

***Geosystems: An Introduction to Physical Geography, 9e* (Christopherson)
Chapter 2 Solar Energy to Earth and the Seasons**

2.1 Multiple Choice Questions

1) 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

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.5 Describe the Sun's operation.

2) The planetesimal hypothesis pertains to the formation of the

- A) universe.
- B) galaxy.
- C) planets.
- D) ocean basins.

Answer: C

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.3 Summarize the origin, formation, and development of Earth.

3) _____ is a supermassive black hole sitting in the galactic center of the Milky Way.

- A) Sagittarius A*
- B) The Orion Spur
- C) Messier 31
- D) Centaurus A

Answer: A

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.2 Locate Earth in the Solar System and Galaxy.

- 4) Light travels at a speed of approximately
A) 80,500 kilometers per hour (50,000 mph).
B) 300,000 kilometers per hour (186,336 mph).
C) 300,000 kilometers per second (186,333 miles per second).
D) 1,000,000,000 kilometers per second (621,118,012 miles per second).

Answer: C

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

- 5) 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

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

- 6) Which of the following does not accurately describe 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) The Earth's orbit around the sun is presently circular and, therefore the Earth is always equidistant from the sun throughout the year.

Answer: D

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

- 7) 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

Diff: 2

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.5 Describe the Sun's operation.

8) Which of the following is false?

- A) The Sun and Solar System are part of the Milky Way 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 an average sized yellow star.

Answer: C

Diff: 2

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.2 Locate Earth in the Solar System and Galaxy.

9) Which of the following is not 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 300 billion stars.
- D) It is the largest galaxy in the universe.

Answer: D

Diff: 2

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.2 Locate Earth in the Solar System and Galaxy.

10) 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

Diff: 2

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.3 Summarize the origin, formation, and development of Earth.

11) Which of the following is not of 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 1 moon.
- D) Several identified planetary satellites are still awaiting official confirmation.

Answer: B

Diff: 2

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.2 Locate Earth in the Solar System and Galaxy.

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.

Answer: B

Diff: 2

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

13) According to findings from the Kepler telescope, the estimated number of planets in the Milky Way is _____ with some _____ in 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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.2 Locate Earth in the Solar System and Galaxy.

- 14) The basic idea behind the planetesimal hypothesis is that
- A) planets form as a direct result of the nuclear fusion of nebular gases and planetesimals.
 - B) planets form from the remains of super-giant planetesimals that undergo nuclear fission and blow apart, thereby creating smaller objects—the planets.
 - C) early in the solar system's history, a star passed near to the Sun and pulled off gases that eventually condensed to form planets.
 - D) small grains of cosmic dust and other solids gradual accrete to form planetesimals that may grow to become protoplanets and eventually planets.

Answer: D

Diff: 3

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.3 Summarize the origin, formation, and development of Earth.

- 15) 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

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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) thermal infrared
- E) radio waves

Answer: E

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

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 Sun's rays are perpendicular to this surface.)

- A) solar point
- B) zenith
- C) subsolar point
- D) North Polar point

Answer: C

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

18) Which of the following is true of 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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

20) The Sun gives 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

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

21) Which of the following is not true of 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) They are surface disturbances caused by magnetic storms.

Answer: C

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

22) A magnetic disturbance on the Sun's surface is called

- A) the electromagnetic spectrum.
- B) the solar wind.
- C) a sunspot.
- D) a magnetospheric cyclone.

Answer: C

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

23) 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

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

- 24) 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

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

- 25) The auroras in the upper atmosphere are caused by
- 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 Earth's atmosphere.

Answer: D

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

- 26) Which of the following is not 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

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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
- B) droughts
- C) both abnormally wet years and droughts
- D) neither abnormally wet years nor droughts

Answer: C

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

28) 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 solar wind does not reach the Earth's surface.
- D) no one else had attempted the experiment before and they wanted to be the first.

Answer: C

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.6 Explain the characteristics of the solar wind.

29) Which of the following is true of the Sun's electromagnetic spectrum?

