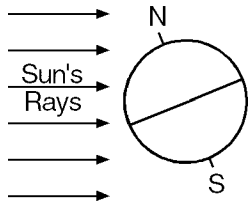
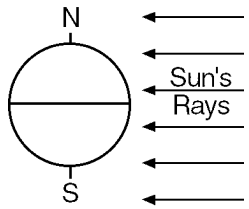
Name: _____

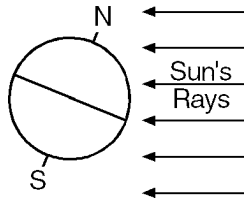
1) As seen from New York State, the noon Sun is
   A) never directly overhead
   B) directly overhead every day
   C) directly overhead on the first day of spring and fall
   D) directly overhead only on the first day of summer

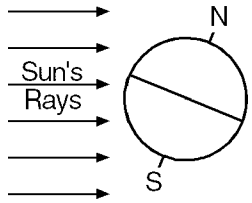
2) Which statement *best* describes the geocentric model of our solar system?
   A) All planets revolve around the Sun.
   B) The Earth is located at the center of the model.
   C) All planets except the Earth revolve around the Sun.
   D) The Sun is located at the center of the model.

3) Which diagram shows the position of the Earth relative to the Sun's rays during a winter day in the Northern Hemisphere?

A)


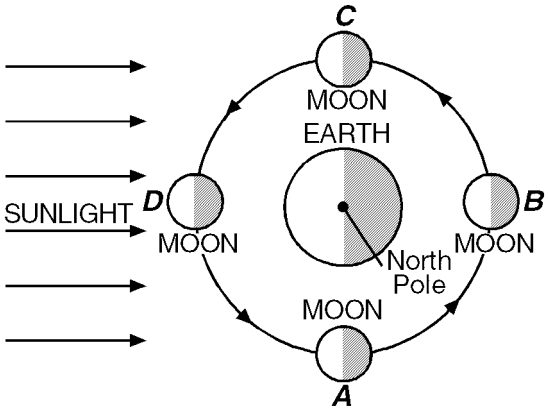
B)


C)


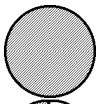
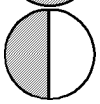
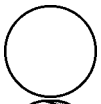
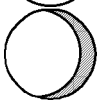
D)


4) Based on the red-shift data on galaxies, most astronomers infer that the universe is currently
   A) fixed and stationary
   B) moving randomly
   C) contracting
   D) expanding

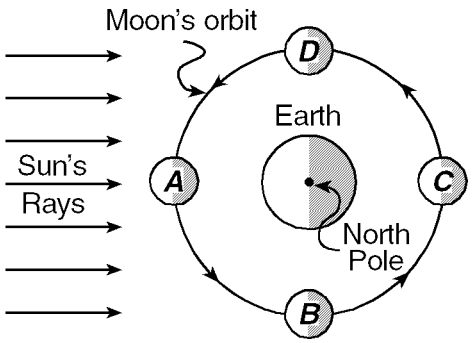
5) The diagram below shows the Moon in four different positions, *A*, *B*, *C*, and *D*, as it orbits Earth.



How does the Moon appear to an observer in New York State when the Moon is located at position *A*?

A) 
B) 
C) 
D) 

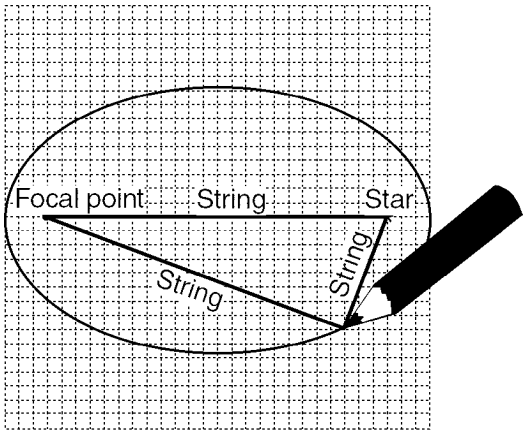
6) The diagram below shows a model of the Moon's orbit around Earth. Letters *A*, *B*, *C*, and *D* represent four positions in the Moon's orbit.



What is the approximate length of time the Moon takes to travel from position *A* to position *C*?

