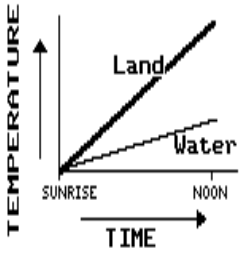
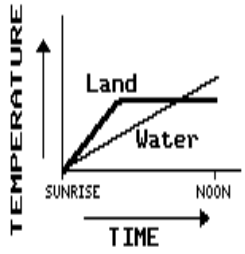
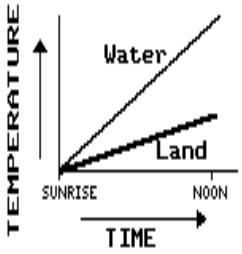
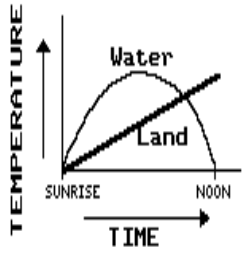
Name: _____

1) Which graph best illustrates the temperature changes on adjacent land and water surfaces as they are heated by the Sun from sunrise to noon on the same day?

A) 

B) 

C) 

D) 

2) During which month does the minimum duration of insolation occur in New York State?

A) July
B) December
C) February
D) September

3) Which condition exists when the rates of water flowing into and out of a lake are balanced so that the lake's depth appears to be constant?

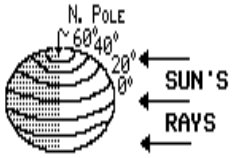
A) equilibrium
B) transpiration
C) saturation
D) hydration

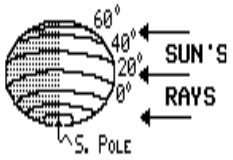
4) According to the data table below, what is the exact shape of the Earth?

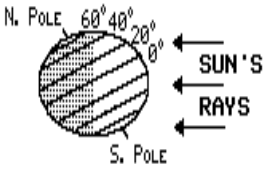
Actual Dimensions of the Earth	
Equatorial Radius	6,378 km
Polar Radius	6,357 km
Equatorial Circumference	40,076 km
Polar Circumference	40,008 km

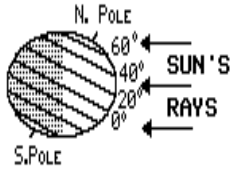
A) slightly bulging at both the Equator and the Poles
B) slightly flattened at both the Equator and the Poles
C) slightly flattened at the Equator and slightly bulging at the Poles
D) slightly flattened at the Poles and slightly bulging at the Equator

5) Which diagram below best represents the illumination of the Earth on the first day of summer in the Northern Hemisphere?

A) 

B) 

C) 

D) 

6) During a period of one year, what would be the *greatest* altitude of the Sun at the North Pole?

A) 90°
B) 0°
C) $23\frac{1}{2}°$
D) $66\frac{1}{2}°$

7) How many calories of heat energy are required to raise the temperature of 6 grams of water from 10°C to 15°C?

A) 30
B) 3240
C) 5
D) 480

8) Which statement is the best example of heat energy transfer by conduction?

A) Heat energy is transferred from the surface soil to the rocks below.
B) Heat energy is transferred from the Earth's surface to the upper atmosphere.
C) Heat energy is transferred from the Sun to the Earth.
D) Heat energy is transferred from the bottom to the top of the lake.

9) On March 21, two observers, one at 45° north latitude and the other at 45° south latitude, watch the "rising" Sun. In which direction(s) must they look?

A) The observer at 45° S. must look westward while the other must look eastward.
B) Both observers must look eastward.
C) The observer at 45° N. must look westward while the other must look eastward.
D) Both observers must look westward.

10) A mineral expands when heated. Which graph best represents the relationship between change in density and change in temperature when that mineral is heated?

A) 

C) 

B) 

D) 

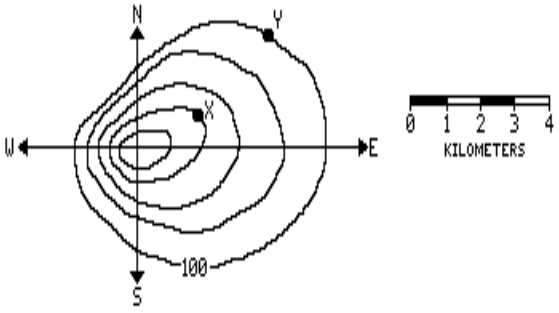
11) The polar circumference of the Earth is 40,008 kilometers. What is the equatorial circumference?

