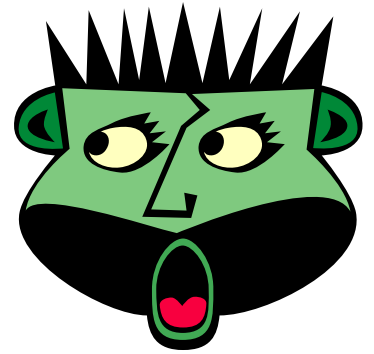


The University of the State of New York  
REGENTS HIGH SCHOOL EXAMINATION



# PHYSICAL SETTING EARTH SCIENCE

Wednesday, June 22, 2005 — 9:15 a.m. to 12:15 p.m., only

This is a test of your knowledge of Earth science. Use that knowledge to answer all questions in this examination. Some questions may require the use of the *Earth Science Reference Tables*. The *Earth Science Reference Tables* are supplied separately. Be certain you have a copy of the 2001 edition of these reference tables before you begin the examination.

Your answer sheet for Part A and Part B–1 is the last page of this examination booklet. Turn to the last page and fold it along the perforations. Then, slowly and carefully, tear off your answer sheet and fill in the heading.

The answers to the questions in Part B–2 and Part C are to be written in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

You are to answer *all* questions in all parts of this examination according to the directions provided in the examination booklet. Record your answers to the Part A and Part B–1 multiple-choice questions on your separate answer sheet. Write your answers to the Part B–2 and Part C questions in your answer booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on your separate answer sheet and in your answer booklet.

When you have completed the examination, you must sign the statement printed at the end of your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet and answer booklet cannot be accepted if you fail to sign this declaration.

Notice . . .

A four-function or scientific calculator and a copy of the 2001 *Earth Science Reference Tables* must be available for you to use while taking this examination.

The use of any communications device is strictly prohibited when taking this examination. If you use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**

## Part A

### Answer all questions in this part.

*Directions (1–35):* For *each* statement or question, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *Earth Science Reference Tables*.

- 1 Which list of three planets and Earth's Moon is arranged in order of increasing equatorial diameter?

(1) Earth's Moon, Pluto, Mars, Mercury  
(2) Pluto, Earth's Moon, Mercury, Mars  
(3) Mercury, Mars, Earth's Moon, Pluto  
(4) Mars, Mercury, Pluto, Earth's Moon

- 2 If Earth's axis were tilted  $35^\circ$  instead of  $23.5^\circ$ , the average temperatures in New York State would most likely

(1) decrease in both summer and winter  
(2) decrease in summer and increase in winter  
(3) increase in summer and decrease in winter  
(4) increase in both summer and winter

- 3 Which star has a higher luminosity and a lower temperature than the Sun?

(1) *Rigel* (3) *Alpha Centauri*  
(2) *Barnard's Star* (4) *Aldebaran*

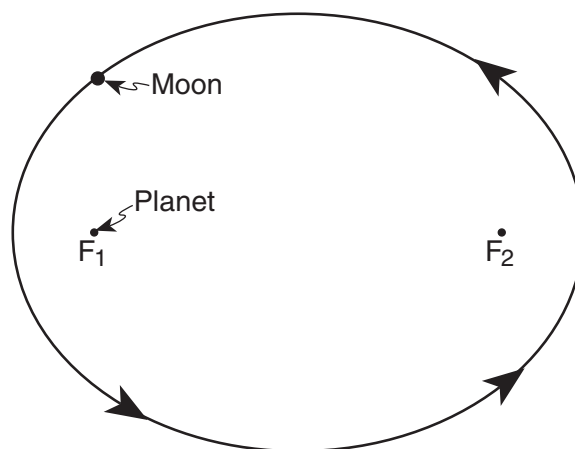
- 4 Starlight from distant galaxies provides evidence that the universe is expanding because this starlight shows a shift in wavelength toward the

(1) red-light end of the visible spectrum  
(2) blue-light end of the visible spectrum  
(3) ultraviolet-ray end of the electromagnetic spectrum  
(4) gamma-ray end of the electromagnetic spectrum

- 5 On which day of the year would the intensity of insolation at Kingston, New York, most likely be greatest?

(1) March 21 (3) September 23  
(2) June 21 (4) December 21

- 6 The diagram below represents the elliptical orbit of a moon revolving around a planet. The foci of this orbit are the points labeled  $F_1$  and  $F_2$ .



(Drawn to scale)

What is the approximate eccentricity of this elliptical orbit?

(1) 0.3 (3) 0.7  
(2) 0.5 (4) 1.4

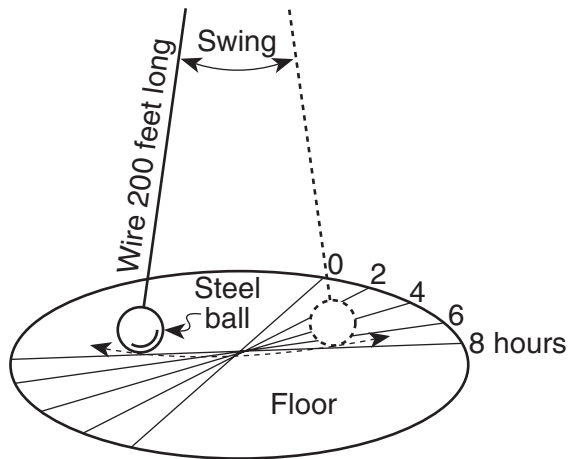
- 7 The coldest climates on Earth are located at or near the poles primarily because Earth's polar regions

(1) receive mostly low-angle insolation  
(2) receive less total yearly hours of daylight  
(3) absorb the greatest amount of insolation  
(4) are usually farthest from the Sun

- 8 Compared to an inland location, a location on an ocean shore at the same elevation and latitude is likely to have

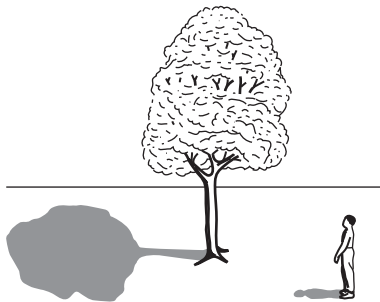
(1) cooler winters and cooler summers  
(2) cooler winters and warmer summers  
(3) warmer winters and cooler summers  
(4) warmer winters and warmer summers

- 9 The diagram below represents a Foucault pendulum swinging freely for 8 hours.



The Foucault pendulum appears to gradually change its direction of swing due to Earth's

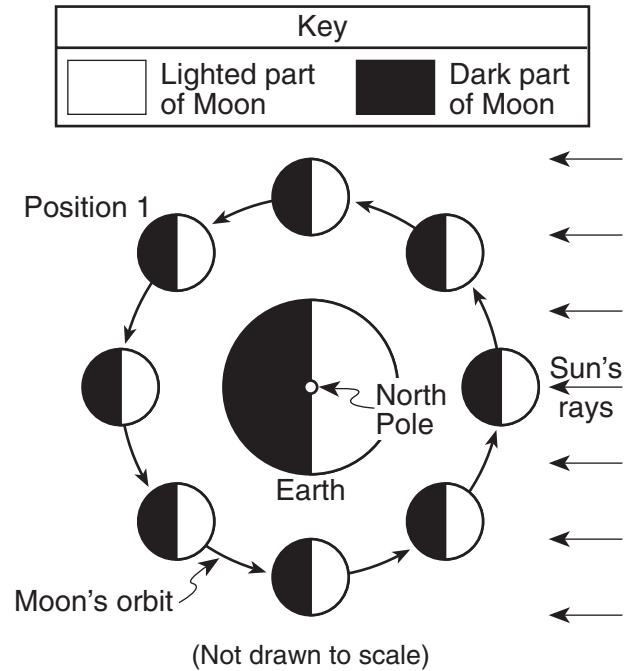
- (1) orbit around the Sun (3) tilted axis  
 (2) curved surface (4) spin on its axis
- 10 The diagram below shows the noontime shadows cast by a student and a tree.



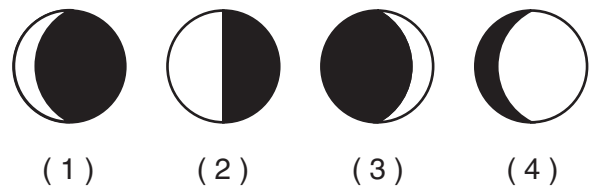
If the time is solar noon and the student is located in New York State, in what direction is the student facing?

- (1) north (3) east  
 (2) south (4) west

- 11 The diagram below represents the Moon in its orbit, as viewed from above Earth's North Pole. Position 1 represents a specific location of the Moon in its orbit.

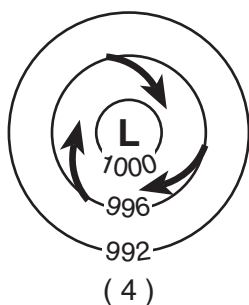
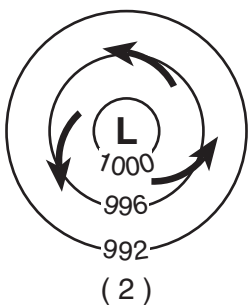
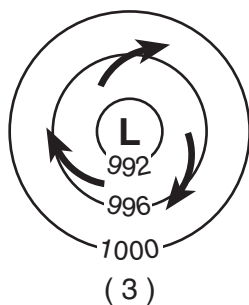
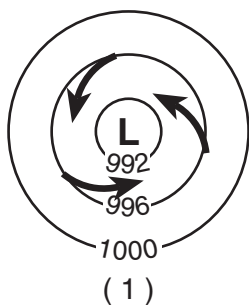


Which phase of the Moon will be seen from Earth when the Moon is at position 1?



