

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

PHYSICAL SETTING
EARTH SCIENCE

Friday, June 17, 2011 — 1:15 to 4:15 p.m., only

Use your knowledge of Earth science to answer all questions in this examination. Before you begin this examination, you must be provided with the *2010 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. 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 *2010 Edition Reference Tables for Physical Setting/Earth Science* 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.

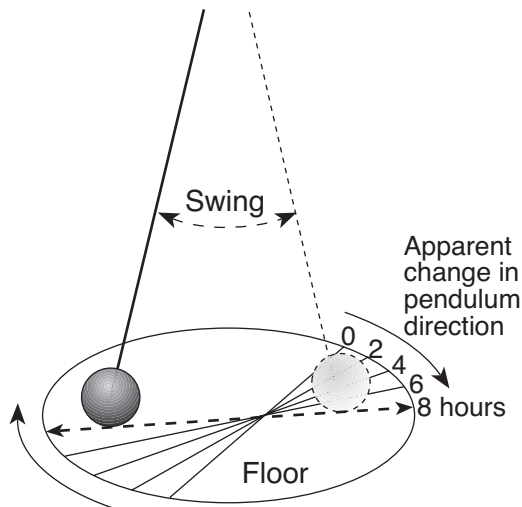
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part.

Directions (1–35): For *each* statement or question, 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 *2010 Edition Reference Tables for Physical Setting/Earth Science*. Record your answers on your separate answer sheet.

- 1 Why do the planets in our solar system have a layered internal structure?
 - (1) All planets cooled rapidly after they formed.
 - (2) The Sun exerts a gravitational force on the planets.
 - (3) Each planet is composed of materials of different densities.
 - (4) Cosmic dust settled in layers on the planets' surfaces.
- 2 The diagram below shows a large pendulum in motion over an 8-hour period.

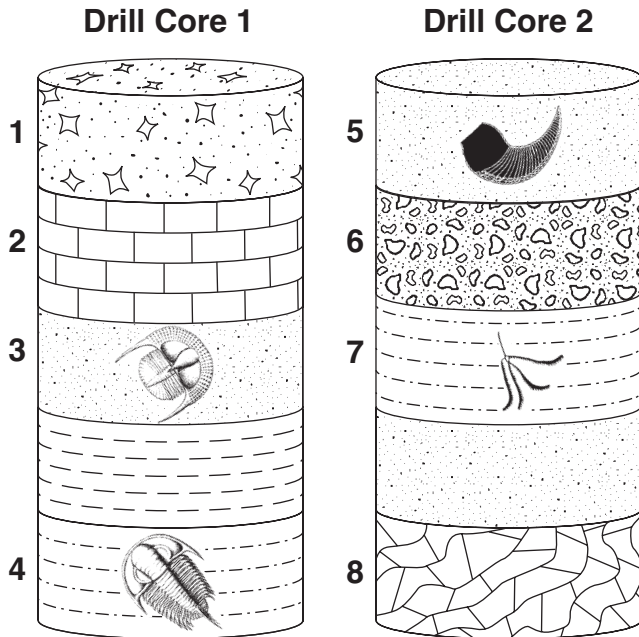


What is the main reason the pendulum appears to change its direction of swing over time?

- (1) tilt of Earth on its axis
 - (2) rotation of Earth on its axis
 - (3) revolution of Earth in its orbit
 - (4) speed of Earth in its orbit
- 3 On which day of the year does the Sun reach the greatest altitude at solar noon in New York City?
 - (1) June 21
 - (2) July 21
 - (3) August 21
 - (4) September 21