A) 12,740 km
B) 40,076 km
C) 25,000 km
D) 40,008 km

12) As water cools from 4°C to 0°C, its density

A) decreases
B) increases
C) remains the same

13) According to the diagram below which represents a contour map of a hill, on which side of the hill does the land have the steepest slope?



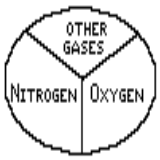
Contour Interval = 10 meters

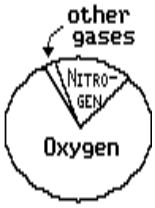
A) north
B) south
C) west
D) east

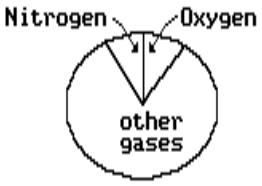
14) An object that is a good radiator of electromagnetic waves is also a good

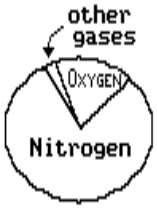
A) reflector of heat
B) insulator from heat
C) retractor of electromagnetic energy
D) absorber of electromagnetic energy

15) According to data in the *Earth Science Reference Tables*, which circle graph best represents the volumes of gases in the troposphere?

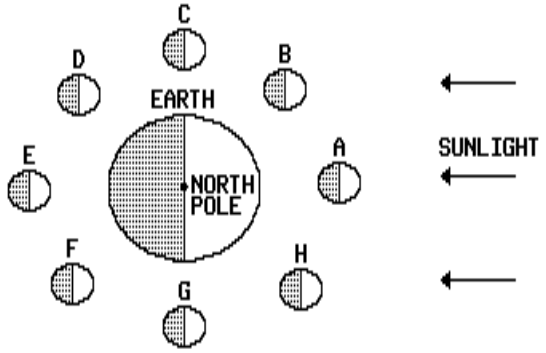
A) 

B) 

C) 

D) 

16) The diagram below represents eight positions of the Moon as it revolves around the Earth.



When viewed from the Earth, which phase of the Moon will be seen when the Moon is at point *E*?

A) first quarter
B) full moon
C) new moon
D) last quarter

17) Which two factors determine the number of hours of daylight at a particular location?

A) latitude and the Earth's average diameter
B) latitude and season
C) longitude and season
D) longitude and the Earth's average diameter

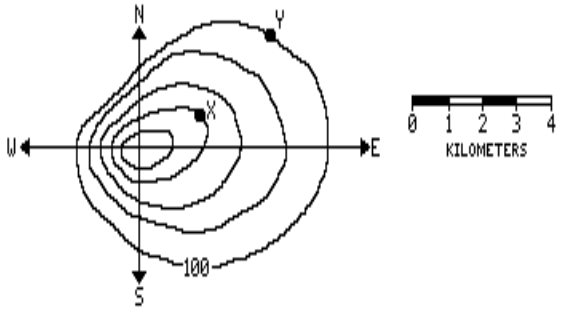
18) Which planetary model allows a scientist to predict the exact positions of the planets in the night sky over many years?

A) The planets' orbits are ellipses in a heliocentric model.
B) The planets' orbits are circles in a geocentric model.
C) The planets' orbits are circles in a heliocentric model.
D) The planets' orbits are ellipses in a geocentric model.

19) A student measures the length of a room to be 6.9 meters. The actual length of the room is 7.5 meters. Determine the student's percent deviation (percent of error).

A) 14%
B) 8%
C) 20%
D) 6%

20) According to the diagram below which represents a contour map of a hill, what is the approximate gradient of the hill between points *X* and *Y*?

