

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

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 23, 2008 — 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 (Revised November 2006)* 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 (Revised November 2006)* 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.

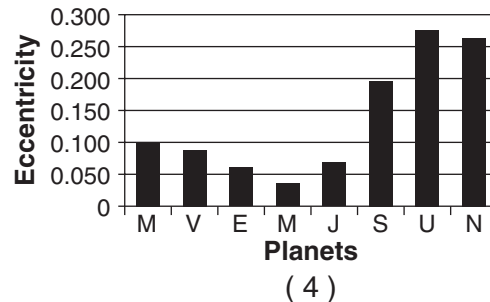
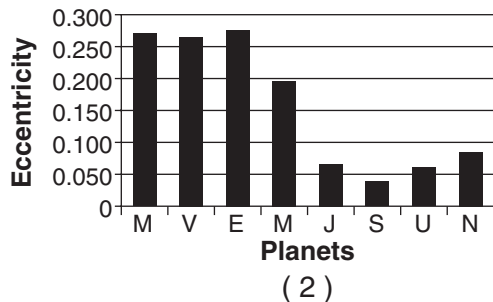
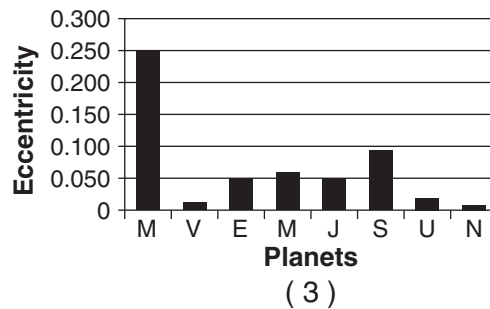
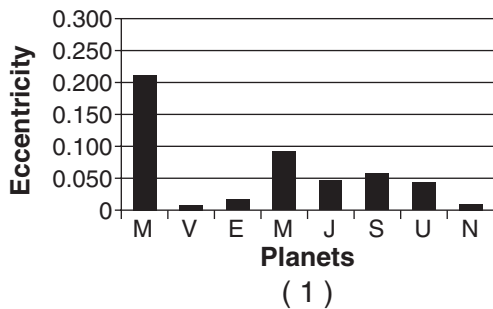
Part A

Answer all questions in this part.

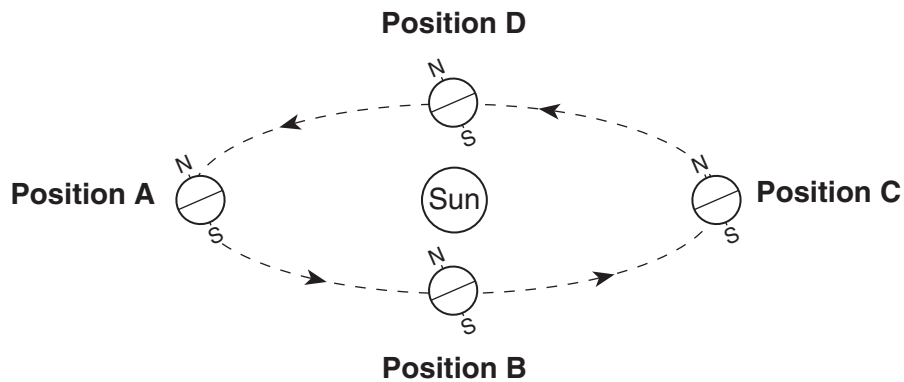
Directions (1–35): For *each* statement or question, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *Earth Science Reference Tables*.

- 1 One factor responsible for the strength of gravitational attraction between a planet and the Sun is the
- (1) degree of tilt of the planet's axis
 - (2) distance between the planet and the Sun
 - (3) planet's period of rotation
 - (4) amount of insolation given off by the Sun
- 2 Which planet is located approximately ten times farther from the Sun than Earth is from the Sun?
- (1) Mars
 - (2) Jupiter
 - (3) Saturn
 - (4) Uranus
- 3 Large craters found on Earth support the hypothesis that impact events have caused
- (1) a decrease in the number of earthquakes and an increase in sea level
 - (2) an increase in solar radiation and a decrease in Earth radiation
 - (3) the red shift of light from distant stars and the blue shift of light from nearby stars
 - (4) mass extinctions of life-forms and global climate changes
- 4 What is the inferred age of our solar system, in millions of years?
- (1) 544
 - (2) 1300
 - (3) 4600
 - (4) 10,000
- 5 The water table usually rises when there is
- (1) a decrease in the amount of infiltration
 - (2) a decrease in the amount of surface area covered by vegetation
 - (3) an increase in the amount of precipitation
 - (4) an increase in the slope of the land
- 6 What causes the Coriolis effect?
- (1) Earth's tilt on its axis
 - (2) the spin of Earth on its axis
 - (3) the orbital motion of the Moon around Earth
 - (4) the orbital motion of Earth around the Sun
- 7 What is the relative humidity when the dry-bulb temperature is 16°C and the wet-bulb temperature is 14°C?
- (1) 90%
 - (2) 80%
 - (3) 14%
 - (4) 13%
- 8 Which weather instrument is used to measure wind speed?
- (1) anemometer
 - (2) wind vane
 - (3) psychrometer
 - (4) thermometer
- 9 A weather station model is shown below.
- The diagram shows a simple weather station model, which is a circle with the number 029 positioned to its right.
- What is the barometric pressure indicated by this station model?
- (1) 0.029 mb
 - (2) 902.9 mb
 - (3) 1002.9 mb
 - (4) 1029.0 mb
- 10 The upward movement of air in the atmosphere generally causes the temperature of that air to
- (1) decrease and become closer to the dewpoint
 - (2) decrease and become farther from the dewpoint
 - (3) increase and become closer to the dewpoint
 - (4) increase and become farther from the dewpoint

11 Which bar graph correctly shows the orbital eccentricity of the planets in our solar system?



12 The diagram below shows Earth in its orbit around the Sun. Positions A, B, C, and D represent Earth at the beginning of each season.

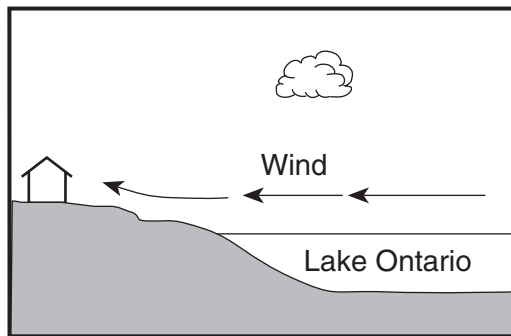


(Not drawn to scale)

At which lettered position of Earth does New York State experience the first day of summer?

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

- 13 The cross section below shows a house on the shore of Lake Ontario in August.



(Not drawn to scale)

Under which conditions would the wind shown in the cross section most likely occur?

- (1) at 2 a.m., when the air over land is 70°F and the air over the lake is 80°F
 - (2) at 6 a.m., when the air over land is 70°F and the air over the lake is 70°F
 - (3) at 2 p.m., when the air over land is 80°F and the air over the lake is 70°F
 - (4) at 10 p.m., when the air over land is 70°F and the air over the lake is 72°F
- 14 Which type of surface absorbs the greatest amount of electromagnetic energy from the Sun?
- (1) smooth, shiny, and light colored
 - (2) smooth, shiny, and dark colored
 - (3) rough, dull, and light colored
 - (4) rough, dull, and dark colored
- 15 Which New York State location is most likely to experience the heaviest winter snowfall when the surface winds are blowing from the west or north-west?
- (1) New York City
 - (2) Binghamton
 - (3) Oswego
 - (4) Plattsburgh
- 16 The largest particles that a stream deposits as it enters a pond are 8 centimeters in diameter. The minimum velocity of the stream is approximately
- (1) 100 cm/sec
 - (2) 200 cm/sec
 - (3) 300 cm/sec
 - (4) 400 cm/sec

- 17 Which ocean current transports warm water away from Earth's equatorial region?

- (1) Brazil Current
- (2) Guinea Current
- (3) Falkland Current
- (4) California Current

- 18 The data table below shows the density of four different mineral samples.