- 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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

30) Which of the following is true?

- A) The Sun emits longwave radiation, whereas the Earth emits shortwave radiation.
- B) The Sun emits shortwave radiation, whereas the Earth emits longwave radiation.
- C) The radiation emitted by the Sun and the 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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

31) The two main portions of the solar spectrum which enter the atmosphere are

- 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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

32) The dominant wavelength emitted by Earth is

- A) gamma radiation.
- B) X-ray radiation.
- C) visible light.
- D) infrared.

Answer: D

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

34) The thermopause refers to

- A) Earth's magnetic field.
- B) the solar atmosphere that extends into space.
- C) the top of Earth's atmosphere.
- D) the Sun's surface.

Answer: C

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

35) Intercepted solar radiation is called

- A) solar wind.
- B) thermosphere.
- C) solar constant.
- D) insolation.

Answer: D

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

36) The average insolation received by the thermopause when the Earth is at its average distance from the sun is known as the

- A) solar constant.
- B) solar wind input to the atmosphere.
- C) energy balance.
- D) incoming solar radiation.

Answer: A

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

37) The solar constant is measured at

- A) the Sun's surface.
- B) the edge of the Sun's atmosphere.
- C) the thermopause.
- D) sea level.

Answer: C

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 true relative to insolation at the thermopause relative to latitude?

- A) Annually, insolation is evenly distributed with little change by latitude.
- B) Annually, lower latitudes receive more insolation than the high latitudes.
- C) Annually, higher latitudes receive more insolation than lower latitudes.
- D) Insolation can only be measured longitudinally, not latitudinally.

Answer: B

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

39) 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 curvature, which presents varied angles to parallel solar rays.

Answer: D

Diff: 2

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

40) 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

Diff: 3

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

41) The _____ emits mainly _____ which is also called _____.

- A) Sun; longwave radiation; infrared
- B) Sun; shortwave radiation; radio waves
- C) Earth; longwave radiation; infrared
- D) Earth; shortwave radiation; infrared
- E) Earth; longwave radiation; ultraviolet

Answer: C

Diff: 3

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

43) The southern hemisphere's summer solstice occurs

- A) at the same time as the northern hemisphere's summer solstice.
- B) on or around June 21.
- C) on or around December 21.
- D) during the northern hemisphere's equinox.

Answer: B

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

44) The term "net radiation" refers to

- A) the total amount of energy received by Earth.
- B) the total amount of energy radiated by Earth.
- C) the difference in amount of incoming and outgoing radiation.
- D) radiation emitted by satellite networks.

Answer: C

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

- 45) Changes in daylength and the Sun's altitude above the horizon over the course of the year
- A) produce Earth's rotation.
 - B) are phenomena that occur only at the equator.
 - C) are responsible for the seasons.
 - D) are factors that follow an irregular, random cycle.

Answer: C

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.9 Define solar altitude, solar declination, and daylength.

- 46) 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

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.9 Define solar altitude, solar declination, and daylength.

- 47) Which of the following is not true?
- A) The Earth's axis is tilted 23.5° relative to the plane of the ecliptic.
 - B) The axis through Earth's two poles points just slightly off Polaris.
 - C) During the winter months, the Earth's axis is aligned towards Southern Cross.
 - D) Throughout the year, the Earth's axis maintains the same alignment relative to the plane of the ecliptic.

Answer: C

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

48) 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

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.9 Define solar altitude, solar declination, and daylength.

49) The Sun's declination refers to

A) the latitude of the subsolar point.

B) the angular height of the Sun above the horizon.

C) how far the Sun is from Earth.

D) its altitude, in thousands of feet, above the horizon.

Answer: A

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.9 Define solar altitude, solar declination, and daylength.

50) The sun's declination migrates through _____ of latitude annually.

A) 23.5°

B) 30°

C) 47°

D) 66.5°

E) 133°

Answer: C

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

53) 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

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

54) Which of the following cannot be attributed to the effects of Earth's rotation?