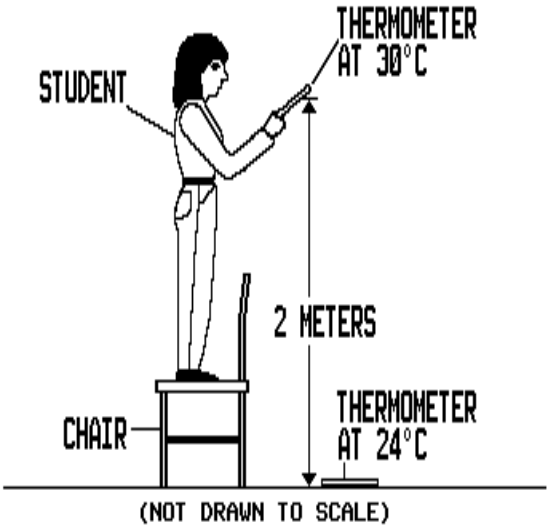


A) 3 m/km
B) 30 m/km
C) 10 m/km
D) 1 m/km

21) Planet *A* has a greater mean distance from the Sun than planet *B*. On the basis of this fact, which further comparison can be correctly made between the two planets?

A) Planet *A*'s revolution period is longer.
B) Planet *A* is larger.
C) Planet *A*'s day is longer.
D) Planet *A*'s speed of rotation is greater.

22) In the diagram below, the thermometer held 2 meters above the floor shows a temperature of 30° C. The thermometer on the floor shows a temperature of 24° C.



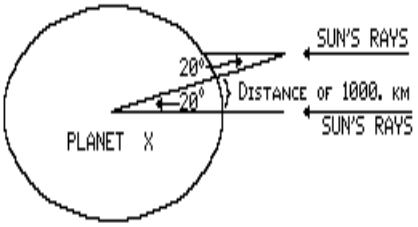
What is the temperature gradient between the two thermometers?

A) 2 C°/m
B) 3 C°/m
C) 4 C°/m
D) 6 C°/m

23) The latitude of a point in the Northern Hemisphere may be determined by measuring the

A) apparent diameter of Polaris
B) apparent diameter of the Sun
C) altitude of Polaris
D) distance of the Sun

24) Based on the diagram below, what is the circumference of planet *X*?



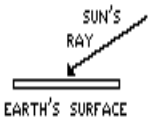
A) 36,000 km
B) 18,000 km
C) 9,000 km
D) 24,000 km

25) An observer in New York State measures the altitude of Polaris to be 44°. According to the *Earth Science Reference Tables*, the location of the observer is nearest to

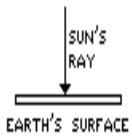
A) Buffalo
B) Watertown
C) Kingston
D) Elmira

26) The diagrams below represent flat horizontal surfaces at four different locations on the Earth. The arrows represent the Sun's rays striking each location at noon on March 21. Which location is farthest from the Equator?

A)


C)


B)


D)


27) The Coriolis effect provides evidence that the Earth

A) has a magnetic field
B) has an elliptical orbit
C) rotates on its axis
D) revolves around the Sun

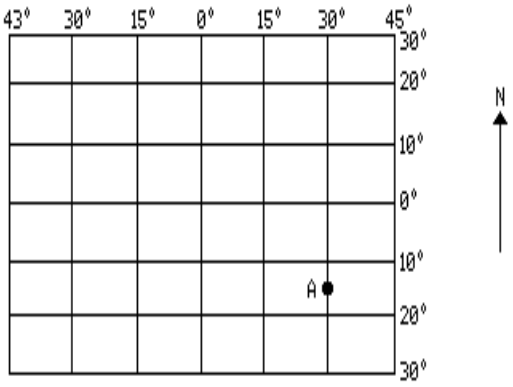
28) According to the *Earth Science Reference Tables*, which of the following takes the longest time to make one complete spin on its axis?

A) Jupiter
B) Mercury
C) Uranus
D) Earth

29) The length of time that daylight is received at a location during one day is called the location's

A) eccentricity of insolation
B) angle of insolation
C) intensity of insolation
D) duration of insolation

30) The diagram below represents a portion of a map of the Earth's grid system. What is the approximate latitude and longitude of point *A*?



A) 15° S. 30° W.
B) 15° N. 30° E.
C) 15° S. 30° E.
D) 15° N. 30° W.

31) As viewed from Earth, the Sun's apparent diameter has shown which type of change over a period of 10 years?

