

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

PHYSICAL SETTING EARTH SCIENCE

Thursday, August 14, 2014 — 12:30 to 3:30 p.m., only

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

Use your knowledge of Earth science to answer all questions in this examination. Before you begin this examination, you must be provided with the *2011 Edition Reference Tables for Physical Setting/Earth Science*. You will need these reference tables to answer some of the questions.

You are to answer all questions in all parts of this examination. You may use scrap paper to work out the answers to the questions, but be sure to record your answers on your answer sheet and in your answer booklet. A separate answer sheet for Part A and Part B–1 has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet. Record your answers to the Part A and Part B–1 multiple-choice questions on this separate answer sheet. Record your answers for the questions in Part B–2 and Part C in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

All answers in your answer booklet should be written in pen, except for graphs and drawings, which should be done in pencil.

When you have completed the examination, you must sign the declaration printed on 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 *2011 Edition Reference Tables for Physical Setting/Earth Science* must be available for you to 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, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Earth Science*. Record your answers on your separate answer sheet.

1 Which evidence best supports the theory that the universe was created by an explosion called the Big Bang?

- (1) impact craters found on Earth
- (2) cosmic background radiation
- (3) the different compositions of terrestrial and Jovian planets
- (4) the blue shift of light from distant galaxies

2 Which star is more massive than our Sun, but has a lower surface temperature?

- (1) *40 Eridani B*
- (2) *Sirius*
- (3) *Aldebaran*
- (4) *Barnard's Star*

3 Which color of visible light has the *shortest* wavelength?

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

4 The table below shows the times of ocean high tides and low tides on a certain date at a New York State location.

Ocean Tides

Type of Tide	Time
high	4:45 a.m.
low	10:58 a.m.
high	5:15 p.m.
low	11:22 p.m.

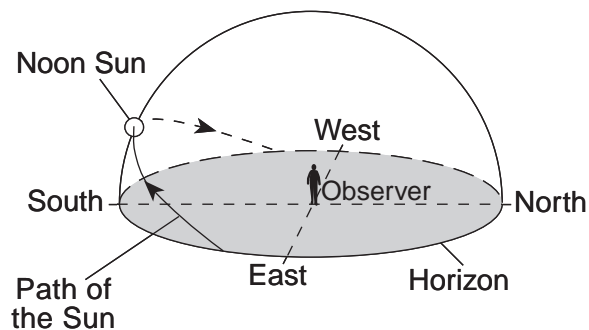
At approximately what time on the following day did the next high tide occur at this location?

- (1) 4:40 a.m.
- (2) 5:40 a.m.
- (3) 4:40 p.m.
- (4) 5:40 p.m.

5 The best evidence of Earth's rotation is provided by the

- (1) shape of Earth's orbit
- (2) shape of the Milky Way galaxy
- (3) changes in the total yearly duration of insolation at a location on Earth
- (4) apparent changes in the direction of swing of a Foucault pendulum

6 The model below shows the apparent path of the Sun as seen by an observer in New York State on the first day of one of the four seasons.



This apparent path of the Sun was observed on the first day of

- (1) spring
- (2) summer
- (3) fall
- (4) winter

7 Which processes are most likely to cause a rise in the water table?

- (1) runoff and erosion
- (2) precipitation and infiltration
- (3) deposition and burial
- (4) solidification and condensation

8 During which phase change does water release the most heat energy?

- (1) freezing
- (2) melting
- (3) condensation
- (4) vaporization

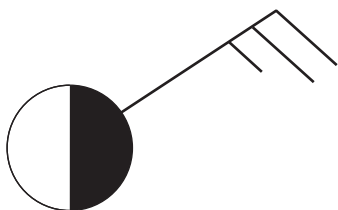
9 What is the average air pressure exerted by Earth's atmosphere at sea level, expressed in millibars and inches of mercury?

- (1) 1013.25 mb and 29.92 in of Hg
- (2) 29.92 mb and 1013.25 in of Hg
- (3) 1012.65 mb and 29.91 in of Hg
- (4) 29.91 mb and 1012.65 in of Hg

10 Which two processes lead to cloud formation in rising air?

- (1) compressing and cooling
- (2) compressing and warming
- (3) expanding and cooling
- (4) expanding and warming

11 The weather station model below shows some of the weather data for a certain location.



What is the wind speed shown on the station model and which instrument is used to measure the wind speed?

- (1) 15 knots, measured by a wind vane
- (2) 15 knots, measured by an anemometer
- (3) 25 knots, measured by a wind vane
- (4) 25 knots, measured by an anemometer

12 If air has a dry-bulb temperature of 2°C and a wet-bulb temperature of -2°C, what is the relative humidity?

- (1) 11%
- (2) 20%
- (3) 36%
- (4) 67%

13 Which current has a cooling effect on the climate of the west coast of South America?

- (1) Falkland Current
- (2) Peru Current
- (3) Benguela Current
- (4) Brazil Current

14 Near which two latitudes are most of Earth's dry climate regions found?

- (1) 0° and 60° N
- (2) 0° and 30° S
- (3) 30° N and 60° N
- (4) 30° N and 30° S

15 Which event followed a massive volcanic eruption and led to the cooling of global temperatures?

- (1) thunderstorms that developed near the eruption
- (2) the release of carbon dioxide and methane gases
- (3) the outflow of magma over Earth's surface
- (4) the addition of ash particles into the atmosphere

16 Rifting of tectonic plates in eastern North America during the Jurassic Period was responsible for the

- (1) formation of the Catskill delta
- (2) first uplift of the Adirondack Mountains
- (3) Alleghenian orogeny
- (4) opening of the Atlantic Ocean

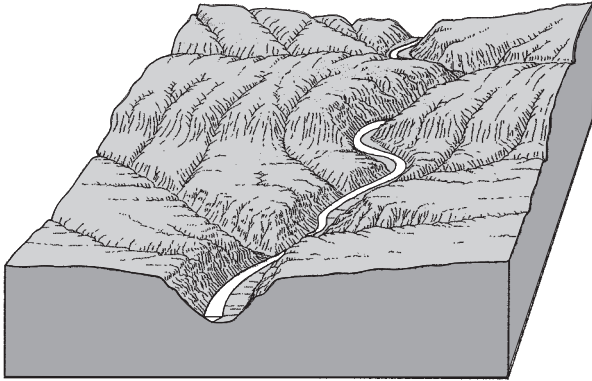
17 The surface bedrock of Mt. Marcy, New York, is composed primarily of which rock?

- (1) anorthosite
- (2) marble
- (3) quartzite
- (4) hornfels

18 Much of the evidence for the evolution of life-forms on Earth has been obtained by

- (1) studying the life spans of present-day animals
- (2) radioactive dating of metamorphic rock
- (3) correlating widespread igneous ash deposits
- (4) examining fossils preserved in the rock record

25 The block diagram below represents a stream flowing from a mountain region.



A brief, heavy rainstorm occurs in the mountains. How will the volume of water and the rate of erosion in the stream change shortly after the rainstorm?

- (1) The volume of water will decrease and the rate of erosion will increase.
- (2) The volume of water will increase and the rate of erosion will decrease.
- (3) Both the volume of water and the rate of erosion will decrease.
- (4) Both the volume of water and the rate of erosion will increase.

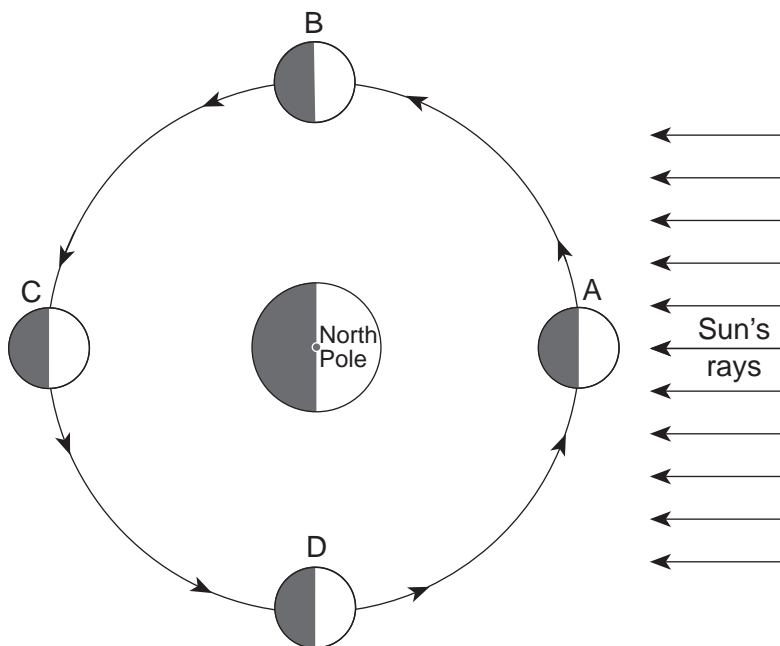
26 The photograph below shows scratched and polished bedrock produced by weathering and erosion.



Which agent of erosion most likely carried sediment that scratched and polished this bedrock surface?

- | | |
|----------------------|-----------------|
| (1) a moving glacier | (3) wave action |
| (2) running water | (4) wind |

Base your answers to questions 27 and 28 on the diagram below and on your knowledge of Earth science. The diagram represents the Moon at different positions, labeled A, B, C, and D, in its orbit around Earth.

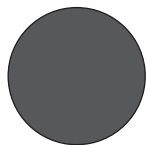


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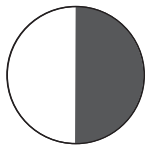
27 At which two Moon positions would an observer on Earth most likely experience the highest high tides and the lowest low tides?

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

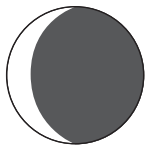
28 During which Moon phase could an observer on Earth see a lunar eclipse occur?



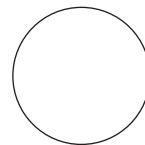
(1)



(2)

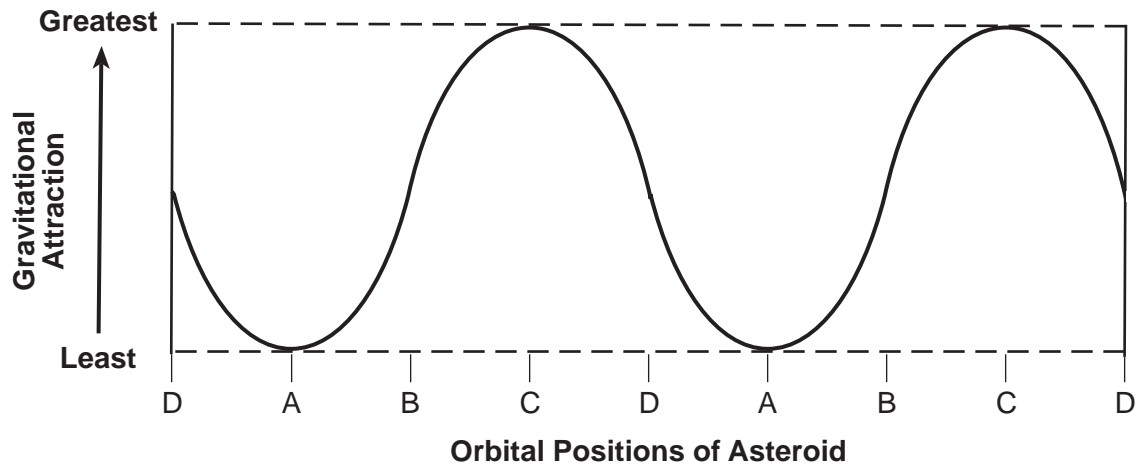


(3)

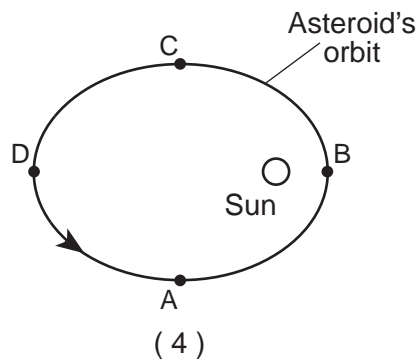
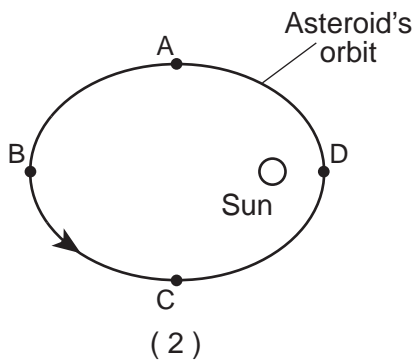
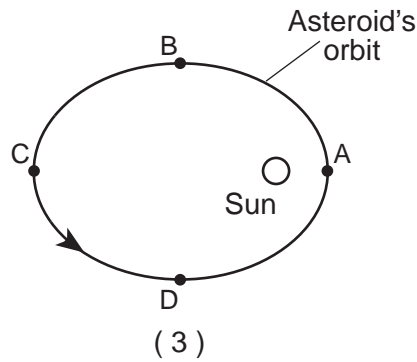
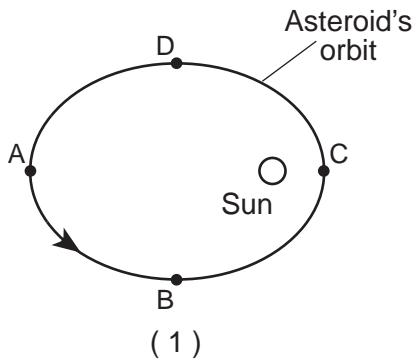


(4)

