The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 28, 2009 — 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 Which statement describes the general relationship between the temperature and the luminosity of main sequence stars?

(1) As temperature decreases, luminosity increases.
(2) As temperature decreases, luminosity remains the same.
(3) As temperature increases, luminosity increases.
(4) As temperature increases, luminosity remains the same.

2 Which planet has the *least* distance between the two foci of its elliptical orbit?

(1) Venus
(2) Earth
(3) Mars
(4) Jupiter

3 Earth's rate of rotation is approximately

(1) 1° per day
(2) 15° per day
(3) 180° per day
(4) 360° per day

4 Light and other forms of electromagnetic radiation are given off by stars using energy released during

(1) nuclear fusion
(2) conduction
(3) convection
(4) radioactive decay

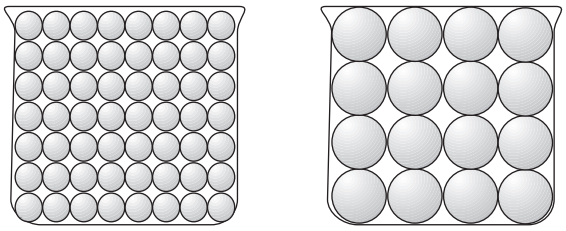
5 The path of a Foucault pendulum provides evidence that Earth

(1) rotates on its axis
(2) revolves in its orbit
(3) is tilted on its axis
(4) has an elliptical orbit

6 What time is it in Greenwich, England (at 0° longitude), when it is noon in Massena, New York?

(1) 7 a.m.
(2) noon
(3) 5 p.m.
(4) 10 p.m.

7 The diagram below shows two identical containers filled with uniform particles that were sorted by size.



Which characteristic is most likely the same for these particle-filled containers?

(1) infiltration rate
(2) water retention
(3) capillarity
(4) porosity

8 Which soil conditions normally result in the greatest amount of runoff?

(1) low permeability and gentle slope
(2) low permeability and steep slope
(3) high permeability and gentle slope
(4) high permeability and steep slope

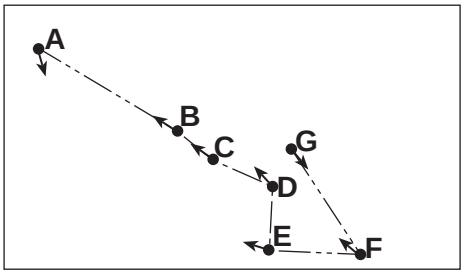
9 Very cold climates occur at Earth's North and South Poles because the polar regions

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

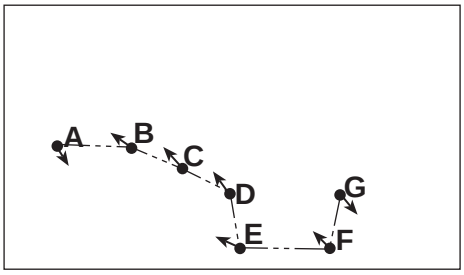
10 A barometric pressure of 1021.0 millibars is equal to how many inches of mercury?

(1) 29.88
(2) 30.15
(3) 30.25
(4) 30.50

11 The diagrams below show apparent changes in the positions of the stars in the Big Dipper that have occurred in the past 200,000 years. The directions of individual star movements as seen from Earth are shown by the arrows.

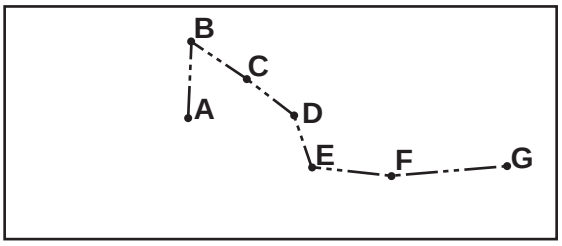


As it was 200,000 years ago

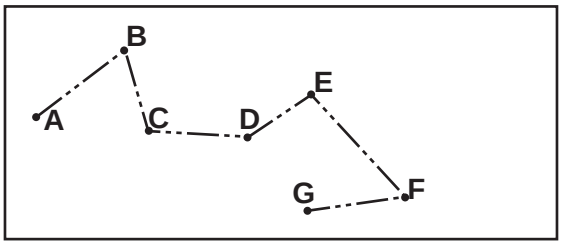


As it is today

Which diagram best represents how the Big Dipper will appear when viewed from Earth in 200,000 years?



(1)



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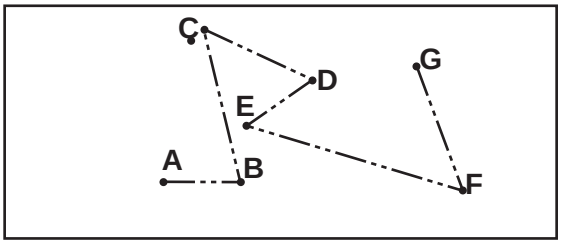

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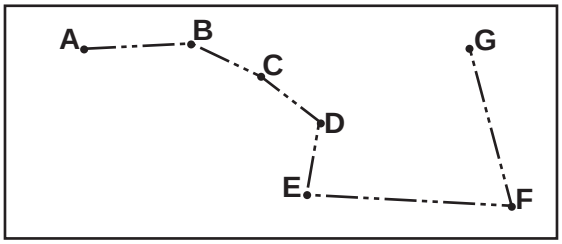
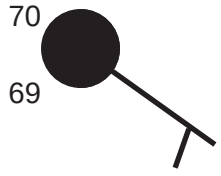
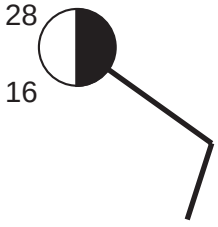


(4)

12 On which station model would the present weather symbol ✱ most likely be found?



(1)



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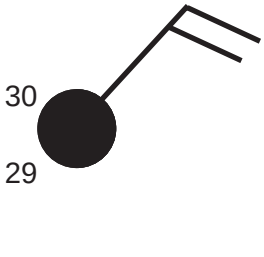

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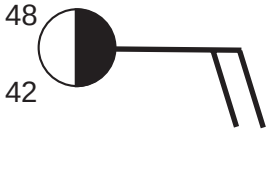
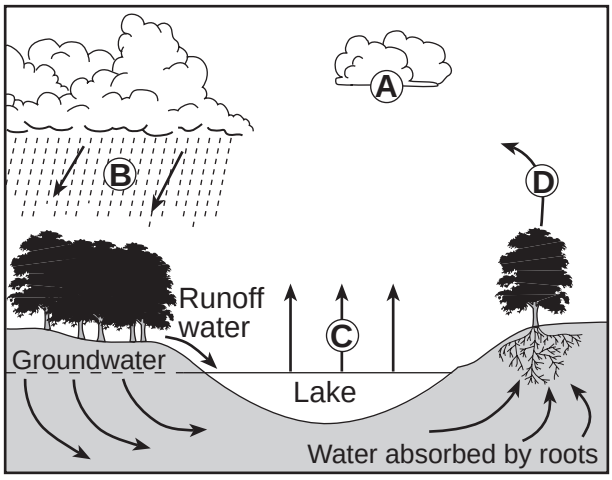


(4)

13 The letters *A* through *D* in the cross section below represent four of the processes that are part of the water cycle.



Which table correctly matches each letter with the process that it represents?

Letter	Process
A	condensation
B	precipitation
C	transpiration
D	evaporation

(1)

Letter	Process
A	transpiration
B	precipitation
C	evaporation
D	condensation

(3)

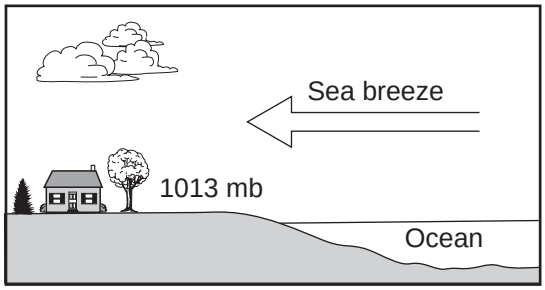
Letter	Process
A	evaporation
B	condensation
C	precipitation
D	transpiration

(2)

Letter	Process
A	condensation
B	precipitation
C	evaporation
D	transpiration

(4)

14 The cross section below shows a sea breeze blowing from the ocean toward the land. The air pressure at the land surface is 1013 millibars.

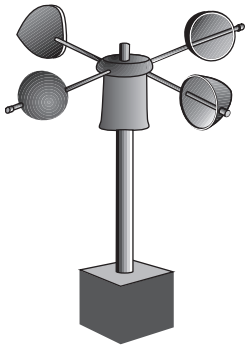


(Not drawn to scale)

The air pressure at the ocean surface a few miles from the shore is most likely

(1) 994 mb
(2) 1005 mb
(3) 1013 mb
(4) 1017 mb

15 An instrument used to measure a weather variable is shown below.



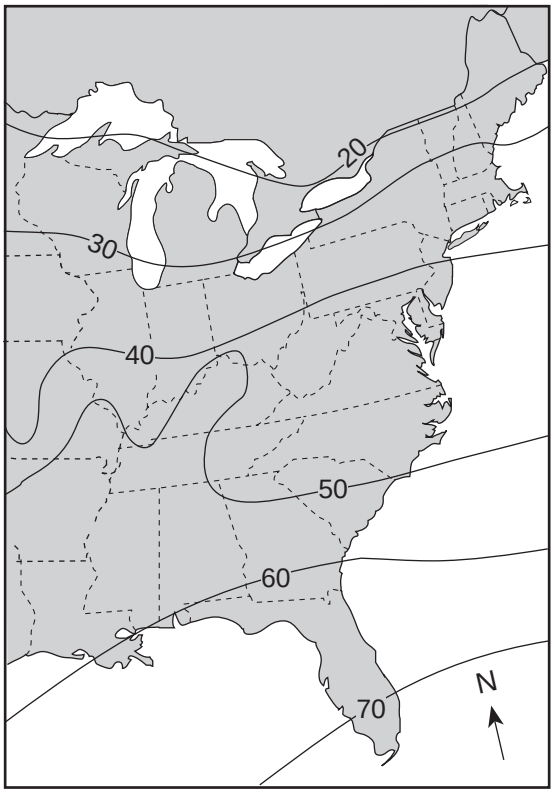
Which weather variable is measured by this instrument?

(1) wind direction
(2) air pressure
(3) wind speed
(4) amount of rainfall

16 Mt. Marcy often has the coldest nighttime temperatures in New York State because of its

(1) latitude and planetary winds
(2) latitude and elevation
(3) longitude and planetary winds
(4) longitude and elevation

17 The map below shows a weather variable recorded at noon on a certain day. Isolines show values from 20 to 70.



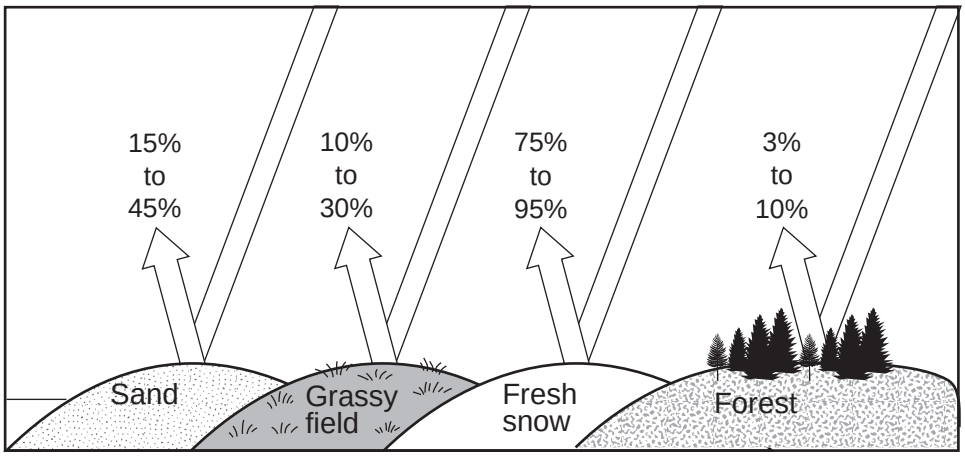
Which atmospheric variable is most likely represented by the isolines on this map?

(1) snowfall in inches
(2) wind speed in knots
(3) barometric pressure in millibars
(4) air temperature in degrees Fahrenheit

18 Which combination of temperature and pressure is inferred to occur within Earth's stiffer mantle?

(1) 3500°C and 0.4 million atmospheres
(2) 3500°C and 2.0 million atmospheres
(3) 5500°C and 0.4 million atmospheres
(4) 5500°C and 2.0 million atmospheres

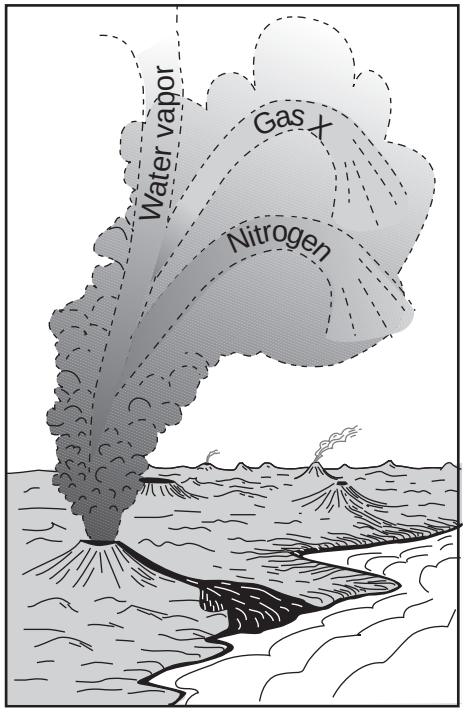
19 The diagram below indicates the amount of solar radiation that is reflected by equal areas of various materials on Earth's surface.