- A) daylength
- B) deflection of the winds
- C) deflection of the ocean currents
- D) rise and fall of tides
- E) latitudinal variations in net radiation

Answer: E

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

55) 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

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 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° from a perpendicular to the plane of the ecliptic.

Answer: D

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

57) Which of the following is not true regarding rotational velocities at different latitudes?

A) At 90° latitude, the rotational velocity is 1452 kmph (902 mph).

B) At 0° latitude, the rotational velocity is 1675 kmph (1040 mph).

C) At 60° latitude, the rotational velocity is 838 kmph (521 mph).

D) At 30° latitude, the rotational velocity is 1452 kmph (902 mph).

Answer: A

Diff: 2

Chapter/section: 2.3 The Seasons

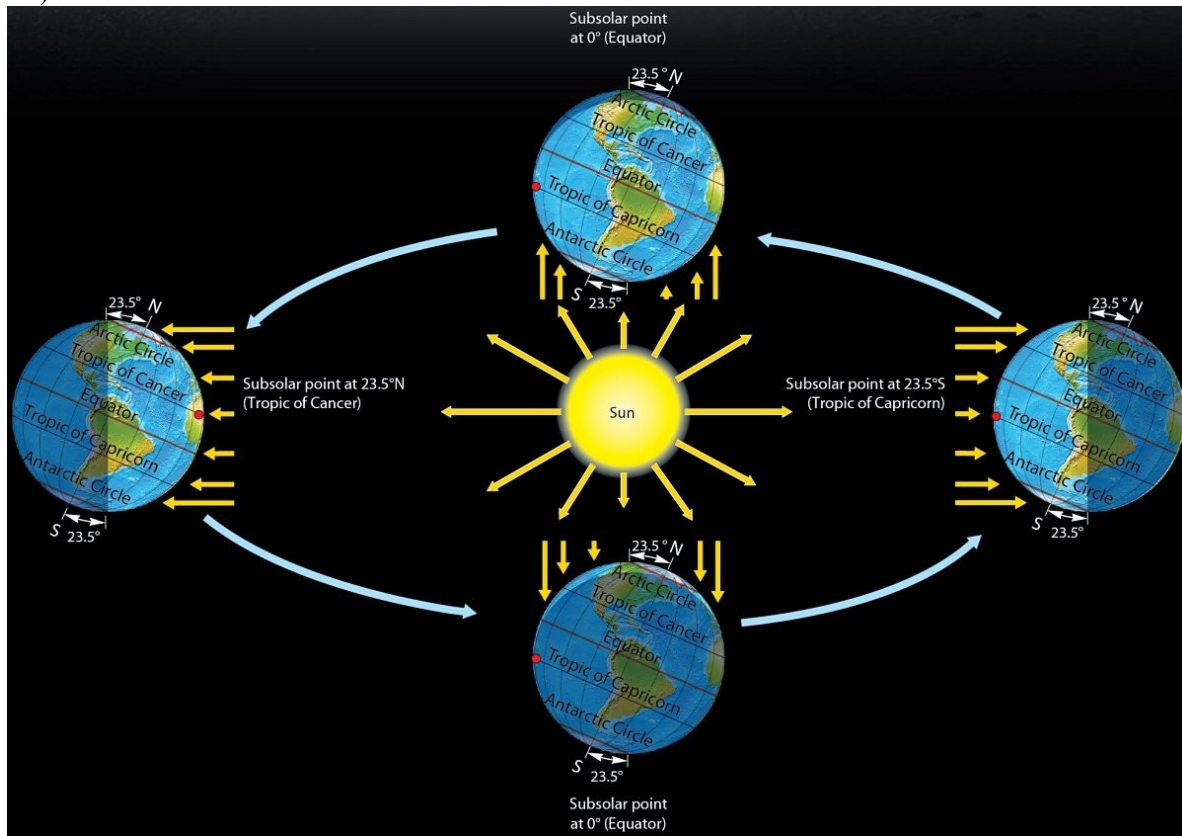
Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

58)