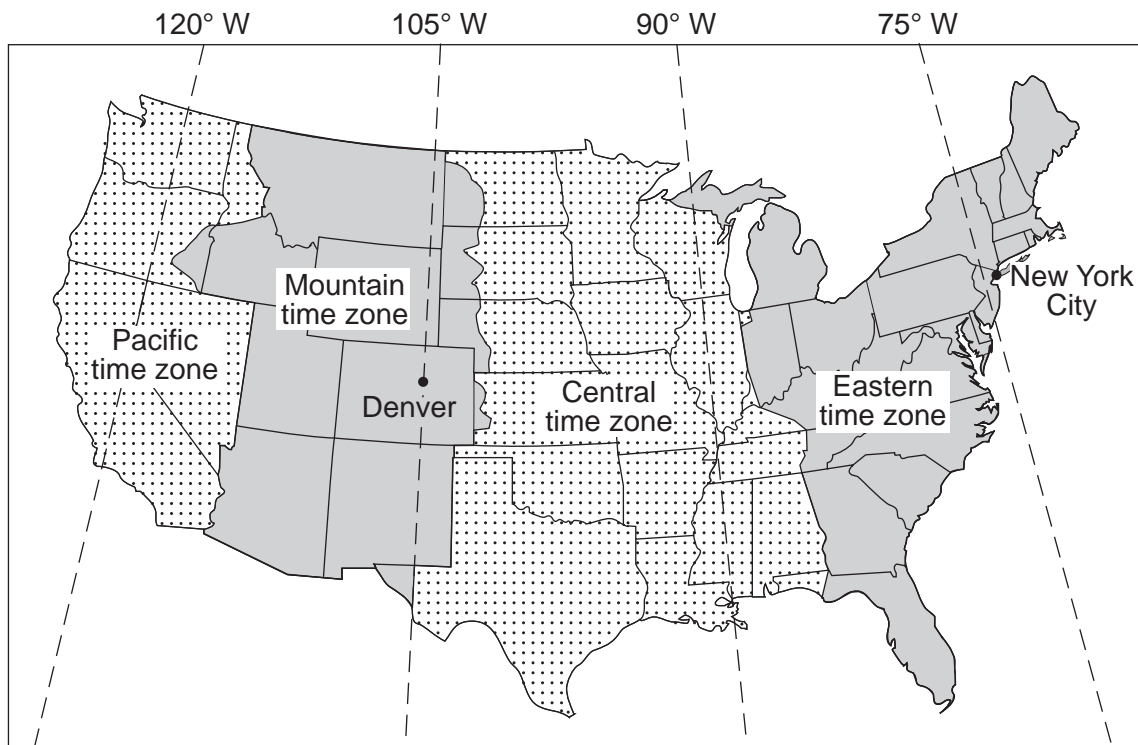
29 The graph below shows the varying amount of gravitational attraction between the Sun and an asteroid in our solar system. Letters A, B, C, and D indicate four positions in the asteroid's orbit.



Which diagram best represents the positions of the asteroid in its orbit around the Sun? [Note: The diagrams are not drawn to scale.]



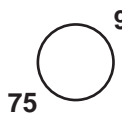
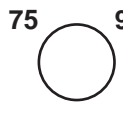
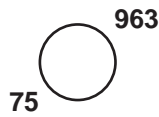
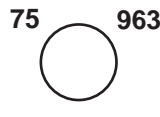
30 The map below shows four major time zones of the United States. The dashed lines represent meridians of longitude. The locations of New York City and Denver are shown.



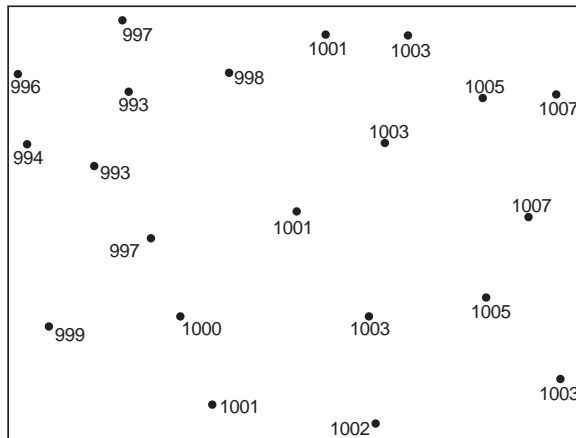
What is the time in New York City when it is noon in Denver?

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

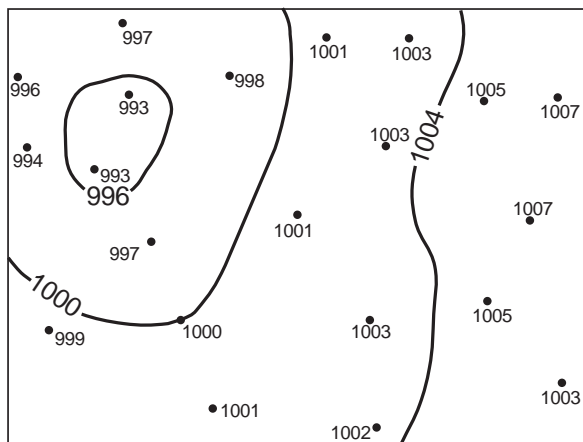
31 Which station model shows an air temperature of 75°F and a barometric pressure of 996.3 mb?

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

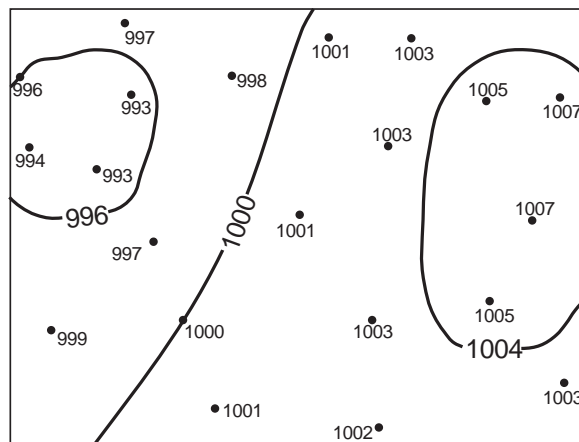
32 The map below shows air pressures recorded in millibars (mb).



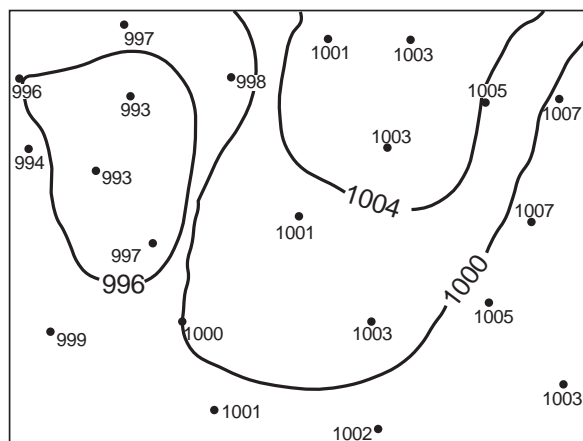
Which map shows the correct location of the 996-mb, 1000-mb, and 1004-mb isobars?



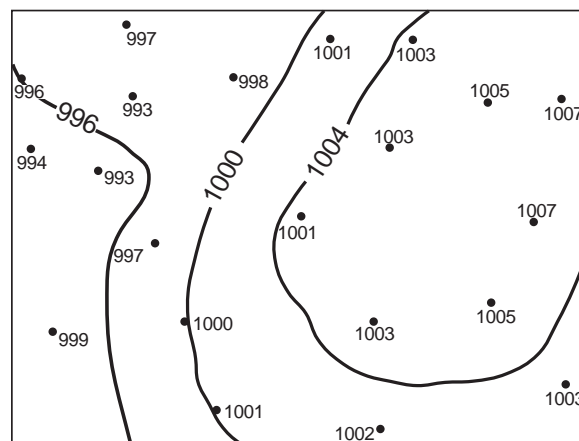
(1)



(3)

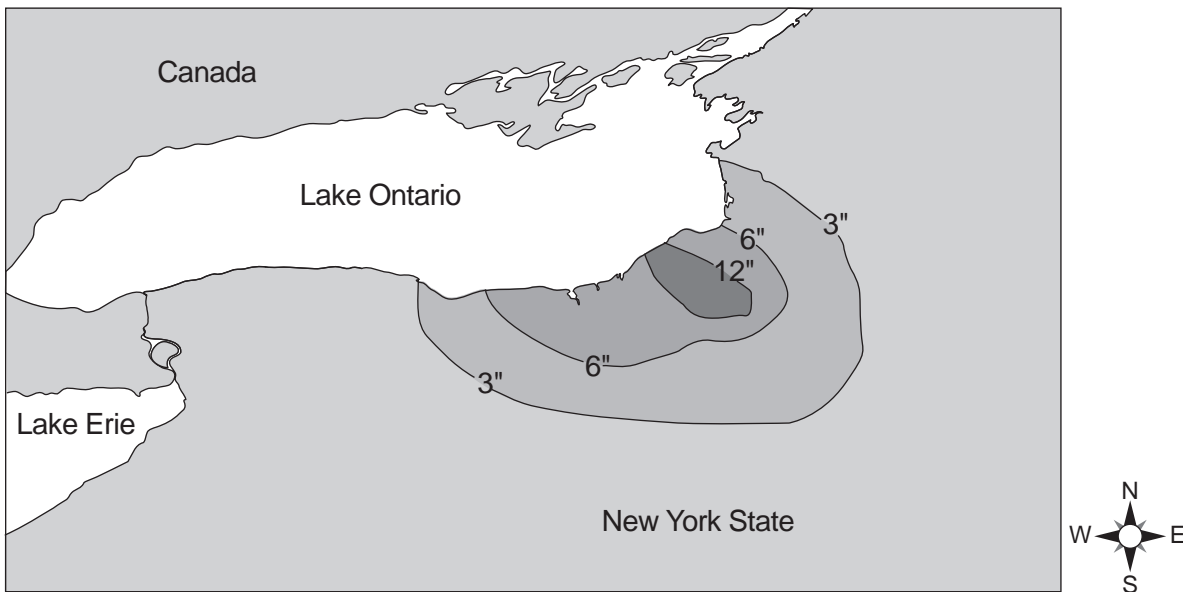


(2)



(4)

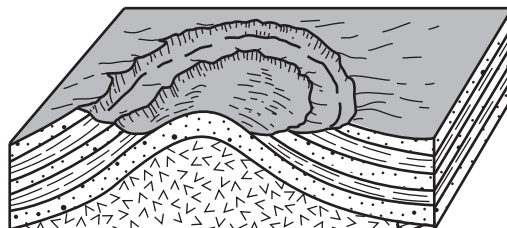
33 The map below shows the amount of snowfall, in inches, produced by a lake-effect snowstorm in central New York State.



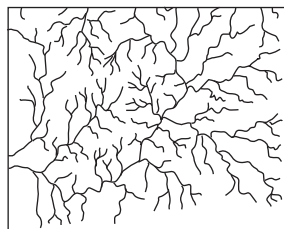
The wind that produced this snowfall pattern most likely came from the

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

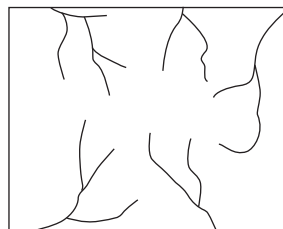
34 The block diagram below represents an igneous dome that uplifted overlying rock layers, which were then weathered and eroded.



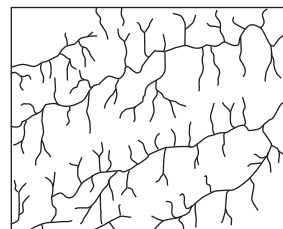
Which stream drainage pattern is most likely found on the surface of the area represented by the block diagram?



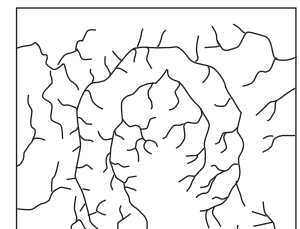
(1)



(2)

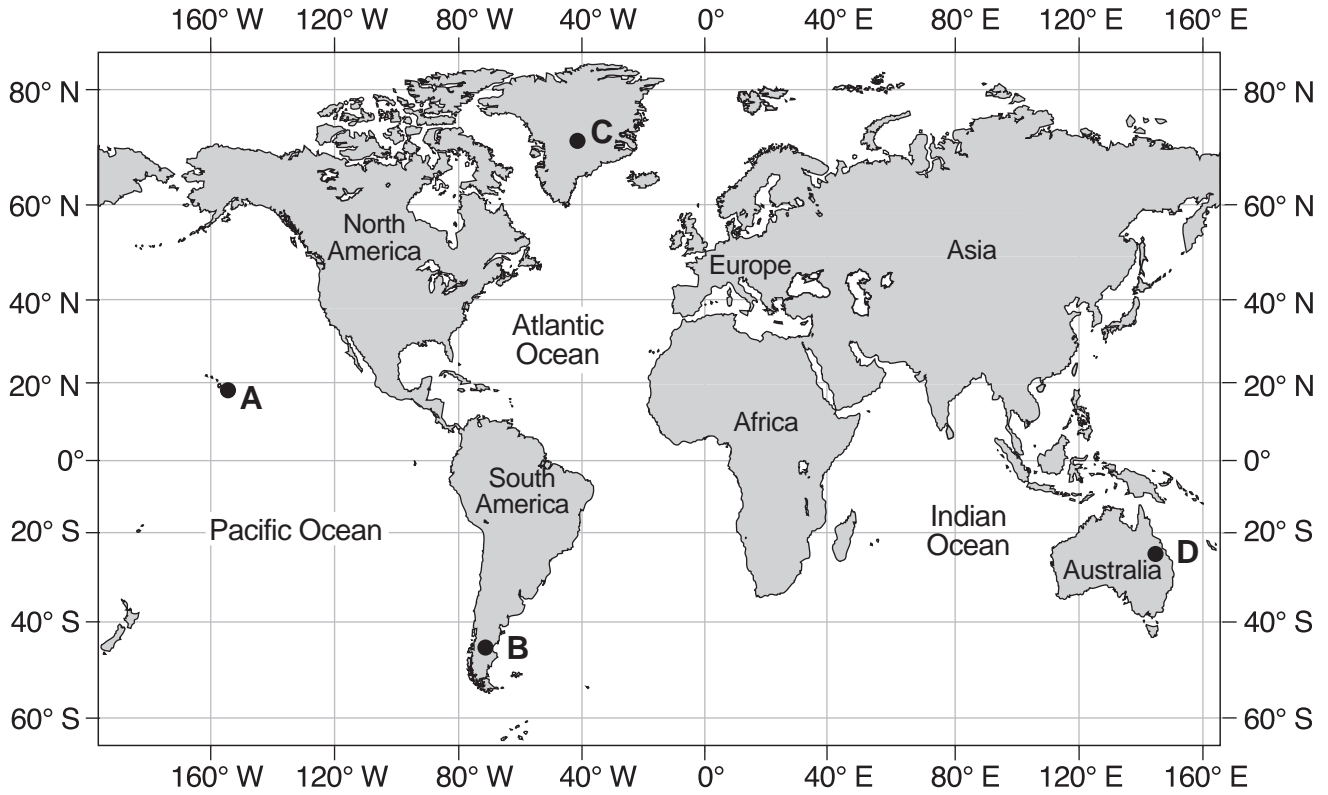


(3)



(4)

35 On the map below, points A through D represent locations on Earth's surface.



Which location is positioned over a mantle hot spot?