Which material absorbs the most solar radiation?

(1) grassy field
(2) fresh snow
(3) sand
(4) forest

20 The diagram below shows a process thought to have produced Earth's early atmosphere.



Which major component is shown as gas *X*?

(1) helium
(2) ozone
(3) carbon dioxide
(4) hydrogen

21 During which two geologic time periods did most of the surface bedrock of the Taconic Mountains form?

(1) Cambrian and Ordovician
(2) Silurian and Devonian
(3) Pennsylvanian and Mississippian
(4) Triassic and Jurassic

22 Which event is an example of chemical weathering?

(1) rocks falling off the face of a steep cliff
(2) feldspar in granite being crushed into clay-sized particles
(3) water freezing in cracks in a roadside outcrop
(4) acid rain reacting with limestone bedrock

23 The entire area drained by a river and its tributaries is called a

(1) delta
(2) watershed
(3) valley
(4) floodplain

24 A meandering stream deposits most of its sediments on the

(1) inside of meanders where the stream flows faster
(2) inside of meanders where the stream flows slower
(3) outside of meanders where the stream flows faster
(4) outside of meanders where the stream flows slower

25 Which natural agent of erosion is mainly responsible for the formation of the barrier islands along the southern coast of Long Island, New York?

(1) mass movement
(2) running water
(3) prevailing winds
(4) ocean waves

26 Which geologic event occurred in New York State at approximately the same time that eurypterids were becoming extinct?

(1) the opening of the Atlantic Ocean
(2) the uplift of the Appalachian Mountains
(3) the formation of the Catskill Delta
(4) the intrusion of the Palisades Sill

27 Which group of elements is listed in increasing order based on the percent by mass in Earth's crust?

(1) aluminum, iron, calcium
(2) aluminum, silicon, magnesium
(3) magnesium, iron, aluminum
(4) magnesium, silicon, calcium

28 Which observation provides the best evidence that Earth revolves around the Sun?

(1) The constellation Orion is only visible in the night sky for part of the year.
(2) The North Star, *Polaris*, is located above the North Pole for the entire year.
(3) The Sun appears to move across Earth's sky at a rate of 15°/hr.
(4) The Coriolis effect causes Northern Hemisphere winds to curve to the right.

29 One reason *Tetragraptus* is considered a good index fossil is that *Tetragraptus*

(1) existed during a large part of the Paleozoic Era
(2) has no living relatives found on Earth today
(3) existed over a wide geographic area
(4) has been found in New York State

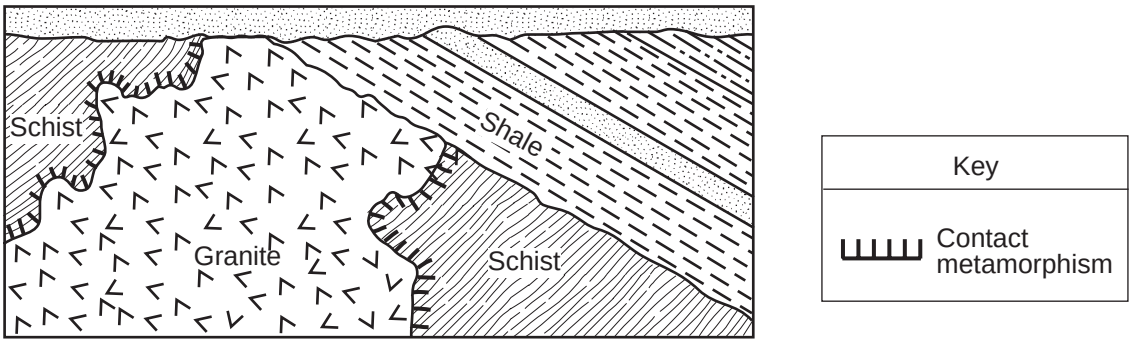
30 What is the dewpoint temperature when the relative humidity is 30% and the air temperature is 20°C?

(1) –28°C
(2) 2°C
(3) 6°C
(4) 9°C

31 An igneous rock contains 10 grams of radioactive potassium-40 and a total of 10 grams of its decay products. During which geologic time interval was this rock most likely formed?

(1) Middle Archean
(2) Late Archean
(3) Middle Proterozoic
(4) Late Proterozoic

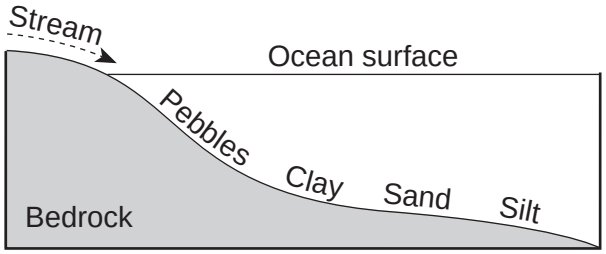
32 The geologic cross section below shows a complex structure containing a granite intrusion.



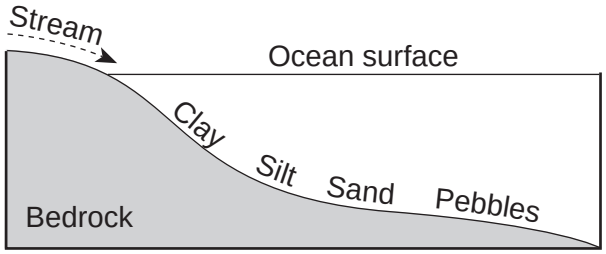
If the granite intrusion occurred 24 million years ago, what are the most probable ages of the schist and shale, in millions of years?

(1) schist – 25; shale – 23
(2) schist – 25; shale – 26
(3) schist – 23; shale – 25
(4) schist – 23; shale – 20

33 Which profile best shows the general depositional pattern that occurs when water from a stream enters the ocean?



(1)



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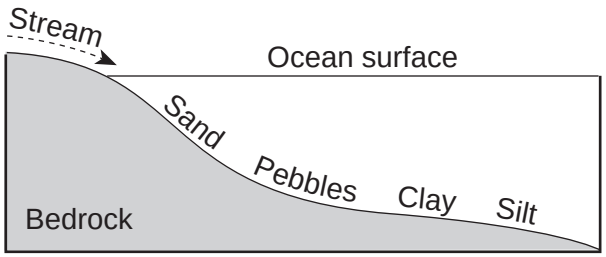

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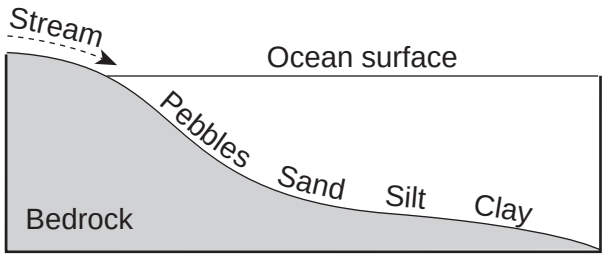


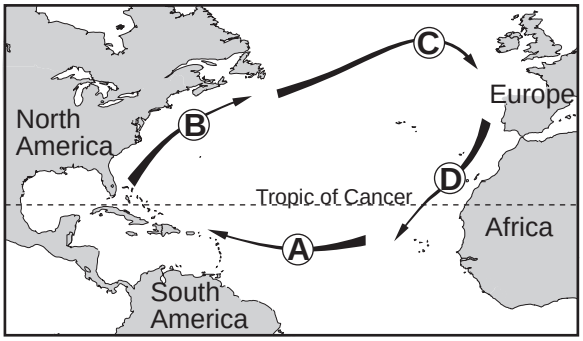
(4)

34 The map below shows the locations of Virginia Beach, Virginia, and Springfield, Missouri.

Virginia Beach experiences cooler summers and warmer winters than Springfield because Virginia Beach

(1) is located closer to the Atlantic Ocean
(2) is located closer to the equator
(3) has a greater average yearly duration of insolation
(4) has a greater average yearly intensity of insolation

35 The arrows labeled *A* through *D* on the map below show the general paths of abandoned boats that have floated across the Atlantic Ocean.



Which sequence of ocean currents was responsible for the movement of these boats?

(1) South Equatorial → Gulf Stream → Labrador → Benguela
(2) South Equatorial → Australia → West Wind Drift → Peru
(3) North Equatorial → Koroshio → North Pacific → California
(4) North Equatorial → Gulf Stream → North Atlantic → Canaries

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 passage below.

Fossils and the History of Earth's Rotation

Data from coral fossils support the hypothesis that Earth's rotation rate has been slowing down by about 2.5 seconds per 100,000 years. Scientists believe this is due to the frictional effects of ocean tides. This slowing rotation rate decreases the number of days in the year.

Scientists have discovered that corals produce a thin layer of shell every day, resulting in growth rings. These daily layers are separated by yearly ridges.

The Devonian coral fossil, *Pleurodictyum*, has approximately 400 growth rings between each yearly ridge, which suggests that there were about 400 days in a year during the Devonian Period.

Supporting this hypothesis, scientists have found coral from the Pennsylvanian Period that have about 390 growth rings per year, while present-day corals have about 365 growth rings per year.

36 Approximately how many fewer Earth days per year are there today than there were during the Devonian Period?

(1) 10
(2) 25
(3) 35
(4) 40

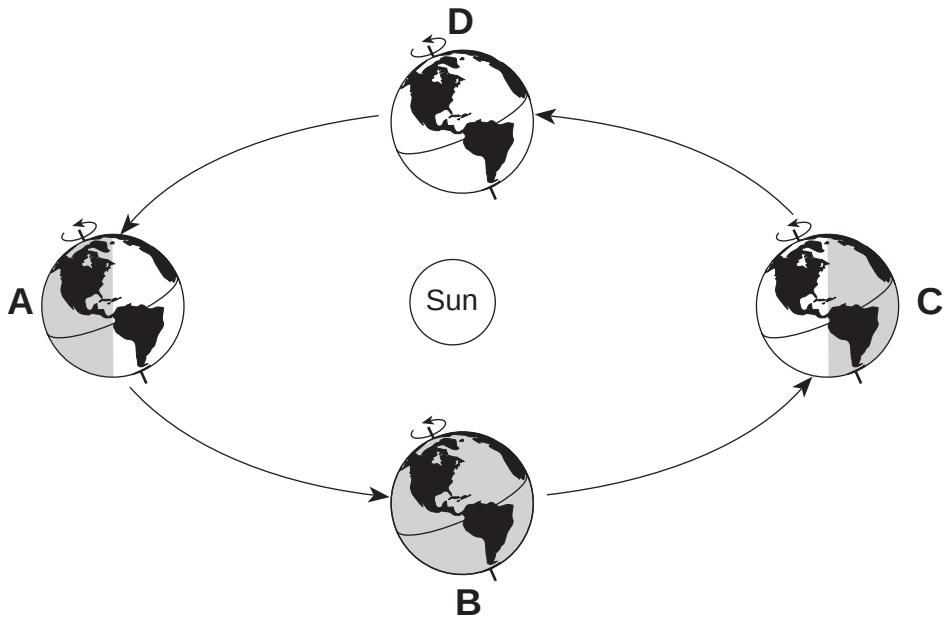
37 What inference can be made about the number of growth rings per year for a coral from the Permian Period and Ordovician Period compared to the number of growth rings per year for the Devonian coral, *Pleurodictyum*?

(1) Ordovician coral would have fewer, but Permian coral would have more.
(2) Ordovician coral would have more, but Permian coral would have fewer.
(3) Both Ordovician and Permian coral would have fewer.
(4) Both Ordovician and Permian coral would have more.

38 The evidence of the fossil *Pleurodictyum* found in surface bedrock in the Finger Lakes region of New York State suggests that this region was once

(1) covered by a glacial ice sheet
(2) covered by a warm, shallow sea
(3) located in a desert area
(4) located in a tropical rain forest

Base your answers to questions 39 through 41 on the diagram below, which shows a model of Earth's orbit around the Sun. Letters *A*, *B*, *C*, and *D* represent Earth's position at the beginning of each season.

