Name: _____

1) Which statement made during a weather report is most likely an inference?
   A) The high temperature for the day was recorded at 2 p.m.
   B) The current barometric pressure is 29.97 in.
   C) The record low temperature for this date was set in 1957.
   D) Hot and humid conditions will continue throughout the week.

2) Which statement about an unidentified rock sample is most likely an inference?
   A) The rock has no visible fossils.
   B) The rock has shiny, wavy mineral bands.
   C) The rock is a metamorphic rock.
   D) The rock is composed of large crystals.

3) During a laboratory activity, four students each determined the density of the same piece of granite. The results are shown in the table below.

Student	Density Determined
1	2.69 g/cm^3
2	2.71 g/cm^3
3	2.72 g/cm^3
4	2.69 g/cm^3

The accepted value for the density of granite is 2.70 grams per cubic centimeter. Therefore, the results of this activity indicate that
   A) the balance used by student 3 was broken
   B) the density determined by each student contains a small error
   C) the accepted density of granite is incorrect
   D) each student determined the exact accepted value for the density of granite

4) A person incorrectly measured the length of a room as 13.0 meters when the actual length was 12.0 meters. What is the person's approximate percent deviation (percentage of error)?
   A) 7.7%
   C) 8.3%
   B) 1.0%
   D) 5.9%

5) A student determined the porosity of a sample of soil to be 37.6%. The actual porosity is 42.3%. The student's percent deviation from the accepted value (percentage of error) is approximately
   A) 11.1%
   C) 12.5%
   B) 4.7%
   D) 79.9%

6) A pebble has a mass of 35 grams and a volume of 14 cubic centimeters. What is its density?
   A) 2.5 g/cm^3
   C) 4.0 g/cm^3
   B) 490 g/cm^3
   D) 0.4 g/cm^3

7) What is the diameter of the Earth? [Refer to the *Earth Science Reference Tables*.]
   A) 63,700 km
   C) 127,400 km
   B) 6,370 km
   D) 12,740 km

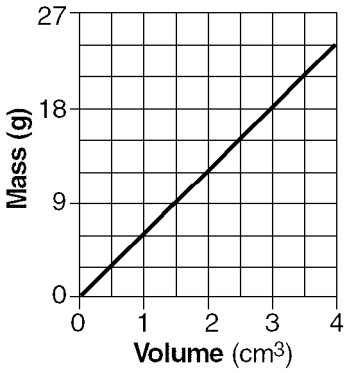
8) A person observes a sediment consisting of clay, sand, and pebbles and then states that this material was transported and deposited by an agent of erosion. This statement is
   A) an observation
   B) an inference
   C) a measurement
   D) a fact

9) Which information in the *Earth Science Reference Tables* is an inference rather than an observation?
   A) The Earth's outer core is made of iron.
   B) A *P*-wave travels 5,600 kilometers in 9 minutes.
   C) Temperature decreases as elevation in the troposphere increases.
   D) Saturn's period of rotation is 10 hours 14 minutes.

10) Water has the *greatest* density at
   A) 0°C in the solid phase
   B) 100°C in the gaseous phase
   C) 4°C in the solid phase
   D) 4°C in the liquid phase

11) Under the same conditions of temperature and pressure, three different samples of the same uniform substance will have the same
   A) shape
   C) density
   B) mass
   D) volume

12) The graph below shows the relationship between the mass and volume of a mineral. What is the density of this mineral?



A) 4.5 g/cm^3 **C) 9.0 g/cm^3**
B) 6.0 g/cm^3 **D) 30 g/cm^3**

13) A student calculated the density of a mineral sample to be 2.7 grams per cubic centimeter. If the accepted value is 3.0 grams per cubic centimeter, what was the student's percent of error?

A) 30% **C) 10%**
B) 11% **D) 9%**

14) A quantity of water is frozen solid and then heated from 0°C to 10°C. Which statement *best* describes the properties of the water during this time?

A) Volume and density change.
B) Mass changes but volume remains constant.
C) Mass and volume change.
D) Volume changes but density remains constant.

15) The basic measurements used to describe stream velocity are

A) length and shape
B) time and direction
C) mass and volume
D) distance and time

16) An observer incorrectly measured the mass of a rock as 428.7 grams. The actual mass was 450.0 grams. What was the observer's approximate percentage of error?

A) 2.1% **C) 4.7%**
B) 4.3% **D) 5.0%**

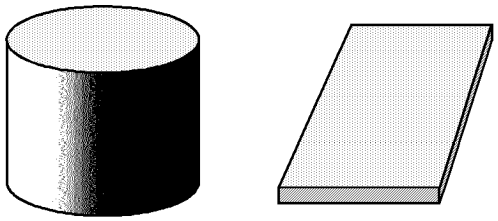
17) A mineral sample is found to have a density of 3.0 grams per cubic centimeter. It is then broken into two pieces, with one piece twice as large as the other. The *smaller* of the two pieces will have a density of

A) 3.0 g/cm^3 **C) 6.0 g/cm^3**
B) 1.5 g/cm^3 **D) 1.0 g/cm^3**

18) A student classifies several objects. The classification system should be based on

A) interpretations
B) hypotheses
C) inferences
D) observations

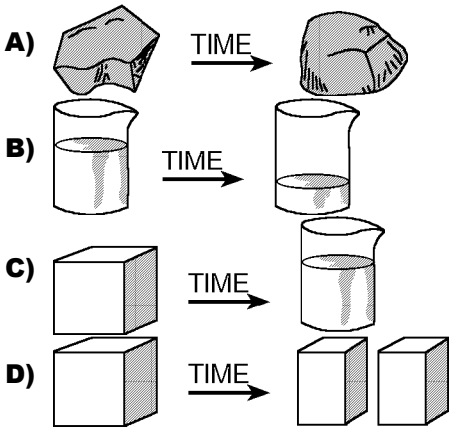
19) The diagrams below represent two solid objects, *A* and *B*, with different densities.



What will happen when the objects are placed in a container of water (water temperature = 4°C)?

A) Both objects will float.
B) Both objects will sink.
C) Object *B* will float, and object *A* will sink.
D) Object *A* will float, and object *B* will sink.

20) The diagrams below show physical changes in four materials after a period of time. Chemical composition of each material remained the same. Which material most likely changed in density?



21) The primary purpose of a classification system is to enable people to
   A) eliminate inaccurate inferences
   B) organize observations in a meaningful way
   C) extend their powers of observation
   D) make measurements that are very accurate

22) A centimeter is 0.01 meter. This measurement can also be expressed as
   A) 1×10^0 m
   B) 1×10^2 m
   C) 1×10^{-1} m
   D) 1×10^{-2} m

23) The use of a triple-beam balance to determine the mass of a rock is an example of measuring by using
   A) inferences and interpretations
   B) a combination of dimensional quantities
   C) all of the five senses
   D) a direct comparison with a standard

24) Student *A* finds the density of a piece of quartz to be 2.50 grams per cubic centimeter. Student *B* finds the density to be 2.80 grams per cubic centimeter. The actual density of quartz is 2.65 grams per cubic centimeter. Which is a true statement about student *A*'s percent of error (percent deviation)?
   A) It is greater than student *B*'s percent of error.
   B) It is the same as student *B*'s percent of error.
   C) It cannot be determined.
   D) It is less than student *B*'s percent of error.

25) Which statement about a mineral sample found in a field in New York State is most likely an inference?
   A) The sample is 8 cm long, 5 cm wide, and 3 cm high.
   B) The sample is rectangular, with sharp, angular corners.
   C) The sample is white in color.
   D) The sample was transported by a glacier.

26) Students calculated the circumference of a globe to be 60. centimeters. The actual circumference of the globe is 63 centimeters. The percent deviation of the students' calculation was
   A) 21%
   B) 0.48%
   C) 5.0%
   D) 4.8%

27) A student determines that the porosity of a large volume of sand is 40%. The accepted value is 46%. What is the student's approximate percent deviation (percent of error) from the accepted value?
   A) 7%
   B) 13%
   C) 10%
   D) 46%

28) Compared to the density of liquid water, the density of an ice cube is
   A) always the same
   B) always less
   C) sometimes less and sometimes greater
   D) always greater

29) What is the mass of a rock that has a density of 2.5 grams per cubic centimeter and a volume of 4.0 cubic centimeters?
   A) 10.0 g
   B) 4.0 g
   C) 1.6 g
   D) 6.2 g

30) A student calculates the period of Saturn's revolution to be 31.33 years. What is the student's approximate deviation from the accepted value?
   A) 19%
   B) 1.9%
   C) 5.9%
   D) 6.3%

31) A student determines the density of a mineral to be 3.5 grams per cubic centimeter. If the accepted value is 4.8 grams per cubic centimeter, what is the student's approximate percent error?
   A) 73%
   B) 27%
   C) 13%
   D) 37%

32) The table below identifies four density groups.

Group	Density g/cm^3
A	1.0-3.9
B	4.0-7.9
C	8.0-11.9
D	12.0-15.9

According to this classification system, a sample of quartz with a mass of 27 grams and a volume of 10 cubic centimeters should be placed in group

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

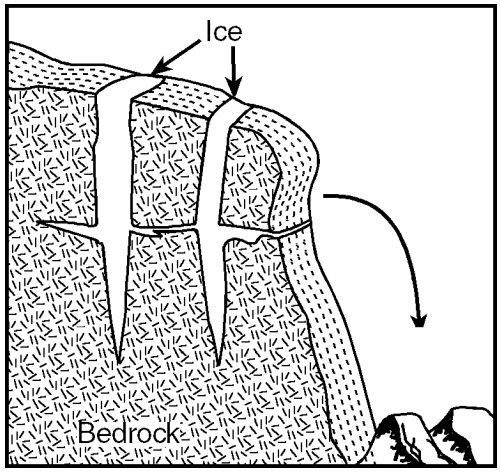
33) Which statement about a rock sample is most likely an inference?

A) The rock has changed color due to weathering.
B) The rock has flat sides and sharp corners.
C) The rock has thin, distinct layers.
D) The rock is made of small, dark-colored crystals.

34) The circumference of the Earth is about 4.0×10^4 kilometers. This value is equal to

A) 40,000 km C) 400,000 km
B) 400 km D) 4,000 km

35) The diagram below shows a process of weathering called frost wedging.



Frost wedging breaks rocks because as water freezes it increases in

A) density C) mass
B) volume D) specific heat

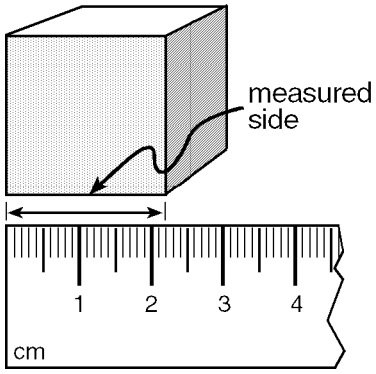
36) A student determines the density of a rock to be 2.2 grams per cubic centimeter. If the accepted density of the rock is 2.5 grams per cubic centimeter, what is the percent deviation (percentage of error) from the accepted value?

A) 8.8% C) 13.6%
B) 30.0% D) 12.0%

37) While walking on a glacier, an observer makes several statements. Which statement is an inference?

A) "The rocks on this glacier are of different sizes."
B) "There are many cracks in this glacier."
C) "Some parts of this glacier will start melting this spring."
D) "Some of the snow on this glacier is powdery."

38) If each side of the cube shown below has the same length as the measured side, what is the approximate volume of the cube?



A) 2.20 cm^3 C) 10.65 cm^3
B) 4.84 cm^3 D) 6.60 cm^3

39) A scientist who is studying a stream would have the most difficulty determining the stream's

A) transported sediment size
B) velocity
C) age in years
D) temperature

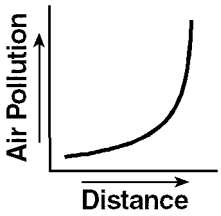
40) Water has its *greatest* density at a temperature of

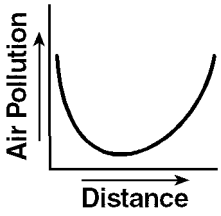
A) 32°C C) 4°C
B) 10°C D) -6°C

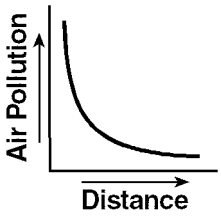
41) **An interface is *best* described as a**

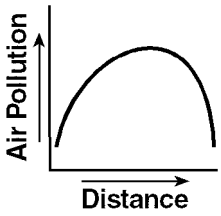
A) change in the state of the environment
B) region that lies just below the surface of the Earth
C) region where no changes are occurring
D) boundary across which energy may be exchanged

42) **Which graph *best* represents the most common relationship between the amount of air pollution and the distance from an industrial city?**

A)


B)


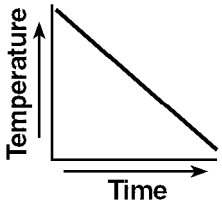
C)


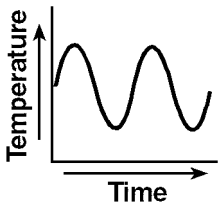
D)


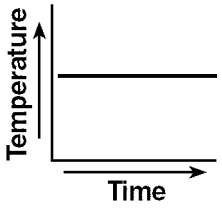
43) **Over a 30-day period, an observer would have the most difficulty measuring the**

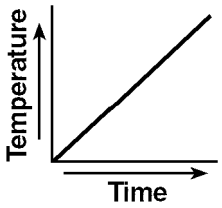
A) discharge of a river
B) changing phases of the Moon
C) weathering of a mountain
D) rotation of the Earth

44) **Which graph most likely illustrates a cyclic change?**

A)


B)


C)


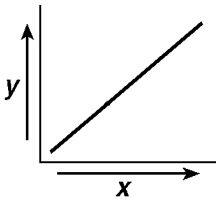
D)


45) **Which processes are all part of the same Earth cycle?**

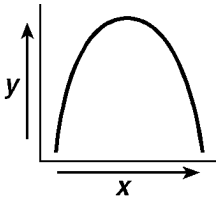
A) precipitation, evaporation, and condensation
B) reflection, refraction, and evolution
C) rotation, revolution, and deposition
D) conduction, convection, and erosion

46) Which graph *best* shows the general relationship between the population density of an area (*x*-axis) and the amount of pollution in the area (*y*-axis)?

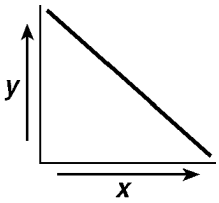
A)



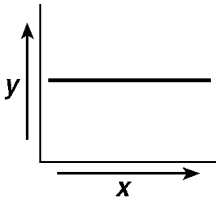
B)



C)



D)



47) The *best* example of a noncyclic event is

- **A) a phase change of the Moon**
- **B) a change of seasons**
- **C) a volcanic eruption**
- **D) an apparent star movement**

48) If wastewater from a nuclear power plant raises the temperature of a nearby body of water, the concentration of biologic pollutants in the water will most likely

- **A) increase**
- **B) remain the same**
- **C) decrease**

49) What are the *best* frames of reference for describing change?

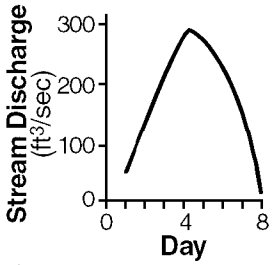
- **A) speed and density**
- **B) weight and temperature**
- **C) time and distance**
- **D) volume and mass**

50) The data table below shows the stream discharge in April for a creek in the southern United States for a period of 8 days.

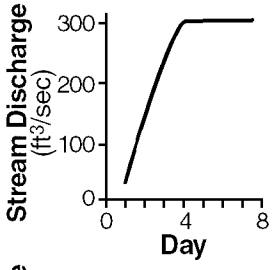
Day	Stream Discharge (ft^3/sec)
1	20.0
2	6.0
3	269.0
4	280.0
5	48.0
6	21.0
7	14.0
8	5.0

Which graph most accurately shows stream discharge for the 8-day period?

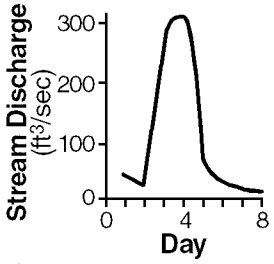
A)



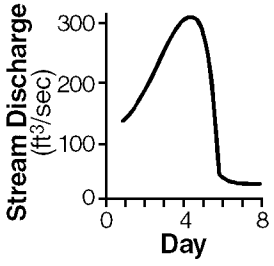
B)



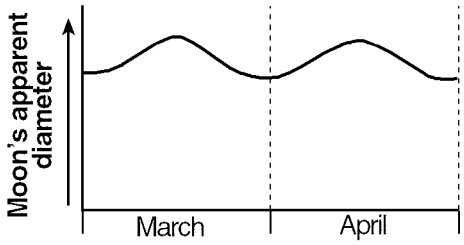
C)



D)



51) An observer on the Earth measured and recorded the slight changes in the apparent diameter of the Moon for 2 months. A graph of the data is shown below.



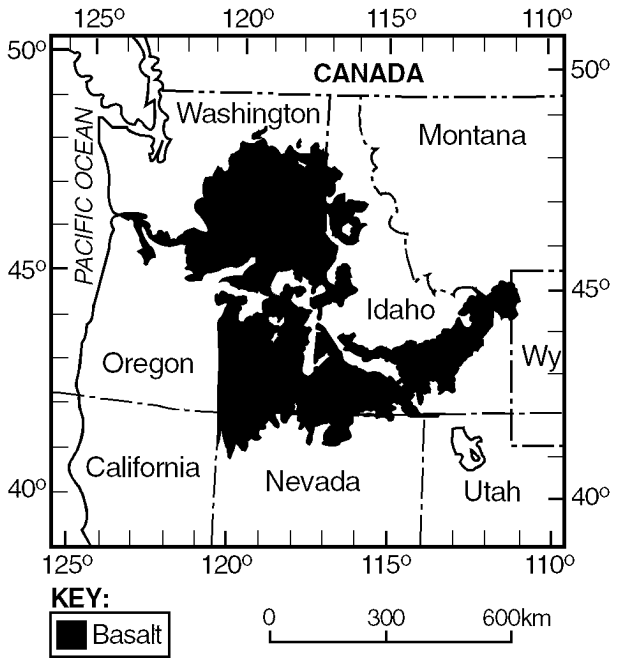
Which statement *best* explains the observations?