A) 1 day
B) 365 days
C) 15 days
D) 30 days

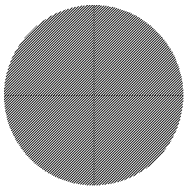
7) The diagram below represents the construction of a model of an elliptical orbit of a planet traveling around a star. The focal point and the center of the star represent the foci of the orbit.



The eccentricity of this orbit is approximately

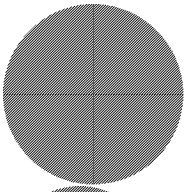
A) 0.3
B) 0.8
C) 1.3
D) 0.5

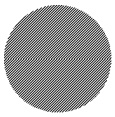
8) The diagram below represents Earth.

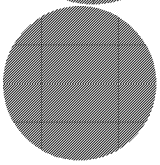


Which diagram *best* represents Mars, drawn to the same scale?

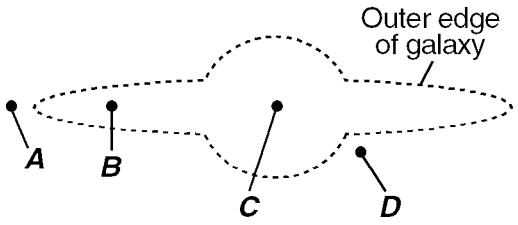
A) 

C) 

B) 

D) 

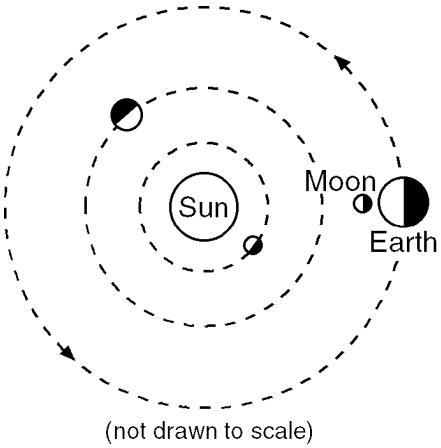
9) The diagram below represents a side view of the Milky Way Galaxy.



At approximately which position is Earth's solar system located?

A) *A*
B) *B*
C) *C*
D) *D*

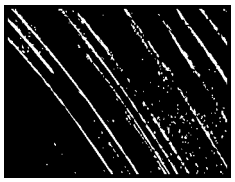
10) The diagram below represents a portion of the solar system.

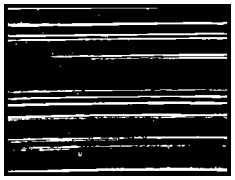


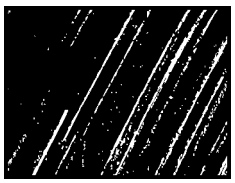
In addition to Earth, which planets are represented by the diagram?

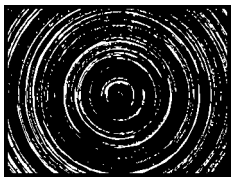
A) Jupiter and Mars
B) Saturn and Pluto
C) Uranus and Neptune
D) Mercury and Venus

11) Which photograph of star trails was taken by an observer facing directly north in New York State?

A) 

B) 

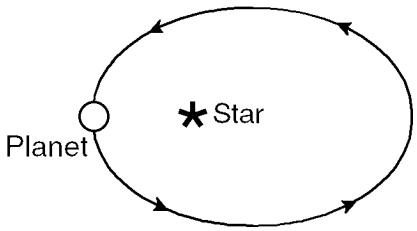
C) 

D) 

12) To an observer located at the Equator, on which date would the Sun appear to be directly overhead at noon?

A) June 6
B) March 21
C) February 1
D) December 21

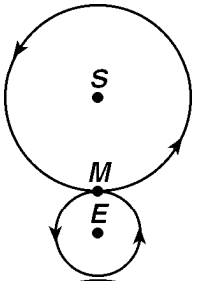
13) The diagram below represents a planet revolving in an elliptical orbit around a star.

