The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, August 13, 2003 — 12:30 to 3:30 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 your use while taking this examination.

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*.

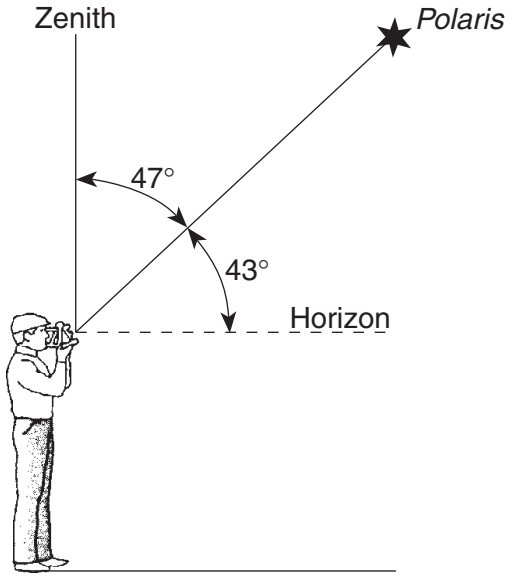
1 Which statement correctly compares the size, composition, and density of Neptune to Earth?

(1) Neptune is smaller, more gaseous, and less dense.
(2) Neptune is larger, more gaseous, and less dense.
(3) Neptune is smaller, more solid, and more dense.
(4) Neptune is larger, more solid, and more dense.

2 A person in New York State worked outdoors in sunlight for several hours on a day in July. Which type of clothing should the person have worn to absorb the *least* electromagnetic radiation?

(1) dark colored with a rough surface
(2) dark colored with a smooth surface
(3) light colored with a rough surface
(4) light colored with a smooth surface

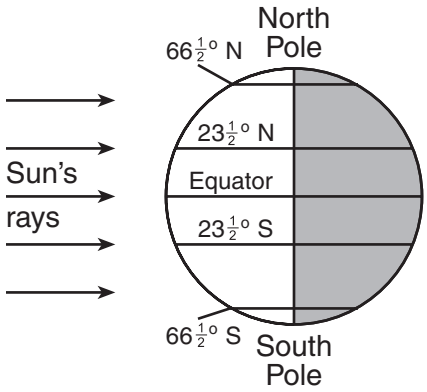
3 The diagram below shows an observer on Earth measuring the altitude of *Polaris*.



What is the latitude of this observer?

(1) 43° N
(2) 43° S
(3) 47° N
(4) 47° S

4 The diagram below represents Earth at a specific position in its orbit as viewed from space. The shaded area represents nighttime.



Which Earth latitude receives the greatest intensity of insolation when Earth is at the position shown in the diagram?

(1) 0°
(2) $23\frac{1}{2}$° N
(3) $66\frac{1}{2}$° N
(4) 90° N

5 Surface ocean currents curve to the right in the Northern Hemisphere because

(1) the Moon spins on its axis
(2) the Moon travels in an orbit around Earth
(3) Earth spins on its axis
(4) Earth travels in an orbit around the Sun

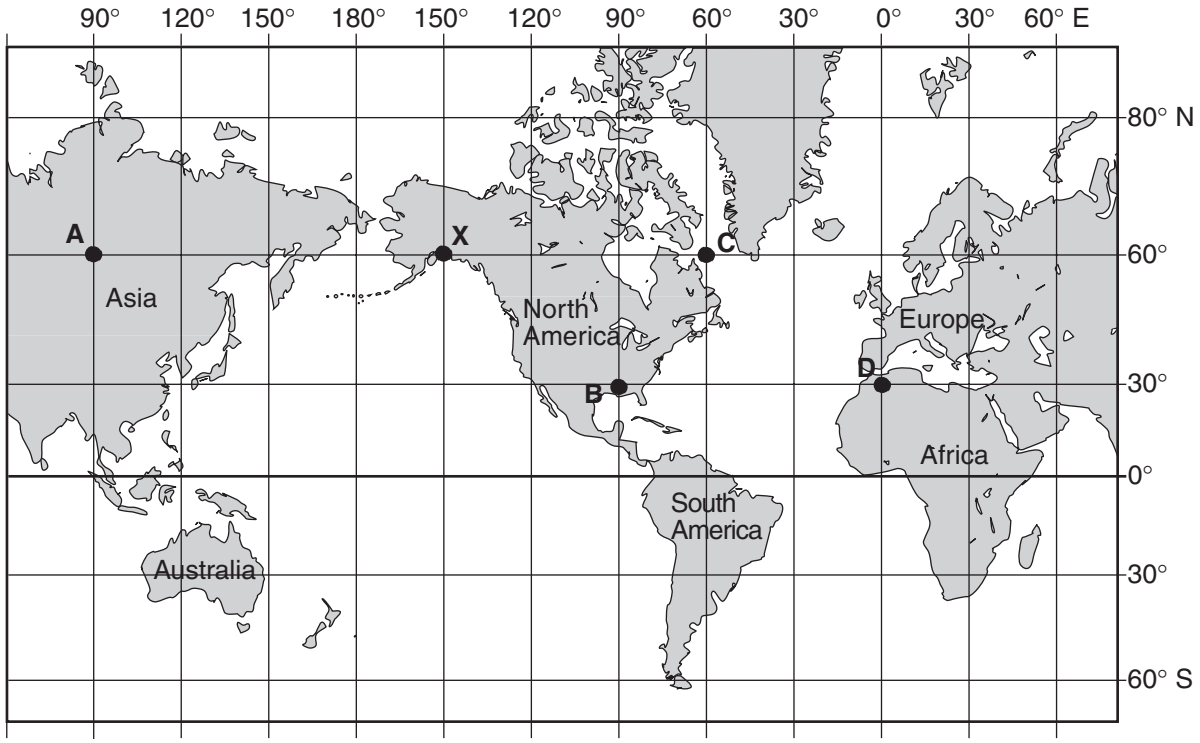
6 Which star color indicates the hottest star surface temperature?

(1) blue
(2) white
(3) yellow
(4) red

7 What is the dewpoint temperature when the dry-bulb temperature is 12°C and the wet-bulb temperature is 4°C?

(1) –9°C
(2) 19°C
(3) 8°C
(4) 4°C

8 Letters *A*, *B*, *C*, *D*, and *X* on the map below represent locations on Earth. The map shows the latitude-longitude grid.



Solar time is based on the position of the Sun. If the solar time is 1 p.m. at location *X*, at which location is the solar time 5 p.m.?

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

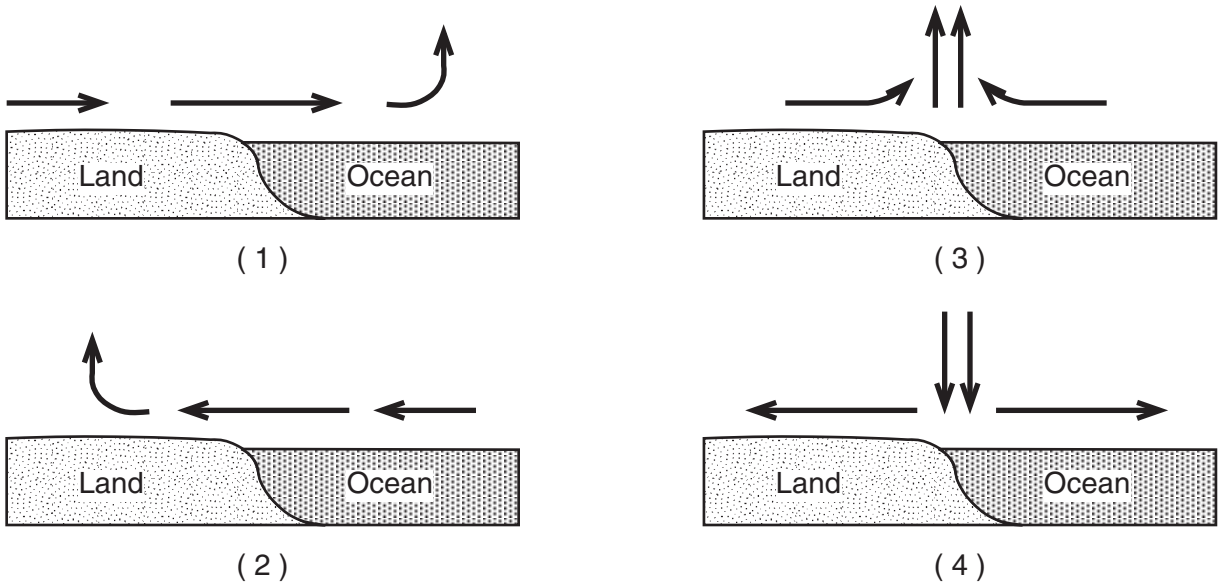
9 The table below shows the duration of insolation (hours of daylight) measured by four observers, *W*, *X*, *Y*, and *Z*, at four different Earth latitudes on both March 21 and June 21. There were clear skies at all four latitudes on both days.

Observer	Duration of Insolation March 21	Duration of Insolation June 21
W	12 hr	0 hr
X	12 hr	12 hr
Y	12 hr	18 hr
Z	12 hr	24 hr

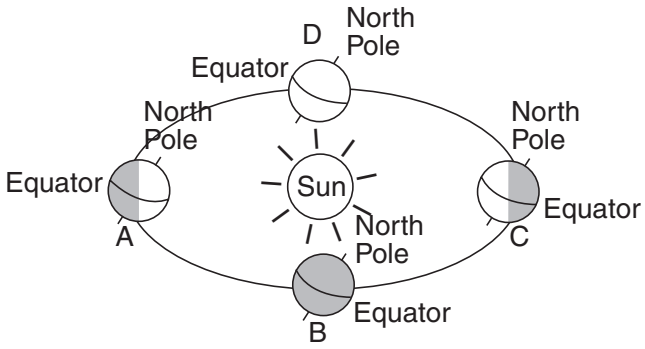
Which observer was located at the Equator?

