

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

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, June 17, 2009 — 1:15 to 4:15 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 Evidence that the universe is expanding is best provided by the

- (1) red shift in the light from distant galaxies
- (2) change in the swing direction of a Foucault pendulum on Earth
- (3) parallelism of Earth's axis in orbit
- (4) spiral shape of the Milky Way Galaxy

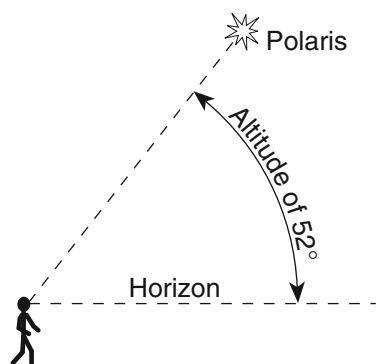
2 Which object forms by the contraction of a large sphere of gases causing the nuclear fusion of lighter elements into heavier elements?

- (1) comet
- (2) planet
- (3) star
- (4) moon

3 In New York State, summer is warmer than winter because in summer New York State has

- (1) fewer hours of daylight and receives low-angle insolation
- (2) fewer hours of daylight and receives high-angle insolation
- (3) more hours of daylight and receives low-angle insolation
- (4) more hours of daylight and receives high-angle insolation

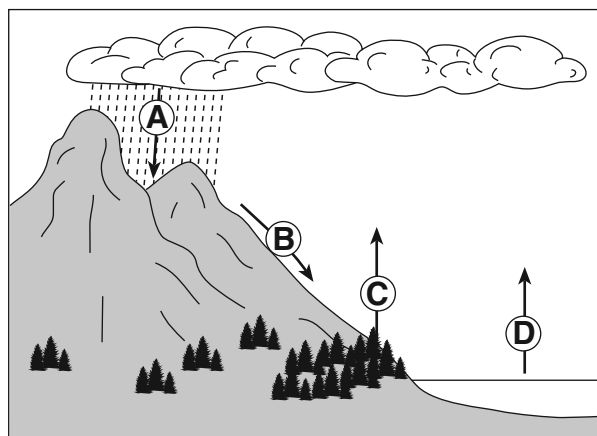
4 The diagram below shows an observer on Earth viewing the star *Polaris*.



What is this observer's latitude?

- (1) 38° N
- (2) 38° S
- (3) 52° N
- (4) 52° S

5 The arrows in the diagram below represent the movement of water in the water cycle.



Which arrow represents the process of transpiration?

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

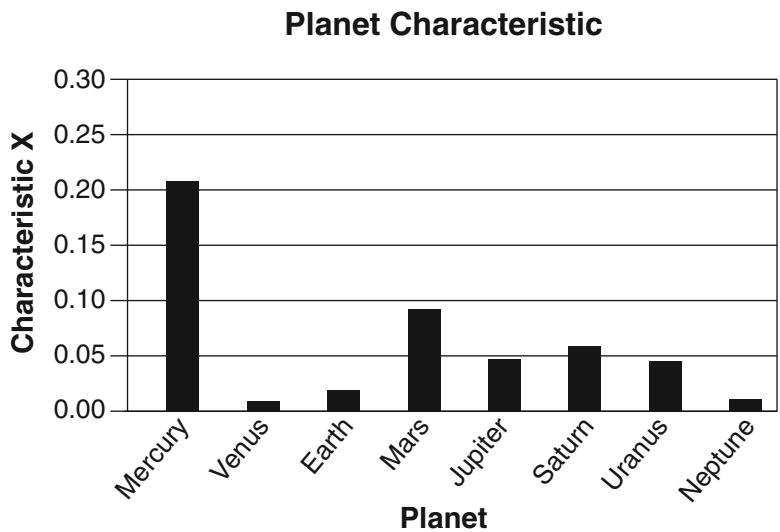
6 Which statement best describes the position of the Sun at sunrise and sunset as seen by an observer in New York State on June 21?

- (1) The Sun rises north of due east and sets north of due west.
- (2) The Sun rises south of due east and sets south of due west.
- (3) The Sun rises north of due east and sets south of due west.
- (4) The Sun rises south of due east and sets north of due west.

7 On a cold winter day, the air temperature is 2°C and the wet-bulb temperature is -1°C. What is the relative humidity at this location?

- (1) 6%
- (2) 37%
- (3) 51%
- (4) 83%

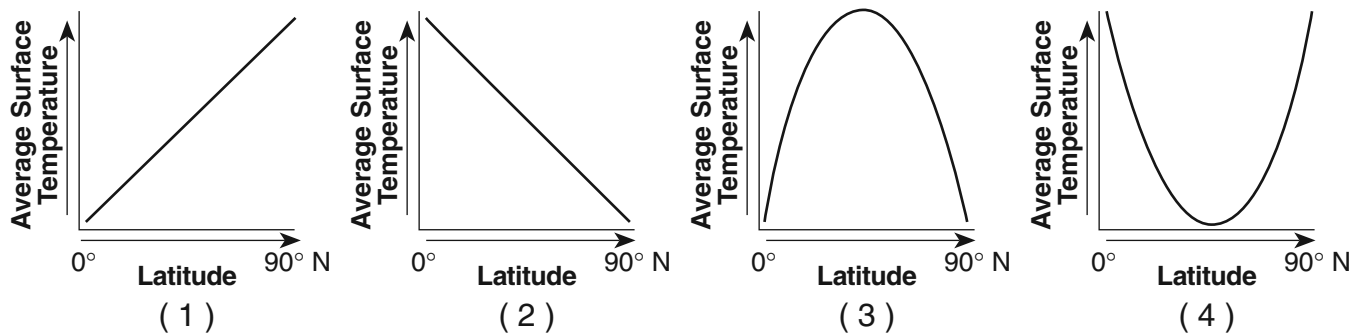
8 The bar graph below shows one planetary characteristic, identified as X, plotted for the planets of our solar system.



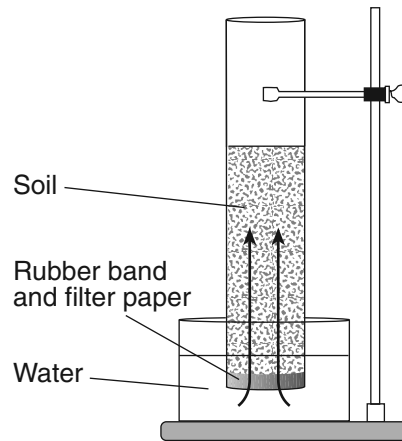
Which characteristic of the planets in our solar system is represented by X?

- (1) mass
- (2) density
- (3) eccentricity of orbit
- (4) period of rotation

9 Which graph best represents the general relationship between latitude and average surface temperature?



- 10 The diagram below shows a laboratory setup. The rubber band holds filter paper across the base of the open tube to hold the soil sample. The tube was placed in the water as shown. The upward movement of water is represented by arrows. The height of the water that moved upward within the soil was measured. Students repeated this procedure using soils with different particle sizes. Results of the experiment are shown in the data table.



Data Table

Average Soil Particle Diameter (cm)	Height of Water in Column (cm)
0.006	30.0
0.2	8.0
1.0	0.5

Results of this experiment lead to the conclusion that

- (1) capillarity is greater in soils with larger particles
- (2) capillarity is greater in soils with smaller particles
- (3) permeability is greater in soils with larger particles
- (4) permeability is greater in soils with smaller particles

11 When two tectonic plates collide, oceanic crust usually subducts beneath continental crust because oceanic crust is primarily composed of igneous rock that has

- (1) low density and is mafic
- (2) low density and is felsic
- (3) high density and is mafic
- (4) high density and is felsic

12 New York State's generalized landscape regions are identified primarily on the basis of elevation and

- (1) bedrock structure
- (2) climate zones
- (3) geologic age
- (4) latitude

13 The data table below shows the origin depths of all large-magnitude earthquakes over a 20-year period.

Data Table

Depth Below Surface (km)	Number of Earthquakes
0–33	27,788
34–100	17,585
101–300	7,329
301–700	3,167

According to these data, most of these earthquakes occurred within Earth's

- (1) lithosphere
- (2) asthenosphere
- (3) stiffer mantle
- (4) outer core

14 What is the largest sediment that can be transported by a stream that has a velocity of 125 cm/sec?

- (1) cobbles
- (2) pebbles
- (3) sand
- (4) clay

15 The photograph below shows a valley.



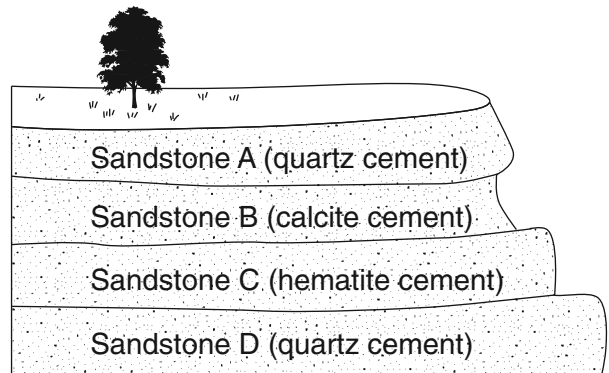
Which agent of erosion most likely produced this valley's shape?

- (1) wave action
- (2) moving ice
- (3) blowing wind
- (4) flowing water

16 Deposition within a meandering stream usually occurs on the inside of the curves because the

- (1) water velocity decreases
- (2) stream gradient increases
- (3) water is deeper
- (4) stream is narrower

17 The diagram below shows an outcrop of different layers of sandstone in a region receiving heavy rainfall.



Which sandstone layer appears to be the *least* resistant to weathering?

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

18 Which process led to the formation of thick salt deposits found in the bedrock at some locations in New York State?

- (1) melting
- (2) runoff
- (3) condensation
- (4) evaporation

19 Oxygen is the most abundant element by volume in Earth's

- (1) inner core
- (2) troposphere
- (3) hydrosphere
- (4) crust

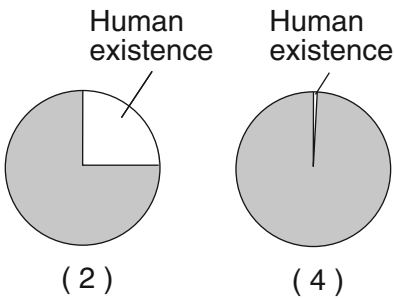
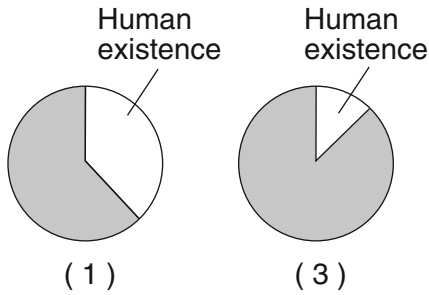
20 Most insolation striking a smooth, light-colored, solid surface is

- (1) refracted
- (2) transmitted
- (3) reflected
- (4) absorbed

21 Which process requires water to gain heat energy from the environment?

- (1) evaporation (3) infiltration
 (2) condensation (4) precipitation

22 Which graph best represents human existence on Earth, compared with Earth's entire history?



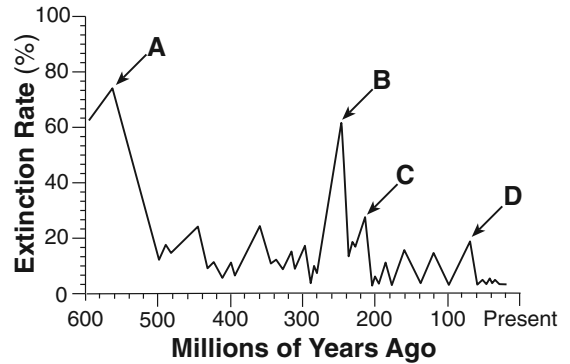
23 How old is a fossil that has radioactively decayed through 4 half-lives of carbon-14?