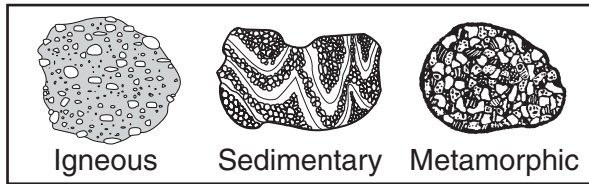
Data Table

Mineral	Density (g/cm ³)
corundum	4.0
galena	7.6
hematite	5.3
quartz	2.7

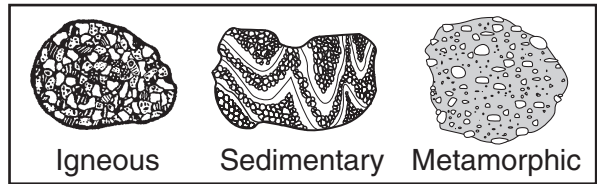
A student accurately measured the mass of a sample of one of the four minerals to be 294.4 grams and its volume to be 73.6 cm³. Which mineral sample did the student measure?

- (1) corundum
 - (2) galena
 - (3) hematite
 - (4) quartz
- 19 Which mineral has a metallic luster, a black streak, and is an ore of iron?
- (1) galena
 - (2) magnetite
 - (3) pyroxene
 - (4) graphite
- 20 The edges of most lithospheric plates are characterized by
- (1) reversed magnetic orientation
 - (2) unusually rapid radioactive decay
 - (3) frequent volcanic activity
 - (4) low *P*-wave and high *S*-wave velocity
- 21 Compared to Earth's continental crust, Earth's oceanic crust is
- (1) thinner and more dense
 - (2) thinner and less dense
 - (3) thicker and more dense
 - (4) thicker and less dense

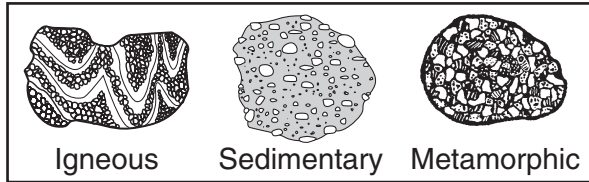
22 In which set are the rock drawings labeled with their correct rock types?



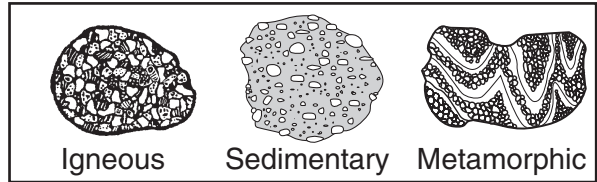
(1)



(3)

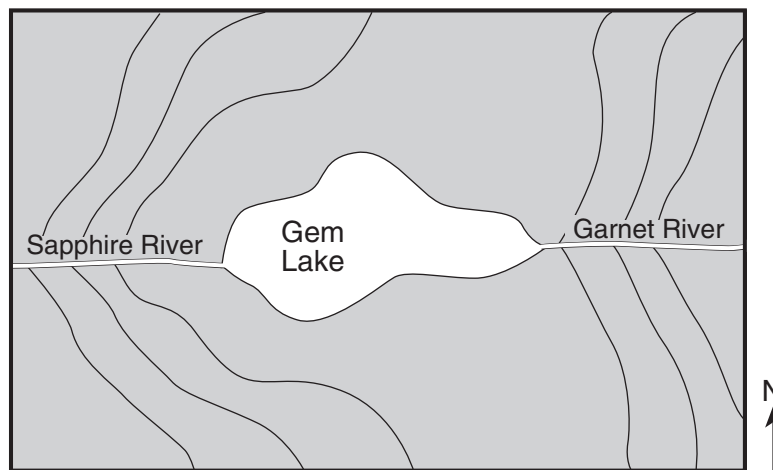


(2)



(4)

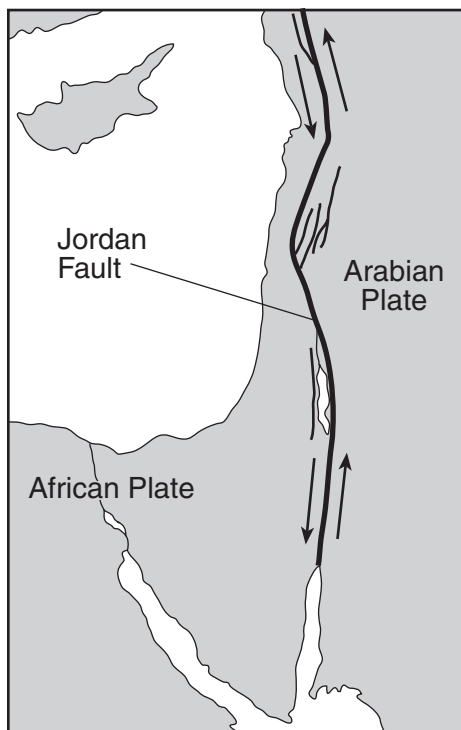
23 The topographic map below shows a lake and two rivers.



In which direction does each of the rivers flow?

- (1) The Sapphire River and the Garnet River both flow east.
- (2) The Sapphire River and the Garnet River both flow west.
- (3) The Sapphire River flows east and the Garnet River flows west.
- (4) The Sapphire River flows west and the Garnet River flows east.

- 24 The map below shows the northern section of the boundary between the Arabian Plate and the African Plate. Arrows show the relative direction of plate motion.

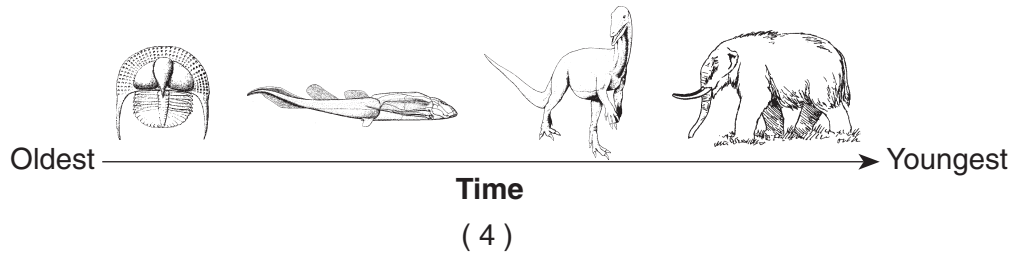
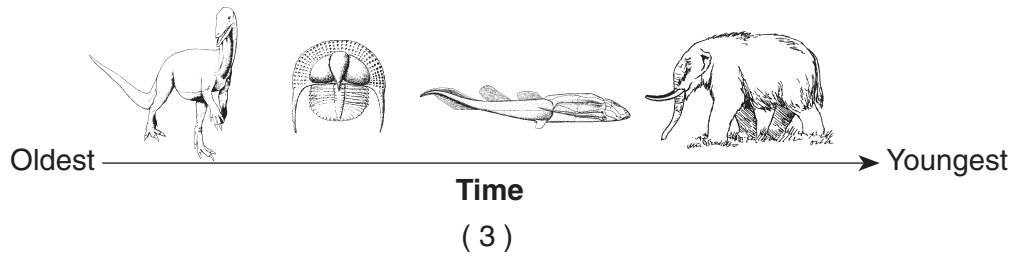
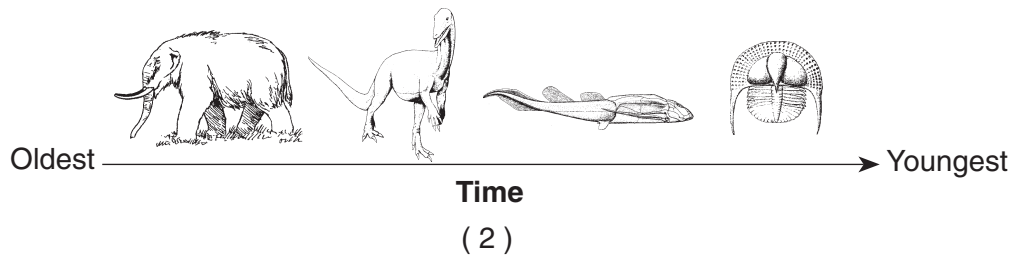
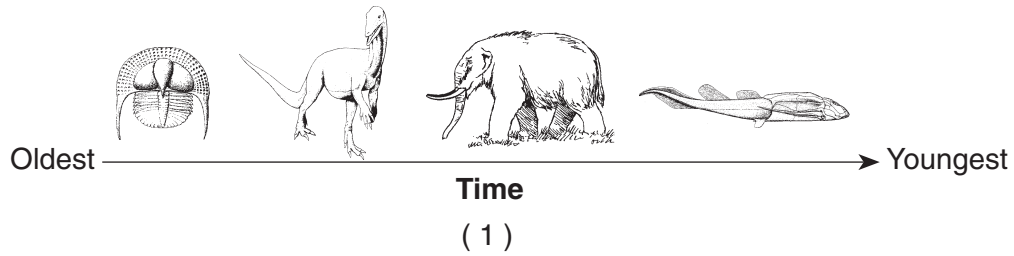


Which type of plate boundary is located at the Jordan Fault?