- 12 During nighttime cooling, most of the energy radiated by Earth's oceans into space is
- (1) ultraviolet rays (3) visible light rays  
 (2) gamma rays (4) infrared rays
- 13 Landscapes with horizontal bedrock structure, steep slopes, and high elevations are classified as
- (1) plateau regions (3) lowland regions  
 (2) plain regions (4) mountain regions

14 Which map view best represents the pattern of isobar values, in millibars, and the pattern of wind flow, shown by arrows, at Earth's surface surrounding a Northern Hemisphere low-pressure center?



15 An observer measured the air temperature and the dewpoint and found the difference between them to be 12°C. One hour later, the difference between the air temperature and the dewpoint was found to be 4°C. Which statement best describes the changes that were occurring?

- (1) The relative humidity was decreasing and the chance of precipitation was decreasing.
- (2) The relative humidity was decreasing and the chance of precipitation was increasing.
- (3) The relative humidity was increasing and the chance of precipitation was decreasing.
- (4) The relative humidity was increasing and the chance of precipitation was increasing.

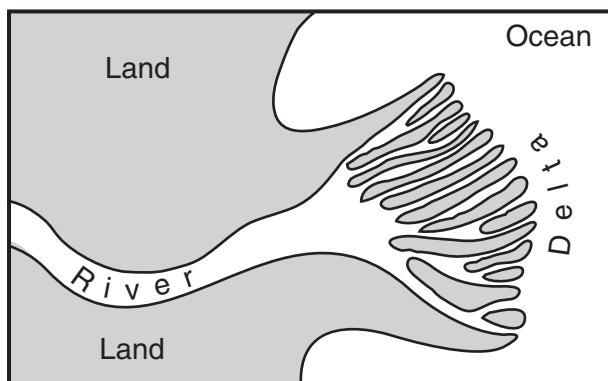
16 Which two ocean currents are both warm currents that primarily flow away from the equator?

- (1) Guinea Current and Labrador Current
- (2) Brazil Current and Agulhas Current
- (3) Alaska Current and Falkland Current
- (4) Canaries Current and Gulf Stream Current

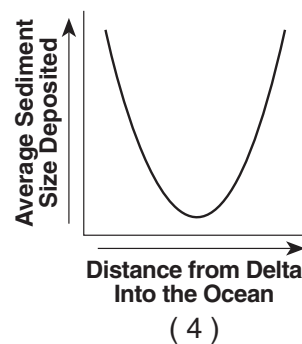
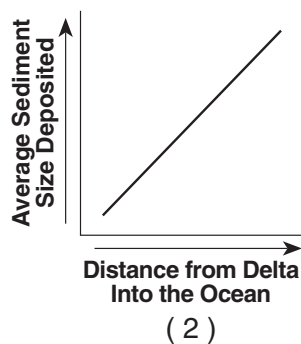
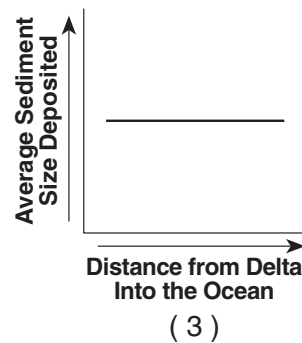
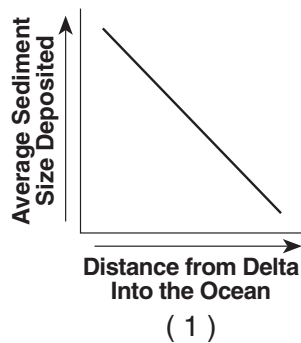
17 Which surface soil conditions allow the most infiltration of rainwater?

- (1) steep slope and permeable soil
- (2) steep slope and impermeable soil
- (3) gentle slope and permeable soil
- (4) gentle slope and impermeable soil

18 The map below shows a river emptying into an ocean, producing a delta.



Which graph best represents the relationship between the distance from the river delta into the ocean and the average size of sediments deposited on the ocean floor?



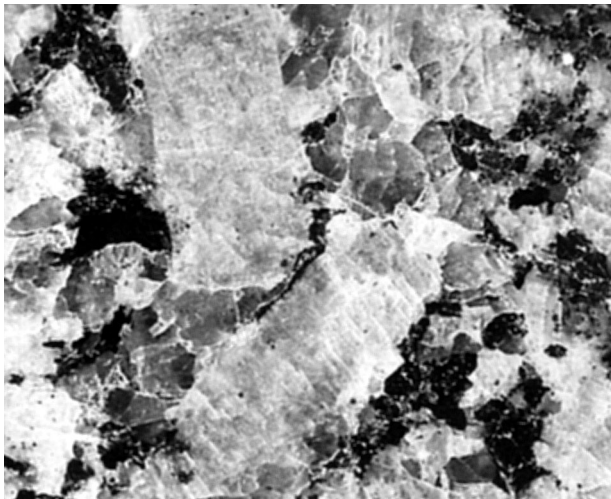
- 19 Which process could lead directly to the formation of pumice rock?
- (1) precipitation of minerals from evaporating seawater
  - (2) metamorphism of unmelted rock material
  - (3) deposition of quartz sand
  - (4) explosive eruption of lava from a volcano

- 20 The rock shown below has a foliated texture and contains the minerals amphibole, quartz, and feldspar arranged in coarse-grained bands.



Which rock is shown?

- (1) slate
  - (2) dunite
  - (3) gneiss
  - (4) quartzite
- 21 The photograph below shows the intergrown crystals of a pegmatite rock.



(Actual size)

Which characteristic provides the best evidence that this pegmatite solidified deep underground?

- (1) low density
- (2) light color
- (3) felsic composition
- (4) very coarse texture

- 22 Which igneous rock, when weathered, could produce sediment composed of the minerals potassium feldspar, quartz, and amphibole?

- (1) gabbro
- (2) granite
- (3) andesite
- (4) basalt

Base your answers to questions 23 and 24 on the photograph below. The photograph shows several broken samples of the same colorless mineral.



- 23 Which physical property of this mineral is most easily seen in the photograph?

- (1) fracture
- (2) hardness
- (3) streak
- (4) cleavage

- 24 Which mineral is most likely shown in the photograph?

- (1) quartz
- (2) calcite
- (3) galena
- (4) halite

- 25 The large coal fields found in Pennsylvania provide evidence that the climate of the north-eastern United States was much warmer during the Carboniferous Period. This change in climate over time is best explained by the

- (1) movements of tectonic plates
- (2) effects of seasons
- (3) changes in the environment caused by humans
- (4) evolution of life

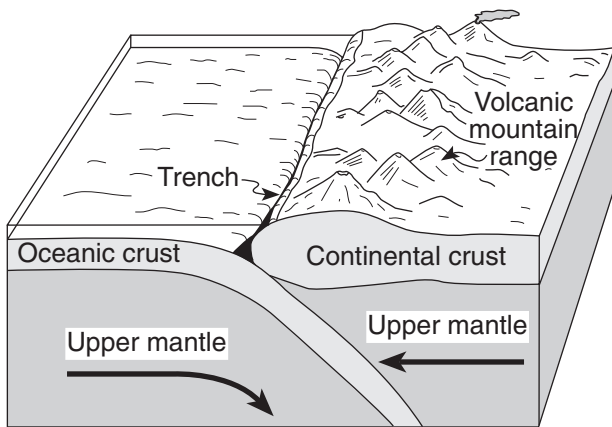
26 What is the inferred temperature at the boundary between Earth's stiffer mantle and outer core?

- (1) 2,500°C (3) 5,000°C  
 (2) 4,500°C (4) 6,200°C

27 Which color of the visible spectrum has the *shortest* wavelength?

- (1) violet (3) yellow  
 (2) blue (4) red

28 The diagram below shows the interaction of two tectonic plates.



(Not drawn to scale)

The type of plate boundary represented in the diagram most likely exists between the

- (1) Antarctic Plate and the African Plate  
 (2) Antarctic Plate and the Indian-Australian Plate  
 (3) South American Plate and the Nazca Plate  
 (4) South American Plate and the African Plate

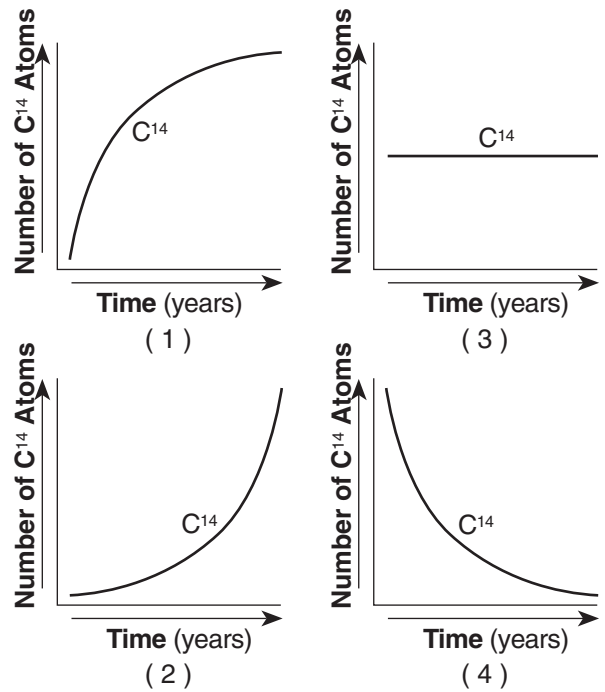
29 When 1 gram of liquid water at 0° Celsius freezes to form ice, how many total calories of heat are lost by the water?

