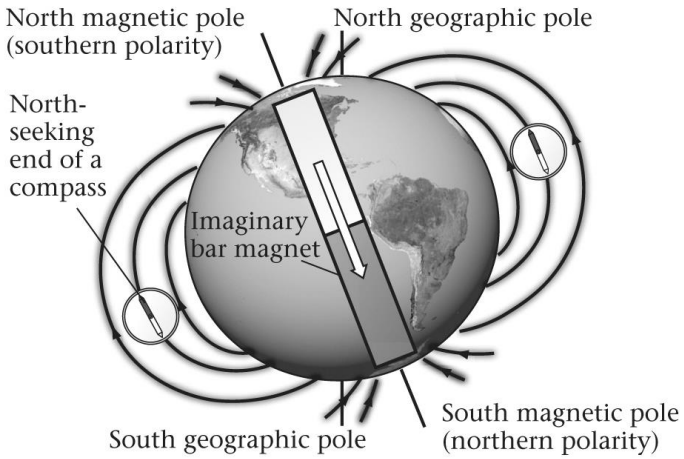
CHAPTER 2: Journey to the Center of the Earth

MULTIPLE CHOICE

1. The shape of Earth's magnetic field is approximately that of a _____.



   a. monopole
   b. dipole (such as that produced by a bar magnet)
   c. torus, a donut-shaped ring parallel to Earth's equator

   ANS: B DIF: Easy REF: 2.2 TOP: I.B
   MSC: Factual

2. Presently, Earth's atmosphere is dominated by which two gases?
   a. hydrogen and oxygen
   b. carbon dioxide and methane
   c. nitrogen and oxygen
   d. nitrous oxide and sulfur dioxide

   ANS: C DIF: Easy REF: 2.2 TOP: I.C
   MSC: Applied

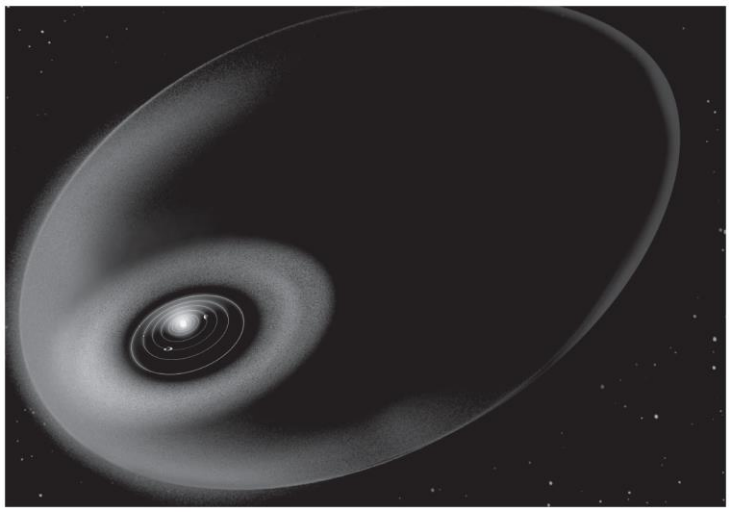
3. If one were to ride a hot air balloon up into the atmosphere, one would experience the concentration of gases _____.
   a. becoming denser
   b. becoming less dense
   c. remaining the same
   d. increasing for the first 10 km, then starts to decline

   ANS: B DIF: Easy REF: 2.2 TOP: II.C
   MSC: Applied

4. If one were to see a comet passing by Earth, it is likely that this comet originated from _____.
   a. the asteroid belt
   b. the Kuiper belt
   c. the heliosphere
   d. interplanetary space

   ANS: B DIF: Easy REF: 2.2 TOP: I.A.iii
   MSC: Applied

5. The region of space that contains the material of our Solar System (shown below) is termed the _____.



a. lithosphere
b. heliosphere
c. cryosphere
d. Oort cloud

ANS: B DIF: Easy REF: 2.2 TOP: I.A.ii
MSC: Factual

6. Earth's surface is protected from solar wind and cosmic radiation by _____.
a. Earth's gravitational field
b. Earth's magnetic field
c. a large, metallic shield launched into orbit by NASA in the 1960s
d. a powerful stream of ions emitted by the Sun

ANS: B DIF: Medium REF: 2.2 TOP: I.B
MSC: Applied

7. Leftovers from the protoplanetery disk that formed our Solar System after the Big Bang can be found where?
a. Heliosphere
b. Oort cloud
c. Kuiper belt
d. Interplanetary space