- (1) divergent (3) convergent
 (2) subduction (4) transform
- 25 A seismograph station recorded the arrival of the first *P*-wave at 7:32 p.m. from an earthquake that occurred 4000 kilometers away. What time was it at the station when the earthquake occurred?
- (1) 7:20 p.m. (3) 7:32 p.m.
 (2) 7:25 p.m. (4) 7:39 p.m.
- 26 Which temperature is inferred to exist in Earth's plastic mantle?
- (1) 2000°C (3) 5000°C
 (2) 3000°C (4) 6000°C

- 27 Which statement correctly compares seismic *P*-waves with seismic *S*-waves?
- (1) *P*-waves travel faster than *S*-waves and pass through Earth's liquid zones.
 (2) *P*-waves travel faster than *S*-waves and do not pass through Earth's liquid zones.
 (3) *P*-waves travel slower than *S*-waves and pass through Earth's liquid zones.
 (4) *P*-waves travel slower than *S*-waves and do not pass through Earth's liquid zones.
- 28 What is the geologic age sequence of the surface bedrock from Ithaca, New York, to Watertown, New York?
- (1) Ordovician, Taconic, Cambrian
 (2) Ordovician, Tertiary, Pleistocene
 (3) Devonian, Silurian, Cambrian
 (4) Devonian, Silurian, Ordovician
- 29 A whalebone that originally contained 200 grams of radioactive carbon-14 now contains 25 grams of carbon-14. How many carbon-14 half-lives have passed since this whale was alive?
- (1) 1 (3) 3
 (2) 2 (4) 4
- 30 Which geologic event occurred during the same geologic period as the first appearance of modern corals in Earth's oceans?
- (1) Grenville Orogeny
 (2) Acadian Orogeny
 (3) intrusion of the Palisades Sill
 (4) formation of the Catskill Delta
- 31 The presence of eurypterid fossils in New York State bedrock indicates that
- (1) eurypterids lived in land environments
 (2) eurypterids first appeared on Earth during the Devonian Period
 (3) most of New York State was once a mountainous region
 (4) areas of New York State were once covered with shallow seas

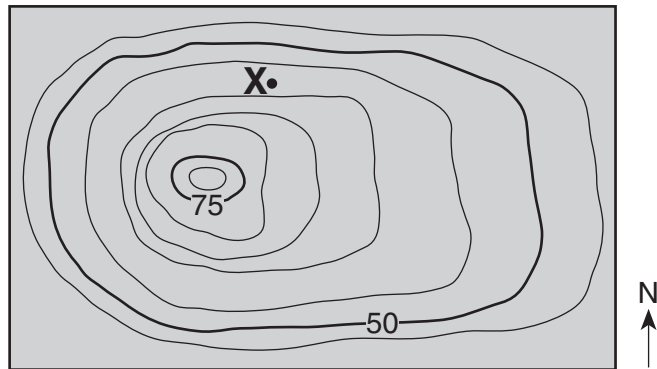
32 Which sequence of New York State index fossils shows the order in which the organisms appeared on Earth?



33 The generalized landscape regions of New York State are classified according to

- (1) bedrock structure and elevation
- (2) bedrock type and index fossils
- (3) latitude and longitude
- (4) climate and topography

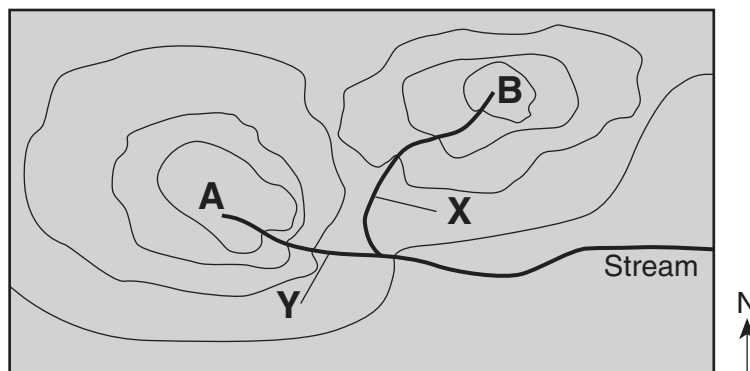
34 Point X is a location on the topographic map below. Elevations are measured in meters.



What is a possible elevation, in meters, of point X?

- (1) 55
- (2) 57
- (3) 68
- (4) 70

35 The topographic map below shows two hills labeled A and B. The tributary streams labeled X and Y have the same volume of water.



Which statement is best supported by the map?

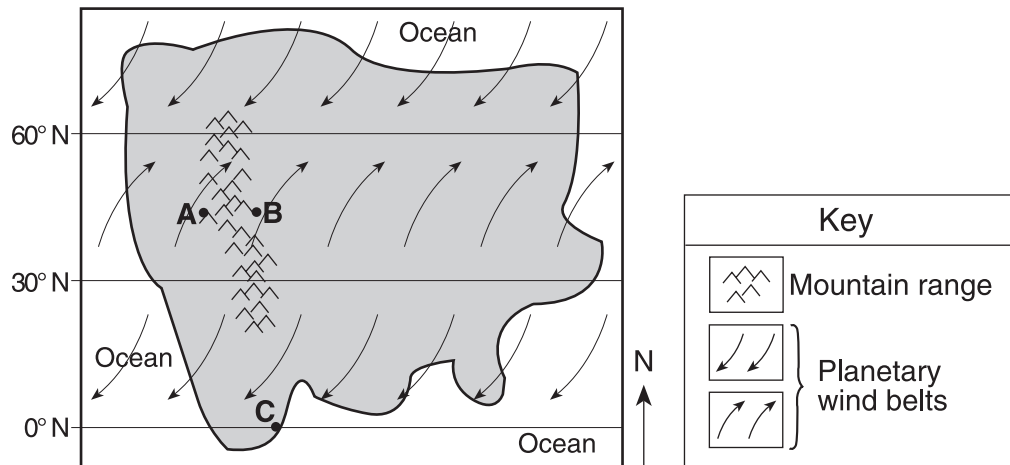
- (1) Hill A is higher than hill B.
 - (2) Hill B is higher than hill A.
 - (3) Stream X flows faster than stream Y.
 - (4) Stream Y flows faster than stream X.
-

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 and 37 on the map below, which represents an imaginary continent. Locations *A* and *B* are on opposite sides of a mountain range on a planet similar to Earth. Location *C* is on the planet's equator.



