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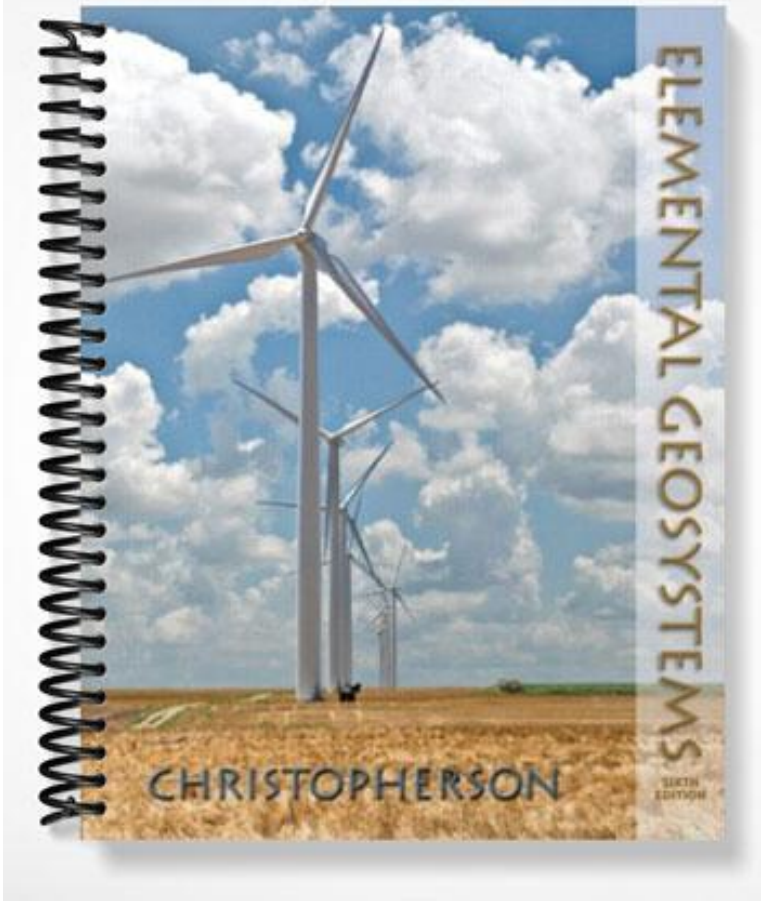

Elemental Geosystems, 6e **(Christopherson)**
Chapter 2 Solar Energy, Seasons, and the Atmosphere

1) Our planet and our lives are powered by
A) energy derived from inside Earth.
B) radiant energy from the Sun.
C) utilities and oil companies.
D) shorter wavelengths of gamma rays, X-rays, and ultraviolet.
Answer: B

2) Which of the following is true?
A) The Sun is the largest star in the Milky Way Galaxy.
B) The Milky Way is part of our Solar System.
C) The Sun produces energy through fusion processes.
D) The Sun is also a planet.
Answer: C

3) Which of the following is true about the Milky Way galaxy in which we live?
A) It is a spiral-shaped galaxy.
B) It is one of millions of galaxies in the universe.
C) It contains approximately 400 billion stars.
D) All of the above are true.
E) Only A and B are true.
Answer: D

4) The planetesimal hypothesis pertains to the formation of the
A) universe.
B) galaxy.
C) planets.
D) ocean basins.
Answer: C

5) The flattened structure of the Milky Way is revealed by
A) the constellations of the Zodiac.
B) a narrow band of hazy light that stretches across the night sky.
C) the alignment of the planets in the solar system.
D) the plane of the ecliptic.
Answer: B

6) Earth and the Sun formed specifically from
A) the galaxy.
B) unknown origins.
C) a nebula of dust and gases.
D) other planets.
Answer: C

7) Which of the following is false regarding stars?
A) They form in great clouds of gas and dust known as nebula.
B) Very few violent physical phenomena occur in stars.
C) New atoms are created inside stars.
D) Nuclear fusion occurs inside stars.
Answer: B

8) Light travels at a speed of approximately
A) 80,500 kilometers per hour (50,000 mph).
B) 300,000 kilometers per hour (186,000 mph).
C) 300,000 kilometers per second (186,000 mps).
D) 1,000,000,000 kilometers per second (621,118,012 miles per second).
Answer: B

9) The plane of Earth's orbit about the Sun is called
A) perihelion.
B) aphelion.
C) the plane of the ecliptic.
D) a great circle.
Answer: C

10) Which of the following accurately describes Earth's distance from the Sun?
A) The Earth-Sun distance averages 150 million kilometers (93 million miles).
B) It takes light an average of 8 minutes and 20 seconds to travel from the Sun to Earth.
C) Earth is closer to the Sun in January (perihelion) and farther away in July (aphelion).
D) All of these are correct.
Answer: D