ANS: B DIF: Medium REF: 2.2 TOP: I.A.i
MSC: Applied

8. As seismic (earthquake-generated) waves travel downward and reach the Moho, they _____.
a. speed up
b. slow down
c. continue at the same velocity
d. are all reflected directly back toward the surface

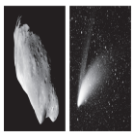
ANS: A DIF: Medium REF: 2.2 TOP: III.D.i.c
MSC: Factual

9. An aurora (shown below) is produced when _____.

a. solar wind particles are directed toward the poles and excite atmospheric gases
b. swamp gases rise upward from the arctic tundra
c. radiation in the Van Allen belts can be seen on a clear, cold night
d. lightning travels from cloud to cloud rather than cloud to ground

ANS: A DIF: Medium REF: 2.2 TOP: I.B
MSC: Applied

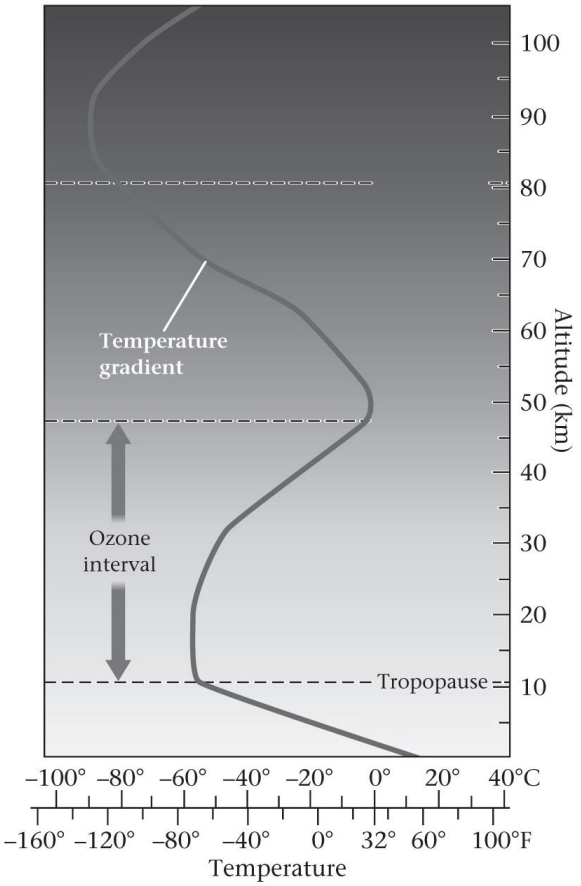
10. Which of the following is NOT true about comets and asteroids?



a. Both orbit the sun
b. Both are planetesimals
c. Both are numerous in our Solar System
d. Both are composed of rock and ice

ANS: D DIF: Medium REF: 2.2 TOP: I.A.iv
MSC: Applied

11. The atmosphere can be divided into several distinct layers.



Beginning with the layer in which we live, they are, in order:
a. stratosphere, troposphere, mesosphere, thermosphere
b. troposphere, stratosphere, thermosphere, mesosphere
c. troposphere, stratosphere, mesosphere, thermosphere
d. stratosphere, troposphere, thermosphere, mesosphere

ANS: C DIF: Difficult REF: 2.2 TOP: I.C
MSC: Factual

12. Substances that can be transformed to a gas at relatively low temperatures are termed _____.
a. glasses
b. melts
c. volatiles
d. mineraloids

ANS: C DIF: Easy REF: 2.3 TOP: II.C.viii
MSC: Factual

13. Most continental topography lies within a range of altitude between _____.
a. sea level and 1 km below sea level
b. sea level and 1 km above sea level
c. 2 to 5 km above sea level
d. 3 to 6 km above sea level

ANS: B DIF: Easy REF: 2.3 TOP: II.A
MSC: Factual

14. Hydrocarbons, such as petroleum and natural gas, are classified as _____.
a. minerals
b. fluid rocks
c. organic materials
d. alloys

ANS: C DIF: Easy REF: 2.3 TOP: II.C.i
MSC: Applied

15. The most common minerals within Earth are _____.
    a. silicates
    b. carbonates
    c. oxides
    d. hydroxides

    ANS: A DIF: Easy REF: 2.3 TOP: II.C
    MSC: Factual

16. Hot, liquid rock beneath the surface of the Earth is termed _____.
    a. lava
    b. magma
    c. volatiles
    d. brimstone

    ANS: B DIF: Easy REF: 2.3 TOP: II.C.vii
    MSC: Factual

17. In order to be defined as a mineral, a substance must _____.
    a. be solid
    b. be naturally occurring
    c. have atoms arranged in an orderly pattern
    d. All of the above are correct.