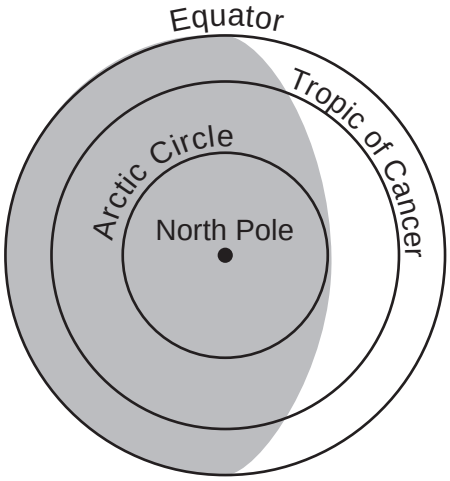


(Not drawn to scale)

39 Which position of Earth represents the first day of summer in the Northern Hemisphere?

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

40 The diagram below shows how Earth is illuminated [lighted] by the Sun as viewed from above the North Pole.



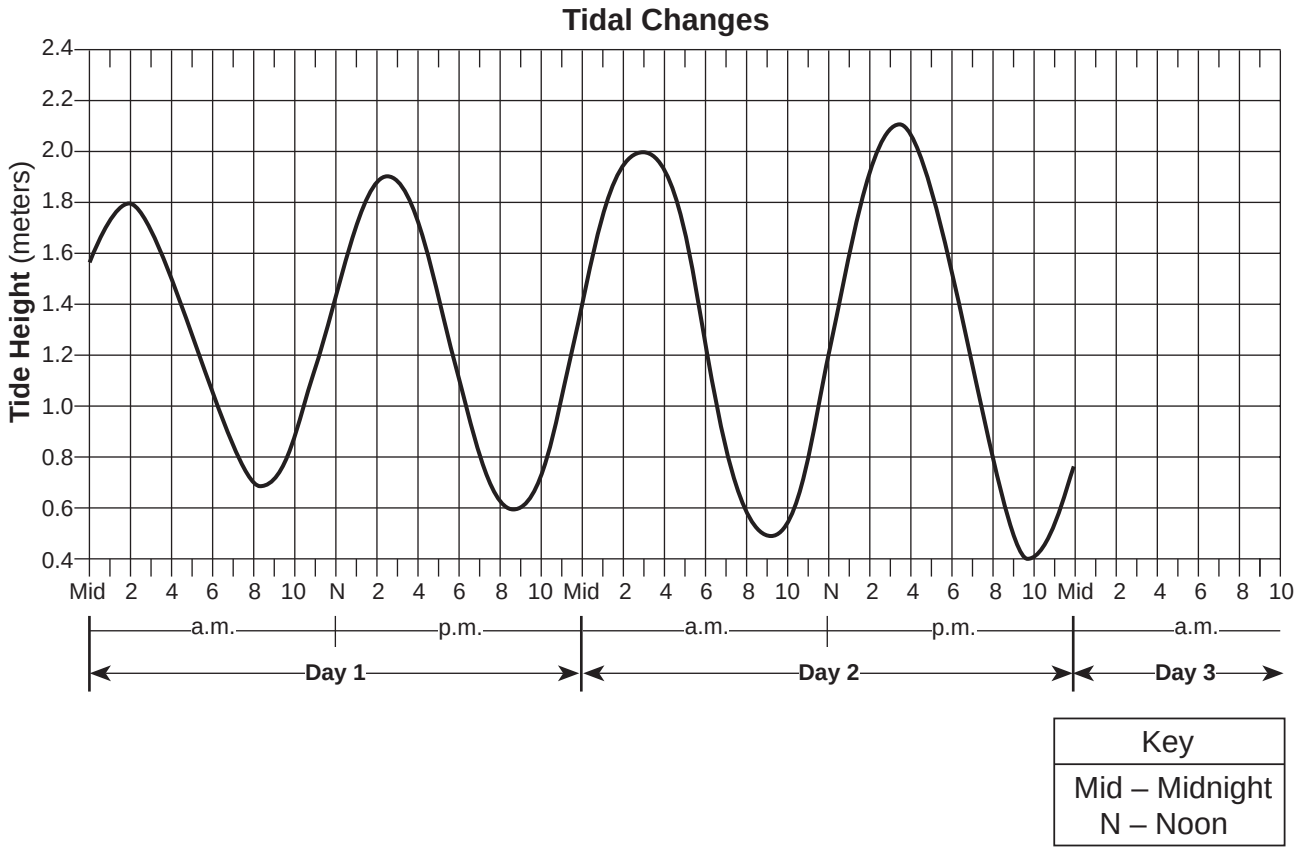
In which orbital position would Earth be illuminated as shown?

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

41 How many degrees will the Sun's vertical rays shift on Earth's surface as Earth travels from position *C* to position *D*?

(1) 15°
(2) 23.5°
(3) 47°
(4) 365°

Base your answers to questions 42 and 43 on the graph below, which shows two days of tidal data from a coastal location in the northeastern United States.



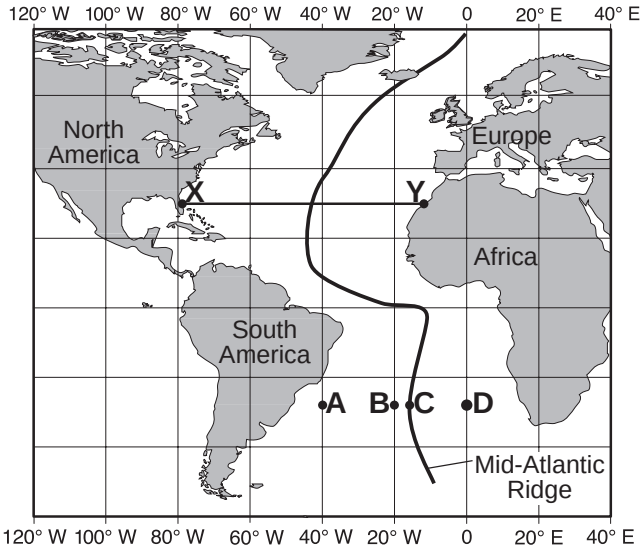
42 The change in the tides as shown on the graph is primarily the result of

(1) Earth's rotation and the Moon's revolution
(2) Earth's rotation and revolution
(3) the Moon's rotation and Earth's revolution
(4) the Moon's rotation and revolution

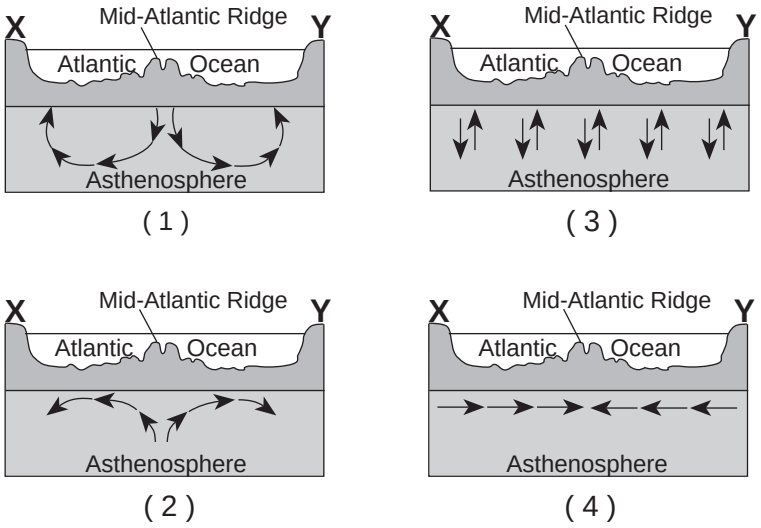
43 If the pattern shown continues, the most likely height and time for the first high tide on day 3 would be

(1) 2.2 meters at 4 a.m.
(2) 2.3 meters at 4 a.m.
(3) 2.2 meters at 5 a.m.
(4) 2.3 meters at 5 a.m.

Base your answers to questions 44 through 46 on the map of the Mid-Atlantic Ridge shown below. Points *A* through *D* are locations on the ocean floor. Line *XY* connects locations in North America and Africa.



44 In which cross section do the arrows best show the convection occurring within the asthenosphere beneath line *XY*?



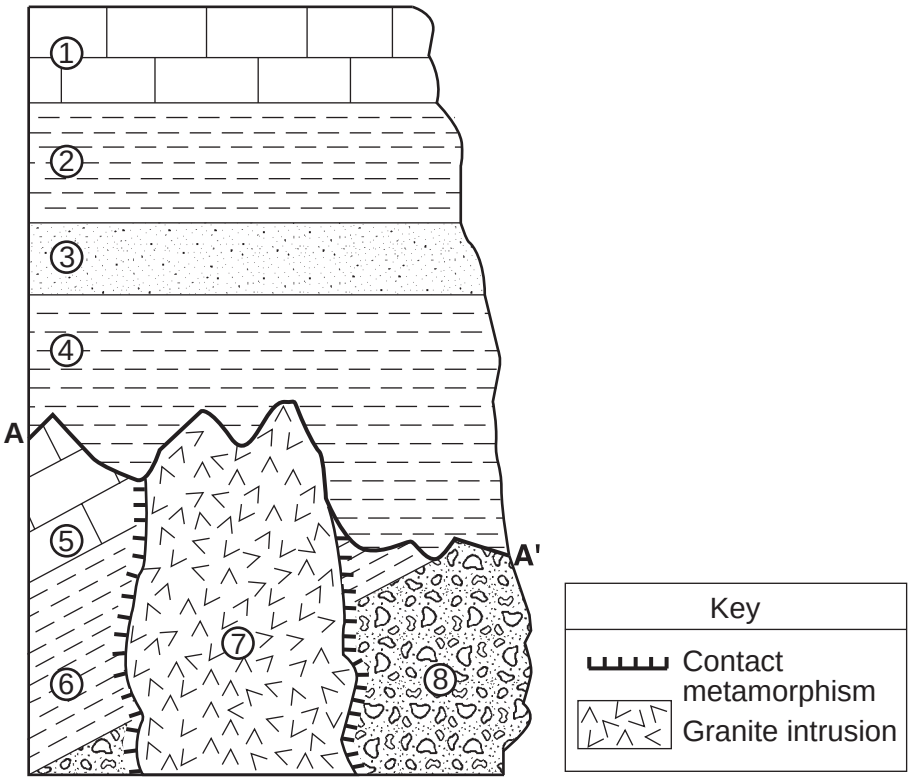
45 Samples of ocean-floor bedrock were collected at points *A*, *B*, *C*, and *D*. Which sequence shows the correct order of the age of the bedrock from oldest to youngest?

(1) $D \rightarrow C \rightarrow B \rightarrow A$
(2) $A \rightarrow D \rightarrow B \rightarrow C$
(3) $C \rightarrow B \rightarrow D \rightarrow A$
(4) $A \rightarrow B \rightarrow D \rightarrow C$

46 The boundary between which two tectonic plates is most similar geologically to the plate boundary at the Mid-Atlantic Ridge?

(1) Eurasian and Indian-Australian
(2) Cocos and Caribbean
(3) Pacific and Nazca
(4) Nazca and South American

Base your answers to questions 47 through 49 on the cross section below. Rock units are labeled 1 through 8. The line between *A* and *A′* indicates an unconformity.



47 Which characteristic of the granite intrusion provides the most evidence that it solidified deep underground?

(1) very hard
(2) coarse texture
(3) light color
(4) felsic composition

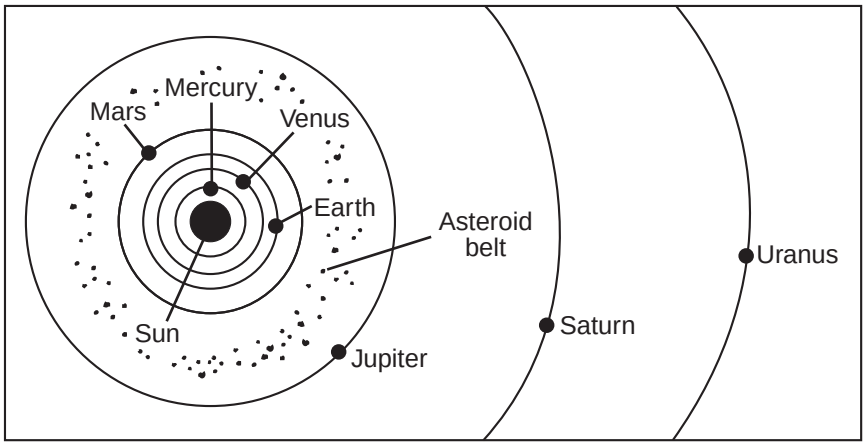
48 Which event occurred sometime after the formation of the unconformity?

(1) formation of rock unit 3
(2) tilting of rock unit 5
(3) deposition of the sediments that formed rock unit 8
(4) intrusion of rock unit 7

49 Which rock most probably formed in the contact metamorphic zone within rock unit 6?

(1) marble
(2) basalt
(3) quartzite
(4) hornfels

Base your answer to question 50 on the diagram below. This diagram shows a portion of the solar system.



(Not drawn to scale)

50 What is the average distance, in millions of kilometers, from the Sun to the asteriod belt?

(1) 129
(2) 189
(3) 503
(4) 857

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 and 52 on the diagram in your answer booklet, which represents the sky above an observer in Elmira, New York. Angular distances above the horizon are indicated. The Sun's apparent path for December 21 is shown.

51 On March 21, the altitude of the noon Sun in Elmira is 48°. On the diagram *in your answer booklet,* draw the Sun's apparent path for March 21, as it would appear to the observer. Be sure your path begins and ends at the correct positions on the horizon and indicates the correct altitude of the noon Sun. [1]

52 On what date of the year does the maximum duration of insolation usually occur at Elmira? [1]

Base your answers to questions 53 through 57 on the weather map in your answer booklet, which shows two fronts associated with a low-pressure system.

