CHAPTER 2: Patterns in the Sky—Motions of Earth and the Moon

MULTIPLE CHOICE

1. The direction directly overhead of an observer defines his or her:
   a. meridian.
   b. celestial pole.
   c. circumpolar plane.
   d. zenith.

   ANS: D DIF: Easy REF: 2.1
   OBJ: Define the bold-faced vocabulary terms within the chapter.
   MSC: Remembering

2. No matter where you are on Earth, stars appear to rotate about a point called the:
   a. zenith.
   b. celestial pole.
   c. meridian.
   d. equinox.

   ANS: B DIF: Easy REF: 2.1
   OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Remembering

3. All stars denoted on the celestial sphere are:
   a. equidistant from Earth.
   b. actually planetary bodies of the solar system.
   c. at varying distances from Earth.
   d. not in the milky Way galaxy.

   ANS: C DIF: Easy REF: 2.1
   OBJ: Explain why the celestial sphere is only a model of the sky and not reality.
   MSC: Remembering

4. If the star Polaris has an altitude of 35°, then we know that:
   a. our longitude is +55°.
   b. our latitude is +55°.
   c. our longitude is +35°.
   d. our latitude is +35°.

   ANS: D DIF: Medium REF: 2.1
   OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

5. At a latitude of +50°, how far above the horizon is the north celestial pole?
   a. 0°
   b. 40°
   c. 50°
   d. 90°

   ANS: C DIF: Medium REF: 2.1
   OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

6. The meridian is defined as a great circle on the sky on which lie the:
   a. celestial equator and vernal equinox.
   b. north and south celestial poles.
   c. zenith and the north and south celestial poles.
   d. zenith and east and west directions.

   ANS: C DIF: Medium REF: 2.1
   OBJ: Define the bold-faced vocabulary terms within the chapter.

MSC: Remembering

7. If the north celestial pole is located at your zenith, what is your latitude?
   a. 0°
   b. +30°
   c. +60°
   d. +90°
   e. This occurs at every latitude.

   ANS: D DIF: Medium REF: 2.1
   OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

8. If the north celestial pole is located on your horizon, what is your latitude?
   a. 0°
   b. +30°
   c. +60°
   d. +90°
   e. This can never happen.

   ANS: A DIF: Medium REF: 2.1
   OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

9. If you travel 20 miles from home to school in 30 minutes, what is your average velocity?
   a. 20 mph
   b. 40 mph
   c. 0.7 mph
   d. 5 mph

   ANS: B DIF: Easy REF: Working It Out 2.1
   OBJ: Relate distance, speed, and time to solve for one variable given the other two.
   MSC: Applying

10. The apparent path of the Sun across the celestial sphere during a year is called the:
    a. prime meridian.
    b. ecliptic plane.
    c. circumpolar plane.
    d. celestial equator.

    ANS: B DIF: Easy REF: 2.2
    OBJ: Define the bold-faced vocabulary terms within the chapter.
    MSC: Remembering

11. The ecliptic plane is defined by the motion of _____ in the sky.
    a. the Moon
    b. the Sun
    c. Polaris
    d. the stars

    ANS: B DIF: Easy REF: 2.2
    OBJ: Define the bold-faced vocabulary terms within the chapter.
    MSC: Remembering

12. If you go out at exactly 9 P.M. each evening over the course of 1 month, the position of a given star will move westward by tens of degrees. What causes this motion?
    a. Earth's rotation on its axis
    b. the revolution of Earth around the Sun
    c. the revolution of the Moon around Earth
    d. the revolution of the Sun around Earth

    ANS: B DIF: Easy REF: 2.2
    OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Understanding

13. The shortest day of the year for a person living in the Northern Hemisphere is the:
    a. summer solstice.
    b. vernal equinox.
    c. winter solstice.
    d. autumnal equinox.

    ANS: C DIF: Easy REF: 2.2
    OBJ: Illustrate how the height of the Sun and the length of a day vary with the season and your latitude. MSC: Remembering

14. On which day of the year does the Sun reach its northern-most point in the sky?
    a. vernal equinox
    b. summer solstice
    c. autumnal equinox
    d. winter solstice

    ANS: B DIF: Easy REF: 2.2
    OBJ: Illustrate how the height of the Sun and the length of a day vary with the season and your latitude. MSC: Remembering

15. When the Northern Hemisphere experiences summer, the Southern Hemisphere experiences:
    a. spring.
    b. summer.
    c. fall.
    d. winter.

    ANS: D DIF: Easy REF: 2.2
    OBJ: Explain why Earth's axial tilt causes seasons. MSC: Remembering

16. Earth's rotational axis precesses in space and completes one revolution every:
    a. 200 years.
    b. 1,800 years.
    c. 26,000 years.
    d. 51,000 years.

    ANS: C DIF: Easy REF: 2.2
    OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Remembering

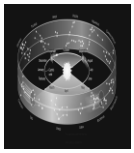
17. Leap years occur because:
    a. Earth's orbital period around the Sun is decreasing.
    b. Earth's orbital period is 365.24 days.
    c. the Gregorian calendar contains only 11 months.
    d. Earth speeds up in its orbit when it comes closest to the Sun.

