Geosystems: An Introduction to Physical Geography, 4e **(Christopherson)**
Chapter 2 Solar Energy to Earth and the Seasons

2.1 Multiple Choice Questions

1) Which of the following best describes our galaxy?
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
Diff: 1 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.5 Describe the Sun's operation.

2) The planetesimal hypothesis pertains to the formation of which of the following?
A) Universe.
B) Galaxy.
C) Planets.
D) Ocean basins.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.3 Summarize the origin, formation, and development of Earth.

3) What is the name of a supermassive black hole in the galactic centre of the Milky Way?
A) Sagittarius A*.
B) The Orion Spur.
C) Messier 31.
D) Centaurus A.
Answer: A
Diff: 1 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

4) At approximately what speed does light travel?
A) 80 500 kilometres per hour.
B) 300 000 kilometres per hour.
C) 300 000 kilometres per second.
D) 1 000 000 000 kilometres per second.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

5) What is the plane of the orbit of Earth about the Sun called?
A) Perihelion.
B) Aphelion.
C) The plane of the ecliptic.
D) A great circle.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

6) Which of the following most accurately describes the distance between Earth and the Sun?
A) The Earth-Sun distance averages 15 million kilometres.
B) It takes light an average of 20 minutes and 8 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) The orbit of Earth around the sun is presently circular and, therefore Earth is always equidistant from the Sun throughout the year.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

7) What powers our planet and our lives?
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
Diff: 2 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.5 Describe the Sun's operation.

8) Which of the following best describes our sun?
A) The Sun and Solar System are part of the Andromeda Galaxy.
B) The Sun produces energy through fusion.
C) The Sun is by far the largest star in the Milky Way Galaxy.
D) The Sun is a greater than average sized, white star.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

9) Which of the following best describes the Milky Way Galaxy in which we live?
A) It is a cone-shaped galaxy.
B) It is one of hundreds of galaxies in the universe.
C) It contains approximately 300 billion stars.
D) It is the largest galaxy in the universe.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

10) From what specifically did Earth and the Sun form?
A) The galaxy.
B) Unknown origins.
C) A nebula of dust and gases.
D) Other planets.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.3 Summarize the origin, formation, and development of Earth.

11) Which of the following best describes our solar system?
A) It consists of 8 planets and some 165 planetary satellites (moons).
B) Of all the planets, Neptune has the most moons.
C) Six of the eight planets have at least 5 moons.
D) Only one of the identified planetary satellites is still awaiting official confirmation.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

12) Which of the following best describes the orbit of Earth 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.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

13) According to findings from the Kepler telescope, what is the estimated number of planets in the Milky Way and on how many are there habitable zones?
A) 300 billion; 125 billion.
B) 25 million; 3 million.
C) 1 billion; 25 million.
D) 50 billion; 500 million.
Answer: D
Diff: 3 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.2 Locate Earth in the Solar System and Galaxy.

14) What is the basic idea behind the planetesimal hypothesis?
A) That planets form as a direct result of the nuclear fusion of nebular gases and planetesimals.
B) That planets form from the remains of super-giant planetesimals that undergo nuclear fission and blow apart, thereby creating smaller objects—the planets.
C) That early in the history of the solar system, a star passed near to the Sun and pulled off gases that eventually condensed to form planets.
D) That small grains of cosmic dust and other solids gradually accrete to form planetesimals that may grow to become protoplanets and eventually planets.
Answer: D
Diff: 3 Type: MC
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.3 Summarize the origin, formation, and development of Earth.

15) What is the dominant wavelength of energy emitted by the Sun?
A) It is shorter than that emitted by Earth.
B) It is longer than that emitted by Earth.
C) It is the same length as that emitted by Earth.
D) It is longer than that emitted by Earth, but the frequency is modulated.
Answer: A
Diff: 1 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

16) Which of the following is characterized by the longest wavelengths?
A) X-rays.
B) Gamma rays.
C) Visible.
D) Radio waves.
Answer: D
Diff: 1 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

17) 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 rays of the Sun are perpendicular to this surface.)
A) Solar point.
B) Zenith.
C) Subsolar point.
D) North Polar point.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

18) Which of the following best describes the subsolar point?
A) The highest latitude at which it occurs is 60° N/S.
B) It only occurs at lower latitudes, between the tropics (23.5° N/S).
C) It occurs at all latitudes at least once throughout the year.
D) It never occurs beyond a few degrees of the equator.
Answer: B
Diff: 1 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

19) 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
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

20) Why does the Sun give off electromagnetic radiation?
A) Because matter is converted into energy.
B) Because matter and energy totally annihilate one another in matter-antimatter reactions.
C) Because energy is converted into matter.
D) Because kinetic energy is converted into potential energy.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

21) Which of the following best describe sunspots?
A) They only affected Earth in geologic time.
B) They can produce flares and prominences.
C) They are brighter than the rest of the surface of the Sun.
D) They are surface disturbances caused by convective storms.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

22) What is a magnetic disturbance on the surface of the Sun called?
A) The electromagnetic spectrum.
B) The solar wind.
C) A sunspot.
D) A magnetospheric cyclone.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

23) On its way to Earth, what does the solar wind first encounter?
A) The atmosphere.
B) The magnetosphere.
C) The surface of Earth.
D) The lower atmosphere.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

24) What is Earth's magnetosphere 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
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

25) What causes the auroras in the upper atmosphere?
A) Visible light interaction with the asthenosphere.
B) AM radio broadcasts.
C) Various weather phenomena.
D) The interaction of the solar wind and upper layers of the atmosphere of Earth.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

26) Which of the following is a consequence of the solar wind?
A) Halos.
B) Disruption of radio communications.
C) Charging of electrical systems.
D) Creation of the magnetosphere of Earth.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.6 Explain the characteristics of the solar wind.