A) The distance from the Earth to the Moon varies in a cyclic manner.
B) The Earth revolves around the Moon each month.
C) The Moon actually increases and decreases in size each month.
D) The apparent diameter of the Moon is always greatest at the new-moon phase.

52) Which measurement, taken daily at a specific New York State location, will usually change the *least* number of degrees over a period of 2 months?

A) air temperature
B) direction toward sunrise
C) direction toward magnetic north
D) altitude of the Sun at noon

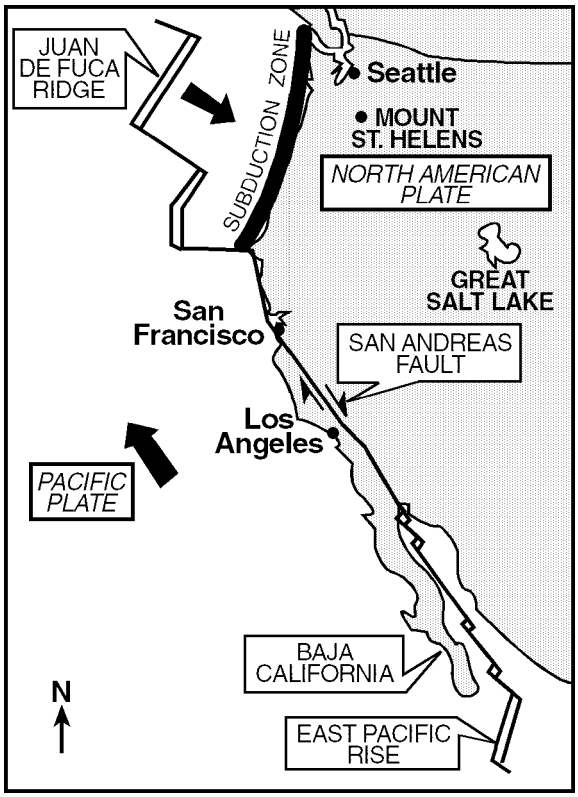
53) The shaded area of the map below represents large areas of surface basaltic bedrock in the northwestern United States.



Which location is in the shaded area of surface basaltic bedrock?

A) 48°N 116°W
B) 46°N 120°W
C) 44°N 122°W
D) 40°N 120°W

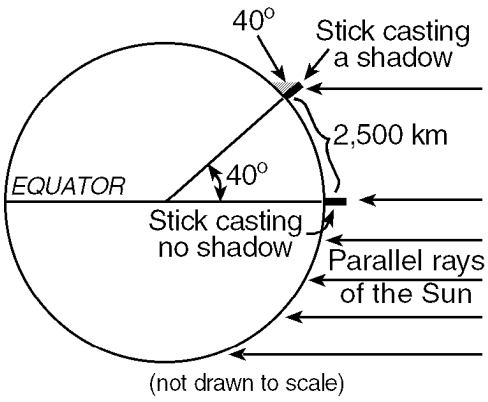
54) The map below shows the crustal plate boundaries located along the Pacific coastline of the United States. The arrows show the general directions in which some of the plates appear to be moving slowly.



Which feature is located at 20° North latitude and 109° West longitude?

A) East Pacific rise
B) San Andreas fault
C) Juan de Fuca Ridge
D) Baja California

55) The diagram below illustrates Eratosthenes' method of finding the circumference of a planet. At noon, when a vertical stick at the Equator casts no shadow, a vertical stick 2,500 kilometers away casts a shadow and makes an angle of 40° with the rays of the Sun as shown.

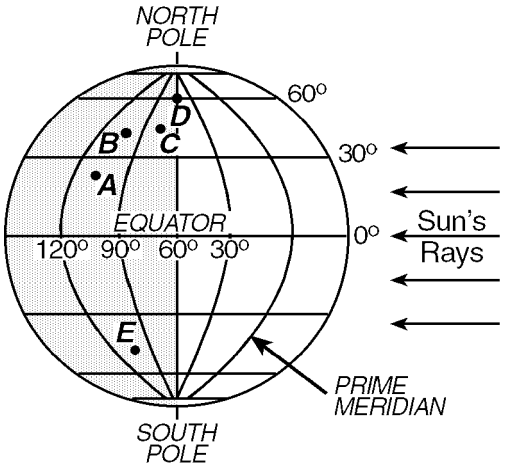


What is the circumference of this planet?

A) 2,500 km **C) 45,000 km**
B) 22,500 km **D) 20,000 km**

Questions 56 through 58 refer to the following:

The diagram below represents the Earth. Some of the latitude and longitude lines have been labeled. Points *A* through *E* represent locations on the Earth's surface.



56) As a traveler goes from location *A* to location *B*, the altitude of Polaris will

A) remain the same
B) decrease
C) increase

57) The latitude and longitude of which location are *closest* to those of New York State?

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

58) What are the approximate latitude and longitude of location *A*?

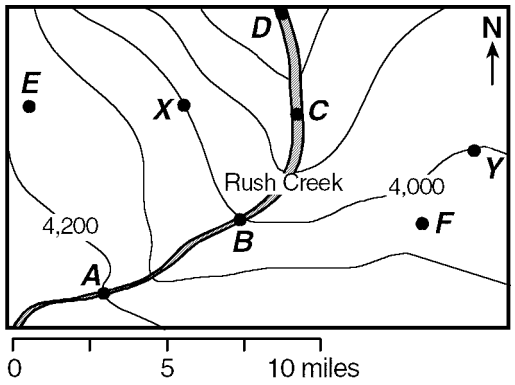
A) 105°S, 25°E **C) 25°N, 105°W**
B) 105°N, 25°W **D) 25°N, 105°E**

59) According to the *Earth Science Reference Tables*, at which New York State location is the altitude of Polaris *closest* to 42°?

A) Albany **C) Mt. Marcy**
B) Slide Mt. **D) Rochester**

Questions 60 through 64 refer to the following:

Points *A*, *B*, *C*, *D*, *E*, *F*, *X*, and *Y* are locations on the topographic map below. Elevation is measured in feet.



60) Between points *C* and *D*, Rush Creek flows toward the

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

61) Which locations have the *greatest* difference in elevation?

A) *E* and *Y* **C) *C* and *F***
B) *B* and *X* **D) *A* and *D***

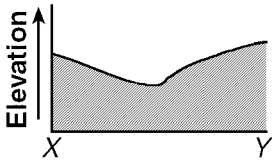
62) What is the contour interval used on this map?

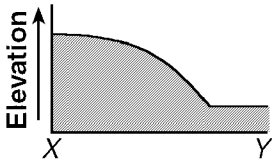
A) 200 ft **C) 100 ft**
B) 50 ft **D) 20 ft**

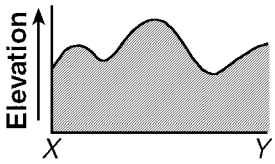
63) The gradient between points *A* and *B* is *closest* to

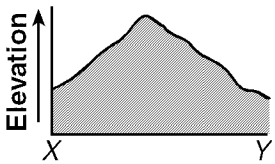
A) 40 ft/mi **C) 200 ft/mi**
B) 80 ft/mi **D) 20 ft/mi**

64) Which diagram *best* represents the profile along a straight line between points *X* and *Y*?

A)


B)


C)


D)


Questions 65 and 66 refer to the following:

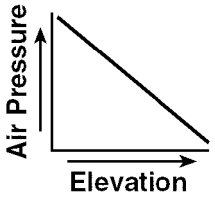
The data table below shows the air pressures and air temperatures collected by nine observers at different elevations on the same side of a high mountain. The data was collected at 12:00 noon on a clear, calm day.

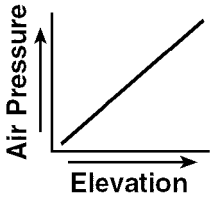
Station	Elevation (m)	Air Pressure (mb)	Air Temperature (°C)
1	SEA LEVEL	1,000	22
2	200	980	20
3	400	960	18
4	600	940	16
5	800	920	14
6	1,000	900	12
7	1,200	880	10
8	1,400	860	9
9	1,600	840	8

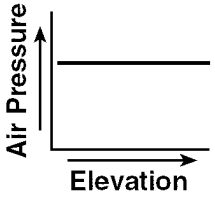
65) From sea level to an elevation of 1,200 meters, air pressure decreased at the rate of

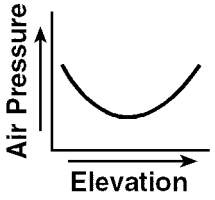
A) 100.0 mb/m **C) 0.1 mb/m**
B) 10.0 mb/m **D) 1.0 mb/m**

66) **Based on the data collected, which graph *best* represents the relationship between elevation above sea level and air pressure?**

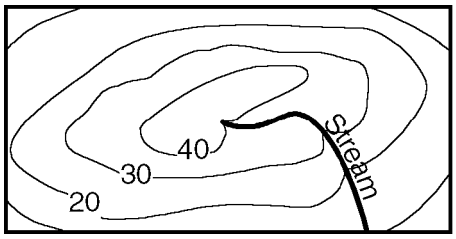
A)


B)


C)


D)


67) **Isolines on the topographic map below show elevations above sea level, measured in meters.**

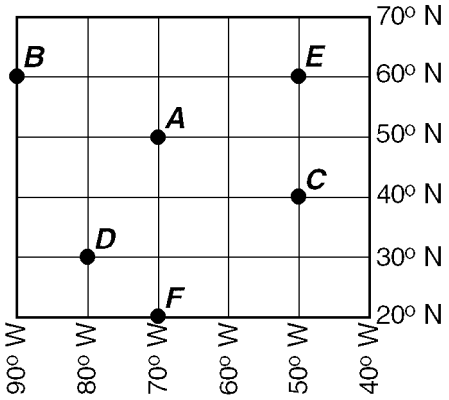


What could be the *highest* possible elevation represented on this map?

A) 41 m **C) 39 m**
B) 45 m **D) 49 m**

Questions 68 and 69 refer to the following:

The latitude and longitude system shown represents a part of the Earth's surface and its latitude-longitude coordinates. Points *A* through *F* represent locations in this area.



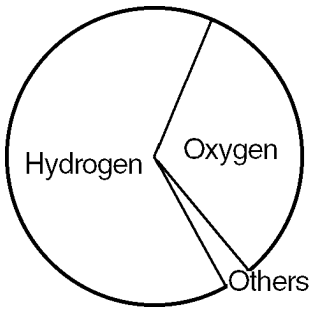
68) **As a person travels from location *B* to location *E*, the observed altitude of Polaris will**

A) increase
B) decrease
C) remain the same

69) **What is the compass direction from point *D* toward point *E*?**

A) southwest **C) northeast**
B) southeast **D) northwest**

70) **The graph below represents percentage of elements by volume.**

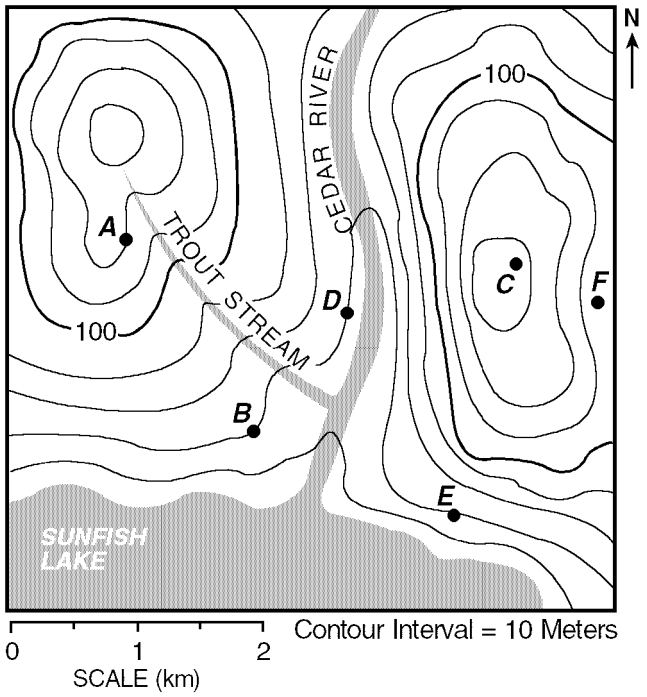


According to the *Earth Science Reference Tables*, this graph *best* represents the elements of the Earth's

A) stratosphere **C) lithosphere**
B) troposphere **D) hydrosphere**

Questions 71 through 75 refer to the following:

The diagram below represents a contour map. Points *A* through *F* represent locations on the map.



71) If no elevation values were given, which general rule could be used to establish that Cedar River flows into Sunfish Lake?

A) Rivers shown on maps generally flow southward.

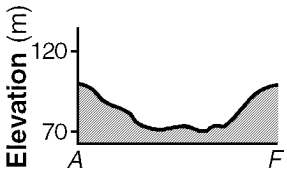
B) Rivers always flow toward large bodies of water.

C) A large body of water is generally the source of water for a river.

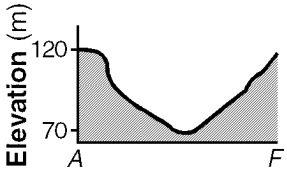
D) Contour lines bend upstream when crossing a river.

72) Which diagram *best* represents the topographic profile from location *A* to location *F*?

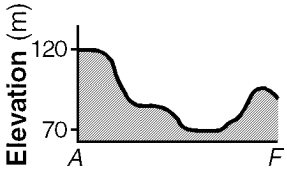
A)



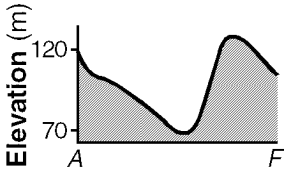
B)



C)



D)



73) Which statement about hill *C* is *best* supported by the map?

A) The steepest slope of hill *C* is on the western side.

B) Hill *C* has been shaped by glaciers.

C) Hill *C* is located approximately 2 km west of the Cedar River.

D) The highest possible elevation of hill *C* is 179 m.

74) What is the most likely elevation of the surface of Sunfish Lake?

A) 151 m **C) 28 m**

B) 140 m **D) 55 m**

75) Which location has the same elevation as location *D*?

A) *F* **B) *A*** **C) *E*** **D) *C***

76) From which measurement could the circumference of the Earth be determined?

A) the period of a Foucault pendulum at two different locations

B) gravity at the poles and at the Equator

C) the altitude of Polaris at midnight above the northern horizon from one location

D) the Sun's altitude at noon from two different locations at the same longitude

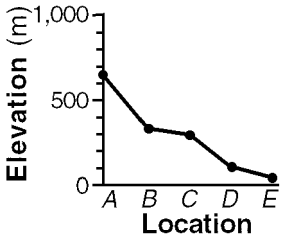
Questions 77 and 78 refer to the following:

The data table below contains data taken at locations *A* through *E* in a stream. The volume of the stream is the same at all locations.

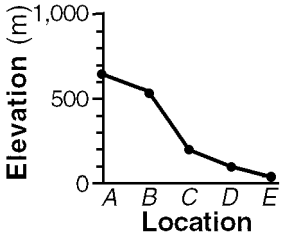
Location In The System	Average Velocity (cm/sec)	Elevation Above Sea Level (m)	Distance From Source (km)
A	10	640	0
B	130	570	20
C	210	200	80
D	100	100	130
E	70	40	200

77) Which diagram *best* represents the stream profile from location *A* to location *E*?

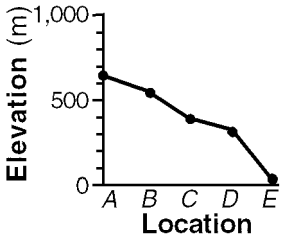
A)



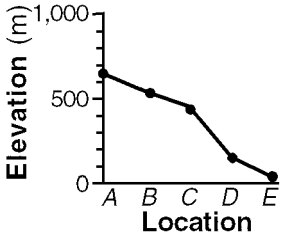
B)



C)



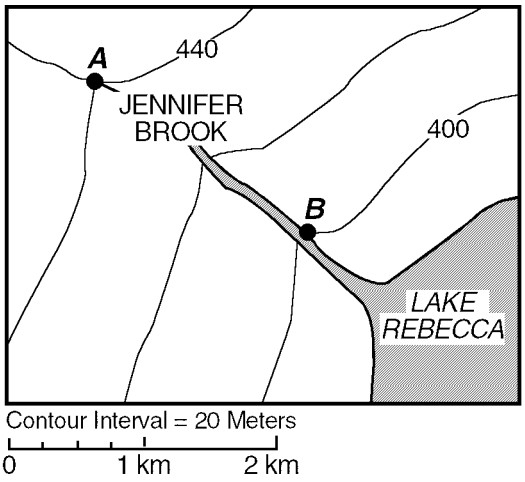
D)



78) What is the gradient of the stream between locations *C* and *D*?

A) 1.1 m/km **C) 2.0 m/km**
B) 3.0 m/km **D) 0.5 m/km**

Questions 79 and 80 refer to the following:



79) In which direction does Jennifer Brook flow?

A) northwest **C) southwest**
B) southeast **D) northeast**

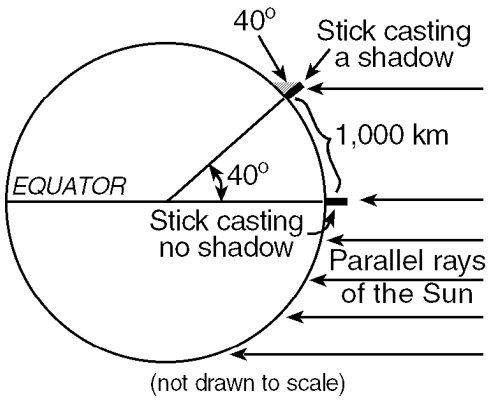
80) What is the approximate gradient, in meters per kilometer, of Jennifer Brook between points *A* and *B*?

A) 80 m/km **C) 40 m/km**
B) 220 m/km **D) 20 m/km**

81) Measurements of the Sun's altitude at the same time from two different Earth locations a known distance apart are often used to determine the

A) length of the major axis of the Earth's orbit
B) period of the Earth's revolution
C) eccentricity of the Earth's orbit
D) circumference of the Earth

82) The diagram below illustrates Eratosthenes' method of finding the circumference of a planet. At noon, when a vertical stick at the Equator casts no shadow, a vertical stick 1,000 kilometers away casts a shadow and makes an angle of 40° with the rays of the Sun as shown.