- (1) 5,700 years (3) 22,800 years
 (2) 17,100 years (4) 28,500 years

24 The gases in Earth's early atmosphere are inferred to have come primarily from

- (1) meteor showers
 (2) melting of glacial ice
 (3) volcanic eruptions
 (4) evaporation of seawater

25 The graph below shows the extinction rate of organisms on Earth during the last 600 million years. Letters A through D represent mass extinctions.



Which letter indicates when dinosaurs became extinct?

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

26 Alternating parallel bands of normal and reversed magnetic polarity are found in the basaltic bedrock on either side of the

- (1) Mid-Atlantic Ridge
 (2) Yellowstone Hot Spot
 (3) San Andreas Fault
 (4) Peru-Chile Trench

27 Which characteristic would most likely remain constant when a limestone cobble is subjected to extensive abrasion?

- (1) shape (3) volume
 (2) mass (4) composition

- 30 According to the fossil record, which sequence correctly represents the evolution of life on Earth?
- (1) fish → amphibians → mammals → soft-bodied organisms
 - (2) fish → soft-bodied organisms → mammals → amphibians
 - (3) soft-bodied organisms → amphibians → fish → mammals
 - (4) soft-bodied organisms → fish → amphibians → mammals
- 31 The data table below compares the climates of two United States cities located at approximately 43° north latitude. The data are based on a 30-year period.

Data Table

Location	Maximum Temperature (°F)	Minimum Temperature (°F)	Mean Annual Precipitation (in)	Mean Annual Snowfall (in)
city A	110	-36	23.8	31.9
city B	98	-19	38.2	92.9

Which statement best explains the climate variation between these two cities?

- (1) City A and city B are located at the same longitude.
 - (2) City A is located at a high elevation, and city B is located at sea level.
 - (3) City A is located far inland, and city B is located near a large body of water.
 - (4) City A is located on the east coast, and city B is located on the west coast.
- 32 The air above a burning candle is heated and rises. Which table correctly identifies the type of heat transfer within the rising air and the change in air density above the burning candle?

Type of Heat Transfer	Change in Air Density
conduction	density increases

(1)

Type of Heat Transfer	Change in Air Density
convection	density increases

(3)

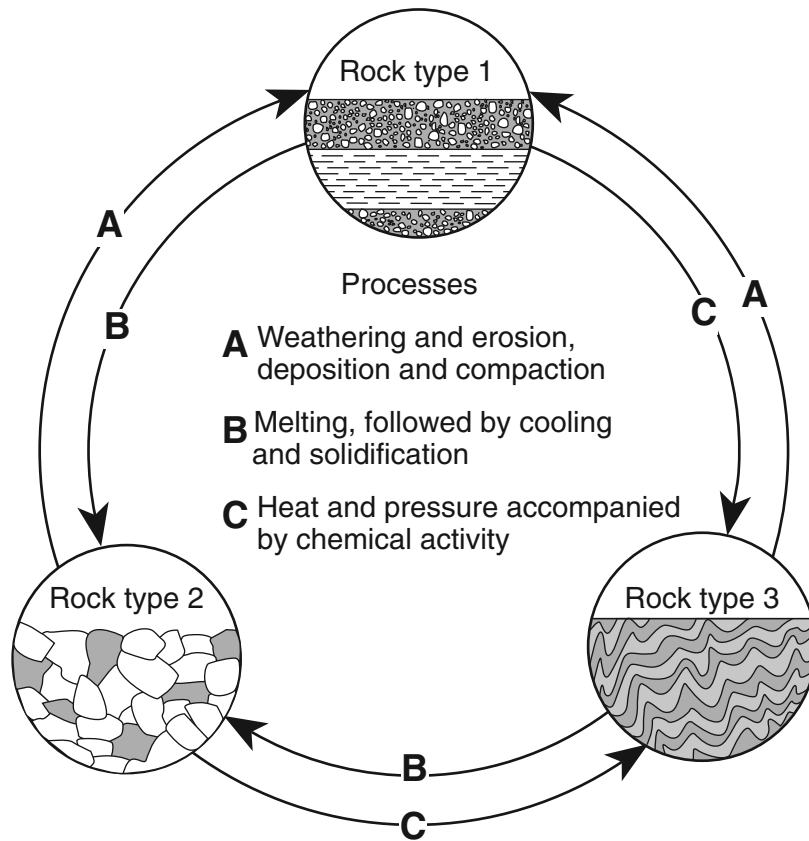
Type of Heat Transfer	Change in Air Density
conduction	density decreases

(2)

Type of Heat Transfer	Change in Air Density
convection	density decreases

(4)

33 The diagram below represents geological processes that act continuously on Earth to form different rock types.



Which table correctly classifies each rock type?

Rock Type	Classification
1	sedimentary
2	metamorphic
3	igneous

(1)

Rock Type	Classification
1	metamorphic
2	igneous
3	sedimentary

(3)

Rock Type	Classification
1	sedimentary
2	igneous
3	metamorphic

(2)

Rock Type	Classification
1	igneous
2	metamorphic
3	sedimentary

(4)

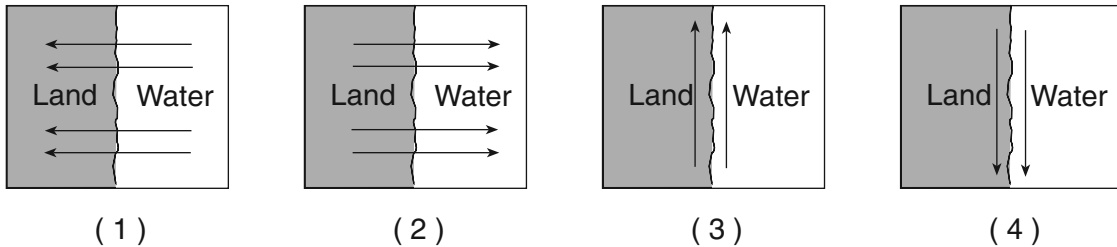
34 The table below shows some properties of four different minerals.

Mineral Variety	Color	Hardness	Luster	Composition
flint	black	7	nonmetallic	SiO ₂
chert	gray, brown, or yellow	7	nonmetallic	SiO ₂
jasper	red	7	nonmetallic	SiO ₂
chalcedony	white or light color	7	nonmetallic	SiO ₂

The minerals listed in the table are varieties of which mineral?

- (1) garnet (3) quartz
(2) magnetite (4) olivine

35 Adjacent water and landmasses are heated by the morning Sun on a clear, calm day. After a few hours, a surface wind develops. Which map best represents this wind's direction?

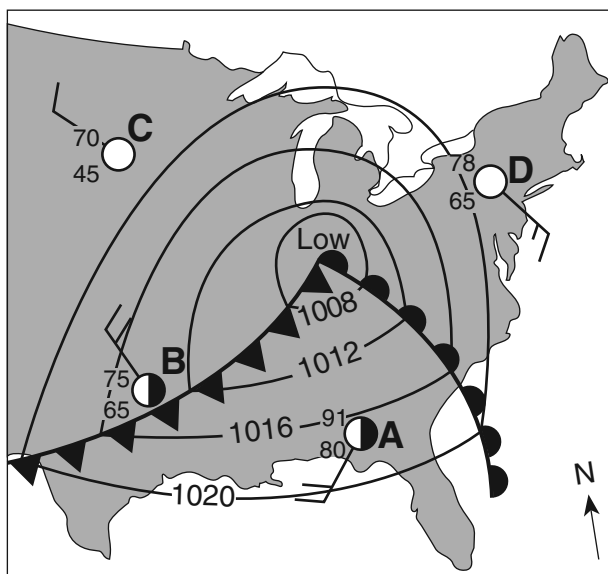


Part B-1

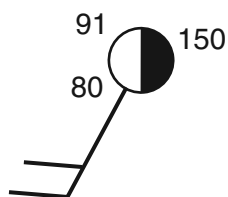
Answer all questions in this part.

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.

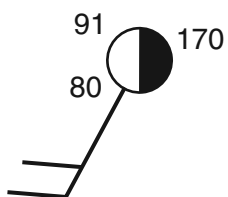
Base your answers to questions 36 through 38 on the weather map below, which shows a low-pressure system over the eastern United States. Letters A through D represent weather stations.



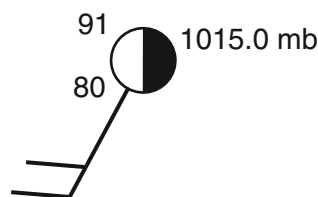
36 Which station model correctly represents the barometric pressure at station A?



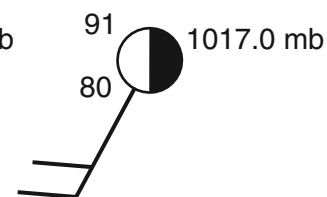
(1)



(2)



(3)



(4)

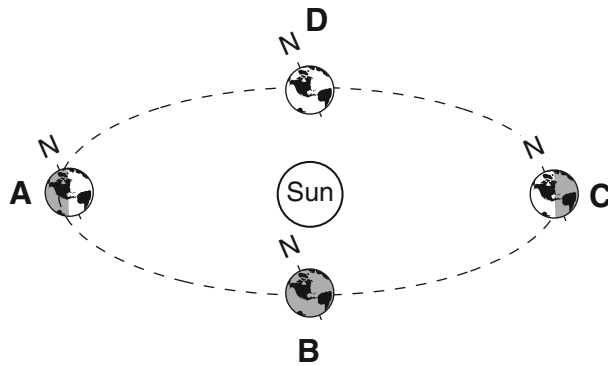
37 Which weather instrument was used to measure wind speed at station D?