27) Which of the following have been correlated with sunspot cycles?
A) Abnormally wet years only.
B) Southern hemisphere droughts.
C) Both abnormally wet years and droughts.
D) Abnormally wet years occurring in association with unusually high windspeeds.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

28) Why did Astronauts deploy a solar wind measuring experiment on the Moon?
A) Because the lunar surface is protected by an atmosphere.
B) Because there is no electromagnetic energy arriving there.
C) Because the solar wind does not reach the surface of Earth.
D) Because no one else had attempted the experiment before and they wanted to be the first.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

29) Which of the following is true of the electromagnetic spectrum from the Sun?
A) It consists exclusively of radiant energy made of gamma ray, X-ray, and ultraviolet wavelengths.
B) It consists exclusively of streams of charged particles.
C) It consists of gamma ray, X-ray, ultraviolet, visible, and infrared wavelengths.
D) It consists exclusively of visible light and infrared energy.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

30) Which of the following best describes the radiation relationship between the Sun and Earth?
A) The Sun emits longwave radiation, whereas Earth emits shortwave radiation.
B) The Sun emits shortwave radiation, whereas Earth emits longwave radiation.
C) The radiation emitted by the Sun and Earth are roughly the same wavelength.
D) Because the Sun is so far away, it is impossible to measure the wavelengths of its radiation.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

31) What are the two main portions of the solar spectrum which enter the atmosphere?
A) X-rays and visible light.
B) Visible and infrared energy.
C) Infrared and gamma rays.
D) Ultraviolet and visible light.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

32) What is the dominant wavelength emitted by Earth?
A) Gamma radiation.
B) X-ray radiation.
C) Visible light.
D) Infrared.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

33) 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
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

34) To what does the thermopause refer?
A) The magnetic field of Earth.
B) The solar atmosphere that extends into space.
C) The top of the atmosphere of Earth.
D) The surface of the Sun.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

35) What is intercepted solar radiation called?
A) Solar wind.
B) Thermosphere.
C) Solar constant.
D) Insolation.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

36) What is the average insolation received by the thermopause when Earth is at its average distance from the sun known as?
A) The solar constant.
B) The solar wind input to the atmosphere.
C) The energy balance.
D) The incoming solar radiation.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

37) Where is the solar constant measured?
A) The surface of the Sun.
B) The edge of the atmosphere of the Sun.
C) The thermopause.
D) Sea level.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

38) Which of the following is best describes the relationship between insolation at the thermopause relative to latitude?
A) Insolation is evenly distributed with little change by latitude on an annual basis.
B) Lower latitudes receive more insolation than high latitudes annually.
C) Higher latitudes receive more insolation than lower latitudes annually.
D) Insolation can only be measured longitudinally, not latitudinally.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

39) What is the uneven distribution of insolation by latitude primarily a result of?
A) Variability in the output from the Sun.
B) The changing distance of Earth from the Sun.
C) Variation in the value of a watt.
D) The curvature of Earth, which presents varied angles to parallel solar rays.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

40) How do radio waves compare to visible light in wavelength and in energy?
A) Longer; less.
B) Longer; more.
C) Shorter; less.
D) Shorter; more.
Answer: A
Diff: 3 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

41) What is important about Wein's Displacement Law?
A) It gives an indication of the rate of precipitation that is required to raise sea level.
B) It allows scientists to calculate the volume of energy contained in the atmosphere of Earth.
C) It summarizes the relationship between the temperature of an object and the mean wavelength of energy that the object emits.
D) It describes the nature of the atmospheric window that exists where water vapour and carbon dioxide absorb incoming solar radiation.
Answer: C
Diff: 3 Type: MC
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

42) Which of the following is correct regarding daylength?
A) Daylength is uniform at all latitudes throughout the years.
B) People living at the equator experience 6 hours difference in daylength between the summer and winter.
C) The equator always receives equal hours of day and night.
D) The range of daylength is shortest in the polar regions.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

43) When does the summer solstice occur in the southern hemisphere?
A) It occurs at the same time as summer solstice in the northern hemisphere.
B) It occurs on or around June 21.
C) It occurs on or around December 21.
D) It occurs during equinox in the northern hemisphere.
Answer: C
Diff: 1 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

44) To what does the term "net radiation" refer?
A) It refers to the total amount of energy received by Earth.
B) It refers to the total amount of energy radiated by Earth.
C) It refers to the difference in amount of incoming and outgoing radiation.
D) It refers to the radiation emitted by satellite networks.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

45) What is important about changes in daylength and the altitude of the Sun above the horizon over the course of the year?
A) These are two factors that produce the rotation of Earth.
B) These are are phenomena that occur only at the equator.
C) These are two of the factors responsible for the seasons.
D) These are factors that follow an irregular, random cycle.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.9 Define solar altitude, solar declination, and daylength.

46) Which of the following best describes the circle of illumination at all times of the year?
A) It divides Earth between northern and southern hemispheres.
B) It divides Earth into eastern and western halves.
C) It separates winter from summer.
D) It divides Earth between equal halves of lightness and darkness.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.9 Define solar altitude, solar declination, and daylength.

47) Which of the following is true regarding the axis of Earth?
A) It is tilted 28.5° relative to the plane of the ecliptic.
B) The axis through the two poles of Earth points just slightly off Sagittarius A*.
C) During the winter months, the axis is aligned towards Southern Cross.
D) Throughout the year, the axis maintains the same alignment relative to the plane of the ecliptic.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

48) What does the altitude of the Sun refer to?
A) It refers to the angular distance from the equator to the latitude at which direct overhead insolation is received.
B) It refers to the angular height of the Sun above the horizon.
C) It refers to the location of the subsolar point.
D) It refers to the distance between the Sun and Earth.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.9 Define solar altitude, solar declination, and daylength.