(1) *W*
(2) *X*
(3) *Y*
(4) *Z*

10 Adjacent land and ocean surfaces have the same temperature at sunrise on a clear, calm, summer day. Then the land and water are heated by the Sun for several hours. Which cross section shows the most likely direction of surface winds that will develop at this ocean shore?



11 The diagram below represents Earth at four different positions, *A*, *B*, *C*, and *D*, in its orbit around the Sun.



(Not drawn to scale)

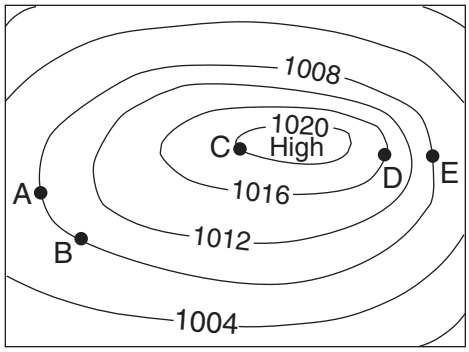
Between which positions would New York State be experiencing the summer season?

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

12 An air mass classified as mP usually forms over which type of Earth surface?

(1) warm land
(2) warm ocean
(3) cool land
(4) cool ocean

13 The air-pressure field map below represents a high-pressure system over the central United States. Isobars show the air pressure, in millibars. Letters *A* through *E* represent locations on Earth's surface.



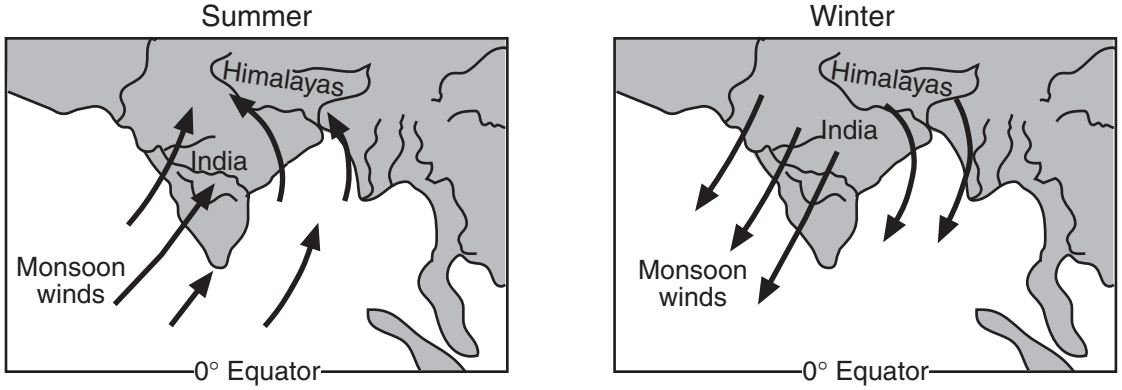
Between which two locations is the wind speed greatest?

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

14 Surface ocean currents located at 40° south latitude, 90° west longitude generally flow toward the

(1) northeast
(2) southeast
(3) southwest
(4) west

15 The arrows on the two maps below show how the monsoon winds over India change direction with the seasons.



How do these winds affect India's weather in summer and winter?

(1) Summer is cooler and less humid than winter.
(2) Summer is warmer and more humid than winter.
(3) Winter is warmer and less humid than summer.
(4) Winter is cooler and more humid than summer.

16 Most water vapor enters Earth's atmosphere by the processes of

(1) condensation and precipitation
(2) radiation and cementation
(3) conduction and convection
(4) evaporation and transpiration

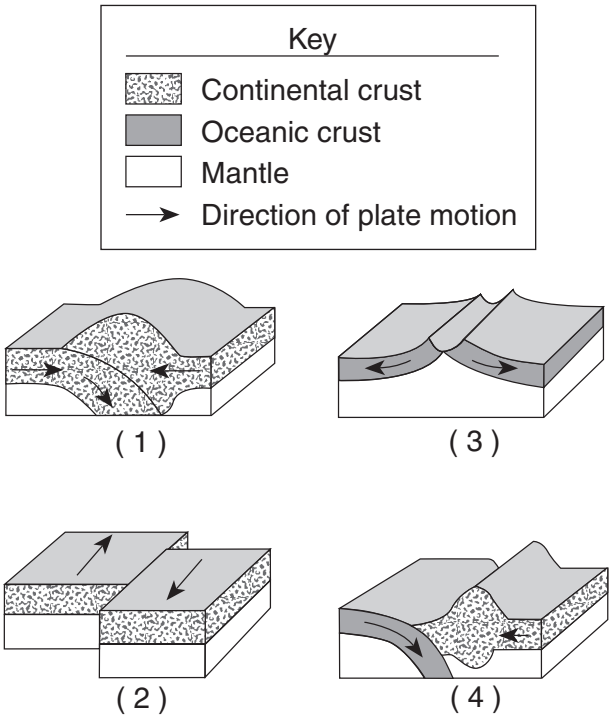
17 At an altitude of 95 miles above Earth's surface, nearly 100% of the incoming energy from the Sun can be detected. At 55 miles above Earth's surface, most incoming x-ray radiation and some incoming ultraviolet radiation can no longer be detected. This missing radiation was most likely

(1) absorbed in the thermosphere
(2) absorbed in the mesosphere
(3) reflected by the stratosphere
(4) reflected by the troposphere

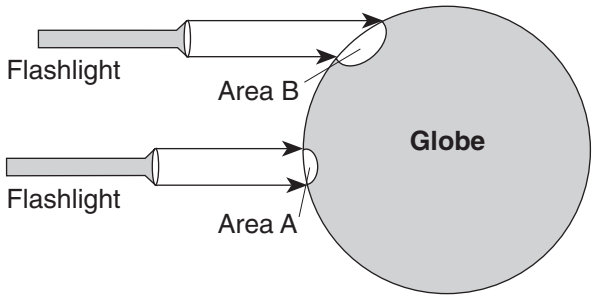
18 Weather along most fronts is usually cloudy with precipitation because the warm air along most fronts is usually

(1) sinking and cooling, causing water to evaporate
(2) sinking and warming, causing water to evaporate
(3) rising and cooling, causing water vapor to condense
(4) rising and warming, causing water vapor to condense

19 Which cross section below best represents the crustal plate motion that is the primary cause of the volcanoes and deep rift valleys found at mid-ocean ridges?



20 The diagram below shows a classroom demonstration. Two identical flashlights were placed in the positions shown and they illuminated areas of varying size, *A* and *B*, on a classroom globe. Thermometers were then placed at the center of each illuminated area to measure the rate of temperature increase. Readings were taken over a period of 30 minutes.



Students most likely observed that the temperature of area *A* increased at a

(1) slower rate than the temperature of area *B* because area *A* received rays that were less concentrated
(2) slower rate than the temperature of area *B* because area *A* received rays that were more slanted
(3) faster rate than the temperature of area *B* because area *A* received rays that were more perpendicular to the surface
(4) faster rate than the temperature of area *B* because area *A* received rays with less total energy

21 The photograph below shows a broken piece of the mineral calcite.

The calcite breaks in smooth, flat surfaces because calcite

(1) is very dense
(2) is very soft
(3) contains certain impurities
(4) has a regular arrangement of atoms

22 Most inferences about the characteristics of Earth's mantle and core are based on

(1) the behavior of seismic waves in Earth's interior
(2) well drillings from Earth's mantle and core
(3) chemical changes in exposed and weathered metamorphic rocks
(4) comparisons between Moon rocks and Earth rocks

23 What is the minimum rate of flow at which a stream of water can maintain the transportation of pebbles 1.0 centimeter in diameter?

(1) 50 cm/sec
(2) 100 cm/sec
(3) 150 cm/sec
(4) 200 cm/sec

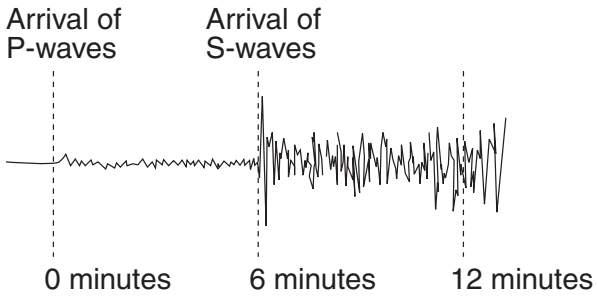
24 Which activity demonstrates chemical weathering?

(1) freezing of water in the cracks of a sandstone sidewalk
(2) abrasion of a streambed by tumbling rocks
(3) grinding of talc into a powder
(4) dissolving of limestone by acid rain

25 Unsorted, angular, rough-surfaced cobbles and boulders are found at the base of a cliff. What most likely transported these cobbles and boulders?

(1) running water
(2) wind
(3) gravity
(4) ocean currents

26 The seismogram below shows *P*-wave and *S*-wave arrival times at a seismic station following an earthquake.



The distance from this seismic station to the epicenter of the earthquake is approximately

(1) 1,600 km
(2) 3,200 km
(3) 4,400 km
(4) 5,600 km

27 The table below gives information about the radioactive decay of carbon-14. Part of the table has been deliberately left blank for student use.

Half-life	Mass of Original Carbon-14 Remaining (grams)	Number of Years
0	1	0
1	$\frac{1}{2}$	5,700
2	$\frac{1}{4}$	11,400
3	$\frac{1}{8}$	17,100
4	$\frac{1}{16}$	
5		
6		
7		

After how many years will $\frac{1}{128}$ gram of the original carbon-14 remain?