11) Which of the following statements is false?
A) A star and the planets that orbit it make up a solar system.
B) It takes light about 100,000 years to cross our galaxy.
C) A galaxy consists of billions of solar systems.
D) There are more galaxies than stars in the universe.
E) When we look at the stars in the night sky, we are looking back in time.
Answer: D

12) Which of the following is true of Earth's orbit about the Sun?
A) It is perfectly circular.
B) It is elliptical.
C) It takes approximately the same time for Earth to orbit the Sun as it does for the rest of the planets in the solar system to orbit the Sun.
D) The orbit does not vary over millions of years.
E) Both B and C are true.
Answer: B

13) In which of the following past Earth atmospheres did photosynthesis begin?
A) living atmosphere
B) modern atmosphere
C) evolutionary atmosphere
D) primordial atmosphere
Answer: A

14) Of all the matter in the Solar System
A) the Sun captured over 99 percent.
B) the bulk remains with all the planets and their satellites.
C) most resides in the planet Jupiter–the largest planet in the solar system.
D) most is scattered about the solar system as individual atoms and molecules.
Answer: A

15) The Sun produces which of the following?
A) mainly visible light and infrared energy
B) mainly ultraviolet and X-rays
C) only solar wind
D) only radiant energy that is beneficial to life
Answer: A

16) During the process by which energy is produced inside of stars
A) hydrogen is fused together to form helium.
B) helium is fused together to form hydrogen.
C) hydrogen splits to form helium.
D) helium splits to form hydrogen.
Answer: A

17) Stars give off electromagnetic radiation because
A) matter is converted into energy.
B) matter and energy totally annihilate one another in matter-antimatter reactions.
C) energy is converted into matter.
D) kinetic energy is converted into potential energy.
Answer: A

18) The solar wind consists principally of
A) neutral hydrogen and helium atoms.
B) planetesimals.
C) free neutrons.
D) positively charged hydrogen nuclei and free electrons.
Answer: D

19) Which of the following is false regarding sunspots?
A) They can be several times larger than Earth.
B) They can produce flares and prominences.
C) They are brighter than the rest of the Sun's surface.
D) Their origin and dynamics are not fully understood.
Answer: C

20) On its way to Earth, the solar wind first encounters
A) the atmosphere.
B) the magnetosphere.
C) Earth's surface.
D) the lower atmosphere.
Answer: B

21) Earth's magnetosphere is generated by
A) nuclear fusion in Earth's core.
B) nuclear fission in Earth's core.
C) dynamo-like motions in Earth's interior.
D) gravitational accretion.
Answer: C

22) The auroras in the upper atmosphere are caused by
A) the interaction of electromagnetic energy with atmospheric gases.
B) AM radio broadcasts.
C) various weather phenomena.
D) the interaction of the solar wind and atmospheric gases.
Answer: D

23) Which of the following is <u>not</u> a consequence of the solar wind?
A) auroras
B) disruption of radio communications
C) overloads of electrical systems
D) creation of Earth's magnetosphere
Answer: D

24) Which of the following have been correlated with sunspot cycles?
A) abnormally wet years
B) droughts
C) both A and B
D) none of the above
Answer: C

25) Astronauts deployed a solar wind measuring experiment on the Moon because
A) the lunar surface is protected by an atmosphere.
B) there is no electromagnetic energy arriving there.
C) the experiment would not work if deployed at Earth's surface due to protective aspects of Earth's atmosphere.
D) there is no solar wind arriving at the lunar surface.
Answer: C

26) Radio waves have a _____ wavelength than visible light and are therefore _____ energetic.
A) longer; less
B) longer; more
C) shorter; less
D) shorter; more
Answer: A

27) The two main portions of the solar spectrum that enter the atmosphere are
A) X-rays and visible light.
B) visible and infrared energy.
C) infrared and gamma rays.
D) ultraviolet and visible.
Answer: B

28) Which of the following sequences is arranged in order from shorter wavelength to longer wavelength?
A) infrared, visible, ultraviolet, X-rays
B) X-rays, ultraviolet, visible, infrared
C) gamma rays, microwaves, visible, X-rays
D) radio waves, light, heat, X-rays
Answer: B

29) The dominant wavelength of energy emitted by the sun is
A) shorter than that emitted by Earth.
B) longer than that emitted by Earth.
C) the same length as that emitted by Earth.
Answer: A

30) The thermopause refers to
A) Earth's magnetic field.
B) the solar atmosphere that extends into space.
C) the top of Earth's atmosphere, some 480 km (300 mi.) above the surface.
D) the Sun's surface.
Answer: C

31) Intercepted solar radiation is called
A) solar wind.
B) thermosphere.
C) solar constant.
D) insolation.
Answer: D