53 On the weather map *in your answer booklet,* write the letter **L** at the location of the center of the low-pressure system. [1]

54 On the weather map *in your answer booklet,* write the air-mass symbols to indicate the most likely locations of the continental polar air mass and maritime tropical air mass that have formed this low-pressure system. [1]

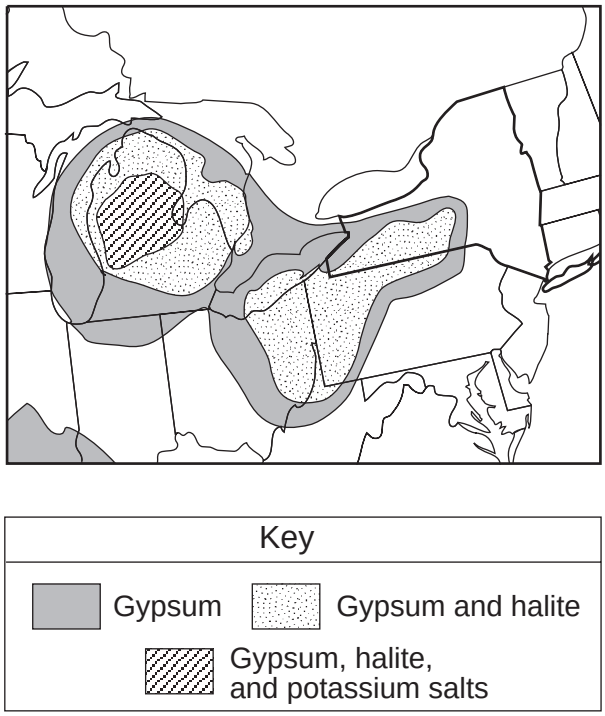
55 On the weather map *in your answer booklet,* place an **X** where precipitation is most likely occurring. [1]

56 Which type of weather front has entered New York State? [1]

57 Warm, moist air is rising along the two frontal surfaces. Describe how the water vapor in this rising air forms clouds. Include *dewpoint* and *condensation* in your answer. [1]

Base your answers to questions 58 and 59 on the map below. The map shows the approximate area in a portion of North America where some sedimentary rock layers composed of gypsum, halite, and potassium salt minerals are found in Earth's crust.

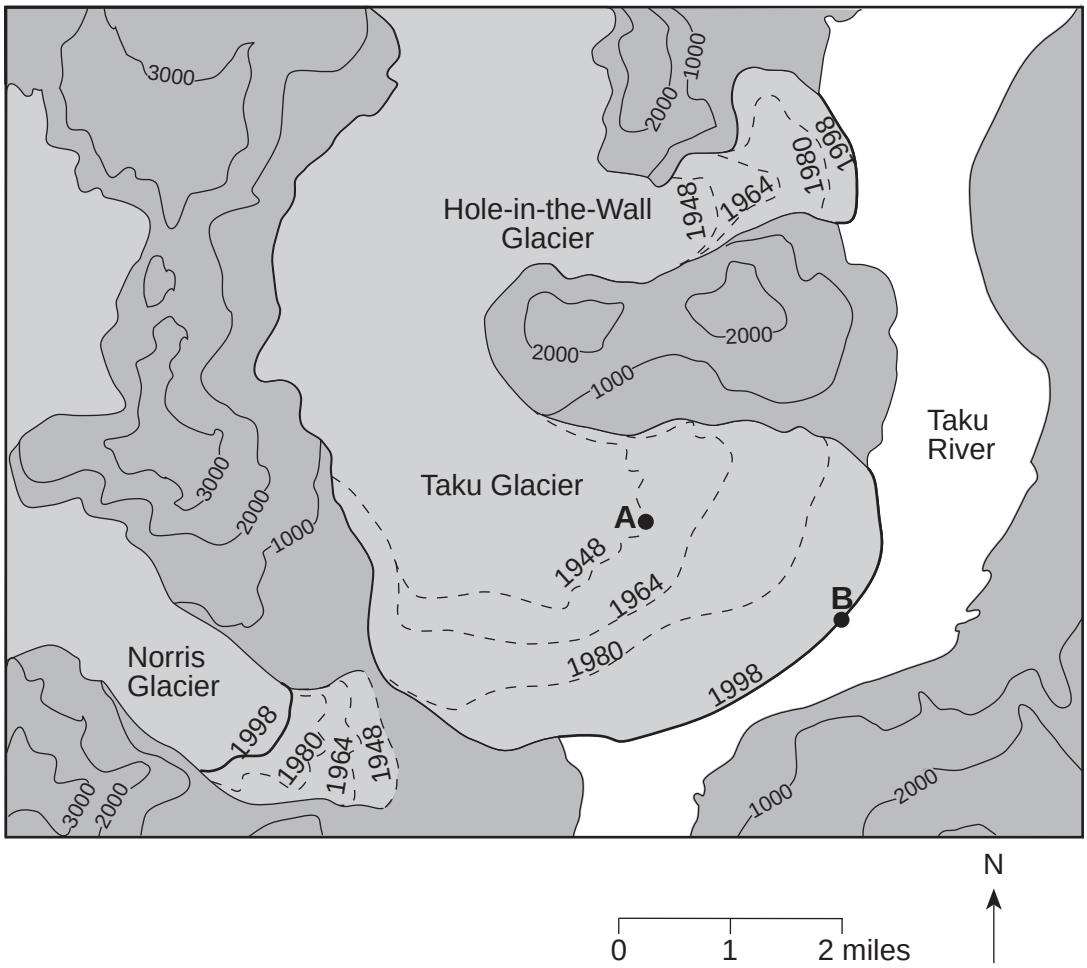
Mineral Deposits



58 Identify *one* New York State landscape region in which deposits of gypsum and halite are commonly found. [1]

59 Identify the sedimentary rock composed of halite and explain how this rock is usually formed. [1]

Base your answers to questions 60 through 62 on the topographic map below, which shows three glaciers found in Alaska. Dashed lines show the inferred location of the front edge of each glacier in 1948, 1964, and 1980. Solid lines show the location of the front edge of each glacier in 1998. Points *A* and *B* show the location of the front edge of the Taku Glacier in 1948 and 1998. Elevations are in feet.



60 Determine the rate, in miles per year, that the front edge of the Taku Glacier moved between point *A* and point *B*. [1]

61 What is the contour interval on this map? [1]

62 If these glaciers completely melted, what *two* pieces of evidence would a scientist most likely find to indicate that glaciers had existed in this area? [1]

Base your answers to questions 63 through 65 on the data table below, which shows the average distance from the Sun, the average surface temperature, and the average orbital velocity for each planet in our solar system.

Data Table

Planet	**Average Distance from Sun** (millions of km)	**Average Surface Temperature** (°C)	**Average Orbital Velocity** (km/sec)
Mercury	58	167	47.9
Venus	108	457	35.0
Earth	150	14	29.8
Mars	228	–55	24.1
Jupiter	778	–153	13.1
Saturn	1427	–185	9.7
Uranus	2869	–214	6.8
Neptune	4496	–225	5.4

63 State the relationship between the average distance from the Sun and the average surface temperature of the Jovian planets. [1]

64 Venus has an atmosphere composed mostly of carbon dioxide. Mercury has almost no atmosphere. Explain how the presence of the carbon dioxide in Venus' atmosphere causes the average surface temperature on Venus to be higher than the average surface temperature on Mercury. [1]

65 On the graph *in your answer booklet*, draw a line to indicate the general relationship between a planet's average distance from the Sun and its average orbital velocity. [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 passage below and on the map in your answer booklet. The passage describes the New Madrid fault system. The numbers on the map show the predicted relative damage at various locations if a large earthquake occurs along the New Madrid fault system. The higher the number, the greater the relative damage.

The New Madrid Fault System

The greatest earthquake risk area east of the Rocky Mountains is along the New Madrid fault system. The New Madrid fault system consists of a series of faults along a weak zone in the continental crust in the midwestern United States. Earthquakes occur in the Midwest less often than in California, but when they do happen, the damage is spread over a wider area due to the underlying bedrock.

In 1811 and 1812, the New Madrid fault system experienced three major earthquakes. Large land areas sank, new lakes formed, the course of the Mississippi River changed, and 150,000 acres of forests were destroyed.

66 On the map *in your answer booklet,* draw the 4, 6, and 8 isolines indicating relative damage. [1]

67 Using the predicted damage numbers, place an **X** on the map to indicate where the New Madrid fault system most likely exists. [1]

68 The distance between the New Madrid fault system and Albany, New York, is 1800 kilometers. What was the time difference between the arrival of the first *P*-wave and the arrival of the first *S*-wave at Albany when the 1812 earthquake occurred? [1]

69 State *one* reason why earthquakes occur more frequently on the western coast of the United States than in the New Madrid region. [1]

70 An emergency management specialist near the New Madrid region is developing a plan that would help save lives and prevent property damage in the event of an earthquake. Describe *two* actions that should be included in the plan. [1]

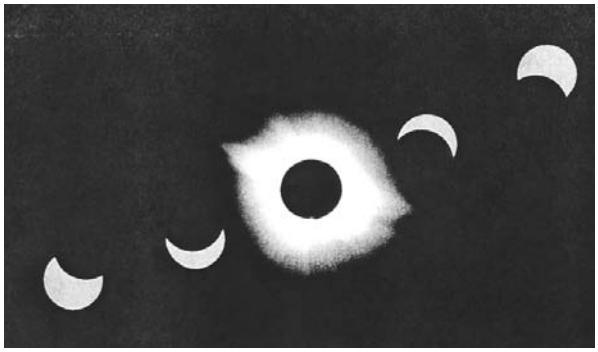
Base your answers to questions 71 through 74 on the data table below and on the graph in your answer booklet. The data table shows the maximum altitude and phase of the Moon observed above the southern horizon on certain dates during January and February at a New York State location. The line on the graph in your answer booklet shows the altitude of the noontime Sun observed during the same time period at the same New York State location.

Data Table

Date	Maximum Altitude of Moon (°)	Phase of Moon
January 4	26	new
January 13	63	first quarter
January 19	72	full
January 26	35	last quarter
February 3	34	new
February 11	70	first quarter
February 18	60	full
February 25	27	last quarter

71 On the grid *in your answer booklet*, plot with an **X** the maximum altitude of the Moon for each date shown on the data table. [1]

72 The multiple-exposure photograph below, taken on February 3, shows a total solar eclipse in the middle of the photograph. The maximum altitude of the Sun on this date was 34° above the southern horizon at this New York State location.

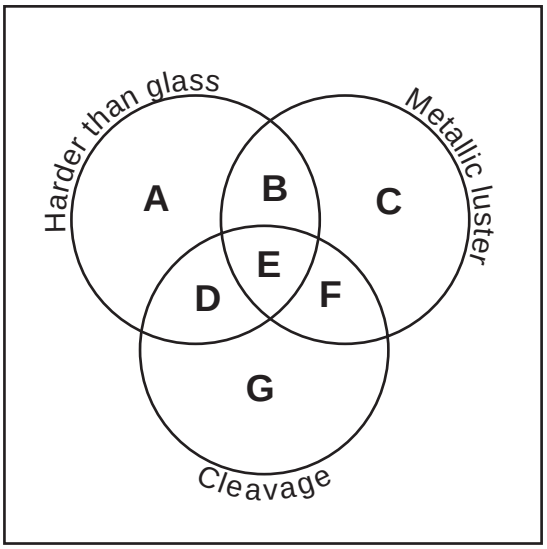


Based on the data table, explain why this total solar eclipse occurred on February 3. [1]

73 The diagram *in your answer booklet* shows the Moon's orbit around Earth. Place an **X** on the orbit to represent the Moon's position on February 18. [1]

74 Assuming that February had 28 days, on which date in March did the next full Moon occur? [1]

Base your answers to questions 75 and 76 on the diagram below of a mineral classification scheme that shows the properties of certain minerals. Letters *A* through *G* represent mineral property zones. Zone *E* represents the presence of all three properties. For example, a mineral that is harder than glass, has a metallic luster, but does not have cleavage, would be placed in zone *B*. Assume that glass has a hardness of 5.5.



75 In which zone would the mineral potassium feldspar be placed? [1]

76 State the name of *one* mineral listed on the *Properties of Common Minerals Table* that could *not* be placed in any of the zones. [1]

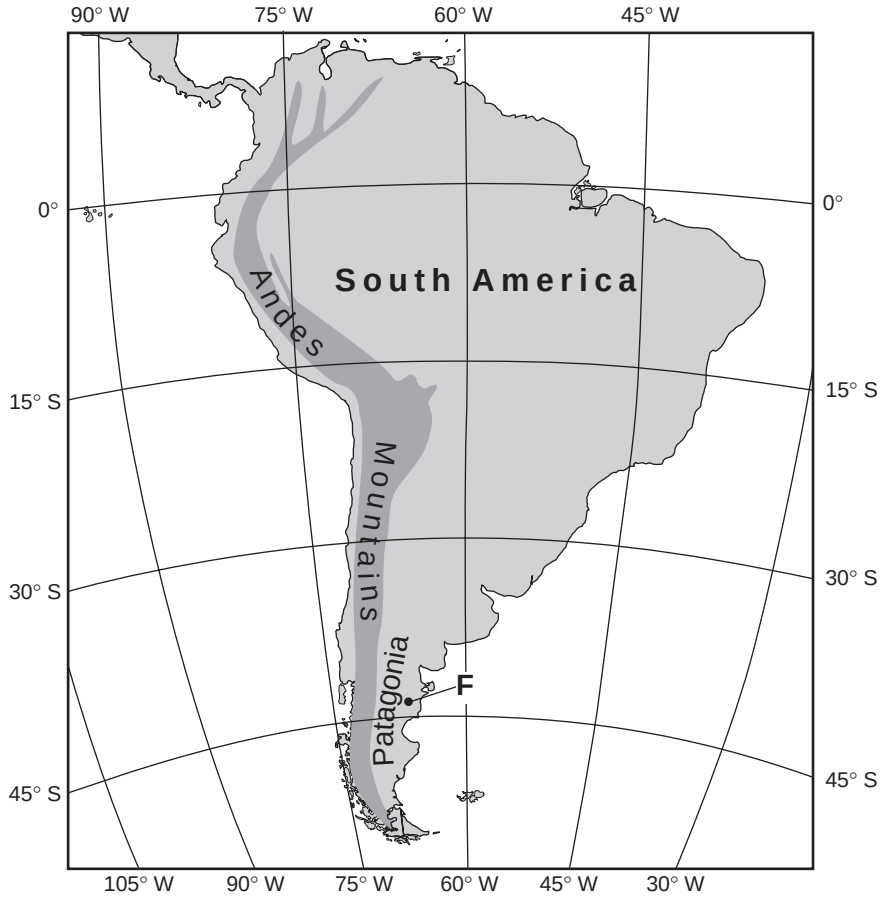
Base your answers to questions 77 through 81 on the passage and map below. Point *F* on the map shows the location where an unusual mammal fossil was found.

