oceanic crust?
    a. approximately 7 km
    b. approximately 70 km
    c. approximately 35 km
    d. approximately 240 km

ANSWER: a

38. Which of the following statements about the Moho (Mohovoricic discontinuity) is false?
    a. The Moho marks the top of a partially molten layer.
    b. The Moho separates denser rocks below from less dense rocks above.
    c. The Moho separates the crust from the mantle.
    d. The speed of seismic waves increases as they pass down through the Moho.

ANSWER: a

39. Why is the average elevation of the continents higher than the average elevation of the seafloor?
    a. because melting of large ice caps has caused isostatic rebound of the continents
    b. because oceanic crust is composed of denser rocks than the continental crust
    c. because the continents are supported by upwelling mantle currents
    d. because subduction pulls down the seafloor

ANSWER: b

40. The temperature at which a rock melts generally ___ with increasing pressure.
    a. increases
    b. remains the same

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c. decreases

ANSWER: a

41. What are the two most abundant elements (by weight) in the whole Earth?
    a. iron and oxygen
    b. oxygen and silicon
    c. silicon and iron

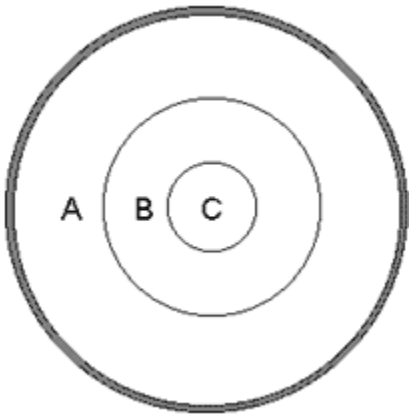
ANSWER: a

42. What happens when seismic waves encounter a boundary between two materials?
    a. All the wave energy bounces off the boundary.
    b. All the wave energy passes through the boundary.
    c. Some of the wave energy bounces off the boundary and some passes through the boundary.

ANSWER: c

43. Beneath mountain belts, the Moho is
    a. deeper than it is beneath normal continental crust.
    b. shallower than it is beneath normal continental crust.
    c. at the same depth as it is beneath normal continental crust.

ANSWER: a



44. Which region of the Earth consists primarily of iron and magnesium silicates?
    a. region A
    b. region B
    c. region C

ANSWER: a

45. The Earth exchanges _____ with the rest of the cosmos.
    a. energy and mass
    b. mass, but not energy,

c. energy, but not mass,
d. neither energy nor mass

ANSWER: a

46. In which of the following subsystems is the Earth's magnetic field generated?
a. climate system
b. hydrologic system
c. geodynamo system
d. plate tectonic system

ANSWER: b

47. The Earth's climate system involves interactions between the atmosphere and the _____.
a. biosphere
b. hydrosphere
c. lithosphere
d. biosphere, hydrosphere, and lithosphere

ANSWER: d

48. On average, the Earth's lithosphere is approximately ____ km thick.
a. 4
b. 20
c. 100
d. 500

ANSWER: c

49. The asthenosphere is _____.
a. cool and strong
b. cool and weak
c. hot and strong
d. hot and weak

ANSWER: d

50. What are the "plates" of plate tectonics made up of?
a. asthenosphere
b. crust
c. lithosphere
d. mantle

ANSWER: c

51. Which of the following relationships is correct?

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a. asthenosphere = crust
b. lithosphere = crust
c. asthenosphere = crust + upper mantle
d. lithosphere = crust + upper mantle

ANSWER: d

52. The motion of a flowing material where hot matter rises from the bottom and cool matter sinks from the surface is called _____ .

a. accretion
b. convection
c. differentiation
d. fusion

ANSWER: b

53. How old are the earliest fossil remains?

a. about 65 billion years old
b. about 2200 billion years old
c. about 540 billion years old
d. about 3500 billion years old

ANSWER: d

54. The plate tectonic system is driven by _____.

a. magnetism
b. the climate system
c. solar heat
d. internal heat

ANSWER: d

55. The three major global geosystems are _____.

a. climate system, solar system, and geodynamo system
b. geodynamo system, plate tectonic system, and solar system
c. climate system, geodynamo system, and plate tectonic system
d. plate tectonic system, climate system, and solar system