(1) 22,800 yr
(2) 28,500 yr
(3) 34,200 yr
(4) 39,900 yr

28 In which layer of Earth's interior is the pressure inferred to be 1.0 million atmospheres?

(1) outer core
(2) inner core
(3) rigid mantle
(4) stiffer mantle

29 Which event occurred earliest in geologic history?

(1) appearance of the earliest grasses
(2) appearance of the earliest birds
(3) the Grenville Orogeny
(4) the intrusion of the Palisades Sill

30 A very large, circular, impact crater under the coast of Mexico is believed to be approximately 65 million years old. This impact event is inferred to be related to the

(1) appearance of the earliest trilobites
(2) advance and retreat of the last continental ice sheet
(3) extinction of the dinosaurs
(4) formation of Pangea

31 The greatest amount of rainwater infiltration occurs on the side of a hill if the surface of a permeable soil has

(1) small soil particles and a steep slope
(2) small soil particles and a gentle slope
(3) large soil particles and a steep slope
(4) large soil particles and a gentle slope

32 Which element is most abundant in Earth's lithosphere?

(1) oxygen
(2) silicon
(3) hydrogen
(4) nitrogen

33 A student incorrectly measured the volume of a mineral sample as 83 cubic centimeters when the actual volume was 89 cubic centimeters. What was the student's approximate percent deviation (percentage of error)?

(1) 6.7%
(2) 7.2%
(3) 9.3%
(4) 14.8%

34 The characteristic of the radioactive isotope uranium-238 that makes this isotope useful for accurately dating the age of a rock is the isotope's

(1) organic origin
(2) constant half-life
(3) common occurrence in sediments
(4) resistance to weathering and erosion

35 In which New York State landscape region is Niagara Falls located?

(1) Tug Hill Plateau
(2) St. Lawrence Lowlands
(3) Allegheny Plateau
(4) Erie-Ontario Lowlands

Part B–1

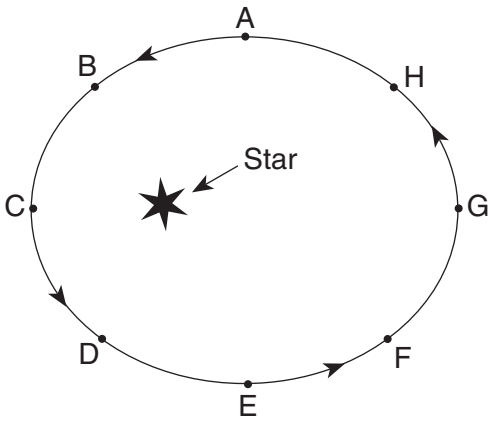
Answer all questions in this part.

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*.

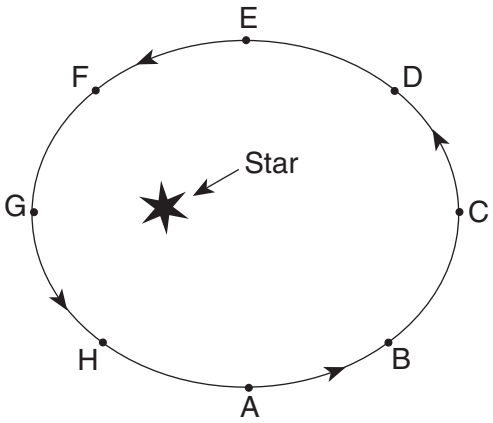
36 The table below shows gravitational data for a planet traveling in an elliptical orbit around a star. The table shows the relative gravitational force between the star and this planet at eight positions in the orbit (letters *A* through *H*). Higher numbers indicate stronger gravitational attraction.

Planet's Position in the Orbit	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
Relative Gravitational Force Between Star and Planet	52	42	25	12	10	12	25	42

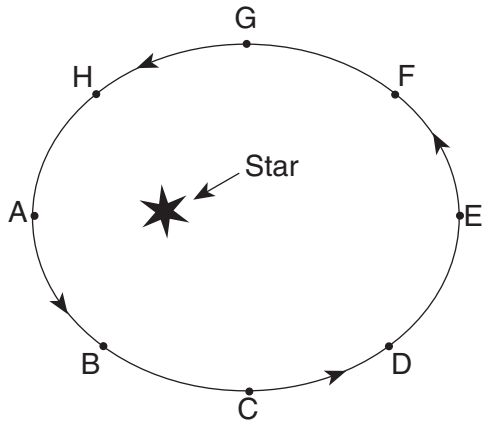
Which diagram best represents the positions of the planet in its orbit that would produce the gravitational forces shown in the data table?



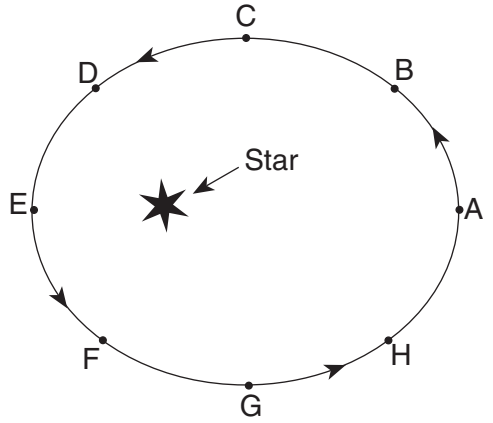
(1)



(3)

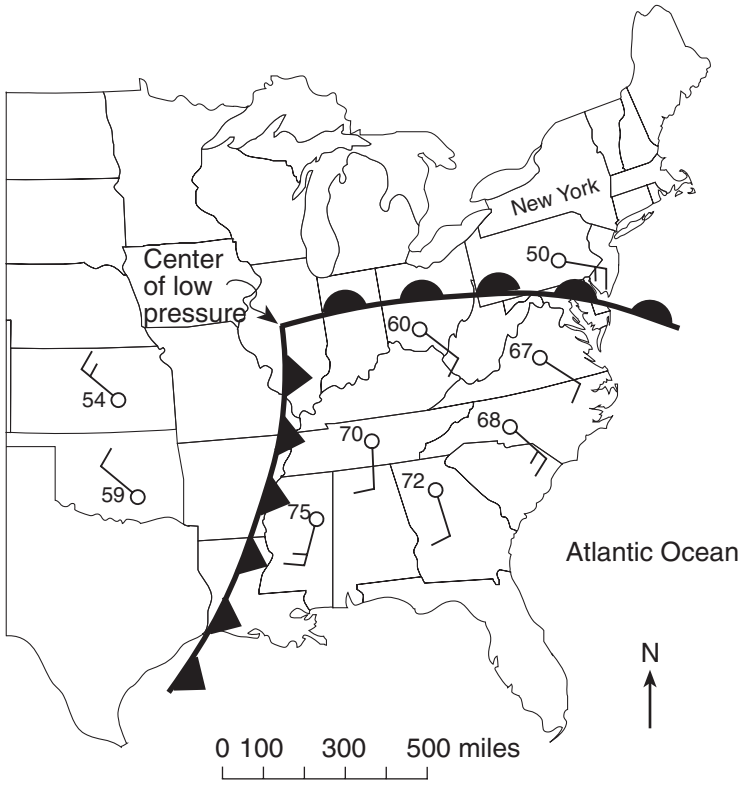


(2)



(4)

Base your answers to questions 37 through 39 on the weather map below, which shows air temperature and winds for a few locations in the eastern half of the United States. A large low-pressure system is shown on the map.



37 Surface winds within this low-pressure system generally flow

(1) clockwise and toward the center of the system
(2) clockwise and away from the center of the system
(3) counterclockwise and toward the center of the system
(4) counterclockwise and away from the center of the system

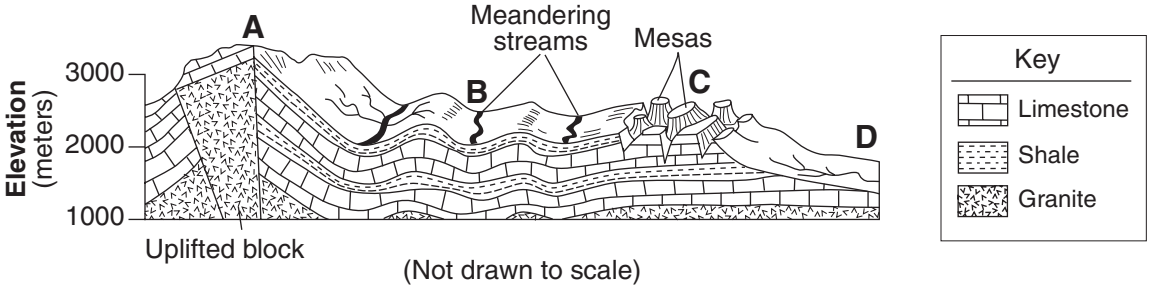
38 Which type of front extends eastward from the low-pressure center?

(1) cold
(2) warm
(3) occluded
(4) stationary

39 If the low-pressure center follows a typical storm track, it will move toward the

(1) southwest
(2) southeast
(3) northwest
(4) northeast

Base your answers to questions 40 through 42 on the geologic cross section and the table below. The cross section represents the bedrock structure beneath four landscape regions, *A*, *B*, *C*, and *D*.



The table below shows characteristics of the four landscape regions *A*, *B*, *C*, and *D*.