49) What does the declination of the Sun refer to?
A) It refers to the latitude of the subsolar point.
B) It refers to the angular height of the Sun above the horizon.
C) It refers to the distance between the Sun and Earth.
D) It refers to the altitude of the Sun, in tens of metres, above the horizon.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.9 Define solar altitude, solar declination, and daylength.

50) The declination of the Sun migrates through how many degrees of latitude annually?
A) 23.5°.
B) 30°.
C) 47°.
D) 66.5°.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.9 Define solar altitude, solar declination, and daylength.

51) Which of the following is true of the number of hours of daylight?
A) The number of hours of daylight includes the hours between dawn and twilight, not just the hours from sunrise to sunset.
B) The number of hours of daylight varies depending on the latitude of the observer.
C) The number of hours of daylight varies the most along the equator.
D) The number of hours of daylight varies the least at higher latitudes.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

52) Which of the following is true regarding daylength?
A) The equator experiences at least six-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° N or S latitude experience about six-hours difference in daylength from winter to summer.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

53) Which of the following characterizes the revolution of Earth?
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
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

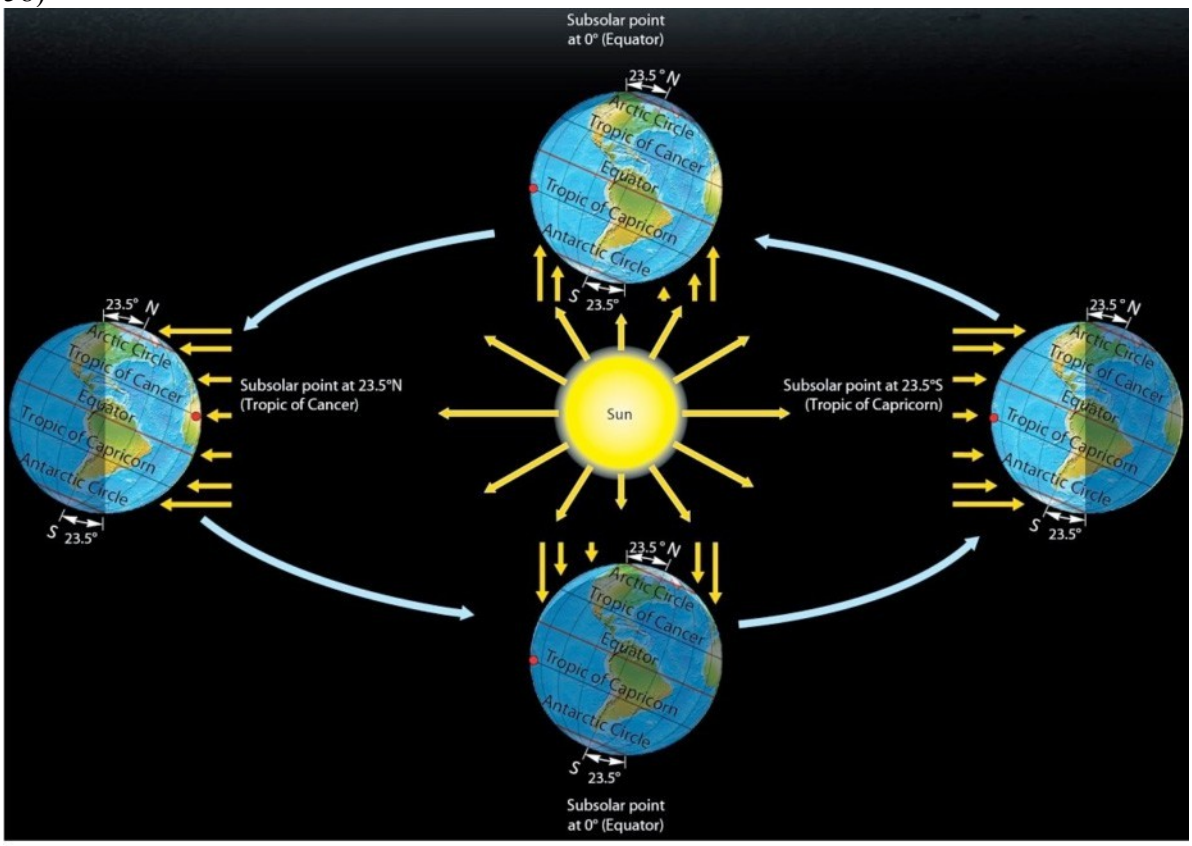
54) Which of the following can be attributed to the effects the rotation of Earth?
A) The migration of the subsolar point.
B) Deflection of winds, ocean currents, or any moving objects.
C) Development of high altitude clouds.
D) Latitudinal variations in net radiation.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

55) How is the rotation of Earth best described?
A) Rotation is from east to west.
B) Rotation is clockwise when viewed from above the South Pole.
C) Rotation is from west to east.
D) Rotation is clockwise when viewed from above the North Pole.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

56) Which of the following is true regarding the axis of Earth?
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° from a perpendicular to the plane of the ecliptic.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