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

Part B-1

Answer all questions in this part.

Directions (36–50): For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the 2011 Edition Reference Tables for Physical Setting/Earth Science. Record your answers on your separate answer sheet.

Base your answers to questions 36 and 37 on the data table below and on your knowledge of Earth science. The data table shows information on six major mass extinction events that occurred many million years ago (mya) in Earth's history.

Some Major Mass Extinctions in Earth's History

Approximate Time (mya)	Certain Life-Forms That Became Extinct
65.5	all dinosaurs and all ammonoids
200	many species of nautiloids, ammonoids, mammal-like reptiles, and early dinosaurs
251	all trilobites and 90% of other marine species and 70% of land species
376	many species of corals, brachiopods, and trilobites
444	more than half of brachiopod species, many trilobite species, and some coral species
520	small shelly fossil species and some early trilobite species

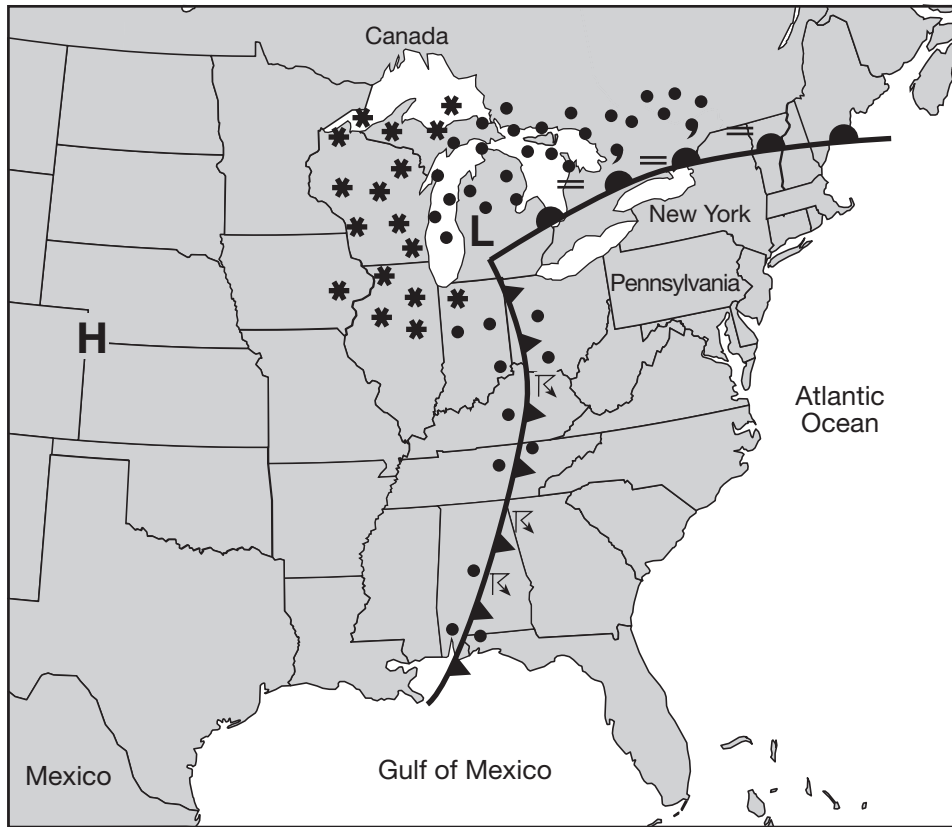
36 More than half of brachiopod species became extinct at the end of the

- (1) Devonian Period
- (2) Silurian Period
- (3) Ordovician Period
- (4) Cambrian Period

37 Which event is generally accepted as the cause of the mass extinction that occurred 65.5 million years ago?

- (1) volcanic eruption
 - (2) continental collision
 - (3) asteroid impact
 - (4) sea-level change
-

Base your answers to questions 38 through 40 on the weather map below and on your knowledge of Earth science. The map of a portion of eastern North America shows a high-pressure center (**H**) and a low-pressure center (**L**), frontal boundaries, and present weather conditions.



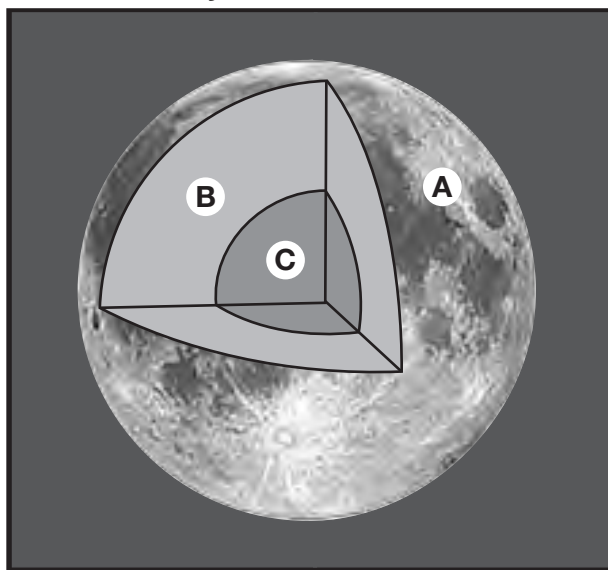
- 38 Which weather condition is shown along the cold front?
- | | |
|----------|-------------------|
| (1) fog | (3) haze |
| (2) snow | (4) thunderstorms |
- 39 What was the most likely source region for the air mass over Pennsylvania?
- | | |
|--------------------|--------------------|
| (1) New York State | (3) Gulf of Mexico |
| (2) Pacific Ocean | (4) Canada |
- 40 The general surface wind circulation associated with the high-pressure center (**H**) is most likely
- | | |
|---------------------------|----------------------------------|
| (1) clockwise and outward | (3) counterclockwise and outward |
| (2) clockwise and inward | (4) counterclockwise and inward |

Base your answers to questions 41 through 43 on the passage and diagram below and on your knowledge of Earth science. The passage describes geologic studies of the Moon. The diagram represents the Moon's surface and interior, showing the inferred depth of each layer below the Moon's surface.

Moon Studies

Scientific instruments left on the Moon's surface recorded 12,558 moonquakes in eight years. Most of these moonquakes originated between 700 km and 1200 km below the Moon's surface. Scientists infer that most moonquakes are caused by the gravitational forces between the Moon, Earth, and the Sun.

Layers of the Moon

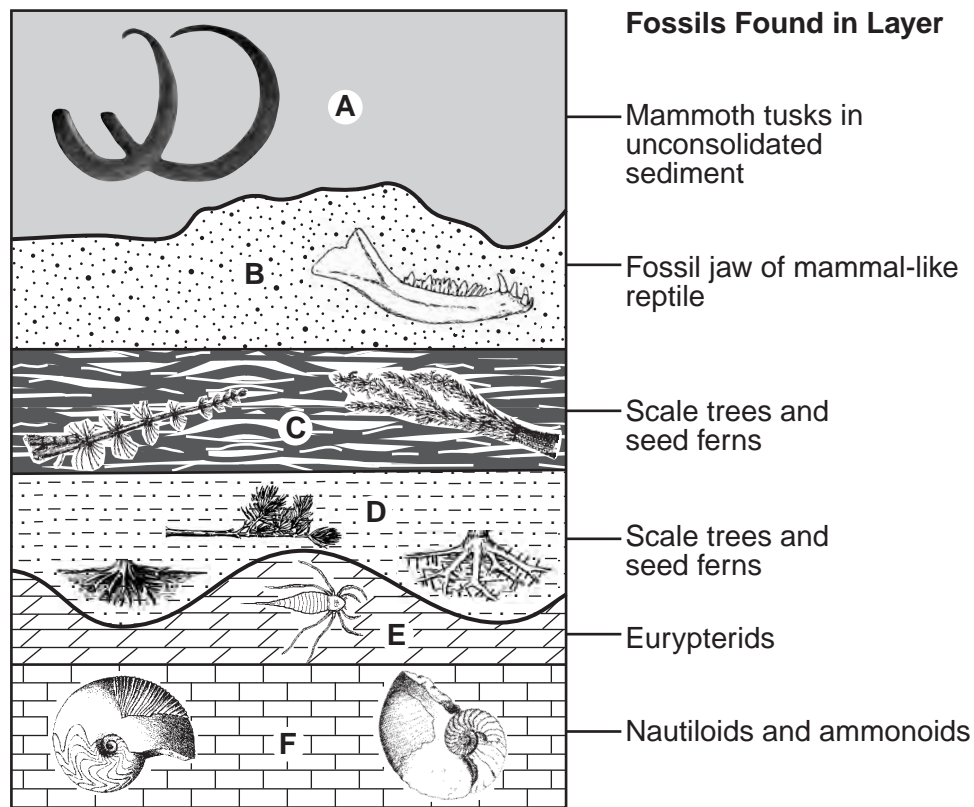


Key	
Inferred Depth Below the Surface:	
A	Crust: 0 km to 60 km
B	Mantle: 60 km to 1100 km
C	Core: 1100 km to 1738 km

(Not drawn to scale)

- 41 The same type of evidence was used to find the inferred depths of both the Moon's interior layers and Earth's interior layers. What evidence was used to determine the inferred depth of the boundary between the Moon's mantle and core?
- (1) seismic data recorded on the Moon's surface
 - (2) magnetic data measured on the Moon's surface
 - (3) convection currents mapped in the Moon's mantle and core
 - (4) temperatures measured in the Moon's mantle and core
- 42 What is the inferred thickness of the Moon's mantle?
- (1) 60 km
 - (2) 638 km
 - (3) 1040 km
 - (4) 1738 km
- 43 Which planet has an average density most similar to the average density of the Moon?
- (1) Mercury
 - (2) Mars
 - (3) Jupiter
 - (4) Neptune
-

Base your answers to questions 44 through 47 on the geologic cross section below and on your knowledge of Earth science. The cross section represents rock and sediment layers, labeled A through F. Each layer contains fossil remains, which formed in different depositional environments. Some layers contain index fossils. The layers have *not* been overturned.



(Not drawn to scale)

44 Which pair of organisms existed when the unconsolidated sediment in layer A was deposited?

- (1) birds and trilobites
- (2) dinosaurs and mastodons
- (3) ammonoids and grasses
- (4) humans and vascular plants

45 Which rock layer formed mainly from the compaction of plant remains?

- (1) E
- (2) B
- (3) C
- (4) F

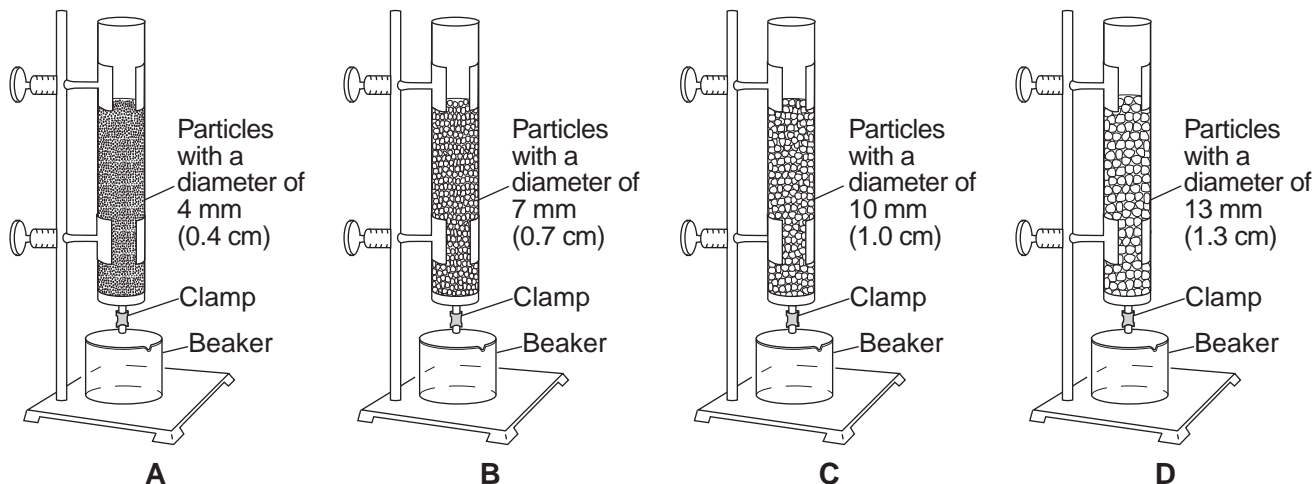
46 During which geologic epoch was layer F deposited?