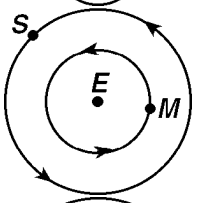


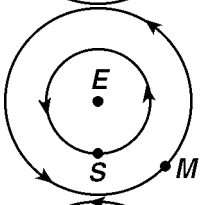
As the planet makes one complete revolution around the star, starting at the position shown, the gravitational attraction between the star and the planet will

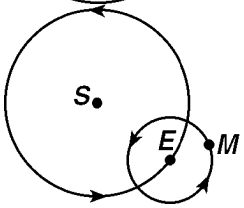
A) decrease, then increase
B) increase, then decrease
C) remain the same
D) continually decrease

14) Which diagram *best* represents the heliocentric model of a portion of the solar system? [*S = Sun, E = Earth, and M = Moon. The diagrams are not drawn to scale.*]

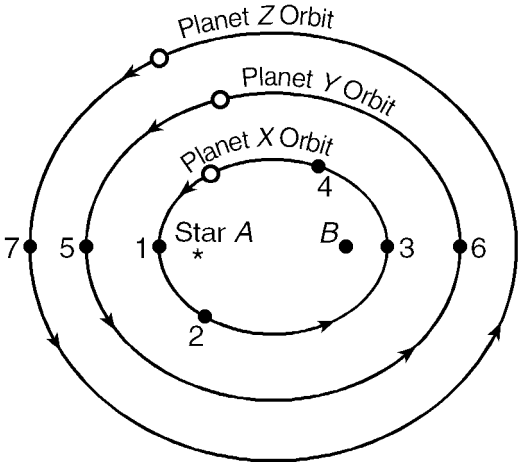
A) 

B) 

C) 

D) 

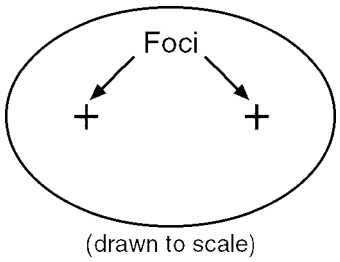
15) The diagram below represents the orbits of three planets, *X*, *Y*, and *Z*, around star *A*. Star *A* is located at one focus and point *B* is the other focus. Numbers 1 through 7 represent different positions of the three planets. The arrows show the direction of revolution.



The orbital paths of these planets around star *A* can *best* be described as having

A) major axes of the same length
B) the same period of rotation
C) an elliptical shape, with star *A* at one focus
D) a circular shape, with star *A* at one focus

16) The diagram below represents the elliptical orbit of a spacecraft around the Sun.



Calculate the eccentricity of the spacecraft's orbit following the directions below:

(1) Write the equation for eccentricity.

(2) Substitute measurements of the diagram into the equation.

(3) Calculate the eccentricity and record your answer in decimal form.

17) The planets known as "gas giants" include Jupiter, Uranus, and

A) Mars
B) Pluto
C) Earth
D) Saturn

18) The average temperature of the planets

A) decreases with greater distance from the Sun
B) has no relationship to the distance from the Sun
C) depends only on the chemical composition of the atmosphere of each planet
D) increases with greater distance from the Sun

19) In New York State, which day has the *shortest* period of daylight?

A) December 21
B) March 21
C) September 21
D) June 21

20) A comparison of the age of Earth obtained from radioactive dating and the age of the universe based on galactic Doppler shifts suggests that

A) Earth is about the same age as the universe
B) the solar system and Earth formed billions of years after the universe began
C) the two dating methods contradict one another
D) the universe is much younger than Earth

21) The apparent change in direction of a Foucault pendulum is caused by

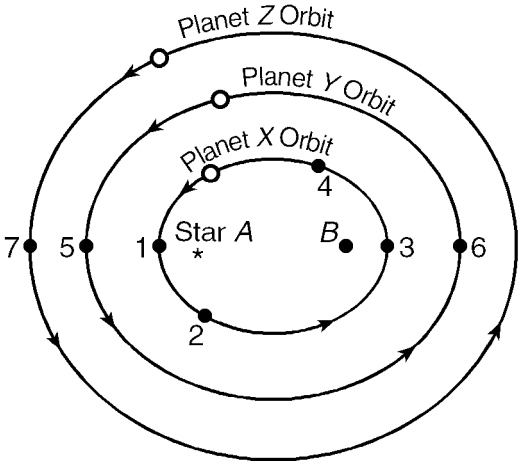
A) the Moon's gravitational attraction
B) Earth's rotation
C) star motions
D) density differences within the mantle

22) Compared to Jupiter and Saturn, Venus and Mars have *greater*

A) equatorial diameters
B) orbital velocities
C) mean distances from the Sun
D) periods of revolution

Questions 23 and 24 refer to the following:

The diagram below represents the orbits of three planets, *X*, *Y*, and *Z*, around star *A*. Star *A* is located at one focus and point *B* is the other focus. Numbers 1 through 7 represent different positions of the three planets. The arrows show the direction of revolution.