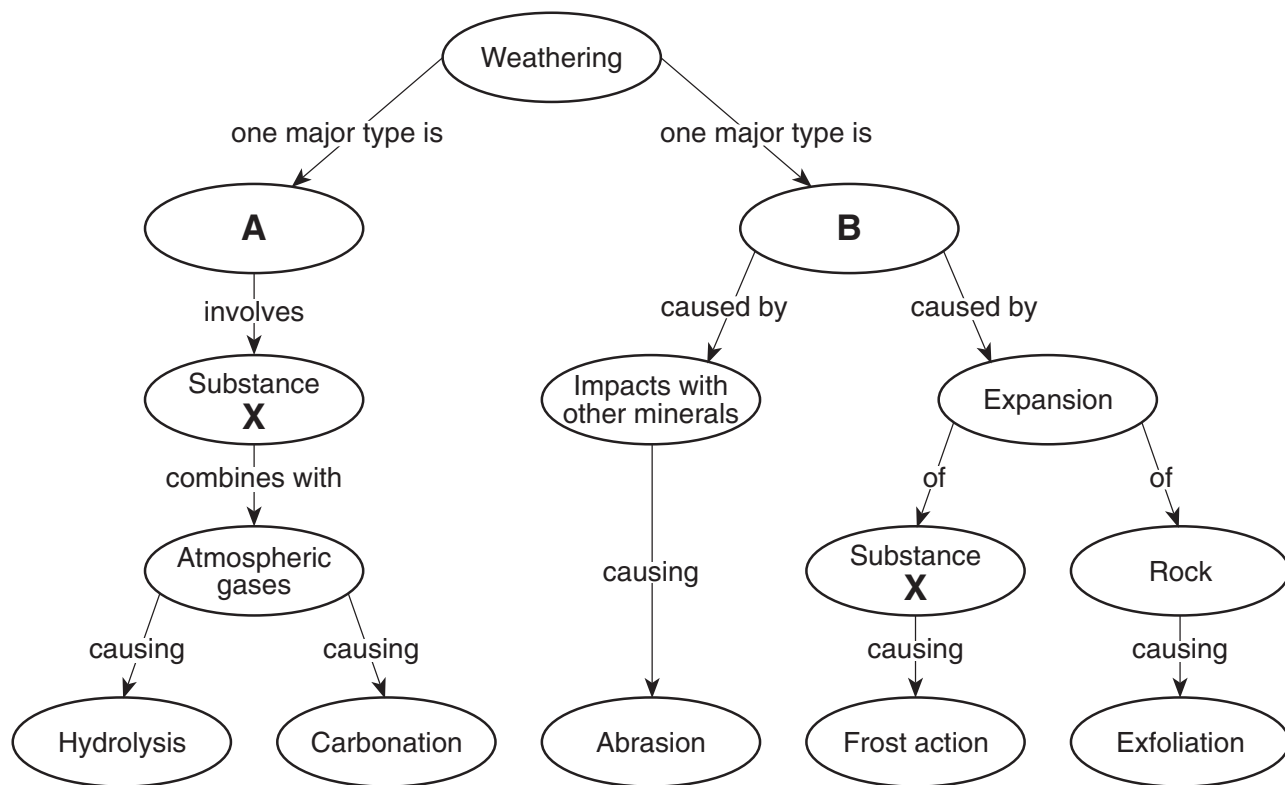
36 Compared to the climate at location *A*, the climate at location *B* would most likely be

- | | |
|---------------------------|---------------------------|
| (1) warmer and more humid | (3) cooler and more humid |
| (2) warmer and less humid | (4) cooler and less humid |

37 Location *C* most likely experiences

- (1) low air pressure and low precipitation
 - (2) low air pressure and high precipitation
 - (3) high air pressure and low precipitation
 - (4) high air pressure and high precipitation
-

Base your answers to questions 38 through 40 on the flowchart below, which shows a general overview of the processes and substances involved in the weathering of rocks at Earth's surface. Letter X represents an important substance involved in both major types of weathering, labeled A and B on the flowchart. Some weathering processes are defined below the flowchart.



Definitions
Frost action – the breakup of rocks caused by the expansion of substance X
Abrasion – the wearing down of rocks or particles as they rub or bounce against other rocks
Exfoliation – the peeling away of large sheets of loosened material at the surface of a rock
Hydrolysis – the change in a material caused by contact with substance X
Carbonation – the change in a material caused by contact with carbonic acid

38 Which term best identifies the type of weathering represented by A?

- (1) physical
- (2) biological
- (3) chemical
- (4) glacial

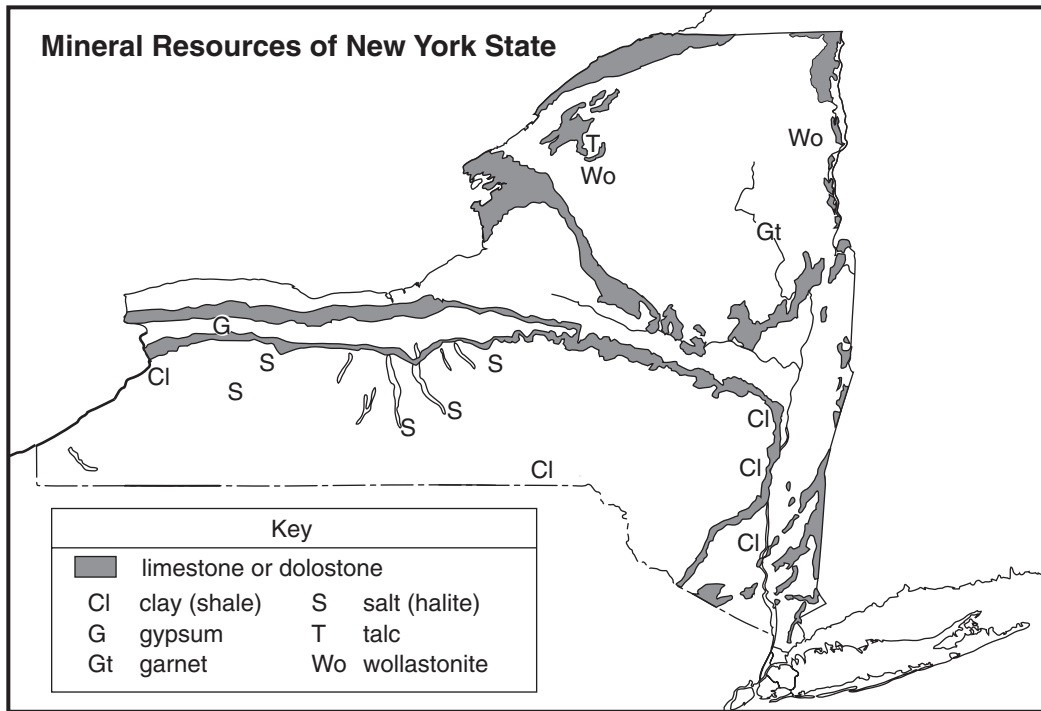
39 Which substance is represented by X on both sides of the flowchart?

- (1) potassium feldspar
- (2) air
- (3) hydrochloric acid
- (4) water

40 Which weathering process is most common in a hot, dry environment?

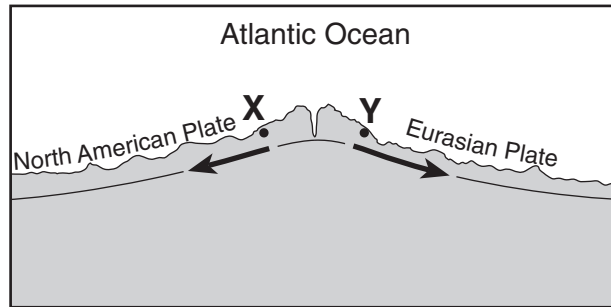
- (1) abrasion
- (2) carbonation
- (3) frost action
- (4) hydrolysis

Base your answers to questions 41 through 44 on the map below, which shows areas where certain minerals were mined in significant amounts during 1989.



- 41 In which New York State landscape region was most of the garnet mined?
- (1) Catskills (2) Adirondack Mountains (3) Tug Hill Plateau (4) Erie-Ontario Lowlands
- 42 What is a common use for the mineral that is mined at the southern end of the two largest Finger Lakes?
- (1) making talcum powder (2) vulcanizing rubber (3) polishing jewelry (4) melting ice
- 43 The gypsum deposits in New York State were formed
- (1) as a result of volcanic eruptions (2) as a result of metamorphism (3) in a shallow ocean (4) in a glacial outwash plain
- 44 The mineral wollastonite has a hardness of 4.5 to 5. Which New York State mineral could easily scratch wollastonite?
- (1) garnet (2) halite (3) talc (4) gypsum

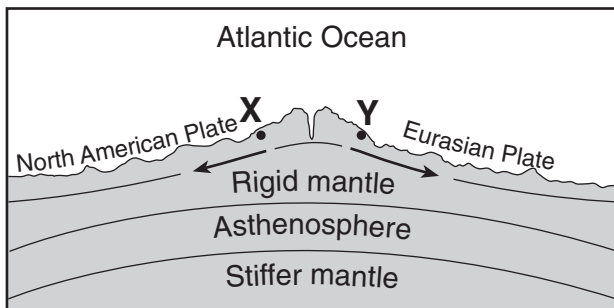
Base your answers to questions 45 and 46 on the cross section below, which shows an underwater mountain range in the Atlantic Ocean. The oceanic bedrock is composed mainly of basalt. Points X and Y are locations in the bedrock that have been diverging at the same rate. The movement of the North American Plate and Eurasian Plate is shown by the two arrows.