- (1) Late Devonian
- (2) Middle Devonian
- (3) Early Devonian
- (4) Late Silurian

47 The depositional environment during the time these layers and fossils were deposited

- (1) was consistently marine
- (2) was consistently terrestrial (land)
- (3) changed from marine to terrestrial (land)
- (4) changed from terrestrial (land) to marine

Base your answers to questions 48 through 50 on the diagram below and on your knowledge of Earth science. The diagram represents setups of laboratory equipment, labeled A, B, C, and D. This equipment was used to test the infiltration rate and water retention of four different particle sizes. Each column was filled to the same level with uniform-sized dry, spherical particles. Water was poured into each column until the water level rose to the top of the particles. Then, the clamp was opened to allow the water to drain into the beaker beneath each column.

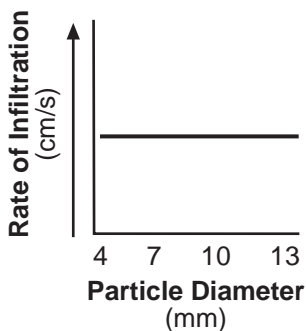


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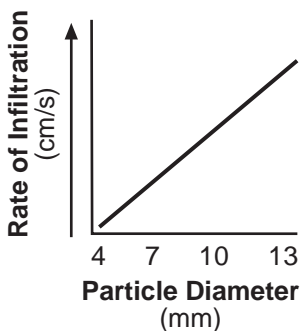
48 All of the particles in these four columns are classified as

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

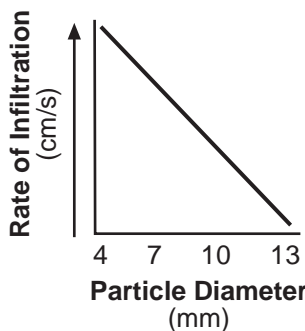
49 Which graph best shows the rate of infiltration of water through the particles in these four columns?



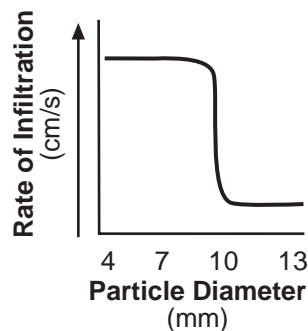
(1)



(2)



(3)



(4)

50 Which column of particles retained the most water after the clamps were opened and the water was drained into the beakers?

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

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 *2011 Edition Reference Tables for Physical Setting/Earth Science*.

Base your answers to questions 51 through 54 on the cross section of part of Earth's crust in your answer booklet and on your knowledge of Earth science. On the cross section, some rock units are labeled with letters A through I. The rock units have *not* been overturned. Line XY represents a fault. Line UV represents an unconformity.

51 On the cross section *in your answer booklet*, draw *two* arrows, one on *each* side of line XY, to show the direction of relative movement that has occurred along the fault. [1]

52 Write the letter of the oldest rock unit in the cross section. [1]

53 Identify the contact metamorphic rock that formed between rock units B and C. [1]

54 The table below shows the ages of the igneous rock units, determined by radioactive dating.

Rock Unit	D	G	H	B
Age (million years)	420	454	420	140

How many million years ago did rock unit I most likely form? [1]

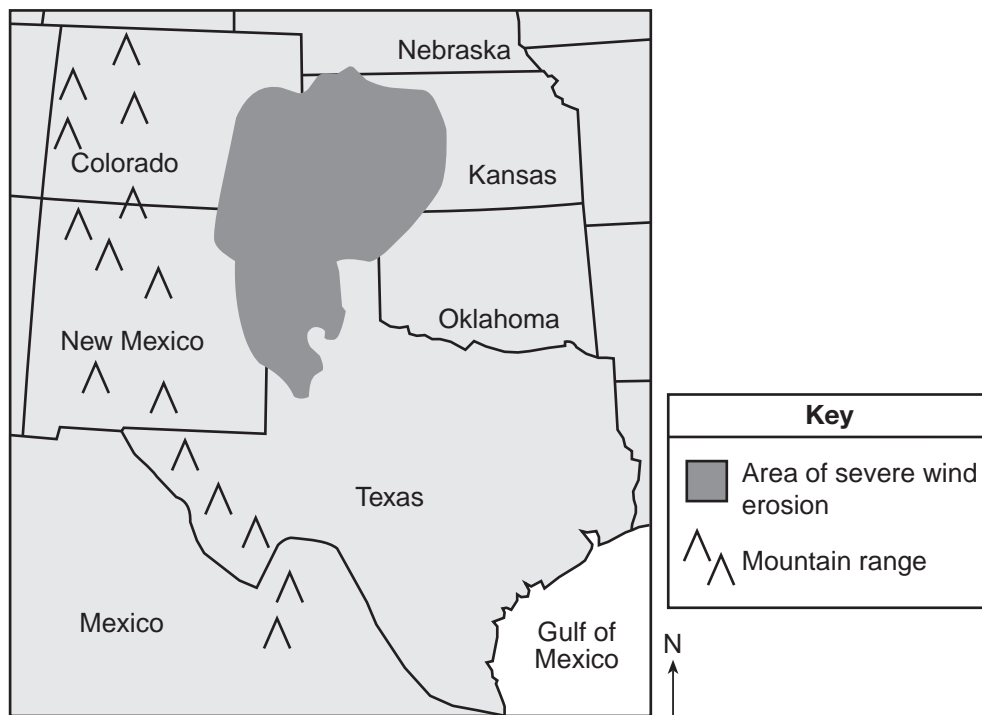
Base your answers to questions 55 through 58 on the passage and map below and on your knowledge of Earth science. The map shows a portion of the Dust Bowl in the southern Great Plains.

The Dust Bowl

In the 1930s, several years of drought affected over 100 million acres in the Great Plains from North Dakota to Texas. For several decades before this drought, farmers had plowed the prairie and loosened the soil. When the soil became extremely dry from lack of rain, strong prairie winds easily removed huge amounts of soil from the farms, forming dust storms. This region was called the Dust Bowl.

In the spring of 1934, a windstorm lasting a day and a half created a dust cloud nearly 2000 kilometers long and caused “muddy rains” in New York State and “black snow” in Vermont. Months later, a Colorado storm carried dust approximately 3 kilometers up into the atmosphere and transported it 3000 kilometers, creating twilight conditions at midday in New York State.

**A Portion of the Dust Bowl
in the Southern Great Plains**



- 55 Identify *one* human activity that was a major cause of the huge dust storms that formed in the Great Plains during the 1930s. [1]
- 56 Describe *one* change in the appearance of the sand particles that were abraded when transported by winds within the Dust Bowl region. [1]
- 57 Identify the name of the layer of the atmosphere in which the dust particles were transported by the Colorado storm to New York State. [1]
- 58 Explain why the dust clouds that moved to the east coast of the United States during the 1934 storm were composed mostly of silt and clay particles instead of sand. [1]

Base your answers to questions 59 through 62 on the topographic map *in your answer booklet* and on your knowledge of Earth science. The map shows an area of New York State that includes a campsite, trail, and buildings near a lake. Points *A*, *B*, *C*, and *D* represent locations on the map.

- 59 Point *A* on the topographic map *in your answer booklet* indicates a certain elevation on the east side of the lake. Place an **X** at the same elevation on the west side of the lake. [1]
- 60 On the grid *in your answer booklet*, construct a topographic profile along line *BC*. Plot the elevation of *each* contour line that crosses line *BC*. Connect *all seven* plots with a line to complete the profile. [1]
- 61 *In your answer booklet*, circle the phrase that indicates the direction of flow of Woodland Brook. Describe the contour-line evidence that supports your answer. [1]
- 62 Campers hiked along the trail from the shoreline of the lake to point *D* to view the landscape. Determine the average gradient, in meters per kilometer, of the route they took on their hike. [1]
-

Base your answers to questions 63 through 65 on the diagram in your answer booklet and on your knowledge of Earth science. The diagram represents a model of Earth's orbit around the Sun. Arrows represent two motions of Earth. Distances from the center of the Sun to the center of Earth are indicated in kilometers. Earth is represented when it is closest to the Sun and when it is farthest from the Sun.

- 63 On the diagram *in your answer booklet*, place an **X** on Earth's orbit at *one* location where Earth's Northern Hemisphere is in winter. [1]
- 64 How many degrees is Earth's axis tilted to a line perpendicular to the plane of Earth's orbit? [1]
- 65 The diagram *in your answer booklet* represents Earth at one position in its orbit around the Sun. Starting at the North Pole, draw a straight arrow that points to the location of *Polaris*. [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 *2011 Edition Reference Tables for Physical Setting/Earth Science*.

Base your answers to questions 66 through 68 on the data table below and on the graph in your answer booklet and on your knowledge of Earth science. The data table lists the number of daylight hours for a location at 50° N on the 21st day of each month for 1 year. The graph shows the number of daylight hours on the 21st day of each month for a location at 70° N and for the equator, 0° .

Daylight Hours at 50° N

Date	Daylight (h)
January 21	8.4
February 21	10.0
March 21	12.0
April 21	13.8
May 21	15.5
June 21	16.2
July 21	15.5
August 21	14.0
September 21	12.0
October 21	10.2
November 21	8.4
December 21	7.5

66 On the graph *in your answer booklet*, plot the number of daylight hours for the 21st day of *each* month listed on the data table. Connect *all* of your plotted data with a line. [1]

67 Explain why the number of daylight hours for all three latitudes was 12 hours on March 21 and September 21. [1]

68 Predict the number of daylight hours that occur at 70° S on June 21. [1]

Base your answers to questions 69 through 71 on the data table below and on your knowledge of Earth science. The table shows air temperatures recorded under identical conditions at 2-hour intervals on a sunny day. Data were recorded 1 meter above ground level both inside and outside of a glass greenhouse.

Data Table

Time	Inside Air Temperature (°C)	Outside Air Temperature (°C)
8 a.m.	15	15
10 a.m.	18	16
12 noon	21	17
2 p.m.	24	18
4 p.m.	24	17

- 69 Describe the color and texture of the surfaces inside the greenhouse that would most likely absorb the greatest amount of visible light. [1]
- 70 Calculate the rate of change in the outside air temperature from 8 a.m. to 2 p.m. in Celsius degrees per hour. [1]
- 71 Most atmospheric scientists infer that global warming is occurring due to an increase in greenhouse gases. State the names of *two* greenhouse gases. [1]
-

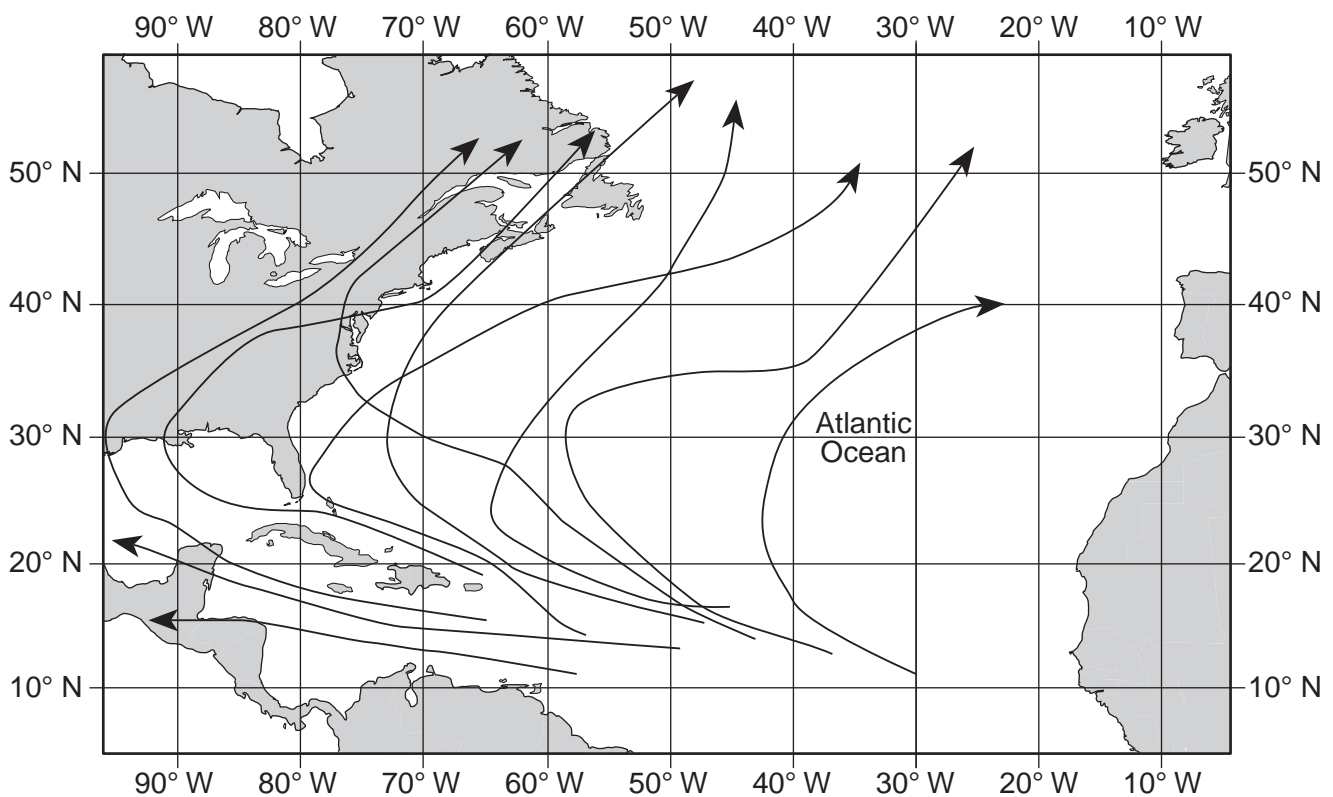
Base your answers to questions 72 through 76 on the side-view model of the solar system in your answer booklet and on your knowledge of Earth science. The planets are shown in their relative order of distance from the Sun. Letter A indicates one of the planets.