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

Chapter/section: 2.3 The Seasons

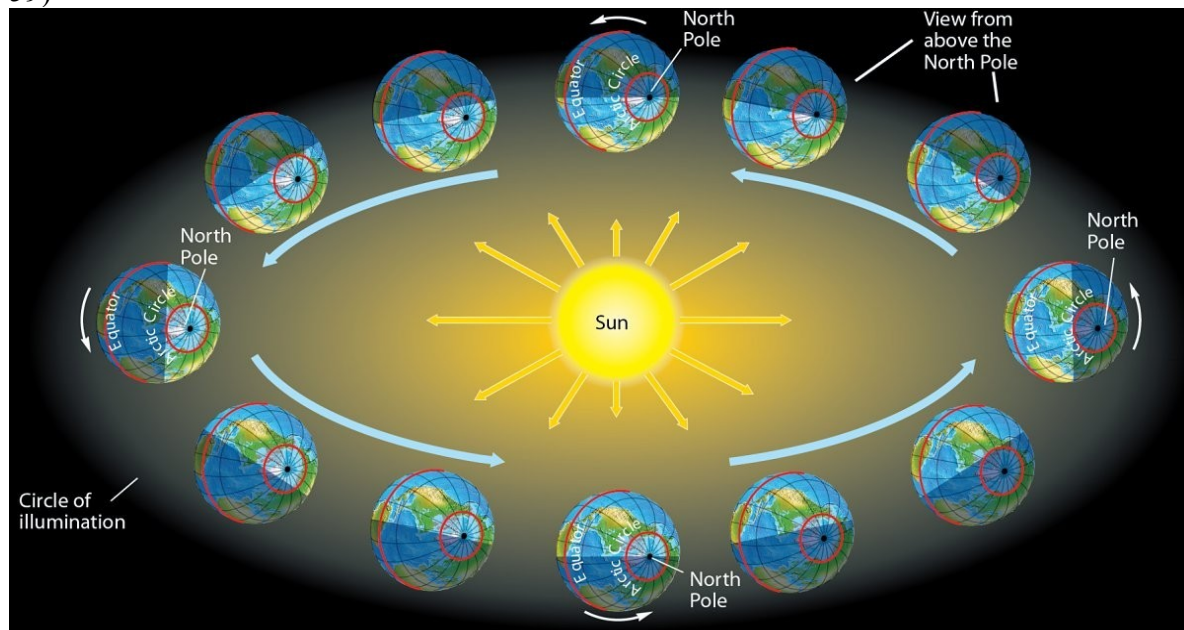
Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

59)



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

Chapter/section: 2.3 The Seasons

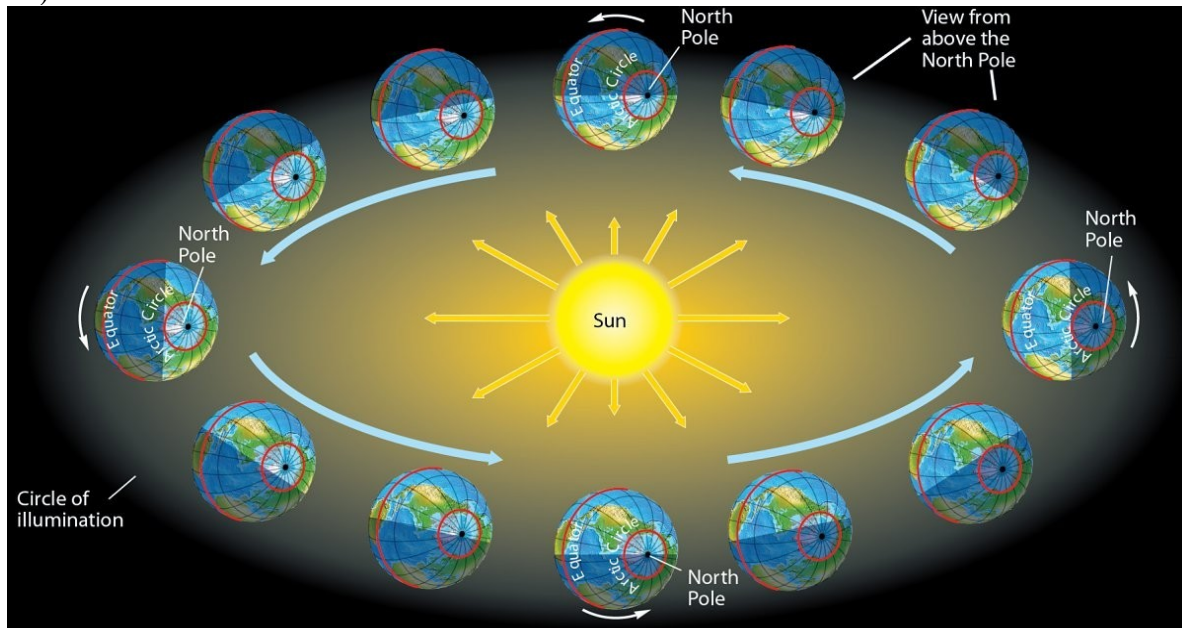
Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