- (1) barometer
- (2) thermometer
- (3) psychrometer
- (4) anemometer

38 Surface winds within this low-pressure system most likely are flowing

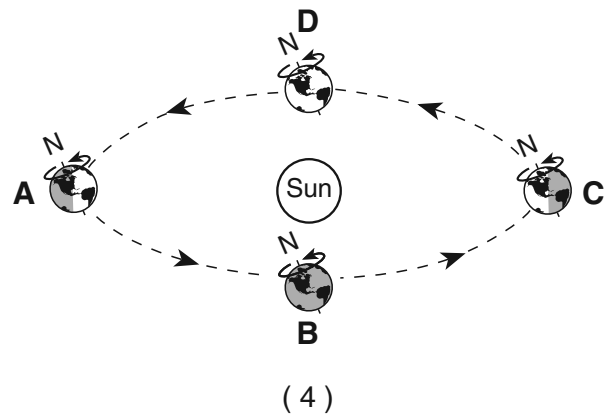
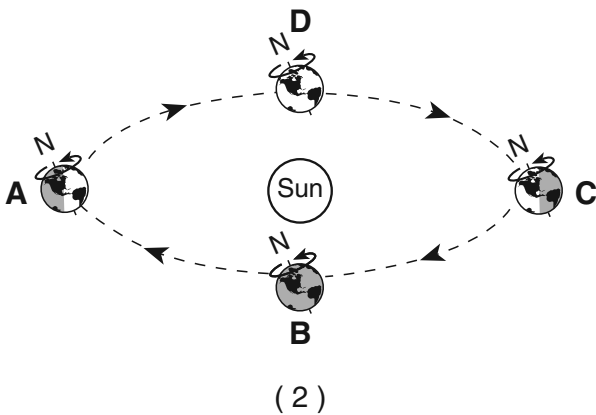
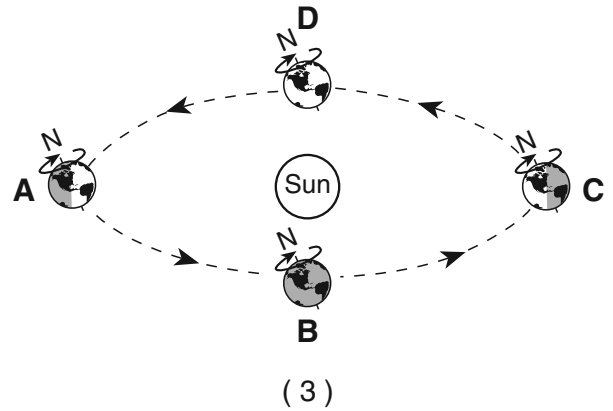
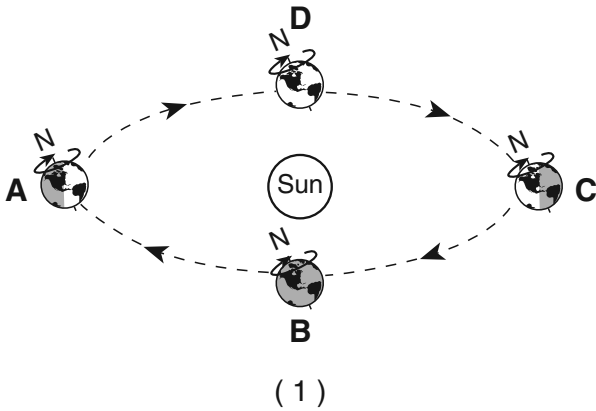
- (1) toward the center in a clockwise pattern
- (2) toward the center in a counterclockwise pattern
- (3) away from the center in a clockwise pattern
- (4) away from the center in a counterclockwise pattern

Base your answers to questions 39 through 42 on the diagram below, which represents Earth in its orbit around the Sun. The position of Earth on the first day of each season is labeled A, B, C, and D.



(Not drawn to scale)

39 Which diagram correctly shows the directions of Earth's revolution and rotation?



40 At which location are the Sun's noontime rays perpendicular to Earth's surface at the Tropic of Cancer (23.5° N)?

- (1) A
- (2) B

- (3) C
- (4) D

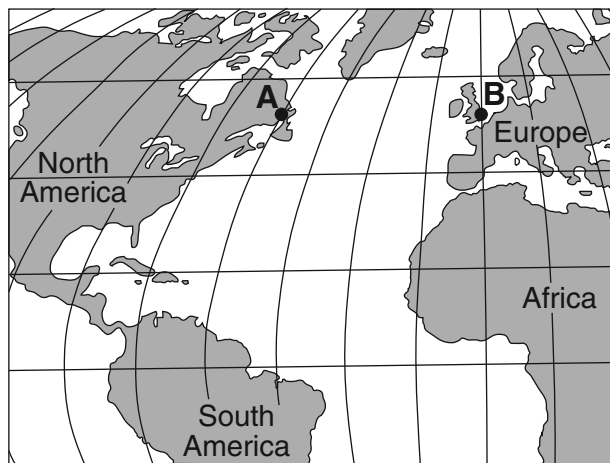
41 What is the approximate rate of Earth's revolution around the Sun?

- (1) 1° per day
- (2) 1° per year
- (3) 15° per day
- (4) 15° per year

42 Which event is caused by Earth's revolution?

- (1) the apparent shift in the path of a Foucault pendulum
 - (2) deflection of planetary winds to the right in the Northern Hemisphere
 - (3) the apparent rising and setting of the Sun
 - (4) different constellations observed in the night sky throughout the year
-

Base your answers to questions 43 and 44 on the map below, which shows locations *A* and *B* on Earth's surface at the same distance from the ocean, at the same elevation above sea level, and at the same latitude.



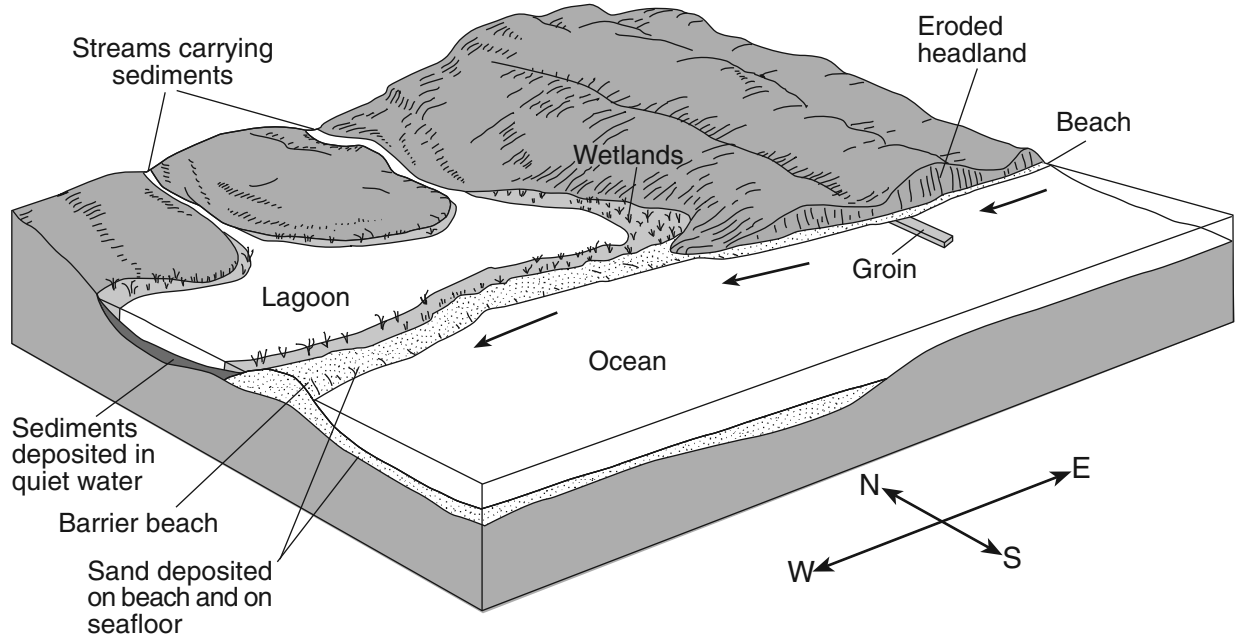
43 Which statement best explains why location *A* has a cooler climate than location *B*?

- (1) Location *A* has a longer duration of insolation each day.
- (2) Location *A* is influenced by a cold ocean current.
- (3) Location *B* is farther from the equator.
- (4) Location *B* has less intense insolation each day.

44 There is a four-hour solar time difference between locations *A* and *B*. What is the difference in longitude between locations *A* and *B*?

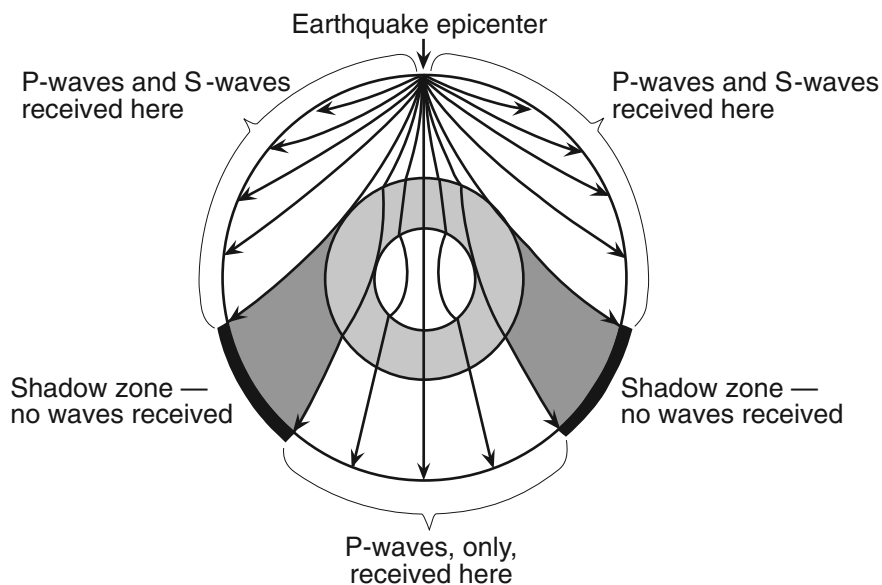
- (1) 15°
 - (2) 23.5°
 - (3) 45°
 - (4) 60°
-

Base your answers to questions 45 through 48 on the diagram below. The arrows show the direction in which sediment is being transported along the shoreline. A barrier beach has formed, creating a lagoon (a shallow body of water in which sediments are being deposited). The eroded headlands are composed of diorite bedrock. A groin has recently been constructed. Groins are wall-like structures built into the water perpendicular to the shoreline to trap beach sand.



- 45 The groin structure will change the pattern of deposition along the shoreline, initially causing the beach to become
- | | |
|--|---|
| (1) wider on the western side of the groin | (3) narrower on both sides of the groin |
| (2) wider on the eastern side of the groin | (4) wider on both sides of the groin |
- 46 Which two minerals are most likely found in the beach sand that was eroded from the headlands?
- | | |
|--|------------------------------------|
| (1) quartz and olivine | (3) potassium feldspar and biotite |
| (2) plagioclase feldspar and amphibole | (4) pyroxene and calcite |
- 47 The sediments that have been deposited by streams flowing into the lagoon are most likely
- | | |
|----------------------------|------------------------------|
| (1) sorted and layered | (3) unsorted and layered |
| (2) sorted and not layered | (4) unsorted and not layered |
- 48 Which event will most likely occur during a heavy rainfall?
- (1) Less sediment will be carried by the streams.
 - (2) An increase in sea level will cause more sediments to be deposited along the shoreline.
 - (3) The shoreline will experience a greater range in tides.
 - (4) The discharge from the streams into the lagoon will increase.

Base your answers to questions 49 and 50 on the cross section below, which shows the paths of seismic waves traveling from an earthquake epicenter through the different layers of Earth's interior.



- 49 No *P*-waves or *S*-waves are received in the shadow zone because
- (1) *P*-waves are absorbed and *S*-waves are refracted by Earth's outer core
 - (2) *P*-waves are refracted and *S*-waves are absorbed by Earth's outer core
 - (3) both the *P*-waves and *S*-waves are refracted by Earth's outer core
 - (4) both the *P*-waves and *S*-waves are absorbed by Earth's outer core
- 50 The distance from Albany, New York, to the epicenter of this earthquake is 5600 km. Approximately how much longer did it take for the *S*-wave to arrive at Albany than the *P*-wave?
- | | |
|------------------------------|-------------------------------|
| (1) 4 minutes and 20 seconds | (3) 9 minutes and 0 seconds |
| (2) 7 minutes and 10 seconds | (4) 16 minutes and 10 seconds |
-

Part B–2

Answer all questions in this part.