- 72 The center of the asteroid belt is approximately 503 million kilometers from the Sun. *In your answer booklet*, draw an **X** on the model between two planets to indicate the center of the asteroid belt. [1]
- 73 State the period of rotation at the equator of planet A. Label your answer with the correct units. [1]
- 74 How many million years ago did Earth and the solar system form? [1]
- 75 Calculate how many times larger the equatorial diameter of the Sun is than the equatorial diameter of Venus. [1]
- 76 Identify the process that occurs within the Sun that converts mass into large amounts of energy. [1]
-

Base your answers to questions 77 through 80 on the diagram in your answer booklet and on your knowledge of Earth science. The diagram represents several common rock-forming minerals and some of the igneous rocks in which they commonly occur. The minerals are divided into two groups, A and B. Dashed lines connect the diagram of diorite to the three minerals that are commonly part of diorite's composition.

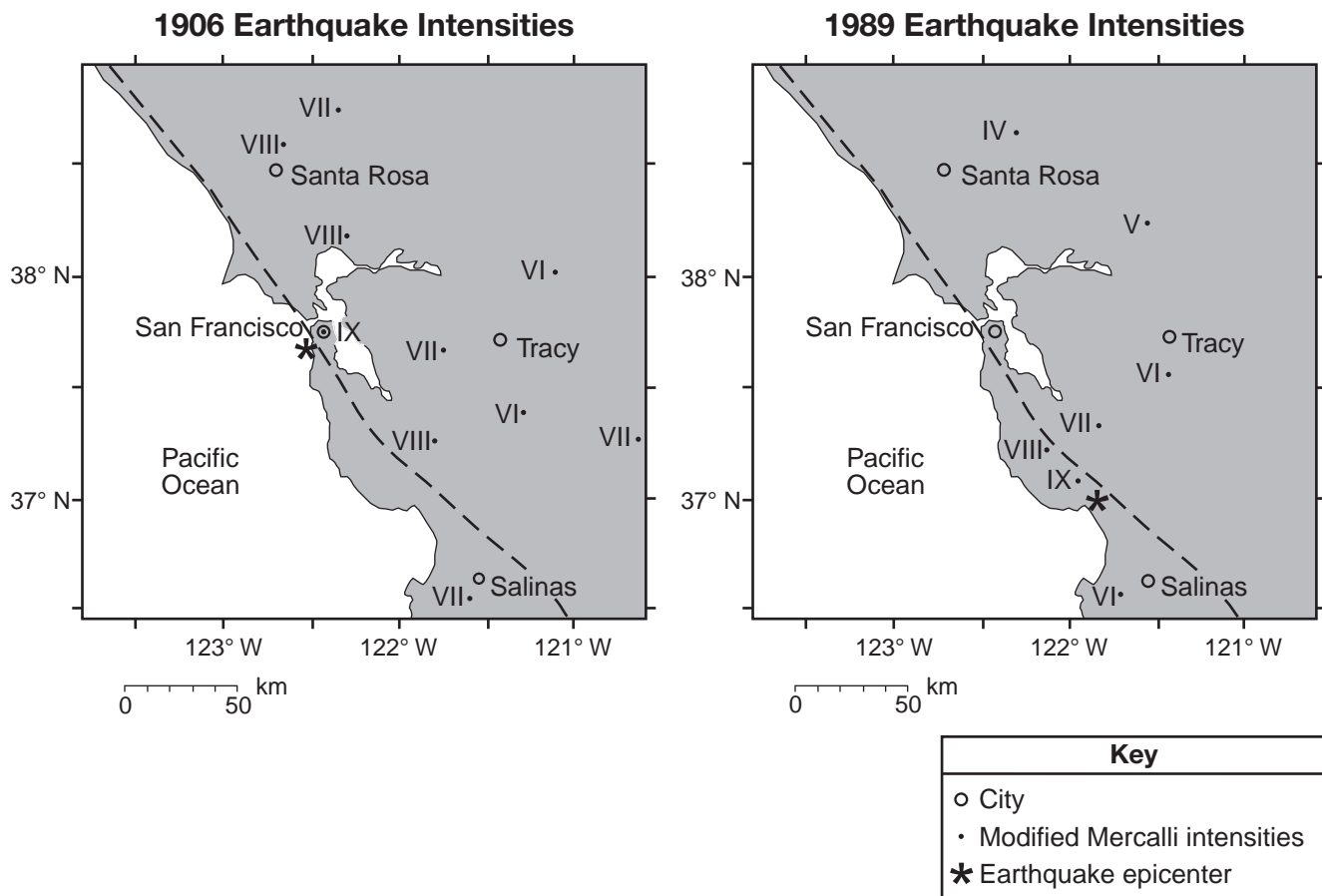
- 77 On the diagram *in your answer booklet*, draw *five* lines to connect the diagram of granite to the symbols of the minerals that are commonly part of granite's composition. [1]
- 78 Describe *one* characteristic of the minerals in group A that makes them different from the minerals in group B. [1]
- 79 Based on the *Earth Science Reference Tables*, identify *one* other mineral found in some samples of diorite that is *not* shown in the diorite sample in the diagram. [1]
- 80 A sedimentary rock sample has the same basic mineral composition as granite. Describe *one* observable characteristic of the sedimentary rock that is different from granite. [1]
-

Base your answers to questions 81 and 82 on the Atlantic hurricane map below and on your knowledge of Earth science. The arrows on the map show the tracks of various hurricanes that occurred during late summer and early fall.



- 81 Describe *one* ocean surface condition or atmospheric condition that makes the area over the Atlantic Ocean between 10° N latitude and 20° N latitude ideal for these hurricanes to form. [1]
- 82 Several of these hurricanes have affected land areas. Describe *two* actions that people who live in hurricane-prone areas should take in order to prepare for future hurricanes. [1]
-

Base your answers to questions 83 through 85 on the maps and table below and on your knowledge of Earth science. The maps show earthquake intensities (IV to IX), according to the table of the Modified Mercalli Intensity Scale, for the 1906 and 1989 earthquakes at several locations in California. The asterisk (*) on each map is the location of each epicenter. The dashed line represents the location of a major fault.



Modified Mercalli Intensity Scale

Level of Intensity	IV	V	VI	VII	VIII	IX
Perceived shaking	light	moderate	strong	very strong	severe	violent
Observed damage	none	very light	light	moderate	moderate to heavy	heavy

83 Name the major fault along which both of these earthquakes occurred and identify the type of plate tectonic boundary that is located along this fault. [1]

84 Based on the Modified Mercalli Intensity Scale, identify the perceived shaking and the observed damage that occurred in the San Francisco area during the 1906 earthquake. [1]

85 Explain why Santa Rosa experienced a lower Modified Mercalli intensity shaking than Salinas experienced during the 1989 earthquake. [1]

PHYSICAL SETTING EARTH SCIENCE

Thursday, August 14, 2014 — 12:30 to 3:30 p.m., only

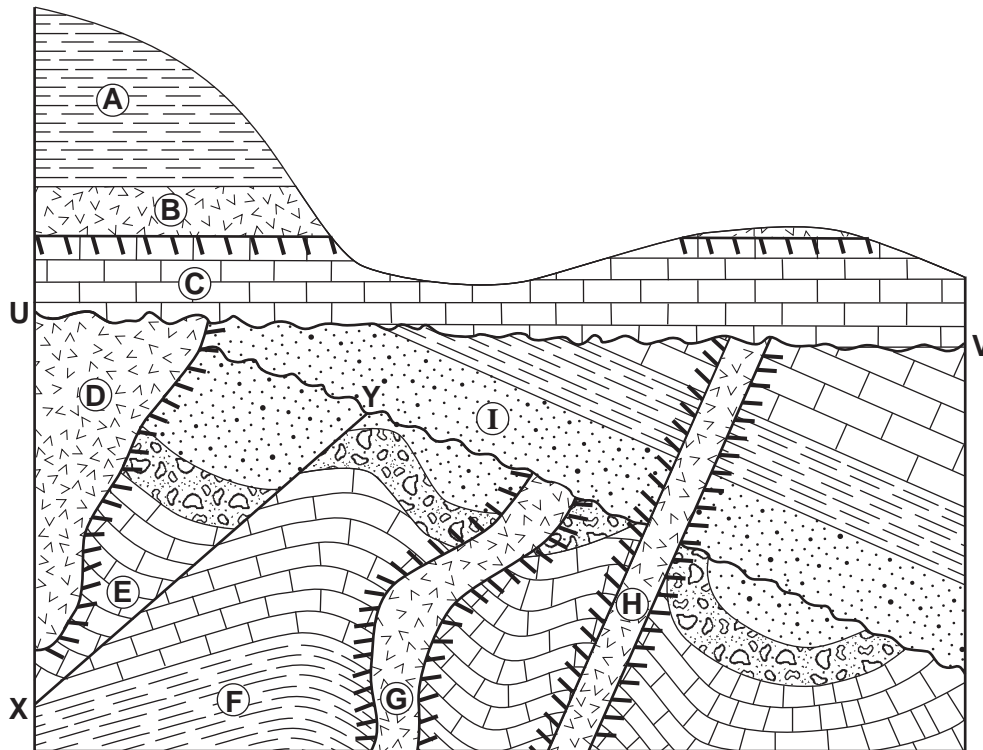
ANSWER BOOKLET

Student Sex: Male
 Female
Teacher
School Grade

Record your answers for Part B-2 and Part C in this booklet.