- (1) 1 (3) 80  
 (2) 0.5 (4) 540

30 The shore of which New York State body of water has large amounts of metamorphic bedrock exposed at the surface?

- (1) western shore of Lake Champlain  
 (2) eastern shore of Lake Erie  
 (3) southern shore of Long Island Sound  
 (4) southern shore of Lake Ontario

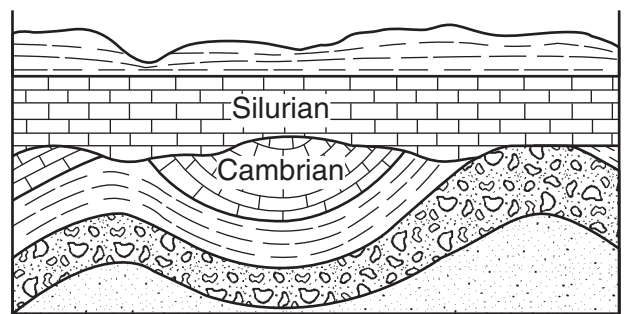
31 Which graph best shows the radioactive decay of carbon-14?



32 Approximately what percentage of the estimated age of Earth does the Cenozoic Era represent?

- (1) 1.4% (3) 11.9%  
 (2) 5.0% (4) 65.0%

33 The geologic cross section below shows the geologic age of two rock layers separated by an unconformity.

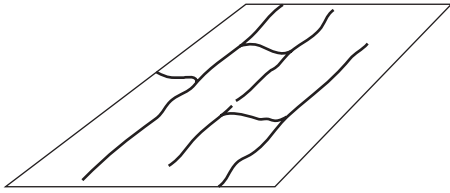


The unconformity at the bottom of the Silurian rock layer indicates a gap in the geologic time record. What is the *minimum* time, in millions of years, shown by the gap?

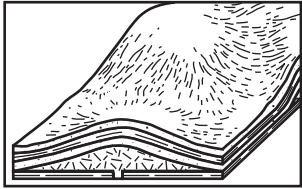
- (1) 13 (3) 101  
 (2) 47 (4) 126



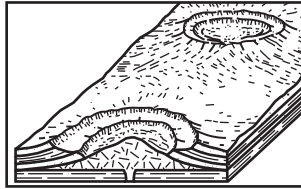
34 The diagram below represents a map view of a stream drainage pattern.



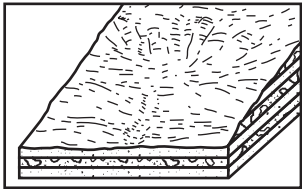
Which underlying bedrock structure most likely produced this stream drainage pattern?



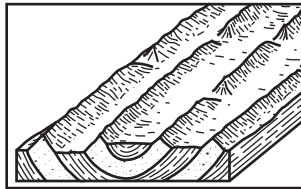
(1)



(3)



(2)



(4)

35 Compared to a maritime tropical air mass, a maritime polar air mass has a

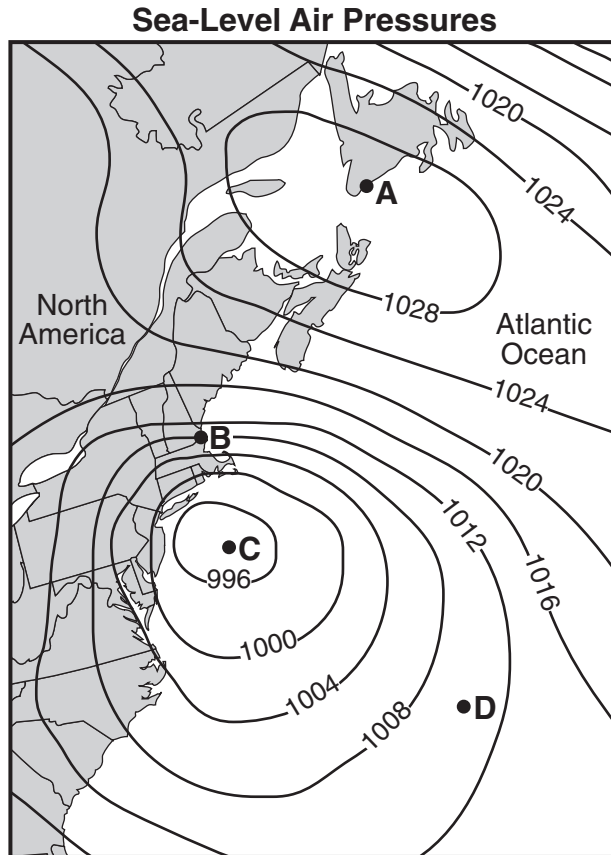
- (1) higher temperature and more water vapor
- (2) higher temperature and less water vapor
- (3) lower temperature and more water vapor
- (4) lower temperature and less water vapor

**Part B-1**

**Answer all questions in this part.**

*Directions (36–50): For each statement or question, write on your separate answer sheet the number of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the Earth Science Reference Tables.*

Base your answers to questions 36 through 38 on the map below, which shows sea-level air pressure, in millibars, for a portion of the eastern coast of North America. Points A, B, C, and D are sea-level locations on Earth's surface.



- 36 Which weather instrument was used to measure the air pressures?
- |                 |                        |
|-----------------|------------------------|
| (1) thermometer | (3) sling psychrometer |
| (2) wind vane   | (4) barometer          |
- 37 Which location most likely recorded the highest wind speed?
- |       |       |
|-------|-------|
| (1) A | (3) C |
| (2) B | (4) D |
- 38 The air pressure recorded at point D was most likely
- |             |             |
|-------------|-------------|
| (1) 1014 mb | (3) 1010 mb |
| (2) 1012 mb | (4) 1006 mb |



Base your answers to questions 39 through 41 on the newspaper article shown below and on your knowledge of Earth science.

### **Fossilized Jellyfish Found in Wisconsin**

Fossil hunters have unearthed the largest collection of fossilized jellyfish ever discovered, including the largest fossilized jellyfish ever found.

The remains of soft-bodied animals such as jellyfish are relatively rare because they don't have bones, fossil dealer Dan Damrow, James W. Hagadorn of the California Institute of Technology and Robert H. Dott Jr. of the University of Wisconsin at Madison noted in describing the find in the journal *Geology*.

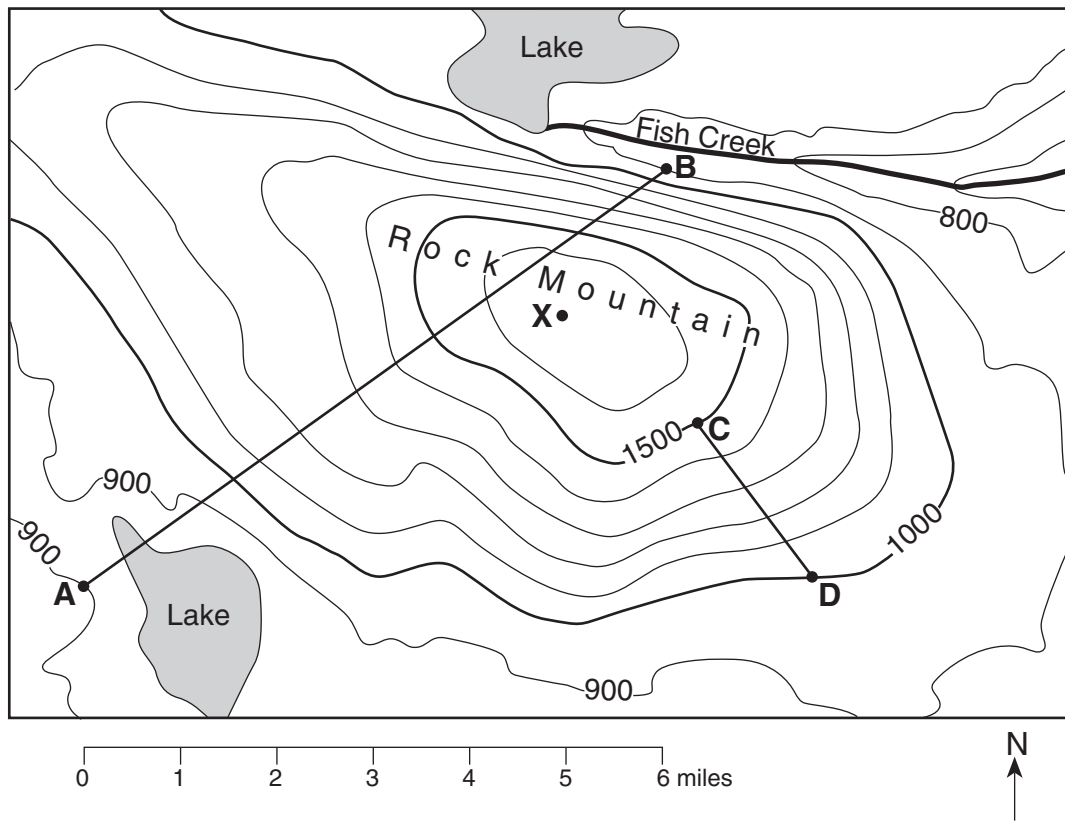
About a half-billion years ago, during the Cambrian period, the quarry in Mosinee, Wis., where the deposits were found was a small lagoon. The jellyfish apparently died when they were washed up by a freak tide or storm, the researchers said. The jellyfish remains were probably preserved because of a lack of erosion from sea water and wind, and a lack of scavengers, the researchers concluded.