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

Base your answers to questions 51 through 53 on the passage below.

Is Earth Gaining Weight?

Scientists believe that Earth may gain more than 100 tons of dust from space every day. The dust comes from thawing comets as they orbit the Sun and from pieces of asteroids that collided with other asteroids. Most asteroids orbit the Sun between Mars and Jupiter. Each dust particle dates back to the days when our solar system was created. So in a way, each tiny speck of dust holds clues to how our solar system formed.

All the space dust produced by comets and asteroids in our solar system is drawn to the Sun by its gravitational force. However, space dust that passes within about 60 miles of Earth's surface may be slowed enough by friction with Earth's atmosphere to be pulled to the surface by Earth's gravity.

- 51 State *one* reason why more space dust is attracted to the Sun than to Earth. [1]
- 52 In which temperature zone of Earth's atmosphere is space dust first slowed enough by friction to be pulled to Earth's surface? [1]
- 53 Approximately how many million kilometers from the Sun are most asteroids located? [1]
-

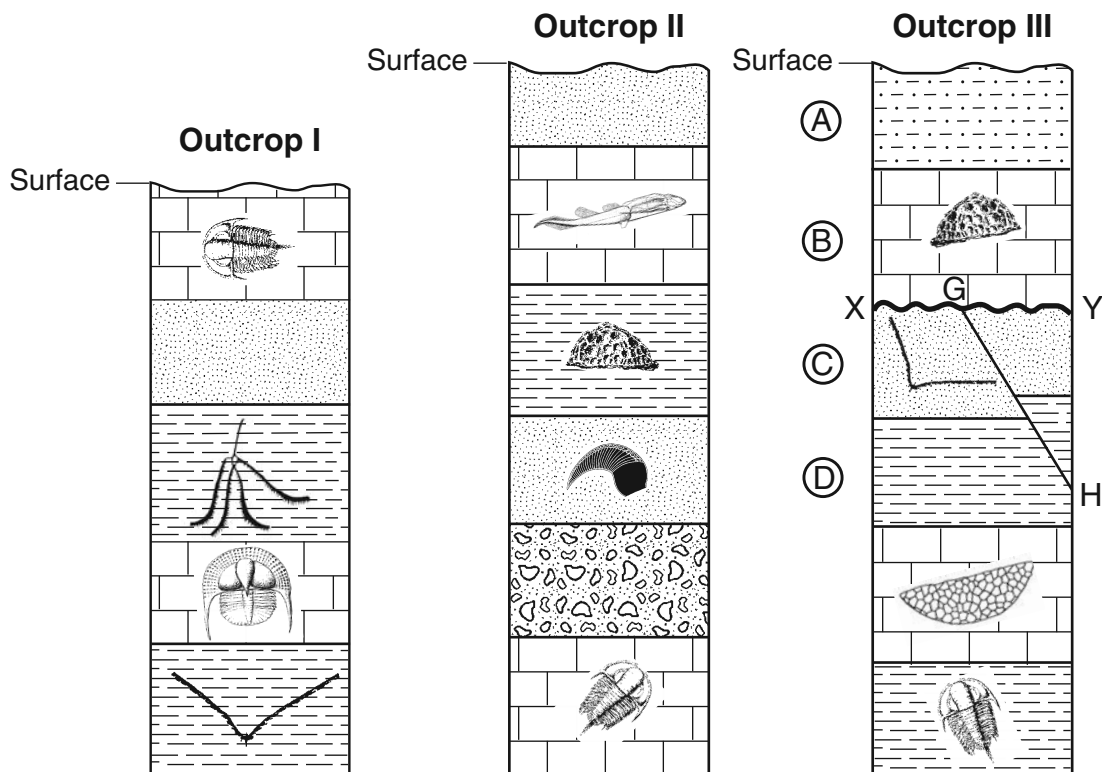
Base your answers to questions 54 through 57 on the data table below. The data table shows the latitude of several cities in the Northern Hemisphere and the duration of daylight on a particular day.

Data Table


City	Latitude (°N)	Duration of Daylight (hr)
Panama City, Panama	9	11.6
Mexico City, Mexico	19	11.0
Tampa, Florida	28	10.4
Memphis, Tennessee	35	9.8
Winnipeg, Canada	50	8.1
Churchill, Canada	59	6.3
Fairbanks, Alaska	65	3.7

- 54 On the grid *in your answer booklet*, plot with an **X** the duration of daylight for each city shown in the data table. Connect your **X**s with a smooth, curved line. [1]
- 55 Based on the data table, state the relationship between latitude and the duration of daylight. [1]
- 56 Use your graph to determine the latitude at which the Sun sets 7 hours after it rises. [1]
- 57 The data were recorded for the first day of a certain season in the Northern Hemisphere. State the name of this season. [1]
-

Base your answers to questions 58 through 60 on the cross sections below, which show widely separated outcrops labeled I, II, and III. Index fossils are found in some of the rock layers in the three outcrops. In outcrop III, layers A, B, C, and D are labeled. Line XY represents an unconformity. Line GH represents a fault.

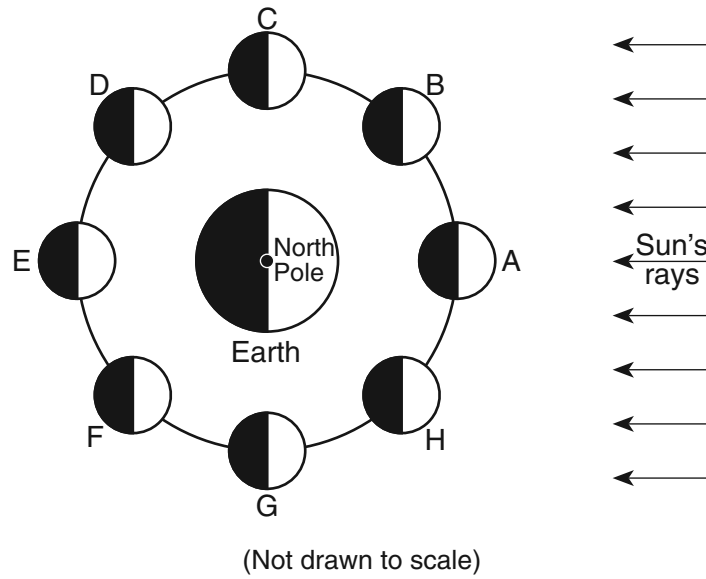


58 Describe *one* characteristic necessary for a fossil to be classified as an index fossil. [1]

59 On outcrop II *in your answer booklet*, place the symbol  for an unconformity between the two rock layers where the Silurian-age bedrock has been removed by erosion. [1]

60 List in order, from oldest to youngest, the relative age of the four rock layers, A, B, C, and D, fault GH, and unconformity XY shown in outcrop III. [1]

Base your answers to questions 61 through 63 on the diagram below, which shows the Moon at positions A through H in its orbit around Earth.



- 61 Which letters represent the *two* positions of the Moon when the *least* difference between the levels of high and low ocean tides occur on Earth? [1]
- 62 How many days does it take for the Moon to complete one cycle of phases as viewed from Earth? [1]
- 63 At which Moon position could a lunar eclipse occur? [1]

Base your answers to questions 64 and 65 on the *Luminosity and Temperature of Stars* graph in the *Earth Science Reference Tables*.

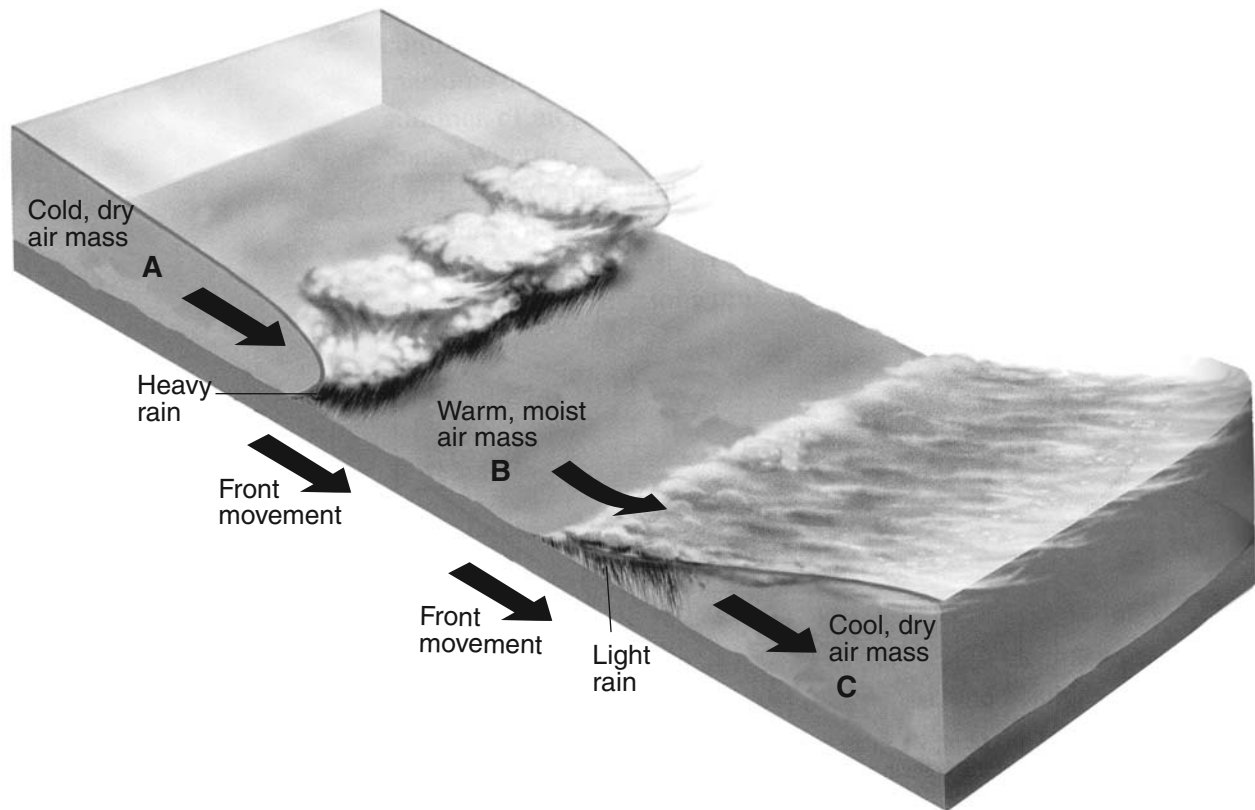
- 64 Describe the relationship between temperature and luminosity of main sequence stars. [1]
- 65 In which group of stars would a star with a temperature of 5000°C and a luminosity of approximately 100 times that of the Sun be classified? [1]

Part C

Answer all questions in this part.