32) 1372 watts per square meter (2 calories per cm^2, per minute) refers to the
A) solar constant, which is the average value of energy received at the thermopause.
B) solar wind input to the atmosphere.
C) average energy receipt at Earth's surface.
D) amount of energy absorbed by the atmosphere.
Answer: A

33) The solar constant is measured at
A) the Sun's surface.
B) the edge of the Sun's atmosphere.
C) the tropopause.
D) sea level.
Answer: C

34) Which of the following is true relative to net radiation at the thermopause?
A) Net radiation is evenly distributed with little change by latitude.
B) positive values in lower latitudes and negative values toward the poles
C) negative values along the equator and positive values toward the poles
D) Net radiation is composed of shortwave energy only.
Answer: B

35) A langley is
A) an expression of the amount of energy received per unit area (cal/cm^2).
B) another name for the visible light spectrum.
C) solar wind input to the atmosphere.
D) the average energy receipt at Earth's surface.
Answer: A

36) The uneven distribution of insolation by latitude is primarily a result of
A) variability in the Sun's output.
B) the changing distance of Earth from the Sun.
C) variation in the value of a watt.
D) Earth's sphericity, which presents varied angles to parallel solar rays.
Answer: D

37) What is the name of the location on the surface of Earth that receives insolation when the Sun is directly overhead? (When this occurs, the Sun's rays are perpendicular to this surface.)
A) solar point
B) zenith
C) subsolar point
D) North Polar point
Answer: C

38) On the northern hemisphere's summer solstice, the north polar region receives _____ daily insolation than areas nearer the equator because _____.
A) more; the Sun does not set
B) more; the Sun is higher in the sky
C) less; the Sun does not rise
D) less; the Sun is lower in the sky
Answer: A

39) The amount of energy received above the South Pole during the southern hemisphere's summer solstice is _____ than that received above the North Pole during the northern hemisphere's summer solstice because _____.
A) more; the atmosphere is thinner above the South Pole
B) more; Earth is closer to the Sun during the southern hemisphere's summer solstice
C) less; the atmosphere is thicker above the South Pole
D) less; Earth is farther from the Sun during the southern hemisphere's summer solstice
Answer: B

40) At all times during the year, the circle of illumination
A) divides Earth between northern and southern hemispheres.
B) divides Earth into eastern and western halves.
C) separates winter from summer.
D) divides Earth between equal halves of lightness and darkness.
Answer: D

41) Which of the following results from radiation imbalances at different latitudes?
A) hurricanes
B) global winds
C) ocean currents
D) all of these
E) none of the above
Answer: D

42) The Sun's altitude refers to
A) the angular distance from the equator to the latitude at which direct overhead insolation is received.
B) the angular height of the Sun above the horizon.
C) the subsolar point.
D) how far the Sun is from Earth.
Answer: B

43) The sun's declination migrates through
A) 23.5 degrees.
B) 30 degrees.
C) 47 degrees.
D) 66.5 degrees.
E) 133 degrees.
Answer: C

44) Which of the following is true regarding daylength?
A) The equator experiences at least 6 hours difference in daylength from winter to summer.
B) Nowhere on Earth does daylength vary by as much as 24 hours.
C) Daylength varies more at the equator than at higher latitudes.
D) The people living at 40 degrees N or S latitude experience about six hours difference in daylength from winter to summer.
Answer: D

45) Which of the following characterizes Earth's revolution?
A) It takes approximately 24 hours.
B) It is responsible for creating the circle of illumination, and hence, day/night relationships.
C) It is clockwise when viewed from above the North Pole.
D) It determines the timing of seasons and length of the year.
Answer: D

46) Earth's rotation is described as
A) east to west.
B) north to south.
C) west to east.
D) clockwise when viewed from above the North Pole.
Answer: C

47) Which of the following is true regarding Earth's axis?
A) The amount of axial tilt fluctuates during the year and forms the basis for seasonal changes.
B) The axis remains parallel to the plane of the ecliptic.
C) Axial tilt is unrelated to the phenomenon of seasonal change.
D) The axis is tilted 23.5 degrees from a perpendicular to the plane of the ecliptic.
Answer: D

48) Which of the following is false regarding rotational velocities at different latitudes?
A) At 90 degrees latitude, the rotational velocity is 1452 kmph (902 mph).
B) At 0 degrees latitude, the rotational velocity is 1675 kmph (1040 mph).
C) At 60 degrees latitude, the rotational velocity is 838 kmph (521 mph).
D) At 30 degrees latitude, the rotational velocity is 1449 kmph (900 mph).
Answer: A

49) On Earth, the Sun passes directly overhead at 25 degrees north latitude _____ times a year.
A) 0
B) 1
C) 2
D) 4
Answer: A