Part B-2

51



Key	
	Igneous rock
	Contact metamorphism

52 _____

53 _____

54 _____ million years ago

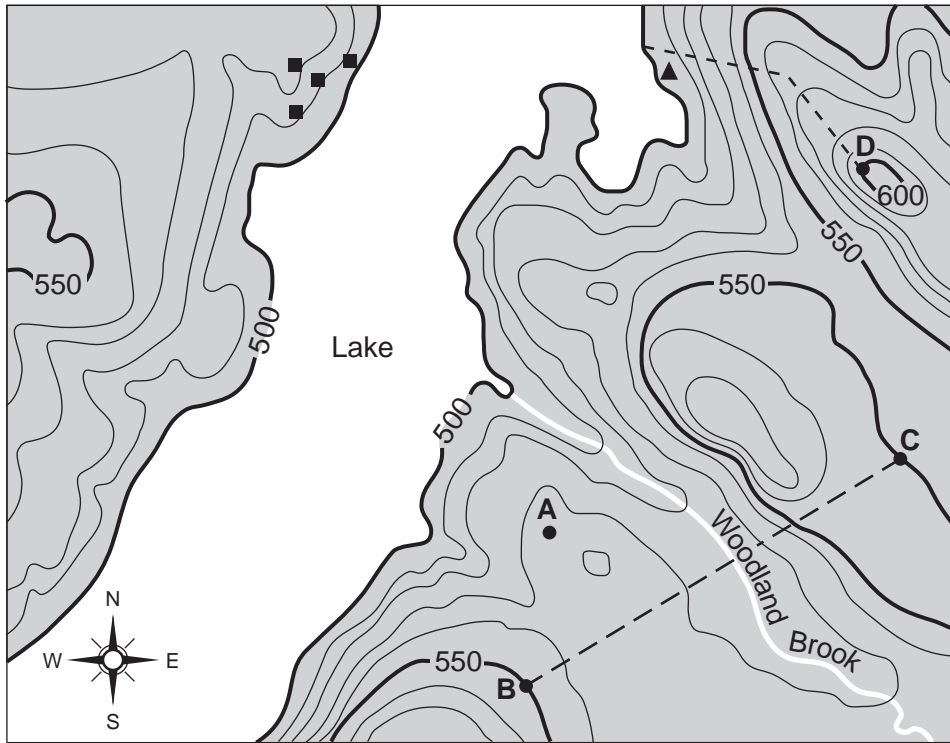
55 _____

56 _____

57 _____

58 _____

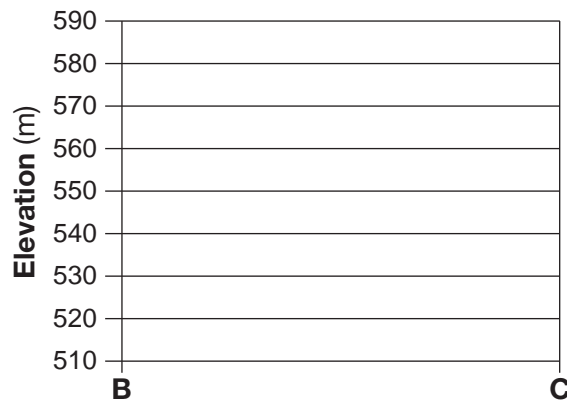
59



0 0.5 1.0 km
 Contour interval = 10 meters

Key	
▲	Campsite
- - - -	Trail
■	Building

60

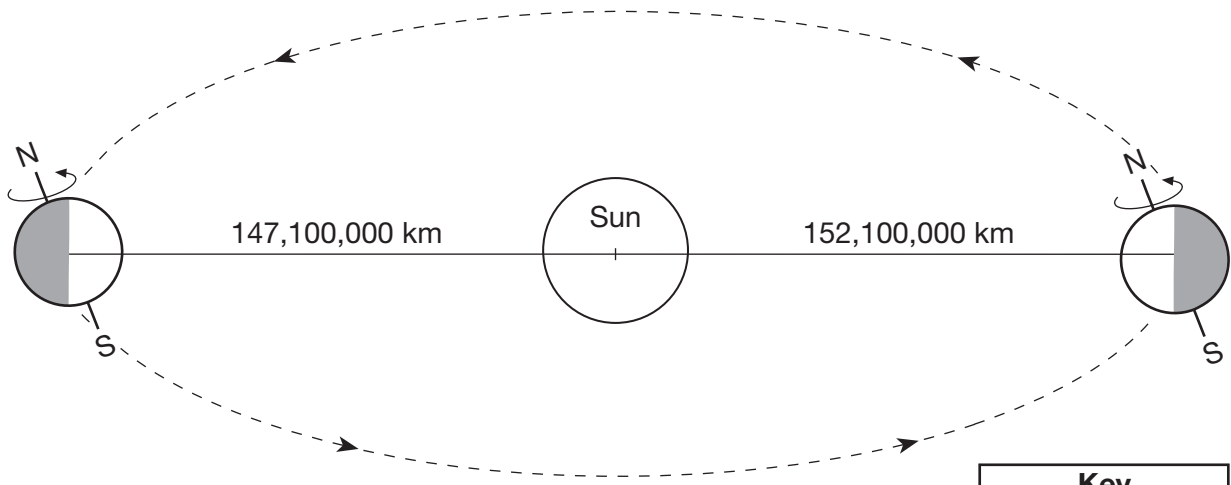


61 Circle one: into the lake out of the lake

Contour-line evidence: _____

62 _____ m/km

63

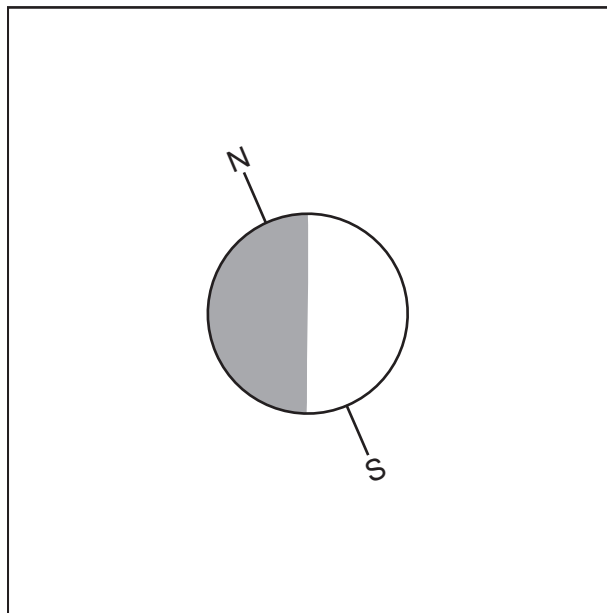


(Not drawn to scale)

Key	
Earth motions:	
-->	Revolution
↻	Rotation

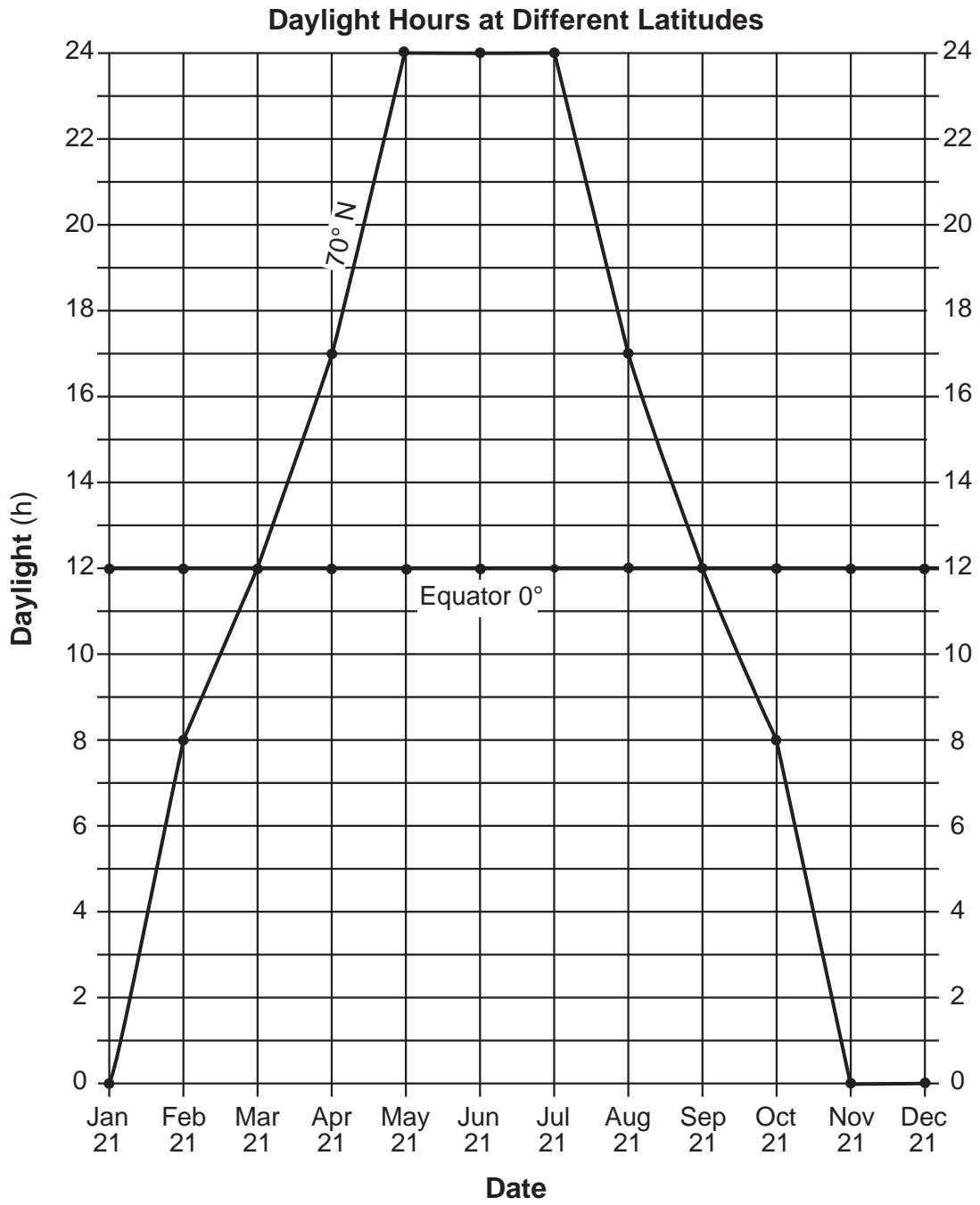
64 _____ °

65



Part C

66



67 _____

68 _____ h

69 Color: _____

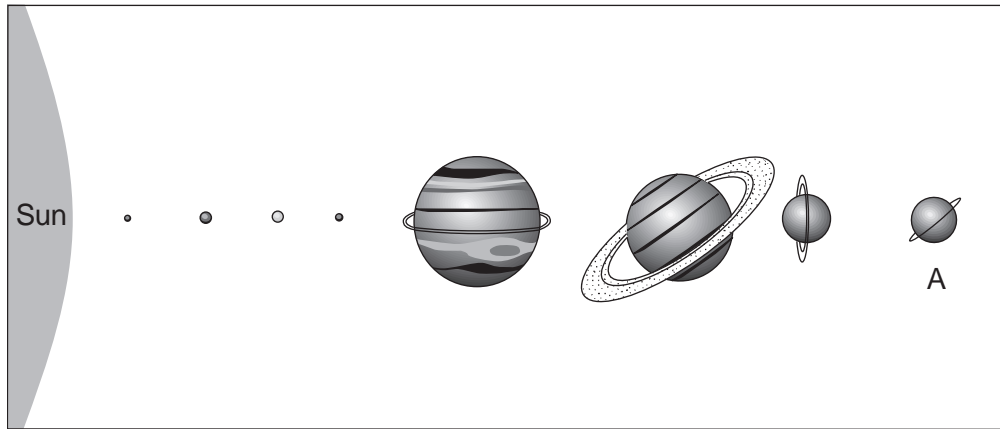
Texture: _____

70 _____ C°/h

71 (1) _____

(2) _____

72



(Not drawn to scale)

73 _____

74 _____ million years ago

75 _____ times larger

76 _____

		Minerals		Igneous Rocks
		Name	Symbol	
Mineral Group A		Quartz		Granite
		Potassium feldspar		
		Plagioclase feldspar		
Mineral Group B		Amphibole		Diorite
		Pyroxene		
		Biotite mica		Gabbro
		Olivine		
				Peridotite

78 Group A: _____

79 _____

80 _____

81 _____

82 Action 1: _____

Action 2: _____

83 _____ **Fault**

Type of plate boundary: _____

84 Perceived shaking: _____

Observed damage: _____

85 _____

FOR TEACHERS ONLY

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

PHYSICAL SETTING/EARTH SCIENCE

Thursday, August 14, 2014 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 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 at: <http://www.p12.nysed.gov/assessment/> and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Part A and Part B-1

Allow 1 credit for each correct response.

Part A

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

Part B-1

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

Directions to the Teacher

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

Do not attempt to correct the student's work by making insertions or changes of any kind. If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Allow 1 credit for each correct response.

At least two science teachers must participate in the scoring of the Part B–2 and Part C open-ended questions on a student's paper. 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 more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

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. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the space provided. The student's score for the Earth Science Performance Test should be recorded in the space provided. Then the student's raw scores on the written test and the performance test should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Thursday, August 14, 2014. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

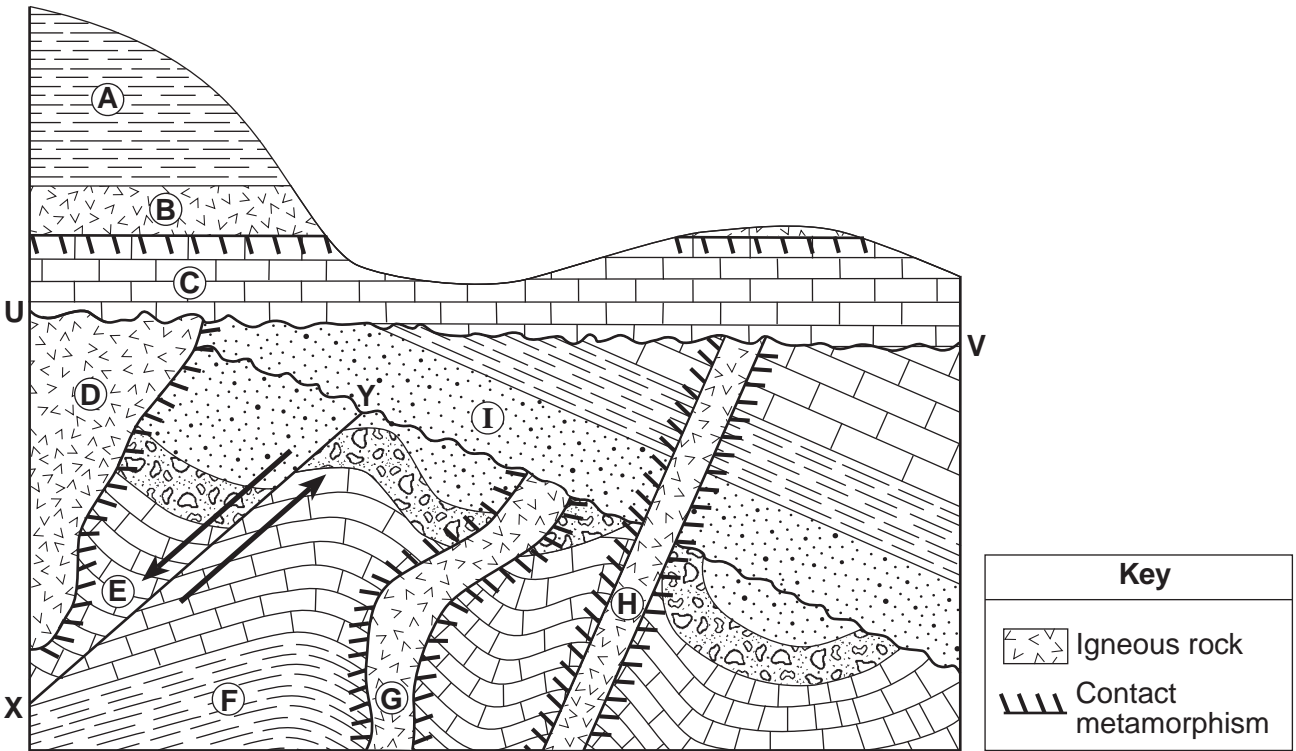
Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Part B-2

Allow a maximum of 15 credits for this part.

- 51 [1] Allow 1 credit for one arrow pointing downward on the left side of line XY and one arrow pointing upward on the right side of line XY.

Example of a 1-credit response:



- 52 [1] Allow 1 credit for *F*.

- 53 [1] Allow 1 credit for marble *or* hornfels.