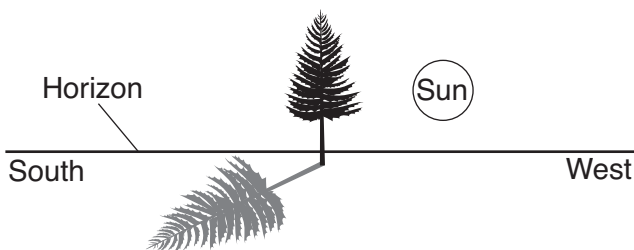
- 4 Cosmic background radiation provides direct evidence for the origin of
 - (1) the universe
 - (2) our solar system
 - (3) Earth's ozone layer
 - (4) Earth's earliest atmosphere
- 5 Planetary winds and ocean currents are deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere due to
 - (1) seasonal changes
 - (2) plate tectonics
 - (3) the Doppler effect
 - (4) the Coriolis effect
- 6 What is the approximate altitude of *Polaris* at Syracuse, New York?
 - (1) 43°
 - (2) 47°
 - (3) 76°
 - (4) 90°
- 7 Most rocks that form from fragmental rock particles are classified as
 - (1) extrusive igneous
 - (2) intrusive igneous
 - (3) clastic sedimentary
 - (4) chemical sedimentary
- 8 Which group of organisms has the shortest record of life on Earth?
 - (1) eurypterids
 - (2) graptolites
 - (3) birds
 - (4) placoderm fish
- 9 What is inferred to be the main source of the free oxygen that first entered Earth's atmosphere?
 - (1) meteorite impacts releasing oxygen
 - (2) oxygen-producing organisms
 - (3) melting of glacial ice into hydrogen and oxygen
 - (4) radioactive decay of rocks containing oxygen

- 10 The drill-core samples below were taken from two locations 1000 kilometers apart. Rock layers 1 through 8 have been labeled. Some index fossils are shown in the layers.



Which numbered layers most likely formed at the same time?

- (1) 1 and 6
 (2) 2 and 8
 (3) 3 and 5
 (4) 4 and 7
- 11 A tree in New York State casts a shadow as shown in the diagram below.



What time of day and season are represented by the diagram?

- (1) early morning in winter
 (2) early morning in summer
 (3) late afternoon in winter
 (4) late afternoon in summer

- 12 Near which two latitudes are most of Earth's major deserts located?

- (1) 0° and 90° N
 (2) 30° S and 60° S
 (3) 30° N and 30° S
 (4) 60° S and 60° N

- 13 How much of an 800-gram sample of potassium-40 will remain after 3.9×10^9 years of radioactive decay?

- (1) 50 grams
 (2) 100 grams
 (3) 200 grams
 (4) 400 grams

- 14 Thin layers of volcanic ash act as excellent time markers in the correlation of bedrock because volcanic ash

- (1) is easily eroded and lasts only a short time on Earth's surface
 (2) stays in the atmosphere for millions of years
 (3) is deposited over millions of years
 (4) falls to Earth over a large area in a short period of time

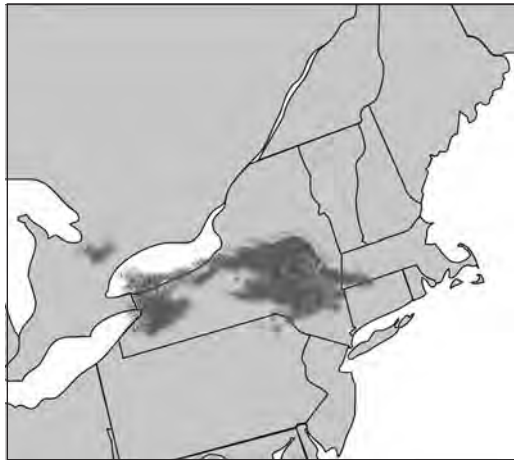
- 15 Evidence indicates that 251 million years ago a mass extinction of many life-forms occurred on Earth. Which form of life became extinct at this time?

- (1) trilobites
 (2) dinosaurs
 (3) mammoths
 (4) eurypterids

- 16 What is the dewpoint when the air temperature is 26°C and the relative humidity is 77%?

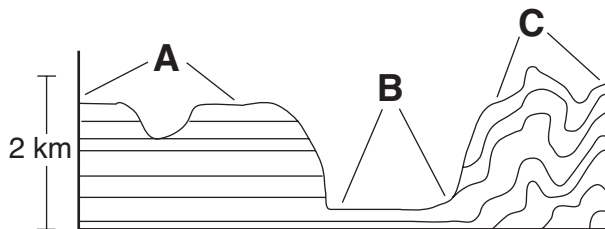
- (1) 3°C
 (2) 20°C
 (3) 22°C
 (4) 23°C

- 17 On the map below, dark-gray areas represent regions of lake-effect snow on a December day.



Which New York State location appears to be experiencing a lake-effect snowstorm?

- (1) New York City (3) Plattsburgh
 (2) Utica (4) Watertown
- 18 The cross section below shows the general bedrock structure of an area containing three different landscape regions, A, B, and C.