Fossil Jaw of Mammal Found in South America

Paleontologists working in Patagonia have found the tiny fossil jaw that may be the first evidence of early mammals in South America.

The fossil, which measures less than a quarter-inch long, is believed to be from the middle or late Jurassic Period. Researchers said it suggests that mammals developed independently in the Southern Hemisphere.

The fossil, named *Asfaltomylos patagonicus*, was discovered in a shale formation in Patagonia. Dinosaurs were the dominant land animal at that time. Mammals were tiny, and hunted insects in the dense tropical vegetation. The now-arid region also has yielded some remarkable dinosaur fossils from the same period in a vast ancient boneyard covering hundreds of square miles.



77 State the latitude and longitude of point *F*, to the *nearest degree*, where the fossil *Asfaltomylos patagonicus* was discovered. Include the correct units and compass directions in your answer. [1]

78 State the name of the dominant sediment particle that was compacted to form the shale in which this fossil was found. [1]

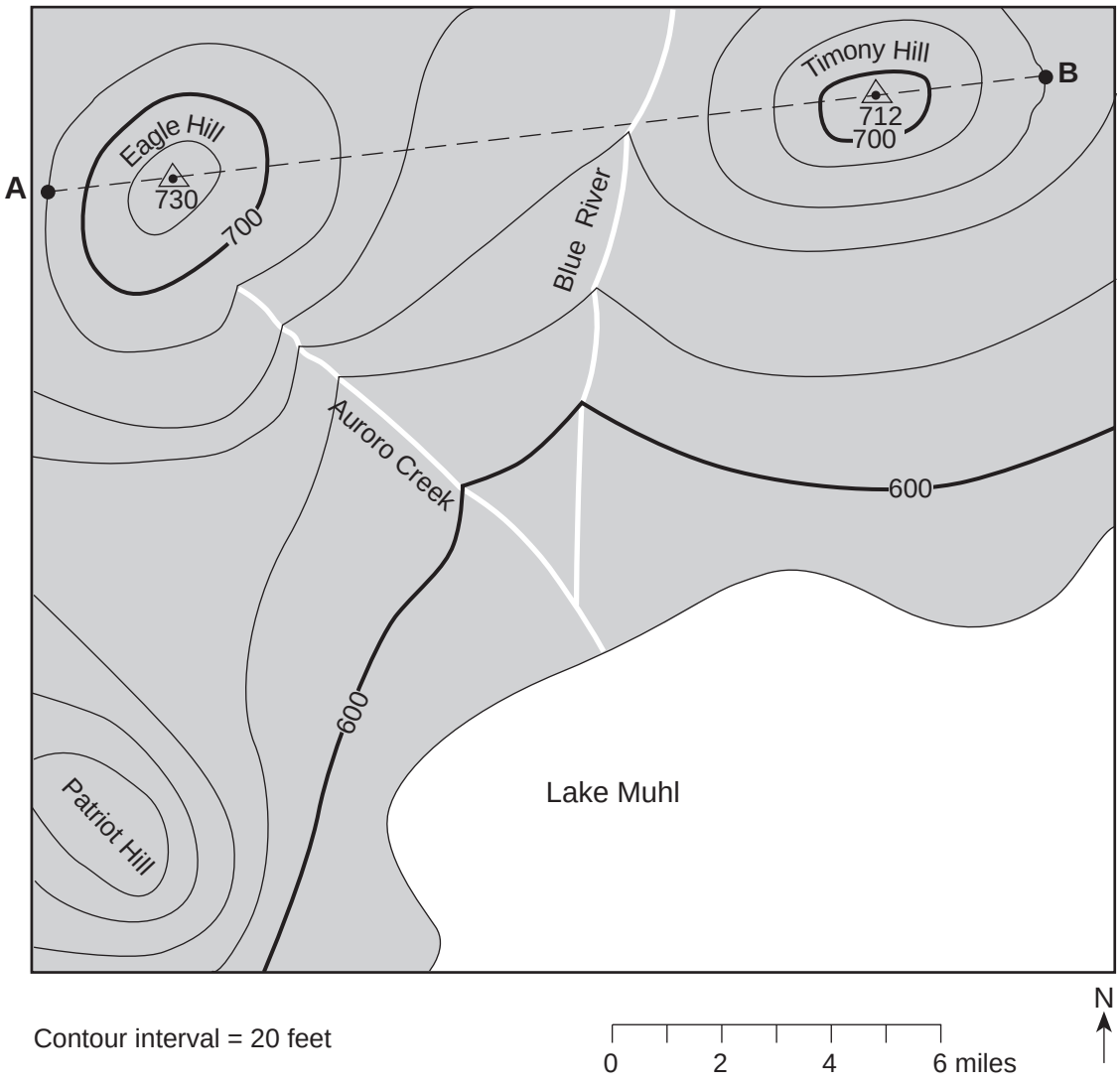
79 What other life-form first appeared on Earth during the geologic period when *Asfaltomylos patagonicus* existed? [1]

80 State *one* method used by geologists to determine the age of the bedrock in which this ancient mammal fossil was found. [1]

81 Explain how the uplift of the Andes Mountains changed eastern Patagonia's climate from a wet tropical forest at the time *Asfaltomylos patagonicus* lived to the arid conditions of today. [1]

Base your answers to questions 82 through 84 on the topographic map below. Points *A* and *B* are reference points on the map. The ⛰ symbols show the highest elevations on Eagle Hill and Timony Hill. Elevations are shown in feet.

Topographic Map



82 Identify the general compass direction toward which Auroro Creek is flowing. [1]

83 State a possible elevation of the top of Patriot Hill. [1]

84 On the grid *in your answer booklet*, construct a topographic profile along line *AB* by plotting an **X** for the elevation of each contour line that crosses line *AB*. Connect the plotted **X**s with a smooth, curved line to complete the profile. Points *A* and *B* have been plotted. [2]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 28, 2009 — 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 must 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.

Tear Here

Signature

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 28, 2009 — 9:15 a.m. to 12:15 p.m., only

ANSWER BOOKLET

☐ Male

Student ..... Sex: ☐ Female

Teacher .....

School ..... Grade .....

Answer all questions in Part B–2 and Part C. Record your answers in this booklet.

	Performance Test Score (Maximum Score: 16)

Part	Maximum Score	Student's Score
A	35	
B–1	15	
B–2	15	
C	20	

Total Written Test Score (Maximum Raw Score: 85)

Final Score (from conversion chart)

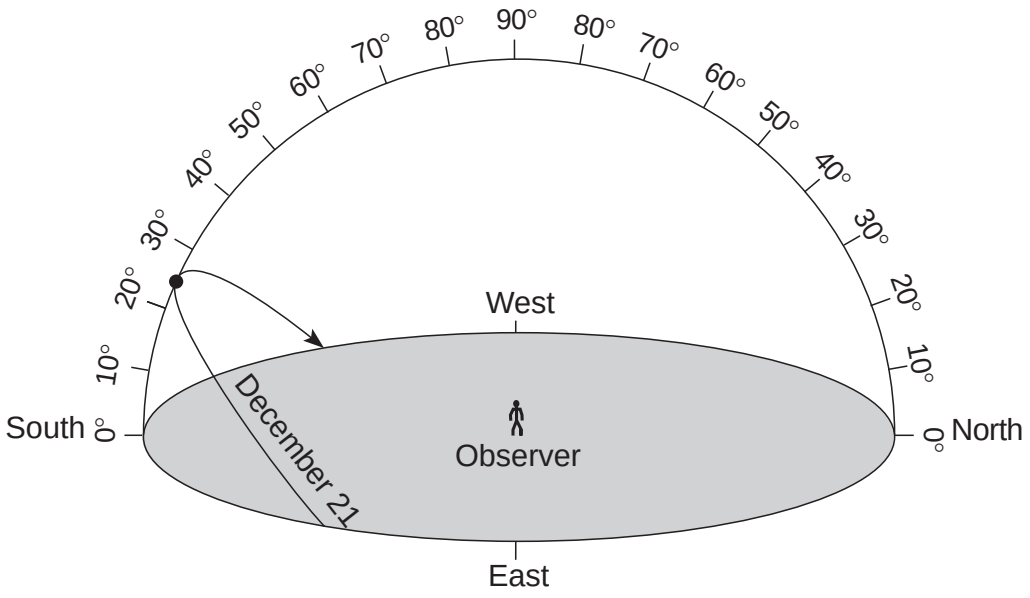
Raters' Initials:

Rater 1 ..... Rater 2 .....

Part B–2

For Raters Only

51



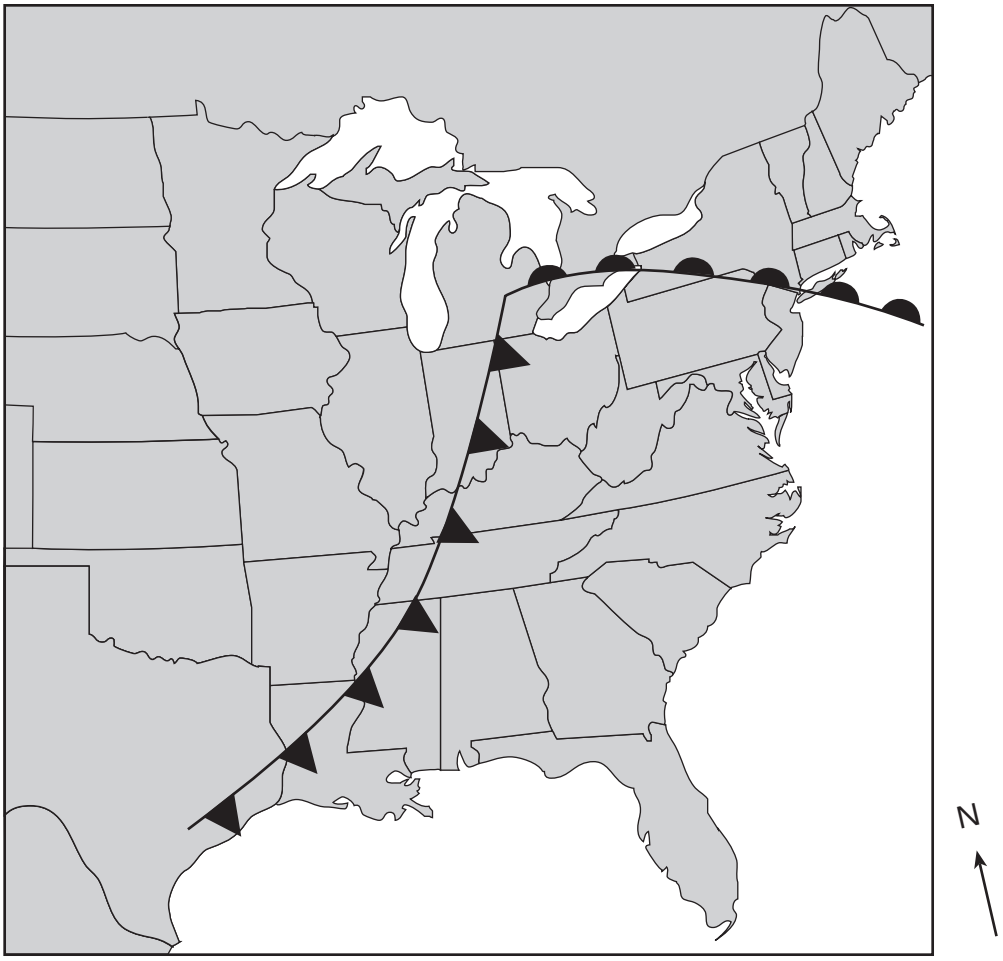
51

52 _____

52

For Raters Only

53–55



56 _____ **front**

57 _____

_____

_____

58 _____

59 Rock name: _____

Formed by: _____

_____

53 ☐

54 ☐

55 ☐

56 ☐

57 ☐

58 ☐

59 ☐

[2]