50) While standing at the Tropic of Cancer, Emma's shadow points north at noon (sun time). Based on this, which of the following can be definitely concluded?
A) It must be the summer solstice.
B) It must be the winter solstice.
C) It must be one of the equinoxes.
D) It must not be the summer solstice.
E) It must not be the winter solstice.
Answer: D

51) On June 21, the Sun never sets at Finn's location. Based on this, it can be concluded that Finn lives
A) between the Tropic of Cancer and the Arctic Circle.
B) between the Tropic of Capricorn and the Antarctic Circle.
C) North of the Arctic Circle.
D) South of the Antarctic Circle.
Answer: C

52) Which of the following statements is true?
A) December 21 = vernal equinox
B) September 22 = summer solstice in Australia
C) March 21 = equal day and nights everywhere on Earth
D) June 21 = equal day and nights everywhere on Earth
E) December 21 = subsolar point at the Tropic of Cancer
Answer: C

53) The Tropic of Cancer refers to
A) that parallel that occurs at 23.5 degrees south latitude.
B) the location of the subsolar point on September 22.
C) the parallel that is the farthest northern location for the subsolar point during the year.
D) 0 degrees latitude when the Sun crosses the equator.
Answer: C

54) The equinox
A) occurs four times during the year.
B) has twelve hours of day and 12 hours of night for all locations.
C) is the longest day of the year at any given place.
D) is when the subsolar point is at one of the tropics.
Answer: B

55) The Tropic of Capricorn refers to
A) that parallel that is 23.5 degrees south latitude.
B) the location of the subsolar point on September 22.
C) the parallel that is the farthest northern location for the subsolar point during the year.
D) that parallel that is 66.5 degrees south latitude.
Answer: A

56) The longest days of the year in the Southern Hemisphere are experienced during the Northern Hemisphere's
A) summer solstice.
B) spring equinox.
C) winter solstice.
D) autumn equinox.
Answer: C

57) The longest days of the year in the Northern Hemisphere are experienced during the
A) time of 24-hour days at the South Pole.
B) vernal equinox.
C) winter solstice.
D) autumnal equinox.
E) time that the Sun is directly overhead at the Tropic of Cancer.
Answer: E

58) Which of the following relationships is incorrect?
A) December solstice – subsolar point at 23.5 degrees S latitude
B) March equinox – subsolar point at 0 degrees latitude
C) June 21 – subsolar point at 23.5 degrees N latitude
D) June solstice – subsolar point at 23.5 degrees N latitude
E) September equinox – subsolar point at 23.5 degrees S latitude
Answer: E

59) Which of the following is true regarding dawn and twilight?
A) Dawn and twilight last longest at the equator–approximately 2.5 hours.
B) The polar regions do not experience dawn and twilight.
C) 60 degrees north and south latitudes receive the most dawn and twilight.
D) The duration of both increases with increasing latitude.
Answer: D

60) Air consists of
A) a mixture of gases that behaves as if it were a single gas.
B) gases that are not well mixed.
C) oxygen only.
D) all of the above
Answer: A

61) Life is possible on Earth primarily because
A) gamma rays and X-rays reach the surface.
B) the ozonosphere and ionosphere shield the surface from harmful radiation.
C) variable gases of all types exist in the atmosphere.
D) ultraviolet radiation reaches the surface.
Answer: B

62) Three criteria used for classification of the atmosphere are
A) structure, origin, temperature.
B) structure, origin, evolution.
C) composition, origin, evolution.
D) composition, temperature, and function.
Answer: D

63) Based on composition, the atmosphere is divided into
A) one continuous region.
B) two broad classifications: homosphere and heterosphere.
C) two functional areas that absorb radiation from the Sun.
D) the troposphere and the stratosphere.
Answer: B

64) Based on temperature, the atmosphere is divided into
A) four regions: ranging from the troposphere to the thermosphere.
B) two broad regions.
C) two functional areas that absorb radiation from the Sun.
D) nitrogen, oxygen, and argon.
Answer: A

65) Based on function, the atmosphere has
A) five regions beginning with the outermost thermosphere.
B) two functional areas that absorb radiation from the Sun.
C) one continuous region.
D) the troposphere and the stratosphere.
Answer: B

66) The heterosphere is the layer of the atmosphere in which the gases are _____ because of _____.
A) well mixed; thermal motions (i.e., convection)
B) well mixed; the influence of gravity which causes gases of different weight to diffuse randomly
C) poorly mixed; thermal motions (i.e., convection)
D) poorly mixed; the influence of gravity which causes gases of different weight to separate into layers
Answer: D

67) The region of the atmosphere that is so evenly mixed that it behaves as if it were a single gas is the
A) homosphere.
B) heterosphere.
C) exosphere.
D) thermosphere.
Answer: A