"It is very rare to discover a deposit which contains an entire stranding event of jellyfish," Hagadorn said. "These jellyfish are not just large for the Cambrian, but are the largest jellyfish in the entire fossil record."

*Washington Post*, January 2002

- 39 These fossilized jellyfish were most likely discovered in which type of rock?
- |               |            |
|---------------|------------|
| (1) sandstone | (3) pumice |
| (2) granite   | (4) slate  |
- 40 Which two marine organisms most likely lived at the same time as these jellyfish?
- |                                  |                                |
|----------------------------------|--------------------------------|
| (1) crinoids and dinosaurs       | (3) brachiopods and gastropods |
| (2) ammonoids and placoderm fish | (4) amphibians and eurypterids |
- 41 Which evidence would lead scientists to suspect that a tide or storm had washed up these jellyfish on a beach?
- (1) Primitive life existed on land 500 million years ago.
  - (2) The rock containing the jellyfish fossils has distorted crystal structure.
  - (3) Treeroot fossils appear to have been pitted and folded.
  - (4) Large ripple marks were found in the fossil-containing rock layers.
-

Base your answers to questions 42 through 44 on the topographic map below. Points A, B, C, D, and X represent locations on the map. Elevations are measured in feet.



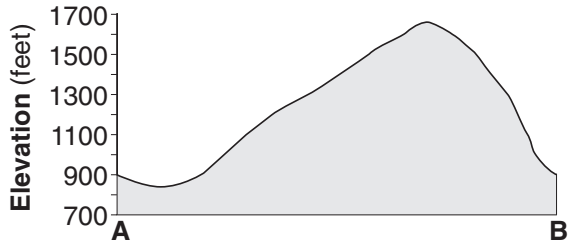
42 What is the highest possible elevation of point X on Rock Mountain?

- |              |              |
|--------------|--------------|
| (1) 1,599 ft | (3) 1,601 ft |
| (2) 1,600 ft | (4) 1,699 ft |

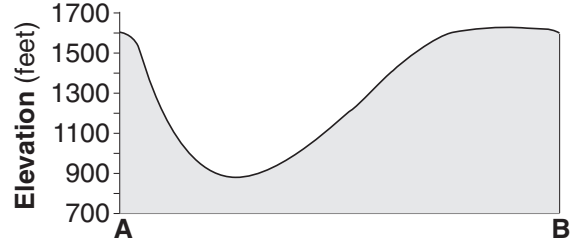
43 What is the average gradient of the slope along straight line CD?

- |               |                 |
|---------------|-----------------|
| (1) 100 ft/mi | (3) 500 ft/mi   |
| (2) 250 ft/mi | (4) 1,000 ft/mi |

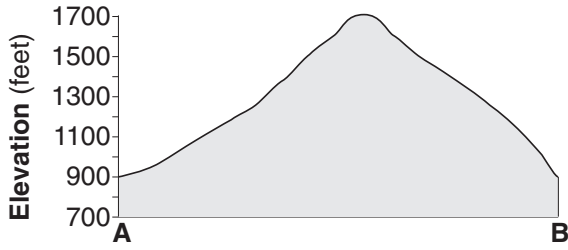
44 Which cross section best represents the profile along straight line AB?



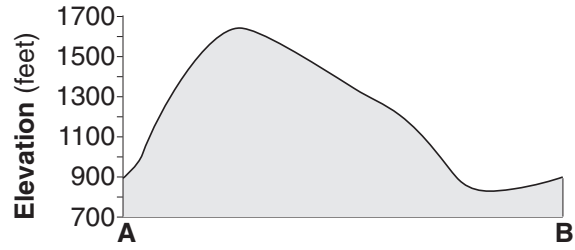
(1)



(3)



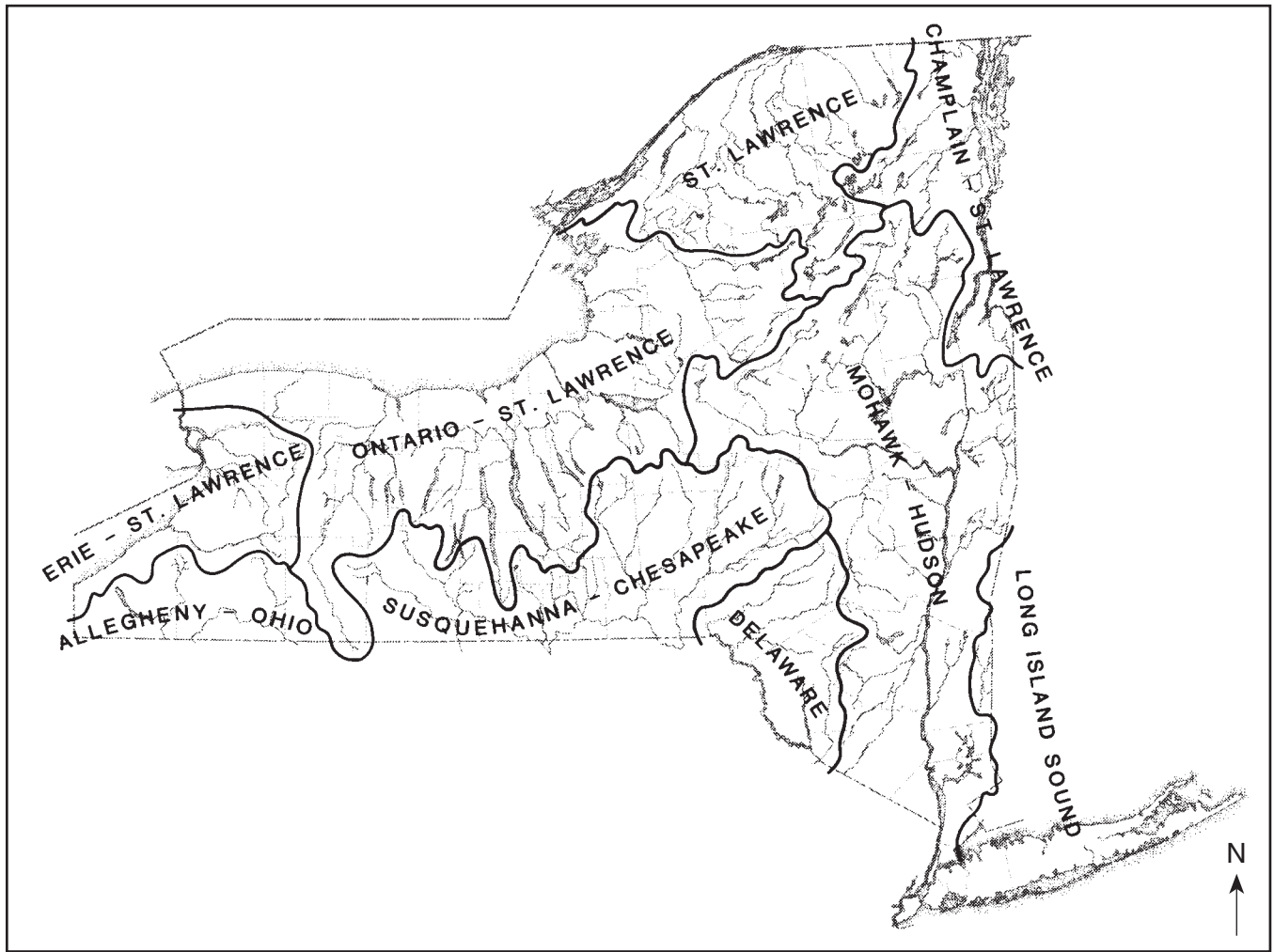
(2)



(4)



Base your answers to questions 45 through 47 on the map below, which shows watershed regions of New York State.



45 On which type of landscape region are both the Susquehanna-Chesapeake and the Delaware watersheds located?

- (1) plain
- (2) plateau
- (3) mountain
- (4) lowland

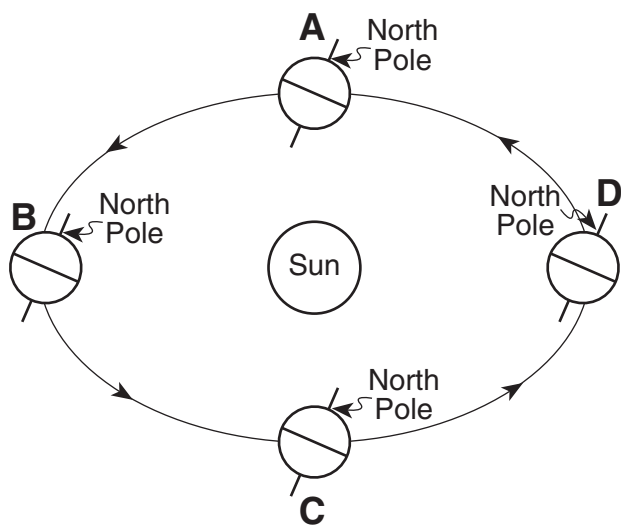
46 In which watershed is the Genesee River located?