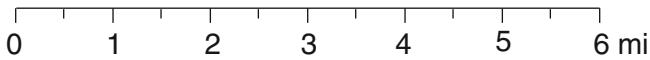
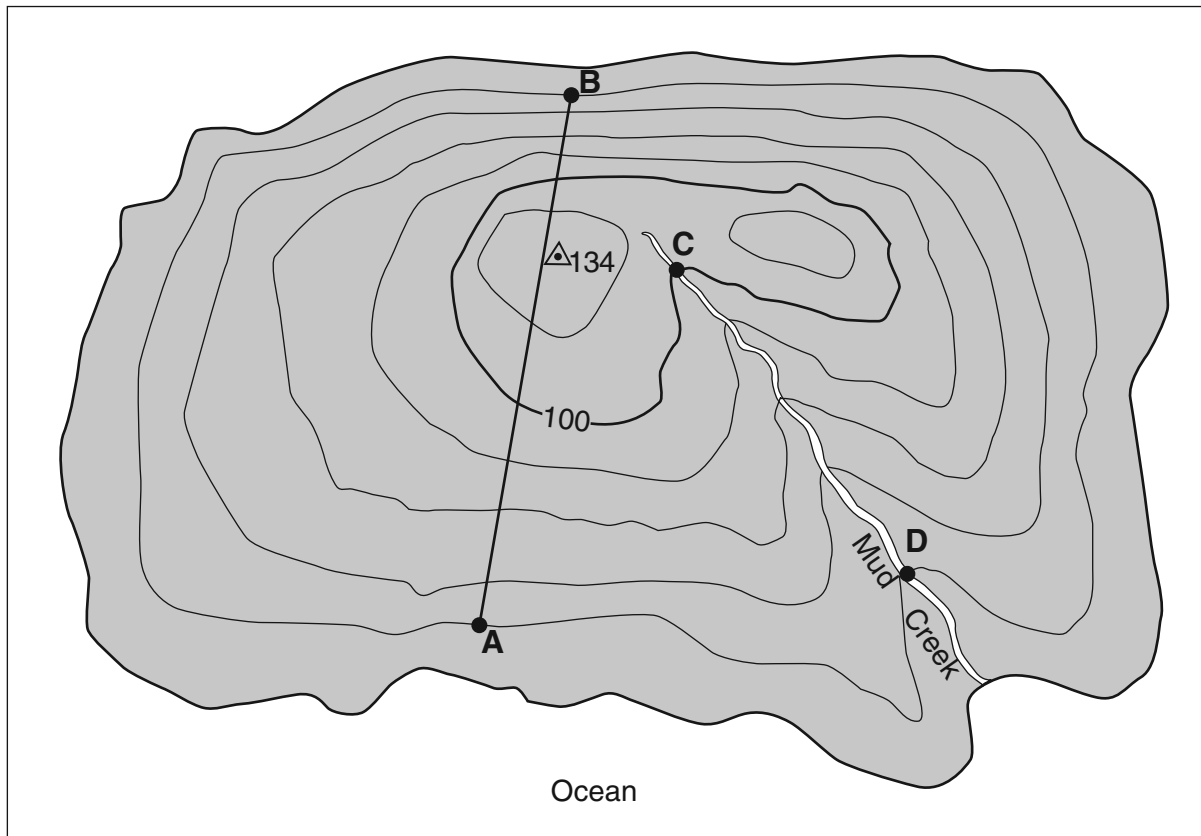
Directions (66–85): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

Base your answers to questions 66 through 68 on the diagram below, which shows air masses, clouds, and rain associated with two fronts that are influencing weather conditions in New York State. Letters *A*, *B*, and *C* represent three air masses. The arrows show the direction of air and front movements.



- 66 Identify the most likely geographic source region for air mass *B*. [1]
- 67 Identify the type of front shown between air mass *B* and air mass *C*. [1]
- 68 Identify *one* process that causes clouds to form in the air rising along the frontal surface between air mass *A* and air mass *B*. [1]
-

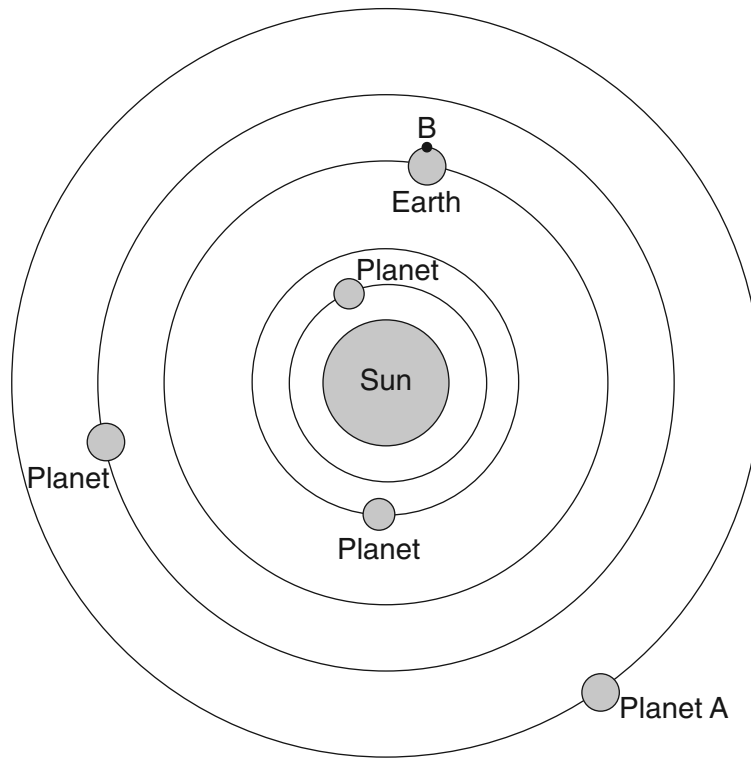
Base your answers to questions 69 through 72 on the topographic map below, which shows a small island in an ocean. Points A, B, C, and D represent surface locations on the island. The symbol $\triangle 134$ represents an elevation on the hilltop. Elevations are measured in feet and distances are measured in miles.



Contour interval = 20 feet

- 69 On the grid in your answer booklet, construct a profile along line AB by plotting an **X** for the elevation of each contour line that crosses line AB. Connect the **Xs** with a smooth, curved line to complete the profile. [1]
- 70 Calculate the gradient of Mud Creek between points C and D and label your answer with the correct units. [1]
- 71 State the compass direction toward which Mud Creek flows. [1]
- 72 Explain how the contour lines on the map indicate that the north side of the island has the steepest slope. [1]

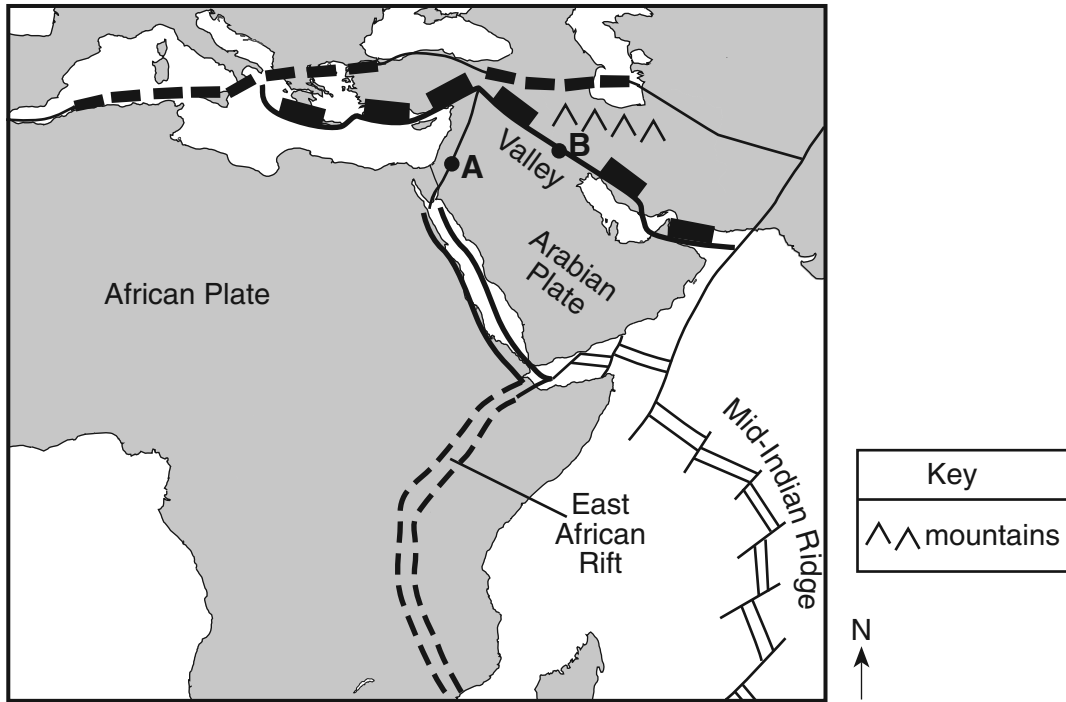
Base your answers to questions 73 through 76 on the diagram below, which shows the heliocentric model of a part of our solar system. The planets closest to the Sun are shown. Point *B* is a location on Earth's equator.



(Not drawn to scale)

- 73 State the name of planet A. [1]
- 74 Explain why location *B* experiences both day and night in a 24-hour period. [1]
- 75 On the graph *in your answer booklet*, draw a line to show the general relationship between a planet's distance from the Sun and the planet's period of revolution. [1]
- 76 Identify *one* feature of the geocentric model of our solar system that differs from the heliocentric model shown. [1]

Base your answers to questions 77 through 79 on the map below, which is an enlargement of a portion of the *Tectonic Plates* map from the *Earth Science Reference Tables*. Points A and B are locations on different boundaries of the Arabian Plate.



- 77 Identify the type of tectonic plate boundary located at point A. [1]
- 78 On the map shown, a valley is located south of point B and a mountain range north of point B. State the tectonic process that is creating these two land features. [1]
- 79 The block diagram *in your answer booklet* represents Earth's surface and interior along the East African Rift. Draw *two* arrows, one through point X and one through point Y, to indicate the relative motion of each of these sections of the continental crust. [1]

Base your answers to questions 80 and 81 on the United States map in your answer booklet, which shows recorded temperatures in degrees Fahrenheit for October 2, 2004. The 60°F isotherm has been drawn on the map.

- 80 On the map *in your answer booklet*, draw the 70°F isotherm. Extend the isotherm to the edges of the continent. [1]
- 81 Identify the two-letter weather map symbol for the dry, cold air mass over North Dakota. [1]

Base your answers to questions 82 through 85 on the passage below.

Asbestos

Asbestos is a general name given to the fibrous varieties of six naturally occurring minerals used in commercial products. Most asbestos minerals are no longer mined due to the discovery during the 1970s that long-term exposure to high concentrations of their long, stiff fibers leads to health problems. Workers who produce or handle asbestos products are most at risk, since inhaling high concentrations of airborne fibers allows the asbestos particles to become trapped in the workers' lungs. Chrysotile is a variety of asbestos that is still mined because it has short, soft, flexible fibers that do not pose the same health threat.

- 82 State *one* reason for the decline in global asbestos use after 1980. [1]
- 83 Chrysotile is found with other minerals in New York State mines located near 44° 30' N, 74° W. In which New York State landscape region are these mines located? [1]
- 84 What determines the physical properties of minerals, such as the long, stiff fibers of some varieties of asbestos? [1]
- 85 The chemical formula for chrysotile is $\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$. State the name of the mineral found on the *Earth Science Reference Tables* that is most similar in chemical composition. [1]
-

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, June 17, 2009 — 1:15 to 4:15 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.

Signature

Tear Here

Tear Here

Tear Here

PHYSICAL SETTING EARTH SCIENCE

Wednesday, June 17, 2009 — 1:15 to 4:15 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.