For Raters Only

60 _____ **mi/yr** **60** ☐

61 _____ **ft** **61** ☐

62 Evidence 1: _____ **62** ☐

Evidence 2: _____

63 _____ **63** ☐

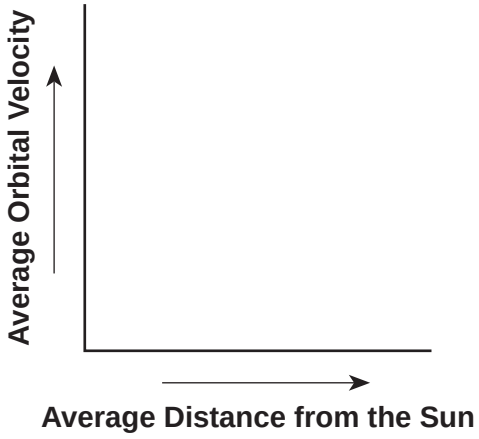
_____

_____

64 _____ **64** ☐

_____

65 **65** ☐



☐

Total Score for Part B–2

For Raters Only

Part C

66–67

66 ☐

67 ☐

68 _____ **min** _____ **sec** ☐

68

69 _____

_____ ☐

69

70 (1) _____

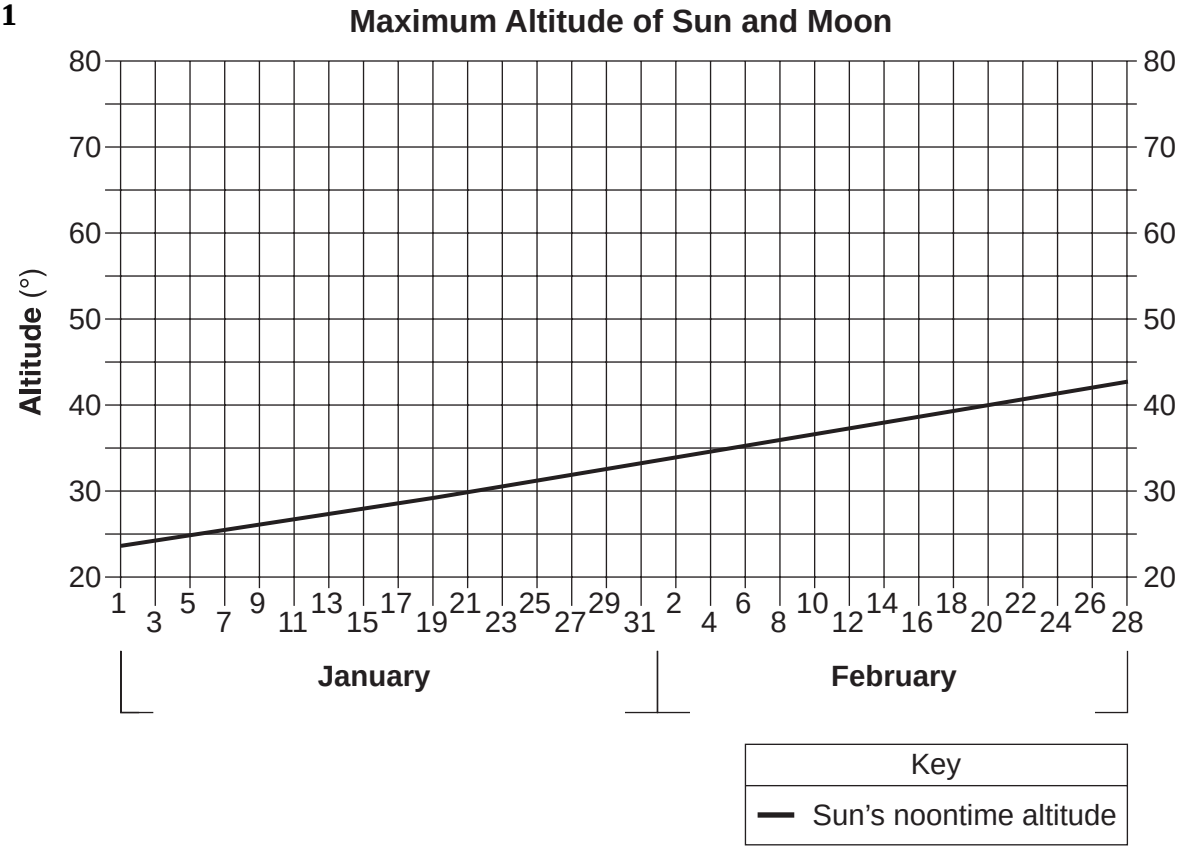
(2) _____ ☐

70

[4]

For Raters Only

71



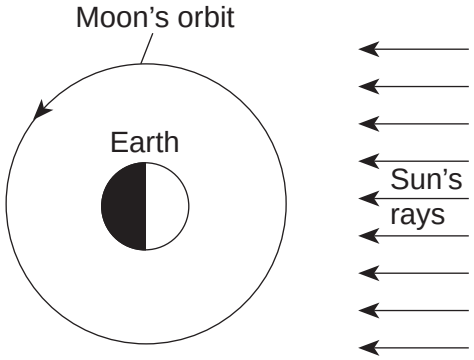
71 ☐

72 _____

_____

72 ☐

73



(Not drawn to scale)

73 ☐

74 March _____

74 ☐

For Raters Only

75 Zone: _____ **75** ☐

76 _____ **76** ☐

77 Latitude: _____ **77** ☐

Longitude: _____

78 _____ **78** ☐

79 _____ **79** ☐

80 _____ **80** ☐

81 _____

_____ **81** ☐

_____

82 _____

83 _____ **ft**

84

For Raters Only

82

83

84

Total Score for Part C

FOR TEACHERS ONLY

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

PS–ES PHYSICAL SETTING/EARTH SCIENCE

Wednesday, January 28, 2009 — 9:15 a.m. to 12:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 before rating student papers.

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site http://www.emsc.nysed.gov/osa/ and select the link "Examination Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents examination period.

Part A and Part B–1
Allow 1 credit for each correct response.

Part A

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

Part B–1

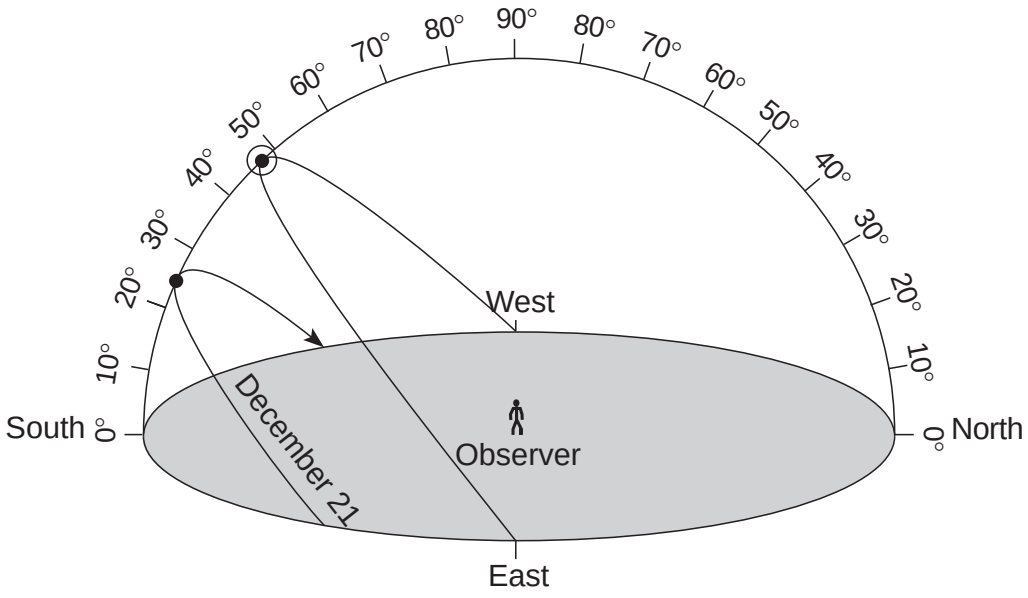
36 . . . . . **3**	44 . . . . . **2**
37 . . . . . **2**	45 . . . . . **2**
38 . . . . . **2**	46 . . . . . **3**
39 . . . . . **3**	47 . . . . . **2**
40 . . . . . **1**	48 . . . . . **1**
41 . . . . . **2**	49 . . . . . **4**
42 . . . . . **1**	50 . . . . . **3**
43 . . . . . **1**	

Part B–2

Allow a total of 15 credits for this part. The student must answer all questions in this part.

51 [1] Allow 1 credit if the Sun's apparent path begins at due east and ends at due west and is drawn so the altitude of the noon Sun is within the circle shown below.

Example of a 1-credit response:



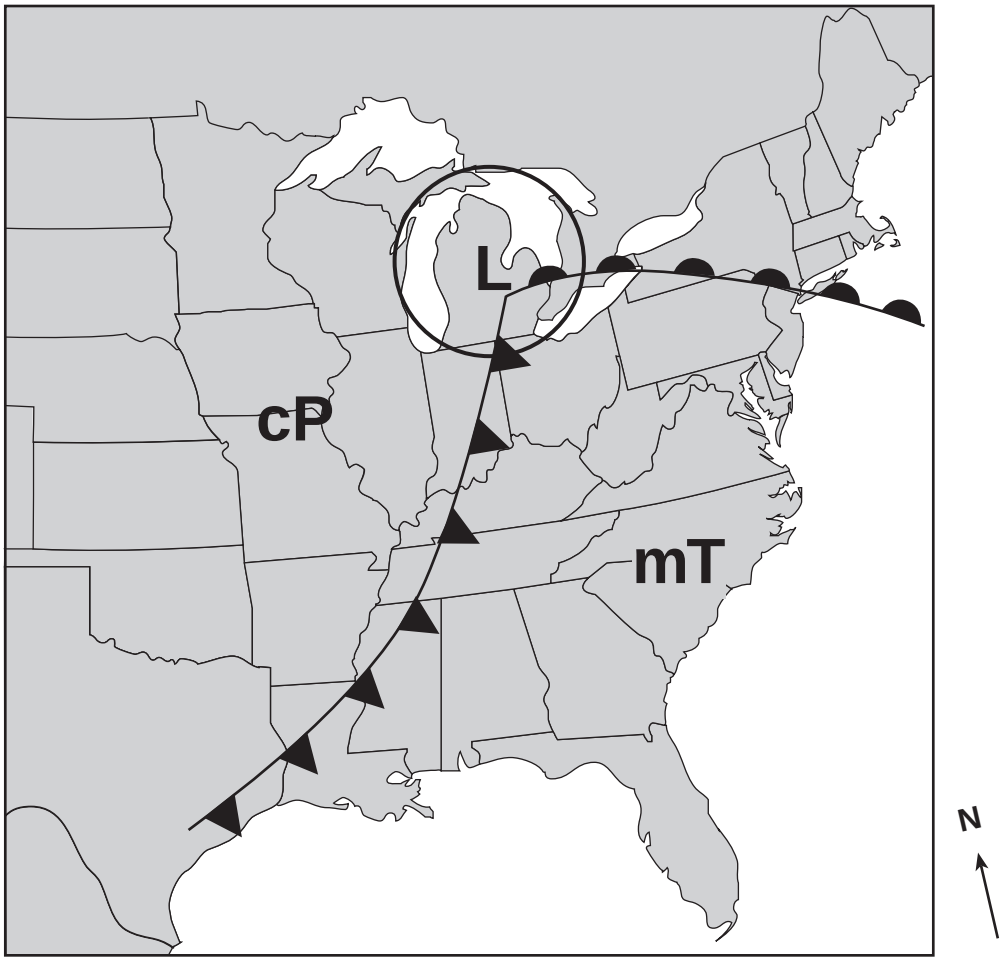
52 [1] Allow 1 credit for any date from June 19 to June 23.

53 [1] Allow 1 credit if the center of the **L** is located within the circle shown below.

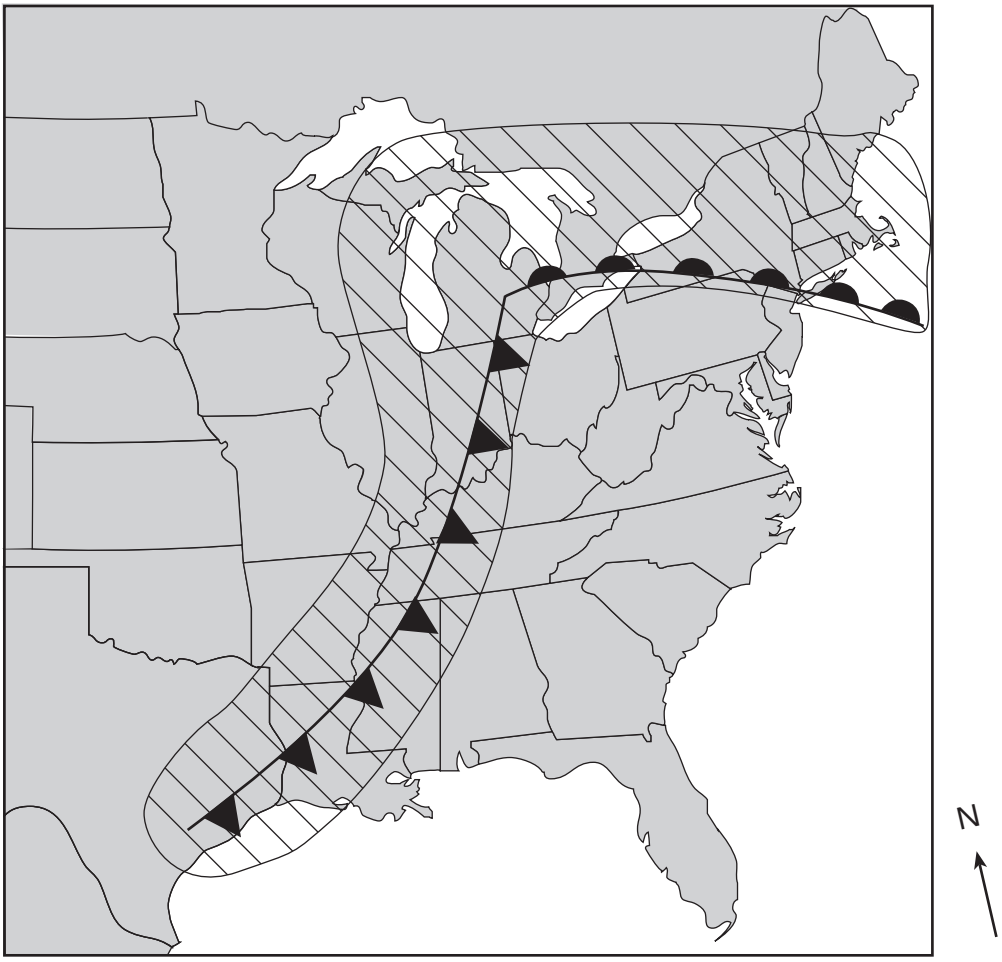
54 [1] Allow 1 credit. The cP air mass could be located anywhere behind the cold front or ahead of the warm front. The mT air mass should be located in front of the cold front and behind the warm front.