23) At which position does planet *X* have the *greatest* orbital velocity?

A) 1 B) 2 C) 3 D) 4

24) Which number indicates the position at which a planet would have the *greatest* gravitational attraction to star *A*? [Assume that all three planets have the same mass.)

A) 5 B) 6 C) 7 D) 3

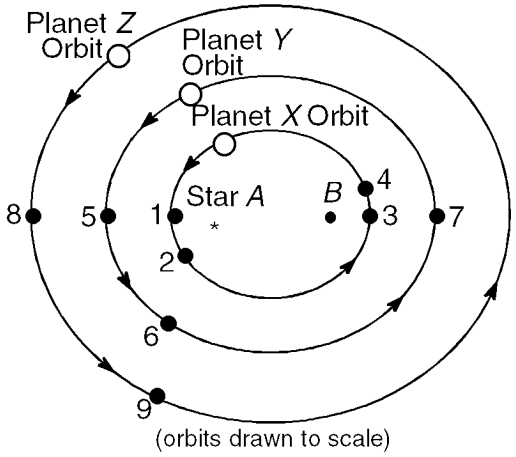
25) Which statement *best* explains the apparent daily motion of the stars around Polaris?

A) The Earth revolves around the Sun.
B) The Earth has the shape of an oblate spheroid.
C) The Earth rotates on its axis.
D) The Earth's orbit is an ellipse.

26) The Moon has more surface craters than Earth does because the Moon has

A) a smaller diameter than Earth
B) no significant atmosphere
C) a surface more sensitive to impacts
D) a stronger gravitational force

27) The diagram below represents the orbits of three planets (*X*, *Y*, and *Z*) around star *A*. Star *A* is located at one focus and point *B* is the other focus. Numbers 1 through 9 represent different positions of the three planets. The arrows show the direction of revolution.

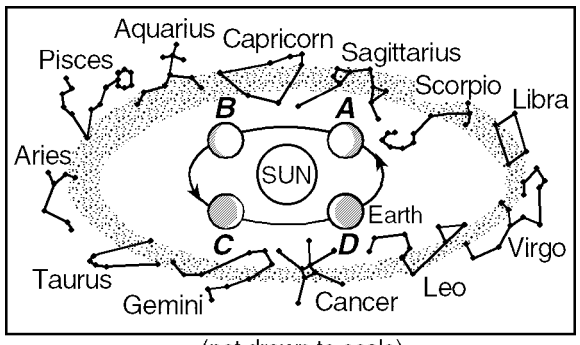


Which statement about the period of revolution of the planets is correct?

A) Planet *X* has a longer period of revolution than planet *Y*.
B) Planet *Z* has a longer period of revolution than planet *X*.
C) The planets have equal periods of revolution.
D) Planet *Y* has a longer period of revolution than planet *Z*.

Questions 28 and 29 refer to the following:

The diagram below shows twelve constellations that are visible in the night sky to an observer in New York State, over the course of a year. Different positions of Earth are represented by Letters *A* through *D*. The arrows represent the direction of Earth's motion around the Sun.



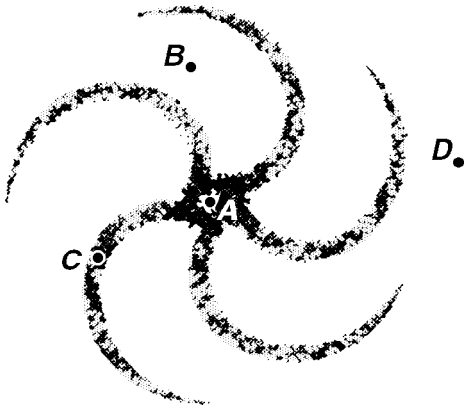
28) Which constellations are *both* visible at midnight to an observer in New York State when Earth is located at position *D*?