<input type="text"/>	Performance Test Score (Maximum Score: 16)	
.....		
Part	Maximum Score	Student's Score
A	35	
<hr/>		
B-1	15	
<hr/>		
B-2	15	
<hr/>		
C	20	
<hr/>		
Total Written Test Score (Maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
<hr/>		
Raters' Initials:		
Rater 1 Rater 2		

Part B-2	
51	_____

52	_____
53	_____ million kilometers

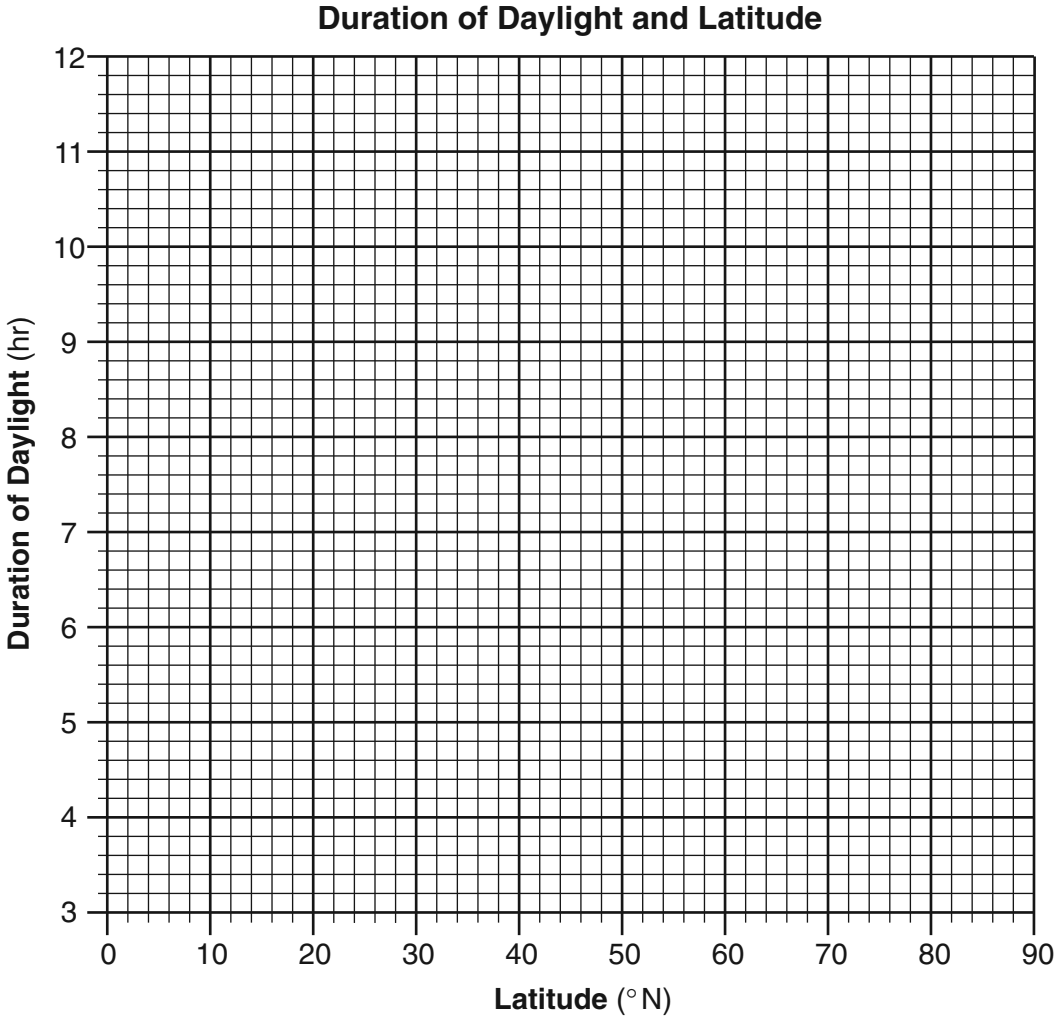
For Raters Only

51

52

53

54



54

55

55

56 _____ °N

56

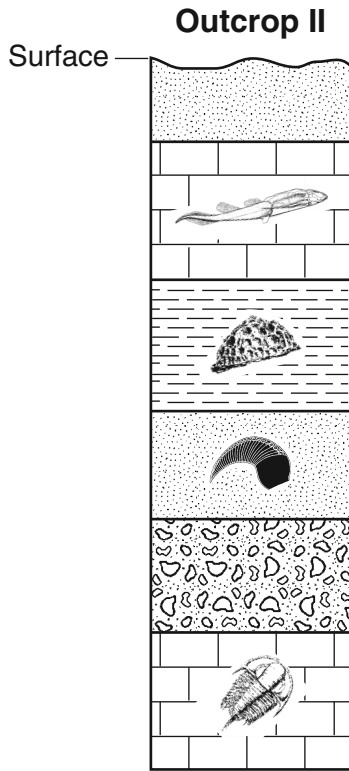
57 _____

57

58

58

59



59

60

Oldest _____ Youngest

60

61

_____ and _____

61

62

_____ days

62

63

63

64

64

65

65

Total Score for Part B-2

[OVER]

Part C

For Raters Only

66 _____

66

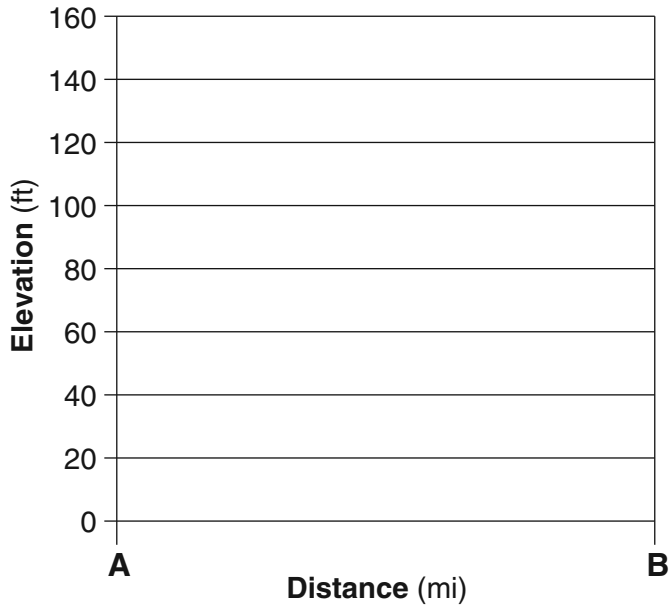
67 _____ front

67

68 _____

68

69



69

70 Gradient = _____

70

71 _____

71

72 _____

72

For Raters Only

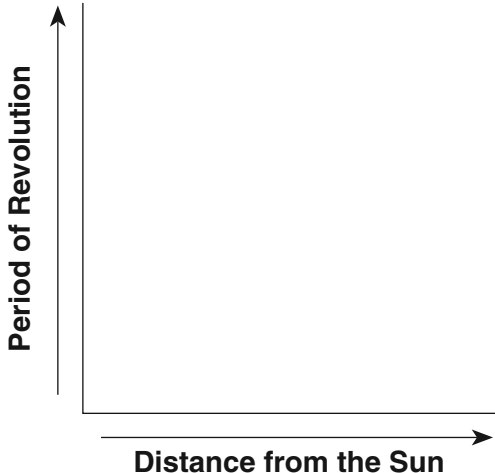
73 _____

73

74 _____

74

75



75

76 _____

76

For Raters
Only

77

78

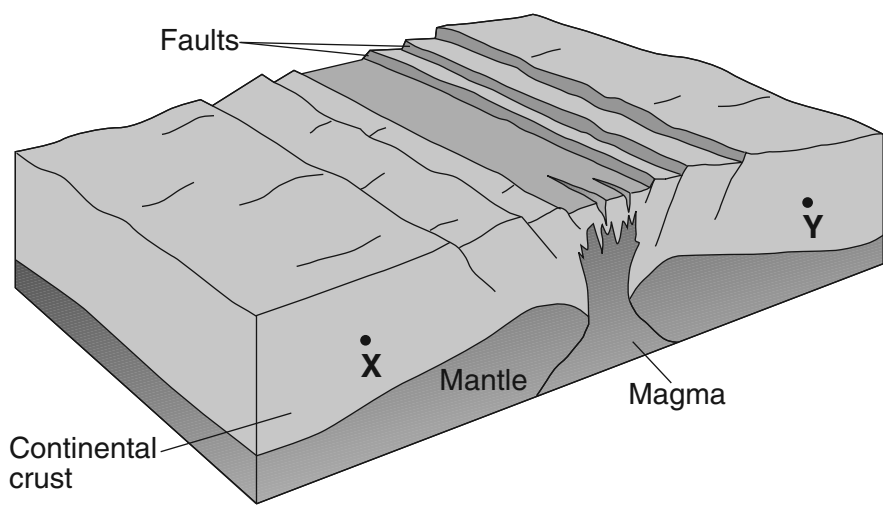
79

77 _____

78 _____

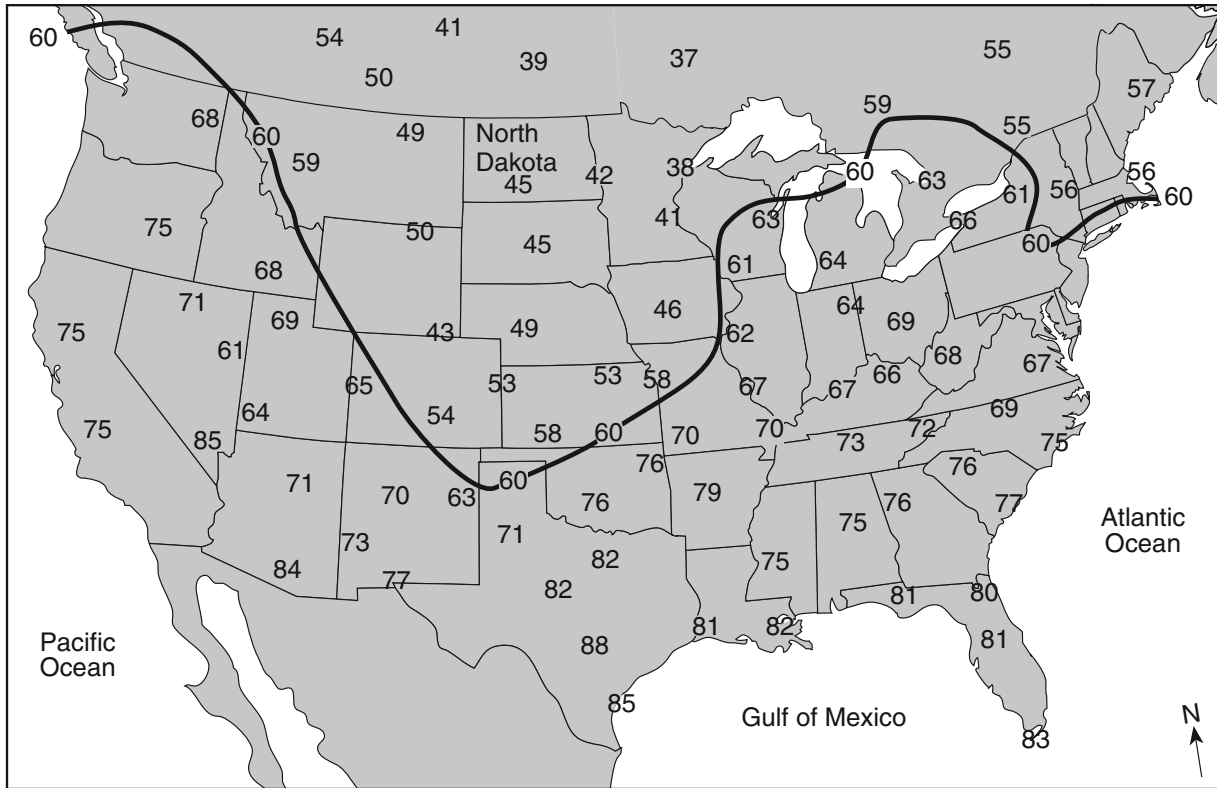
79

East African Rift



For Raters Only

80



80

81

81

82

82

83

83

84

84

85

85

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, June 17, 2009 — 1:15 to 4:15 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			Part B-1	
1 1	13 1	25 4	36 2	44 4
2 3	14 2	26 1	37 4	45 2
3 4	15 2	27 4	38 2	46 2
4 3	16 1	28 1	39 4	47 1
5 3	17 2	29 3	40 3	48 4
6 1	18 4	30 4	41 1	49 2
7 3	19 4	31 3	42 4	50 2
8 3	20 3	32 4	43 2	
9 2	21 1	33 2		
10 2	22 4	34 3		
11 3	23 3	35 1		
12 1	24 3			

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 Booklet for 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 check mark 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.