    ANS: B DIF: Easy REF: 2.2
    OBJ: Define the bold-faced vocabulary terms within the chapter.
    MSC: Understanding

18. The Earth's axial tilt is 23.5 degrees. If the Earth's axial tilt was 15 degrees, which would be TRUE?
    a. The seasons would remain the same.
    b. Summers would be warmer.
    c. Winters would last longer.
    d. Winters would be warmer.

    ANS: D DIF: Medium REF: 2.2
    OBJ: Explain why Earth's axial tilt causes seasons. MSC: Applying

19. Assume you are observing the night sky from a typical city in the United States at a latitude of +40°. Use the figure below to determine which constellation of the zodiac would be nearest the meridian at midnight in March.



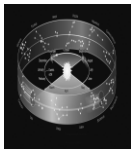
a. Scorpius
b. Gemini
c. Aquarius
d. Leo

ANS: D DIF: Medium REF: 2.2
OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Applying

20. We experience seasons because:
a. Earth's equator is tilted relative to the plane of the Earth's orbit around the Sun.
b. Earth is closer to the Sun in summer and farther from the Sun in the winter.
c. the length of the day is longer in the summer and shorter in the winter.
d. Earth moves with a slower speed in its orbit during summer and a faster speed during winter.

ANS: A DIF: Medium REF: 2.2
OBJ: Explain why Earth's axial tilt causes seasons. MSC: Remembering

21. Assume you are observing the night sky from a typical city in the United States at a latitude of +40°. Use the figure below to determine which month it is if the zodiac constellation Taurus is on your meridian at midnight.



a. July
b. November
c. January
d. May

ANS: B DIF: Medium REF: 2.2
OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Applying

22. The amount of the Earth's surface receiving sunlight during the day is
a. the same in the northern and southern hemispheres during June.
b. less in the southern hemisphere than in the northern hemisphere during December.
c. more in the northern hemisphere than in the southern hemisphere during December.
d. less in the northern hemisphere than in the southern hemisphere during December.

ANS: D DIF: Medium REF: 2.2
OBJ: Explain why Earth's axial tilt causes seasons. MSC: Understanding

23. If you went out tonight and looked at the sky at midnight, at what time would you have to observe 6 months from now in order to find the stars in exactly the same position in the sky? Assume that you could see the stars at any time, day or night.
a. 6 A.M.
b. noon
c. 6 P.M.
d. midnight

ANS: B DIF: Difficult REF: 2.2
OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Applying

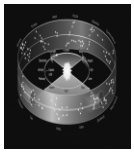
24. The shortest day of the year for a person living in the Southern Hemisphere is the:
a. summer solstice (June 21).
b. vernal equinox (March 20).
c. winter solstice (December 21).
d. autumnal equinox (September 22).

ANS: A DIF: Difficult REF: 2.2
OBJ: Illustrate how the height of the Sun and the length of a day vary with the season and your latitude. MSC: Applying

25. For a person who lives at a latitude of +40°, when is the Sun directly overhead at noon?
    a. only on the summer solstice
    b. only on the vernal and autumnal equinoxes
    c. Never
    d. Always

    ANS: C DIF: Difficult REF: 2.2
    OBJ: Illustrate how the height of the Sun and the length of a day vary with the season and your latitude. MSC: Applying

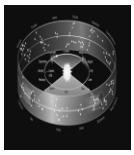
26. Assume you are observing the night sky from a typical city in the United States at a latitude of +40°. Use the figure below to determine which constellation of the zodiac would be nearest the meridian at 6 P.M. in September.



    a. Scorpius
    b. Gemini
    c. Aquarius
    d. Leo

    ANS: A DIF: Difficult REF: 2.2
    OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Analyzing

27. Assume you are observing the night sky from a typical city in the United States at a latitude of +40°. Use the figure below to determine which constellation of the zodiac would be rising at 10 P.M. in May.



    a. Pisces
    b. Virgo
    c. Gemini
    d. Capricornus

    ANS: D DIF: Difficult REF: 2.2
    OBJ: Relate Earth's position around the Sun to the zodiacal constellations we observe in the nighttime sky. MSC: Analyzing

28. In consecutive non-leap years, the exact time at which the Autumnal or Vernal Equinoxes occurs is:
    a. later than the times they occurred in the previous year.
    b. earlier than the times it occurred in the previous year.
    c. exactly the same times they occurred in the previous year.
    d. randomly earlier or later than the times they occurred in the previous year.

    ANS: A DIF: Difficult REF: 2.2
    OBJ: Identify the path of the ecliptic, the solstices, and the equinoxes on the celestial sphere.
    MSC: Analyzing

29. The Moon undergoes synchronous rotation, and as a consequence the:
    a. rotational period of the Moon equals the orbital period of the Moon around Earth.
    b. rotational period of the Moon equals the rotational period of Earth.
    c. rotational period of the Moon equals the orbital period of Earth around the Sun.
    d. Moon does not rotate as it orbits Earth.

    ANS: A DIF: Easy REF: 2.3
    OBJ: Explain what causes us to observe Moon phases. MSC: Remembering

30. In regard to the phase of the Moon, the term *waxing* means:
    a. less than half-illuminated.
    b. more than half-illuminated.
    c. becoming smaller.
    d. increasing in brightness.