Landscape Region	Relief	Bedrock
A	great relief, high peaks, deep valleys	faulted and tilted structure; many bedrock types, including igneous
B	moderate relief, rounded peaks, wide valleys	folded sedimentary bedrock
C	moderate to high relief	horizontal sedimentary bedrock layers
D	very little relief, low elevations	horizontal sedimentary bedrock layers

40 Which terms best describe the surface landscapes of *A*, *B*, *C*, and *D*?

(1) *A*—mountains, *B*—ridges and valleys, *C*—plateau, *D*—plain
(2) *A*—plateau, *B*—plain, *C*—mountains, *D*—ridges and valleys
(3) *A*—plain, *B*—mountains, *C*—plateau, *D*—plain
(4) *A*—ridges and valleys, *B*—plateau, *C*—plain, *D*—mountains

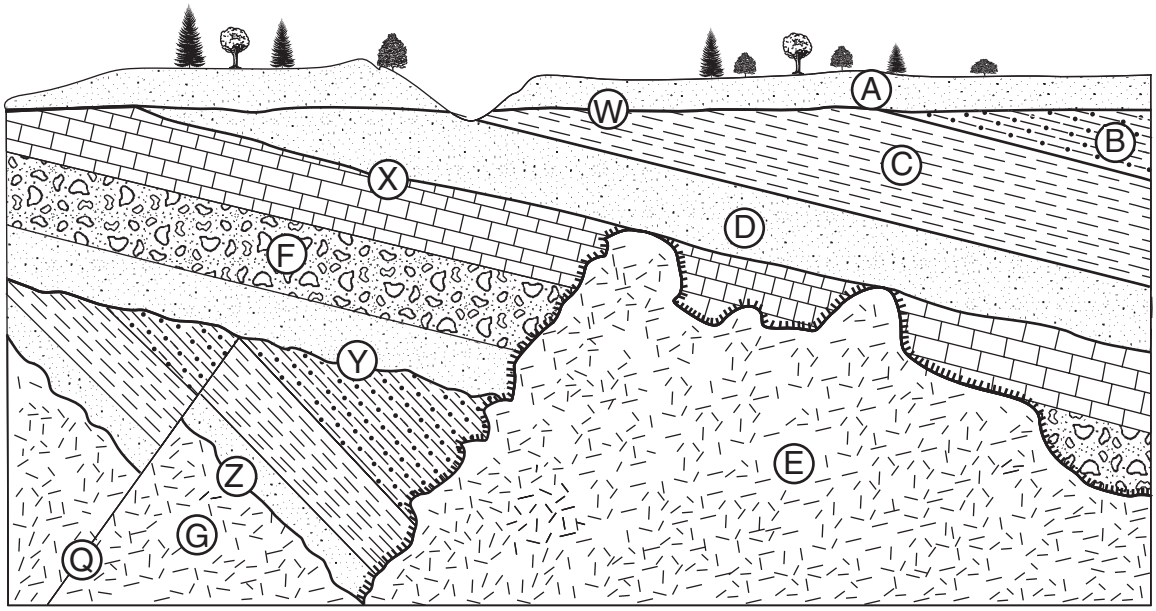
41 The meandering streams shown in landscape region *B* usually form where there are

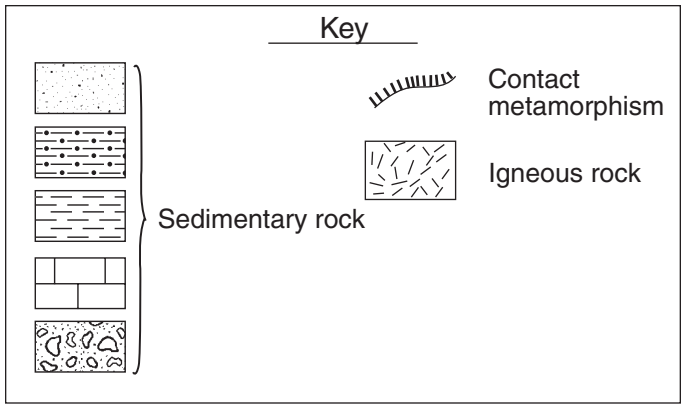
(1) volcanic cones
(2) gentle gradients
(3) many fractures in the bedrock
(4) numerous escarpments

42 The sharp, angular flat-topped hills (mesas) in landscape region *C* were most likely produced by a climate that was

(1) tropical
(2) humid
(3) dry
(4) polar

Base your answers to questions 43 through 47 on the geologic cross section of bedrock shown below. *A* through *G* identify rock layers and *Q* represents a fault. Lines *W*, *X*, *Y*, and *Z* are locations of unconformities. The rocks have not been overturned.





43 Which rock or feature is oldest?

(1) rock *A*
(2) rock *G*
(3) fault *Q*
(4) unconformity *Z*

44 The unconformities shown in the cross section represent

(1) buried erosional surfaces
(2) locations of index fossils
(3) volcanic ash deposits
(4) boundaries between oceanic and continental crust

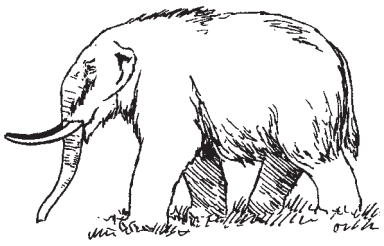
45 The movement of bedrock along fault *Q* most probably produced

(1) gaps in the rock record
(2) an earthquake
(3) a volcanic lava flow
(4) zones of contact metamorphism

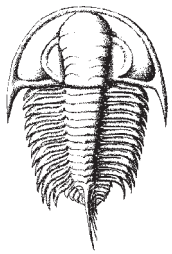
46 Which rock most likely formed in the zone of contact between rock *E* and rock *F*?

(1) obsidian
(2) slate
(3) metaconglomerate
(4) sandstone

47 Rock layers *B*, *C*, and *D* formed during the Devonian Period. Which fossil might be found in these rock layers?



Mastodont
(1)

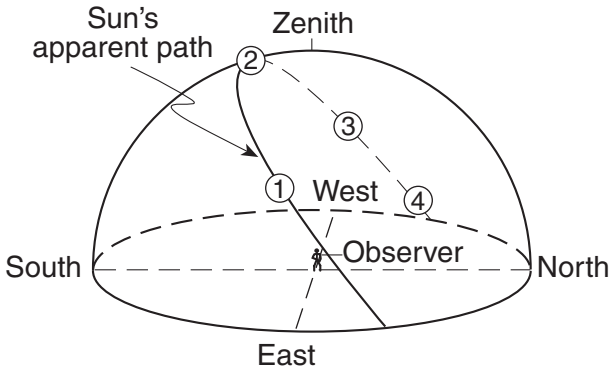


Elliptocephala
(2)

Phacops
(3)

Cystiphyllum
(4)

Base your answers to questions 48 and 49 on the diagram below, which shows numbered positions of the Sun at four different times along the Sun's apparent daily path, as seen by an observer in New York State. Numbers ① through ④ represent apparent positions of the Sun.



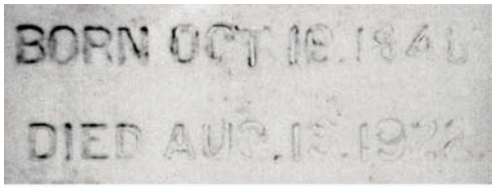
48 The observer had the longest shadow when the Sun was at position

(1) 1
(2) 2
(3) 3
(4) 4

49 During which day of the year is the Sun most likely to follow the apparent path shown?

(1) March 1
(2) July 1
(3) October 1
(4) December 1

50 The two photographs below show dates on tombstones found in a cemetery in St. Remy, New York. The tombstones were 5 meters apart and both faced north. Tombstone *A* had dates cut into the rock in 1922. Tombstone *B* had dates cut into the rock in 1892.



Tombstone A (1922)

Tombstone B (1892)

Which statement best explains why the dates are more difficult to read on tombstone *A* than on tombstone *B*?

(1) Tombstone *A* is composed of minerals less resistant to weathering than tombstone *B*.
(2) Tombstone *A* has undergone a longer period of weathering than tombstone *B*.
(3) Tombstone *A* experienced cooler temperatures than tombstone *B*.
(4) Tombstone *A* was exposed to less acid rain than tombstone *B*.

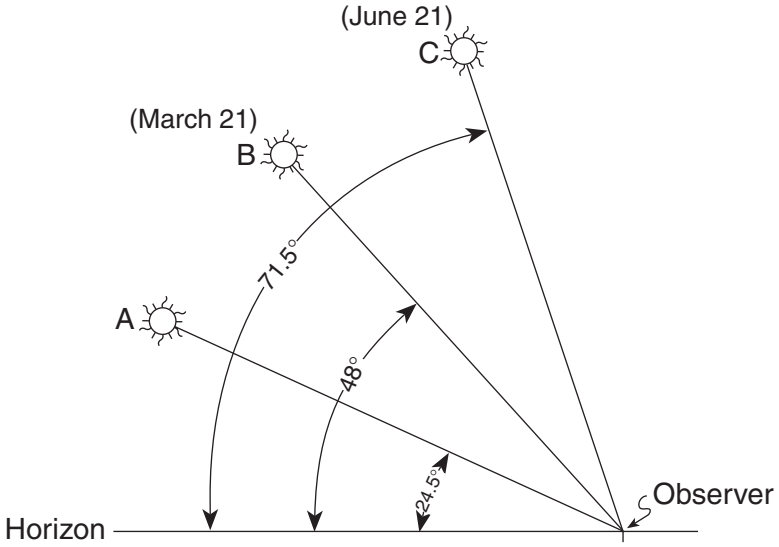
Part B–2

Answer all questions in this part.

Directions (51–63): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables.*

51 State the general relationship between a planet's distance from the Sun and the time a planet takes to complete one orbit around the Sun. [1]

Base your answers to questions 52 through 54 on the diagram below, which shows the altitude of the Sun at solar noon on certain dates. The positions of the Sun, labeled *A*, *B*, and *C*, were measured by an observer at 42° north latitude. The date when the Sun was observed at position *A* has been deliberately left blank.



52 Which season begins in New York State when the noontime Sun is observed at position *A*? [1]

53 Position *B* represents the Sun's position at solar noon on March 21. On what other date of the year would the noontime Sun be observed at position *B*? [1]

54 What is the total change in altitude that occurs as the noontime Sun appears to move from position *A* to position *C*? [1]

Base your answers to questions 55 through 57 on the weather station model provided in your answer booklet.