What is the circumference of this planet?

A) 12,000 km **C) 40,000 km**
B) 4,000 km **D) 9,000 km**

83) According to the *Earth Science Reference Tables*, if atmospheric pressure measurements were taken at regular intervals from sea level to the stratopause, the measurements would most likely show that the pressure

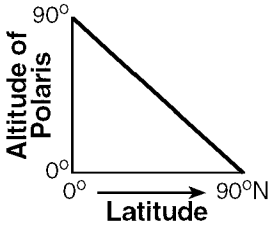
A) decreases, then increases
B) decreases, only
C) remains the same
D) increases, only

84) A stream begins at an elevation of 2,000 meters and ends in a lake at an elevation of 400 meters. The lake is 320 kilometers from the stream's source. What is the average gradient of the stream?

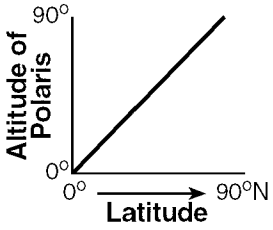
A) 2.0 m/km **C) 1.6 m/km**
B) 5.0 m/km **D) 8.0 m/km**

85) Which graph *best* represents the altitude of Polaris observed at northern latitude positions on the Earth's surface?

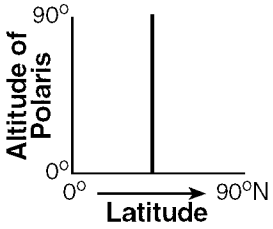
A)



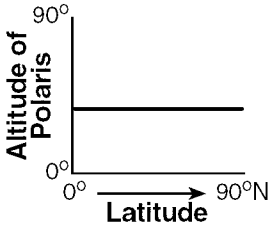
B)



C)

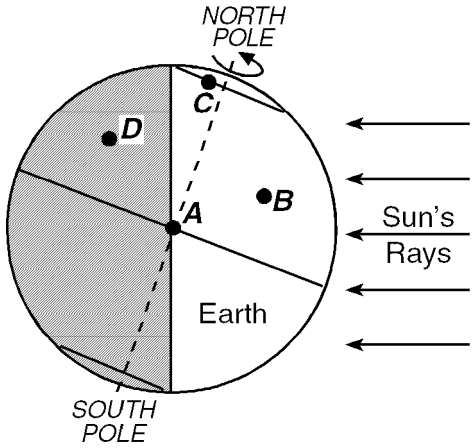


D)



Questions 86 and 87 refer to the following:

The diagram below illustrates the position of the Earth in relation to the Sun on one particular day. Points *A*, *B*, *C*, and *D* are locations on the Earth's surface.



86) In which direction would an observer at point *D* look to find Polaris?

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

87) What is the latitude of point *A*?

A) 90° N **C) 0°**
B) $23\frac{1}{2}$° N **D) 15° N**

88) As a person travels due west across New York State, the altitude of Polaris will

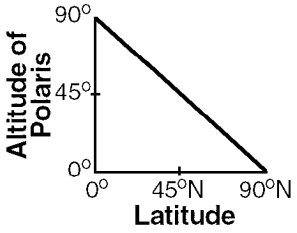
A) decrease
B) increase
C) remain the same

89) The *best* evidence that the Earth has a spherical shape would be provided by

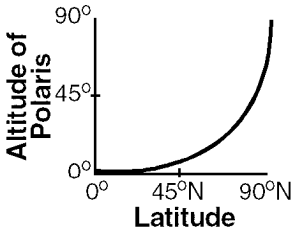
A) the change in the time of sunrise and sunset at a single location during 1 year
B) photographs of the Earth taken from space
C) the prevailing wind direction at many locations on the Earth's surface
D) the time the Earth takes to rotate on its axis at different times of the year

90) Which graph *best* represents the relationship between the latitude of an observer and the observed altitude of Polaris above the northern horizon?

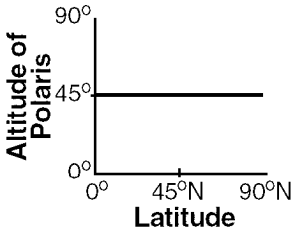
A)



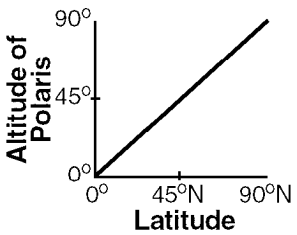
B)



C)



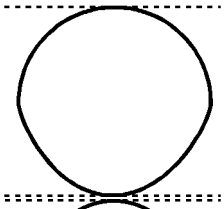
D)

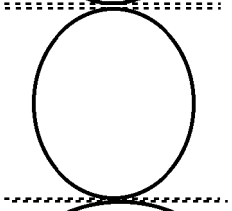


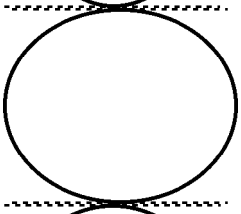
91) According to the *Earth Science Reference Tables*, what is the approximate thickness of the troposphere?

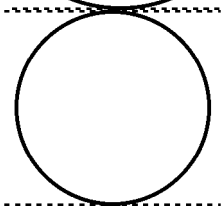
A) 27 km **C) 50 km**
B) 12 km **D) 7 km**

92) Which diagram most accurately shows the cross-sectional shape of the Earth?

A) 

B) 

C) 

D) 

93) According to the *Earth Science Reference Tables*, as altitude increases from the tropopause to the mesopause, the atmospheric temperature will

A) increase, then decrease
B) decrease, only
C) increase, only
D) decrease, then increase

94) How are latitude and longitude lines drawn on a globe of the Earth?

A) Longitude lines are parallel and latitude lines meet at the poles.
B) Longitude lines are parallel and latitude lines meet at the Equator.
C) Latitude lines are parallel and longitude lines meet at the Equator.
D) Latitude lines are parallel and longitude lines meet at the poles.

95) To an observer on a ship at sea, at which latitude does the North Star appear *closest* to the horizon?

A) 5° N
B) 50° N
C) 85° N
D) 20° N

96) What is the difference in mean solar time between 30°N 75°W and 30°N 90°W?

A) 1 hour
B) 3 hours
C) 6 hours
D) 2 hours

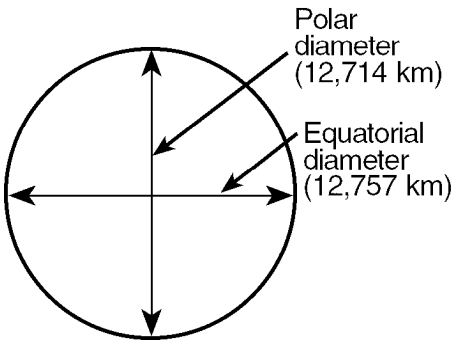
97) A contour map shows two locations, *X* and *Y*, 5 kilometers apart. The elevation at location *X* is 800 meters and the elevation at location *Y* is 600 meters. What is the gradient between the two locations? [Refer to the *Earth Science Reference Tables*.]

A) 12 m/km
B) 40 m/km
C) 160 m/km
D) 120 m/km

98) The actual polar diameter of the Earth is 12,714 kilometers. The equatorial diameter of the Earth is approximately

A) 12,700 km
B) 12,671 km
C) 12,714 km
D) 12,757 km

99) The diagram below represents the Earth's polar and equatorial diameters.



The Earth's polar circumference must be

A) greater than the equatorial circumference
B) less than the equatorial circumference
C) the same as the equatorial circumference

100) Which list shows atmospheric layers in the correct order upward from the Earth's surface?

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

101) According to the *Earth Science Reference Tables*, what is the diameter of the Moon?

A) 6.37×10^3 km
B) 7.35×10^{22} km
C) 1.74×10^3 km
D) 3.48×10^3 km

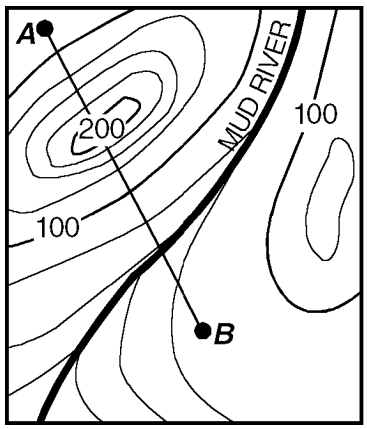
102) The total amount of water vapor per cubic meter in the atmosphere at sea level is approximately

A) 15 g/m^3
B) 30 g/m^3
C) 8 g/m^3
D) 1 g/m^3

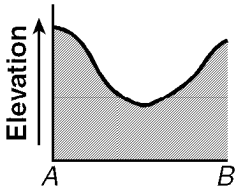
103) According to the *Earth Science Reference Tables*, the temperature in the stratosphere ranges from approximately

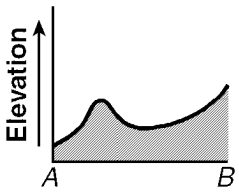
A) -55°F to 0°F
B) 10°C to 50°C
C) -55°C to 0°C
D) 10°F to 35°F

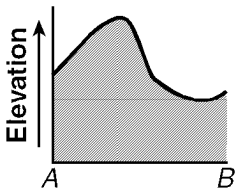
104) The isoline diagram below represents an elevation field.

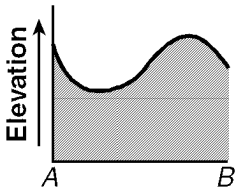


Which profile *best* represents the topography along line *AB*?

A)


B)


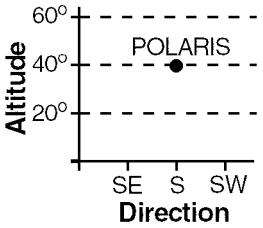
C)


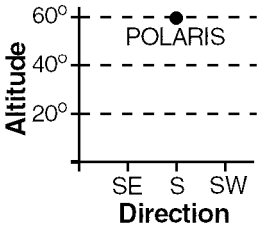
D)


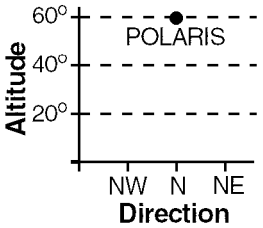
105) According to the *Earth Science Reference Tables*, the most abundant gas in the troposphere is

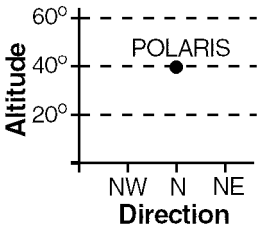
A) nitrogen
B) oxygen
C) carbon dioxide
D) water vapor

106) **Which diagram *best* shows the altitude and direction of Polaris for an observer in New York City? [Refer to the *Earth Science Reference Tables*.]**

A)


B)


C)


D)


107) **A stream in New York State begins at a location 350 meters above sea level and flows into a swamp 225 meters above sea level. The length of the stream is 25 kilometers. What is the gradient of the stream?**

A) 12 m/km
B) 5 m/km
C) 9 m/km
D) 17 m/km

108) **The angle of the star Polaris above the northern horizon can be used to determine an observer's**

A) latitude
B) solar time
C) longitude
D) local time

109) **Measurements taken from space show the Earth to be**

A) greatest in diameter at the poles
B) pear shaped
C) a perfect sphere
D) greatest in diameter at the Equator

110) **Which object *best* represents a true scale model of the shape of the Earth?**

A) a football
B) a Ping-Pong ball
C) a pear
D) an egg

111) **Oxygen is the most abundant element by volume in the Earth's**

A) hydrosphere
B) crust
C) troposphere
D) inner core

112) **According to the *Earth Science Reference Tables*, what is the temperature of the atmosphere at the stratopause?**

A) -55°C
B) 15°C
C) -90°C
D) 0°C

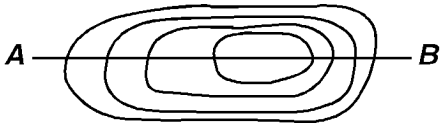
113) **In which atmospheric layer is most water vapor found?**

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

114) **From which set of polar and equatorial diameters can the actual shape of the Earth be inferred?**

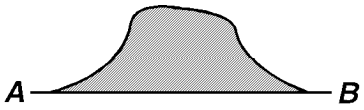
A) polar diameter = 12,714 km, equatorial diameter = 12,714 km
B) polar diameter = 12,714 km, equatorial diameter = 12,756 km
C) polar diameter = 12,756 km, equatorial diameter = 12,714 km
D) polar diameter = 12,756 km, equatorial diameter = 12,756 km

115) The diagram below represents contour lines on a topographic map with cross-section line *AB*.



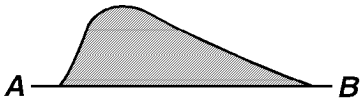
Which diagram *best* represents the topographic profile along line *AB*?

A)

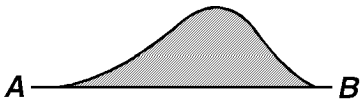


B)

C)

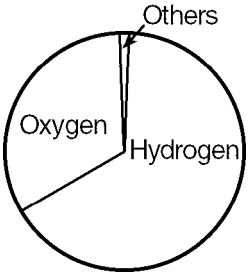


D)

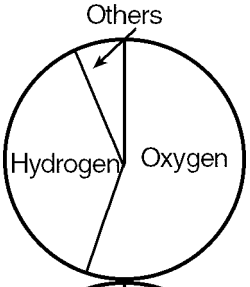


116) Which graph *best* represents the percentage by volume of the elements making up the Earth's hydrosphere?

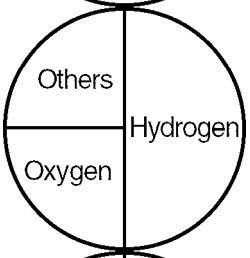
A)



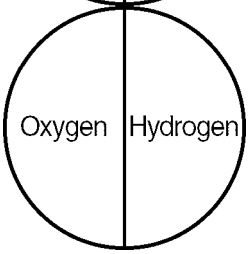
B)



C)

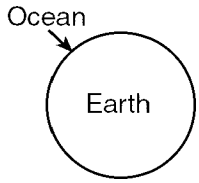


D)

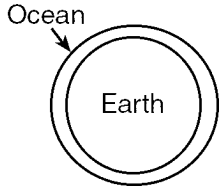


117) Which diagram *best* represents the Earth with the ocean depth drawn to scale?

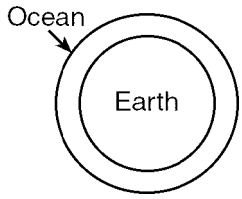
A)



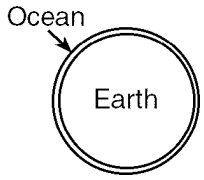
B)



C)



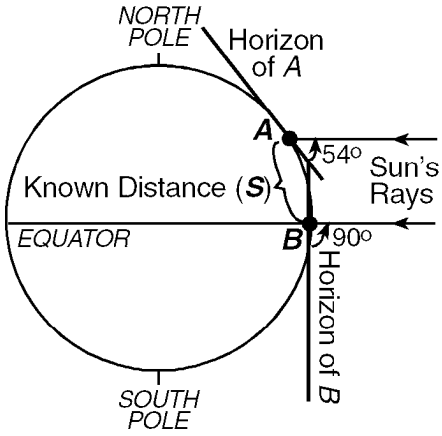
D)



118) The solid rock material that directly underlies the sediments on the ocean floor is part of the Earth's

A) troposphere
B) outer core
C) lithosphere
D) hydrosphere

119) The diagram below shows the altitude of the noon Sun as measured on March 21 by observers at locations *A* and *B*.



According to the *Earth Science Reference Tables*, an observer can use the known distance, *S*, and the Sun's altitude at *A* and *B* to find the Earth's

A) eccentricity
B) oblateness
C) density
D) circumference

120) The average radius of the Earth is approximately 6.4×10^3 kilometers. This value is equal to

A) 64,000 km
B) 640 km
C) 6,400 km
D) 640,000 km

121) Which layer of the atmosphere has the *greatest* density?

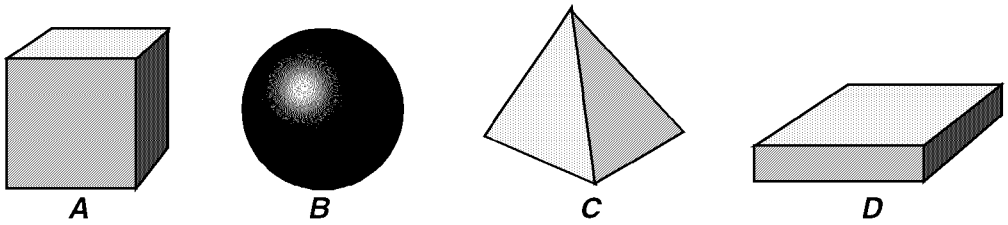
A) troposphere
B) mesosphere
C) thermosphere
D) stratosphere

122) Which statement *best* describes the stratosphere? [Refer to the *Earth Science Reference Tables*.]

A) It is located 75 kilometers above sea level.
B) It absorbs large amounts of water vapor from the troposphere.
C) It is warmer at the top than at the bottom.
D) It has greater pressure at the top than at the bottom.

Questions 123 through 125 refer to the following:

The diagrams below represent four solid objects made of the same uniform material. The accepted values for the volume and mass of each object are given, except for the volume of object *A*.



A	*B*	*C*	*D*
Mass = 8.00 g Volume = ?	Mass = 6.30 g Volume = 3.15 cm^3	Mass = 4.00 g Volume = 2.00 cm^3	Mass = 3.50 g Volume = 1.75 cm^3

(not drawn to scale)

123) A sample having a volume of 1 cubic centimeter was cut from each object. Which is an accurate statement about the samples?

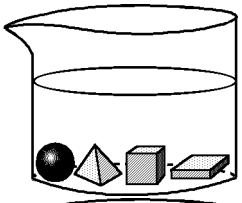
A) Each sample has the same shape.
B) The sample from object *B* has the greatest volume.
C) Each sample has the same mass.
D) The sample from object *D* has the greatest density.