68) The solar constant is measured at
A) the outer boundary of the exosphere.
B) the outer boundary of the thermosphere.
C) the top of the stratosphere.
D) the top of the troposphere.
E) Earth's surface at the equator.
Answer: B

69) The thermosphere closely corresponds to the
A) ionosphere.
B) heterosphere.
C) homosphere.
D) exosphere.
E) both the ionosphere and the heterosphere.
Answer: E

70) When the Sun is active,
A) the thermopause lies closer to Earth's surface.
B) the thermopause extends farther from the surface of Earth.
C) the thermosphere temporarily ceases to exist.
D) the gases in the thermosphere become uniformly mixed.
Answer: B

71) Which of the following is true of the ionosphere?
A) It primarily absorbs harmful infrared wavelengths.
B) All radio signals pass through this region virtually unaffected.
C) The region principally absorbs gamma rays, X-rays, and interacts with the solar wind.
D) It is being depleted through interactions with human-produced chlorofluorocarbons.
Answer: C

72) Which of the following lists the correct sequence of gases, from most to least, in terms of percentage within the homosphere?
A) nitrogen, argon, oxygen, xenon, carbon dioxide
B) nitrogen, oxygen, argon, carbon dioxide, trace gases
C) oxygen, PAN, ozone, nitrogen, carbon dioxide
D) nitrogen, oxygen, neon, hydrocarbons, carbon dioxide
Answer: B

73) Which of the following is true regarding the depletion of ozone in the ozonosphere?
A) The depletion is restricted to the arctic and antarctic regions.
B) It results from chemical reactions with chlorine that is derived from CFCs.
C) It results from the burning of fossil fuels.
D) There is little scientific evidence to support the idea that ozone is being depleted as a result of human activity.
Answer: B

74) The ozonosphere is critical to life because it
A) affects temperatures.
B) absorbs visible light wavelengths.
C) absorbs most ultraviolet wavelengths.
D) produces the auroras.
Answer: C

75) The three stable (i.e., nonvariable) gases in the atmosphere, in order of abundance from most to least, are
A) carbon dioxide, argon, and oxygen.
B) oxygen, carbon dioxide, and argon.
C) nitrogen, oxygen, and argon.
D) oxygen, argon, and nitrogen.
Answer: C

76) The two most abundant gases in the atmosphere are
A) water vapor and carbon dioxide.
B) nitrogen and water vapor.
C) nitrogen and oxygen.
D) oxygen and carbon dioxide.
Answer: C

77) About half of Earth's crust consists of compounds containing
A) nitrogen.
B) argon.
C) carbon dioxide.
D) oxygen.
E) ozone.
Answer: D

78) Oxygen (O_2) is
A) a gas that principally originates from volcanic sources.
B) a by-product of plant-leaf operations that are stimulated by light.
C) one of the gases from Earth's earliest atmospheres.
D) now measured at 78.084 percent by volume in the homosphere.
Answer: B

79) Temperatures within the stratosphere
A) decrease with altitude according to the normal lapse rate.
B) remain about the same from the tropopause to the stratopause.
C) increase with altitude because of the absorption of ultraviolet radiation.
D) decrease with altitude due to radiation losses.
Answer: C

80) A by-product of photosynthesis is
A) nitrogen.
B) argon.
C) oxygen.
D) xenon.
Answer: C

81) Which of the gases listed below has accumulated in the atmosphere as a result of biological processes?
A) argon
B) oxygen
C) nitrogen
D) water vapor
Answer: B

82) Which of the following is false regarding carbon dioxide?
A) It is critically important in regulating the temperature of the planet.
B) It is a natural product of life processes (i.e., respiration).
C) It occurs in large amounts in the atmosphere–as one would expect given the important role it plays in life processes and in regulating the temperature of the planet.
D) The amount of carbon dioxide has increased as a result of human activities.
E) All of these are true.
Answer: C

83) Temperatures increase with increasing altitude in what two atmospheric layers?
A) troposphere and mesosphere
B) troposphere and stratosphere
C) stratosphere and mesosphere
D) stratosphere and thermosphere
Answer: C

84) Temperatures in the stratosphere _____ with increasing altitude because _____.
A) decrease; of the normal lapse rate effect
B) decrease; ozone blocks sunlight from entering this layer
C) increase; ozone absorbs ultraviolet radiation from the Sun and then reradiates it at infrared wavelengths
D) increase; ozone acts as a greenhouse gas which traps ultraviolet energy radiated by Earth's surface
Answer: C

85) Which layer of the atmosphere contains noctilucent clouds?
A) stratosphere
B) thermosphere
C) troposphere
D) mesosphere
Answer: D