ANSWER: c

56. Solar energy energizes which of the Earth's components?

a. atmosphere
b. biosphere
c. hydrosphere
d. all of the above

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ANSWER: d

57. The ability of the Earth's atmosphere to retain heat is referred to as the _____.
    a. solar effect
    b. radiation effect
    c. biosphere effect
    d. greenhouse effect

ANSWER: d

58. Magnetic reversals of the Earth's magnetic field are when _____.
    a. the Earth's north and south poles flip
    b. the Earth's magnetic field decreases in intensity
    c. the Earth's magnetic poles wander
    d. the Earth's magnetic field increases in intensity

ANSWER: a

59. Which of the following powers the Earth's internal heat engine?
    a. radioactivity
    b. heat trapped during the formation of the Earth
    c. A and B
    d. neither A nor B

ANSWER: c

60. How thick is average lithosphere?
    a. 25 km
    b. 100 km
    c. 250 km
    d. 1000 km

ANSWER: b

61. Which of the following statements about the asthenosphere is false?
    a. The asthenosphere lies beneath the lithosphere.
    b. The asthenosphere is stronger than the lithosphere.
    c. The asthenosphere rises close to the surface beneath mid-ocean ridges.
    d. The asthenosphere is partially molten.

ANSWER: b

62. The boundary between the mantle and the core lies at a depth of approximately _____.
    a. 300 kilometers
    b. 1000 kilometers

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c. 3000 kilometers
d. 10,000 kilometers

ANSWER: c

63. Which of the following regions is the source of most basaltic magma?
a. the asthenosphere
b. the lithosphere
c. the lower mantle
d. the outer core

ANSWER: a

64. What element makes up most of the Earth's core?
a. iron
b. oxygen
c. magnesium
d. silicon

ANSWER: a

65. What drives plate tectonics?
a. erosion
b. solar energy
c. thermal conduction
d. thermal convection

ANSWER: d

66. Over geologic time, most of the heat lost from the Earth's interior has been transported by _____.
a. conduction
b. convection
c. radioactive decay
d. solar radiation

ANSWER: b

67. Which of the following regions is hottest?
a. the crust
b. the inner core
c. the mantle
d. the outer core

ANSWER: b

68. The temperature at the center of the Earth is approximately _____.

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a. 200°C
b. 500°C
c. 2000°C
d. 5000°C

ANSWER: d

69. Above what temperature do materials lose their permanent magnetism?

a. 100°C
b. 500°C
c. 1000°C
d. 5000°C

ANSWER: b

70. Approximately how often does the Earth's magnetic field reverse itself?

a. every 50 years
b. every 5000 years
c. every 500,000 years
d. every 50,000,000 years

ANSWER: c

71. Which of the following Earth systems is powered by solar energy?

a. climate system
b. geodynamic system
c. plate tectonic system

ANSWER: a

72. Which of the following statements about the lithosphere is not true?

a. The lithosphere is cool and relatively brittle.
b. The lithosphere includes the crust and uppermost mantle.
c. The lithosphere is easily deformed, like a tube of toothpaste.

ANSWER: c

73. The Earth's lithosphere is broken into approximately ___ large, rigid plates.

a. 2
b. 12
c. 50

ANSWER: b

74. In a convecting system, like a pot of boiling water or the Earth's mantle,

a. cool material rises.

b. warm material rises.
c. both cool and warm material rise.

ANSWER: b

75. Which of the following statements is correct?
a. The Earth's asthenosphere is much stronger than the lithosphere.
b. The Earth's asthenosphere is much weaker than the lithosphere.
c. The Earth's asthenosphere and lithosphere are similar in strength.

ANSWER: b

76. Which of the following statements is correct?
a. biosphere system, atmosphere system, and hydrosphere system.
b. lithosphere system, asthenosphere system, and deep mantle system.
c. climate system, plate tectonic system, and geodynamic system.

ANSWER: c

77. The geodynamo system is responsible for producing the Earth's
a. magnetic field.
b. convecting mantle.
c. weather.

ANSWER: a

78. In the plate tectonic system, the lithospheric plates ride on the hot, weak ___ layer.
a. asthenosphere
b. deep mantle
c. outer core

ANSWER: a

79. Which of the following rock types would be least likely to record the magnetic field at the time the rock formed?
a. basaltic lava flow
b. deep-sea shale
c. alluvial conglomerate

ANSWER: c

80. The Earth has had a magnetic field for the last ___ years.
a. 5 million
b. 1 billion
c. 3.5 billion

ANSWER: c

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81. Which of the following statements is true?
    a. The Earth's magnetic poles are aligned with its rotation axis.
    b. The Earth's magnetic poles are inclined about 11° from its rotation axis.
    c. The Earth's magnetic poles are inclined about 45° from its rotation axis.