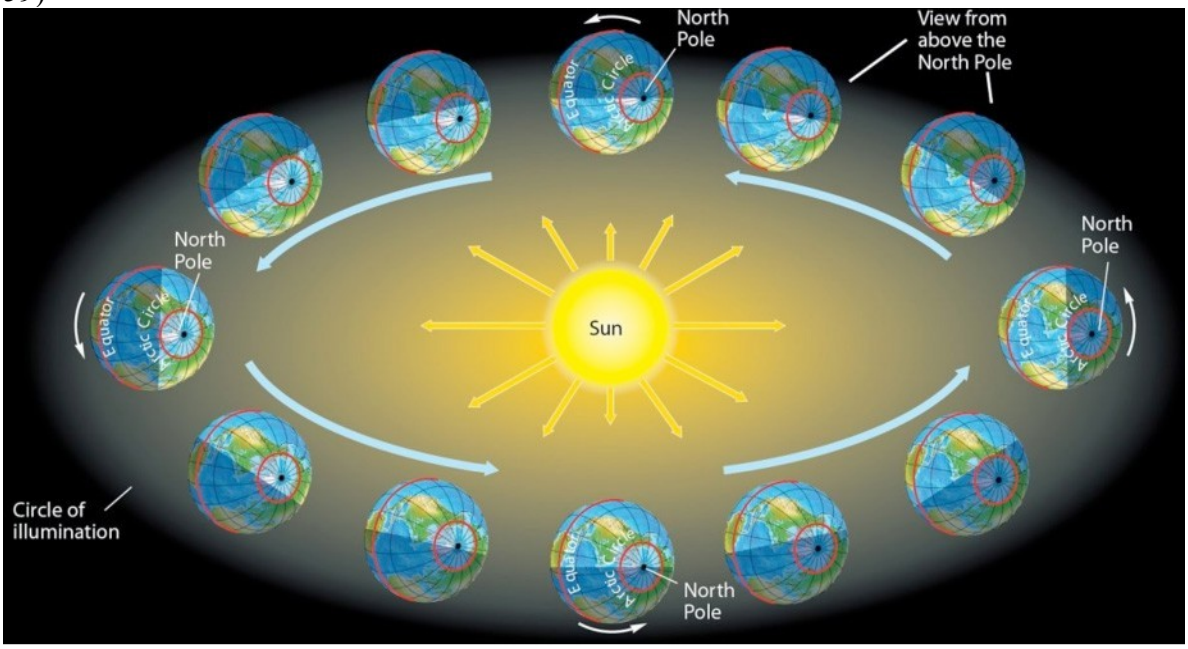
57) Which of the following is true regarding rotational velocities at different latitudes?
A) At 90° latitude, the rotational velocity is 1452 km • h^{-1}.
B) At 0° latitude, the rotational velocity is 1675 km • h^{-1}.
C) At 60° latitude, the rotational velocity is 8380 km • h^{-1}.
D) At 30° latitude, the rotational velocity is 1452 km • h^{-1}.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

58)



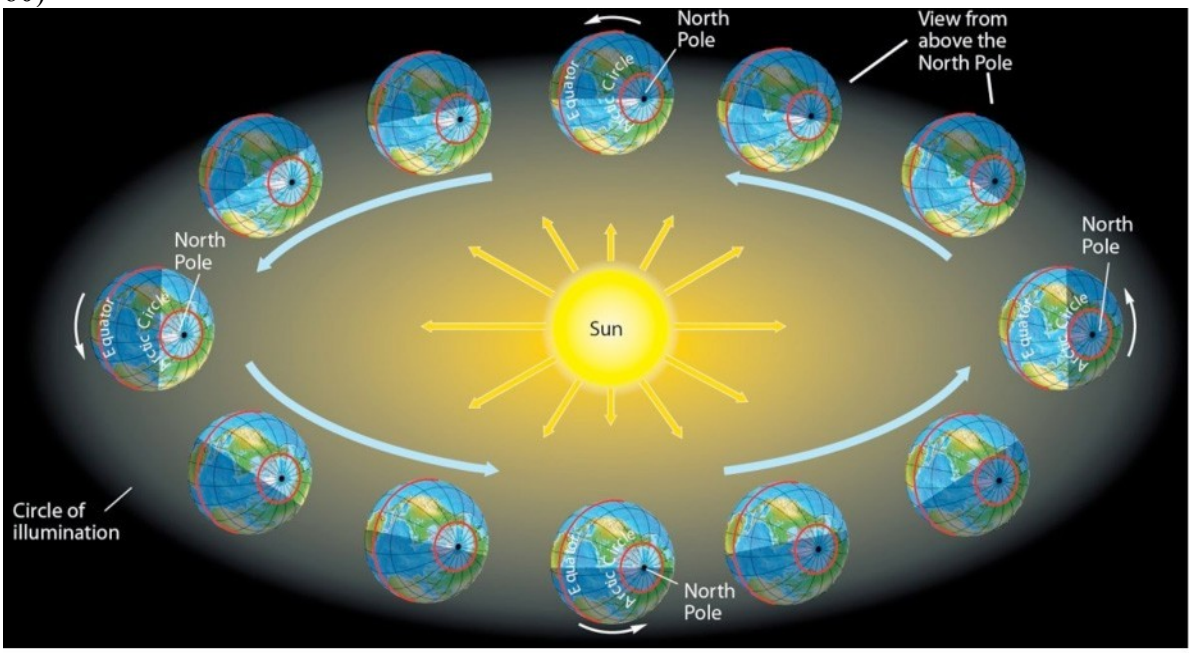
With reference to the figure above, which of the following is true for the December Solstice?
A) The subsolar point is at the equator.
B) The Arctic Circle is completely within the circle of illumination.
C) The Antarctic Circle is completely within the circle of illumination.
D) The subsolar point is at the Tropic of Cancer (23.5° N).
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

59)