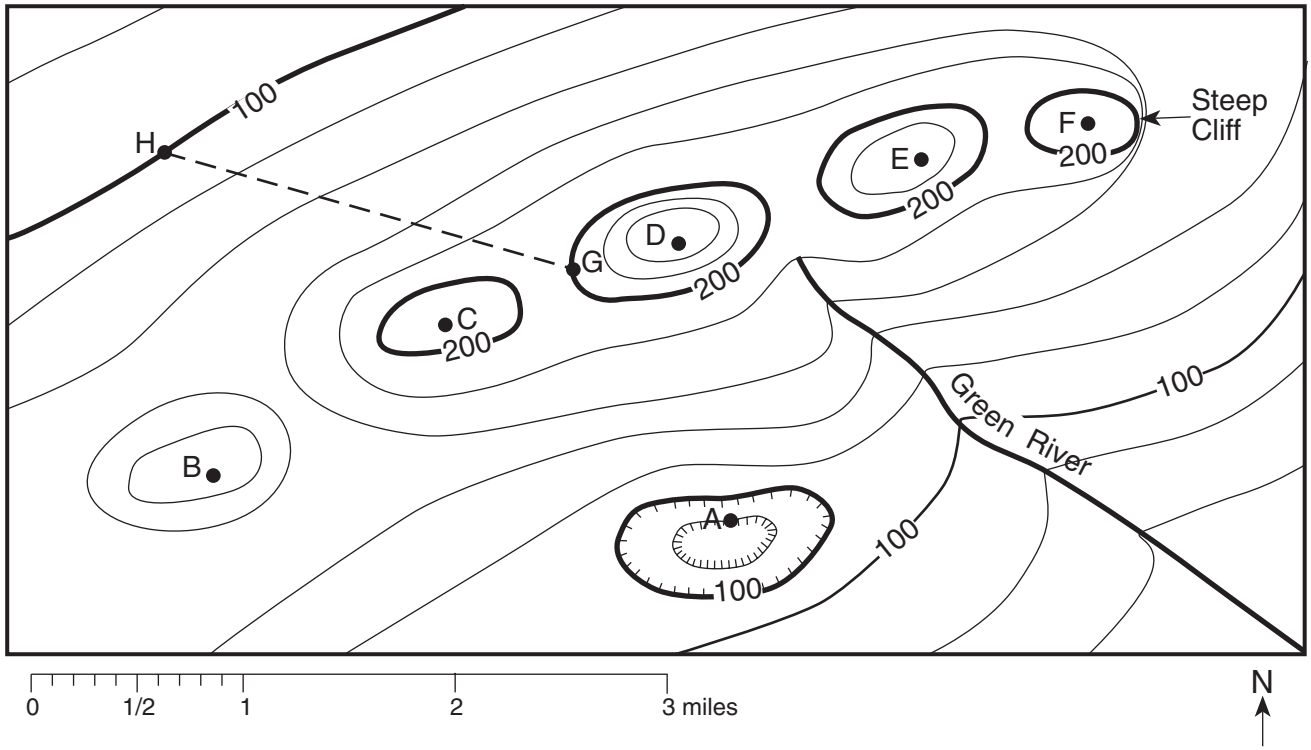
55 On the weather station model provided *in your answer booklet,* draw the proper symbols to indicate a wind of 25 knots blowing from the southeast. [1]

56 What is the actual air pressure shown by this weather station model? [1]

57 *a* What specific type of precipitation is occurring at this weather station? [1]

b State one additional weather condition shown by the station model. Explain how this weather condition provides evidence of high relative humidity. [1]

Base your answers to questions 58 through 61 on the contour map below. Letters *A* through *H* represent locations in the area represented by the map. Contour lines are labeled in feet.



58 Calculate the gradient of the slope along the dashed line between points *G* and *H* on the map. Label the answer with the correct units. [2]

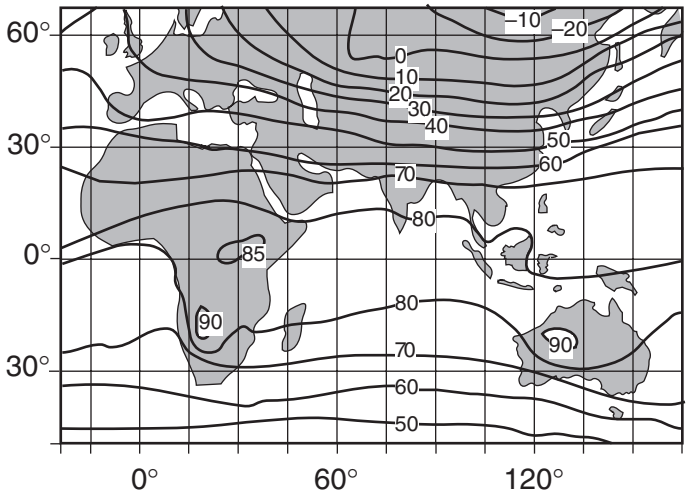
59 State how the shape of the contour lines crossing the Green River indicates that this river flows toward the southeast. [1]

60 Which letter represents the highest elevation? [1]

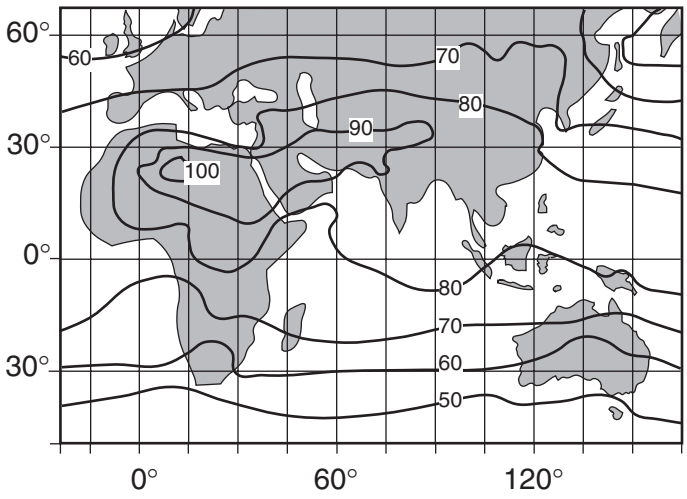
61 Explain how the contour lines on the map indicate that the location labeled "Steep Cliff" is accurately named. [1]

Base your answers to questions 62 and 63 on the isotherm maps below and on your knowledge of Earth science. The maps show the average monthly air temperatures (°F) over a portion of Earth's surface for January and July.

January Average Temperature (°F)



July Average Temperature (°F)



62 The hottest average January temperatures occur at approximately what latitude? [1]

63 From January to July, there is a smaller temperature change in the Southern Hemisphere than in the Northern Hemisphere. Explain why the Southern Hemisphere's larger ocean-water surface causes this smaller temperature change. [1]

Part C

Answer all questions in this part.

Directions (64–80): 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 64 through 66 on the diagram provided in your answer booklet and on your knowledge of Earth science. The diagram shows the Sun, Earth, and the Moon's orbit around Earth as viewed from space.

64 On the diagram provided *in your answer booklet,* draw a circle of approximately this size ◯ to represent the Moon's position in its orbit when a solar eclipse is viewed from Earth. [1]

65 Approximately how many complete revolutions does the Moon make around Earth each month? [1]

66 Explain why solar eclipses do not occur every time the Moon revolves around Earth. [1]

Base your answers to questions 67 through 70 on the table below and on your knowledge of Earth science. The table shows air temperatures and air pressures recorded by a weather balloon rising over Buffalo, New York.

Altitude Above Sea Level (m)	**Air Temperature** (°C)	**Air Pressure** (mb)
300	16.0	973
600	16.5	937
900	15.5	904
1,200	13.0	871
1,500	12.0	842
1,800	10.0	809
2,100	7.5	778
2,400	5.0	750
2,700	2.5	721

67 On the grid provided *in your answer booklet,* construct a graph of altitude above sea level and air temperature by following the directions below.

a Plot an **X** for the air temperature recorded at *each* altitude shown on the table. [1]

b Connect the **X**s with a solid line. [1]

68 What weather instrument is usually attached to a weather balloon to measure air pressure? [1]

69 State the relationship shown in the table between altitude above sea level and air pressure recorded by the rising weather balloon. [1]

70 This rising weather balloon also recorded dewpoint temperatures. If the dewpoint at 1,500 meters was 12°C, what was the relative humidity of the air at 1,500 meters above sea level? [1]

Base your answers to questions 71 through 74 on the reading passage below and on your knowledge of Earth science.

Greenhouse Effect

The warming of Earth's surface and lower atmosphere tends to intensify with an increase in atmospheric carbon dioxide. The atmosphere allows a large percentage of the visible light rays from the Sun to reach Earth's surface. Some of this energy is reradiated by Earth's surface in the form of long-wave infrared radiation. Much of this infrared radiation warms the atmosphere when it is absorbed by molecules of carbon dioxide and water vapor. A similar warming effect is produced by the glass of a greenhouse, which allows sunlight in the visible range to enter, but prevents infrared radiation from leaving the greenhouse.

The absorption of infrared radiation causes Earth's surface and the lowest layer of Earth's atmosphere to warm to a higher temperature than would otherwise be the case. Without this "greenhouse" warming, Earth's average surface temperature could be as low as –73°C. The oceans would freeze under such conditions.

Many scientists believe that modern industrialization and the burning of fossil fuels (coal, oil, and natural gas) have increased the amount of atmospheric carbon dioxide. This increase may result in an intensified greenhouse effect on Earth causing significant alterations in climate patterns in the future. Scientists estimate that average global temperatures could increase by as much as 5°C by the middle of the 21st century.