60)



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.
- E) There is 24 hours of daylight at the South Pole.

Answer: D

Diff: 2

Chapter/section: 2.3 The Seasons

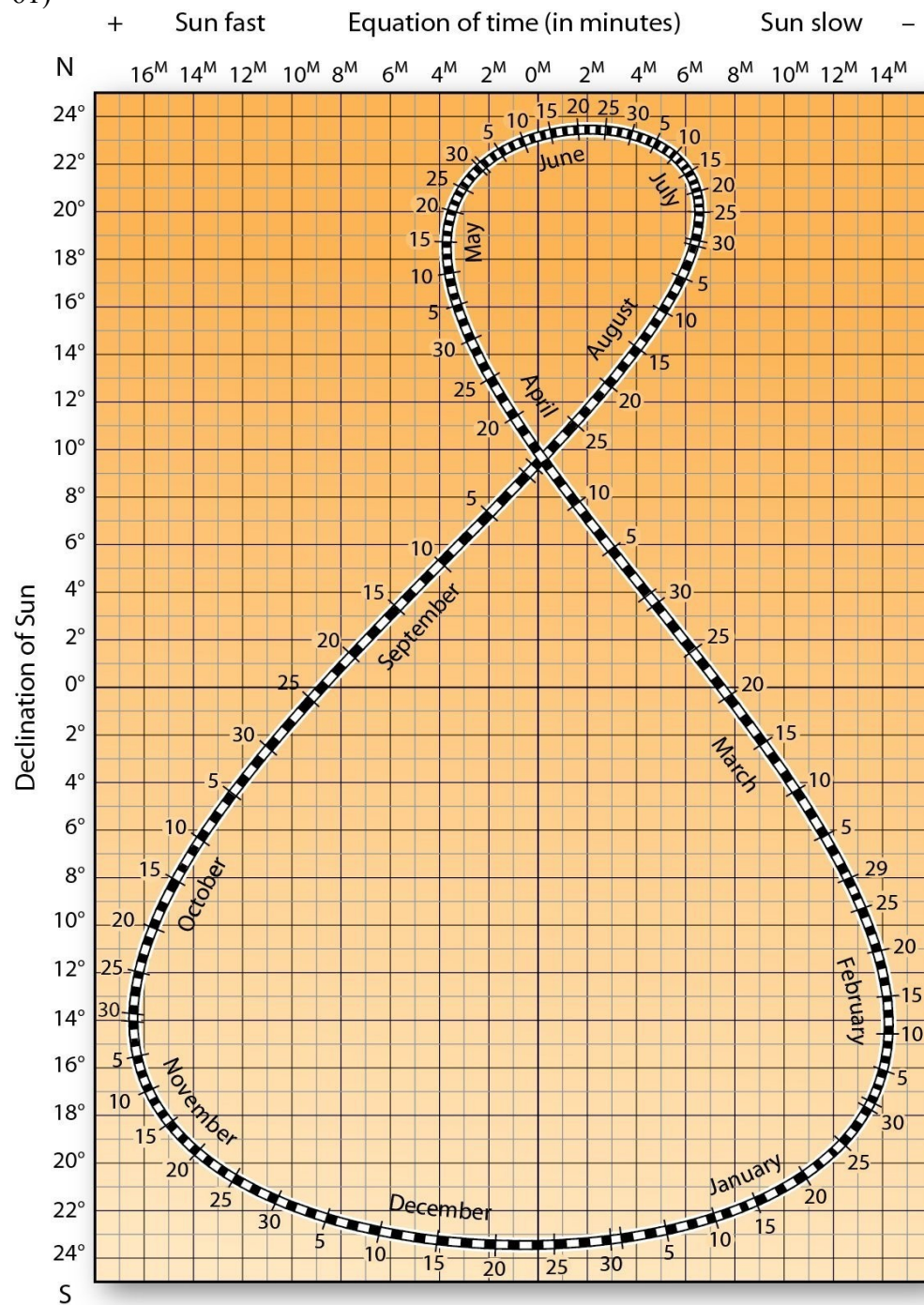
Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