- (1) Ontario-St. Lawrence
- (2) Susquehanna-Chesapeake
- (3) Mohawk-Hudson
- (4) Delaware

47 Most of the surface bedrock of the Ontario-St. Lawrence watershed was formed during which geologic time periods?

- (1) Precambrian and Cambrian
- (2) Ordovician, Silurian, and Devonian
- (3) Mississippian, Pennsylvanian, and Permian
- (4) Triassic, Jurassic, and Cretaceous

Base your answers to questions 48 through 50 on the diagram below, which represents an exaggerated view of Earth revolving around the Sun. Letters A, B, C, and D represent Earth's location in its orbit on the first day of each of the four seasons.



(Not drawn to scale)

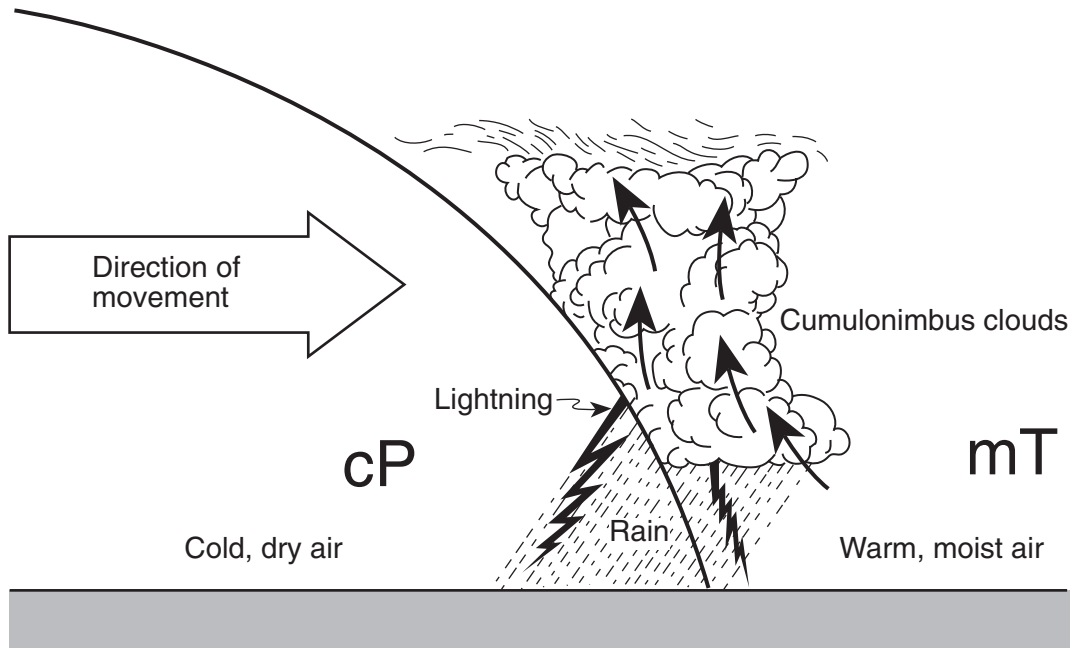
- 48 Which location in Earth's orbit represents the first day of fall (autumn) for an observer in New York State?
- |       |       |
|-------|-------|
| (1) A | (3) C |
| (2) B | (4) D |
- 49 Earth's rate of revolution around the Sun is approximately
- |                         |                           |
|-------------------------|---------------------------|
| (1) $1^\circ$ per day   | (3) $15^\circ$ per hour   |
| (2) $360^\circ$ per day | (4) $23.5^\circ$ per hour |
- 50 Which observation provides the best evidence that Earth revolves around the Sun?
- (1) Stars seen from Earth appear to circle *Polaris*.
  - (2) Earth's planetary winds are deflected by the Coriolis effect.
  - (3) The change from high ocean tide to low ocean tide is a repeating pattern.
  - (4) Different star constellations are seen from Earth at different times of the year.
-




**Part B-2**

**Answer all questions in this part.**

*Directions (51–65):* Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

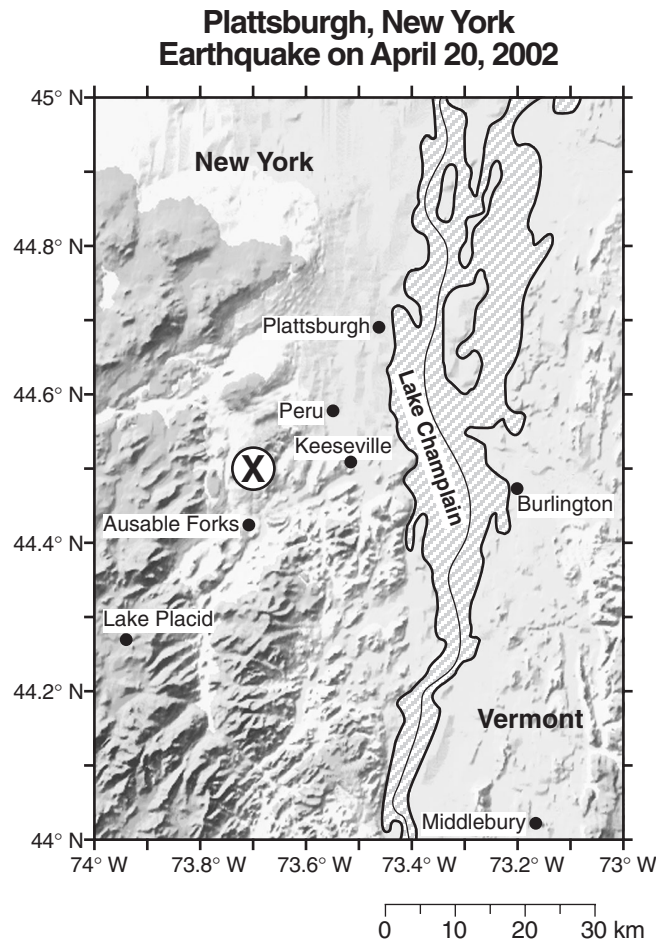
Base your answers to questions 51 through 53 on the cross section below, which shows a typical cold front moving over New York State in early summer.







- 51 Explain why the warm, moist air is rising at the frontal boundary. [1] 
- 52 State *one* process that causes clouds to form in this rising air. [1] 
- 53 Central Canada was the geographic source region for the cP air mass shown in the cross section. Identify the most likely geographic source region for the mT air mass shown in the cross section. [1] 
-

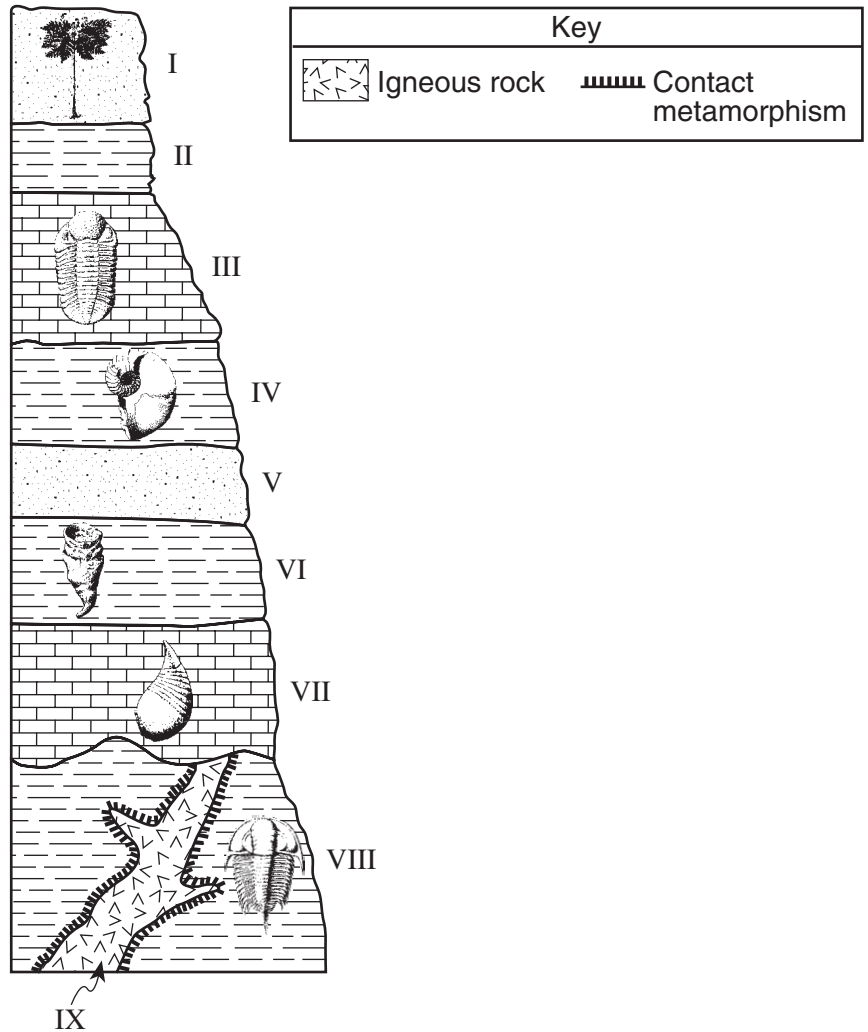


Base your answers to questions 54 through 57 on the map below and on your knowledge of Earth science. The map shows the location of the epicenter, (X), of an earthquake that occurred on April 20, 2002, about 29 kilometers southwest of Plattsburgh, New York.