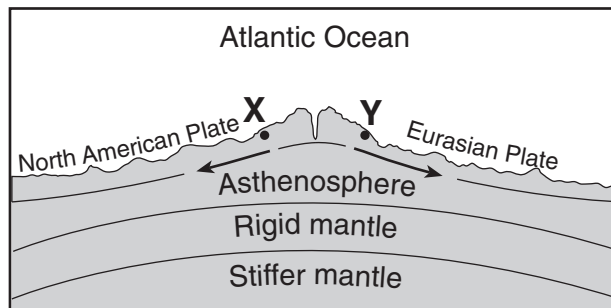
(Not drawn to scale)

- 45 Which statements best describe the age and magnetic orientation of the basalts found at locations X and Y?
- (1) The basalt at location X is younger than the basalt at location Y. Both locations have the same magnetic orientation.
 - (2) The basalts at locations X and Y are the same age. Both locations have the same magnetic orientation.
 - (3) The basalts at locations X and Y are the same age. Location X has normal magnetic orientation and location Y has reversed magnetic orientation.
 - (4) The basalt at location X is older than the basalt at location Y. Location X has reversed magnetic orientation and location Y has normal magnetic orientation.

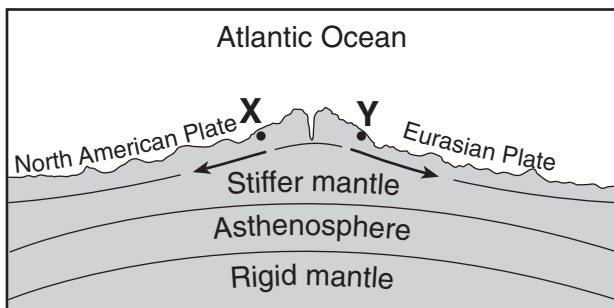
46 Which cross section best represents the relative locations of Earth's asthenosphere, rigid mantle, and stiffer mantle? (The cross sections are not drawn to scale.)



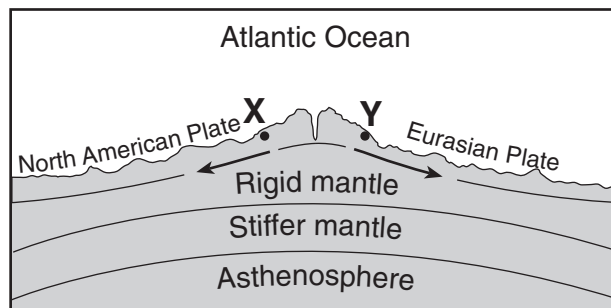
(1)



(3)

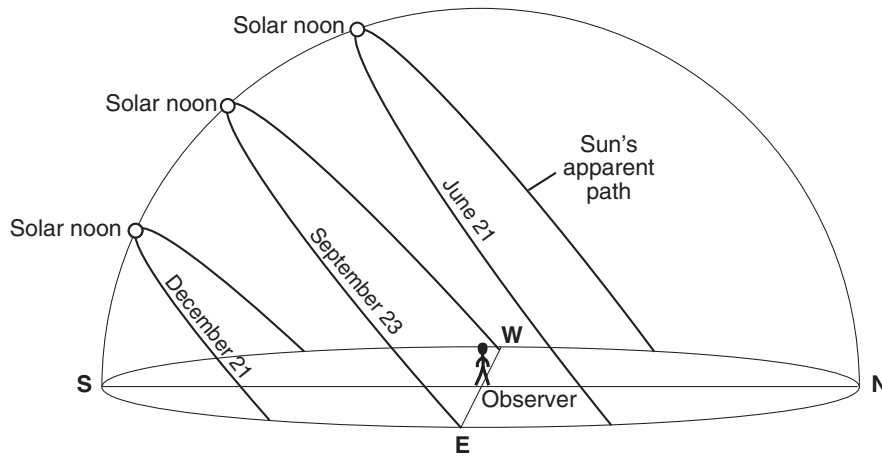


(2)



(4)

Base your answers to questions 47 through 50 on the diagram below, which represents the Sun's apparent paths and the solar noon positions for an observer at 42° N latitude on December 21, September 23, and June 21.



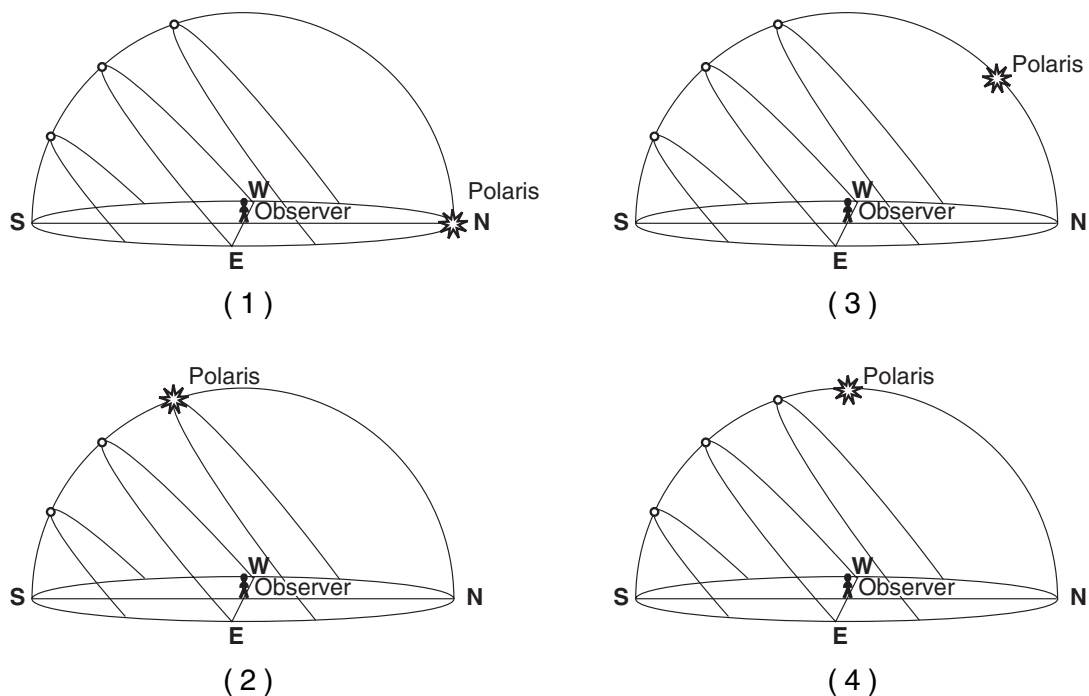
47 In which direction will sunrise occur on June 21?

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

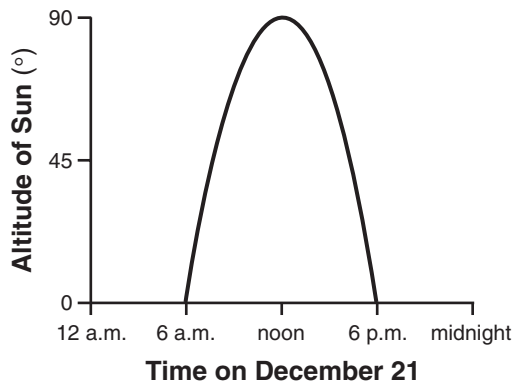
48 How many hours occurred between sunrise and solar noon on September 23?

- (1) 6
- (2) 8
- (3) 12
- (4) 24

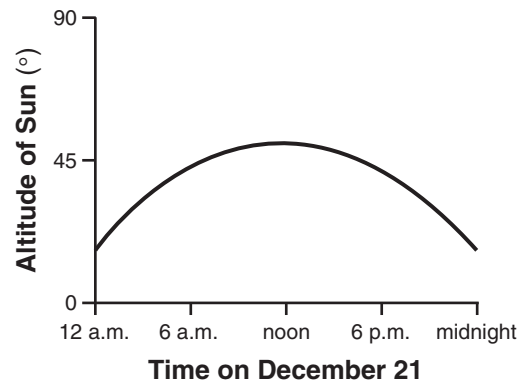
49 Which diagram best shows the location of *Polaris* relative to the observer?