    ANS: D DIF: Easy REF: 2.3 TOP: II.C.ii
    MSC: Factual

18. Topographically, most of the ocean floor is made up of _____.
    a. ocean trenches (5–12 km below sea level)
    b. ocean plains (2.5–4.5 km below sea level)
    c. submarine mountains (less than 2.5 km below sea level)

    ANS: B DIF: Medium REF: 2.3 TOP: II.B
    MSC: Applied

19. Which of the following is most representative of Earth's hydrosphere?
    a. lakes and rivers only
    b. surficial freshwater, the oceans, groundwater, and atmospheric water
    c. a layer of hydrogen gas in the outer reaches of the atmosphere
    d. the oceans, but not rivers or lakes

    ANS: B DIF: Medium REF: 2.3 TOP: II.B
    MSC: Applied

20. In the whole Earth, the four most common elements are oxygen, silicon, magnesium, and _____.
    a. copper
    b. lead
    c. iron
    d. zinc

    ANS: C DIF: Medium REF: 2.3 TOP: II.C
    MSC: Factual

21. If you were measuring the elevation of a mountain, you would be measuring variation in _____, whereas if you were doing the same on a mid-ocean ridge, you would be measuring variation in _____.
    a. bathymetry; topography
    b. bathymetry; isostasy
    c. topography; isostasy
    d. topography; bathymetry

    ANS: D DIF: Medium REF: 2.3 TOP: II.A | II.B

MSC: Applied

22. Glass is different from a mineral because it _____.
    a. is not naturally occurring
    b. is not solid
    c. does not have atoms arranged in an orderly pattern
    d. All of the above are correct.

    ANS: C DIF: Medium REF: 2.3 TOP: II.C.iii
    MSC: Applied

23. Which of the following is NOT an example of sediment?
    a. sand
    b. ground-up seashells
    c. cobbles on a beach
    d. None of the above are correct.

    ANS: D DIF: Medium REF: 2.3 TOP: II.C.v
    MSC: Applied

24. A mixture of copper and tin would be called _____.
    a. a metal
    b. an alloy
    c. a melt
    d. a volatile

    ANS: B DIF: Medium REF: 2.3 TOP: II.C.vi
    MSC: Applied

25. A silica-rich igneous rock that has coarse crystals and which makes up much of the continental crust is _____.
    a. peridotite
    b. granite
    c. gabbro
    d. basalt

    ANS: B DIF: Difficult REF: 2.3 TOP: II.C.iv
    MSC: Applied

26. A fracture in the crust, where rocks slide past one another, is termed a _____.
    a. fold
    b. fault
    c. flying layer
    d. frictional discontinuity

    ANS: B DIF: Easy REF: 2.4 TOP: III.B
    MSC: Factual

27. Earth's geothermal gradient is the rate of temperature change incurred by _____.
    a. increasing altitude in the atmosphere
    b. increasing depth at ocean trenches
    c. traversing from either pole toward the equator
    d. traversing down within Earth's interior

    ANS: D DIF: Easy REF: 2.4 TOP: III.C
    MSC: Factual

28. During a journey to the center of the Earth, one would experience temperature _____.
    a. and pressure both increasing
    b. and pressure both decreasing
    c. increasing, but pressure staying nearly the same
    d. remaining remarkably constant, but pressure increasing

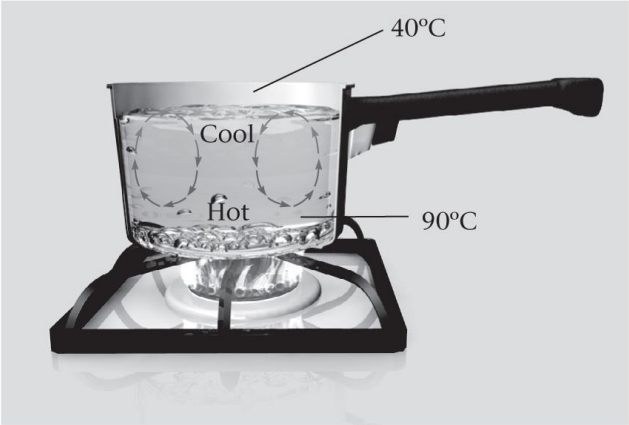
    ANS: A DIF: Easy REF: 2.4 TOP: III.C