86) Which of the following is true of the mesosphere?
A) It contains clouds that are visible at night.
B) Windstorms involving wind velocities in excess of 320 kmph (200 mph) occur in this layer.
C) It is the coldest layer of the atmosphere.
D) All of these are true.
E) None of these are true.
Answer: D

87) Dr. Rowland and Dr. Molina
A) first stated the photochemistry interactions of chlorofluorocarbons and ozone.
B) found automobile exhaust and sunlight were producing photochemical smog.
C) first wrote about the possible destruction of ozone in the year 1989.
D) are not mentioned in the text.
Answer: A

88) Which of the following is true of chlorofluorocarbons?
A) They have been used as propellants in spray cans.
B) They are used in refrigeration systems.
C) They are used to make foam products.
D) All of the above are true.
E) B and C only
Answer: D

89) Which of the following is true of chlorofluorocarbons?
A) The main component of CFC molecules responsible for destroying ozone is the carbon in the CFC molecule.
B) The main component of CFC molecules responsible for destroying ozone is the fluorine in the CFC molecule.
C) The CFC molecules react with ultraviolet light to release chlorine, which then destroys ozone.
D) Most of the CFC-induced ozone destruction is occurring near the equator, rather than near the poles.
Answer: C

90) Which of the following is false regarding the ozone hole?
A) In 2006 it was three times larger than the United States.
B) The amount of ozone depletion has grown worse over the last few years.
C) The amount of ozone depletion is greatest over the northern polar regions.
D) Ozone loss is occurring over the midlatitudes as well as over the polar regions.
E) Thousands of people die each year in North America as a result of skin cancers–some of which can be attributed to ozone depletion.
Answer: C

91) Which of the following are affected by the loss of ozone?
A) crop yields
B) phytoplankton populations
C) immune systems
D) eye tissues
E) all of these
Answer: E

92) Increased levels of ultraviolet light at Earth's surface
A) pose a threat of skin cancer to all races.
B) are related to an increasing rate of skin cancer.
C) have been identified as causing damage to oceanic life forms.
D) are tied to the general reduction in stratospheric ozone.
E) All of these are correct.
Answer: E

93) The atmospheric portion of the biosphere occurs in the
A) heterosphere.
B) troposphere.
C) ozonosphere.
D) lithosphere.
Answer: B

94) Directly above the midlatitudes, the tropopause (-57 degrees C) occurs at approximately
A) 1 km.
B) 13 km (8 mi.).
C) 37 km (22 mi.).
D) 50 km (30 mi.).
Answer: B

95) The tropopause occurs at a _____ elevation above the tropics than above the poles because _____.
A) lower; the stratosphere is thicker over the tropics and so it compresses the troposphere
B) lower; the troposphere weighs more in the tropics and so it sinks
C) higher; the troposphere is hotter in the tropics, and this causes the air to rise to greater heights
D) higher; the stratosphere is thinner over the tropics and this allows the troposphere to expand
Answer: C

96) Weather is confined to the troposphere because
A) terrestrial radiation provides no heat whatsoever to the other layers of the atmosphere.
B) solar radiation does not heat other layers of the atmosphere.
C) cold air sinks from the stratosphere into the troposphere.
D) the temperature of the stratosphere prevents tropospheric air from rising into it.
Answer: D

97) The problem of air pollution was first reported during
A) the time of the Romans (2000 years ago).
B) the Middle Ages (approximately 550 AD to 1500 AD).
C) the 1800s.
D) the 20th century.
Answer: A

98) Variable atmospheric components refer to
A) only natural gases and materials.
B) nitrogen, oxygen, argon, and carbon dioxide.
C) natural sources of dust and aerosols, such as volcanic dust and forest fire smoke, but nothing anthropogenic (human-caused).
D) both natural and anthropogenic gases and materials.
Answer: D

99) Temperature inversions occur
A) when surface temperatures are higher than overlying layers of air.
B) when there is good air drainage and ventilation of the surface air.
C) when surface temperatures are lower than warmer overlying air.
D) during episodes of reduced air pollution.
Answer: C

100) Sources of natural variable gases and materials include all of the following except
A) volcanoes.
B) forest fires.
C) plants and decaying plants.
D) industrial activity.
Answer: D

101) With regards to carbon monoxide (CO), which of the following is false?
A) Anthropogenic CO is principally produced by automobiles.
B) Natural CO is produced by decaying organic debris, forest fires, or organic matter decomposition.
C) Few effects of CO on humans have been identified.
D) It is a colorless, odorless and tasteless gas.
Answer: C

102) The reaction of automobile exhaust and ultraviolet light
A) produces photochemical smog.
B) produces industrial smog.
C) is affecting the stratospheric ozone concentration.
D) forms smoke and fog.
Answer: A