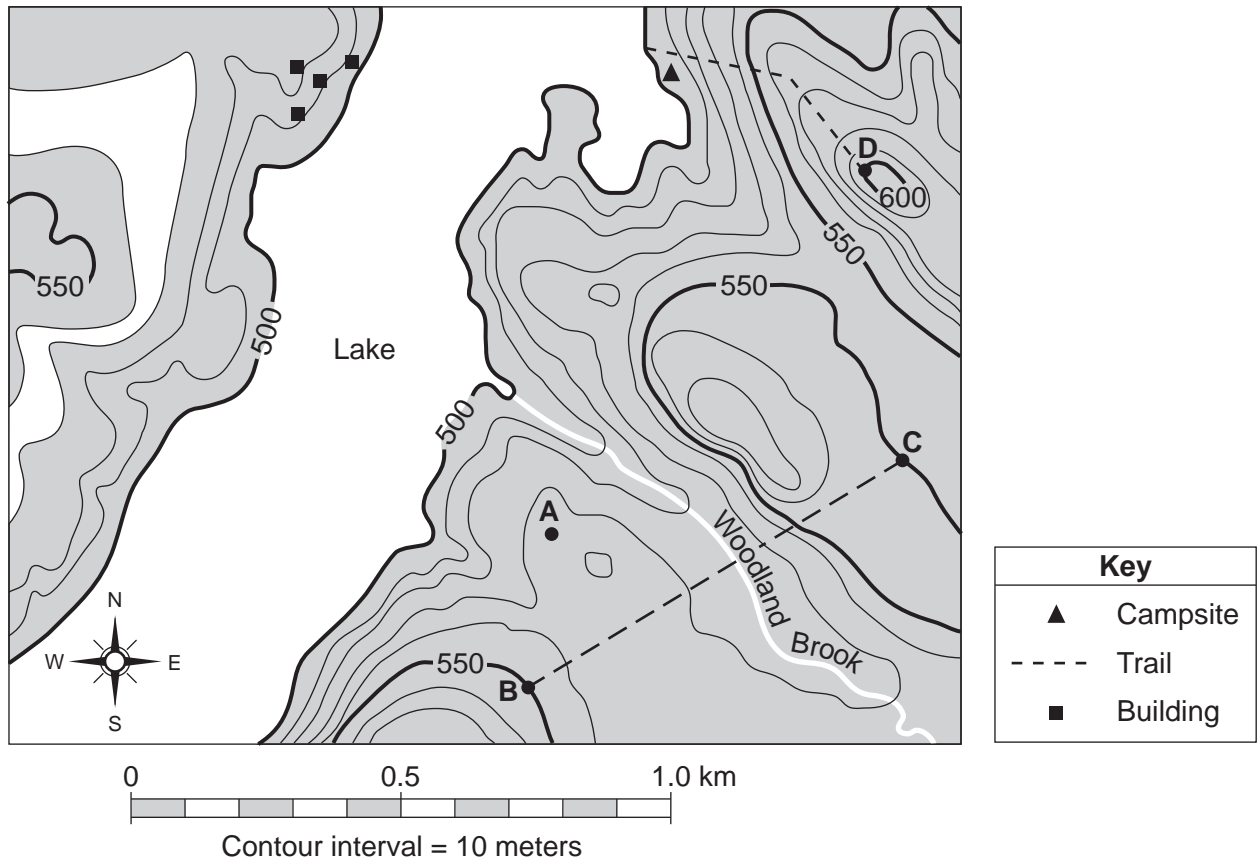
- 54 [1] Allow 1 credit for any value greater than 420 million years ago but less than 454 million years ago.

- 55** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- plowing large areas of the plains
 - poor farming practices
 - Farmers loosened the soil.
 - Farmers removed vegetation that had held the soil in place/deforested the land.
 - farming
- 56** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- They became more rounded.
 - They became smaller in size/thinner/finer.
 - The outside surface became scratched/frosted/pitted.
 - Sand grains become smoother.
- 57** [1] Allow 1 credit for troposphere.
- 58** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The velocity of the wind could carry only small/less dense/flatter particles.
 - Sand is heavier and not likely to be carried that far.
 - The velocity of the wind was not great enough to carry sand particles.
 - Smaller particles are eroded more easily.
 - Silt and clay are smaller-sized particles.

- 59 [1] Allow 1 credit if the center of an **X** is located in the white area between the 530 m and 540 m contour lines on the west side of the lake as shown below.

Note: Allow credit even if a symbol other than an **X** is used.

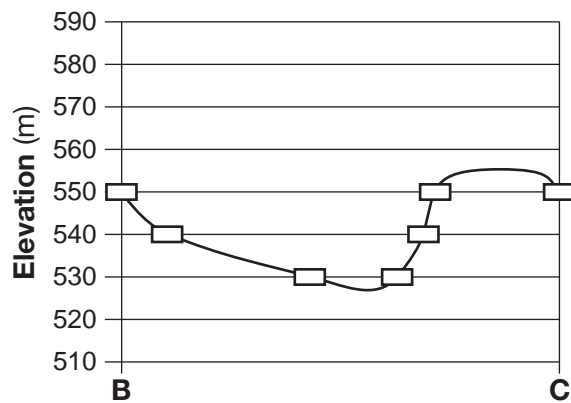
Do *not* allow credit if the center of the **X** touches the 530 or the 540 contour line.



- 60 [1] Allow 1 credit if the centers of *all seven* student plots are within or touching the rectangles shown below and are correctly connected with a line passing within or touching the rectangles. The line must show the lowest elevation between 520 m and 530 m, and the highest elevation between 550 m and 560 m.

Note: Allow credit if the line does not pass through the student plots but is still within or touching the rectangles.

It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.



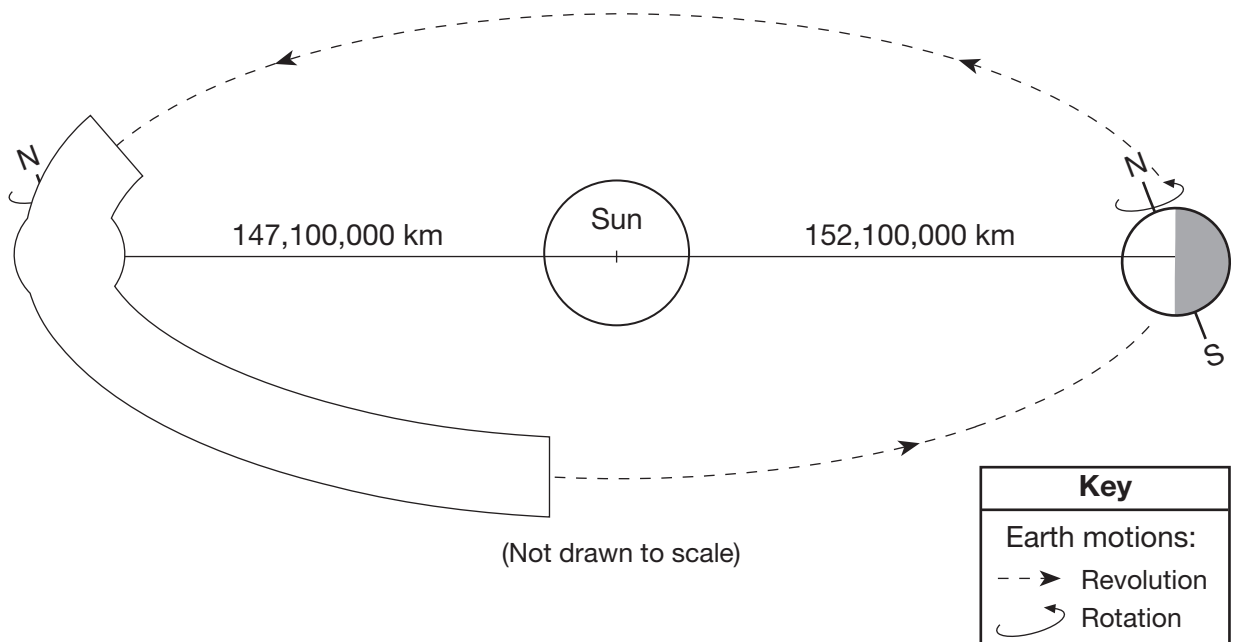
- 61** [1] Allow 1 credit if *both* “into the lake” is circled and the “contour-line evidence” is correct. Acceptable evidence includes, but is not limited to:
- The contour lines bend away from the lake where they cross the stream.
 - The lines do not go straight across, but curve to the southeast when they cross Woodland Brook.
 - The contour lines that cross Woodland Brook show the lowest elevation where the brook enters the lake.
 - law of the Vs/Contour lines make a V shape that points uphill where they cross a stream.
 - A river flows from a higher elevation to a lower elevation.

Note: Allow credit if “into the lake” is not circled, but is included in the student’s evidence.

- 62** [1] Allow 1 credit for any value from 185 m/km to 215 m/km.

- 63** [1] Allow 1 credit if the center of the **X** is within or touching the clear banded region shown below.

Note: Allow credit if a symbol other than an **X** is used.
It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.



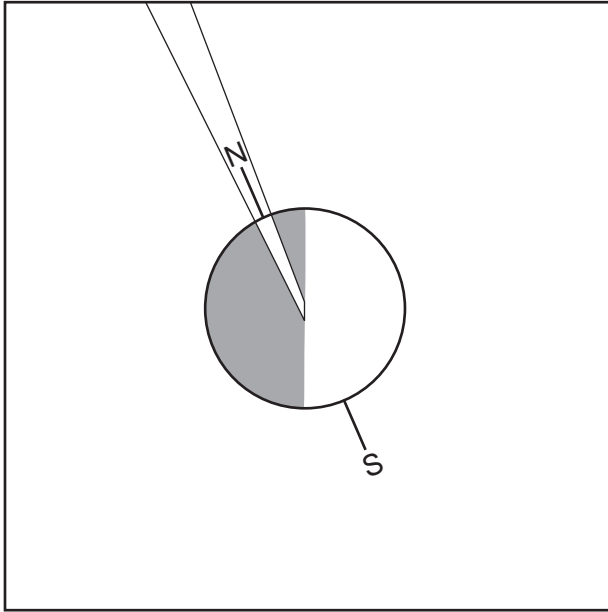
64 [1] Allow 1 credit for any value from 23.4° to 23.5° .

Note: Allow credit if the student indicates a fraction, such as $23\frac{1}{2}$.

65 [1] Allow 1 credit for an arrow that is aligned with Earth's axis and is within the cone-shaped area shown below.

Note: It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.

Allow credit even if the arrow does not start exactly at the North Pole.

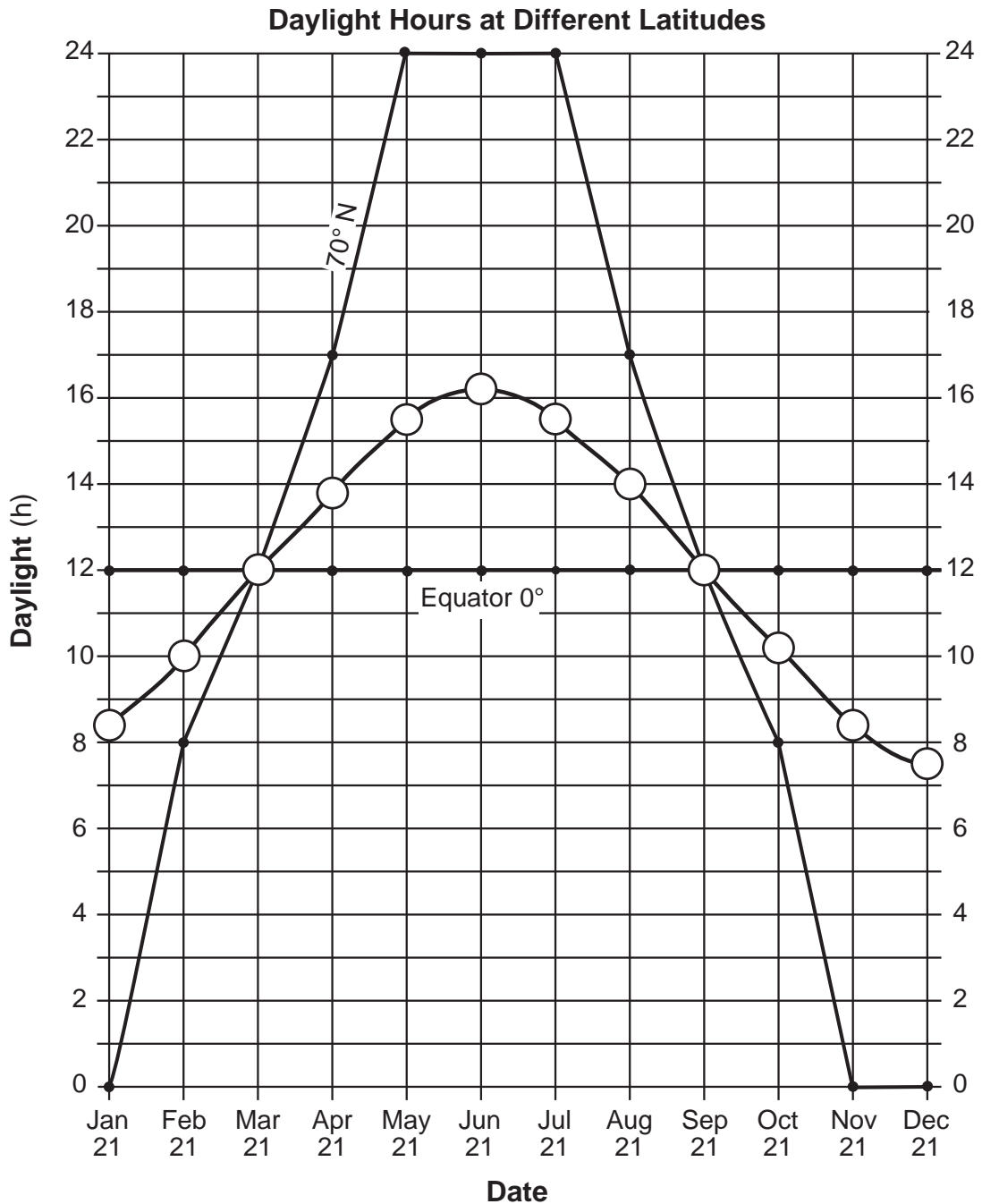


Part C

66 [1] Allow 1 credit if the centers of *all 12* student plots are within or touching the circles shown below and a correctly drawn line passes within or touches each circle.

Note: Allow credit if the student line does not pass through the student plots but is still within or touching the circles.

It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.