Students' 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 that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Wednesday, June 17, 2009. 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 for that administration be used to determine the student's final score.

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. Acceptable responses include, but are not limited to:

- The Sun has a greater gravitational attraction for particles than Earth does.
- The Sun has a larger mass than Earth.
- The more massive object has more gravity.

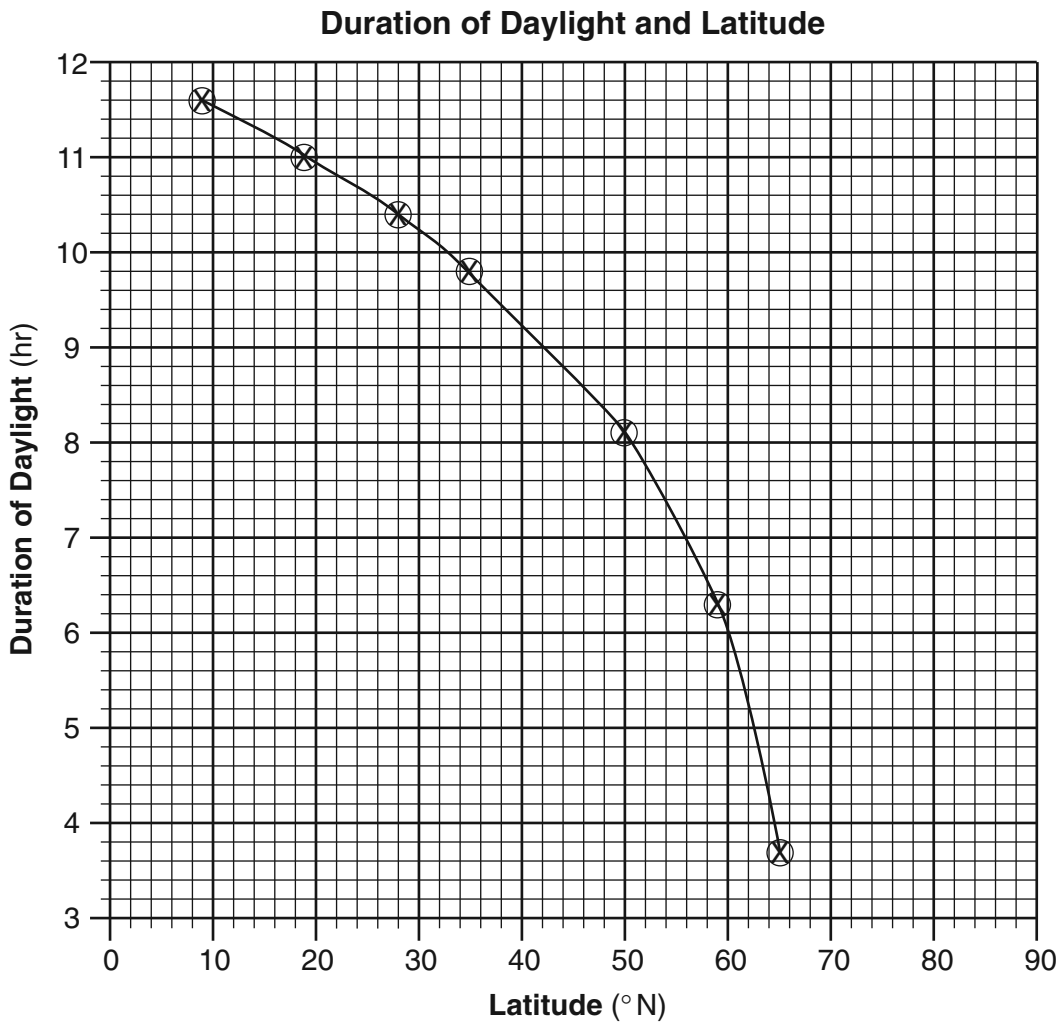
52 [1] Allow 1 credit for thermosphere.


53 [1] Allow 1 credit for any response between 227.9 and 778.3 million kilometers.

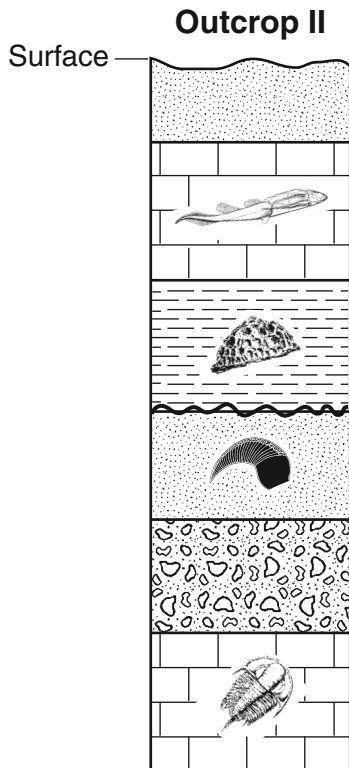
54 [1] Allow 1 credit if the center of all **Xs** are plotted within the circles shown and are correctly connected with a smooth, curved line that passes through the circles.

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

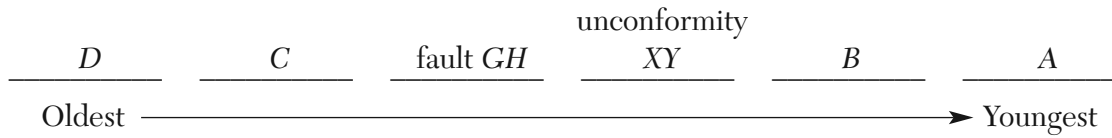
Example of a 1-credit response:



- 55 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- As latitude increases, the duration of daylight decreases.
 - Higher latitudes have shorter daylight periods. Lower latitudes have longer daylight periods.
 - It is an inverse relationship.
- 56 [1] Allow 1 credit for a correct answer $\pm 1^\circ$ based on the student-drawn graph. For example, on the graph shown, the answer should be $56^\circ \pm 1^\circ$ N.
- 57 [1] Allow 1 credit for winter.
- 58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- wide geographic distribution
 - existed for a short period of geologic time
- 59 [1] Allow 1 credit for placing the symbol  between the layers shown below.



60 [1] Allow 1 credit for the correct sequence shown below.



61 [1] Allow 1 credit for *C* and *G*.

62 [1] Allow 1 credit for any value from 29 to 30 days.

63 [1] Allow 1 credit for *E* or full Moon.

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

- As temperature increases, luminosity increases.
- This is a direct relationship.

65 [1] Allow 1 credit for red giants or giants.

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. Acceptable responses include, but are not limited to:

- Gulf of Mexico
- a warm ocean surface

67 [1] Allow 1 credit for warm front.

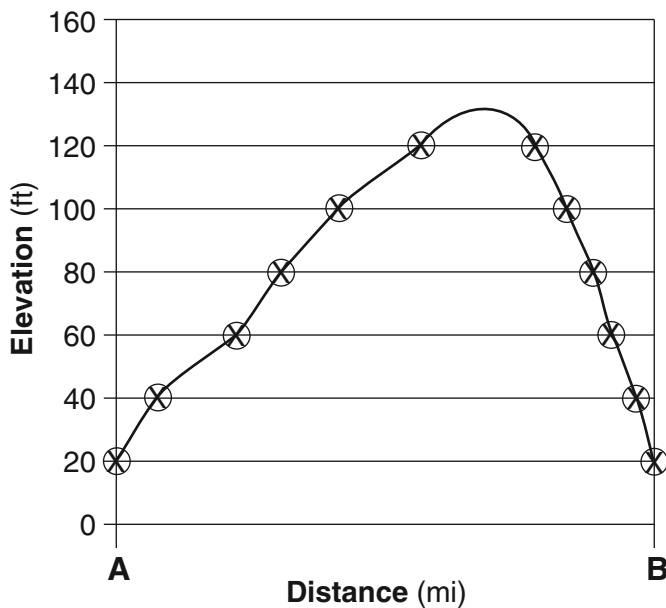
68 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- condensation
- expansion
- cooling
- deposition/sublimation

69 [1] Allow 1 credit if the centers of ten to twelve **Xs** are within the circles shown below and are correctly connected with a smooth, curved line that passes through the circles and extends above 120 feet but below 140 feet.

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

Example of a 1-credit response:



70 [1] Allow 1 credit for any value from 18 to 22 with the correct units. Acceptable units include, but are not limited to:

- ft/mi
- feet/mile

71 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- southeast
- SE
- northwest to southeast

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

- The contour lines are closer together.
- More closely spaced contour lines indicate a steeper gradient.

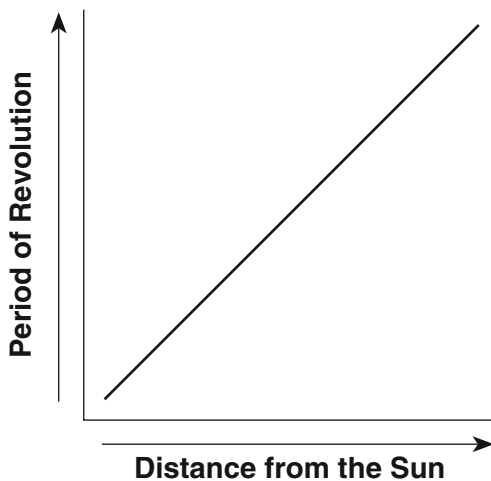
73 [1] Allow 1 credit for Jupiter.

74 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- Earth’s rotation causes day and night.
- The daily change from day to night results from Earth’s spin on its axis.

75 [1] Allow 1 credit for a line graph which shows a direct relationship.

Example of a 1-credit response:



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

- The geocentric model has Earth in the center.
- In a geocentric model Earth does not rotate.
- Planets revolve around Earth instead of the Sun.