124) What is the volume of object *A*?

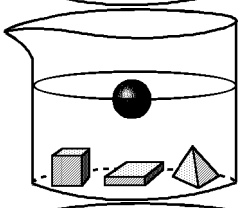
A) 8.00 cm^3
B) 4.00 cm^3
C) 1.00 cm^3
D) 2.00 cm^3

125) Which diagram *best* shows what would happen if the four objects were placed in a large beaker of water at room temperature?

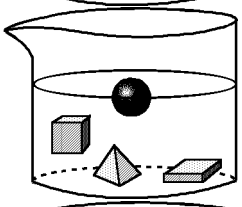
A)



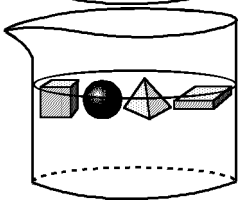
B)



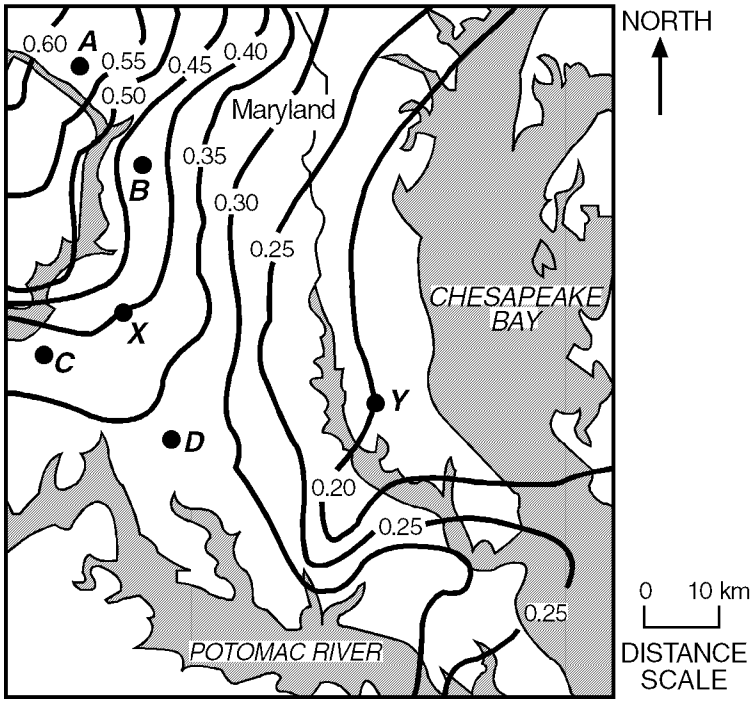
C)



D)



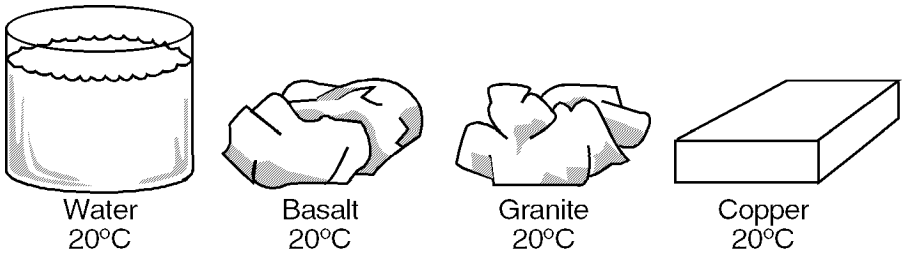
126) The field map below shows the average size of particles deposited by streams that drained an area of Maryland during the Pleistocene Epoch. The field values represent particle diameters in centimeters.



Which particle size would be most common at location *X*? [Particles are drawn actual size.]

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

127) The diagrams below represent 100-gram samples of four different Earth materials at room temperature. Each material has an initial temperature of 20°C.



What happens when the four substances are heated?

A) Their volume increases but their mass remains constant.
B) Their volume decreases but their mass remains constant.
C) Their volume and mass both increase.
D) Their volume and mass both decrease.

Questions 128 through 132 refer to the following:

The table below shows data for a student's collection of rock samples *A* through *I*, which are classified into groups *X*, *Y*, and *Z*. For each rock sample, the student recorded mass, volume, density, and a brief description. The density for rock *D* has been left blank.

Rock Collection

Group	Rock	Mass (g)	Volume (cm^3)	Density (g/cm^3)	Description
X	*A*	82.9	34.4	2.41	Grey, smooth, rounded
	B	114.2	42.6	2.68	Brown, smooth, rounded
	C	144.7	63.2	2.29	Black, smooth rounded
Y	*D*	159.4	59.7		Black and grey crystals, angular
	E	87.7	33.1	2.65	Clear and pink crystals, angular
	F	59.6	21.0	2.84	White, grey, and black crystals, angular
Z	*G*	201.1	68.4	2.94	Grey, shiny, flat
	H	85.1	39.8	2.14	Brown, sandy feel, flat
	I	110.2	47.3	2.33	Dark grey, flaky, flat

128) The student's classification system is based on

A) density
B) mass
C) color
D) shape

129) To obtain the data recorded in the column labeled "Description," the student used

A) a triple-beam balance
B) a calculator
C) her senses
D) an overflow can

130) The approximate density of rock sample *D* is

A) 3.32 g/cm^3
B) 2.67 g/cm^3
C) 2.75 g/cm^3
D) 3.75 g/cm^3

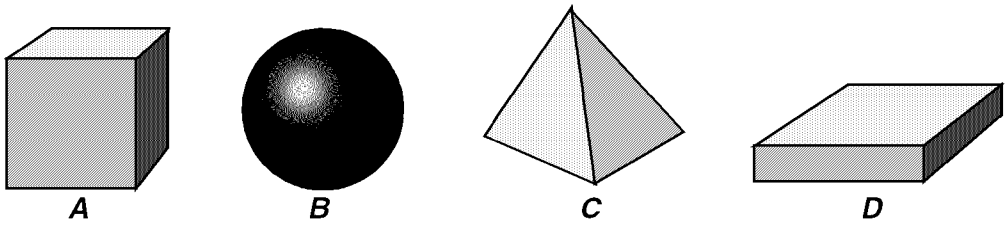
131) Which statement is an inference rather than an observation?

A) Rock *E* has a volume of 33.1 cm^3.
B) Rock *B* has been rounded by stream action.
C) Rock *G* is the same color as rock *I*.
D) Rock *H* is flat.

132) The student broke rock *G* into two pieces. Compared to the density of the original rock, the density of one piece would most likely be

A) less
B) the same
C) greater

133) The diagrams below represent four solid objects made of the same uniform material. The accepted values for the volume and mass of each object are given, except for the volume of object *A*.



A	*B*	*C*	*D*
Mass = 8.00 g Volume = ?	Mass = 6.30 g Volume = 3.15 cm^3	Mass = 4.00 g Volume = 2.00 cm^3	Mass = 3.50 g Volume = 1.75 cm^3

(not drawn to scale)

A student made four statements about the objects. Which statement was an observation?

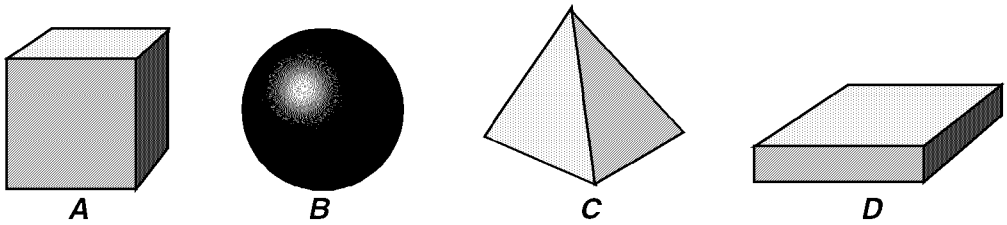
A) Object *C* is made of silicon and oxygen.

B) Object *B* is a sphere.

C) Object *A* is a piece of the mineral halite.

D) Object *D* may be able to float due to its shape.

134) The diagrams below represent four solid objects made of the same uniform material. The accepted values for the volume and mass of each object are given, except for the volume of object *A*.



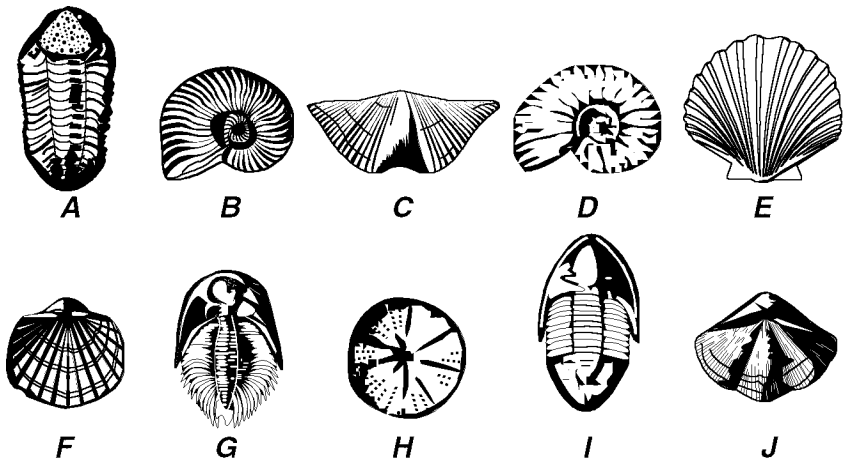
A	*B*	*C*	*D*
Mass = 8.00 g Volume = ?	Mass = 6.30 g Volume = 3.15 cm^3	Mass = 4.00 g Volume = 2.00 cm^3	Mass = 3.50 g Volume = 1.75 cm^3

(not drawn to scale)

A student incorrectly determines the volume of object *C* to be 1.90 cubic centimeters. What is the student's percentage of error?

A) 2% **B) 5%** **C) 1%** **D) 10%**

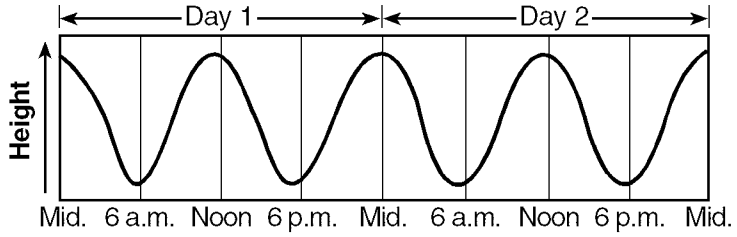
135) The diagrams below represent fossils found at different locations.



When classified by similarity of structure, which three fossils should be grouped together?

A) *A*, *F*, and *H* **B) *B*, *D*, and *I*** **C) *C*, *F*, and *J*** **D) *E*, *G*, and *H***

136) The graph below shows the changes in height of ocean water over the course of 2 days at one Earth location.



Which statement concerning these changes is *best* supported by the graph?

A) The changes are noncyclic and occur at sunrise and sunset.
B) The changes are cyclic and occur at the same time every day.
C) The changes are noncyclic and may occur at any time.
D) The changes are cyclic and occur at predictable time interval

Questions 137 through 139 refer to the following:

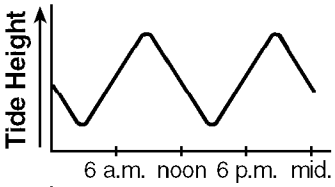
The Bay of Fundy, located on the east coast of Canada, has the highest ocean tides in the world. The St. John River enters the Bay of Fundy at the city of St. John, where the river actually reverses direction twice a day at high tides. Data for the famous Reversing Falls of the St. John River are given below for high and low tides on June 26 through 28, 1994.

Tidal Record for Reversing Falls, St. John River

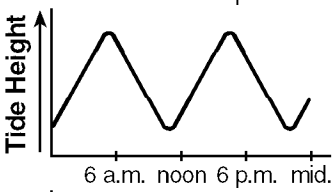
Date	Time of First High Tide	Time of First Low Tide	Time of Second High Tide	Time of Second Low Tide
June 26	2:25 a.m.	8:45 a.m.	2:55 p.m.	9:05 p.m.
June 27	3:15 a.m.	9:35 a.m.	3:45 p.m.	9:55 p.m.
June 28	4:05 a.m.	10:25 a.m.	4:35 p.m.	10:45 p.m.

137) Which graph *best* represents the tides recorded on June 28?

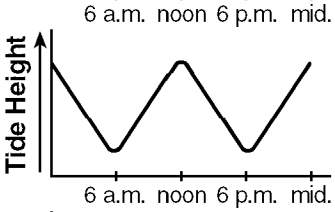
A)



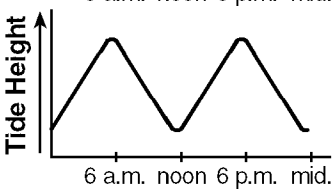
B)



C)



D)



138) Tides in the Bay of Fundy are *best* described as

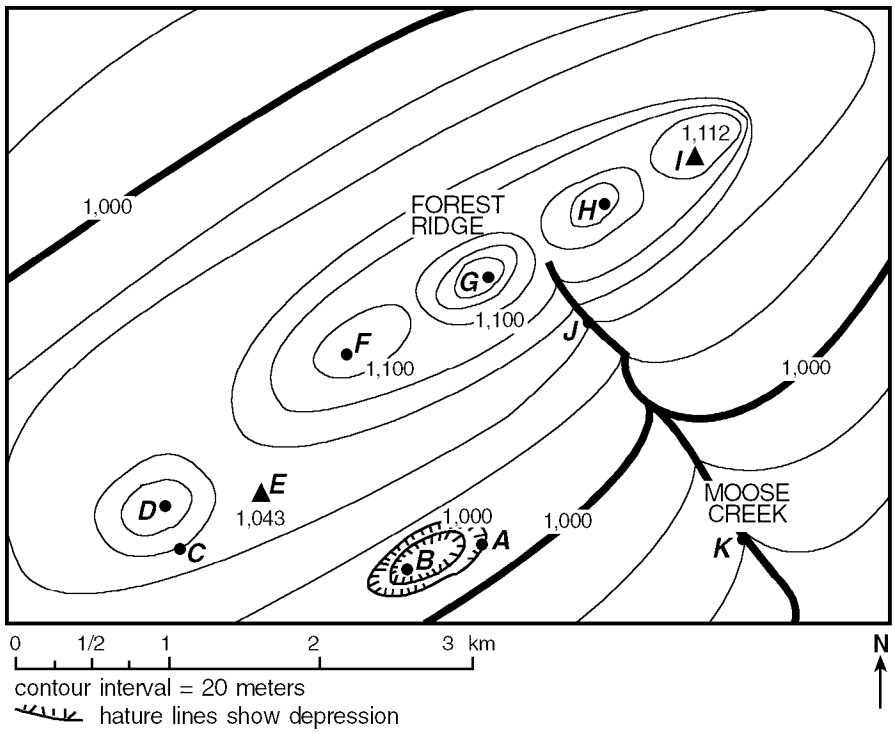
A) predictable and cyclic
B) unpredictable and cyclic
C) unpredictable and noncyclic
D) predictable and noncyclic

139) Compared to the first high tide on June 26, how much later in the day did the first high tide occur on June 27?

A) 1 h 10 min
B) 10 min
C) 50 min
D) 5 h 40 min

Questions 140 through 144 refer to the following:

The diagram below represents a contour map below. Letters *A* through *K* represent locations in the area. Hachure lines show depressions.



140) Which equation would be used to determine the stream gradient along Moose Creek between points *J* and *K*?

A) gradient = (1,040 m - 960 m) × 20 m

B) gradient = $\frac{1.8\text{ km}}{80\text{ m}} \times 100$

C) gradient = $\frac{0.8\text{ km}}{60\text{ m}}$

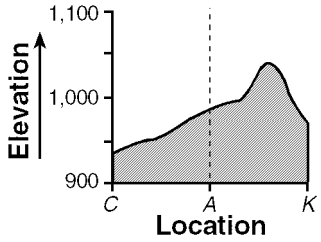
D) gradient = $\frac{80\text{ m}}{1.8\text{ km}}$

141) Which hilltop could have an elevation of 1,145 meters?

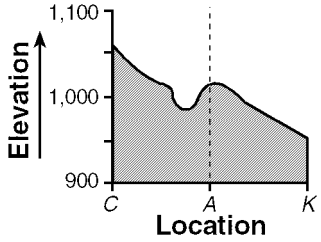
A) *F*
B) *G*
C) *H*
D) *D*

142) Which graph *best* represents the map profile along a straight line from point *C* through point *A* to point *K*?

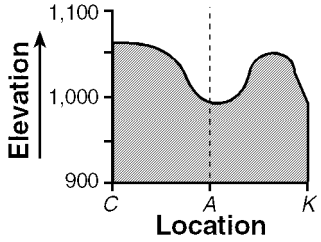
A)



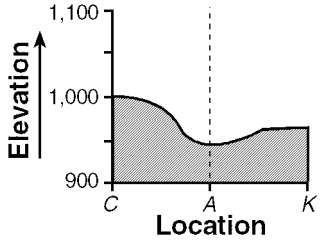
B)



C)



D)



143) Toward which direction does Moose Creek flow?