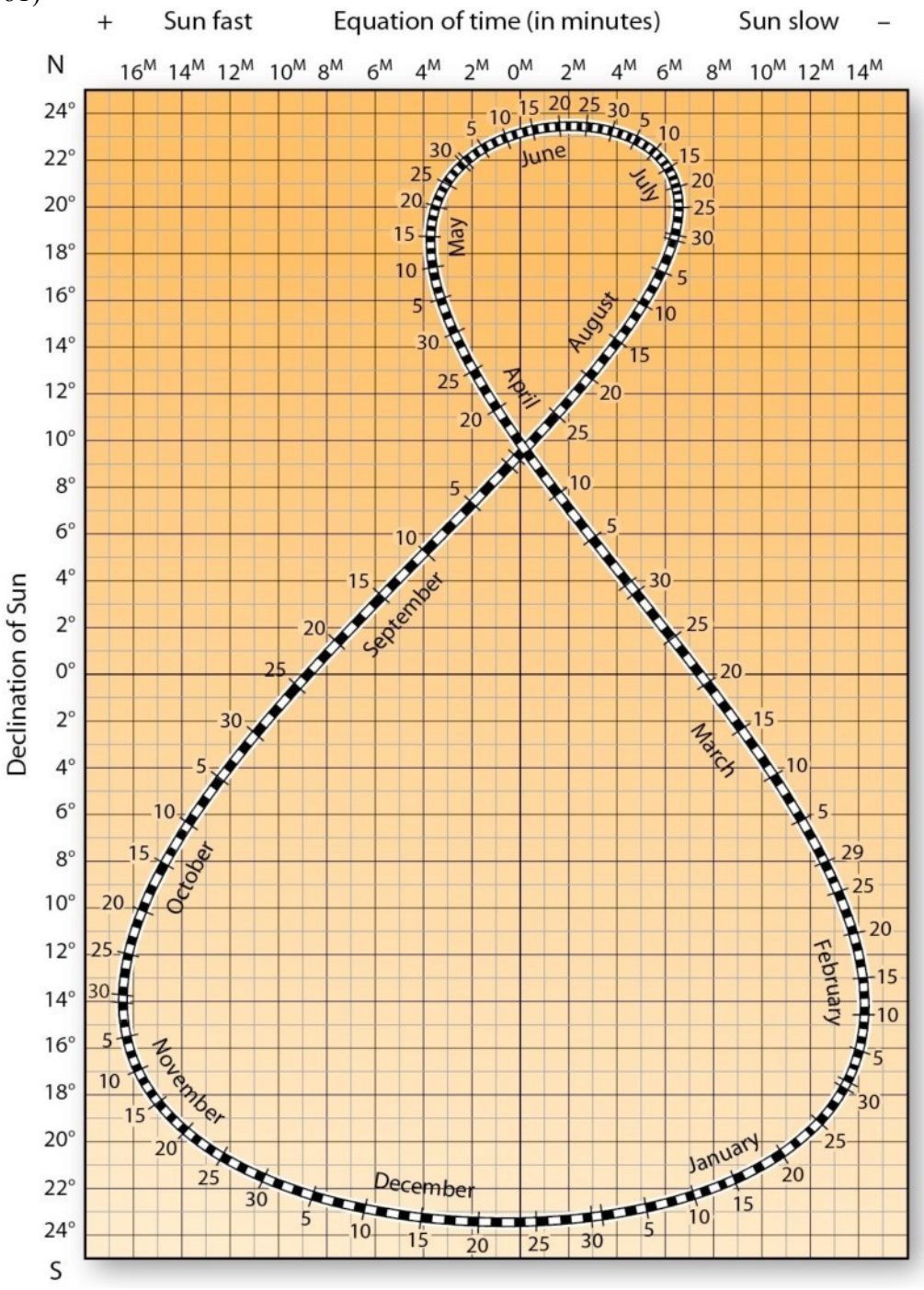
With reference to the figure above, which of the following is true for the March Equinox?
A) The subsolar point is at the equator.
B) The subsolar point is at the Tropic of Cancer (23.5° N).
C) The subsolar point is at the Tropic of Capricorn (23.5° S).
D) The subsolar point is at the Prime Meridian.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

60)



With reference to the figure above, which of the following is true for the September Equinox?
A) There is 24 hours of daylight at the North Pole.
B) The Arctic Circle is completely within the circle of illumination.
C) The Antarctic Circle is completely within the circle of illumination.
D) The circle of illumination passes through both the poles.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

61)



With reference to the figure above, on approximately which dates is the subsolar point 16° S?
A) March 30 and September 15.
B) February 5 and November 5.
C) April 25 and August 20.
D) May 5 and August 10.
Answer: B

Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.9 Define solar altitude, solar declination, and daylength.

62) Which of the following is true of Quito, Ecuador (0° 15' N, 78° 35' S)?
A) Quito experiences days and nights of equal lengths throughout the year.
B) During the June Solstice, Quito experiences 24 hours of darkness because it is completely outside of the circle of illumination.
C) At noon on June 21st, the sun is directly overhead in Quito.
D) Quito is at a latitude that is never the subsolar point.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.9 Define solar altitude, solar declination, and daylength.

63) Which of the following is true of the September equinox?
A) All latitudes on Earth, except the Equator, experience unequal daylengths.
B) The subsolar point is at the Tropic of Cancer (23.5° N).
C) The sun rises at the South Pole, where it will remain over the horizon for the following six months.
D) The Northern Hemisphere spring officially begins.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

64) Which of the following is true of the March equinox?
A) Moving south of the equator, daylength increases, while moving north of the equator daylength decreases.
B) The direct rays of the Sun strike perpendicular at the Tropic of Capricorn (23.5° S).
C) At all latitudes between the poles, day and night are of equal length.
D) In the Southern Hemisphere, it is known as the vernal equinox.
Answer: C
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

65) On Earth, the Sun passes directly overhead at 25° N latitude how many times a year?
A) 0.
B) 1.
C) 2.
D) 4.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.9 Define solar altitude, solar declination, and daylength.