    ANS: D DIF: Easy REF: 2.3
    OBJ: Explain what causes us to observe Moon phases. MSC: Remembering

31. If tonight the Moon is in the waxing gibbous phase, in 3 days the Moon will most likely be in the:
    a. new phase.
    b. full phase.
    c. third quarter phase.
    d. first quarter phase.

    ANS: B DIF: Easy REF: 2.3
    OBJ: Define the phases of the Moon. MSC: Remembering

32. If there is a full Moon out tonight, approximately how long from now will it be in the third quarter phase?
    a. 3 to 4 days
    b. 1 week
    c. 2 weeks
    d. 1 month

    ANS: B DIF: Easy REF: 2.3
    OBJ: Illustrate the Sun-Moon-Earth geometry needed to produce each Moon phase.
    MSC: Applying

33. Which of the following is FALSE?
    a. Everyone on Earth observes the same phase of the Moon on a given night.
    b. The phases of the Moon cycle with a period of approximately 1 month.
    c. In some phases, the Moon can be observed during the day.
    d. The observed phase of the Moon changes obviously over the course of one night.

    ANS: D DIF: Easy REF: 2.3
    OBJ: Explain what causes us to observe Moon phases. MSC: Remembering

34. We observe different phases of the Moon because:
    a. the Moon passes through different portions of the Earth's shadow during its orbit.
    b. some parts of the Moon reflect and other parts absorb sunlight.
    c. the orbital position of the Moon determines which portion and how much of the lunar surface is illuminated by sunlight.
    d. the Moon emits light in some places and only reflects light in other places.

    ANS: C DIF: Easy REF: 2.3
    OBJ: Explain what causes us to observe Moon phases. MSC: Remembering

35. The gibbous is in the "waning" state between the:
    a. third quarter and new Moon phases.
    b. new Moon and first quarter phases.
    c. first and second quarter phases.
    d. full Moon and third quarter phases.

    ANS: D DIF: Easy REF: 2.3

OBJ: Define the phases of the Moon. MSC: Remembering

36. At what time does a third quarter Moon rise? (Hint: A third quarter Moon occurs approximately 3 weeks after a new Moon.)
    a. 12 midnight
    b. 12 noon
    c. 6 A.M.
    d. 6 P.M.

    ANS: A DIF: Medium REF: 2.3
    OBJ: Illustrate the Sun-Moon-Earth geometry needed to produce each Moon phase.
    MSC: Applying

37. At what time does the waxing gibbous phase rise?
    a. 3 P.M.
    b. 9 A.M.
    c. 3 A.M.
    d. 9 P.M.

    ANS: A DIF: Difficult REF: 2.3
    OBJ: Illustrate the Sun-Moon-Earth geometry needed to produce each Moon phase.
    MSC: Applying

38. If a person on Earth currently views the Moon in a waxing crescent phase, in what phase would the Earth appear to a person on the Moon?
    a. waxing crescent
    b. waxing gibbous
    c. waning gibbous
    d. waning crescent

    ANS: C DIF: Difficult REF: 2.3
    OBJ: Illustrate the Sun-Moon-Earth geometry needed to produce each Moon phase.
    MSC: Applying

39. During which lunar phase do solar eclipses occur?
    a. new
    b. first quarter
    c. full
    d. third quarter

    ANS: A DIF: Easy REF: 2.4
    OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
    MSC: Remembering

40. A partial lunar eclipse occurs when:
    a. the Sun appears to go behind the Moon.
    b. the Moon passes through part of Earth's shadow.
    c. the Moon shadows part of the Sun.
    d. Earth passes through part of the Moon's shadow.

    ANS: B DIF: Easy REF: 2.4
    OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
    MSC: Remembering

41. Solar and lunar eclipses are rare because the Moon's orbital plane is tipped by:
    a. 5.2° relative to the plane defined by Earth's equator.
    b. 5.2° relative to Earth's orbital plane.
    c. 23.5° relative to the plane defined by Earth's equator.
    d. 23.5° relative to Earth's orbital plane.

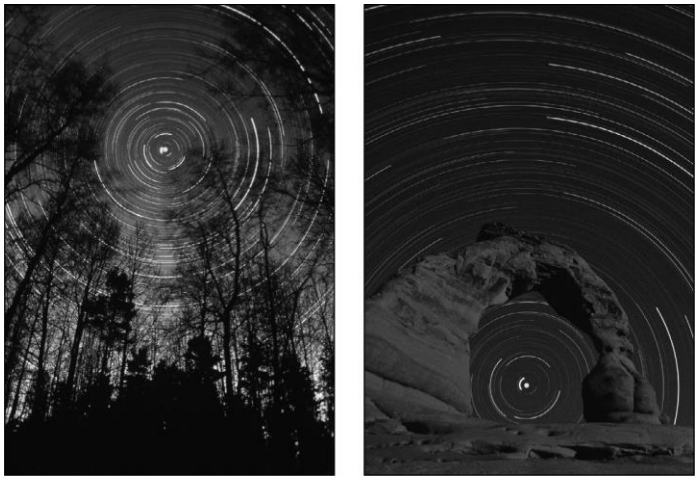
    ANS: B DIF: Medium REF: 2.4
    OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
    MSC: Understanding

42. Approximately how often do lunar eclipses occur?
    a. twice every year
    b. once per month
    c. twice every 11 months
    d. once every 11 years

    ANS: C DIF: Difficult REF: 2.4
    OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
    MSC: Remembering

SHORT ANSWER

1. The figure below is a time exposure of the sky, showing the motion of the stars through the night. What is the name for the stars that never rise or set below the horizon?