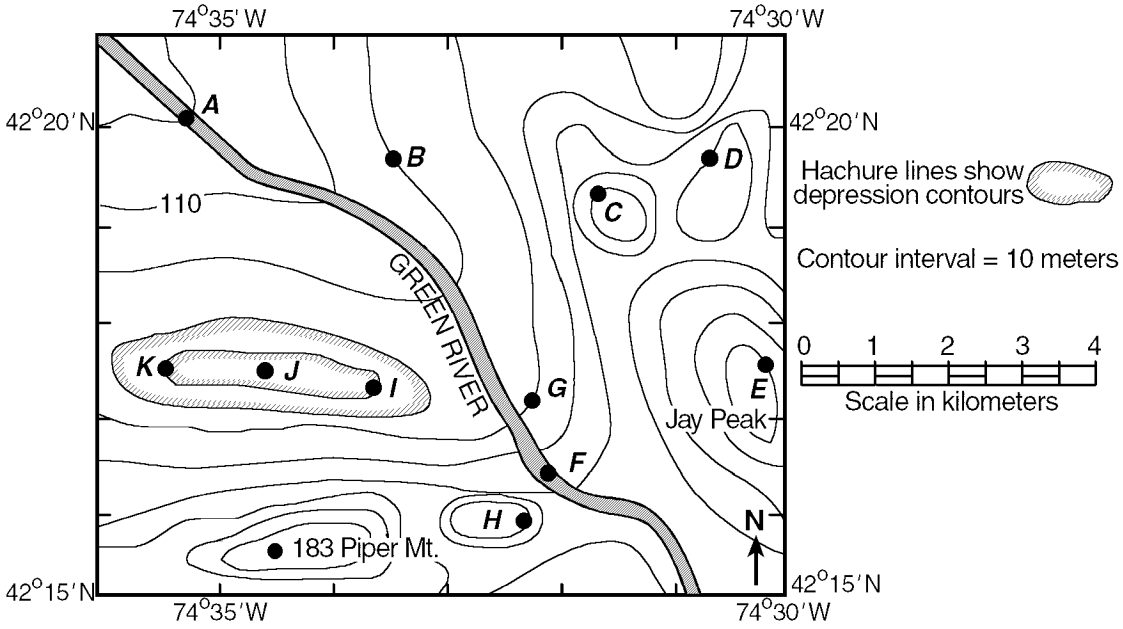
A) southwest
B) northeast
C) southeast
D) northwest

144) What is the *lowest* possible elevation of point *B*?

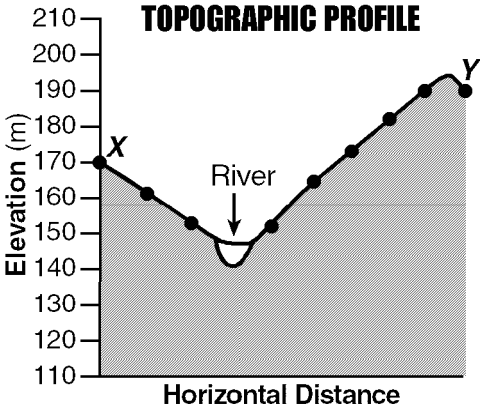
A) 981 m
B) 961 m
C) 941 m
D) 971 m

Questions 145 through 148 refer to the following:

Letters *A* through *K* are reference points on the contour map below.



145) The diagram below represents a topographic profile between two points on the map.



Which two locations are represented on the diagram by *X* and *Y*, respectively?

A) *B* and *H*
B) *A* and *I*
C) *K* and *C*
D) *H* and *E*

146) What is the latitude and longitude of location *B*?

A) 42°19′ N 74°33′ W
B) 42°19′ N 74°34′ W
C) 42°20′ N 74°33′ W
D) 42°20′ N 74°34′ W

147) Which points are located at the same elevation above sea level?

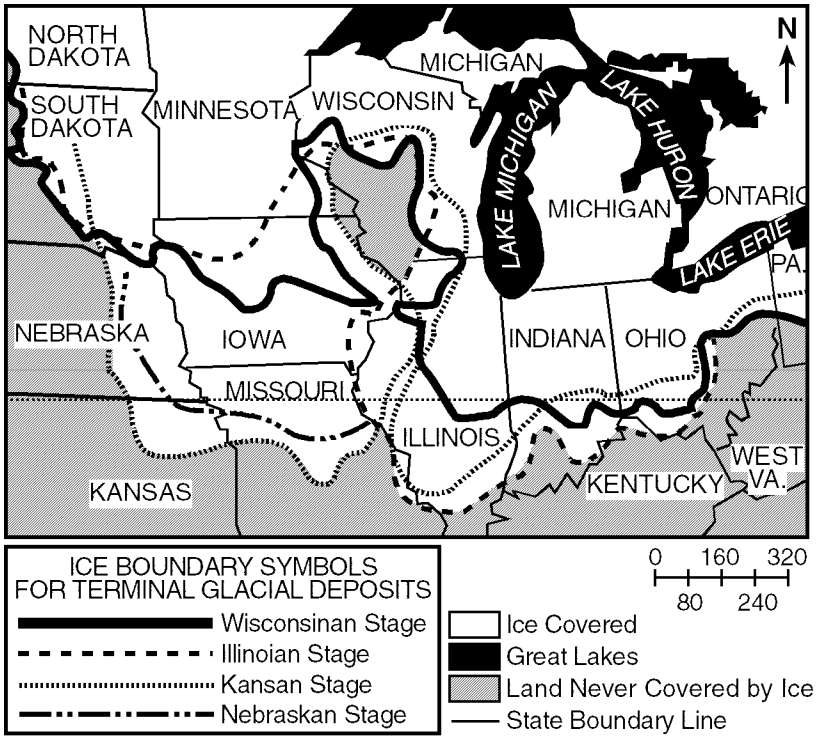
A) *I* and *K*
B) *C* and *B*
C) *H* and *E*
D) *A* and *F*

148) In which direction is Green River flowing?

A) southwest
B) northwest
C) northeast
D) southeast

Questions 149 through 151 refer to the following:

The map below shows the southernmost advance of four major stages of continental glaciation in the central United States. White areas represent land once covered by glacial ice. The general direction of ice movement was from north to south.



149) Which state was partly or completely covered by glacial ice during all four stages of ice advance?

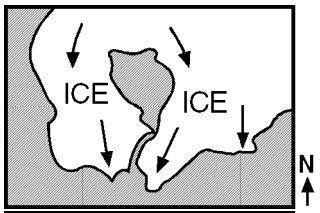
A) Missouri **C) Iowa**
B) Kentucky **D) Kansas**

150) In the state of Kansas, the average distance between the Nebraskan Stage ice boundary and the Kansan Stage ice boundary is approximately

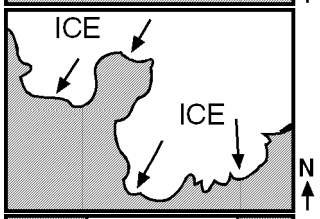
A) 180 km **C) 300 km**
B) 90 km **D) 40 km**

151) Which map *best* represents the southernmost advance of the continental ice sheet during the Wisconsinan Stage?

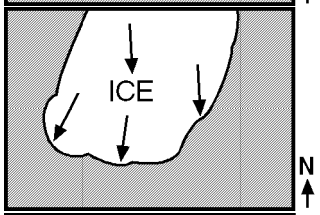
A)



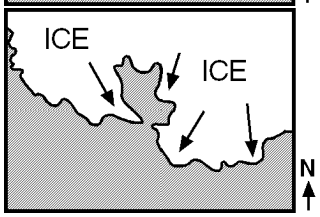
B)



C)

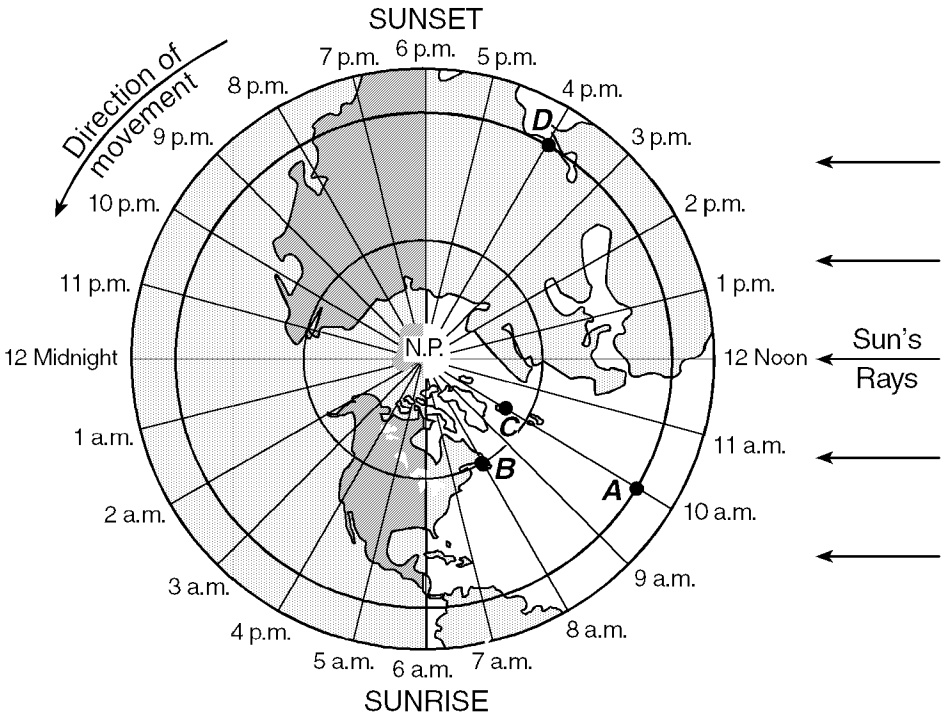


D)



Questions 152 through 154 refer to the following:

The map below represents a view of the Earth looking down from above the North Pole (N.P.), showing the Earth's 24 standard time zones. The Sun's rays are striking the Earth from the right. Points *A*, *B*, *C*, and *D* are locations on the Earth's surface.



152) Which two points have the same longitude?

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

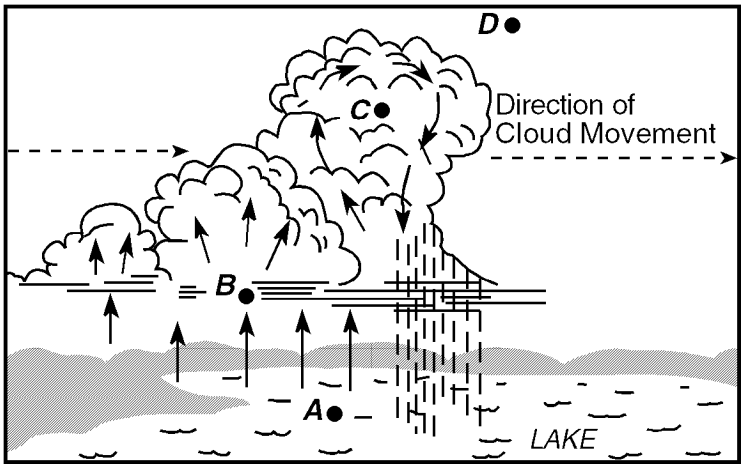
153) At which position would the altitude of the North Star (Polaris) be *greatest*?

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

154) Areas within a time zone generally keep the same standard clock time. In degrees of longitude, approximately how wide is one standard time zone?

A) $23\frac{1}{2}°$
B) $15°$
C) $7\frac{1}{2}°$
D) $30°$

155) The diagram below shows air movements associated with cumulus cloud formation over a lake during a summer day. *A*, *B*, *C*, and *D* are reference points.

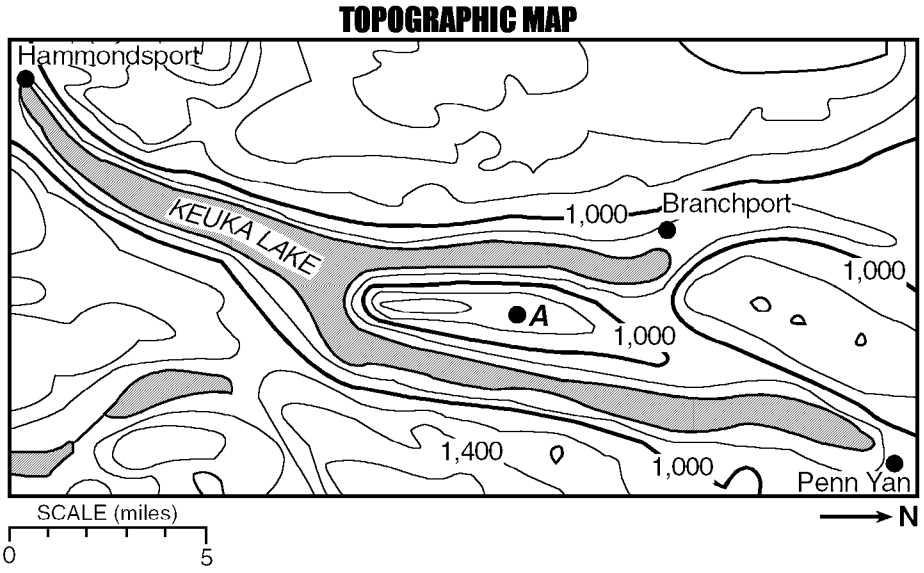


Point *D* is 10 kilometers above the Earth's surface. In which layer of the atmosphere is point *D* located?

A) lower mesosphere
B) upper troposphere
C) lower stratosphere
D) upper stratosphere

Questions 156 and 157 refer to the following:

The topographic map below represents Keuka Lake, one of the Finger Lakes in New York State. Branchport, Hammondsport, and Penn Yan are towns near the lake.



156) According to the map, about how many miles long is Keuka Lake?

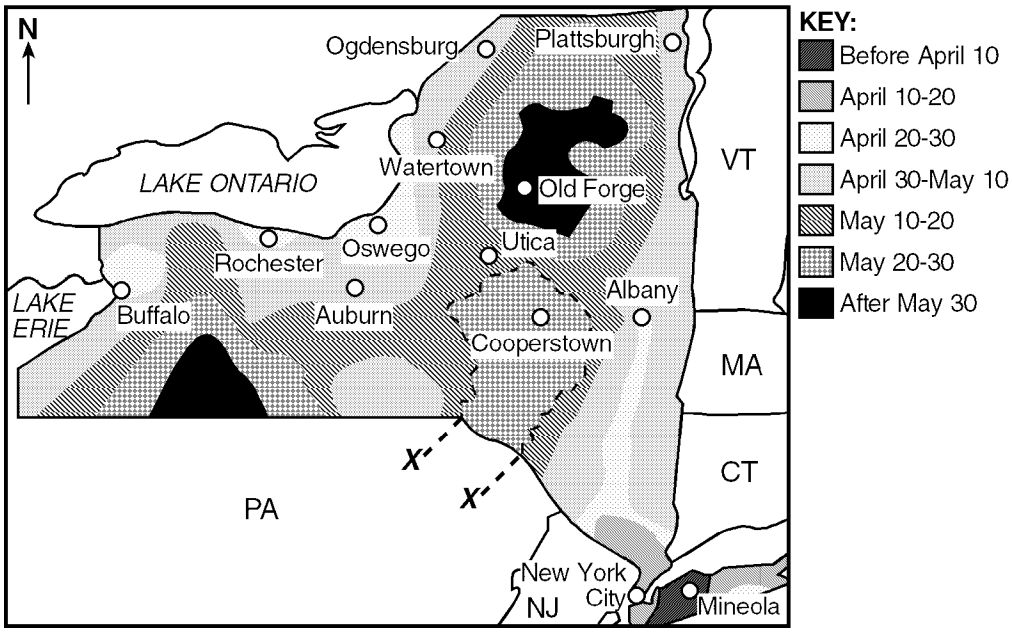
A) 24
B) 15
C) 29
D) 19

157) If the lake level were to rise to 1,000 feet above sea level, the area at *A* would

A) be under water
B) remain attached to the mainland to the north
C) become an island
D) become attached to the mainland to the south

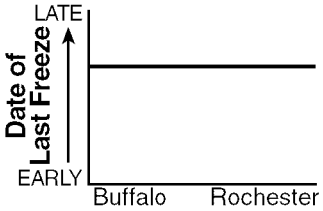
Questions 158 through 161 refer to the following:

The map below shows the average date of the last freezing temperatures in the spring at locations in New York State.

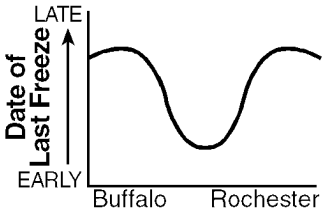


158) Which graph *best* represents the pattern in the date of the last spring freeze along a line from Buffalo to Rochester?

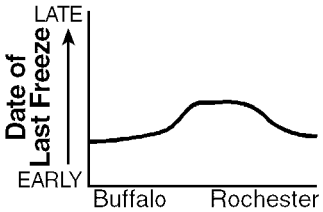
A)



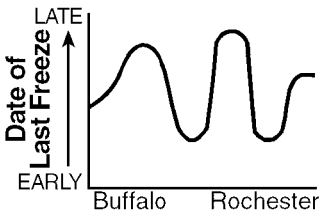
B)



C)



D)



159) In which location is the average date of the last spring freeze *earliest* in the year?

A) Buffalo
B) Cooperstown
C) Mineola
D) Plattsburgh

160) Why do the Adirondacks tend to have the latest date of freezing temperatures in New York State?

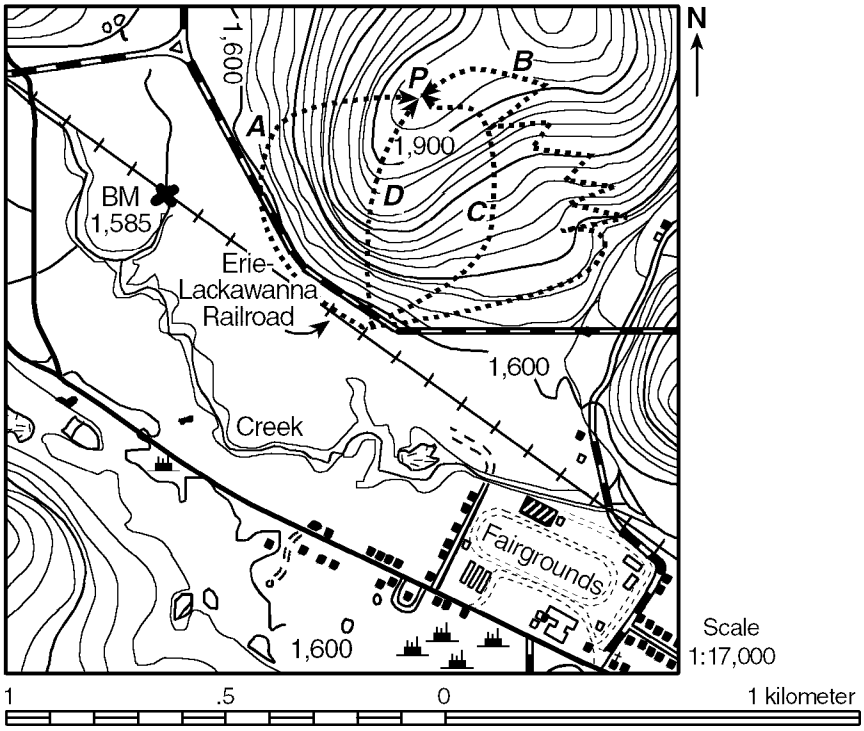
A) They receive more insolation and have less cloud cover.
B) They are surrounded by the Atlantic Ocean.
C) They receive moist air from the prevailing westerlies from the Great Lakes.
D) They are at high latitudes and altitudes.