ANSWER: b

82. What is the lower mantle made up of?
    a. dense silicate minerals
    b. iron-nickel alloy
    c. silicate melt

ANSWER: a

83. How old are the oldest rocks now found on the Earth's surface?
    a. 0.5 billion years old
    b. 4.0 billion years old
    c. 2.5 billion years old
    d. 4.5 billion years old

ANSWER: b

84. The Earth's atmosphere has been oxygen-rich for _____ of the Earth's history.
    a. about 25%
    b. about 50%
    c. about 75%
    d. about 99%

ANSWER: b

85. Large continental masses had formed on the Earth by _____.
    a. 0.3 billion years ago
    b. 2.5 billion years ago
    c. 1.0 billion years ago
    d. 4.0 billion years ago

ANSWER: b

86. What caused the mass extinctions 65 million years ago that ended the Age of Dinosaurs?
    a. major bolide impact
    b. massive volcanic eruptions
    c. global glaciation
    d. all of the above

ANSWER: a

87. The first evidence of erosion by water in the rock record occurred _____.

a. 4000 Ma
b. 3500 Ma
c. 2500 Ma
d. 3800 Ma

ANSWER: d

88. The first appearance of *Homo sapiens* on Earth occurred _____.

a. 16 Ma
b. 0.16 Ma
c. 1.6 Ma
d. 1600 Ma

ANSWER: b

89. How many major mass extinction events have occurred throughout Earth's history?

a. 5
b. 10
c. 2
d. 1

ANSWER: a

90. Which of the following statements about the age of the Earth and Moon is true?

a. The Earth is approximately 3 billion years older than the Moon.
b. The Earth and Moon are approximately the same age.
c. The Earth is approximately 1.5 billion years younger than the Moon.
d. The Earth is approximately 4.5 billion years younger than the Moon.

ANSWER: b

91. The oldest terrestrial material found on the Earth is approximately _____ old.

a. 4.4 billion years
b. 4400 years
c. 4.4 million years
d. 440 hundred years

ANSWER: a

92. Humans have been on Earth for ___ of Earth's history.

a. less than 1%
b. approximately 50%
c. more than 90%

ANSWER: a

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93. When did our solar system form?
    a. about 540 million years ago
    b. about 2.5 billion years ago
    c. about 4.6 billion years ago

ANSWER: c

94. Evidence in the rock record shows that there have been ___ major extinction events during Earth's history.
    a. 10
    b. 5
    c. 2

ANSWER: b

95. About when did the first animals evolve on Earth, according to current geological understanding?
    a. 10 million years ago
    b. 60 million years ago
    c. 100 million years ago
    d. 600 million years ago

ANSWER: d

96. About when are *Homo sapiens* thought to have evolved?
    a. 6000 years ago
    b. 10,000,000 years ago
    c. 200,000 years ago
    d. 65,000,000 years ago

ANSWER: c

97. How did Earth's atmosphere become oxygenated?
    a. volcanic outgassing
    b. gasses from asteroid impacts
    c. radiation interacting with the atmosphere
    d. oxygen-producing organisms

ANSWER: d

98. Geologic evidence indicates Earth's moon and core formed within about the first 100 million years of Earth history.
    a. True
    b. False

ANSWER: True

99. Approximately when did the mass-extinction event that led to the demise of the dinosaurs occur?
    a. 50 thousand years ago

b. 443 million years ago
c. 1.4 billion years ago
d. 65 million years ago

ANSWER: d

100. Which class of animals rose to dominance after the extinction of the dinosaurs?
a. amphibians
b. mammals
c. marine invertebrates
d. reptiles

ANSWER: b

101. Earth's hydrosphere did not begin to form until at least 2 billion years ago.
a. True
b. False

ANSWER: False

102. About what percentage of species went extinct during the largest mass extinction in Earth history?
a. 15%
b. 40%
c. 70%
d. 95%

ANSWER: d