A) noncyclic and unpredictable
B) cyclic and unpredictable
C) cyclic and predictable
D) noncyclic and predictable

32) Winds appear to curve toward the right in the Northern Hemisphere. This curving to the right is caused by the Earth's

A) revolution
B) shape
C) size
D) rotation

33) Some constellations (star patterns) observed in the summer skies in New York State are different from those observed in the winter skies. The best explanation for this observation is that

A) the Earth revolves around the Sun
B) constellations revolve around the Earth
C) constellations are moving away from the Earth
D) the Earth rotates on its axis

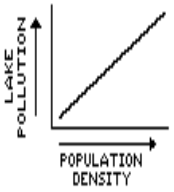
34) In which phase (state) do most Earth materials have their *greatest* density?

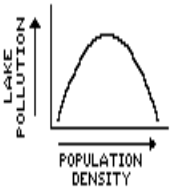
A) gaseous
B) solid
C) liquid

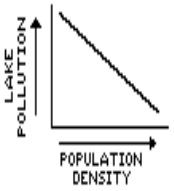
35) Which process is primarily responsible for the transfer of energy by air currents within the Earth's atmosphere?

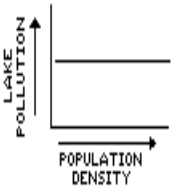
A) absorption
B) radiation
C) convection
D) conduction

36) Which graph best represents the typical relationship between population density near a lake and pollution of the lake?

A) 

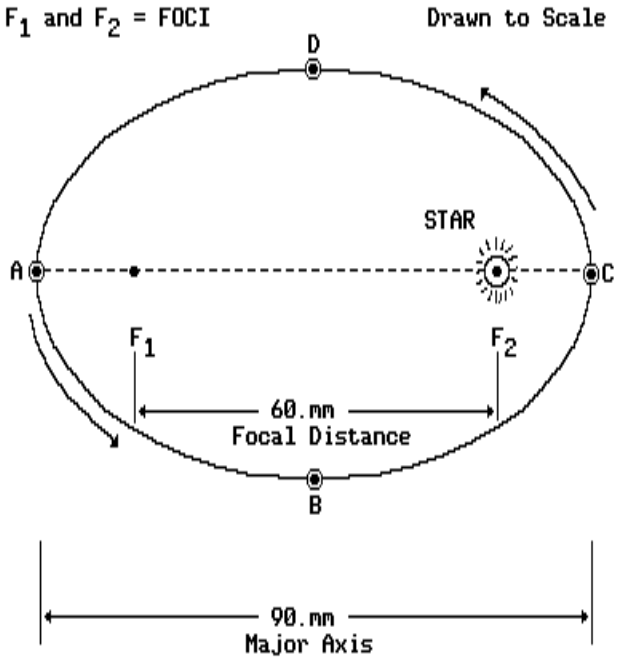
C) 

B) 

D) 

Questions 37 through 40 refer to the following:

The diagram below is a model of the orbit of an imaginary planet *Q* around a star. Points *A*, *B*, *C*, and *D* indicate four orbital positions of the planet *Q*.



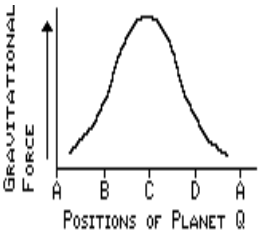
37) How would a scale drawing of the Earth's orbit around the Sun compare to the scale drawing shown of planet *Q*'s orbit?

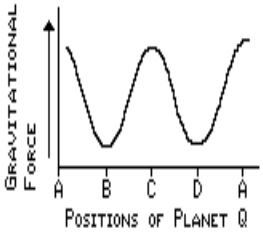
A) Earth's orbit would appear to be the same shape as planet *Q*'s.
B) Earth's orbit would appear to have a more eccentric shape than planet *Q*'s.
C) Earth's orbit would appear to have a more circular shape than planet *Q*'s.

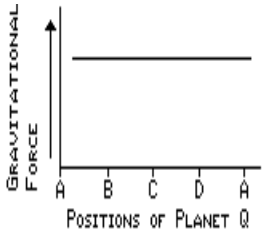
38) What is the approximate eccentricity of planet *Q*'s orbit?