103) Photochemical reactions produce
A) principally sulfur dioxides.
B) particulates such as dust, dirt, soot, and ash.
C) ozone and peroxyacetyl nitrates (PAN).
D) carbon monoxide.
Answer: C

104) What three pollutants react in the presence of sunlight to produce ozone?
A) particulates, carbon monoxide, and water vapor
B) sulfur oxides, lead, and carbon monoxide
C) hydrocarbons, nitrogen dioxide, and carbon monoxide
D) nitrogen dioxide, particulates, and water vapor
Answer: C

105) O_3 in the lower troposphere
A) forms acid rain.
B) is not associated with transportation.
C) causes eye, nose, and throat irritation in humans.
D) has not been found to cause any damage to crops and plants.
Answer: C

106) Which of the following statements about ozone is false?
A) Ozone in the stratosphere protects human health.
B) Ozone in the lower atmosphere protects human health.
C) Anthropogenically-produced ozone in the lower atmosphere cannot offset the loss of ozone that is destroyed by CFCs in the upper atmosphere.
D) All of these are false.
Answer: B

107) The single major source for photochemical reactants in the United States are
A) steel mills and the agricultural industry.
B) electrical generation stations.
C) automobiles.
D) rapid transit, buses, and excessive use of light rail systems.
Answer: C

108) Industrial smog is
A) associated with photochemistry.
B) principally associated with coal-burning industries.
C) a relatively recent problem that developed during the latter half of this century.
D) principally associated with transportation.
Answer: B

109) Natural rainfall is often slightly acidic. The natural acidity primarily results from the interaction of water with
A) carbon dioxide.
B) sulfur oxides.
C) nitrogen oxides.
D) PAN.
E) ozone.
Answer: A

110) In the lower atmosphere, H_2SO_4 is
A) formed from photochemical reactions.
B) related to the problem of acid deposition.
C) a problem that only occurred during the first half of this century.
D) formed by a combination of O_2 and NO_2.
Answer: B

111) What two pollutants react with water to produce acid rain?
A) sulfur oxides and nitrogen oxides
B) sulfur oxides and ozone
C) nitrogen oxides and ozone
D) sulfur oxides and PAN
Answer: A

112) Which of the following is a consequence of acid rain?
A) the dying of forests
B) damage to aquatic ecosystems (rivers and lakes)
C) changes in soil chemistry
D) forest and soil damage only
E) all of the above
Answer: E

113) The lower the pH of a liquid
A) the more acidic it is.
B) the more basic (alkaline) it is.
C) the more neutral it is.
D) None of the above–pH is not a measure of acidity, it is a measure of chemical reactivity.
Answer: A

114) At sea level, the pressure of the atmosphere is about _____ kg per square centimeter, or _____ pounds per square inch.
A) 1.0; 14.7
B) 2.6; 9.4
C) 8.2; 3.3
D) 6.7; 19.9
Answer: A

115) Half of Earth's atmosphere lies below an elevation of _____ meters.
A) 14,000
B) 11,000
C) 8,300
D) 5,500
Answer: D

116) Of the people who die in the United States each year, roughly _____ percent were killed by air pollution.
A) 1.1
B) 2.0
C) 3.0
D) 4.8
Answer: B

117) The main ingredient in photochemical smog is
A) ozone.
B) particulate matter.
C) nitrogen dioxide.
D) carbon monoxide.
Answer: A

118) The EPA has estimated that the Clean Air Act has led to a net positive financial impact of about _____ dollars.
A) 500 million
B) 500 billion
C) 2 trillion
D) 22 trillion
Answer: D

119) The Clean Air Act
A) is no longer in effect.
B) did not result in significant reductions of any major air pollutants.
C) was made stronger during the Reagan administration.
D) has saved the country several trillion dollars.
Answer: D

120) Since the implementation of the Clean Air Act this pollutant has had the greatest percent decrease
A) nitrogen oxides.
B) carbon monoxide.
C) sulfates.
D) lead.
Answer: D

121) The Clean Air Act saved about _____ lives in 1990.
A) 1,000
B) 7,000
C) 95,000
D) 110,000
E) 200,000
Answer: E

122) Which of the following is true?
A) 75 percent of the atmosphere occurs below 10,700 m (35,105 ft).
B) 90 percent of the atmosphere is below 1000 m (3300 ft).
C) All but 0.001 percent of the atmosphere is accounted for within the troposphere.
D) 90 percent of the atmosphere is above the tropopause at 16,000 m (52,500 ft).
Answer: A

123) The most distant galaxies yet observed are at least 10 billion light years away.
Answer: TRUE

124) Relative to the speed of light, Earth is, on average, only 8 minutes and 20 seconds from the Sun.
Answer: TRUE

125) Earth is at perihelion in early January when it is closest to the Sun.
Answer: TRUE