66) Which of the following statements is true?
A) The Northern Hemisphere vernal equinox is the Southern Hemispheres Autumnal Equinox.
B) The Northern Hemisphere vernal equinox is also the Southern Hemispheres Vernal Equinox.
C) The Northern Hemisphere vernal equinox is the Southern Hemispheres Winter Solstice.
D) The Northern Hemisphere vernal equinox is the Southern Hemispheres Summer Solstice.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

67) Which of the following best describes the equinox?
A) It occurs four times during the year.
B) It has 12 hours of day and 12 hours of night for all locations.
C) It is the longest day of the year at any given place.
D) It occurs when the subsolar point is at one of the tropics.
Answer: B
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

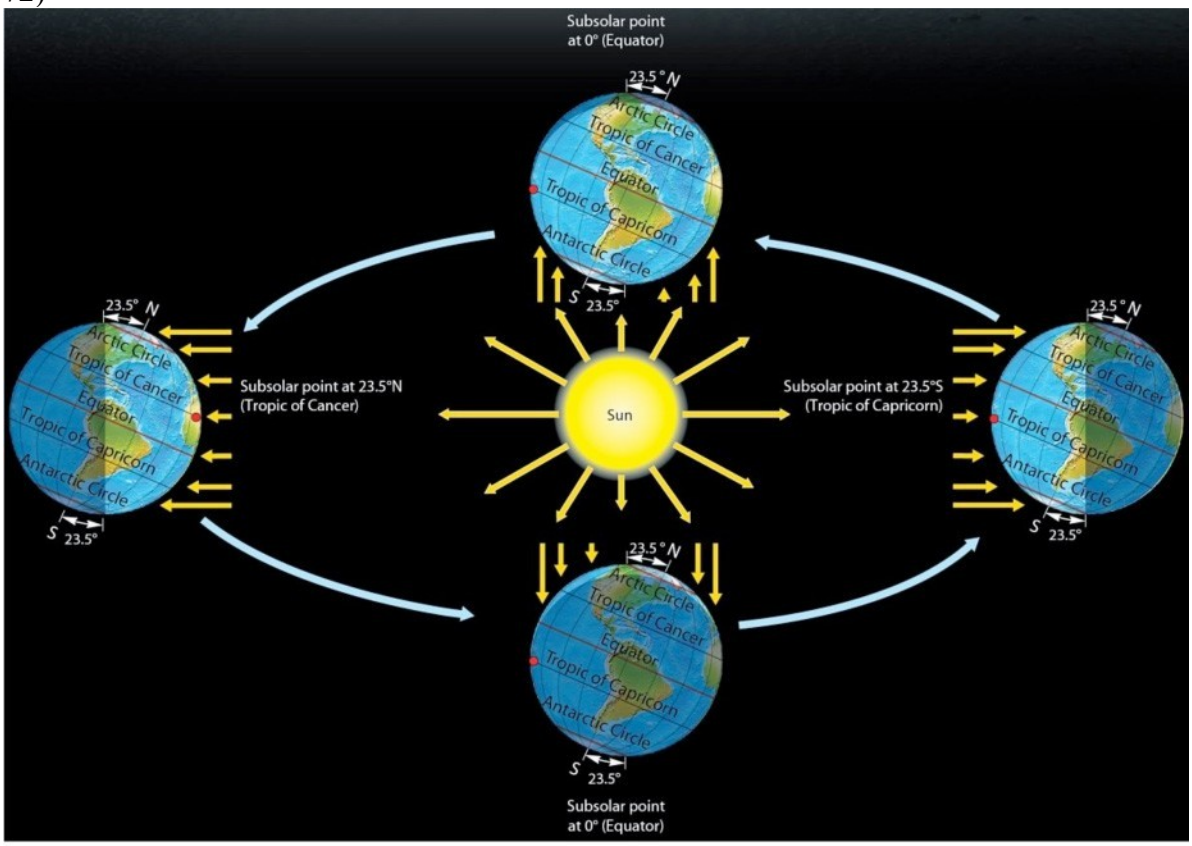
68) To what does the Tropic of Capricorn refer?
A) It is the parallel that is 23.5° S latitude.
B) It is the location of the subsolar point on September 22.
C) It is the parallel that is the farthest northern location for the subsolar point during the year.
D) It is the parallel that is 66.5° S latitude.
Answer: A
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

69) 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° north and south latitudes receive the most dawn and twilight.
D) The duration of both increases with increasing latitude.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

70) On June 21st, where is the declination of the Sun?
A) It is at the equator.
B) It is located at Rio de Janeiro, Brazil and Alice Springs, Australia.
C) It is on the Tropic of Capricorn.
D) The Tropic of Cancer.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

71) Which of the following is correct relative to insolation at the thermopause?
A) In June, the North Pole receives over 500 watts per square metre per day.
B) In June, the South Pole receives over 550 watts per square metre per day.
C) Throughout the year, the equatorial receipt varies between 100 and 400 watts per square metre per day.
D) It receives an average amount of insolation equal to 100 watts per square metre per day.
Answer: A
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

72)



With reference to the figure above, which of the following is true for the June Solstice?