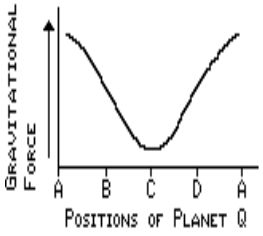
A) 0.06 C) 1.50
B) 0.15 D) 0.67

39) Which graph best approximates the gravitational force between the star and planet *Q* at positions *A* through *D*?

A) 

B) 

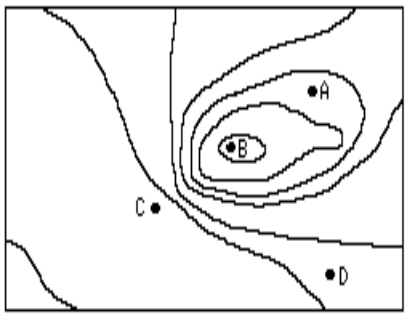
C) 

D) 

40) At which position in its orbit does planet *Q* have the *greatest* velocity?

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

41) The diagram below is a contour map. Between which two points is the slope of the hill steepest?



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

42) Which statement about a cumulus cloud seen over Syracuse, N.Y., is an inference?

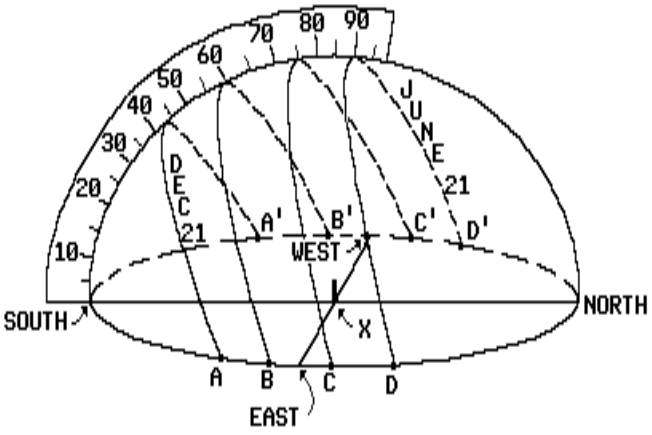
A) The cloud formed over Lake Ontario.
B) The cloud has an irregular shape.
C) The base of the cloud is determined to be 2.6 km above ground.
D) The cloud appears white.

43) How many calories of latent heat does one gram of water lose when it freezes?

A) 32 cal
B) 80 cal
C) 1 cal
D) 540 cal

Questions 44 through 46 refer to the following:

The diagram below represents a plastic hemisphere upon which lines have been drawn to show the apparent paths of the Sun on four days at one location in the Northern Hemisphere. Two of the paths are dated. The protractor is placed over the north-south line. *X* represents the position of a vertical post.



44) Which path of the Sun would result in the longest shadow of the vertical post at solar noon?

A) *C-C′*
B) *A-A′*
C) *B-B′*
D) *D-D′*

45) What is the latitude of this location?

A) $66\frac{1}{2}°$ N
B) 0°
C) $23\frac{1}{2}°$ N
D) 90° N

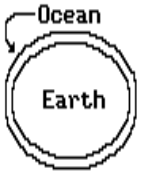
46) How many degrees does the altitude of the Sun change from December 21 to June 21?

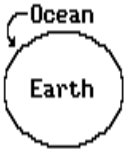
A) $66\frac{1}{2}°$
B) 74°
C) 43°
D) 47°

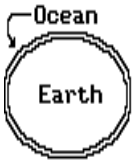
47) According to the *Earth Science Reference Tables*, which material would require the most heat energy to increase the temperature of 1 gram of the material one Celsius degree?

A) granite
B) water
C) ice
D) basalt

48) The diagrams below represent true scale models for the solid Earth. Which diagram would best show the ocean depth also drawn to the same scale?

A) 

C) 

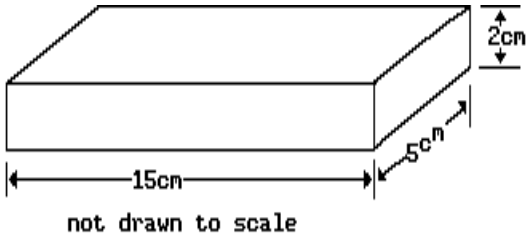
B) 

D) 

49) What color and texture of a material would absorb the *least* solar radiation?