61)



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 30
- D) May 5 and August 10

Answer: B

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.9 Define solar altitude, solar declination, and daylength.

62) Which of the following is true of Quito, Ecuador ($0^{\circ} 15' \text{ N}$, $78^{\circ} 35' \text{ S}$)?

- 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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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.
- E) The subsolar point is at the Tropic of Capricorn (23.5° S).

Answer: C

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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, the daylength increases, while moving north of the equator the daylength decreases.
- B) The sun's direct rays 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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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° north latitude _____ times a year.

- A) 0
- B) 1
- C) 2
- D) 4

Answer: A

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

67) The equinox

- A) occurs four times during the year.
- B) has 12 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

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

68) The Tropic of Capricorn refers to

- A) that parallel that is 23.5° 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° south latitude.

Answer: A

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

70) On June 21st, the Sun's declination is at

- A) the equator.
- B) Rio de Janeiro, Brazil and Alice Springs, Australia.
- C) the Tropic of Capricorn.
- D) the Tropic of Cancer.

Answer: D

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 m^2 per day.
- B) In June, the South Pole receives over 550 watts per m^2 per day.
- C) Throughout the year, the equatorial receipt varies between 100 and 400 watts per m^2 per day.
- D) It receives an average amount of insolation equal to 100 watts per m^2 per day.