Note: Do *not* allow credit if air-mass letters are reversed, i.e., Pc and Tm.

Example of a 2-credit response for questions 53 and 54:



55 [1] Allow 1 credit if the center of the **X** is placed anywhere within the crosshatched area shown below.



56 [1] Allow 1 credit for a warm front.

57 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Rising air expands, cools to the dewpoint, and condensation of water vapor occurs.

— Condensation occurs when the dewpoint is reached.

— Water vapor condenses when dewpoint is reached.

58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Allegheny Plateau

— Erie-Ontario Lowlands

— Appalachian Plateau

59 [1] Allow 1 credit for rock salt and a correct explanation. Acceptable explanations include, but are not limited to:

— crystals of halite settling in an evaporating sea

— precipitation from seawater

— chemical deposition

60 [1] Allow 1 credit for any value from 0.035 to 0.045 mi/yr.

61 [1] Allow 1 credit for 1000 ft.

62 [1] Allow 1 credit for *two* correct responses. Acceptable responses include, but are not limited to:

— U-shaped valleys in the area

— parallel scratches in the bedrock

— unsorted sediment deposits

— moraines

— drumlins

63 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The greater the average distance a Jovian planet is from the Sun, the colder the temperature.

— An inverse relationship exists between distance and temperature for the Jovian planets.

— The closer the Jovian planet is to the Sun, the warmer the average surface temperature.

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Carbon dioxide causes a greenhouse effect on Venus.

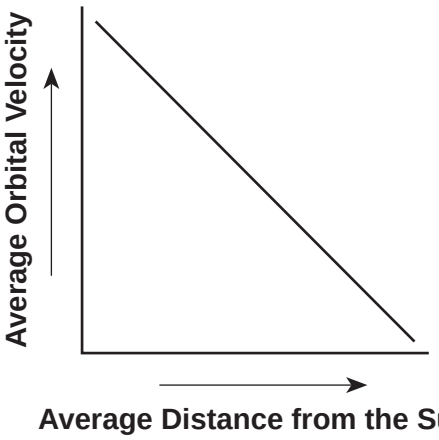
— Carbon dioxide is an excellent absorber of infrared radiation.

— Carbon dioxide traps heat and keeps it from escaping.

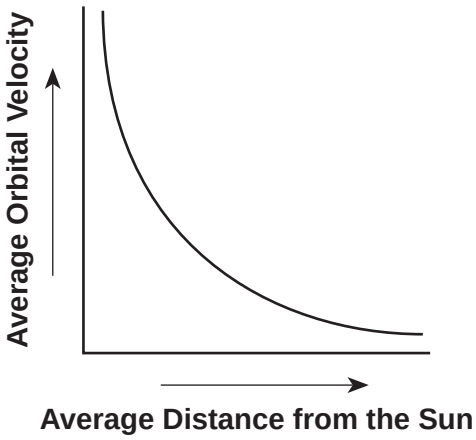
— The carbon dioxide-rich atmosphere absorbs energy in Venus' atmosphere and reradiates it.

65 [1] Allow 1 credit for a graph that shows an inverse relationship.

Examples of 1-credit responses:



or



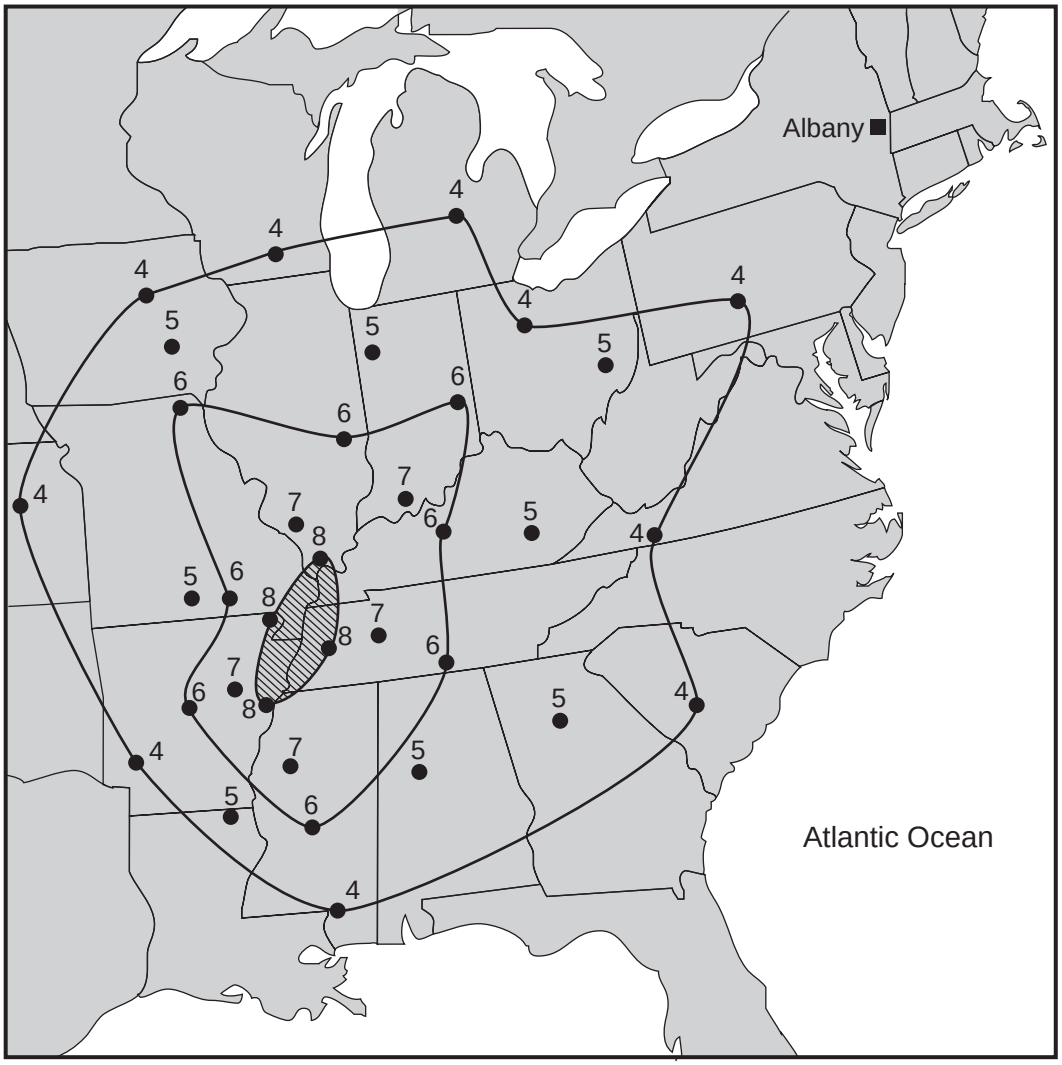
Part C

Allow a total of 20 credits for this part. The student must answer all questions in this part.

66 [1] Allow 1 credit if all *three* isolines are drawn correctly. If more than the three required isolines are drawn, all isolines must be correct to receive credit. Isolines do *not* have to be labeled but must touch all equal value points to receive credit.

67 [1] Allow 1 credit if the center of the **X** is located within the crosshatched area below.

Example of a 2-credit response for questions 66 and 67:



68 [1] Allow 1 credit for 3 min 0 sec ± 10 seconds.

69 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The western coast of the United States is near plate boundaries.

— More major faults are located on the western coast of the United States.

— Fewer active faults are located in the central portion of the United States compared to the western coast of the United States.

— The central portion of the United States is in the middle of a tectonic plate.

70 [1] Allow 1 credit for *two* correct responses. Acceptable responses include, but are not limited to:

— plan evacuation routes

— identify earthquake hazard zones or areas that are subject to damage during an earthquake

— plan emergency communication procedures

— develop emergency information brochures

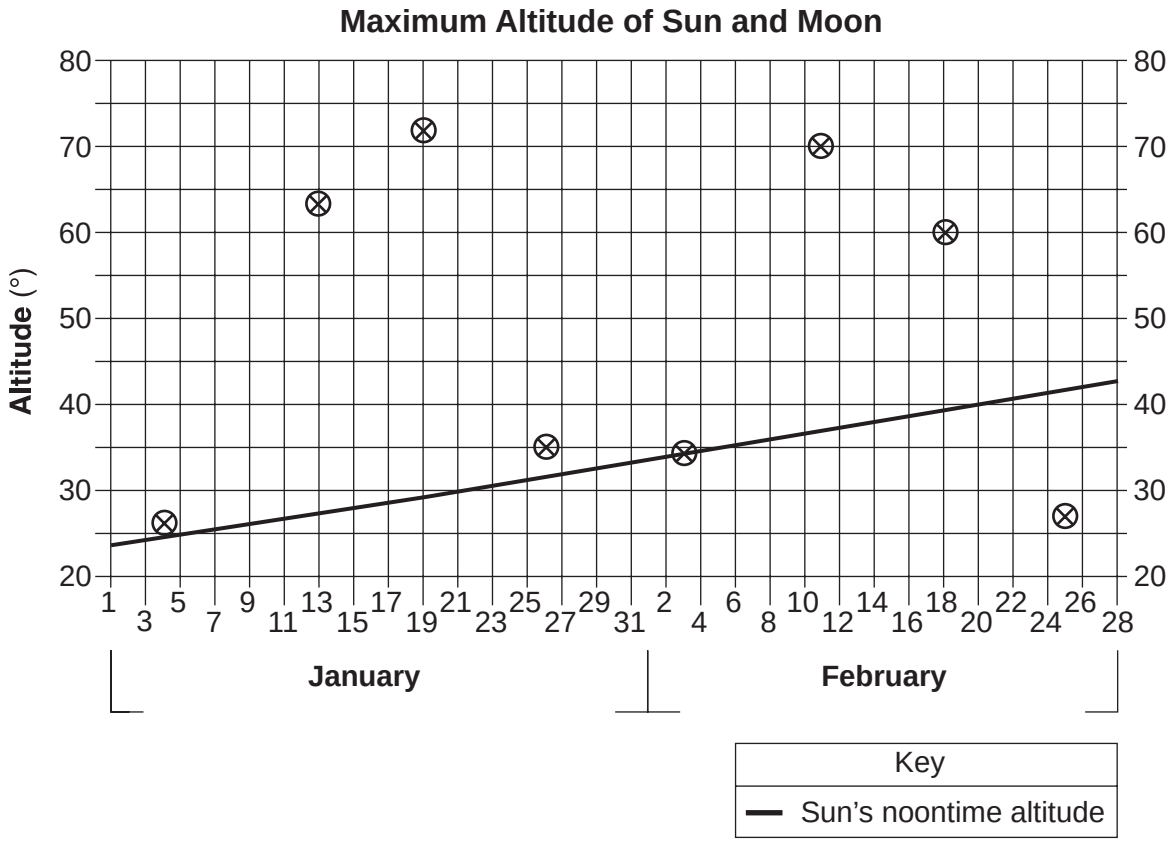
— store food, supplies, and fresh water

— build earthquake-resistant structures

— identify shelter locations

71 [1] Allow 1 credit if the center of seven or eight **X**s are correctly plotted within the circles shown below.

Example of a 1-credit graph:



72 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

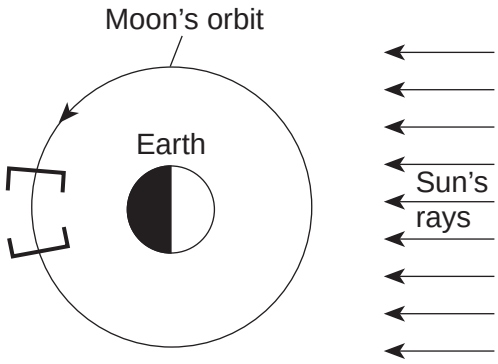
— The Sun and the Moon were at the same altitude on February 3.

— The Sun and the Moon were aligned with Earth.

— This solar eclipse occurred at the new Moon phase.

— The apparent paths of the Sun and the Moon crossed.

73 [1] Allow 1 credit for correctly placing the center of the **X** between the brackets shown below.



(Not drawn to scale)

74 [1] Allow 1 credit for March 18 *or* March 19 *or* March 20.

75 [1] Allow 1 credit for zone *D*.

76 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— sulfur

— hematite

77 [1] Allow 1 credit for any latitude from 40° S to 44° S and any longitude from 65° W to 69° W. The correct units and compass directions must be included.

78 [1] Allow 1 credit for clay.

79 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— earliest birds

— birds

80 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— radioactive dating

— identifying an index fossil in the layer containing this fossil

— correlating rock layers or fossils

81 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Mountain barriers changed the flow of winds.