- 67 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- These dates represent the first days of spring and fall.
 - The Sun rises due east and sets due west at all latitudes.
 - The Sun’s direct rays are at the equator at solar noon on these dates.
 - March 21 and September 21 are equinoxes.
 - There are 12 hours of daylight and 12 hours of darkness on an equinox at all latitudes.
 - Earth’s axis is not tilted toward the Sun or away from the Sun at that time.

68 [1] Allow 1 credit for 0 h.

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

Color: — black

— dark

Texture: — rough

— bumpy

— uneven

— jagged

— coarse

70 [1] Allow 1 credit for a value of $0.5\text{ C}^\circ/\text{h}$.

Note: Do *not* allow credit for negative values or for any fraction other than $\frac{1}{2}$.

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

— carbon dioxide/ CO_2

— methane/ CH_4

— water vapor/ H_2O

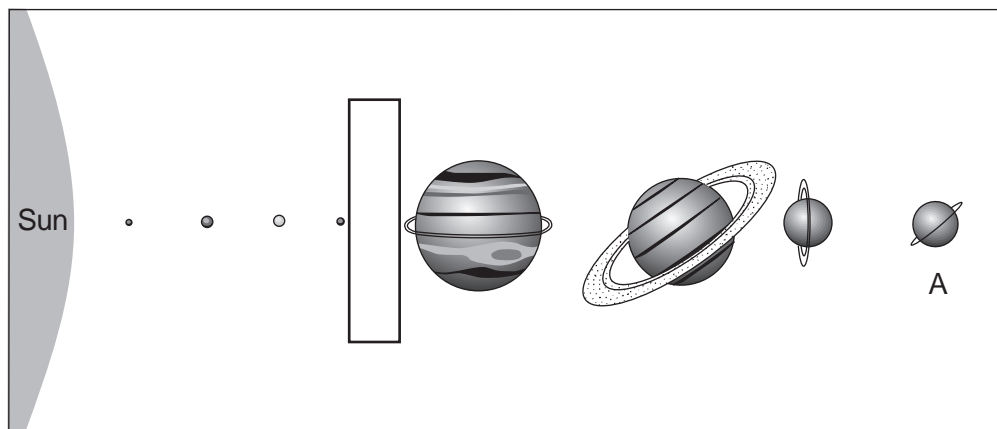
— chlorofluorocarbons/CFCs

— nitrous oxide/ N_2O

— ozone/ O_3

72 [1] Allow 1 credit if the center of the **X** is drawn in or touches the box shown below.

Note: Allow credit if a symbol other than an **X** is used.



(Not drawn to scale)

73 [1] Allow 1 credit for 16 with the correct units. Acceptable units include, but are not limited to:

- h
- hrs
- hours

74 [1] Allow 1 credit for a value equivalent to 4600 million years ago.

Note: If the student crosses out million years ago, allow credit if an equivalent value is expressed in other units (e.g. 4.6 billion years ago).

75 [1] Allow 1 credit for any value from 115 to 115.003305 times larger.

Note: Do *not* allow credit if a unit is included (e.g. 115 km).

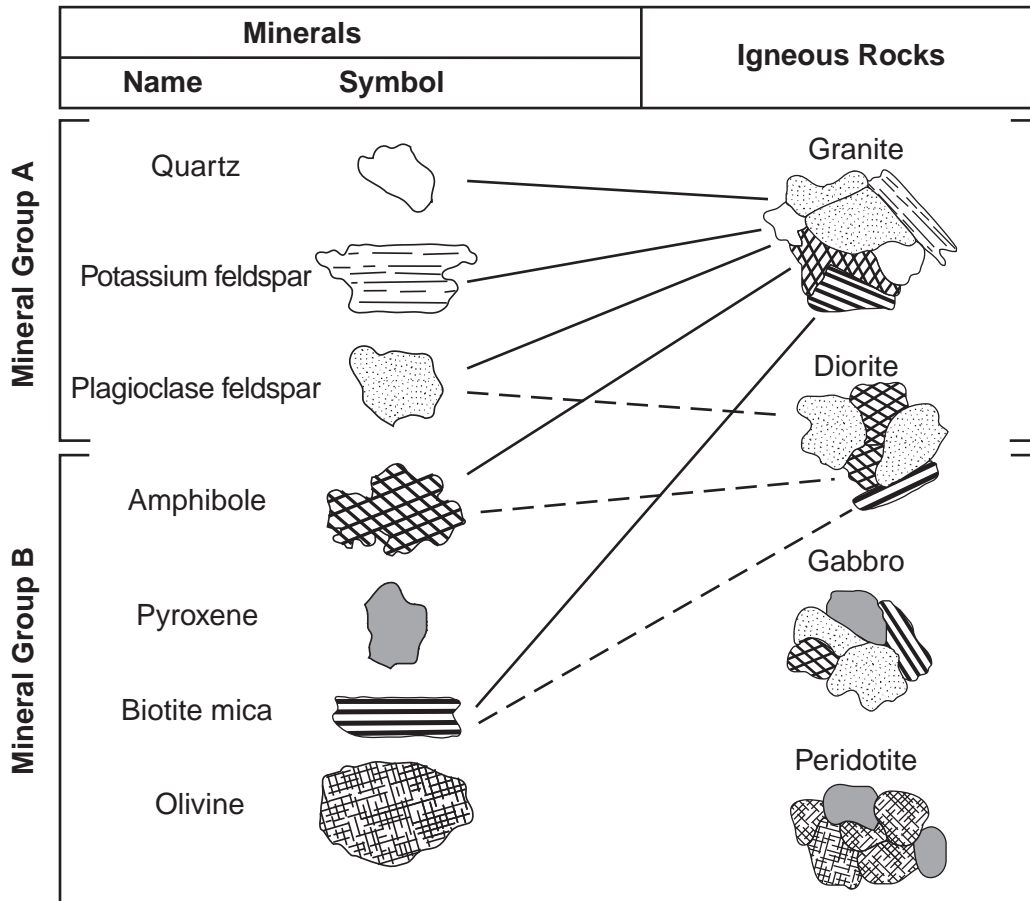
76 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- fusion
- nuclear fusion
- conversion of hydrogen to helium/H to He

77 [1] Allow 1 credit if *all five* lines are drawn from granite to the minerals quartz, potassium feldspar, plagioclase feldspar, amphibole, and biotite mica.

Note: If extra lines are drawn between the minerals and the rocks, all lines must be correct in order to receive credit.

Example of a 1-credit response:



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

Group A:

- lighter colored
- more felsic
- lower density
- lacks magnesium/Mg/iron/Fe
- rich in silicon/Si/aluminum/Al

79 [1] Allow 1 credit for quartz *or* pyroxene.

- 80** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The particles are layered.
 - The sedimentary rock may have fossils.
 - There are no intergrown crystals.
 - The sedimentary rock may have rounded or angular fragments.
 - The grains are cemented together.
 - The rock contains different sediments.
 - Sedimentary rock contains fragments.

- 81** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The warm waters that give the hurricane its energy are located in this tropical region of the ocean.
 - Warm ocean waters between 10° N and 20° N fuel hurricanes.
 - Warm and/or humid atmospheric conditions exist between 10° N and 20° N.
 - a maritime tropical air mass
 - low air pressure
 - rising air currents
 - low wind shear

- 82** [1] Allow 1 credit for *two* acceptable responses. Acceptable responses include, but are not limited to:
- learn about hurricane risks for area
 - learn safe emergency evacuation routes/shelter locations
 - obtain/check emergency equipment (radio, flashlight, first-aid kit)
 - have enough water and nonperishable food
 - make sure to have materials to secure home (plywood, shatter-resistant glass, hurricane shutters/straps, sandbags)
 - update insurance

Note: Do *not* allow credit for any action that implies an imminent hurricane.

- 83** [1] Allow 1 credit for San Andreas Fault *and* an acceptable plate tectonic boundary. Acceptable boundaries include, but are not limited to:
- transform boundary/transforming
 - Plates slide horizontally past each other.
- 84** [1] Allow 1 credit if *both* responses are correct.
- Perceived shaking: violent
- Observed damage: heavy
- 85** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Santa Rosa was farther from the 1989 earthquake epicenter.
 - Earthquake waves lose energy as they travel outward from the epicenter.
 - As distance from the epicenter increases, intensity decreases.
 - Salinas was closer to the origin of the earthquake.

Note: All responses must correctly refer to the earthquake epicenter or earthquake origin in order to receive credit.

Regents Examination in Physical Setting/Earth Science

August 2014

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

The Chart for Determining the Final Examination Score for the August 2014 Regents Examination in Physical Setting/Earth Science will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Thursday, August 14, 2014. 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 <http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm>.
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

August 2014 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		62	70, 75
Math Key Idea 2	2	49, 59	66
Math Key Idea 3			72
Science Inquiry Key Idea 1	15, 18	37, 41, 51, 53, 54, 56, 58	67, 69, 71, 76, 77, 81
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	3, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 21, 22, 23, 31, 35	36, 38, 43, 44, 45, 46, 48, 53, 55, 57, 58, 62	70, 72, 73, 74, 75, 78, 79, 80, 83, 85
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1	4, 7, 25, 27, 29	55, 58, 63	78, 80, 81
Key Idea 2	6, 14, 19, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35	38, 39, 40, 42, 43, 44, 45, 46, 47, 48, 50, 52, 53, 54, 60, 61, 63, 64, 65	77, 78, 79, 80, 83, 84, 85
Key Idea 3		36	84
Key Idea 4			
Key Idea 5	4, 7, 15, 19, 27, 29	40, 51, 54, 56	68
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			82
Standard 4			
Key Idea 1	1, 2, 4, 5, 6, 7, 17, 18, 19, 27, 28, 29, 30	36, 37, 43, 44, 46, 49, 50, 51, 52, 54, 63, 64, 65	67, 72, 73, 74, 75, 76
Key Idea 2	3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 24, 25, 26, 31, 32, 33, 34, 35	38, 39, 40, 41, 42, 47, 48, 55, 56, 57, 58, 59, 60, 61, 62	66, 68, 69, 70, 71, 81, 82, 83, 84, 85
Key Idea 3	23	45, 53	77, 78, 79, 80
Reference Tables			
ESRT 2011 Edition (Revised)	2, 3, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 21, 22	36, 38, 43, 44, 45, 46, 48, 53, 57, 58, 62	72, 73, 74, 75, 77, 78, 79, 80, 83

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Office of State Assessment
Albany, New York 12234

Scoring Clarification

Regents Examination in Physical Setting/Earth Science

August 2014

Laboratory Performance Test, Station 3 Only

Some copies of the Rating Guide for the Laboratory Performance Test that schools may have received for the August administration contain a value for the eccentricity of Saturn's orbit (page 8) that is inconsistent with the value provided in the Station 3 diagram. *For only those students who were assigned the planet Saturn* for their work on this station, allow credit for either 0.054 or 0.056 as their answer to the eccentricity of the planet's orbit (page 4 of the Answer Booklet).

Please photocopy this notice and give a copy of it to each teacher scoring the Laboratory Performance Test of the Regents Examination in Physical Setting/Earth Science.

Thank you for your hard work on behalf of the students in New York State.

The State Education Department / The University of the State of New York
Regents Examination in Physical Setting/Earth Science – August 2014
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 66 would receive a final examination score of 86.

		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	95	95	94	94	93	93	92	91	91	90	89	88	86	85	83	82	80
	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	93	93	92	92	92	91	90	90	89	88	87	86	85	83	82	80	78
	72	92	92	92	91	91	90	90	89	88	87	86	85	84	82	81	79	77
	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	91	90	90	89	89	88	88	87	86	85	84	83	82	81	79	77	76
68	90	90	89	89	88	88	87	86	85	85	84	82	81	80	78	77	75	
67	90	90	89	89	88	88	87	86	85	85	84	82	81	80	78	77	75	
66	89	89	88	88	87	87	86	85	85	84	83	82	80	79	77	76	74	
65	88	88	87	87	86	86	85	85	84	83	82	81	80	78	77	75	73	
64	87	87	87	86	86	85	84	84	83	82	81	80	79	77	76	74	72	
63	86	86	86	85	85	84	84	83	82	81	80	79	78	77	75	73	71	
62	86	85	85	84	84	83	83	82	81	80	79	78	77	76	74	72	71	
61	85	84	84	84	83	82	82	81	80	79	78	77	76	75	73	72	70	
60	84	84	83	83	82	82	81	80	80	79	78	77	75	74	72	71	69	
59	83	83	82	82	81	81	80	79	79	78	77	76	74	73	71	70	68	
58	83	83	82	82	81	81	80	79	79	78	77	76	74	73	71	70	68	
57	82	82	81	81	81	80	79	79	78	77	76	75	74	72	71	69	67	
56	81	81	81	80	80	79	78	78	77	76	75	74	73	71	70	68	66	
55	80	80	80	79	79	78	78	77	76	75	74	73	72	71	69	67	65	
54	80	79	79	78	78	77	77	76	75	74	73	72	71	70	68	66	65	
53	79	78	78	78	77	77	76	75	74	74	72	71	70	69	67	66	64	
52	78	78	77	77	76	76	75	74	74	73	72	71	69	68	66	65	63	
51	77	77	76	76	75	75	74	73	73	72	71	70	69	67	66	64	62	
50	76	76	75	75	75	74	73	73	72	71	70	69	68	66	65	63	61	
49	75	74	74	73	73	72	72	71	70	69	68	67	66	65	63	61	60	
48	74	73	73	72	72	71	71	70	69	68	67	66	65	64	62	60	59	
47	73	73	72	72	71	71	70	69	68	68	67	65	64	63	61	60	58	
46	72	72	71	71	70	70	69	68	68	67	66	65	63	62	60	59	57	
45	71	71	70	70	69	69	68	68	67	66	65	64	63	61	60	58	56	

**Final Examination Scores
Regents Examination in Physical Setting/Earth Science – August 2014 – continued**

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