MSC: Applied

29. People have speculated about Earth's interior since ancient times. The astronomer Nevil Maskelyne estimated Earth's _____ in 1776, whereas the author Jules Verne described the interior of the Earth as a series of interconnected _____ in 1864 and the physicist Emil Weichert determined that Earth's interior must contain _____ in 1896.
a. circumference; dungeons; rocks
b. weight; caverns; metal
c. weight; dungeons; rocks
d. mass; caverns; metal

ANS: D DIF: Difficult REF: 2.4 TOP: III.A
MSC: Factual

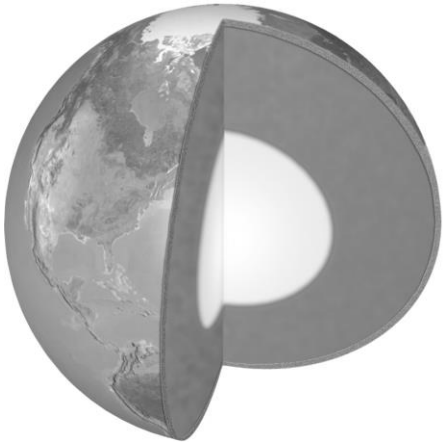
30. Heat transfer that occurs through the movement of a fluid, driven by temperature differences among various points within the fluid, is termed _____.



a. radiation
b. conduction
c. convection
d. adhesion

ANS: C DIF: Easy REF: 2.5 TOP: III.F.iii
MSC: Factual

31. The densest layer of Earth is the _____.

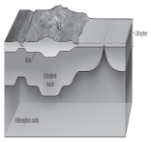


a. crust
b. mantle
c. outer core
d. inner core

ANS: D DIF: Easy REF: 2.5 TOP: III.D.iii

MSC: Factual

32. On average, continental crust is approximately _____ as oceanic crust.



a. equally thick
b. half as thick
c. five times as thick
d. 20 times as thick

ANS: C DIF: Easy REF: 2.5 TOP: III.D.i.b
MSC: Applied

33. The thickness of the Earth's crust varies from _____.
a. 100 to 500 m
b. 1 to 10 km
c. 5 to 500 km
d. 7 to 70 km

ANS: D DIF: Easy REF: 2.5 TOP: III.D.i
MSC: Factual

34. Of the three primary chemical layers of the Earth (crust, mantle, core), which is the thickest layer?
a. crust
b. mantle
c. core

ANS: C DIF: Easy REF: 2.5 TOP: III.D
MSC: Factual

35. Which layer of the Earth has the greatest density?
a. crust
b. mantle
c. core

ANS: C DIF: Easy REF: 2.5 TOP: III.D
MSC: Factual

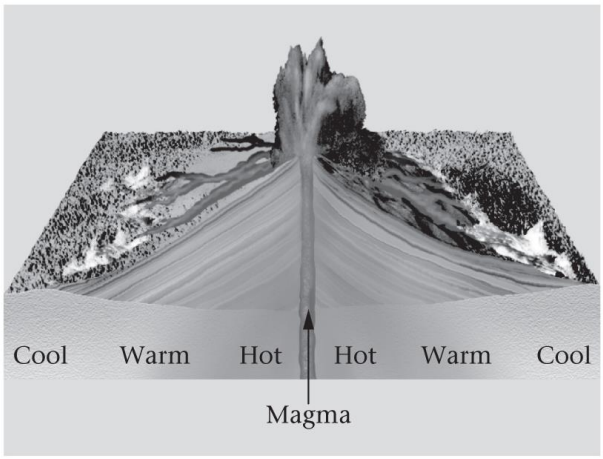
36. The Moho _____.
a. lies at uniform depth everywhere it is found in Earth
b. is found deeper underneath continents than under oceans
c. is found deeper underneath oceans than under continents
d. is found well below the crust/mantle boundary

ANS: B DIF: Easy REF: 2.5 TOP: III.D.i.c
MSC: Applied

37. When you are warmed by the Sun, you are experiencing _____, as opposed to when you burn yourself touching a metal object whose other end is being heated you are experiencing _____.
a. advection; conduction
b. radiation; conduction
c. radiation; convection
d. advection; convection

ANS: B DIF: Medium REF: 2.5 TOP: III.F.i | III.F.ii
MSC: Applied

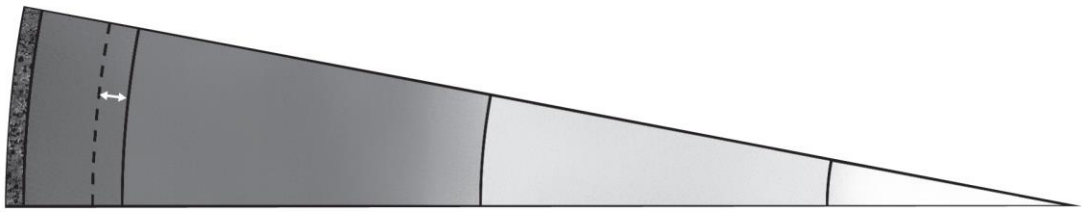
38. The image below shows _____, where a hot liquid rises into a cooler material, and heat then conducts from the hot liquid into the cooler material.