— The air sinks on the Patagonia side of the Andes.

— Patagonia is located on the leeward side of the mountains.

— Patagonia is located in the rain shadow.

82 [1] Allow 1 credit for southeast *or* SE.

83 [1] Allow 1 credit for any elevation between 680 feet and 700 feet.

84 [2] Allow a maximum of 2 credits, allocated as follows:

Allow 2 credits if the centers of ten or eleven student-plotted **X**s are within the circles shown below and the **X**s are correctly connected with a line that falls within the circles.

Allow 1 credit if the centers of only eight or nine student-plotted **X**s are within the circles shown below and the **X**s are correctly connected with a line that falls within the circles.

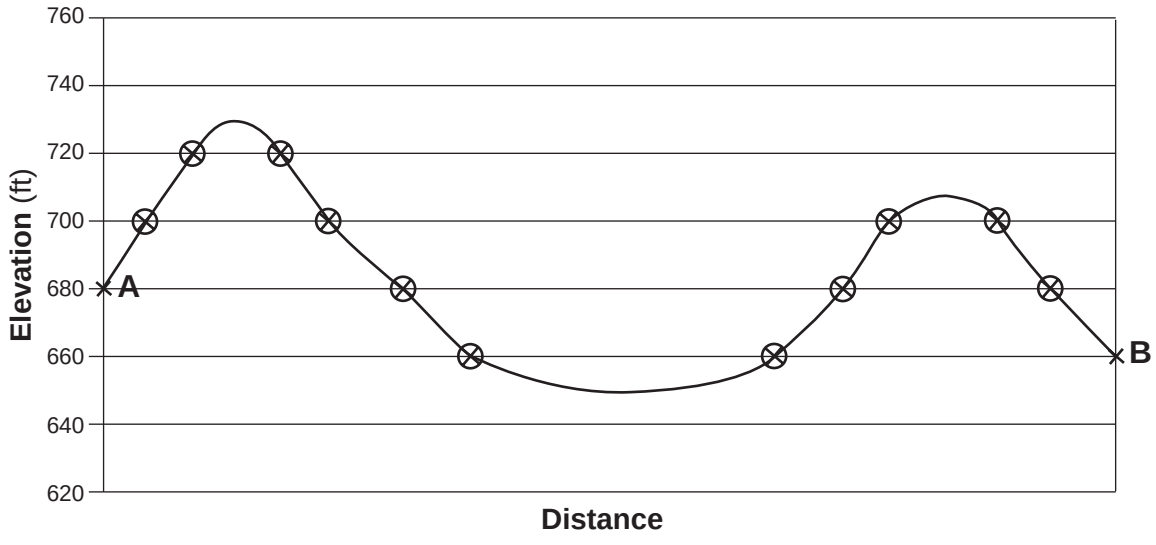
or

Allow 1 credit if the centers of ten or eleven student-plotted **X**s are within the circles shown below but are *not* correctly connected with a line that falls within the circles.

Note: Eagle Hill must be greater than 720 feet but less than 740 feet, and Timony Hill must be greater than 700 feet but less than 720 feet. The low point of the profile must be less than 660 feet, but greater than 640 feet.

It is recommended that an overlay be used to ensure uniformity in scoring.

Example of a 2-credit response:



Regents Examination in Physical Setting/Earth Science

January 2009

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scaled Scores)

The *Chart for Determining the Final Examination Score for the January 2009 Regents Examination in Physical Setting/Earth Science* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Wednesday, January 28, 2009. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Earth Science must NOT be used to determine students' final scores for this administration.

Submitting Online Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to www.emsc.nysed.gov/osa/exameval.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

January 2009 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	2, 3	60, 65	66, 71
Math Key Idea 2	1, 18	43, 63	68
Math Key Idea 3	6	36, 50, 61	67
Science Inquiry Key Idea 1	5, 28	59	69, 81
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		37	79
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1		55	
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1	17	38, 47, 54, 57	78, 80
Key Idea 2	7, 10, 11, 12, 13, 14, 16,19, 20, 32, 33, 34, 35	39, 40, 41, 42, 44, 45, 48, 49, 50, 51, 53, 54, 55, 56, 58, 59, 60, 61	72, 73, 75, 76, 77, 82, 83, 84
Key Idea 3			83, 84
Key Idea 4			
Key Idea 5	10, 24	42, 43, 44, 45, 51, 52, 55, 62	72, 73, 74, 81
Key Idea 6		64	
Standard 7			
Key Idea 1			70
Key Idea 2			
Standard 4			
Key Idea 1	1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 20, 21, 26, 28, 29, 31, 32	36, 37, 38, 39, 40, 41, 42, 43, 48, 50, 51, 63, 66	71, 72, 73, 74, 77, 79, 80
Key Idea 2	9, 11, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 30, 33, 34, 35	44, 45, 46, 52, 53, 54, 55, 56, 57, 58, 60, 61, 62, 64	66, 67, 68, 69, 70, 81, 82, 83, 84
Key Idea 3	27	47, 49, 59	75, 76, 78
Reference Tables			
ESRT 2001 Edition (Revised)	1, 2, 3, 6, 11, 15, 18, 21, 26, 27, 30, 31, 33, 35	37, 46, 47, 49, 50, 54, 55, 56, 58, 59, 60	68, 69, 75, 76, 78, 79

University of the State of New York
State Education Department

Regents Examination in Physical Setting/Earth Science – January 2009

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

To determine the student's final score, locate the student's Total Performance Test Score across the top of the chart and the Total Written Test Score down the side of the chart. The point where the two scores intersect is the student's final examination score. For example, a student receiving a Total Performance Test Score of 10 and Total Written Test Score of 72 would receive a final examination score of 90.

Total Performance Test Score

Total Written Test Score	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
85	100	99	99	99	98	98	97	96	96	95	94	93	91	90	88	87	85
84	99	99	98	98	98	97	96	96	95	94	93	92	91	89	88	86	84
83	99	99	98	98	98	97	96	96	95	94	93	92	91	89	88	86	84
82	98	98	98	97	97	96	95	95	94	93	92	91	90	88	87	85	83
81	98	98	98	97	97	96	95	95	94	93	92	91	90	88	87	85	83
80	97	97	97	96	96	95	95	94	93	92	91	90	89	88	86	84	82
79	97	96	96	95	95	94	94	93	92	91	90	89	88	87	85	83	82
78	97	96	96	95	95	94	94	93	92	91	90	89	88	87	85	83	82
77	96	95	95	95	94	94	93	92	91	91	89	88	87	86	84	83	81
76	96	95	95	95	94	94	93	92	91	91	89	88	87	86	84	83	81
75	95	95	94	94	93	93	92	91	91	90	89	88	86	85	83	82	80
74	94	94	93	93	92	92	91	90	90	89	88	87	86	84	83	81	79
73	94	94	93	93	92	92	91	90	90	89	88	87	86	84	83	81	79
72	93	93	92	92	92	91	90	90	89	88	87	86	85	83	82	80	78
71	92	92	92	91	91	90	90	89	88	87	86	85	84	82	81	79	77
70	92	92	92	91	91	90	90	89	88	87	86	85	84	82	81	79	77
69	92	91	91	90	90	89	89	88	87	86	85	84	83	82	80	78	77
68	91	90	90	89	89	88	88	87	86	85	84	83	82	81	79	77	76
67	90	90	89	89	88	88	87	86	85	85	84	82	81	80	78	77	75
66	89	89	88	88	87	87	86	85	85	84	83	82	80	79	77	76	74
65	89	89	88	88	87	87	86	85	85	84	83	82	80	79	77	76	74
64	88	88	87	87	86	86	85	85	84	83	82	81	80	78	77	75	73
63	87	87	87	86	86	85	84	84	83	82	81	80	79	77	76	74	72
62	86	86	86	85	85	84	84	83	82	81	80	79	78	77	75	73	71
61	86	85	85	84	84	83	83	82	81	80	79	78	77	76	74	72	71
60	85	84	84	84	83	82	82	81	80	79	78	77	76	75	73	72	70
59	84	84	83	83	82	82	81	80	80	79	78	77	75	74	72	71	69
58	83	83	82	82	81	81	80	79	79	78	77	76	74	73	71	70	68
57	82	82	81	81	81	80	79	79	78	77	76	75	74	72	71	69	67
56	81	81	81	80	80	79	78	78	77	76	75	74	73	71	70	68	66
55	81	81	81	80	80	79	78	78	77	76	75	74	73	71	70	68	66
54	80	80	80	79	79	78	78	77	76	75	74	73	72	71	69	67	65
53	80	79	79	78	78	77	77	76	75	74	73	72	71	70	68	66	65
52	78	78	77	77	76	76	75	74	74	73	72	71	69	68	66	65	63
51	77	77	76	76	75	75	74	73	73	72	71	70	69	67	66	64	62
50	76	76	75	75	75	74	73	73	72	71	70	69	68	66	65	63	61
49	75	75	75	74	74	73	73	72	71	70	69	68	67	65	64	62	60
48	75	74	74	73	73	72	72	71	70	69	68	67	66	65	63	61	60
47	74	73	73	72	72	71	71	70	69	68	67	66	65	64	62	60	59
46	73	73	72	72	71	71	70	69	68	68	67	65	64	63	61	60	58
45	72	72	71	71	70	70	69	68	68	67	66	65	63	62	60	59	57
44	71	71	70	70	69	69	68	68	67	66	65	64	63	61	60	58	56

Total Performance Test Score
January 2009 Examination in Physical Setting/Earth Science – continued

Total Performance Test Score

Total Written Test Score	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
43	70	70	70	69	69	68	67	67	66	65	64	63	62	60	59	57	55
42	69	68	68	67	67	66	66	65	64	63	62	61	60	59	57	55	54
41	68	67	67	67	66	65	65	64	63	62	61	60	59	58	56	55	53
40	67	67	66	66	65	65	64	63	63	62	61	60	58	57	55	54	52
39	66	66	65	65	64	64	63	62	62	61	60	59	57	56	54	53	51
38	65	65	64	64	64	63	62	62	61	60	59	58	57	55	54	52	50
37	63	63	63	62	62	61	61	60	59	58	57	56	55	54	52	50	48
36	63	62	62	61	61	60	60	59	58	57	56	55	54	53	51	49	48
35	62	61	61	61	60	60	59	58	57	57	55	54	53	52	50	49	47
34	61	61	60	60	59	59	58	57	57	56	55	54	52	51	49	48	46
33	59	59	58	58	58	57	56	56	55	54	53	52	51	49	48	46	44
32	58	58	58	57	57	56	56	55	54	53	52	51	50	48	47	45	43
31	58	57	57	56	56	55	55	54	53	52	51	50	49	48	46	44	43
30	56	56	55	55	54	54	53	52	51	51	50	48	47	46	44	43	41
29	55	55	54	54	53	53	52	51	51	50	49	48	46	45	43	42	40
28	54	54	53	53	52	52	51	51	50	49	48	47	46	44	43	41	39
27	52	52	52	51	51	50	50	49	48	47	46	45	44	43	41	39	37
26	52	51	51	50	50	49	49	48	47	46	45	44	43	42	40	38	37
25	50	50	49	49	48	48	47	46	46	45	44	43	41	40	38	37	35
24	49	49	48	48	47	47	46	45	45	44	43	42	40	39	37	36	34
23	47	47	47	46	46	45	44	44	43	42	41	40	39	37	36	34	32
22	46	46	46	45	45	44	44	43	42	41	40	39	38	37	35	33	31
21	45	44	44	44	43	43	42	41	40	40	38	37	36	35	33	32	30
20	44	44	43	43	42	42	41	40	40	39	38	37	35	34	32	31	29
19	42	42	41	41	41	40	39	39	38	37	36	35	34	32	31	29	27
18	41	41	41	40	40	39	39	38	37	36	35	34	33	31	30	28	26
17	40	39	39	38	38	37	37	36	35	34	33	32	31	30	28	26	25
16	39	39	38	38	37	37	36	35	34	34	33	31	30	29	27	26	24
15	37	37	36	36	35	35	34	34	33	32	31	30	29	27	26	24	22
14	35	35	35	34	34	33	33	32	31	30	29	28	27	26	24	22	20
13	35	34	34	33	33	32	32	31	30	29	28	27	26	25	23	21	20
12	33	33	32	32	31	31	30	29	29	28	27	26	24	23	21	20	18
11	32	32	31	31	30	30	29	28	28	27	26	25	23	22	20	19	17
10	30	30	30	29	29	28	27	27	26	25	24	23	22	20	19	17	15
9	29	28	28	27	27	26	26	25	24	23	22	21	20	19	17	15	14
8	27	27	26	26	25	25	24	23	23	22	21	20	18	17	15	14	12
7	26	26	25	25	24	24	23	22	22	21	20	19	18	16	15	13	11
6	24	24	24	23	23	22	22	21	20	19	18	17	16	14	13	11	9
5	23	22	22	21	21	20	20	19	18	17	16	15	14	13	11	9	8
4	21	21	20	20	19	19	18	17	17	16	15	14	12	11	9	8	6
3	20	20	19	19	18	18	17	17	16	15	14	13	12	10	9	7	5
2	18	18	18	17	17	16	16	15	14	13	12	11	10	9	7	5	3
1	17	16	16	16	15	14	14	13	12	11	10	9	8	7	5	4	2
0	15	15	14	14	13	13	12	11	11	10	9	8	6	5	3	2	0