- 54 State the latitude and longitude of this earthquake epicenter. Express your answers to the *nearest tenth of a degree* and include the compass directions. [1] 
- 55 What is the *minimum* number of seismographic stations needed to locate the epicenter of an earthquake? [1] 
- 56 Explain why this earthquake was most likely felt with greater intensity by people in Peru, New York, than by people in Lake Placid, New York. [1] 
- 57 A seismic station located 1,800 kilometers from the epicenter recorded the *P*-wave and *S*-wave arrival times for this earthquake. What was the difference in the arrival time of the first *P*-wave and the first *S*-wave? [1] 
-

Base your answers to questions 58 through 60 on the cross section of the bedrock outcrop shown below and on your knowledge of Earth science. Index fossils found in some of the rock units are shown. The rock units are labeled I through IX.



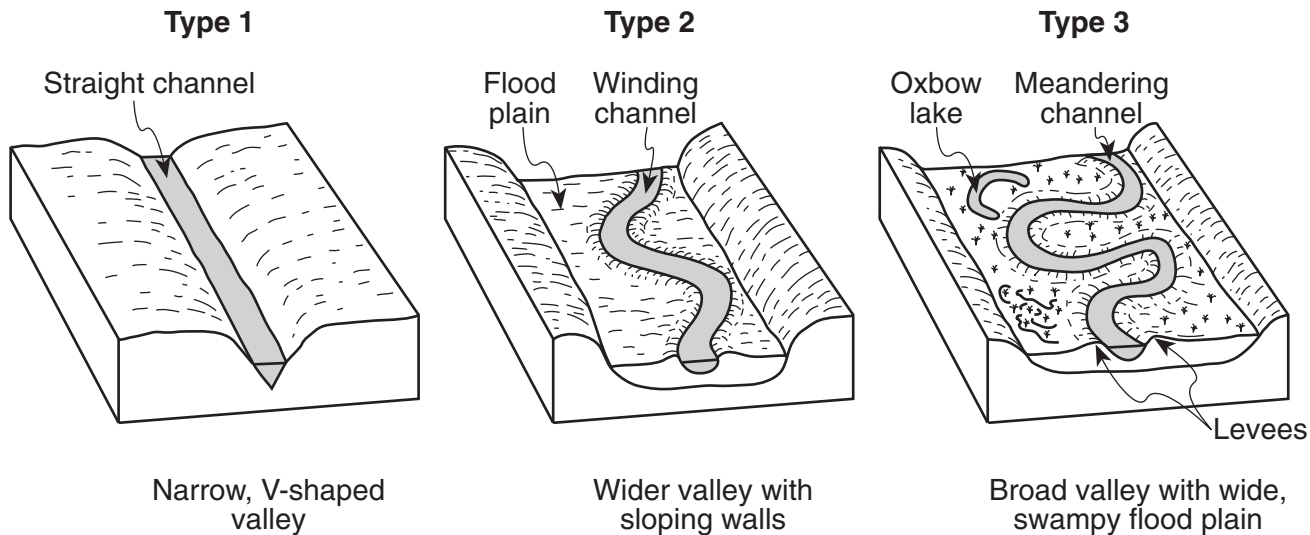
58 In the space provided *in your answer booklet*, number the relative age of rock units VII, VIII, and IX from 1 to 3, with number 1 indicating the oldest rock and number 3 indicating the youngest rock. [1]

59 The fossil shown in rock unit VIII is a member of an extinct group of fossils. State *two* other index fossils that are also members of the same group of extinct fossils. [1]

60 Based on the fossils shown in the limestone and shale layers, state the type of environment in which these sedimentary rocks were deposited. [1]

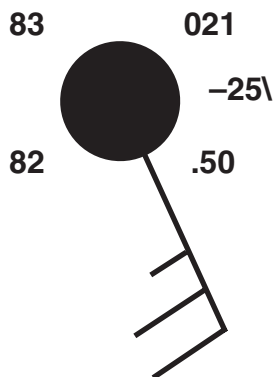
---

Base your answers to questions 61 through 63 on the block diagrams below, which show three types of streams with equal volumes.



- 61 Explain how the differences between the type 1 and type 3 stream channels indicate that the average velocities of the streams are different. [1]
- 62 Explain why the outside of the curve of a meandering channel experiences more erosion than the inside of the curve. [1]
- 63 Explain how the cobbles and pebbles that were transported by these streams became smooth and rounded in shape. [1]
- 

Base your answers to questions 64 and 65 on the station model below, which shows the weather conditions at Rochester, New York, at 4 p.m. on a particular day in June.



- 64 What was the actual barometric pressure, according to the station model, to the nearest tenth of a millibar? [1]
- 65 The winds shown by this station model were blowing from which compass direction and at what wind speed? [1]
-

### Part C


Answer all questions in this part.

*Directions (66–83):* Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

Base your answers to questions 66 and 67 on the data table below, which lists the apparent diameter of the Sun, measured in minutes and seconds of a degree, as it appears to an observer in New York State. (Apparent diameter is how large an object appears to an observer.)

**Apparent Diameter of the Sun During the Year**

Date	Apparent Diameter ( ' = minutes " = seconds)
January 1	32'32"
February 10	32'25"
March 20	32'07"
April 20	31'50"
May 30	31'33"
June 30	31'28"
August 10	31'34"
September 20	31'51"
November 10	32'18"
December 30	32'32"

66 On the grid provided *in your answer booklet*, graph the data shown on the table by marking with a dot the apparent diameter of the Sun for *each* date listed and connecting the dots with a smooth, curved line. [2] 

67 Explain why the apparent diameter of the Sun changes throughout the year as Earth revolves around the Sun. [1] 

---

Base your answers to questions 68 through 71 on the passage below and on your knowledge of Earth science.





### Watching the Glaciers Go

Mountain glaciers and ice caps in tropical areas of the world are melting fast and may vanish altogether by the year 2020. That was the chilling news last year from Lonnie Thompson, a geologist at Ohio State University’s Byrd Polar Research Center who has been studying icy areas near the equator in South America, Africa, and the Himalayas for two decades.

It doesn’t take a glacier scientist to see the changes. In 1977, when Thompson visited the Quelccaya ice cap in Peru, it was impossible not to notice a schoolbus-size boulder stuck in its grip. When Thompson returned in 2000, the rock was still there but the ice wasn’t — it had retreated far into the distance.

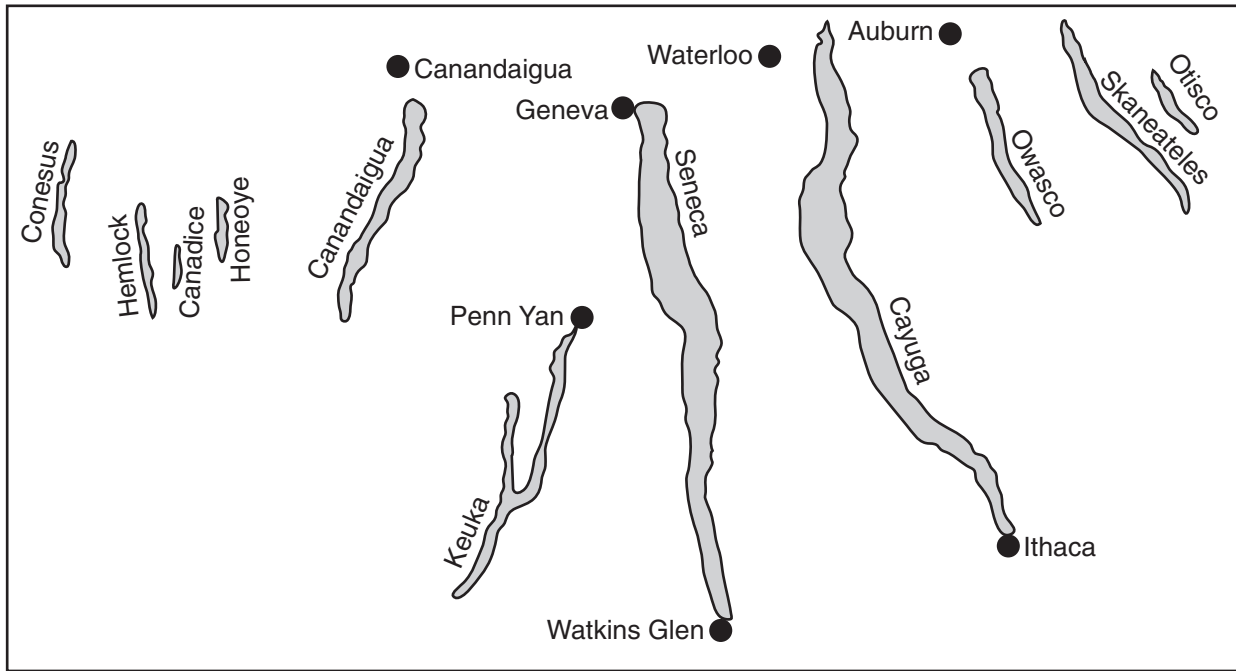
Most scientists believe the glaciers are melting because of global warming — the gradual temperature increase that has been observed with increasing urgency during the past decade. Last year a panel of the nation’s top scientists, the National Research Council, set aside any lingering skepticism about the phenomenon, concluding definitively that average global surface temperatures are rising and will continue to do so.