    ANS:
    Circumpolar stars.

    DIF: Easy REF: 2.1
    OBJ: Show the path a star follows on the sky from the time it rises until it sets.
    MSC: Remembering

2. The center of the Milky Way lies approximately 30° south of the celestial equator. From what latitudes on Earth is it impossible to view the center of our galaxy?

    ANS:
    At latitudes greater than 90° – 30° = 60°, it would be impossible to see the center of our galaxy because it would lie below the horizon.

    DIF: Easy REF: 2.1
    OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

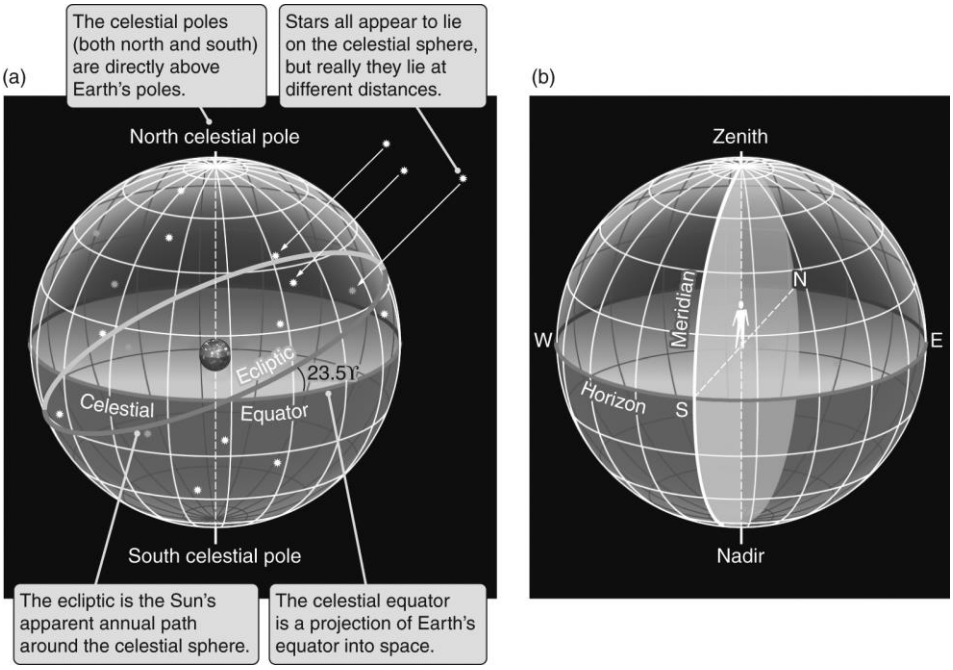
3. On what place(s) on Earth can you stand and have the great circle of the celestial equator be at the same height relative to your horizon for all 360° of its circumference?

    ANS:
    You can stand at either the North Pole or the South Pole.

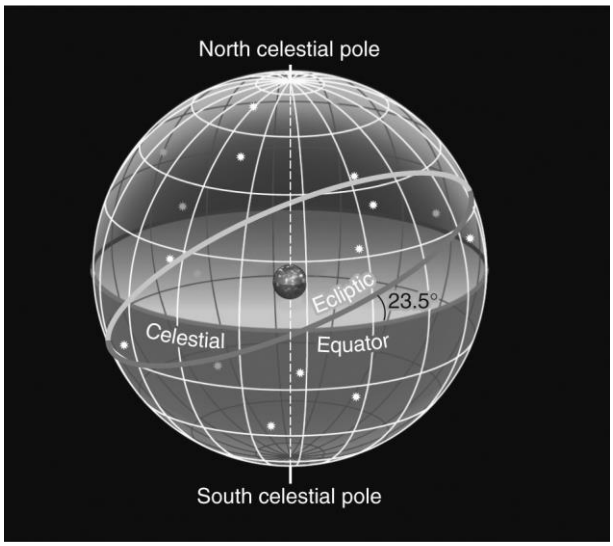
    DIF: Medium REF: 2.1

OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

4. For the following figure, label the north and south celestial poles, the celestial equator, and the ecliptic.



ANS:



DIF: Medium REF: 2.1
OBJ: Identify the locations of the north celestial pole, south celestial pole, celestial equator, zenith, meridian, and horizon on the celestial sphere. MSC: Remembering

5. How is the observed height of Polaris above the horizon related to an observer's latitude? (Hint: Consider three cases of observers located at the equator, the North Pole, and latitude = +45°.)

ANS:

The observed height of Polaris above the horizon is equal to an observer's latitude. For an observer at the equator (latitude = 0°), Polaris is on the horizon. For an observer at the North Pole (latitude = +90°), Polaris is at the zenith or 90° above the horizon. For an observer at latitude = +45°, Polaris is 45° above the horizon.

DIF: Medium REF: 2.1
OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Remembering

6. Explain how you could use the stars to navigate a ship from northeast to southwest in the Northern Hemisphere.

ANS:
Divide route in two parts: north to south and east to west. Use the change in the distance above the north horizon that Polaris appears for north – south motion. Follow a star that passes through your zenith for east – west motion.