161) The isoline shown as dashed line *X* in the diagram represents

A) May 31
B) 32° F
C) May 20
D) 0° C

Questions 162 through 165 refer to the following:

The heavy dashed lines on the topographic map below represent four hiking paths, *A*, *B*, *C*, and *D*. Point *P* is a location on the map.



162) What is the contour interval for this map?

A) 20 ft **C) 10 ft**
B) 100 ft **D) 25 ft**

163) On this map, 1 centimeter represents how many centimeters on the surface of the Earth?

A) 1,900 **C) 17,000**
B) 1,600 **D) 14,700**

164) What is the approximate length of the portion of the Erie-Lackawanna railroad tracks shown on the map?

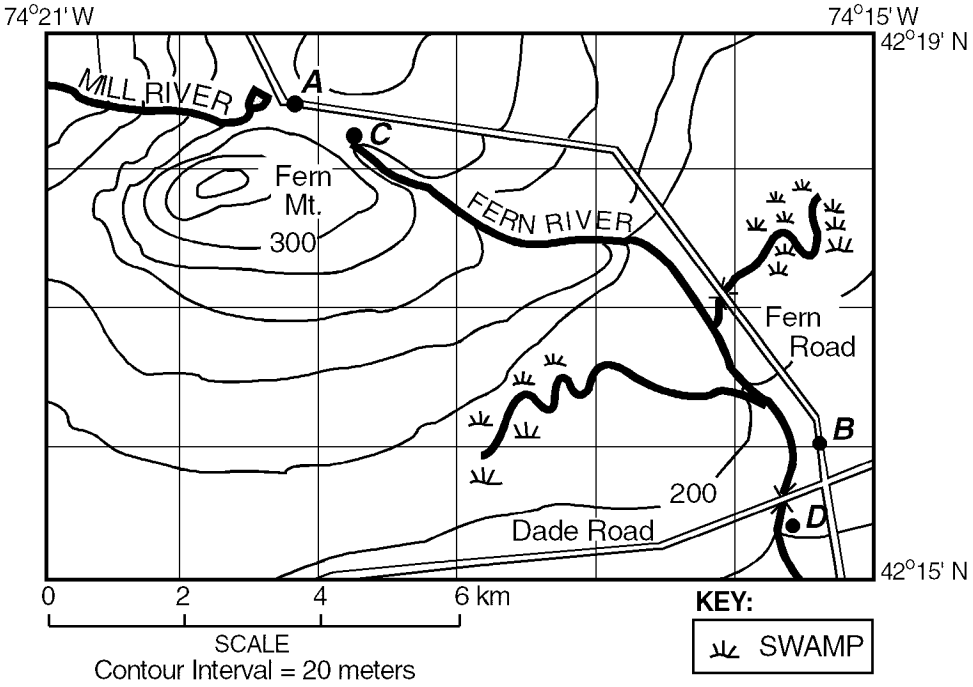
A) 2.0 km **C) 2.5 km**
B) 3.5 km **D) 3.0 km**

165) Which path climbs the *steepest* part of the hill from the railroad tracks to point *P*?

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

Questions 166 through 170 refer to the following:

Points *A* through *D* represent locations in the region.



166) What is the approximate change in elevation from point *C* to point *D*?

A) 280 m **C) 300 m**
B) 500 m **D) 100 m**

167) Compared to Mill River, Fern River appears to

A) flow toward the same lake
B) have fewer tributaries
C) flow in the opposite direction
D) drain a smaller region

168) The top of Fern Mountain could have an elevation of

A) 351 m **C) 362 m**
B) 500 m **D) 301 m**

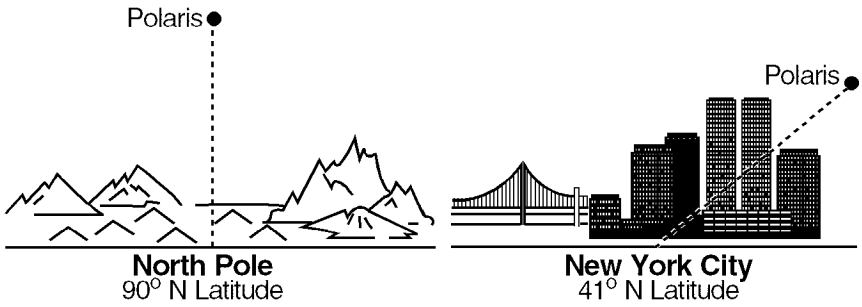
169) What is the approximate latitude of point *B*?

A) 74°22′ W **C) 74°15′ W**
B) 42°16′ N **D) 42°19′ N**

170) What is the approximate distance between point *A* and point *B* measured along Fern Road?

A) 9.0 km **C) 8.0 km**
B) 5.0 km **D) 10.0 km**

171) The diagrams below show the altitude of Polaris at two different Earth locations.

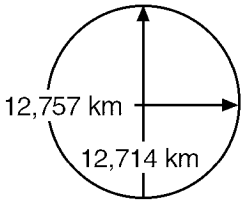


Which statement is *best* supported by the diagram?

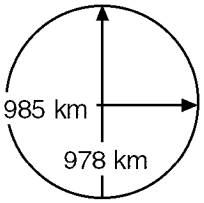
A) The altitude of Polaris varies with the season of the year.
B) Polaris is clearly visible only at the North Pole.
C) Polaris appears directly overhead at all locations in the Northern Hemisphere.
D) The altitude of Polaris is 41° at New York City.

172) The diagrams below compare the shapes of the Earth and three other planets. (Note: The diagrams are not drawn to scale.)

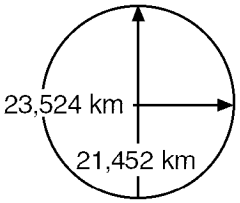
(Roundness ratio = $\frac{\text{Polar diameter}}{\text{Equatorial diameter}}$.)



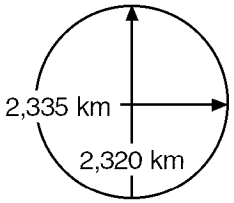
Earth
Polar diameter = 12,714 km
Equatorial diameter = 12,757 km
Roundness ratio = 0.9966



Planet *A*
Polar diameter = 978 km
Equatorial diameter = 985 km
Roundness ratio = 0.9929



Planet *B*
Polar diameter = 21,452 km
Equatorial diameter = 23,524 km
Roundness ratio = 0.9119

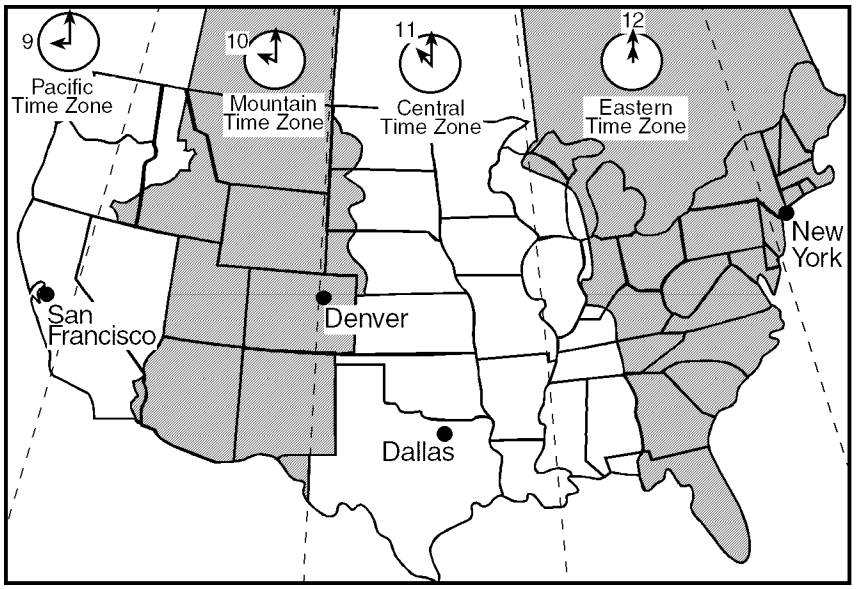


Planet *C*
Polar diameter = 2,320 km
Equatorial diameter = 2,335 km
Roundness ratio = 0.9935

How does the shape of the Earth compare to the shape of planets *A*, *B*, and *C*?

A) The Earth is less round than planets *A*, *B*, and *C*.
B) The Earth is more round than planets *A*, *B*, and *C*.
C) The Earth is more round than planets *A* and *B*, but less round than planet *C*.
D) The Earth is more round than planet *A*, but less round than planets *B* and *C*.

Questions 173 and 174 refer to the following:



173) The dashed boundaries between time zones are how many degrees of longitude apart?

A) 10°
B) $23\frac{1}{2}°$
C) 15°
D) 24°

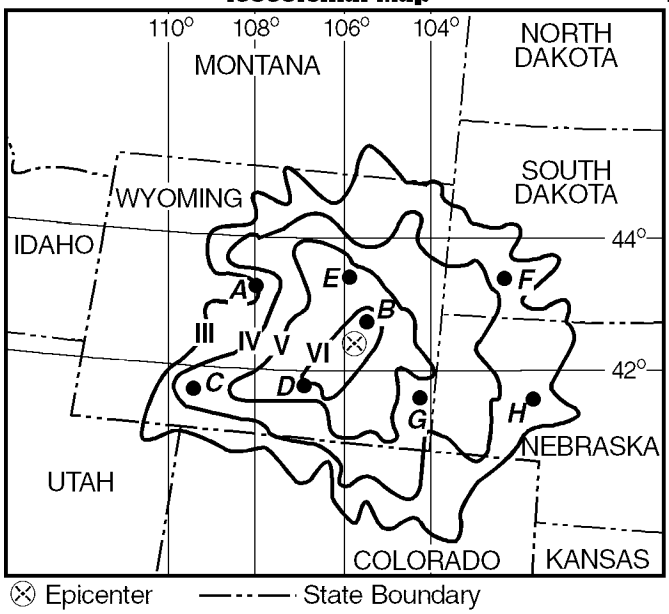
174) What is the time in San Francisco when it is 6 a.m. in Dallas?

A) 3 a.m.
B) 5 a.m.
C) 7 a.m.
D) 4 a.m.

Questions 175 and 176 refer to the following:

The isolines on the isoseismal map below connect points of equal earthquake intensity. Letters *A* through *H* represent locations near an earthquake epicenter. The *Modified Mercalli Intensity Scale* below measures the strength of an earthquake in terms of the effects it produces.

Isoseismal Map



Modified Mercalli Intensity Scale

Intensity Level	Effect
I	Felt only by a few people
II	Felt indoors by a few people, especially on the upper floors of buildings.
III	Vibration like that of a passing heavy truck: heavy objects swing
IV	Dishes, windows, and doors rattle
V	Dishes and windows may break; felt by nearly everyone
VI	Felt by all; heavy furniture may move

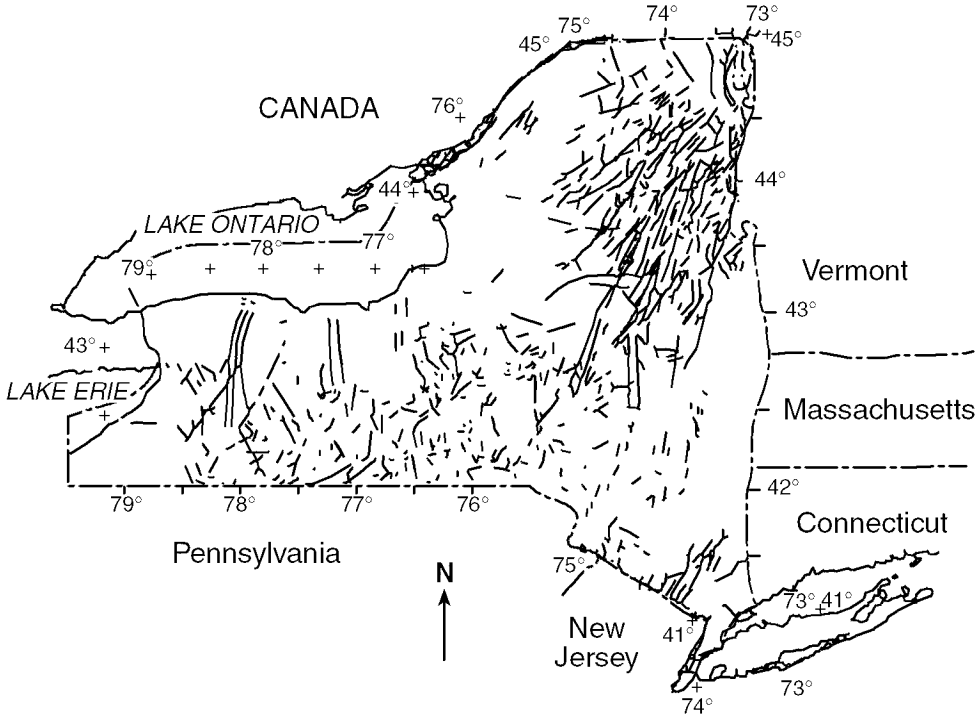
175) What is the approximate latitude and longitude of the epicenter?

A) 43°30′ N 106°10′ W
B) 42°30′ N 105°45′ W
C) 107°10′ N 43°30′ W
D) 106°45′ N 42°30′ W

176) Between which two locations did the *greatest* change in earthquake intensity occur?

A) *G* and *H*
B) *A* and *B*
C) *C* and *D*
D) *E* and *F*

177) The map below shows many of the major faults and fractures in the surface bedrock of New York State.

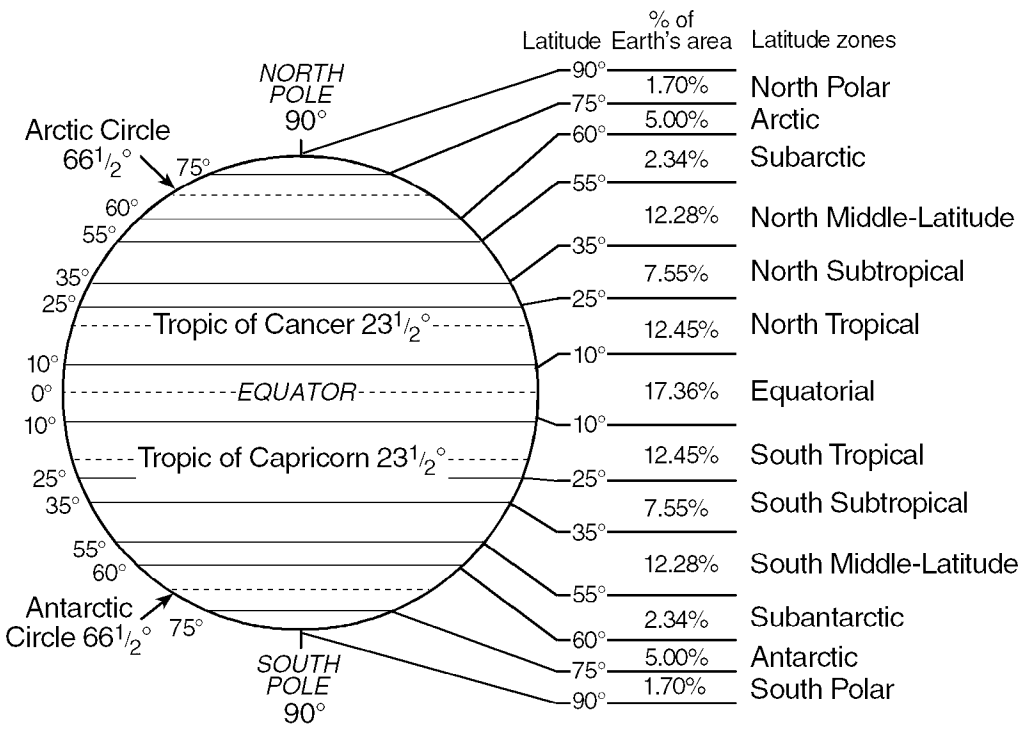


A large earthquake associated with one of these faults occurred at 45°N 75°W on September 5, 1994. Which location in New York State was *closest* to the epicenter of the earthquake?

A) Buffalo
B) Albany
C) Massena
D) New York City

Questions 178 and 179 refer to the following:

The diagram below shows the latitude zones of the Earth.



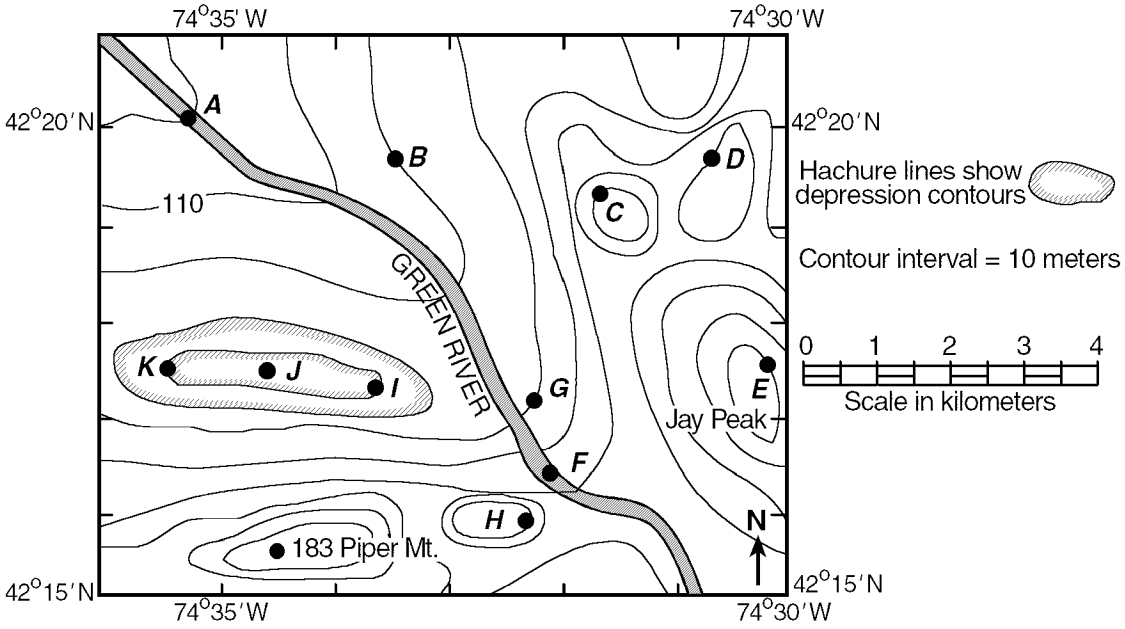
178) What is the total number of degrees of latitude covered by the Equatorial zone?