“Watching the Glaciers Go,”  
*Popular Science*, vol. #7, January 2002

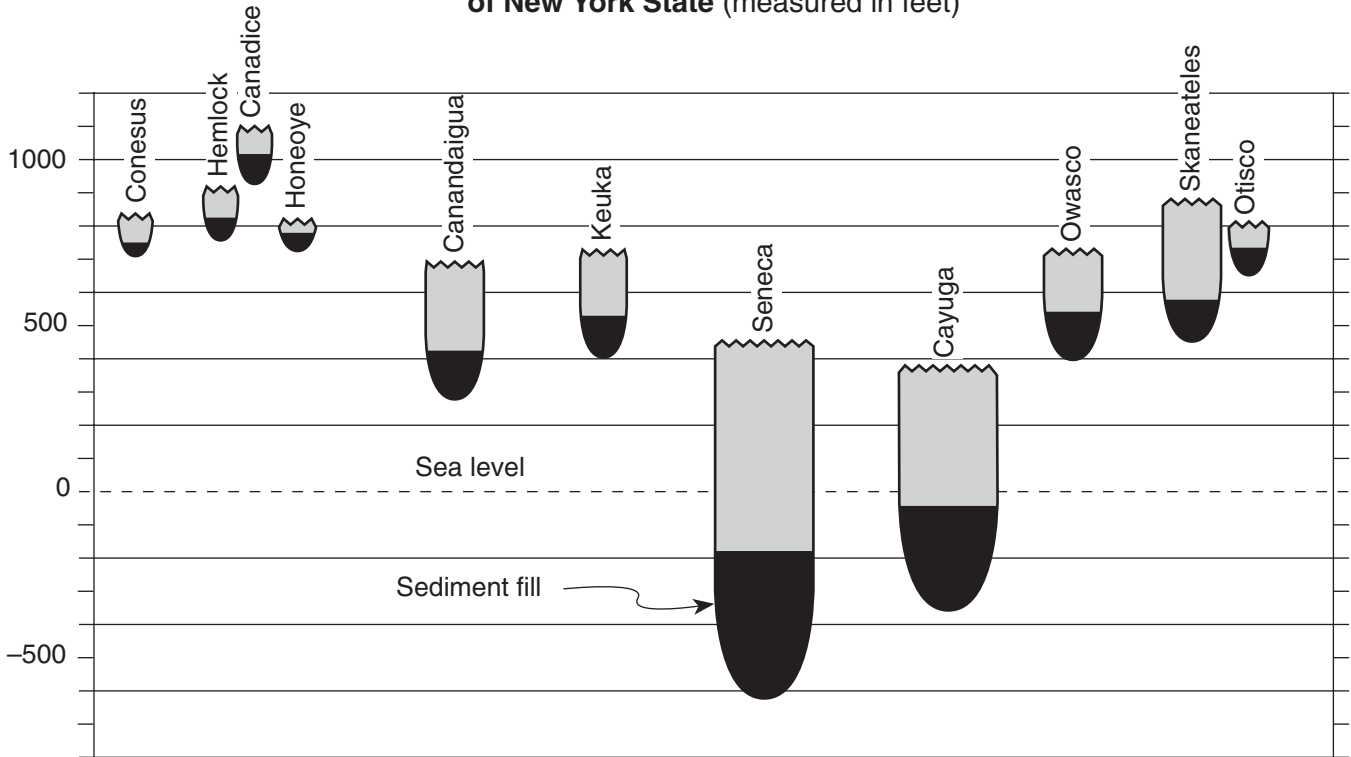
- 68 State *one* greenhouse gas that is an excellent absorber of infrared radiation and may be responsible for global warming. [1] 
- 69 Describe the arrangement of sediment deposited directly from glaciers. [1] 
- 70 Some glaciers currently exist near Earth’s equator due to the cold, snowy climate of certain locations. Which type of landform exists where these glaciers occur? [1] 
- 71 Describe *one* action humans could take to reduce the global warming that is melting the Quelccaya ice cap. [1] 
-

Base your answers to questions 72 through 75 on the map and cross section of the Finger Lakes Region shown below and on your knowledge of Earth science.





**Finger Lakes Region of New York State**







**Elevation and Depth of the Finger Lakes of New York State (measured in feet)**



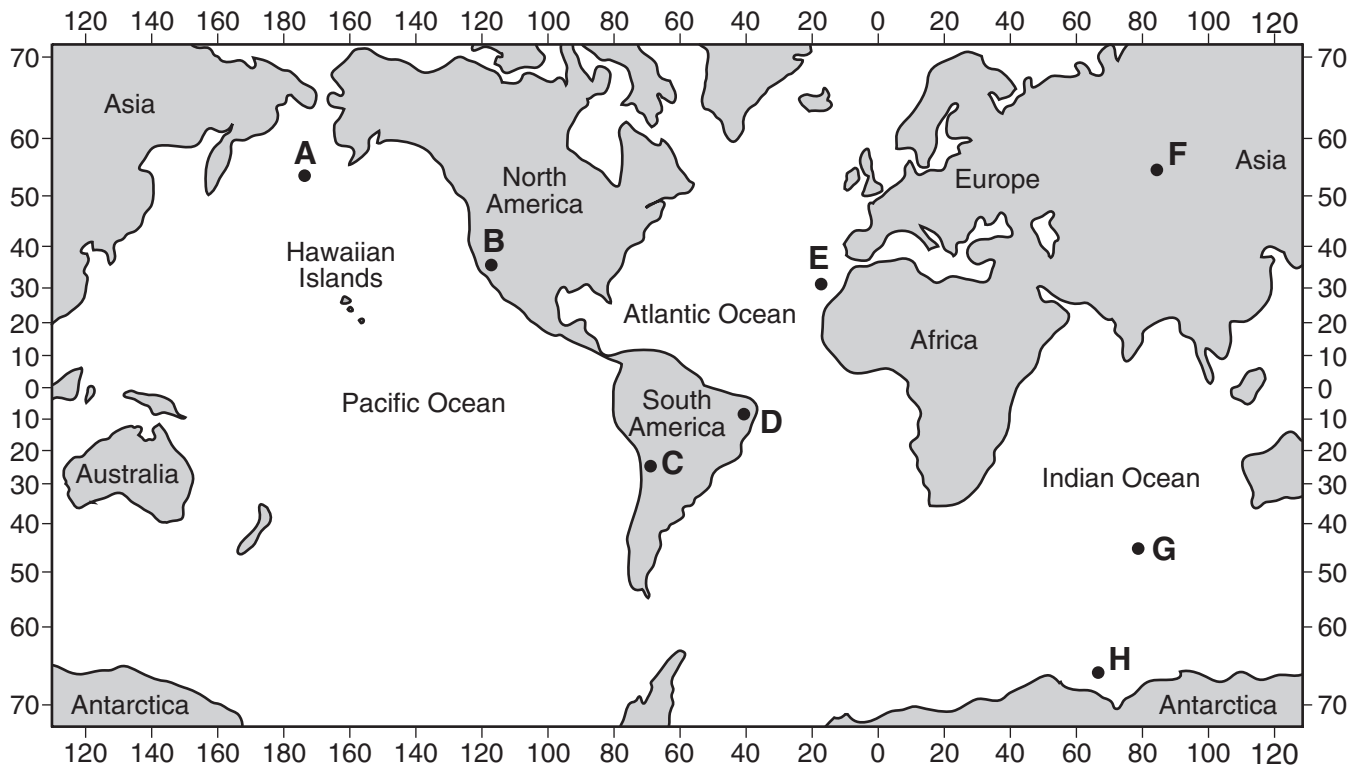


- 72 According to the cross section, how thick from top to bottom is the sediment fill in Seneca Lake? [1] 
- 73 State *one* possible explanation for the north-south orientation of the Finger Lakes. [1] 
- 74 During some winters, a few of the Finger Lakes remain unfrozen even though the land around the lakes is frozen. Explain how the specific heat of water can cause these lakes to remain unfrozen. [1] 
- 75 Identify *two* processes that normally occur to form the type of surface bedrock found in the Finger Lakes Region. [1] 
- 

Base your answers to questions 76 through 79 on the diagram provided in your answer booklet, which shows observations made by a sailor who left his ship and landed on a small deserted island on June 21. The diagram represents the apparent path of the Sun and the position of *Polaris*, as observed by the sailor on this island.

- 76 On the diagram provided *in your answer booklet*, draw an arrow on the June 21 path of the Sun to show the Sun's direction of apparent movement from sunrise to sunset. [1] 
- 77 The sailor was still on the island on September 23. On the diagram provided *in your answer booklet*, draw the Sun's apparent path for September 23, as it would have appeared to the sailor. Be sure your September 23 path indicates the correct altitude of the noon Sun and begins and ends at the correct points on the horizon. [2] 
- 78 Based on the sailor's observations, what is the latitude of this island? Include the units and the compass direction in your answer. [1] 
- 79 The sailor observed a 1-hour difference between solar noon on the island and solar noon at his last measured longitude onboard his ship. How many degrees of longitude is the island from the sailor's last measured longitude onboard his ship? [1] 
-

Base your answers to questions 80 through 83 on the world map shown below and on your knowledge of Earth science. Letters A through H represent locations on Earth's surface.



80 Explain why most earthquakes that occur in the crust beneath location B are shallower than most earthquakes that occur in the crust beneath location C. [1]

81 Explain why location A has a greater probability of experiencing a major earthquake than location D. [1]

82 Explain why a volcanic eruption is more likely to occur at location E than at location F. [1]

83 Explain why the geologic age of the oceanic bedrock increases from location G to location H. [1]

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING  
EARTH SCIENCE

Wednesday, June 22, 2005 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Student ..... Sex:  Male  Female Grade .....

Teacher ..... School .....