71 The lowest layer of Earth's atmosphere has undergone a large increase in temperature due to the presence of greenhouse gases. State the name of this temperature-zone layer. [1]

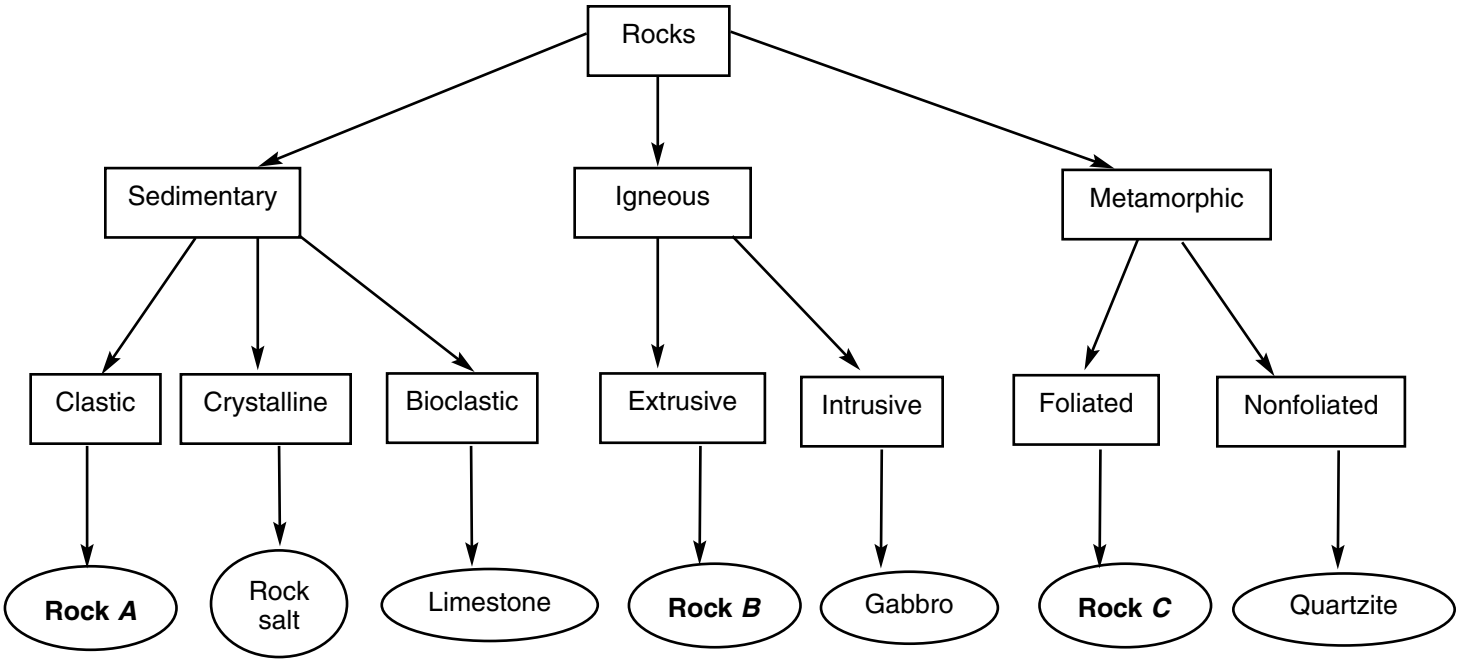
72 State a possible wavelength, in centimeters, of infrared radiation. [1]

73 Explain why most scientists believe an increase in the greenhouse effect will cause sea levels to rise. [1]

74 State one possible change humans could make to significantly reduce the amount of greenhouse gases added to the atmosphere each year. [1]

Base your answers to questions 75 through 78 on the Rock Classification flowchart shown below. Letters *A*, *B*, and *C* represent specific rocks in this classification scheme.

Rock Classification Flowchart



75 Rock *A* is composed of very fine-grained quartz and feldspar particles 0.005 centimeter in diameter. State the name of rock *A*. [1]

76 Rock *B* has a glassy, vesicular texture and is composed mainly of potassium feldspar and quartz. State the name of rock *B*. [1]

77 Granite could be placed in the same position in the flowchart above as gabbro. Describe *two* differences between granite and gabbro. [1]

78 The diagram below represents two magnified views showing the arrangement of minerals before and after metamorphism of rock *C*. State the name of rock *C*. [1]

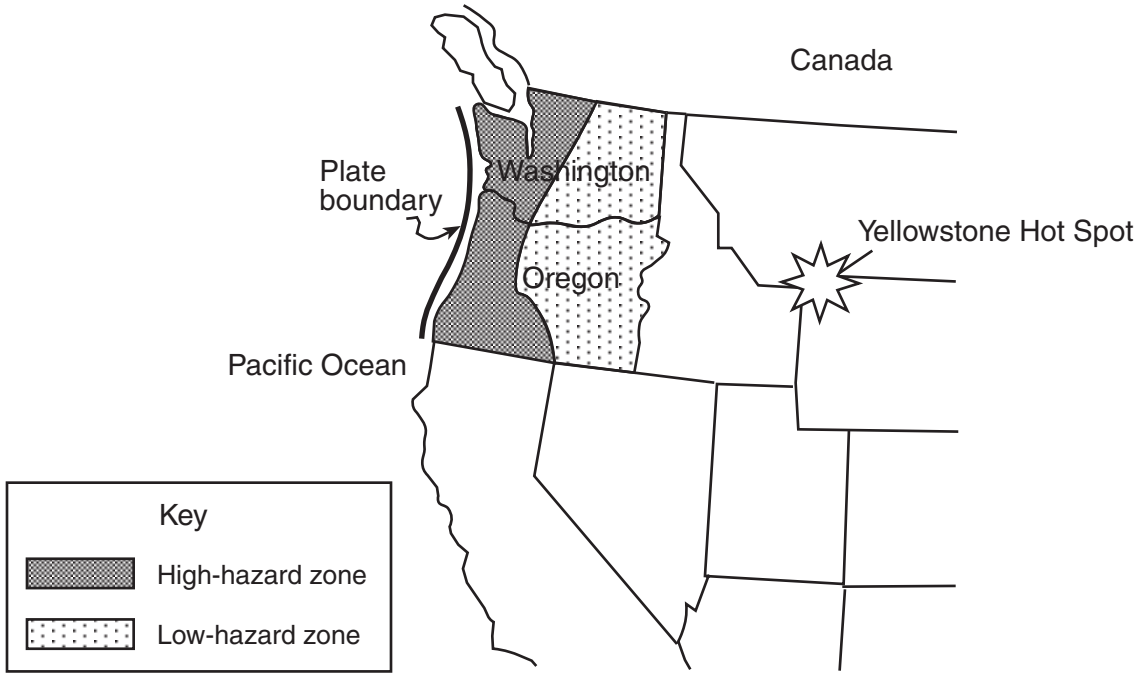
Mineral Arrangement
Before Metamorphism

Rock C Showing Banding
After Metamorphism

Base your answers to questions 79 and 80 on the reading passage and map of the western United States below and on your knowledge of Earth science. The states of Washington and Oregon have been labeled on the map. The plate boundary shown on the map is the source area for high-magnitude earthquakes in Washington and Oregon. Two hazardous zones associated with these earthquakes are also shown.

Washington and Oregon Earthquakes

Large-magnitude earthquakes have occurred in Washington and Oregon as a result of crustal movement along thrust faults bordering the coasts of these states. Thrust faults occur when one section of Earth's crust slides over another section. Associated with the sudden movement of these thrust faults, coastlines can drop several feet, flooding forests with saltwater. Geologists have discovered evidence from various geologic ages of flooded coastal forests in the bedrock layers of Washington and Oregon. They have also found layers of sandstone thought to have been derived from sand deposits left by tsunamis. Using the rock record, scientists conclude that very large magnitude earthquakes occur every 300 to 500 years with the most recent large quake occurring about 200 years ago.



79 *a* What is a tsunami? [1]

b State how tsunamis can affect coastal regions. [1]

80 *a* Identify the tectonic plates on both sides of the plate boundary shown on the map. [1]

b Identify the type of tectonic plate boundary shown on the map that is responsible for the thrust faults along the Washington and Oregon coastline. [1]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, August 13, 2003 — 12:30 to 3:30 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

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, August 13, 2003 — 12:30 to 3:30 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: 23)	
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** ☐

53 _____ **53** ☐

54 _____ **degrees** **54** ☐

For Raters Only

55

55 ☐

56 _____ **millibars** **56** ☐

57 ***a*** _____ **57***a* ☐

b Weather condition: _____ ***b*** ☐

Explanation: _____

_____

_____

[b]

For Raters Only

58 Gradient = _____ **58** ☐

59 _____

_____ **59** ☐

_____

60 _____ **60** ☐

61 _____

_____ **61** ☐

_____

62 _____ **62** ☐

63 _____

_____ **63** ☐

_____

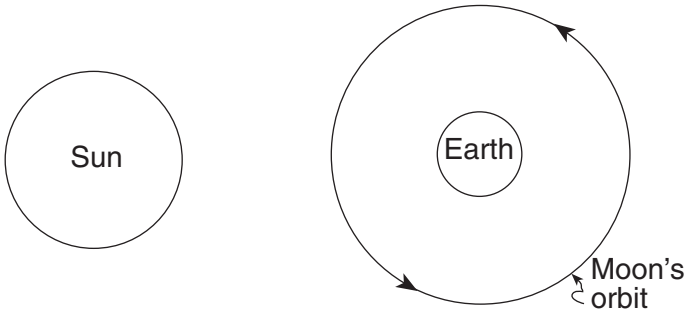
☐

Total Score for Part B–2

Part C

For Raters Only

64



(Not drawn to scale)