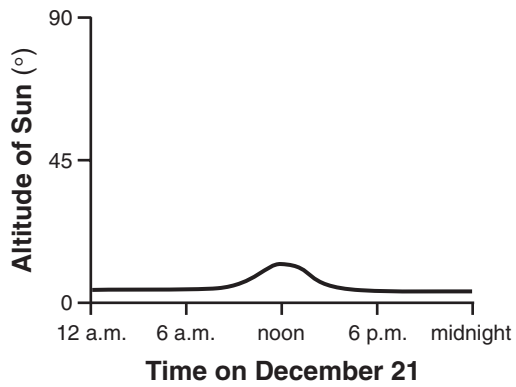
50 Which graph best shows the altitude of the Sun, as measured by the observer located at 42° N, at various times on December 21?



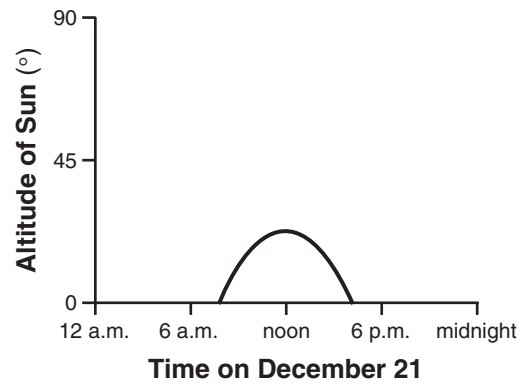
(1)



(3)



(2)



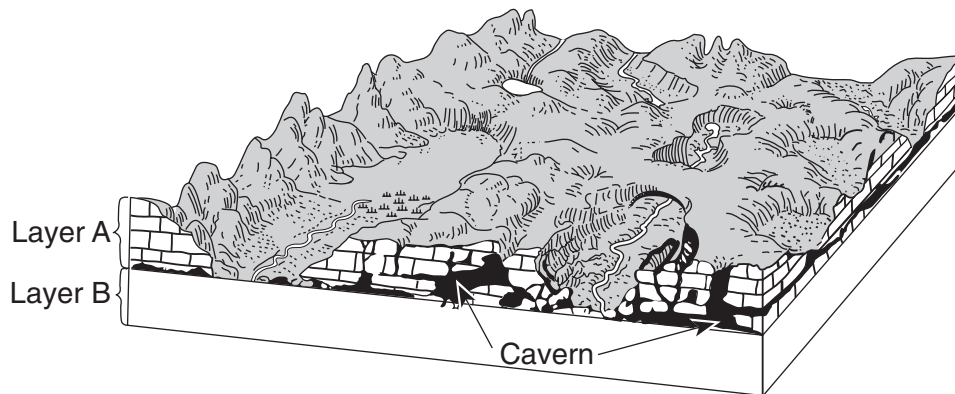
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Part B-2

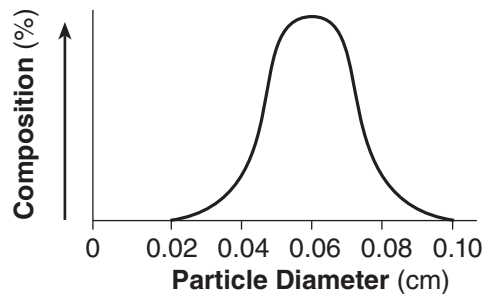
Answer all questions in this part.

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 block diagram below, which shows the landscape features of an area of Earth's crust. Two sedimentary rock layers, A and B, are labeled in the diagram. The rock symbol for layer B has been omitted.



- 51 Identify the most abundant mineral in rock layer A. [1]
- 52 Describe how the caverns formed in rock layer A. [1]
- 53 The graph below shows the particle sizes that compose the clastic sedimentary rock in layer B.



In the box in your answer booklet, draw the map symbol from the *Earth Science Reference Tables* that represents rock layer B. [1]

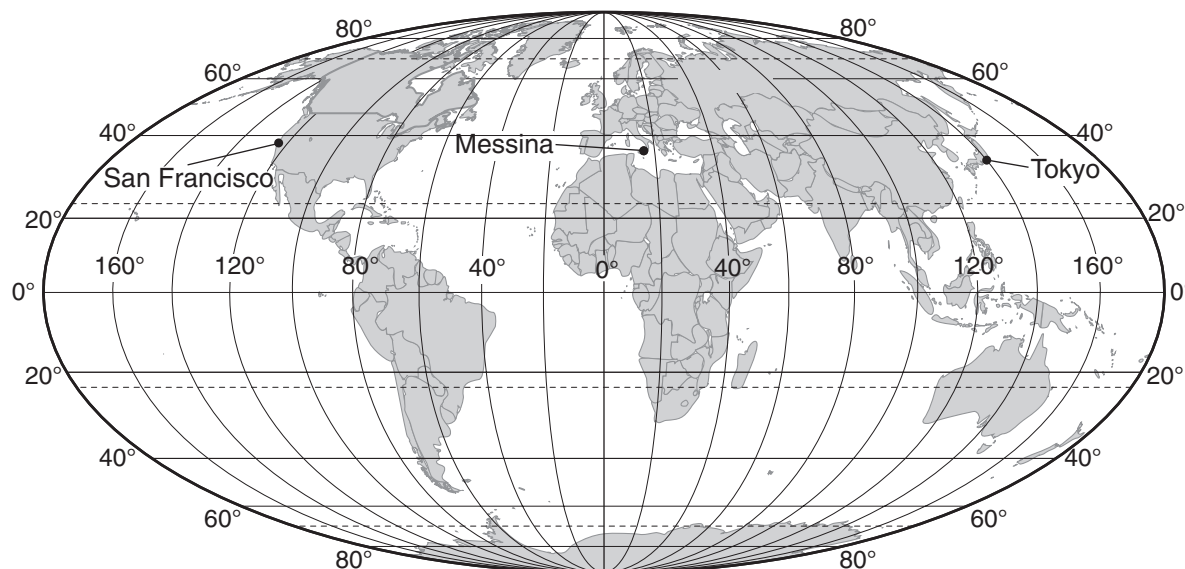
Base your answers to questions 54 through 56 on the table below, which lists the location of some earthquakes, their Richter magnitude, and their year of occurrence.

Data Table

Location	Richter Magnitude	Year
San Francisco, United States	7.8	1906
Messina, Italy	7.5	1908
Tokyo, Japan	8.3	1923
San Francisco, United States	7.1	1989

54 What data do scientists use to determine the magnitude of earthquakes without visiting the actual sites? [1]

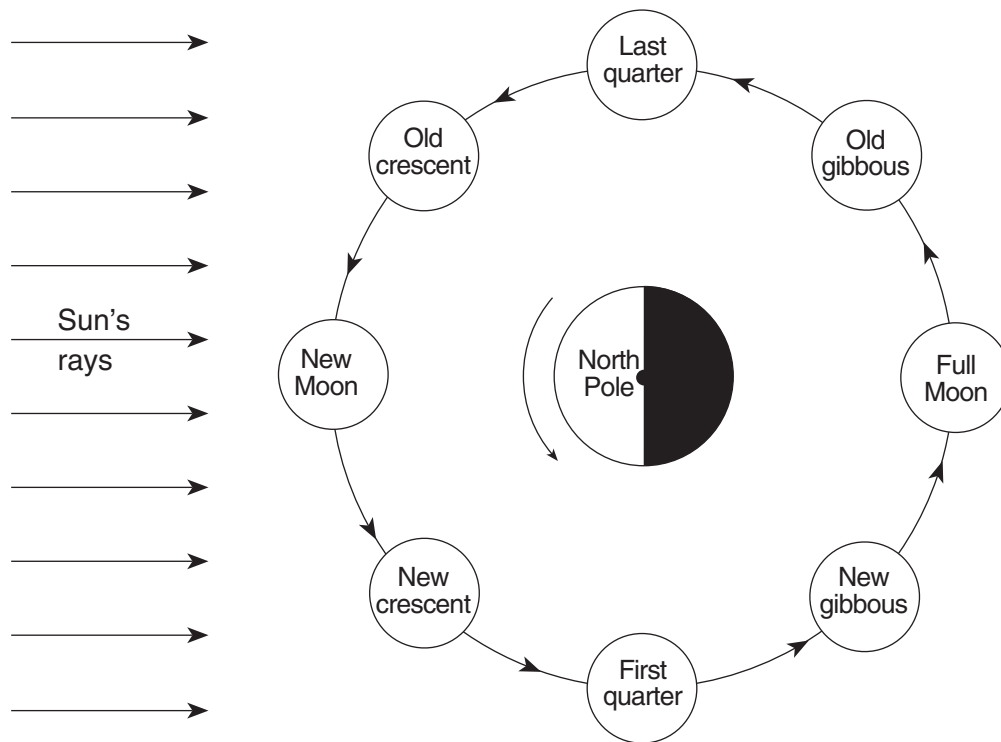
55 The locations of the earthquakes listed in the table are shown on the map below.