Record your answers to Part A and Part B-1 on this answer sheet.

Part A

- 1 ..... 13 ..... 25 .....
- 2 ..... 14 ..... 26 .....
- 3 ..... 15 ..... 27 .....
- 4 ..... 16 ..... 28 .....
- 5 ..... 17 ..... 29 .....
- 6 ..... 18 ..... 30 .....
- 7 ..... 19 ..... 31 .....
- 8 ..... 20 ..... 32 .....
- 9 ..... 21 ..... 33 .....
- 10 ..... 22 ..... 34 .....
- 11 ..... 23 ..... 35 .....
- 12 ..... 24 .....

Part A Score

Part B-1

- 36 ..... 44 .....
- 37 ..... 45 .....
- 38 ..... 46 .....
- 39 ..... 47 .....
- 40 ..... 48 .....
- 41 ..... 49 .....
- 42 ..... 50 .....
- 43 .....

Part B-1 Score

Write your answers to Part B-2 and Part C in your answer booklet.

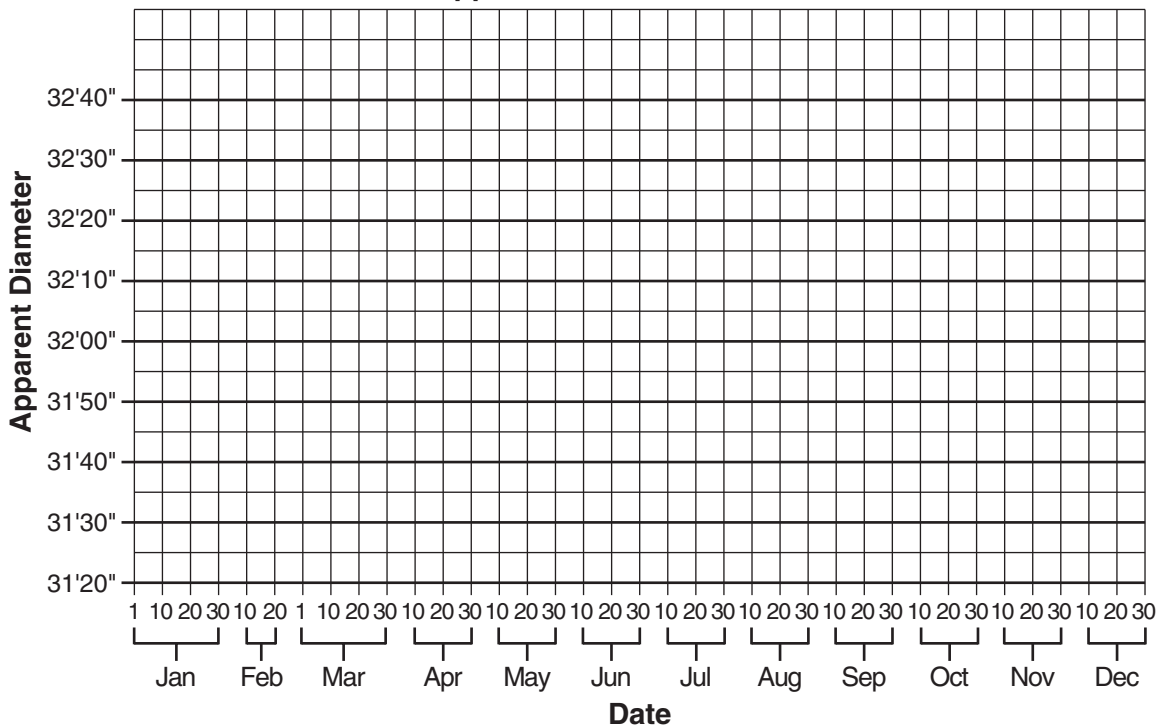
The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

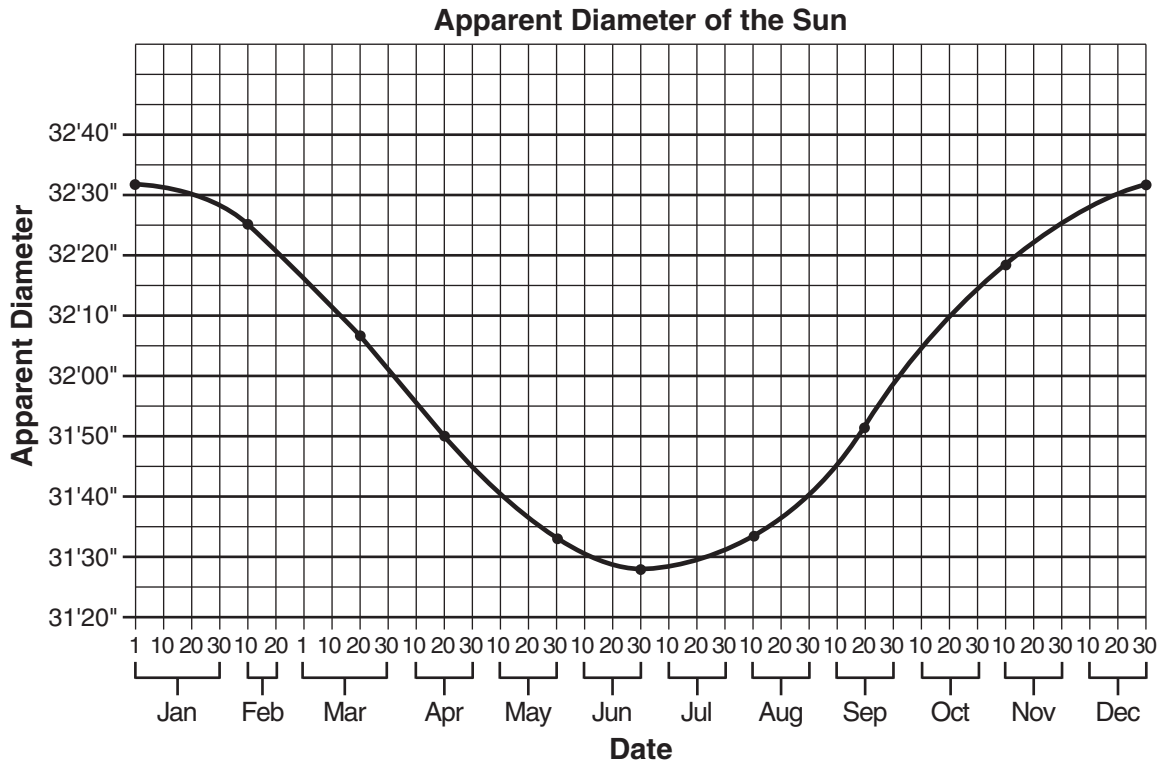
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Signature

## Apparent Diameter of the Sun

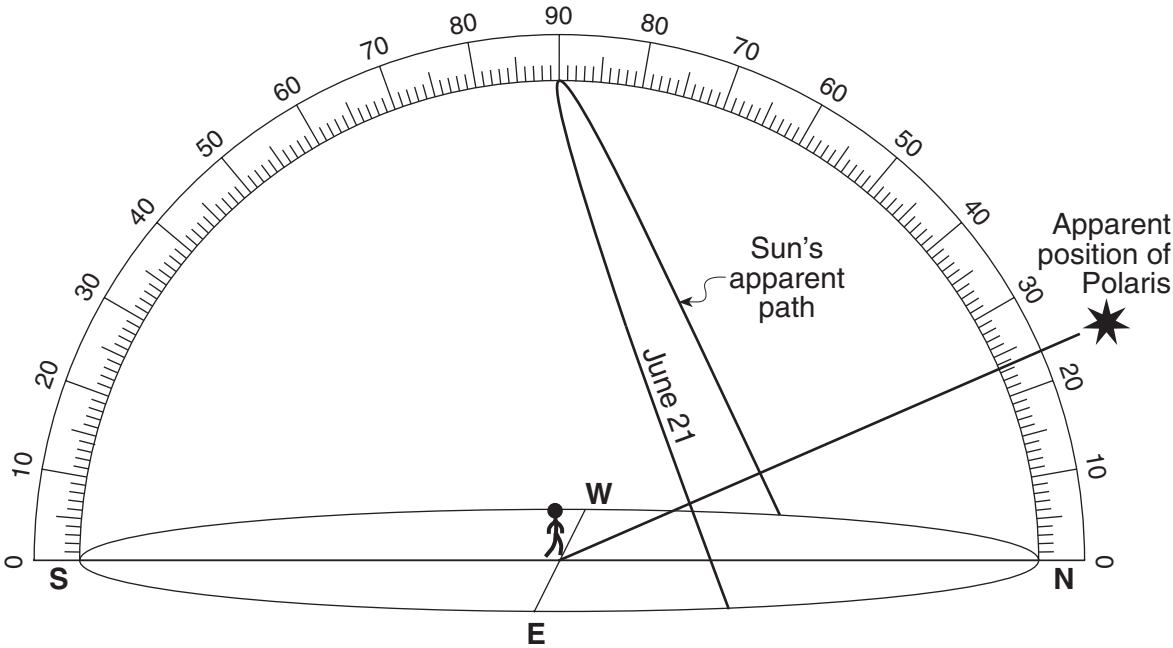


## Example of a 2-Credit Response



**Note:** Allow credit if the student-drawn line is dot-to-dot or a smooth curve.  
Also allow credit if a symbol other than a dot is used.

### Sailor's Observations on the Deserted Island





76 and 77 An example of correctly drawn arrows and the apparent September 23 path are shown below.