Answer: A

Diff: 3

Chapter/section: 2.3 The Seasons

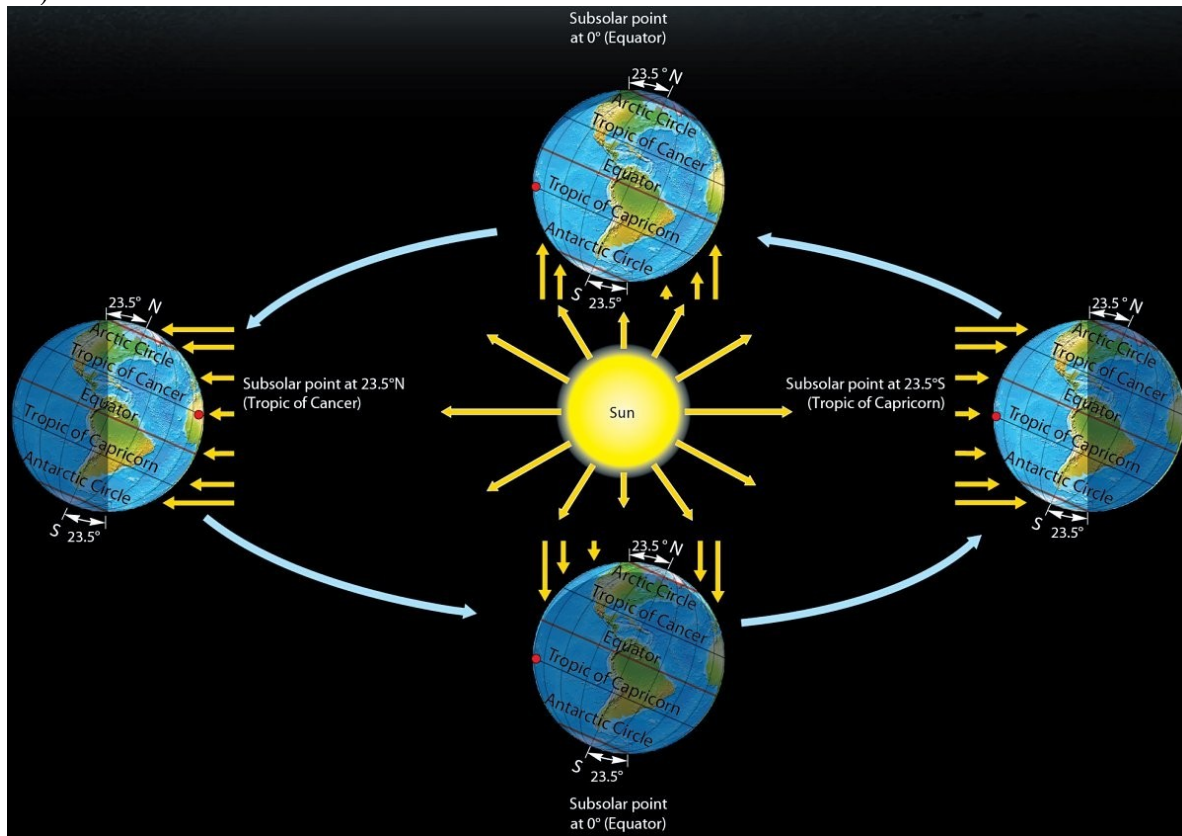
Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

72)



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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

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.
- E) It must not be the winter solstice.

Answer: D

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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, 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) above the Arctic Circle.
- D) below the Antarctic Circle.

Answer: C

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

76) The Tropic of Cancer refers to

- A) the parallel that occurs at 23.5° 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° latitude when the Sun crosses the equator.

Answer: C

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 the Northern Hemisphere's

- A) Summer solstice.
- B) Spring equinox.
- C) Winter solstice.
- D) earlier than during daylight savings time only.

Answer: C

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 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

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

- 79) Which of the following relationships is incorrect?
- A) December solstice - subsolar point at 23.5 S latitude
 - B) March equinox - subsolar point at 0° latitude
 - C) June 21 - subsolar point at 23.5 N latitude
 - D) June solstice - subsolar point at 23.5 N latitude
 - E) September equinox - subsolar point at 23.5° S latitude

Answer: E

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 Sun's altitude 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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 the 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

Chapter/section: 2.4 The Human Denominator

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 14. How human actions modify the physical environment

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 kilometers.

Answer: TRUE

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.1 Distinguish between galaxies, stars, and planets.

6) Earth is closest to the Sun in early January.

Answer: TRUE

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.2 Locate Earth in the Solar System and Galaxy.

10) The Earth's axis is tilted 19.5° relative to the plane of the ecliptic.

Answer: FALSE

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

11) According to the planetesimal hypothesis, solar systems condense from nebular dust and gas.

Answer: TRUE

Diff: 1

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

14) The Sun's principal outputs consist of the solar wind and radiant energy.

Answer: TRUE

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.5 Describe the Sun's operation.

15) A solar maximum is a period during which sunspots are numerous.

Answer: TRUE

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.5 Describe the Sun's operation.

16) The electromagnetic spectrum only shows the wavelengths associated with solar radiation.

Answer: FALSE

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.6 Explain the characteristics of the solar wind.

21) Shorter wavelengths tend to have a lower frequency.

Answer: FALSE

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

23) The Sun's radiant energy is composed primarily of visible light and infrared wavelengths.

Answer: TRUE

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.7 Explain the characteristics of the electromagnetic spectrum of radiant energy.

24) The Earth radiates energy primarily in the ultraviolet wavelengths.