A) 10°
B) 20°
C) 0°
D) 17°

179) In which latitude zone is New York State located?

A) North Subtropical
B) North Middle-Latitude
C) North Tropical
D) North Polar

180) Letters *A* through *K* are reference points on the contour map below.

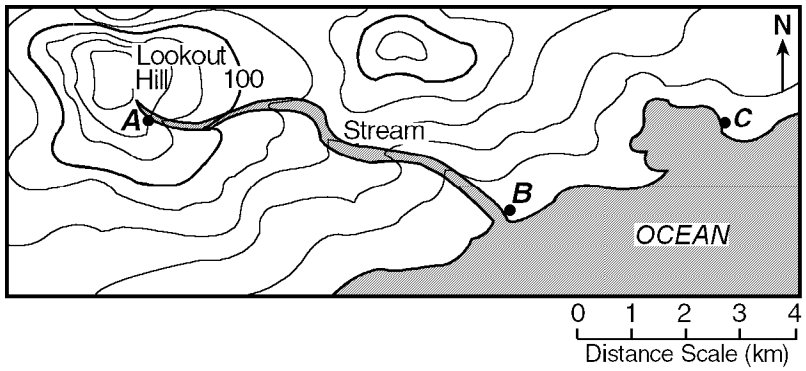


What is the approximate distance along Green River from point *A* to point *F*?

A) 10 km **B) 9 km** **C) 7 km** **D) 5 km**

Questions 181 through 185 refer to the following:

Points *A* through *C* are locations on the contour map below. Elevations are in meters.



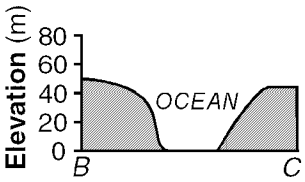
181) Which side of Lookout Hill has the *steepest* slope?

A) west **C) north**

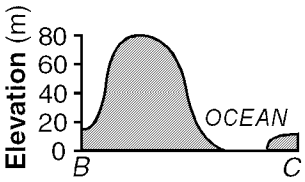
B) east **D) south**

182) Which diagram *best* represents the profile between point *B* and point *C*?

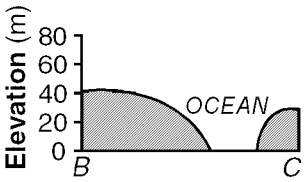
A)



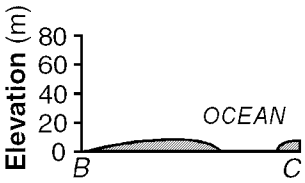
B)



C)



D)



183) The elevation at point *A* is

A) 300 m **C) 60 m**
B) 140 m **D) 100 m**

184) What is the approximate length of the stream between point *A* and point *B*?

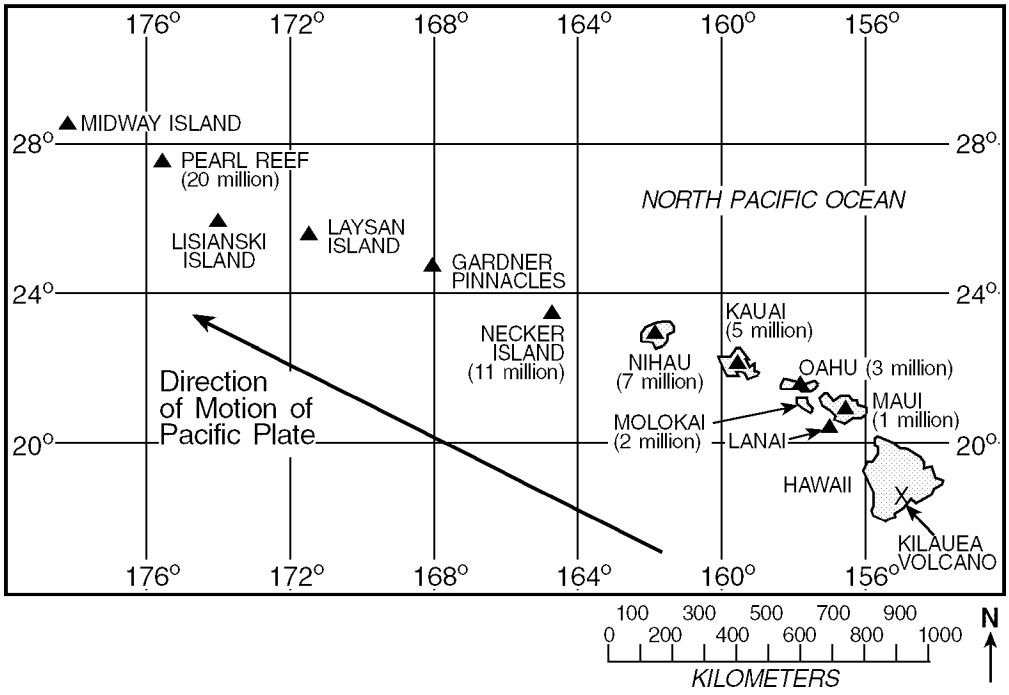
A) 5 km **C) 7 km**
B) 10 km **D) 9 km**

185) In which direction is the stream flowing?

A) southwest **C) northeast**
B) southeast **D) northwest**

186) The map below shows the location of major islands and coral reefs in the Hawaiian Island chain. Their ages are given in millions of years.

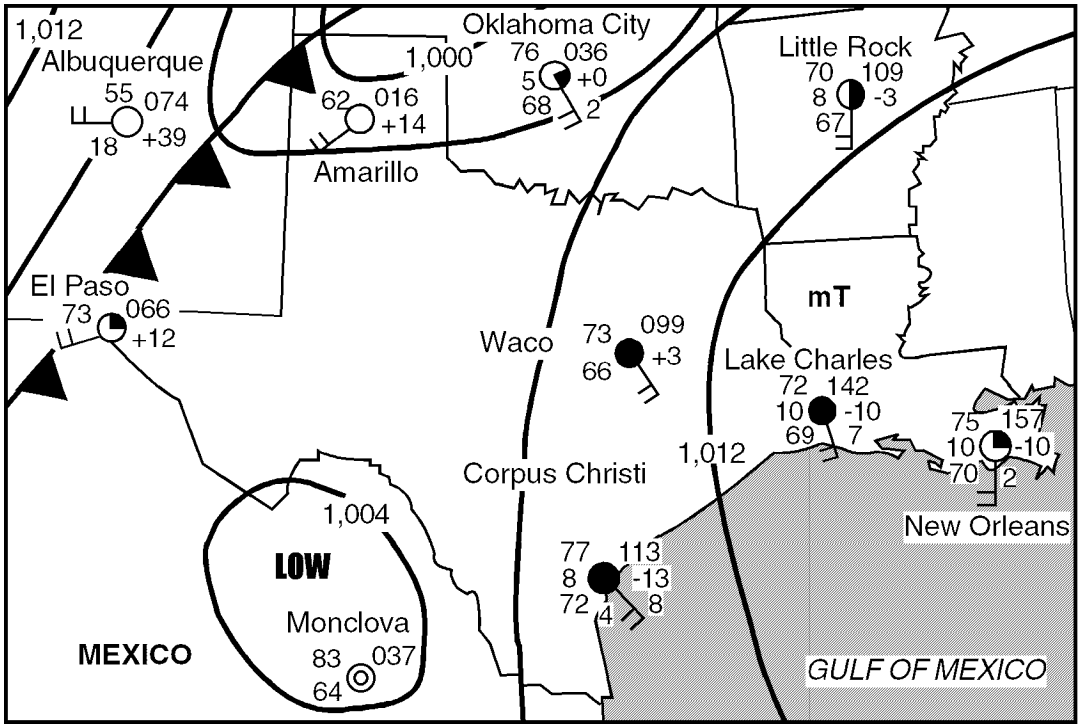
The islands of the Hawaiian chain formed from the same source of molten rock, called a hot plume. The movement of the Pacific Plate over the Hawaiian hot plume created a trail of extinct volcanoes that make up the Hawaiian Islands. The island of Hawaii (lower right) is the most recent island formed. Kilauea is an active volcano located over the plume on the island of Hawaii.



What is the location of Lisianski Island?

A) 26°S 174°W **B) 26°S 174°E** **C) 26°N 174°W** **D) 26°N 174°E**

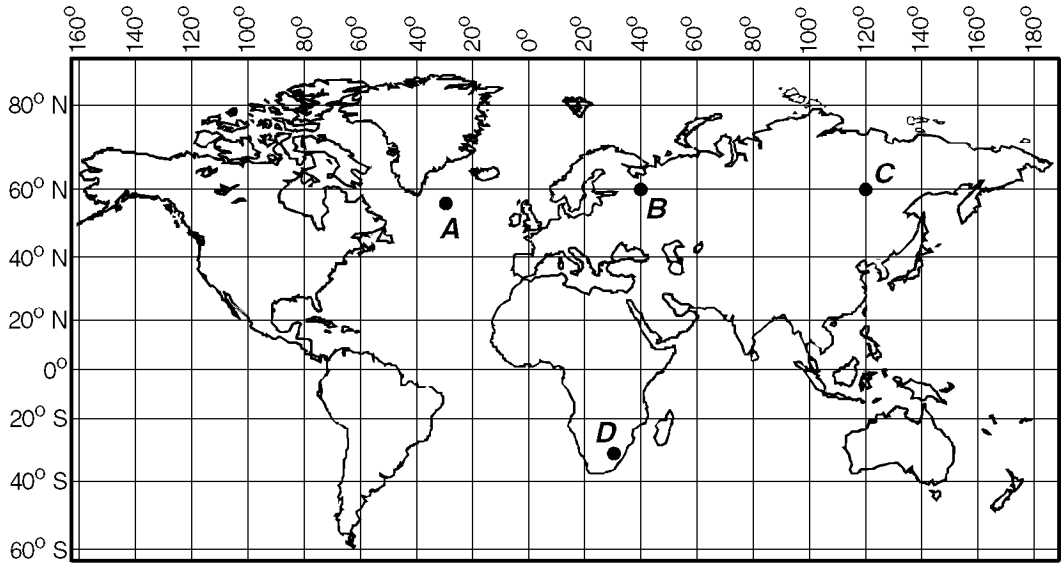
187) The weather map below shows part of the southern United States and northern Mexico.



The isolines on this map connect locations that have the same

A) dewpoint temperature
B) relative humidity
C) barometric pressure
D) air temperature

188) The world map below shows latitude and longitude. Letters *A*, *B*, *C*, and *D* represent locations on the map.

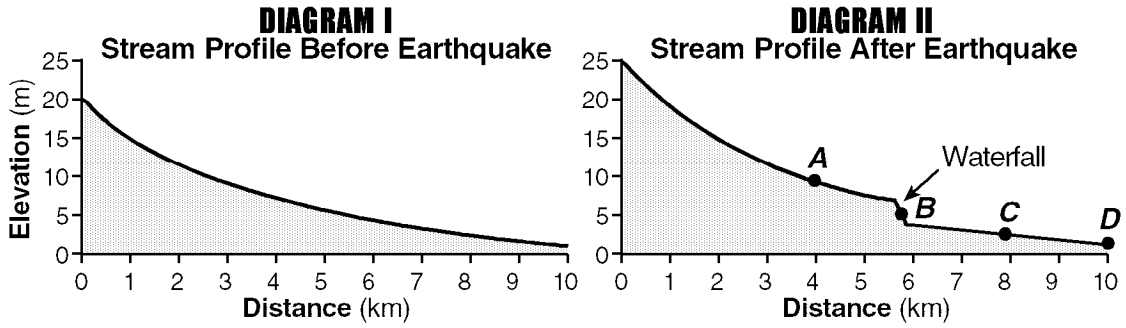


For which location are the correct latitude and longitude given?

A) *A*: 45°S 30°W
B) *B*: 40°N 60°W
C) *C*: 60°N 120°E
D) *D*: 30°S 30°W

Questions 189 and 190 refer to the following:

Diagram *I* below represents a stream's profile before an earthquake. Diagram *II* represents the same stream's profile after an earthquake elevated a portion of the land and produced a waterfall.



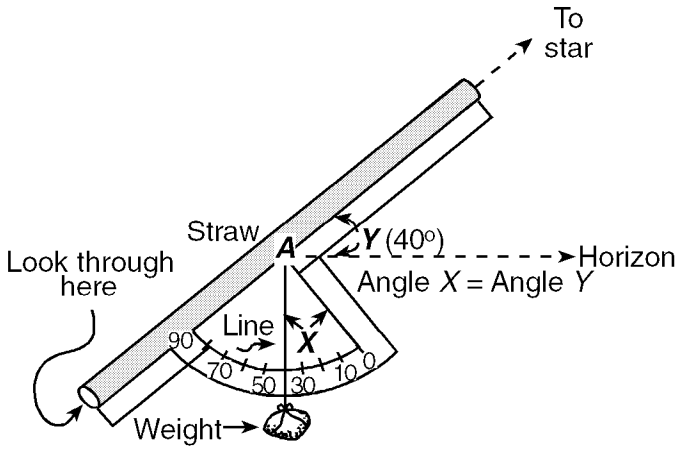
189) What was the approximate average gradient of the stream before the earthquake?

A) 0.5 m/km
B) 10 m/km
C) 2 m/km
D) 20 m/km

190) Compared to the stream's average gradient before the earthquake, the stream's average gradient after the earthquake is

A) greater
B) less
C) the same

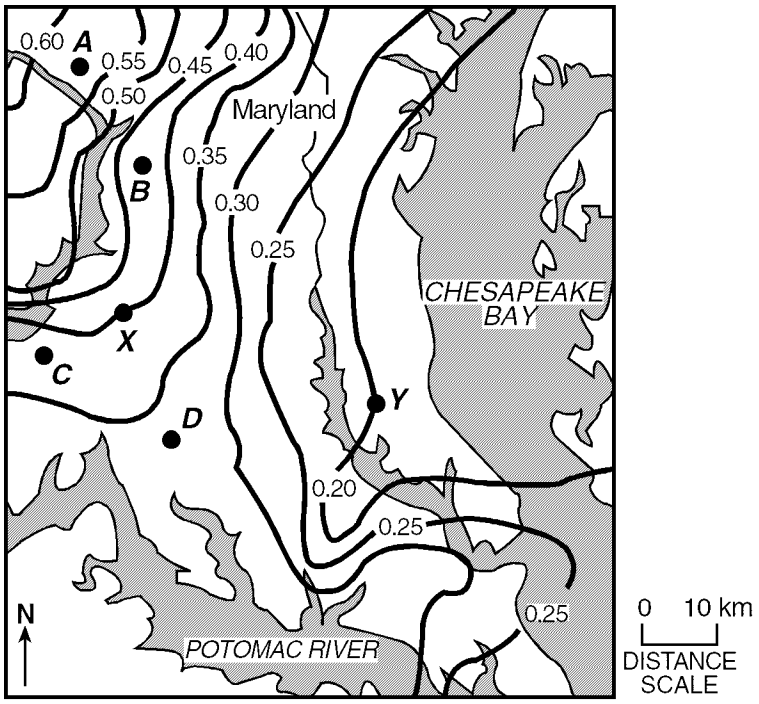
191) The diagram below shows an instrument made from a drinking straw, protractor, string, and rock.



This instrument was most likely used to measure the

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

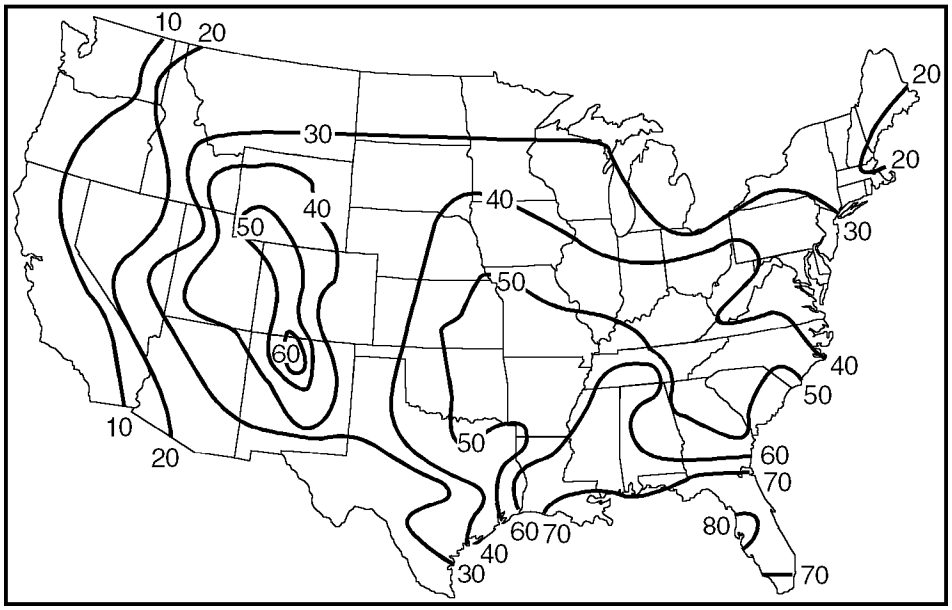
192) The field map below shows the average size of particles deposited by streams that drained an area of Maryland during the Pleistocene Epoch. The field values represent particle diameters in centimeters.



At which location would the sediment particles have an average diameter of 0.33 centimeter?

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

193) The map below shows the average yearly number of thunderstorms in the United States.