DIF: Difficult REF: 2.1
OBJ: Illustrate how the stars that are visible and their motion through the sky change with one's location on Earth. MSC: Applying

7. Earth has an average radius of approximately 6.4×10^3 km. What is the average speed of the ground due to the rotation of Earth at its equator in kilometers per second (km/s) if there are 8.64×10^4 seconds per day?

ANS:
Here the students need to convert the radius of Earth to its circumference: $C = 2\pi r =$ 4.02×10^4 km. Divide this distance by the number of seconds, and we get a speed of 0.465 km/s = 1,676 km/h.

DIF: Difficult REF: Working It Out 2.1
OBJ: Relate distance, speed, and time to solve for one variable given the other two.
MSC: Applying

8. What would be the effect on the seasons if the tilt of Earth's axis were 10° rather than 23.5°?

ANS:
If the tilt of Earth's axis were smaller, there would be a less dramatic temperature shift between the seasons because the angle of the Sun's rays would vary less and the length of day/night would be more equal throughout the year.

DIF: Easy REF: 2.2 OBJ: Explain why Earth's axial tilt causes seasons.
MSC: Understanding

9. Earth experiences seasons because of the tilt of its axis. What are the two consequences of this tilt that contribute to the seasons?

ANS:
(1) Variation in the length of day.
(2) Variation in the directness of the Sun's rays.

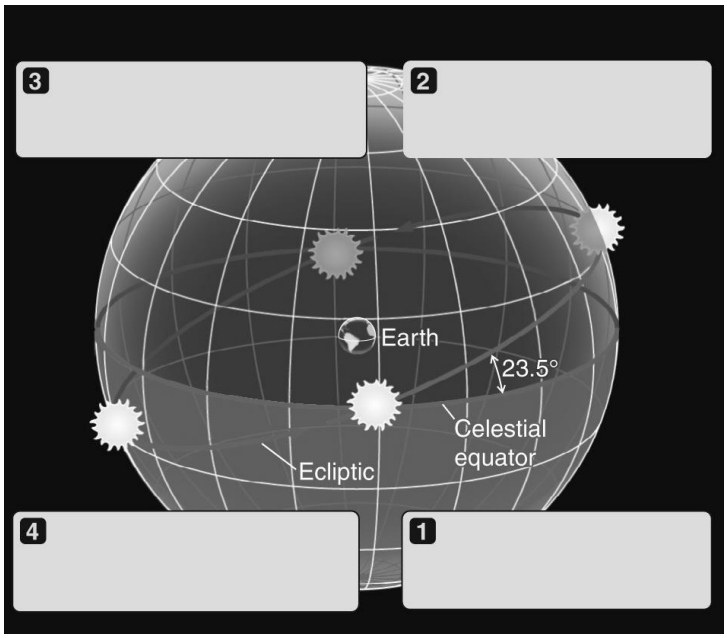
DIF: Medium REF: 2.2 OBJ: Explain why Earth's axial tilt causes seasons.
MSC: Applying

10. What is the length of day during the equinoxes and solstices? Does it matter if you are in the Northern or Southern Hemisphere?

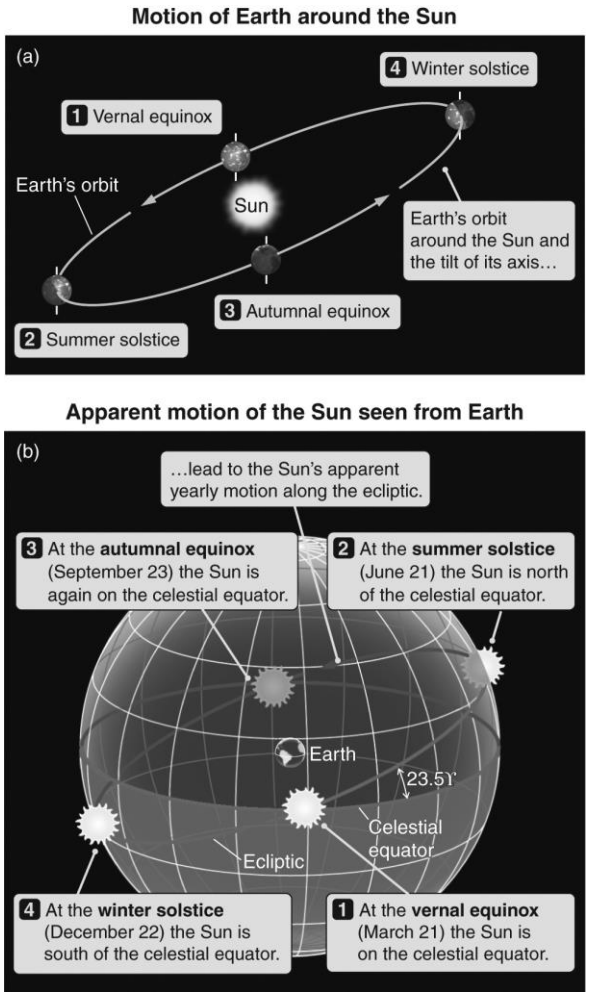
    ANS:
    The equinoxes occur when the Sun is directly above the equator; the entire world experiences a 12-hour day and a 12-hour night. The solstices occur when the Sun is farthest from the equator (north or south). On these days, one hemisphere experiences its longest day and shortest night, while the other hemisphere experiences its shortest day and longest night.