Explain how the locations of these earthquakes are related to tectonic plates. [1]

56 Identify the process in Earth's asthenosphere that is inferred to be the cause of tectonic plate motion. [1]

Base your answers to questions 57 through 60 on the diagram below, which shows Earth as viewed from above the North Pole. The nighttime side of Earth has been shaded. The Moon is shown at eight positions in its orbit around Earth. The name of each Moon phase is indicated at each Moon position. The dark portion of each Moon position has not been shaded.



(Not drawn to scale)

- 57 On the diagram *in your answer booklet*, shade the portion of the Moon that is in darkness to show the last quarter phase as viewed from New York State. [1]
- 58 Explain what causes the Moon's phases when viewed from Earth. [1]
- 59 Which Moon phase occurs approximately one week after the New Moon phase? [1]
- 60 Explain why the same side of the Moon always faces Earth. [1]
-
- 61 Complete the table *in your answer booklet* by identifying the color and classification of the star *Procyon B*. The data for the Sun have been completed as an example. [1]
-

Base your answers to questions 62 through 65 on the cross section in your answer booklet which shows a portion of Earth's crust. Letters *A* through *J* represent rock units or geologic structures. The rock units have not been overturned.

62 On the cross section *in your answer booklet*, draw a circle around the letter of the oldest rock unit shown. [1]

63 On the same cross section, place an **X** to indicate a location where the rock, marble, was formed. [1]

64 Describe *one* piece of evidence shown in the cross section that suggests rock unit *D* is younger than rock unit *F*. [1]

65 Explain why rock unit *H* is *not* one continuous layer. [1]

Part C

Answer all questions in this part.

Directions (66–84): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

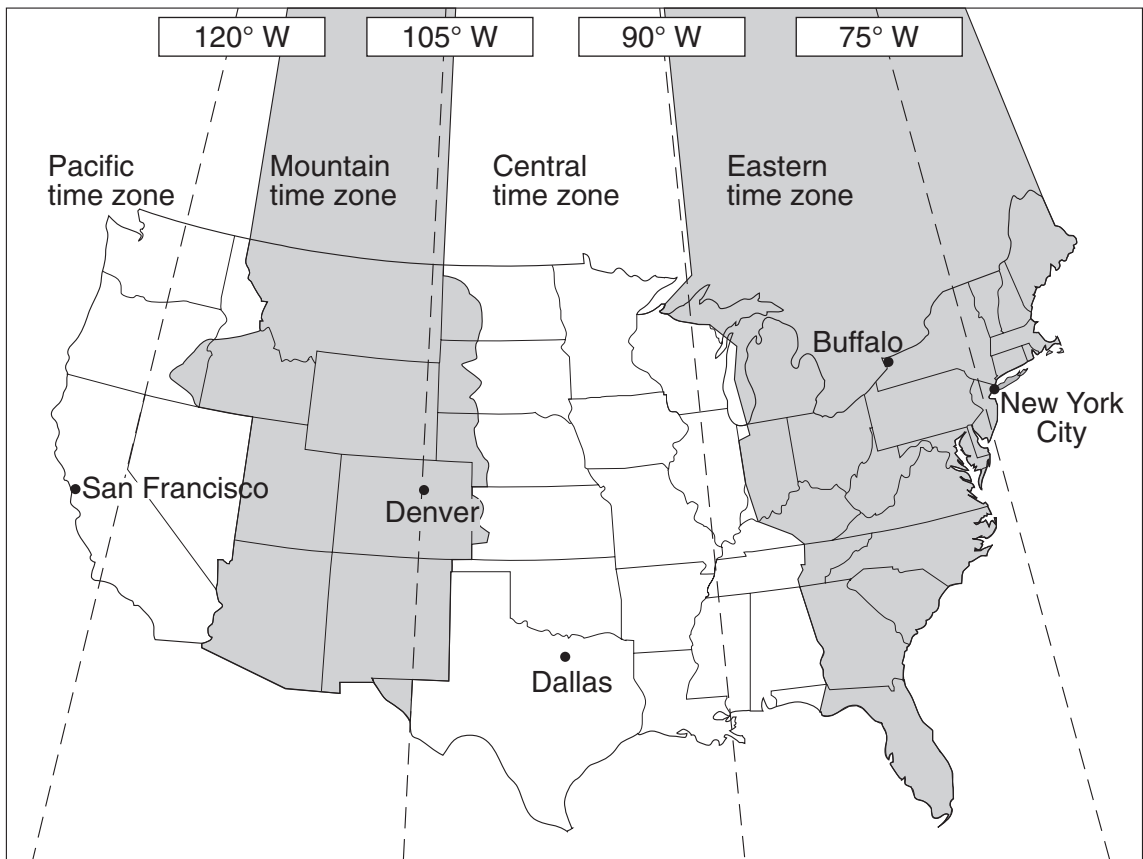
Base your answers to questions 66 through 70 on the weather map in your answer booklet. The isobars show air pressures, in millibars. Points *A* and *B* indicate locations on the map.

- 66 On the weather map *in your answer booklet*, place an **X** centered on the geographic region that was most likely the source of the mT air mass. [1]
- 67 Calculate the pressure gradient along a straight line between point *A* and point *B* on the map. Label your answer with the correct units. [2]
- 68 Describe the evidence shown on the map that indicates strong winds were blowing between Miles City and Pierre. [1]
- 69 In the table *in your answer booklet*, write the names of the cities listed below in sequence from lowest relative humidity to highest relative humidity. [1]
- Albuquerque
Chicago
New York City
- 70 Describe the pattern of the surface winds around the center of the low-pressure system (**L**). [1]
-

Base your answers to questions 71 and 72 on the passage and time zones map shown below.

Time Zones

In 1883, Earth was divided into 24 time zones. The United States (excluding Alaska and Hawaii) has four time zones, which are indicated by different shadings on the map. Each zone is roughly centered on lines of longitude that are 15° apart. These lines are shown as dashed lines on the map. Most locations within a time zone have the same time. This time is called standard time. As you move to the west, the time in each zone is one hour earlier than the previous time zone.