a. advection
b. conduction
c. convection
d. radiation

ANS: A DIF: Medium REF: 2.5 TOP: III.F.iv
MSC: Factual

39. From left to right, correctly label each section of this slice of the Earth.



a. crust, liquid outer core, transition zone, solid inner core, upper mantle, lower mantle
b. crust, upper mantle, transition zone, lower mantle, liquid outer core, solid inner core
c. transition zone, crust, upper mantle, lower mantle, liquid outer core, solid inner core
d. transition zone, crust, liquid outer core, solid inner core, upper mantle, lower mantle

ANS: B DIF: Medium REF: 2.5 TOP: III.D
MSC: Factual

40. As compared to the rocks that make up the crust, Earth as a whole is _____.
a. considerably more dense
b. considerably less dense
c. slightly less dense
d. about the same density

ANS: A DIF: Medium REF: 2.5 TOP: II.C.iv
MSC: Applied

41. The velocities of seismic waves traveling from earthquake foci _____.
a. are uniform throughout all layers of Earth
b. monotonically decrease with depth, at a consistent rate of deceleration
c. monotonically increase with depth, at a consistent rate of acceleration
d. generally increase with depth, occasionally making abrupt jumps termed seismic velocity discontinuities

ANS: D DIF: Medium REF: 2.5 TOP: III.B

MSC: Conceptual

42. The boundary between the crust and the mantle is marked by a seismic-velocity discontinuity called _____.
    a. the Edsel
    b. the Moho
    c. Lyell's surface
    d. the crantle

    ANS: B DIF: Medium REF: 2.5 TOP: III.D.i.c
    MSC: Factual

43. Earth's magnetic field is generated by the _____.
    a. flow of the liquid inner core
    b. flow of the liquid outer core
    c. convective flow of the mantle
    d. magnetic minerals within the crust

    ANS: B DIF: Medium REF: 2.5 TOP: III.D.iii
    MSC: Applied

44. The metallic content of Earth's core is _____.

    a. likely similar to what has been found in metallic meteorites
    b. partly liquid and partly solid
    c. an iron alloy (mostly iron with a few other elements mixed in)
    d. All of the above are correct.

    ANS: D DIF: Medium REF: 2.5 TOP: III.E
    MSC: Applied

45. As compared to ultramafic rocks, mafic rocks have a _____.
    a. greater proportion of silica
    b. lesser proportion of silica
    c. greater proportion of iron and magnesium atoms

    ANS: A DIF: Difficult REF: 2.5 TOP: II.C.iv
    MSC: Applied

46. Ophiolite sequences are important to geologists because they preserve _____.
    a. continental crust
    b. oceanic crust
    c. deep mantle material
    d. asthenosphere

    ANS: B DIF: Difficult REF: 2.5 TOP: III.D.i.a
    MSC: Conceptual

47. The lithosphere is composed of the _____.
    a. crust only

b. crust, mantle, and outer core
c. top 100 m of sediments and sedimentary rocks
d. crust and the uppermost part of the mantle

ANS: D DIF: Easy REF: 2.6 TOP: III.H
MSC: Factual

48. The lithosphere lies directly above the _____.
a. transition zone
b. crust
c. asthenosphere
d. lower mantle

ANS: C DIF: Easy REF: 2.6 TOP: III.H
MSC: Factual

49. The distinction between the crust and the mantle is primarily on the basis of a difference in _____; the distinction between the lithosphere and the asthenosphere is primarily on the basis of a difference in _____.
a. chemistry (mineral content); degree of physical rigidity
b. color; chemistry (mineral content)
c. degree of physical rigidity; chemistry (mineral content)
d. chemistry (mineral content); chemistry as well

ANS: A DIF: Medium REF: 2.6 TOP: III.D.iii | III.G | III.H
MSC: Conceptual

50. As compared to the asthenosphere, the lithosphere is _____.
a. cooler and more able to flow
b. hotter and more able to flow
c. cooler and less able to flow
d. hotter and less able to flow

ANS: C DIF: Medium REF: 2.6 TOP: III.G | III.H
MSC: Applied