A) Leo and Virgo
B) Aries and Taurus
C) Aquarius and Scorpio
D) Pisces and Libra

29) The constellations observed from New York State when Earth is at position *A* are different from the constellations observed when Earth is at position *C* because

A) Earth is tilted on its axis
B) the stars move around Earth as shown by star trails
C) Earth moves in its orbit
D) the lengths of day and night are different

30) The diagram below represents the Milky Way Galaxy.



Which letter *best* represents the location of the Earth's solar system?

A) *A* B) *B* C) *C* D) *D*

31) According to Kepler's Harmonic Law of Planetary Motion, the farther a planet is located from the Sun, the

A) longer its period of revolution
B) shorter its period of revolution
C) shorter its period of rotation
D) longer its period of rotation

32) Which member of the solar system has a diameter of 3.48×10^3 kilometers?

A) Earth C) the Sun
B) Pluto D) Earth's Moon

33) In what way are the planets Mars, Mercury, and Earth similar?

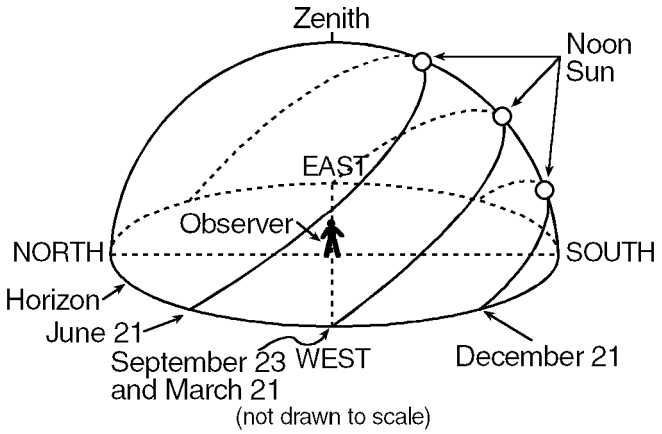
A) They have elliptical orbits with the Sun at one focus.
B) They are perfect spheres.
C) They have the same period of revolution.
D) They exert the same gravitational force on each other.

34) The surface of Venus is much hotter than would be expected, considering its distance from the Sun. Which statement *best* explains this condition?

A) Venus has many active volcanoes.
B) The clouds of Venus are highly reflective.
C) Venus has a slow rate of rotation.
D) The atmosphere of Venus contains a high percentage of carbon dioxide.

Questions 35 and 36 refer to the following:

The diagram below represents the apparent daily path of the Sun across the sky in the Northern Hemisphere on the dates indicated.



35) Which observation about the Sun's apparent path at this location on June 21 is *best* supported by the diagram?

A) Sunset occurs south of west.
B) The Sun appears to move across the sky, at a rate of 10° per hour.
C) Sunrise occurs north of east.
D) The Sun's total daytime path is shortest on this date.

36) At noon on which date would the observer cast the *longest* shadow?

A) December 21
B) September 23
C) June 21
D) March 21

37) The tilt of the Earth on its axis is a cause of the Earth's

A) 24-hour day
B) uniform daylight hours
C) changing length of day and night
D) $365\frac{1}{4}$-day year

38) If the average distance from a satellite to the Earth is decreased, the period of revolution of the satellite will

A) remain the same
B) increase
C) decrease

39) The Earth has fewer impact craters than Mercury because of the

A) slower weathering and erosion rates on the Earth
B) more rapid subduction of crustal plates on Mercury
C) faster rotational speed of Mercury
D) destruction of meteorites in the Earth's upper atmosphere

40) Compared to the distances between the planets of our solar system, the distances between stars are usually

A) much greater
B) much less
C) about the same

41) Which statement *best* describes how galaxies generally move?

A) Galaxies do not move.
B) Galaxies move randomly.
C) Galaxies move away from one another.
D) Galaxies move toward one another.