    DIF: Medium REF: 2.2
    OBJ: Illustrate how the height of the Sun and the length of a day vary with the season and your latitude. MSC: Remembering

11. The figure below shows four locations of the Sun on the ecliptic. Label each appropriately with the labels: autumnal equinox, vernal equinox, summer solstice, and winter solstice.



    ANS:



DIF: Medium REF: 2.2
OBJ: Identify the path of the ecliptic, the solstices, and the equinoxes on the celestial sphere.
MSC: Remembering

12. For an observer in Seattle, Washington, which is located at latitude = +47°, what is the minimum height above the southern horizon that the Sun will have throughout the year, and approximately when will this occur?

ANS:
The Sun will be at its minimum height above the southern horizon at noon on the winter solstice (December 21). In Seattle at a latitude of +47°, the celestial equator will have a height of $90° - 47° = 43°$ above the southern horizon. Because Earth's axis is tilted by 23.5° relative to the direction perpendicular to its orbital plane around the Sun, the Sun will reach a height of $43° - 23.5° = 19.5°$ above the southern horizon at noon on the winter solstice.

DIF: Difficult REF: 2.2
OBJ: Illustrate how the height of the Sun and the length of a day vary with the season and your latitude. MSC: Applying

13. On which great celestial circle(s) on the celestial sphere would you find the position of the autumnal equinox?

ANS:

On both the celestial equator and the ecliptic planes.

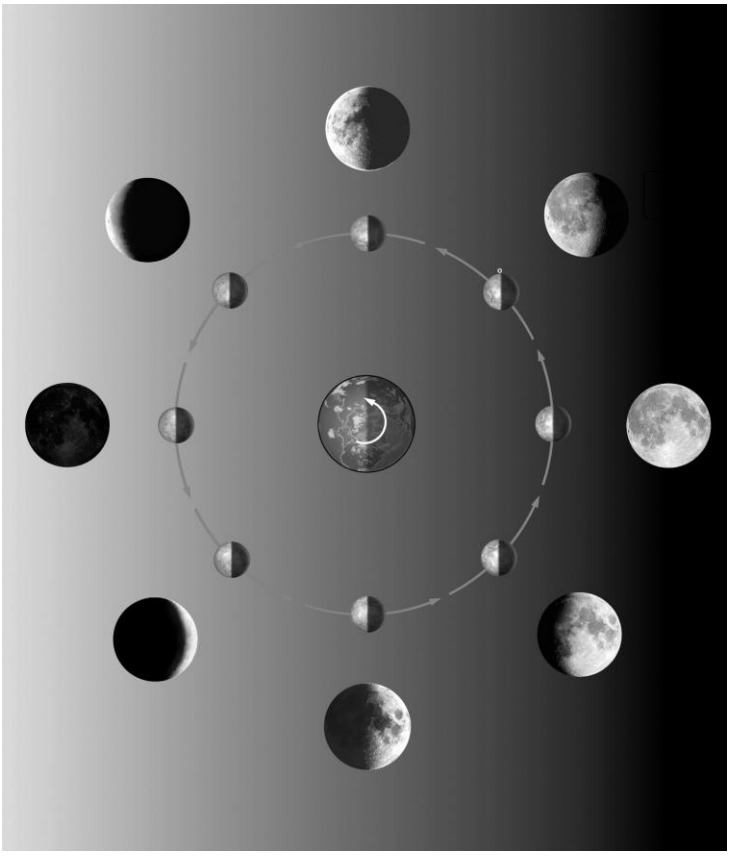
DIF: Difficult REF: 2.2
OBJ: Identify the path of the ecliptic, the solstices, and the equinoxes on the celestial sphere.
MSC: Applying

14. How does “gibbous” differ from “crescent”?

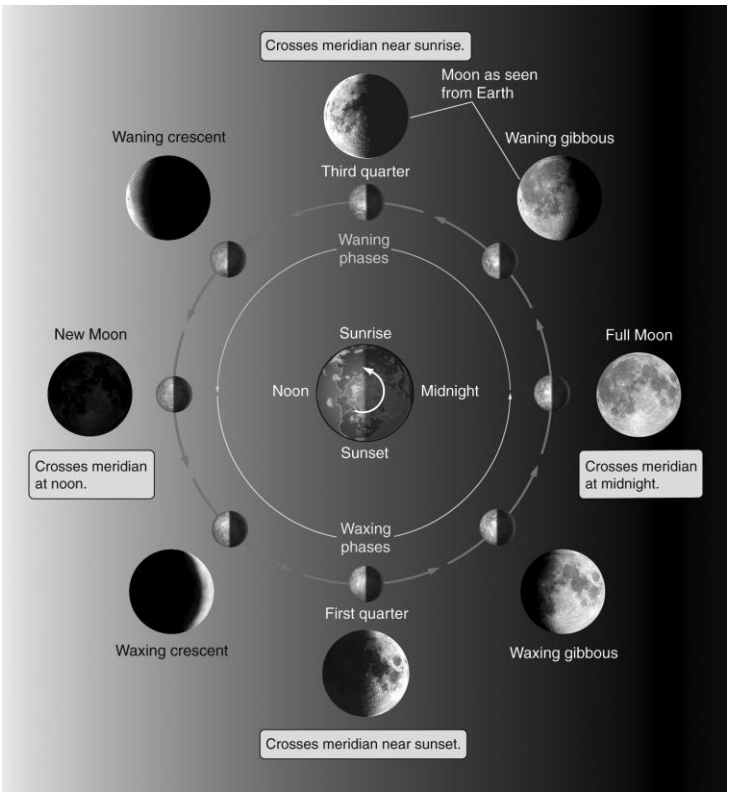
ANS:
The crescent is the concave curve bounded illuminated portion of the lunar surface whereas the gibbous is bounded by a convex curve.