A) white and rough
B) black and smooth
C) white and smooth
D) black and rough

50) The diagram below represents a rectangular object with a mass of 450 grams. According to the *Earth Science Reference Tables*, what is the density of the object?



A) 1 gram per cubic centimeter
B) 4 grams per cubic centimeter
C) 2 grams per cubic centimeter
D) 3 grams per cubic centimeter

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

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

52) A measurement is best defined as

A) a direct comparison with a known standard
B) an inference made by using the human senses
C) a group of inferred properties
D) an interpretation based on theory

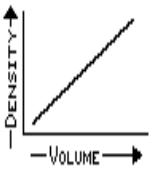
53) How many calories of latent heat would have to be absorbed by 100 grams of liquid water at 100° C in order to change all of the liquid water into water vapor at 100° C?

A) 100 cal
B) 8,000 cal
C) 1,000 cal
D) 54,000 cal

54) A student calculates the densities of five different pieces of aluminum, each having a different volume. Which graph best represents this relationship?

A) 

C) 

B) 

D) 

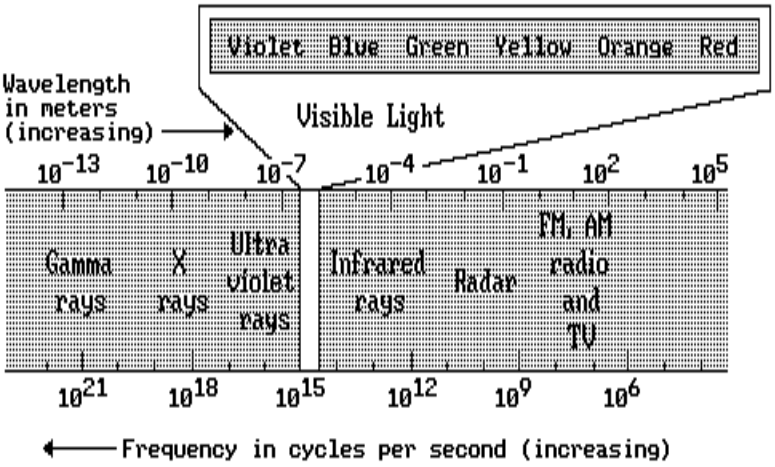
55) At which temperature would an object radiate the *least* amount of electromagnetic energy?

A) the temperature at the stratopause (0° C)
B) the temperature of the North Pole on December 21 (-60° F)
C) room temperature (293 K)
D) the boiling point of water (100° C)

56) According to the *Earth Science Reference Tables*, which part of the atmosphere has the *smallest* distance from the bottom to the top of its zone?

A) mesosphere
B) troposphere
C) stratosphere
D) thermosphere

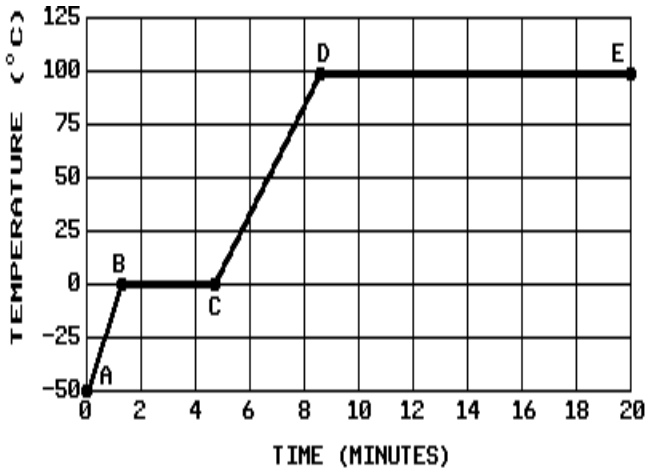
57) The diagram below shows part of the electromagnetic spectrum.



Which form of electromagnetic energy shown on the diagram has the *lowest* frequency and *longest* wavelength?