42) The *greatest* difference in seasons would occur on a planet that has

A) a slightly elliptical orbit
B) a circular orbit
C) its axis of rotation inclined 45° to the plane of its orbit around the Sun
D) its axis of rotation perpendicular to the plane of its orbit around the Sun

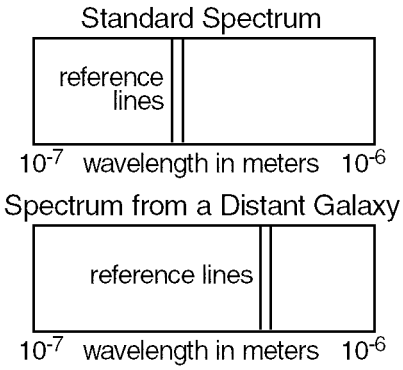
43) Which planet's orbital shape would be most similar to Jupiter's orbital shape?

A) Uranus
B) Pluto
C) Mercury
D) Venus

44) Major ocean and air currents appear to curve to the right in the Northern Hemisphere because

A) Earth rotates on its axis
B) Earth has seasons
C) Earth revolves around the Sun
D) Earth's axis is tilted

45) The diagram below shows reference lines on a standard spectrum and a spectrum from a distant galaxy moving away from Earth.

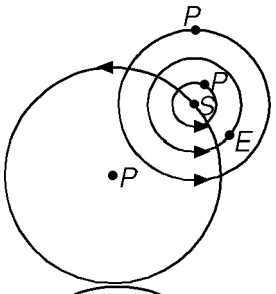


If the spectral lines produced by the light from a distant galaxy are

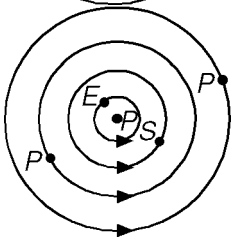
A) shifted toward the blue, the galaxy is stationary
B) shifted toward the red, the galaxy is moving towards us.
C) are shifted toward the red, the galaxy is moving away from us
D) shifted toward the blue, the galaxy is moving away from us

46) Which diagram represents a geocentric model? [Key: *E* = Earth, *P* = Planet, *S* = Sun]

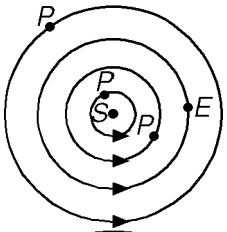
A)



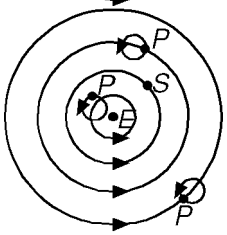
B)



C)



D)



47) A student in New York State observed that the altitude of the Sun at noon is decreasing each day. During which month could the student have made these observations?

A) May
B) January
C) October
D) March

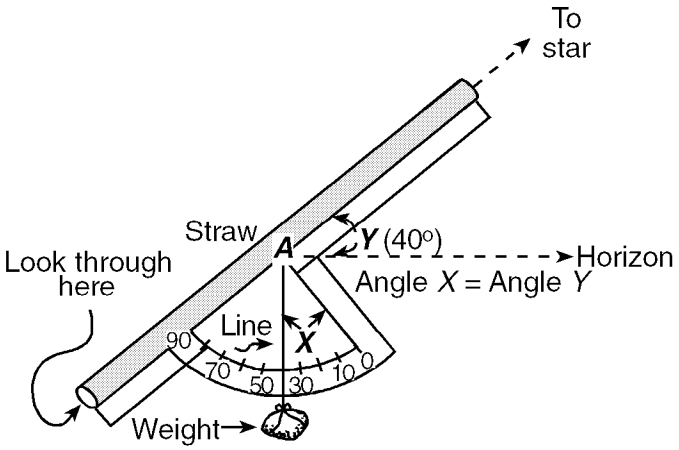
48) Background radiation detected in space is believed to be evidence that

A) the Universe is contracting
B) galaxies are evenly spaced throughout the Universe
C) the Universe began with a primeval explosion
D) all matter in the Universe is stationary

49) With respect to one another, galaxies have been found to be

A) stationary
B) moving in random directions
C) moving closer together
D) moving farther apart

50) The diagram below shows an instrument made from a drinking straw, protractor, string, and rock.



This instrument was most likely used to measure the

A) mass of the Earth
B) altitude of a star
C) distance to a star
D) mass of the suspended weight