A) The subsolar point is at the equator.
B) The Arctic Circle is completely within the circle of illumination.
C) The Antarctic Circle is completely within the circle of illumination.
D) The subsolar point is at the Tropic of Capricorn (23.5° S).
Answer: B
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

73) 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.
Answer: D
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

74) On June 21, the Sun never sets at Finn's location. Based on this, where can it be concluded that Finn lives?
A) He lives between the Tropic of Cancer and the Arctic Circle.
B) He lives between the Tropic of Capricorn and the Antarctic Circle.
C) He lives above the Arctic Circle.
D) He lives below the Antarctic Circle.
Answer: C
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

75) For observers in the Northern Hemisphere, which of the following is true?
A) Daylength becomes increasingly longer during the period from the summer solstice until the winter solstice.
B) Daylength decreases from the winter solstice until the vernal equinox, when it begins to increase.
C) Daylength is longest on the summer solstice and is shortest on the winter solstice.
D) Daylength variations are negligible for all locations throughout the year except above the Arctic Circle.
Answer: C
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

76) To what does the Tropic of Cancer refer?
A) It refers to the parallel that occurs at 23.5° S latitude.
B) It refers to the location of the subsolar point on September 22.
C) It refers to the parallel that is the farthest northern location for the subsolar point during the year.
D) It refers to 0° latitude when the Sun crosses the equator.
Answer: C
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

77) The longest days of the year in the Southern Hemisphere are experienced during what time in the Northern Hemisphere?
A) Summer solstice.
B) Spring equinox.
C) Winter solstice.
D) Autumnal equinox.
Answer: C
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

78) The longest days of the year in the Northern Hemisphere are experienced during what time?
A) The time of 24-hour days at the South Pole.
B) Vernal equinox.
C) Winter solstice.
D) The time that the Sun is directly overhead at the Tropic of Cancer.
Answer: D
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

79) Which of the following relationships is correct?
A) December solstice — subsolar point at 23.5° N latitude.
B) March equinox — subsolar point at 23.5° S latitude.
C) June 21 — subsolar point at 23.5° N latitude.
D) June solstice — subsolar point at 0° latitude.
Answer: C
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

80) Which of the following is true regarding the point of sunrise for a location in the northern hemisphere?
A) It migrates from southeast to northeast from winter to summer.
B) It remains fixed throughout the year; only the altitude of the Sun changes.
C) It moves to the south from winter to summer.
D) It is along the western horizon in summer, and the eastern horizon in winter.
Answer: A
Diff: 3 Type: MC
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

81) Which of the following is an example of humans influencing solar energy or seasonality?
A) Solar winds affect communication systems on Earth.
B) Seasonal change determines the rhythm of life and food resources.
C) Solar energy drives ecosystem processes that benefit humans.
D) Longer summers due to climate change have altered migration patterns of some animals.
Answer: D
Diff: 2 Type: MC
Chapter/section: 2.4 The Human Denominator
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

2.2 True/False Questions

1) The Solar System, Sun, and Earth formed about 4.6 billion years ago.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.1 Distinguish between galaxies, stars, and planets.

2) The Milky Way galaxy contains approximately 300 billion stars, of which the Sun is an average sized star.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.1 Distinguish between galaxies, stars, and planets.

3) The Milky Way is about 100 000 light-years from side to side.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.1 Distinguish between galaxies, stars, and planets.

4) At the speed of light, Earth is an average of only 6 minutes and 40 seconds from the Sun.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.1 Distinguish between galaxies, stars, and planets.

5) A light-year is an astronomical unit of length equal to approximately 9.5 trillion kilometres.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.1 Distinguish between galaxies, stars, and planets.

6) Earth is closest to the Sun in early January.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

7) Our solar system is located towards the middle of the Milky Way galaxy.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

8) Earth is farthest from the Sun at perihelion and closest at aphelion.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

9) Earth is closest to the Sun in early July.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

10) The axis of Earth is titled 19.5° relative to the plane of the ecliptic.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.2 Locate Earth in the Solar System and Galaxy.

11) According to the planetesimal hypothesis, solar systems condense from nebular dust and gas.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.3 Summarize the origin, formation, and development of Earth.

12) In order to study the planetesimal hypothesis, astronomers study this process in other parts of the Galaxy.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.3 Summarize the origin, formation, and development of Earth.

13) The distance from the Sun to Earth does not vary throughout the year.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

14) The principal outputs from the Sun consist of the solar wind and radiant energy.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.5 Describe the Sun's operation.

15) A solar maximum is a period during which sunspots are numerous.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.5 Describe the Sun's operation.

16) The electromagnetic spectrum only shows the wavelengths associated with solar radiation.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

17) The electromagnetic spectrum of radiant energy travels in waves at the speed of light in all directions from the Sun.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

18) Auroras are associated with massive bursts of solar wind called coronal mass ejections.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

19) The Sun emits radiant energy composed almost entirely of ultraviolet and gamma-ray wavelengths.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

20) Auroras are mainly visible at lower latitudes, from the equator to about 15° N/S.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

21) Shorter wavelengths tend to have a lower frequency.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

22) The correct order for wavelengths of electromagnetic radiation, from shortest to longest is: X-rays, infrared, radio waves, visible light, and ultraviolet.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

23) Radiant energy from the Sun is composed primarily of visible light and infrared wavelengths.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

24) Earth radiates energy primarily in the ultraviolet wavelengths.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

25) Intercepted solar energy is called insolation and is measured as the solar constant at the top of the atmosphere.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

26) The magnetosphere deflects the solar wind toward the two poles on Earth.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.6 Explain the characteristics of the solar wind.

27) The amount of the solar energy received by a given location varies depending upon the season.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

28) All points on the surface of Earth experience the subsolar point at some moment during the year.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.9 Define solar altitude, solar declination, and daylength.

29) The solar constant varies by latitude.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

30) The height of the Sun in the sky above the horizon is termed its altitude.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.9 Define solar altitude, solar declination, and daylength.