Answer: FALSE

Diff: 1

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 3. Read and interpret graphs and data.

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 Earth's two poles.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

28) All points on Earth's surface experience the subsolar point at some moment during the year.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.9 Define solar altitude, solar declination, and daylength.

29) The solar constant varies by latitude.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.8 Illustrate the interception of solar energy and its uneven distribution at the top of the atmosphere.

30) The Sun's height in the sky above the horizon is termed its altitude.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

32) The speed of the Earth's rotation is fastest at the poles.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

33) Rotation is Earth's motion on its axis; revolution is its motion about the Sun.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.4 Reconstruct Earth's annual orbit about the Sun.

34) The Earth's rotation is gradually slowing.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

35) Earth's axis is tilted 23.5° from a perpendicular to the plane of the ecliptic.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

36) The Earth's axial alignment varies throughout the year.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

38) The subsolar point is at the Tropic of Cancer on December 21.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

39) All places on Earth experience the same daylength on March 21.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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° north latitude twice a year.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 the Southern Hemisphere's winter.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

43) On the northern hemisphere's summer solstice, areas above Arctic Circle are completely within the circle of illumination.

Answer: TRUE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

44) The subsolar point's maximum latitude is 47° N/S.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

45) The beginning of the Northern Hemisphere spring occurs when the subsolar point is at the Tropic of Cancer.

Answer: FALSE

Diff: 1

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 1/2 Knowledge/Comprehension

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 Earth's curvature, with only the subsolar point receiving sunlight from directly overhead.

Answer: TRUE

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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 at Earth as a result of Earth's elliptical orbit.

Answer: FALSE

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

50) Earth's spherical shape is not a factor with regards to seasonality.

Answer: FALSE

Diff: 2

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 3/4 Application/Analysis

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

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

Chapter/section: 2.4 The Human Denominator

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 14. How human actions modify the physical environment

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.

52) Longer falls and earlier springs caused by climate change have lengthened the growing season in the United States.

Answer: TRUE

Diff: 1

Chapter/section: 2.4 The Human Denominator

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 14. How human actions modify the physical environment

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

Chapter/section: 2.1 The Solar System, Sun, and Earth

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

2) Describe the causes and consequences of the uneven distribution of insolation.

Answer: Due to the Earth's curved surface, 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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 the Earth in terms of the electromagnetic spectrum.

Answer: The sun emits shortwave radiation primarily in the visible and infrared wavelengths, while the Earth emits longwave radiation primarily in the thermal infrared wavelengths.

Diff: 3

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 Earth's energy system, 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

2

W/m²); Subsolar point: the only point where insolation arrives perpendicular to the surface.

Diff: 3

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 the Earth between the poles have equal daylengths; and it marks the sunrise/set at the poles. The solstices mark the beginning of the summer and winter, are 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

Chapter/section: 2.2 Solar Energy: From Sun to Earth

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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: The Earth's revolution around the sun; the Earth's rotation on its axis; the Earth's axial tilt; axial parallelism; and the Earth's sphericity.

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 the importance thereof.

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 Sun's altitude vary throughout the year?

Answer: Answers will vary depending on where students live.

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 are little seasonal variations; insolation varies throughout the year (as does daylength), there are greater season variations.

Diff: 3

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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

Chapter/section: 2.3 The Seasons

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 07. The physical processes that shape the patterns of Earth's surface

Global Sci. LO: 8. Communicate effectively in writing.

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 shift in the subtropical high pressure zone in Africa are leading to decreased rainfall; in the United States, the trend has been towards a longer growing season; and in Alaska, longer summers have changed migration patterns of moose.

Diff: 3

Chapter/section: 2.4 The Human Denominator

Bloom's Taxonomy: 5/6 Synthesis/Evaluation

Geo Standard: 14. How human actions modify the physical environment

Global Sci. LO: 8. Communicate effectively in writing.

LO: 2.10 Describe the annual variability of solar altitude, solar declination, and daylength—Earth's seasonality.