64 ☐

65 _____ **revolution(s)**

65 ☐

66 _____

_____

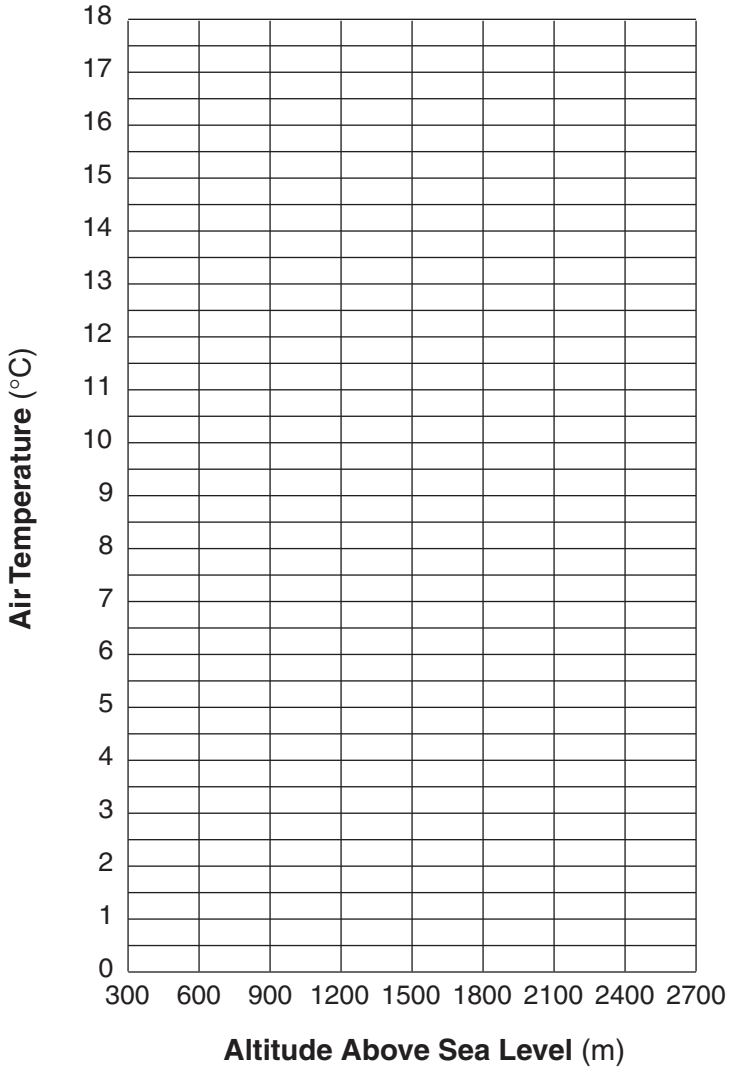
_____

_____

66 ☐

For Raters Only

67



67 ☐

68 _____ **68** ☐

69 _____ **69** ☐

_____

70 _____ **% relative humidity** **70** ☐

For Raters Only

71 _____ **71** ☐

72 _____ **cm** **72** ☐

73 _____ **73** ☐

_____

74 _____ **74** ☐

_____

75 _____ **75** ☐

76 _____ **76** ☐

77 (1) _____ **77** ☐

(2) _____

78 _____ **78** ☐

79 ***a*** _____ **79*a*** ☐

_____

b _____ ***b*** ☐

_____

80 ***a*** _____ **Plate** and _____ **Plate** **80*a*** ☐

b _____ ***b*** ☐

☐

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, August 13, 2003 — 12:30 p.m. to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

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

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

Part A

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

Part B–1

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

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Physical Setting/Earth Science examination. Additional information about scoring is provided in the publication *Information for Administering and Scoring Regents Examinations in the Sciences*.

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* correct the student's work by making insertions or changes of any kind.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a checkmark each incorrect or omitted answer. In the box provided at the end of each part, record the number of questions the student answered correctly for that part.

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score all the open-ended questions on a student's answer paper.

Student's responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide. In the student's answer booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

Fractional credit is *not* allowed. Only whole-number credit may be given to a response. Units need not be given when the wording of the questions allows such omissions.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet and then should add these four scores and enter the total in the box labeled "Total Written Test Score." The student's score for the Earth Science Performance Test should be entered in the space provided. Then, the student's raw scores on the performance test and written test should be converted to a scaled score by using the conversion chart printed at the end of this Scoring Key and Rating Guide. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination to another, it is crucial that for each administration, the conversion chart provided in the scoring key for that administration be used to determine the student's final score. The chart in this scoring key is usable only for this administration of the examination.

Part B–2

51 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

The farther a planet is from the Sun, the longer the planet takes to complete one orbit around the Sun.

direct relationship

52 [1] Allow 1 credit for **winter**.

53 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

September 21

September 22

September 23

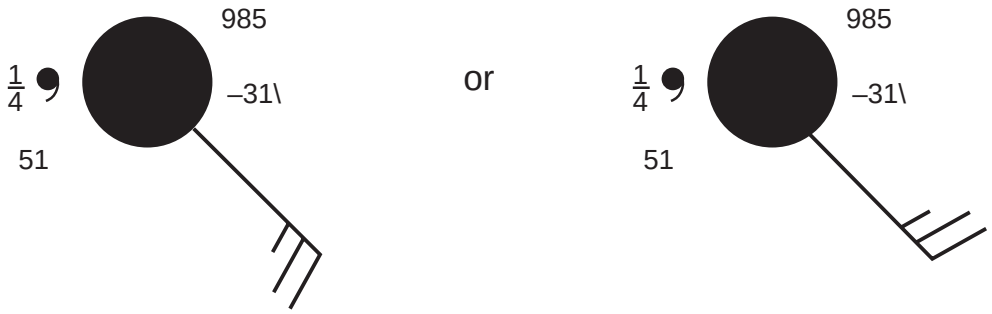
September 24

autumnal equinox

first day of fall

54 [1] Allow 1 credit for **47** degrees.

55 [1]



Allow 1 credit for correct symbols of both the wind direction and wind speed.

56 [1] Allow 1 credit for **998.5** millibars.

57 [2] ***a*** Allow 1 credit for **drizzle**.

Note: Do *not* allow credit for rain.

b Allow 1 credit for a correct response. Responses must include both a weather condition and a correct explanation to receive credit. Acceptable responses include, but are not limited to, these examples:

Weather Condition	Explanation
100% cloud cover	indicates that saturated air has condensed
low visibility ($\frac{1}{4}$ mile)	is most likely caused by water droplets in the air
low air pressure	because humid air is less dense than dry air
Air pressure decreased during the last 3 hours.	This change may indicate that moist air has arrived.

58 [2] Allow 1 credit for **50** (±3)**.**

and

Allow 1 credit for the correct unit **feet per mile** or **ft/mi.**

Note: Do *not* allow credit for ft/m.

59 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

Contour lines that cross the Green River bend in the opposite direction of river flow.

Contour lines bend upstream when crossing the Green River.

Contour lines that cross the river form V-shapes. The point of each V-shape indicates the uphill or upstream direction.

60 [1] Allow 1 credit for **D**.

61 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

Contour lines are extremely close together.

The most closely spaced contour lines indicate the steepest gradient.

62 [1] Allow 1 credit for **20° south** (±8°). The correct compass direction must be included.

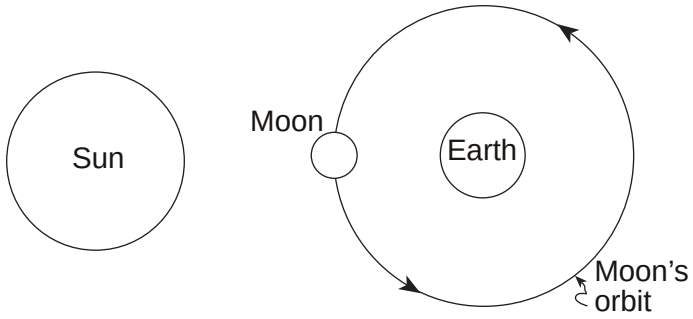
63 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

Water has a higher specific heat than the land.

Water takes a longer time to heat up and cool down than land.

Part C

64 [1]



(Not drawn to scale)

Allow 1 credit for drawing the Moon on the orbit directly between the Sun and Earth.

65 [1] Allow 1 credit for **1** or **1.1** revolution.

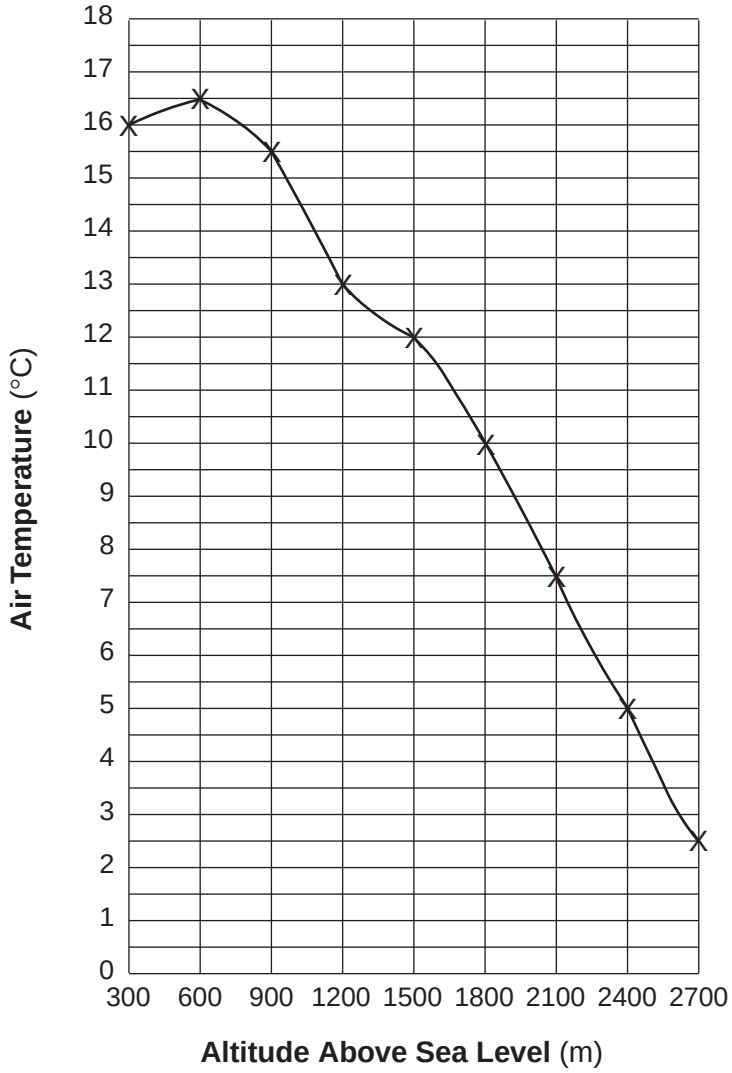
66 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

The Moon's orbit around Earth is *not* always in the same plane as Earth's orbit around the Sun.

The Moon usually passes above or below the Sun as seen from Earth.