A) AM radio
B) red light
C) infrared rays
D) gamma rays

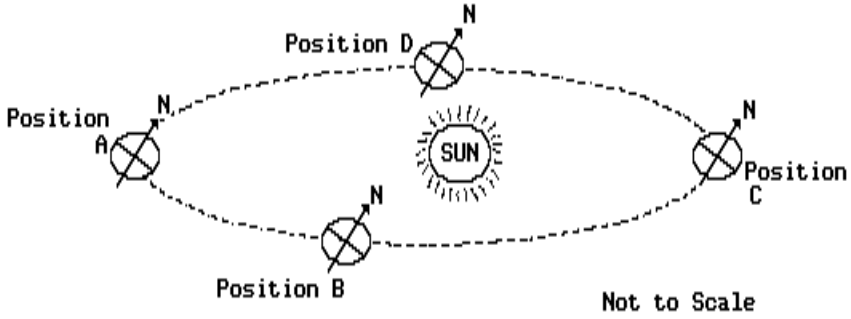
58) The graph below shows the temperatures recorded when a sample of water was heated at a constant rate from -50° C to 100° C during a 20-minute period.



How many calories of heat would be used to change the temperature of 20 grams of the water from the temperature at point *C* to the temperature at point *D*?

A) 800 calories B) 540 calories C) 2,000 calories D) 200 calories

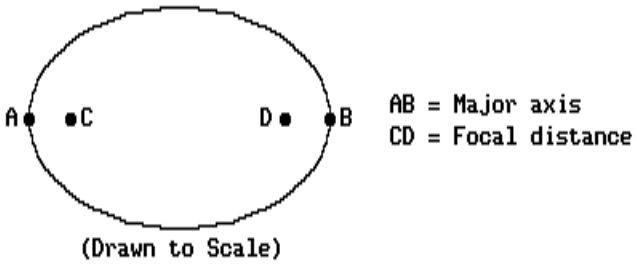
59) The diagram below shows four positions of the Earth in its orbit around the Sun. The diagram indicates relative positions of the Earth to the Sun, but the diagram has not been drawn to scale.



In which position would New York State receive the maximum insolation?

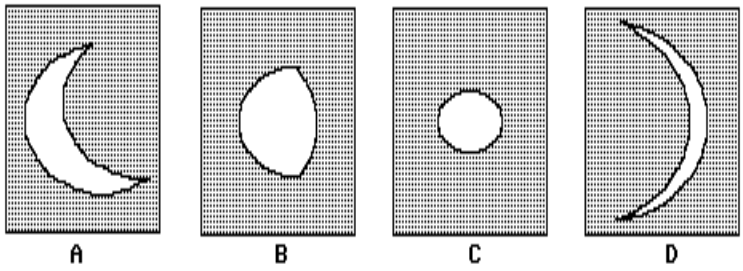
A) *C* B) *A* C) *B* D) *D*

60) What is the approximate eccentricity of the ellipse shown below?



A) 1.4 B) 0.40 C) 0.73 D) 0.15

61) Diagrams *A* through *D* below, represent phases of a planet as seen by an observer on Earth using a telescope. The diagram is drawn to scale.

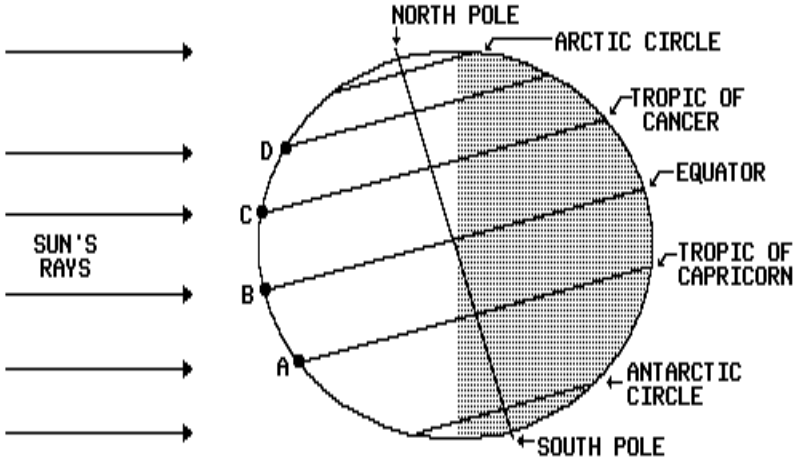


What is the most logical conclusion about this planet?