DIF: Easy REF: 2.3 OBJ: Define the phases of the Moon.
MSC: Remembering

15. The figure below shows the different phases of the Moon. Label each phase of the Moon shown.

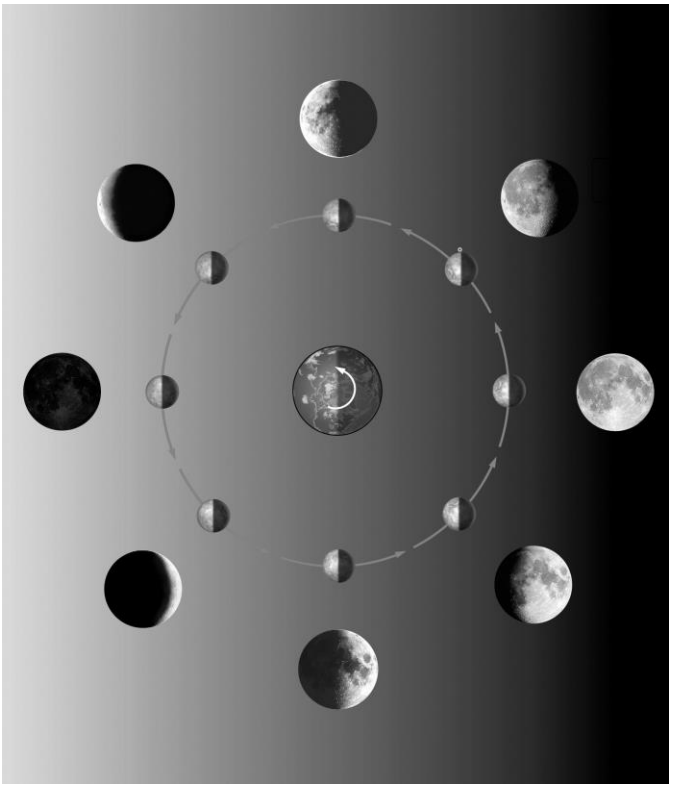


ANS:

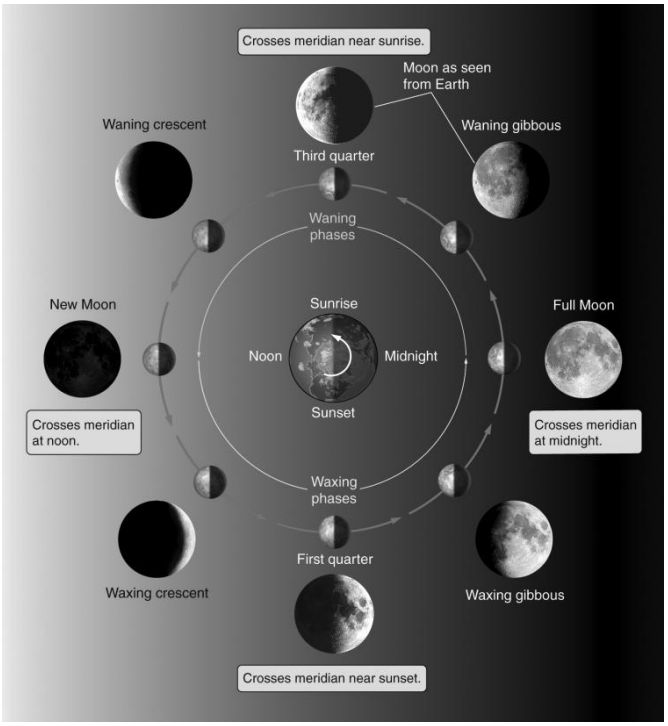


DIF: Medium REF: 2.3 OBJ: Define the phases of the Moon.
MSC: Remembering

16. The figure below shows the different phases of the Moon. Label each phase of the Moon. Approximately what time would the full Moon rise above your horizon? The third quarter Moon? The new Moon? The first quarter Moon?