The Sun, Moon, and Earth are only occasionally aligned in a straight line.

67 [2]



Allow 1 credit for correctly plotting seven or more points, even if **X**s are not used.

and

Allow 1 credit for correctly connecting the plotted **X**s or points, even if they are plotted incorrectly.

68 [1] Allow 1 credit for **barometer** or **altimeter**.

69 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

inverse realtionship

indirect relationship

As elevation increases, air pressure decreases.

70 [1] Allow 1 credit for **100**% relative humidity.

71 [1] Allow 1 credit for **troposphere**.

72 [1] Allow 1 credit for a correct response. Acceptable responses range from 7.0×10^{-5} to 5.0×10^{-2} according to the *Earth Science Reference Tables*. Acceptable responses include, but are not limited to, these examples:

0.0001 *or* 0.001 *or* 0.01

10^{-4} *or* 10^{-3} *or* 10^{-2}

73 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, this example:

An increase in global temperatures will cause glaciers and continental ice sheets to gradually melt.

74 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

Pass a law to limit greenhouse gas emissions.

Stop burning the rain forests.

Increase car pool/mass transit use.

75 [1] Allow 1 credit for **siltstone**.

76 [1] Allow 1 credit for **pumice**.

77 [1] Allow 1 credit for *two* correct responses. Acceptable responses include, but are not limited to, these examples:

Granite is lighter in color than gabbro.

Granite is less dense than gabbro.

Granite's composition is more felsic, while gabbro's composition is more mafic.

Granite contains the minerals potassium feldspar and quartz; gabbro does not.

78 [1] Allow 1 credit for **gneiss**.

79 [2] ***a*** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

large ocean wave or series of ocean waves generated by an earthquake

wave caused by an earthquake

Note: Accept the commonly used term *tidal wave*, but do *not* accept the response that tsunamis are caused by tides.

b Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

flooding

bringing in sand deposits

destruction of coastal property

80 [2] ***a*** Allow 1 credit for **Juan de Fuca** Plate and **North American** Plate.

b Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

subduction zone

convergent plate boundary

or

Allow 1 credit for a response that is consistent with the student's answer for 80*a*.

Note: Do *not* allow credit for thrust faults.

Regents Examination in Physical Setting/Earth Science – August 2003

CHART FOR DETERMINING THE FINAL EXAMINATION SCORE
(USE FOR AUGUST 2003 EXAMINATION ONLY.)

To determine the student's final examination score, locate the student's total performance test score across the top of the chart and the student's total written test score down the side of the chart. The point where those two scores intersect is the student's final examination score. For example, a student receiving a total performance test score of 14 and a total written test score of 68 would receive a final examination score of 84.

Total Performance Test Score

Total Written Test Score	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
85	100	99	98	97	97	97	97	96	96	95	95	94	94	93	92	92	91	90	89	89	88	87	86	85
84	99	98	97	97	96	96	96	95	95	94	94	93	93	92	92	91	90	89	89	88	87	86	85	84
83	99	98	97	97	96	96	96	95	95	94	94	93	93	92	92	91	90	89	89	88	87	86	85	84
82	98	97	96	96	96	95	95	94	94	94	93	93	92	91	91	90	89	89	88	87	86	85	84	83
81	97	96	95	95	95	94	94	94	93	93	92	92	91	90	90	89	88	88	87	86	85	84	83	82
80	97	96	95	95	95	94	94	94	93	93	92	92	91	90	90	89	88	88	87	86	85	84	83	82
79	97	96	94	94	94	93	93	93	92	92	91	91	90	90	89	88	88	87	86	85	84	83	83	82
78	96	95	94	93	93	93	92	92	91	91	91	90	89	89	88	87	87	86	85	84	84	83	82	81
77	96	95	94	93	93	93	92	92	91	91	91	90	89	89	88	87	87	86	85	84	84	83	82	81
76	95	94	93	92	92	92	91	91	91	90	90	89	89	88	87	87	86	85	84	84	83	82	81	80
75	94	93	92	92	91	91	91	90	90	89	89	88	88	87	86	86	85	84	84	83	82	81	80	79
74	93	92	91	91	90	90	90	89	89	88	88	87	87	86	86	85	84	83	83	82	81	80	79	78
73	93	92	91	91	90	90	90	89	89	88	88	87	87	86	86	85	84	83	83	82	81	80	79	78
72	92	91	90	90	90	89	89	88	88	88	87	87	86	85	85	84	83	83	82	81	80	79	78	77
71	92	90	89	89	89	88	88	88	87	87	86	86	85	85	84	83	83	82	81	80	79	78	77	77
70	91	90	88	88	88	88	87	87	86	86	85	85	84	84	83	82	82	81	80	79	78	78	77	76
69	90	89	88	87	87	87	86	86	86	85	85	84	83	83	82	82	81	80	79	78	78	77	76	75
68	89	88	87	86	86	86	85	85	85	84	84	83	83	82	81	81	80	79	78	78	77	76	75	74
67	88	87	86	86	85	85	85	84	84	83	83	82	82	81	80	80	79	78	78	77	76	75	74	73
66	88	87	86	86	85	85	85	84	84	83	83	82	82	81	80	80	79	78	78	77	76	75	74	73
65	87	86	85	85	84	84	84	83	83	82	82	81	81	80	80	79	78	78	77	76	75	74	73	72
64	86	85	84	84	84	83	83	83	82	82	81	81	80	79	79	78	77	77	76	75	74	73	72	71
63	86	85	83	83	83	82	82	82	81	81	80	80	79	79	78	77	77	76	75	74	73	72	72	71
62	85	84	82	82	82	82	81	81	80	80	79	79	78	78	77	76	76	75	74	73	72	72	71	70
61	84	83	82	81	81	81	80	80	80	79	79	78	77	77	76	76	75	74	73	72	72	71	70	69
60	83	82	81	80	80	80	80	79	79	78	78	77	77	76	75	75	74	73	72	72	71	70	69	68
59	82	81	80	80	79	79	79	78	78	77	77	76	76	75	75	74	73	72	72	71	70	69	68	67
58	81	80	79	79	79	78	78	77	77	77	76	76	75	74	74	73	72	72	71	70	69	68	67	66
57	80	79	78	78	78	77	77	77	76	76	75	75	74	73	73	72	71	71	70	69	68	67	66	65
56	80	79	77	77	77	76	76	76	75	75	74	74	73	73	72	71	71	70	69	68	67	66	66	65
55	79	78	77	76	76	76	75	75	74	74	74	73	72	72	71	70	70	69	68	67	67	66	65	64
54	78	77	76	75	75	75	74	74	74	73	73	72	72	71	70	70	69	68	67	67	66	65	64	63
53	76	75	74	74	73	73	73	72	72	71	71	70	70	69	69	68	67	66	66	65	64	63	62	61
52	75	74	73	73	73	72	72	71	71	71	70	70	69	68	68	67	66	66	65	64	63	62	61	60
51	75	73	72	72	72	71	71	71	70	70	69	69	68	68	67	66	66	65	64	63	62	61	60	60
50	74	73	71	71	71	71	70	70	69	69	68	68	67	67	66	65	65	64	63	62	61	61	60	59
49	73	72	71	70	70	70	69	69	69	68	68	67	66	66	65	65	64	63	62	61	61	60	59	58
48	72	71	70	69	69	69	68	68	68	67	67	66	66	65	64	64	63	62	61	61	60	59	58	57
47	71	70	69	69	68	68	68	67	67	66	66	65	65	64	63	63	62	61	61	60	59	58	57	56
46	70	69	68	68	67	67	67	66	66	65	65	64	64	63	63	62	61	61	60	59	58	57	56	55
45	69	68	66	66	66	65	65	65	64	64	63	63	62	62	61	60	60	59	58	57	56	55	55	54
44	68	67	65	65	65	65	64	64	63	63	62	62	61	61	60	59	59	58	57	56	55	55	54	53

Regents Examination in Physical Setting/Earth Science – August 2003

CHART FOR DETERMINING THE FINAL EXAMINATION SCORE
(USE FOR AUGUST 2003 EXAMINATION ONLY.)

Total Performance Test Score

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

Map to Core Curriculum

August 2003 Physical Setting/ Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	33	54,56	65,67
Math Key Idea 2	27	36,51	65,70,71
Math Key Idea 3	3	60	
Sci. Inq. Key Idea 1	21,22,25	41,42,43,50,61	66,69,73,79a,79b
Sci. Inq. Key Idea 2			
Sci. Inq. Key Idea 3	1,3,4,6,7,8,9, 10,11,13,15,19, 20,28,29,30	36,40,43,44,47, 48,52,53,54, 57a,59,62	65,69,71,72,75, 76,77,78,79a,79b, 80a,80b
Eng. Des. Key Idea 1			74
Standard 2			
Key Idea 1	26	37,38,39,53	68
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1		46,55,56,57b, 63	66
Key Idea 2	3,4,10,13,19	40,43,52,55,61	64
Key Idea 3		51,58,59,60,61, 62	72
Key Idea 4		36	74
Key Idea 5	8,11,15,20	38,39,41,44,45, 48,49,50,53,58	67
Key Idea 6			64,74
Standard 7			
Key Idea 1			74
Key Idea 2			
Standard 4			
Performance Indicator 1	1,3,4,5,8,9,11, 27,29,30,31,34	36,43,44,45,46, 47,48,49,52,53, 54	64,65,66
Performance Indicator 2	2,7,10,12,13, 14,15,16,17,18, 19,20,22,24,25, 26,28,35	37,38,39,40,41, 42,50,55,56,57, 58,59,60,61,62, 63	67,68,69,70,71, 72,73,74,79a,79b, 80a,80b
Performance Indicator 3	21,32		75,76,77,78
Reference Tables			
ESRT 2001 edition	1,6,7,12,14,17, 19,23,26,27,28, 29,30,32,33,35	38,46,47,51,55, 56,57,58,63	65,71,72,75,76, 77,78,80a,80b