A) The apparent diameter of the planet varies throughout the year.
B) The planet has a slower orbital velocity than the Earth.
C) The planet does not rotate on its axis.
D) The planet is closest to the Earth at position *C*.

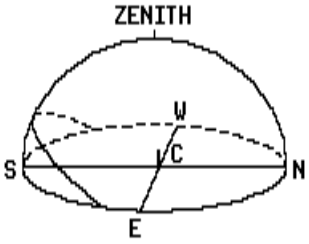
Questions 62 through 64 refer to the following:

The diagram below represents the Earth at a specific position in its orbit. Arrows indicate radiation from the Sun. Points *A* through *D* are locations on the Earth's surface.

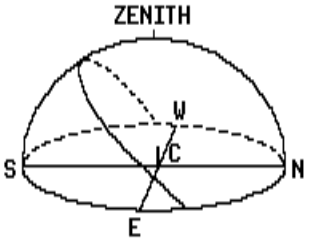


62) Which diagram below best represents the path of the Sun on this date as seen by an observer at location *C*?

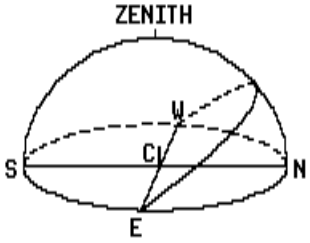
A)



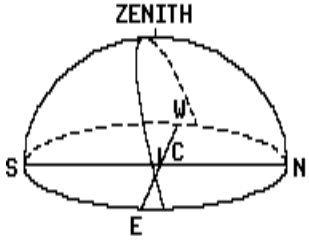
B)



C)



D)



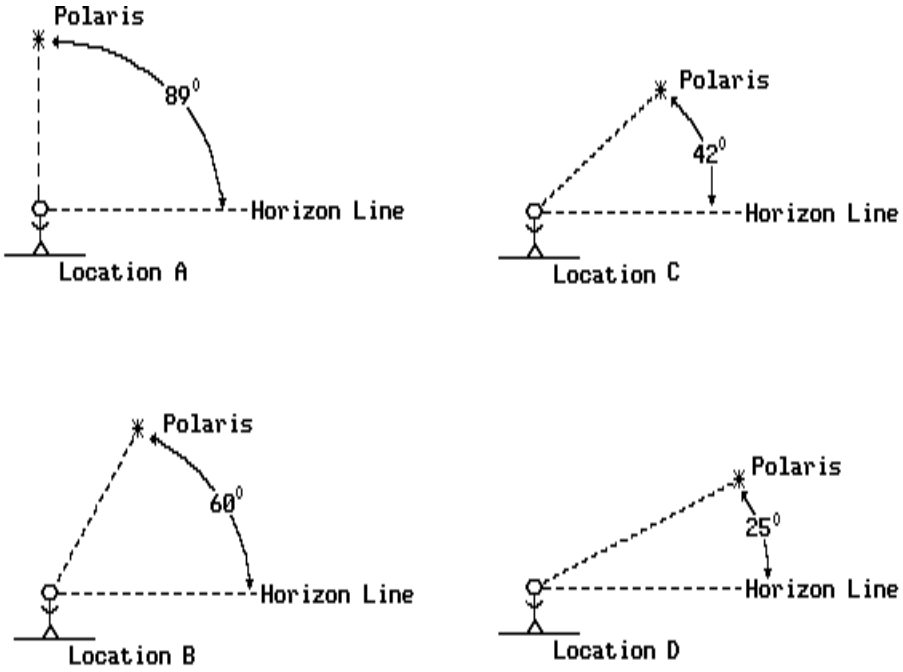
63) As an observer travels from position *B* to position *D*, the altitude of Polaris in the nighttime sky will

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

64) Which location would have the *greatest* number of daylight hours when the Earth is in this position?

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

65) The diagrams below represent observers at four different locations *A*, *B*, *C*, and *D* on the Earth's surface and the altitude of Polaris at each location.



The observations of the altitude of Polaris made by the four observers provide information about the

A) time at the observers' locations
B) density of the earth
C) longitude of the observers' locations
D) shape of the Earth