77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- transform boundary
- transform fault

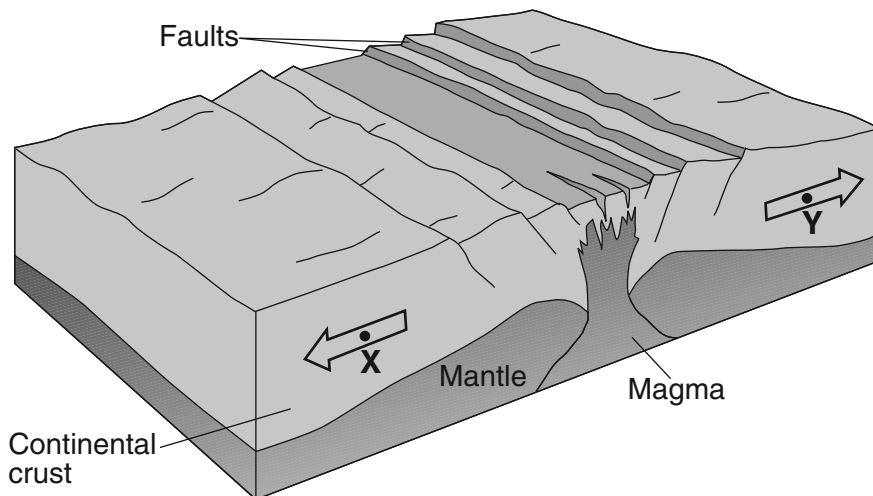
78 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- subduction of Arabian Plate
- convergence

79 [1] Allow 1 credit if *both* arrows show correct directions, even if the arrows do *not* pass through the points.

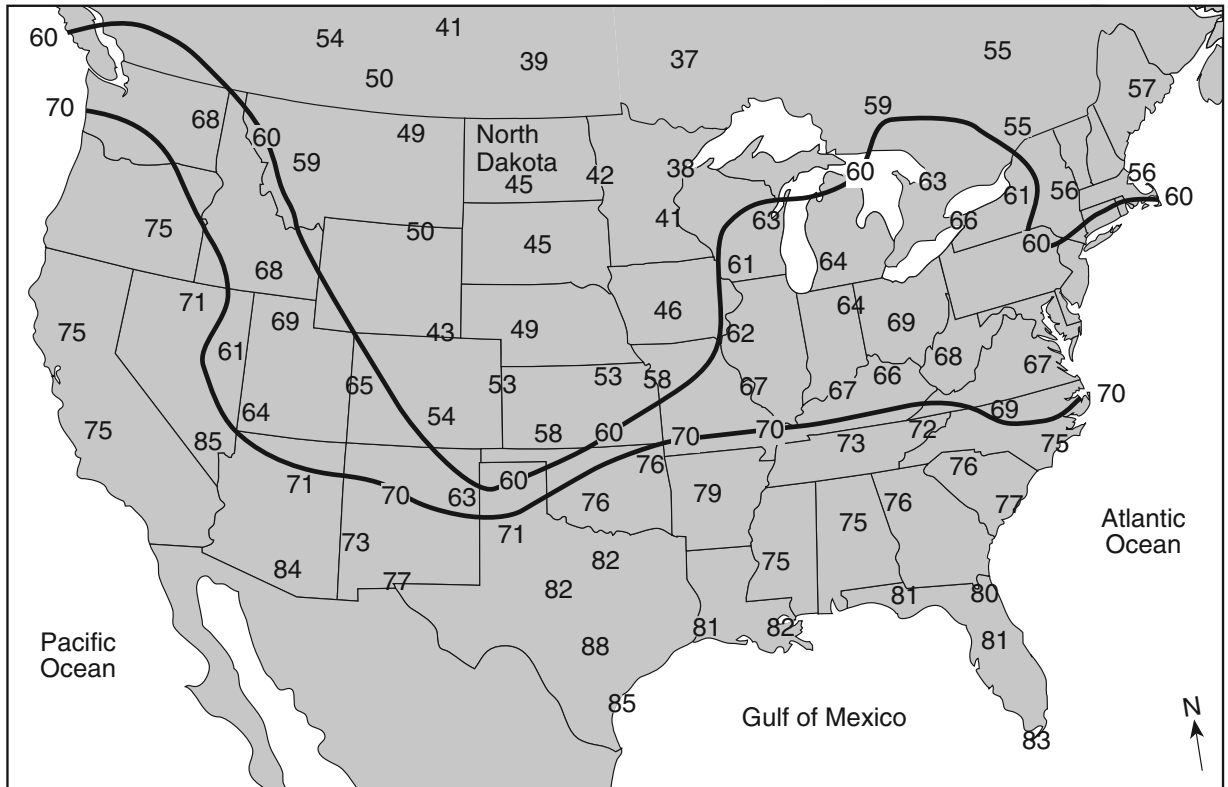
Example of a 1-credit response:

East African Rift



- 80 [1] Allow 1 credit for a correctly drawn 70°F isotherm. The isotherm must extend to the edges of the continent. If additional isotherms are drawn, all isotherms must be correct to receive credit.

Example of a 1-credit response:



- 81 [1] Allow 1 credit for cP or cA. Allow credit for either uppercase or lowercase letters.

Note: Do not allow credit if the letters are reversed, such as, Pc.

- 82 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The dangers of asbestos fibers were realized.
 - Concern over the health risk of asbestos resulted in less use.
 - Exposure to high concentrations of asbestos leads to health problems.

- 83 [1] Allow 1 credit for Adirondacks or Adirondack Mountains or Grenville Province.

- 84** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- the internal arrangement of atoms
 - chemical composition
 - the environment in which they form
 - chains of silicate tetrahedra

- 85** [1] Allow 1 credit for talc.

Regents Examination in Physical Setting/Earth Science

June 2009

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

The *Chart for Determining the Final Examination Score for the June 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, June 17, 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.

Online Submission of 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

June 2009 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	8	44, 54	69, 70, 75
Math Key Idea 2	9, 10, 14, 22, 25	41, 50, 52, 53, 55, 56, 64, 65	
Math Key Idea 3			80
Science Inquiry Key Idea 1	1, 15, 18, 19, 24, 29	49, 57, 58, 59	74, 76, 84
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3			
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1	11, 16, 32	38, 42, 46, 47, 48, 63	66, 68, 79
Key Idea 2	4, 5, 13, 17, 28, 33, 35	36, 39, 43, 45, 49, 60, 61, 63	67, 71, 72, 73, 76, 77, 78, 79, 80, 81, 83
Key Idea 3			70, 72
Key Idea 4		51	
Key Idea 5	3, 6, 23, 26, 27, 30, 31	40, 42, 56, 60, 61, 62	67
Key Idea 6			
Standard 7			
Key Idea 1			82
Key Idea 2			
Standard 4			
Key Idea 1	1, 2, 4, 5, 6, 8, 10, 21, 22, 23, 24, 25, 28, 30	39, 40, 41, 42, 44, 51, 53, 55, 57, 58, 59, 60, 61, 62, 63, 64, 65	73, 74, 75, 76, 83
Key Idea 2	3, 7, 9, 11, 12, 13, 14, 15, 16, 17, 18, 20, 26, 27, 31, 32, 35	36, 37, 38, 43, 45, 47, 48, 49, 50, 52, 54, 55, 56	66, 67, 68, 69, 70, 71, 72, 77, 78, 79, 80, 81 83
Key Idea 3	19, 29, 33, 34	46	82, 84, 85
Reference Tables			
ESRT 2001 Edition (Revised)	7, 8, 11, 13, 14, 19, 21, 22, 23, 25, 26, 28, 29, 30, 33, 34	36, 41, 43, 44, 46, 50, 52, 53, 59, 60, 64, 65	67, 70, 73, 75, 77, 78, 81, 83, 85



Regents Examination in Physical Setting/Earth Science – June 2009

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

(Not to be Used for the Braille Edition)

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 71 would receive a final examination score of 90.

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

**Final Examination Scores
June 2009 Examination in Physical Setting/Earth Science – continued**

Total Performance Test Score

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
43	71	71	70	70	69	69	68	68	67	66	65	64	63	61	60	58	56
42	70	70	70	69	69	68	67	67	66	65	64	63	62	60	59	57	55
41	69	68	68	67	67	66	66	65	64	63	62	61	60	59	57	55	54
40	68	67	67	67	66	65	65	64	63	62	61	60	59	58	56	55	53
39	67	67	66	66	65	65	64	63	63	62	61	60	58	57	55	54	52
38	66	66	65	65	64	64	63	62	62	61	60	59	57	56	54	53	51
37	65	65	64	64	64	63	62	62	61	60	59	58	57	55	54	52	50
36	64	64	64	63	63	62	61	61	60	59	58	57	56	54	53	51	49
35	63	62	62	61	61	60	60	59	58	57	56	55	54	53	51	49	48
34	62	61	61	61	60	60	59	58	57	57	55	54	53	52	50	49	47
33	61	61	60	60	59	59	58	57	57	56	55	54	52	51	49	48	46
32	59	59	58	58	58	57	56	56	55	54	53	52	51	49	48	46	44
31	58	58	58	57	57	56	56	55	54	53	52	51	50	48	47	45	43
30	58	57	57	56	56	55	55	54	53	52	51	50	49	48	46	44	43
29	57	56	56	55	55	54	54	53	52	51	50	49	48	47	45	43	42
28	55	55	54	54	53	53	52	51	51	50	49	48	46	45	43	42	40
27	54	54	53	53	52	52	51	51	50	49	48	47	46	44	43	41	39
26	52	52	52	51	51	50	50	49	48	47	46	45	44	43	41	39	37
25	52	51	51	50	50	49	49	48	47	46	45	44	43	42	40	38	37
24	51	50	50	50	49	48	48	47	46	45	44	43	42	41	39	38	36
23	49	49	48	48	47	47	46	45	45	44	43	42	40	39	37	36	34
22	48	48	47	47	47	46	45	45	44	43	42	41	40	38	37	35	33
21	46	46	46	45	45	44	44	43	42	41	40	39	38	37	35	33	31
20	45	44	44	44	43	43	42	41	40	40	38	37	36	35	33	32	30
19	44	44	43	43	42	42	41	40	40	39	38	37	35	34	32	31	29
18	42	42	41	41	41	40	39	39	38	37	36	35	34	32	31	29	27
17	41	41	41	40	40	39	39	38	37	36	35	34	33	31	30	28	26
16	40	39	39	38	38	37	37	36	35	34	33	32	31	30	28	26	25
15	39	39	38	38	37	37	36	35	34	34	33	31	30	29	27	26	24
14	37	37	36	36	35	35	34	34	33	32	31	30	29	27	26	24	22
13	35	35	35	34	34	33	33	32	31	30	29	28	27	26	24	22	20
12	34	33	33	33	32	31	31	30	29	28	27	26	25	24	22	21	19
11	33	33	32	32	31	31	30	29	29	28	27	26	24	23	21	20	18
10	31	31	30	30	30	29	28	28	27	26	25	24	23	21	20	18	16
9	29	29	29	28	28	27	27	26	25	24	23	22	21	20	18	16	14
8	28	27	27	27	26	26	25	24	23	23	21	20	19	18	16	15	13
7	27	27	26	26	25	25	24	23	23	22	21	20	18	17	15	14	12
6	25	25	24	24	24	23	22	22	21	20	19	18	17	15	14	12	10
5	24	23	23	22	22	21	21	20	19	18	17	16	15	14	12	10	9
4	22	22	21	21	20	20	19	18	17	17	16	14	13	12	10	9	7
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