126) We live on a continent on a small planet that orbits about an average star that is located near the trailing edge of a galaxy that is in a local group of galaxies in the Universe.
Answer: TRUE

127) Earth is farthest from the Sun at perihelion and closest at aphelion.
Answer: FALSE

128) The Sun and Earth formed from a collapsing cloud of dust and gas.
Answer: TRUE

129) The Solar System, Sun, and Earth formed about 4.6 to 5 billion years ago.
Answer: TRUE

130) Energy is liberated within the Sun's interior through a process known as nuclear fusion.
Answer: TRUE

131) The electromagnetic spectrum of radiant energy travels in waves at the speed of light in all directions from the Sun.
Answer: TRUE

132) Sunspots vary in a cycle from 7 to 17 years, averaging 11 years from a maximum to maximum peak.
Answer: TRUE

133) The correct order for wavelengths of electromagnetic radiation, from shortest to longest is: gamma rays, X-rays, infrared, radio waves, visible light, and ultraviolet.
Answer: FALSE

134) The Sun produces more gamma rays than Earth.
Answer: TRUE

135) The amount of the solar energy received by a given location is not really constant–it varies depending upon the season and Earth's distance from the Sun.
Answer: TRUE

136) The latitude of the subsolar point is its declanation.
Answer: TRUE
137) The Sun's height in the sky above the horizon is termed its altitude.
Answer: TRUE

138) Seasonality involves the variability of both daylength and the altitude of the Sun.
Answer: TRUE

139) Rotation is Earth's motion on its axis; revolution is its motion about the Sun.
Answer: TRUE

140) Earth's axis is tilted 23.5 degrees from a perpendicular to the plane of the ecliptic.
Answer: TRUE

141) The subsolar point is at the Tropic of Cancer on December 21.
Answer: FALSE

142) All places on Earth receive the same period of day and night on March 21.
Answer: TRUE

143) The duration of dawn and twilight tends to increase with increasing latitude.
Answer: TRUE

144) On the northern hemisphere's summer solstice, the north polar region receives more total daily energy than the equator.
Answer: TRUE

145) The modern atmosphere, with the amount of oxygen that exists today, developed as early as 600 million years ago.
Answer: TRUE

146) Weather (rain, fog, storms, etc.) occurs primarily in the troposphere.
Answer: TRUE

147) Based on composition, the atmosphere is divided into two broad regions: the ionosphere and the ozonosphere.
Answer: FALSE

148) The heterosphere has a layered structure, whereas the homosphere occurs as an even mixture of gases.
Answer: TRUE

149) When the Sun is active, the thermosphere increases in size.
Answer: TRUE

150) The principal gases of the homosphere (by volume) are nitrogen, helium, and argon.
Answer: FALSE

151) The ozone layer protects Earth's surface from most of the incoming ultraviolet radiation.
Answer: TRUE

152) The first major statement proposing the interaction of CFCs and stratospheric ozone was made in the 1970s.
Answer: TRUE

153) As soon as the scientific basis for ozone destruction by CFCs was worked out, political leaders in the U.S. immediately proposed legislation to ban the production of all CFCs.
Answer: FALSE

154) Both nitrogen dioxide and sulfur dioxide are principally produced by automobiles.
Answer: FALSE

155) The fact that nature produces more pollution than humans do means that anthropogenic pollution is insignificant, and we need not worry about it.
Answer: FALSE

156) Atmospheric circulation ultimately connects all places on Earth to one another.
Answer: TRUE

157) The higher the UV Index, the faster a person will sunburn.
Answer: TRUE

158) Skin damage resulting from exposure to the Sun is cumulative, i.e., the skin never completely heals from previous sunburns.
Answer: TRUE

159) Photochemical smog results from the interaction of sunlight with the combustion products of automobiles.
Answer: TRUE

160) More than half the air pollution in the U.S. is produced by automobiles.
Answer: TRUE

161) Normal rainfall has a neutral pH.
Answer: FALSE

162) Acid rain with a pH comparable to that of lemon juice has fallen in the U.S.
Answer: TRUE

163) Air pressure is produced through the motion, size, and number of air molecules.
Answer: TRUE

164) The atmosphere exerts an average force of approximately 1 kg/cm^2 (14.7 lbs/in^2) at sea level.
Answer: TRUE

165) Approximately fifty percent of the atmosphere is compressed by gravity below an elevation of 5500 m (18,000 ft).
Answer: TRUE

166) Ozone is the main ingredient of photochemical smog.
Answer: TRUE

167) The Clean Air Act actually saves fewer than 1000 lives per year.
Answer: FALSE

168) The Clean Air Act has not been cost effective.
Answer: FALSE

169) Gas mileage for 2003 vehicles was better than for 2002 vehicles.
Answer: FALSE