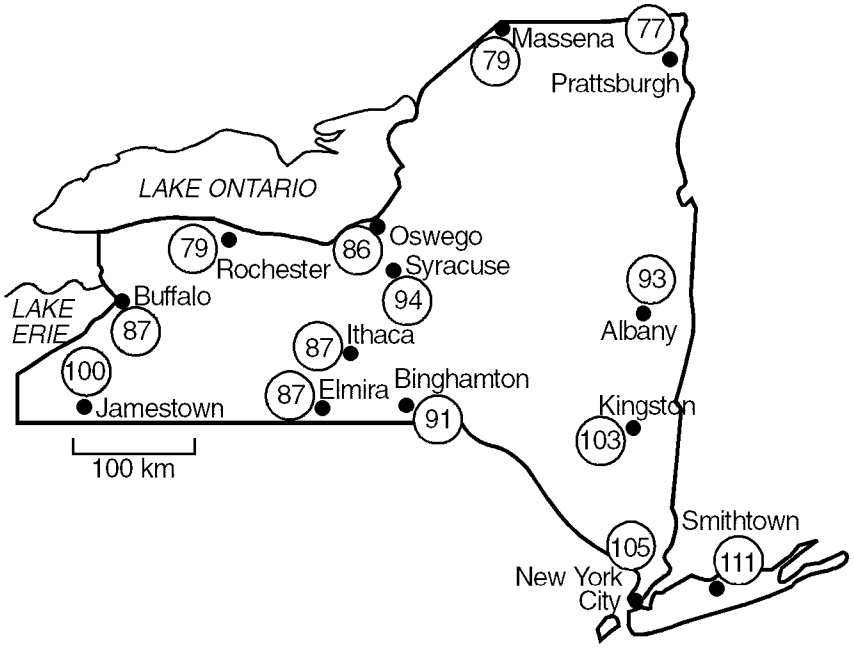


Approximately how many thunderstorms occur yearly in Albany, New York?

A) 32 **B) 25** **C) 19** **D) 41**

Questions 194 through 196 refer to the following:

The map below shows average annual amounts of precipitation in centimeters for several selected locations within New York State.

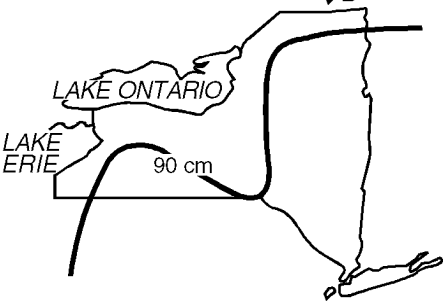


194) **Which map *best* represents the position of the 90-centimeter precipitation isoline?**

A)


B)


C)


D)


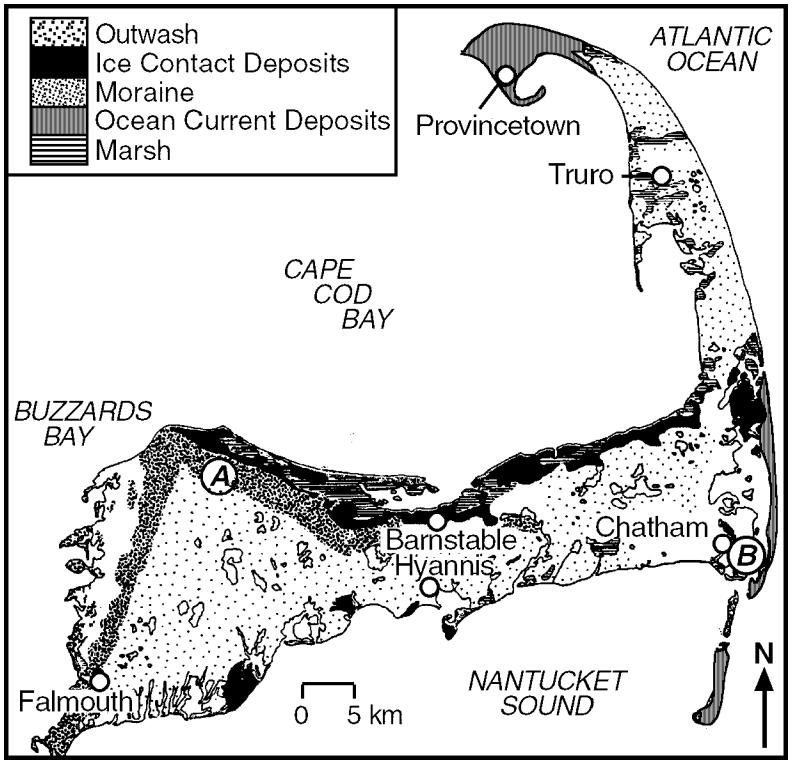
195) **In an eastward direction across New York State from Jamestown to Kingston, the average annual precipitation generally**

A) **increases, then decreases**
B) **decreases, only**
C) **decreases, then increases**
D) **increases, only**

196) **Between which two locations is the change in precipitation *greatest* per 100 kilometers?**

A) **Albany and Kingston**
B) **Massena and Plattsburgh**
C) **Rochester and Oswego**
D) **Buffalo and Jamestown**

197) The map below shows geologic features of Cape Cod, Massachusetts. The locations of several towns are shown as small circles.

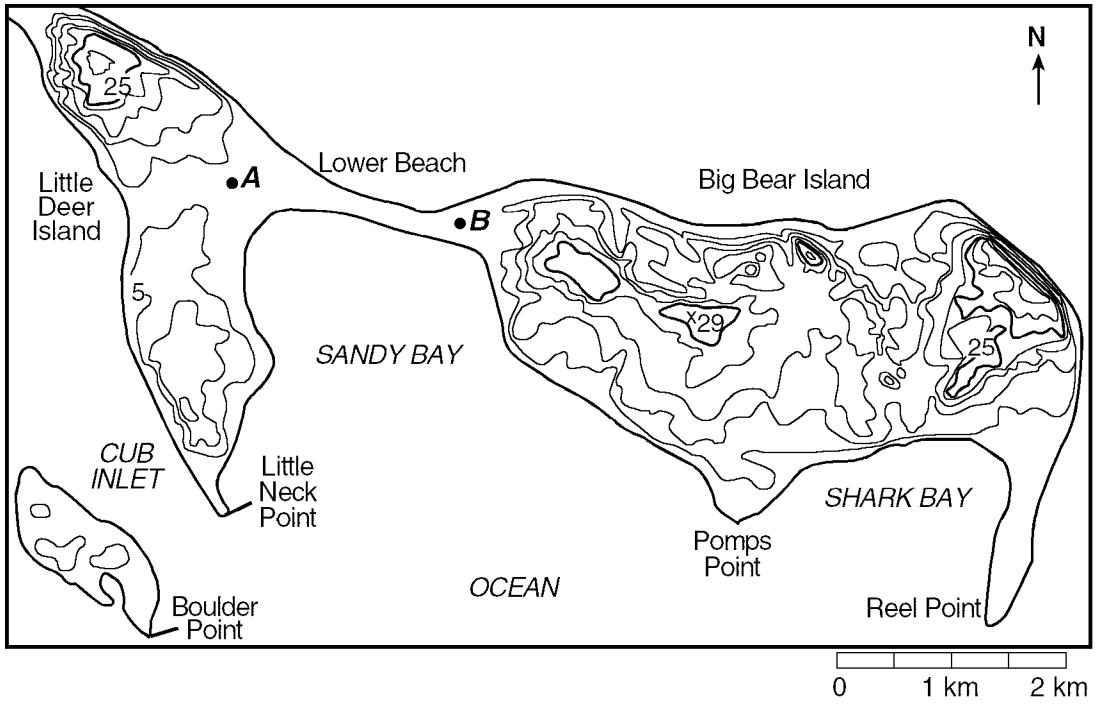


What is the approximate straight-line distance in kilometers from Hyannis to Chatham?

A) 25 km **B) 15 km** **C) 21 km** **D) 5 km**

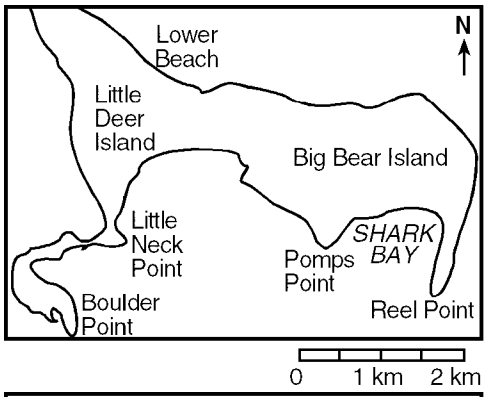
Questions 198 through 202 refer to the following:

Points *A* and *B* represent locations on the topographic map below. Elevations are shown in meters.

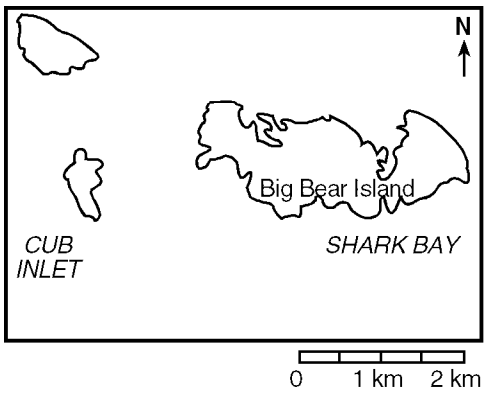


198) Which map would *best* represent this area if sea level were to rise 10 meters?

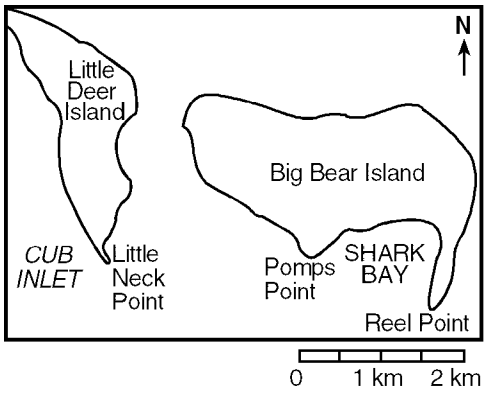
A)



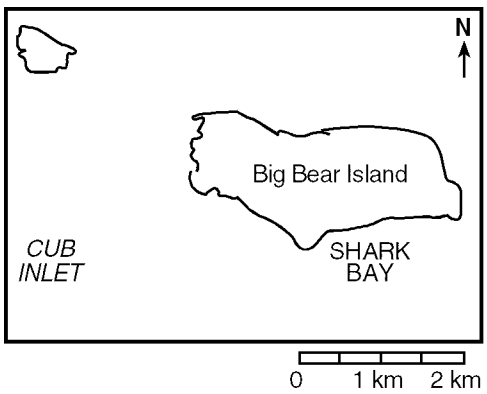
B)



C)

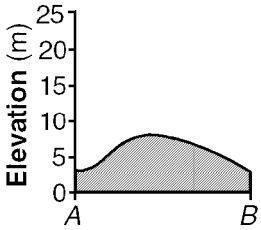


D)

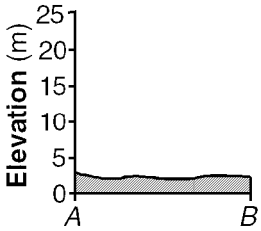


199) Which diagram *best* represents the topographic profile from location *A* to location *B*?

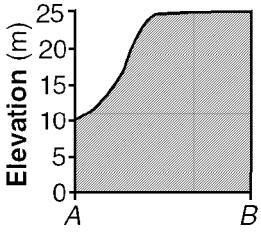
A)



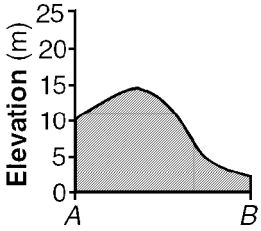
B)



C)



D)



200) What is the approximate distance across Cub Inlet from Little Neck Point to Boulder Point?

A) 2.4 km **C) 1.4 km**
B) 2.9 km **D) 1.9 km**

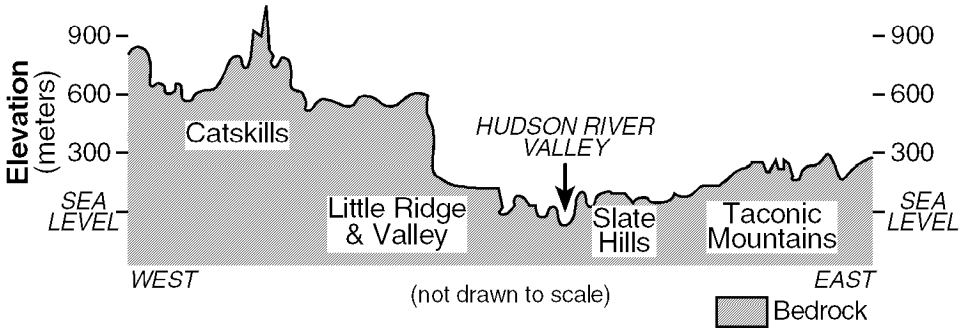
201) What could be the *highest* elevation on Little Deer Island?

A) 5 m **C) 34 m**
B) 39 m **D) 25 m**

202) Which section of Big Bear Island has the *steepest* coastline?

A) northeast **C) northwest**
B) southwest **D) southeast**

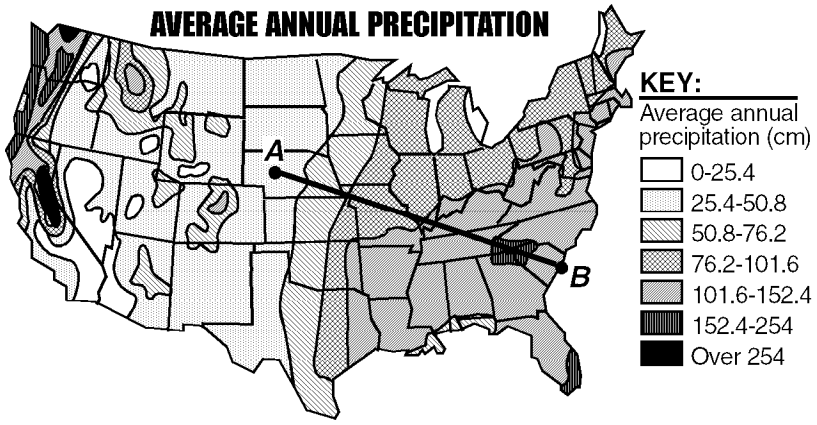
203) The diagram below is a west-to-east profile across the Hudson River Valley area showing the bedrock surface and elevation.



Which latitude is *closest* to the profile shown in the diagram?

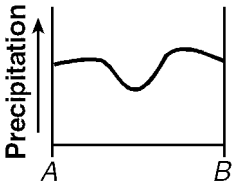
A) 44°30′ N **B) 43°30′ N** **C) 40°30′ N** **D) 42°30′ N**

204) Map *B* below shows the average annual precipitation for sections of the United States.

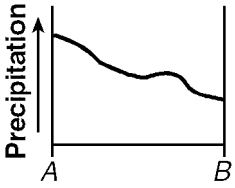


Which graph *best* represents the annual precipitation received along line *AB* on the map?

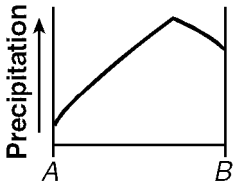
A)



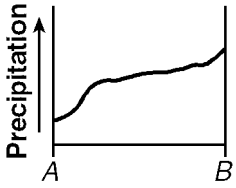
B)



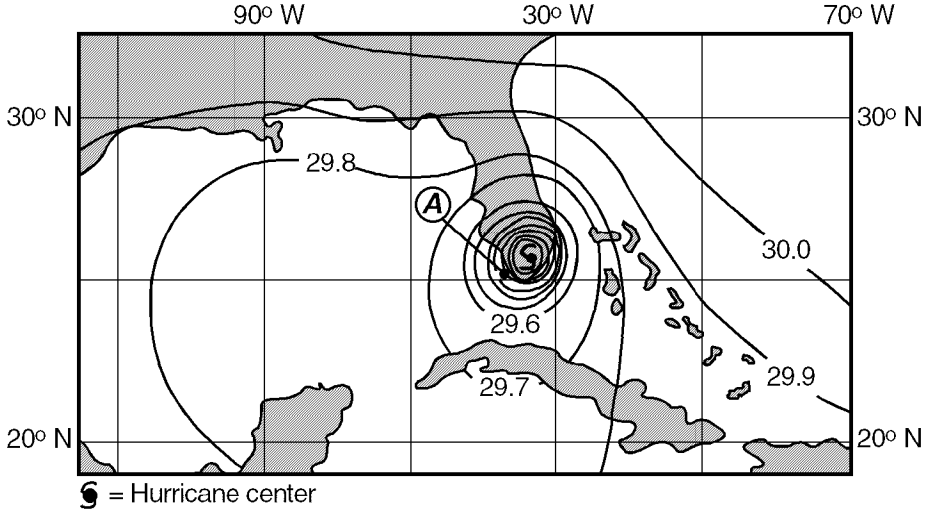
C)

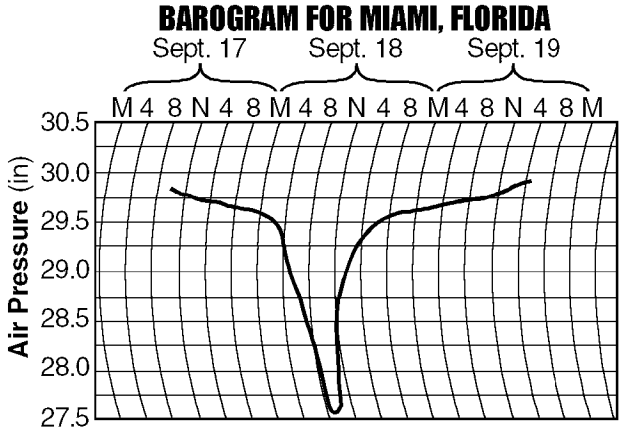


D)



205) The weather map below shows a hurricane that was located over southern Florida. The isobars show air pressure in inches of mercury. Letter *A* represents a point near the west coast of Florida. The barogram shows the recorded air pressure in inches of mercury as the hurricane passed near Miami, Florida.





What is the latitude and longitude at the center of the hurricane?

A) 34°N 89°W **B) 26°N 81°W** **C) 26°N 89°W** **D) 34°N 81°W**