31) Seasonality involves the variability of both daylength and the altitude of the Sun.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

32) The speed of the rotation of Earth is fastest at the poles.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

33) Rotation is the motion of Earth on its axis; revolution is the motion of Earth about the Sun.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

34) The rotation of Earth is gradually slowing.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

35) The axis of Earth is tilted 23.5° from a perpendicular to the plane of the ecliptic.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

36) The axial alignment of Earth varies throughout the year.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

37) Earth rotates east to west, or clockwise, when viewed from above the North Pole.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

38) The subsolar point is at the Tropic of Cancer on December 21.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

39) All places on Earth experience approximately the same daylength on March 21.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

40) The Sun is directly overhead north of 23.5° N latitude twice a year.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

41) The June solstice marks the beginning of Southern Hemisphere winter.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

42) Twilight is the period of diffused light that occurs before sunrise.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

43) On the summer solstice in the northern hemisphere, areas above Arctic Circle are completely within the circle of illumination.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

44) The maximum latitude of the subsolar point is 47° N/S.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

45) The beginning of Northern Hemisphere spring occurs when the subsolar point is at the Tropic of Cancer.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

46) The Sun rises at the North Pole on the March equinox and remains over the horizon for the following six months.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 1/2 Knowledge/Comprehension
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

47) Lower latitudes experience the greatest seasonal variation throughout an average year.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

48) The uneven distribution of insolation at the thermopause is caused by the curvature of Earth, with only the subsolar point receiving sunlight from directly overhead.
Answer: TRUE
Diff: 2 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

49) The seasons are caused by the changing amounts of energy received on Earth as a result of the elliptical orbit.
Answer: FALSE
Diff: 2 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

50) The spherical shape of Earth is not a factor with regard to seasonality.
Answer: FALSE
Diff: 2 Type: TF
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 3/4 Application/Analysis
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

51) While seasonality can affect humans, humans cannot affect seasonality.
Answer: FALSE
Diff: 1 Type: TF
Chapter/section: 2.4 The Human Denominator
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

52) Longer autumns and earlier springs caused by climate change have lengthened the growing season in the Canada and the United States.
Answer: TRUE
Diff: 1 Type: TF
Chapter/section: 2.4 The Human Denominator
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

2.3 Essay Questions

1) Why is the light year a useful unit of measurement for astronomical distances?
Answer: The size of the universe is vast; the light year is therefore a useful unit of measurement for distances of such galactic scale.
Diff: 3 Type: ES
Chapter/section: 2.1 The Solar System, Sun, and Earth
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

2) Describe the causes and consequences of the uneven distribution of insolation.
Answer: Due to the curved surface of Earth, lower latitudes receive more concentrated direct insolation, while higher latitudes receive less concentrated, more diffuse insolation. This latitudinal imbalance in energy drives global circulation in the atmosphere and oceans.
Diff: 3 Type: ES
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

3) Describe the radiation emitted from both the Sun and Earth in terms of the electromagnetic spectrum.
Answer: The sun emits shortwave radiation primarily in the visible and infrared wavelengths, while Earth emits longwave radiation primarily in the thermal infrared wavelengths.
Diff: 3 Type: ES
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

4) How does the daily insolation received at the top of the atmosphere vary annual from lower to higher latitudes?
Answer: At lower latitudes, daily insolation is high throughout the year, with little variation month to month. At higher latitudes, insolation values are greatest in the summer months, lowest in the winter months, and vary greatly with latitude.
Diff: 3 Type: ES
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

5) Define these terms: thermopause, insolation, solar constant, subsolar point.
Answer: Thermopause: outer boundary of the energy system of Earth, the region at the top of the atmosphere (approx. 480 km); insolation: incoming solar radiation; solar constant: average insolation received at the thermopause when Earth is at its average distance from the Sun (1372 $W \bullet m^{-2}$); Subsolar point: the only point where insolation arrives perpendicular to the surface.
Diff: 3 Type: ES
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.9 Define solar altitude, solar declination, and daylength.

6) Explain the significance of each of the equinoxes and solstices.
Answer: The equinoxes mark the beginning of the spring and fall, all locations on Earth between the poles have equal daylengths; and it marks the sunrise/set at the poles. The solstices that mark the beginning of the summer and winter, occur when the subsolar point is at its maximum latitude; and when either the Arctic (June solstice) or Antarctic (December Solstice) Circles are completely within the circle of illumination.
Diff: 3 Type: ES
Chapter/section: 2.2 Solar Energy: From Sun to Earth
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

7) What primary factors determine the seasons on Earth?
Answer: Revolution of Earth around the Sun; rotation of Earth on its axis; Earth's axial tilt; axial parallelism; and sphericity of Earth.
Diff: 3 Type: ES
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

8) What is the circle of illumination and why is it important?
Answer: The circle of illumination is the dividing line between day and night. Combined with the four factors that cause the seasons, the circle of illumination will influence daylength throughout the year.
Diff: 3 Type: ES
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

9) For where you live, how do daylength and the altitude of the Sun vary throughout the year?
Answer: Answers will vary depending on where students live.
Diff: 3 Type: ES
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.9 Define solar altitude, solar declination, and daylength.

10) Why are seasonal changes less noticeable near the equator than at mid-latitudes?
Answer: Because the equatorial region receives fairly constant high insolation and has consistent daylength throughout the year, there is little seasonal variation; at the mid-latitudes,insolation varies throughout the year (as does daylength), there are greater seasonal variations.
Diff: 3 Type: ES
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

11) Draw and label a diagram of the Earth-Sun relationship for the four seasons. Include the average distance from Earth to the Sun, the location of the subsolar point for each seasonal event, and the name and date for each of the solstices and equinoxes.
Answer: Answers will vary. Figure GIA 2.1 is a good basis for the answer.
Diff: 3 Type: ES
Chapter/section: 2.3 The Seasons
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

12) Discuss ways in which anthropogenic climate change affects seasonality.
Answer: There are several examples given in the book, but students can select others, as well. Seasonal shifts in the subtropical high pressure zone in Africa are leading to decreased rainfall; in the Canada and the United States, the trend has been towards a longer growing season; and in the far north, longer summers have changed migration patterns of moose.
Diff: 3 Type: ES
Chapter/section: 2.4 The Human Denominator
Bloom's Taxonomy: 5/6 Synthesis/Evaluation
LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.