71 When it is 1 a.m. in New York City, what time is it in Denver? [1]

72 Explain, in terms of Earth's rotation, why the time zones are 15° of longitude apart. [1]

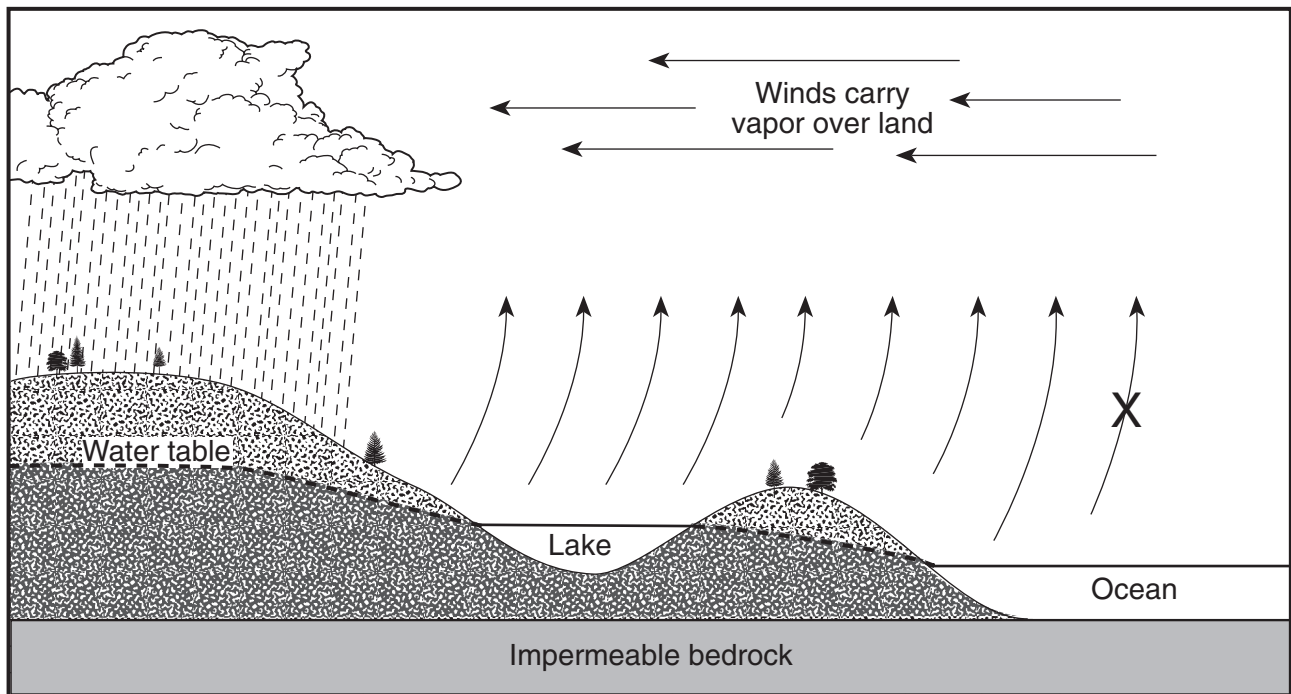
Base your answers to questions 73 and 74 on the data table below, which shows the average number of days with thunderstorms that occur over land areas at different latitudes each year.

Data Table

Latitude	Average Number of Days a Thunderstorm Occurs Over Land
60° N	5
45° N	14
30° N	19
15° N	30
0° (equator)	56
15° S	44
30° S	21
45° S	8
60° S	0

- 73 On the grid *in your answer booklet*, plot, with an **X**, the average number of days per year a thunderstorm occurs over a land area for *each* latitude shown on the data table. Connect the centers of the **X**s with a line. [1]
- 74 State the relationship between latitude and the average number of days each year that thunderstorms occur over a land area. [1]
-

Base your answers to questions 75 through 79 on the cross section below, which shows the general pattern of water movement in the water cycle. Letter X represents a water-cycle process.



75 What process of the water cycle is represented by X? [1]

76 Describe the process of condensation. [1]

77 Describe *one* surface condition that would allow runoff to occur. [1]

78 Explain *one* role of plants in the water cycle. [1]

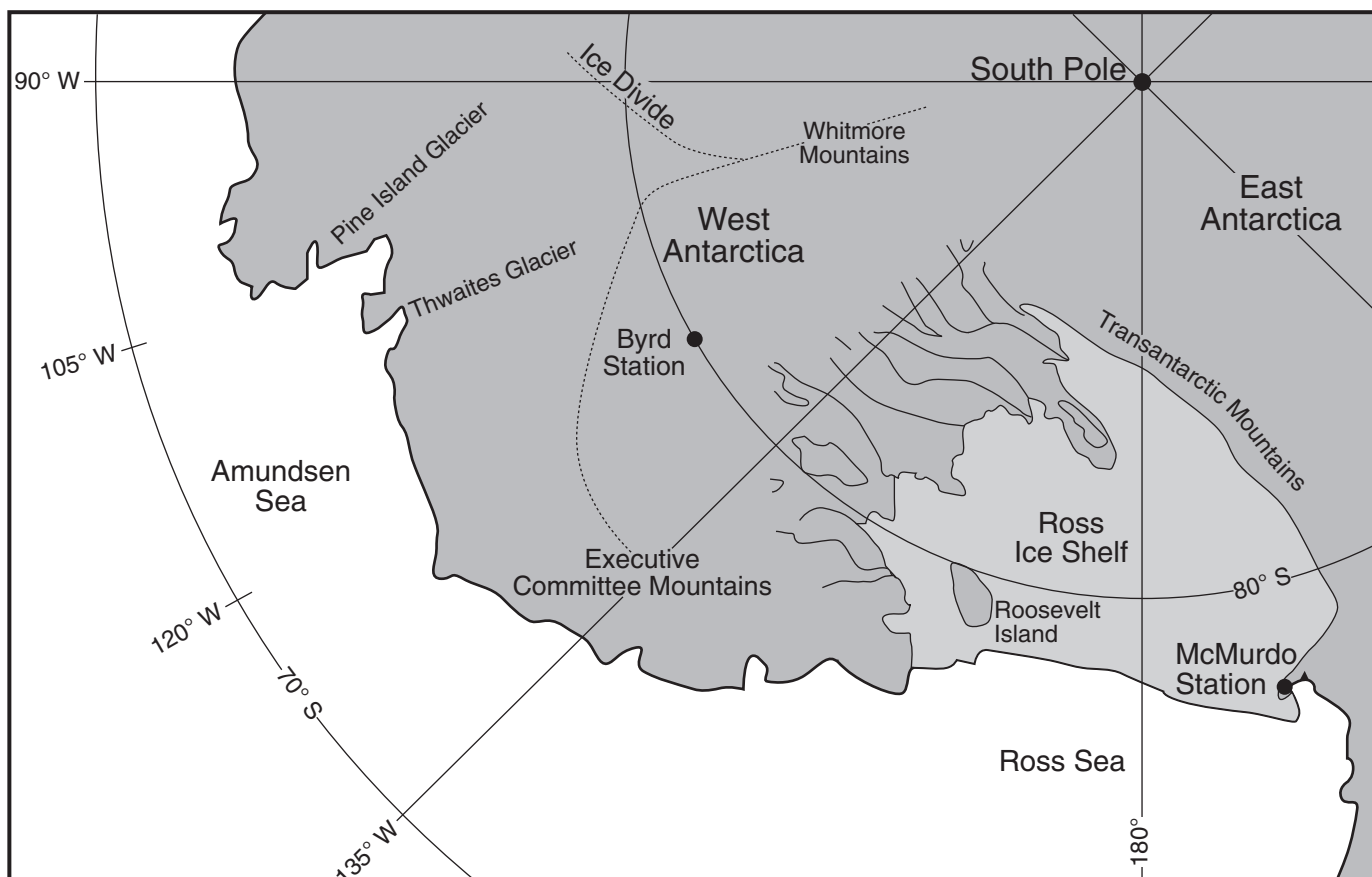
79 As the lake surface freezes in the winter, how many calories of heat are released by each gram of water? [1]

Base your answers to questions 80 through 84 on the passage and map below. The map shows a portion of the continent of Antarctica.

Antarctica's Ice Sheet

The size and shape of the West Antarctic Ice Sheet depends on many factors, including melting and freezing beneath the glacier, the amount of snowfall, snow removal by wind, iceberg formation, and the rate of ice flow. Glacial moraines are found in the Executive Committee Mountains shown on the map. Moraines are located up to 100 meters in elevation above the present ice sheet surface, which indicates that a thicker ice sheet existed 20,000 years ago.

The world's oceans and climate are influenced by Antarctica's ice. Even a small increase in sea level from melting glaciers would be a disaster for the nearly two billion people who live near coastal areas.



80 Identify *one* piece of evidence found on the sides of some Antarctic mountains that indicates that an ice sheet, hundreds of meters thicker than the current ice sheet, existed in the past. [1]

81 What is the duration of insolation on December 21 at McMurdo Station? [1]

- 82 State the latitude and longitude of Byrd Station. Your answer must include *both* the units and the compass directions. [1]
- 83 Describe the arrangement of sediment found in a glacial moraine. [1]
- 84 Identify *one* change that would cause a decrease in the size of the West Antarctic Ice Sheet. [1]
-

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 23, 2008 — 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.

Signature

Tear Here

Tear Here

Tear Here