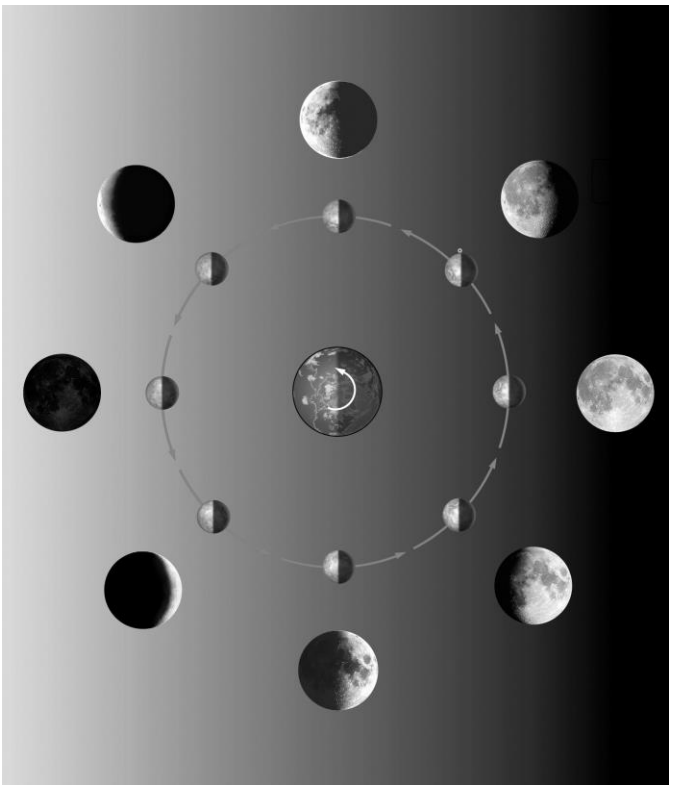
ANS:



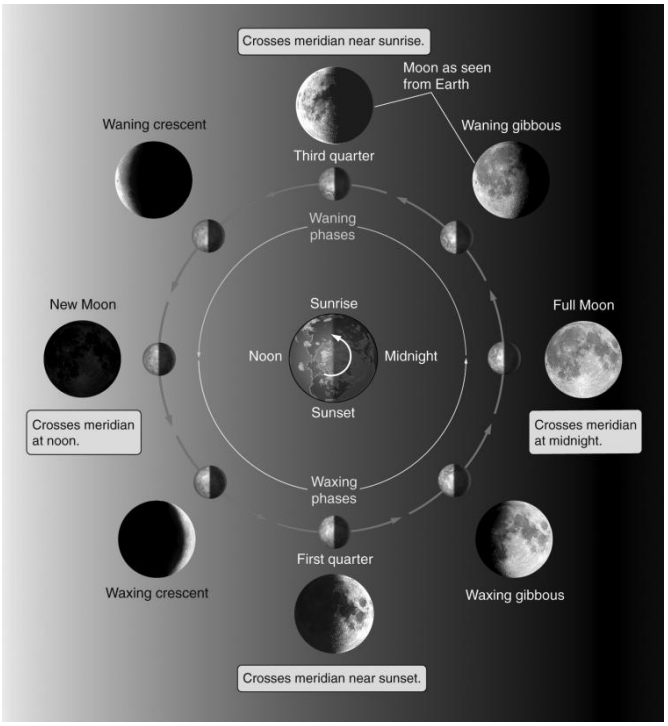
The full Moon would rise at sunset. The third quarter Moon would rise at midnight. The new Moon would rise at sunrise. The first quarter Moon would rise at noon.

DIF: Medium REF: 2.3 OBJ: Define the phases of the Moon.
MSC: Understanding

17. The figure below shows the different phases of the Moon. Label each phase of the Moon. What time would the full Moon be on your meridian? The new Moon?



ANS:



The full Moon would be on the meridian at midnight. The new Moon would be on the meridian at noon.

DIF: Medium REF: 2.3 OBJ: Define the phases of the Moon.
MSC: Analyzing

18. Explain why we always see the same side of the Moon from Earth.

ANS:
The amount of time it takes for the Moon to rotate once about its axis is exactly equal to the amount of time it takes to orbit once around Earth.

DIF: Medium REF: 2.3
OBJ: Explain what causes us to observe Moon phases. MSC: Understanding

19. If the Moon was full 3 days ago, what phase will it be tonight and when will it rise and set?

ANS:
The Moon's phase cycles on a 29.5-day period. Therefore, the Moon tonight will be approximately halfway between the full and third quarter phases, and thus it will be in the waning gibbous phase. It will be on an observer's eastern horizon and rising halfway between 6 P.M. and midnight, which is 9 P.M. It will set 12 hours later at 9 A.M.

DIF: Difficult REF: 2.3
OBJ: Illustrate the Sun-Moon-Earth geometry needed to produce each Moon phase.
MSC: Applying

20. How does the appearance of the first and third quarter Moon phases differ? Why?

ANS:
The pattern of illumination during the first quarter is a mirror image of the illumination pattern during the third quarter. The Moon is on opposite sides of its orbit around the Earth during these two phases.

DIF: Difficult REF: 2.3
OBJ: Illustrate the Sun-Moon-Earth geometry needed to produce each Moon phase.
MSC: Analyzing

21. The figure below shows a solar eclipse. What type of solar eclipse is it?

ANS:
An annular solar eclipse.

DIF: Easy REF: 2.4
OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
MSC: Remembering

22. Why can a solar eclipse only occur during a new Moon?

ANS:
Eclipses are caused by shadows. In order for the Moon to cast a shadow on the Earth, it must be located between the Earth and the Sun. This location configuration defines the new Moon phase.

DIF: Easy REF: 2.4
OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
MSC: Understanding

23. How might you use a lunar eclipse to estimate the relative sizes of the Earth and Moon?

ANS:
Count the number of Moon diameters that span the path in the sky in which the Moon is in the Earth's shadow.

DIF: Medium REF: 2.4
OBJ: Illustrate the Sun-Moon-Earth geometries needed to produce solar and lunar eclipses.
MSC: Applying