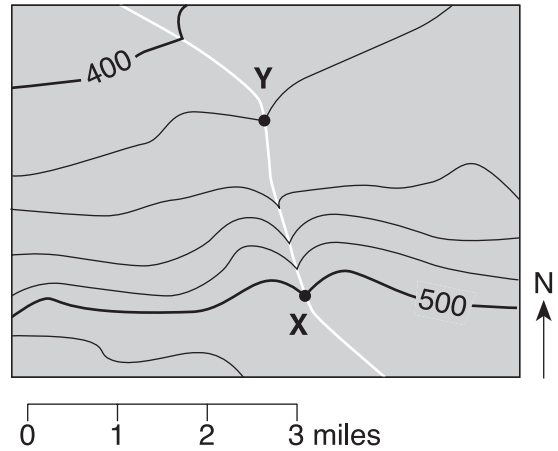


(Not drawn to scale)

Which list correctly identifies the type of landscapes represented by letters A, B, and C?

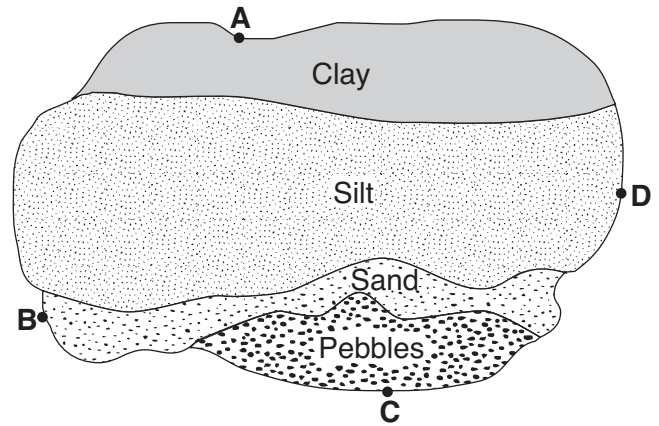
- (1) A = plain, B = plateau, C = mountain
 (2) A = mountain, B = plateau, C = plain
 (3) A = mountain, B = plain, C = plateau
 (4) A = plateau, B = plain, C = mountain
- 19 In New York State, the surface bedrock of the Catskills consists mainly of
- (1) weakly consolidated gravels and sands
 (2) quartzites, dolostones, marbles, and schists
 (3) conglomerates, red sandstones, basalt, and diabase
 (4) limestones, shales, sandstones, and conglomerates

- 20 The topographic map below shows a stream crossing several contour lines and passing through points X and Y. Elevations are measured in feet.



What is the approximate gradient between point X and point Y?

- (1) 10 ft/mi (3) 40 ft/mi
 (2) 20 ft/mi (4) 80 ft/mi
- 21 The map below shows an overhead view of sediments that have accumulated at the bottom of a lake. Points A through D represent locations on the shoreline of the lake.



A river most likely flows into the lake nearest to location

- (1) A (3) C
 (2) B (4) D
- 22 An increase in which gas in Earth's atmosphere will most significantly increase global temperatures?
- (1) methane (3) nitrogen
 (2) oxygen (4) hydrogen

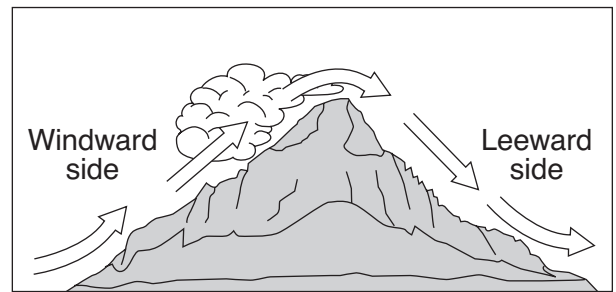
23 The topographic map below shows two hills located in upstate New York.



Which agent of erosion is most responsible for the shape of these hills?

- | | |
|-------------|--------------|
| (1) wind | (3) waves |
| (2) gravity | (4) glaciers |
- 24 During an El Niño event, surface water temperatures increase along the west coast of South America. Which weather changes are likely to occur in this region?
- (1) decreased air temperature and decreased precipitation
 - (2) decreased air temperature and increased precipitation
 - (3) increased air temperature and increased precipitation
 - (4) increased air temperature and decreased precipitation

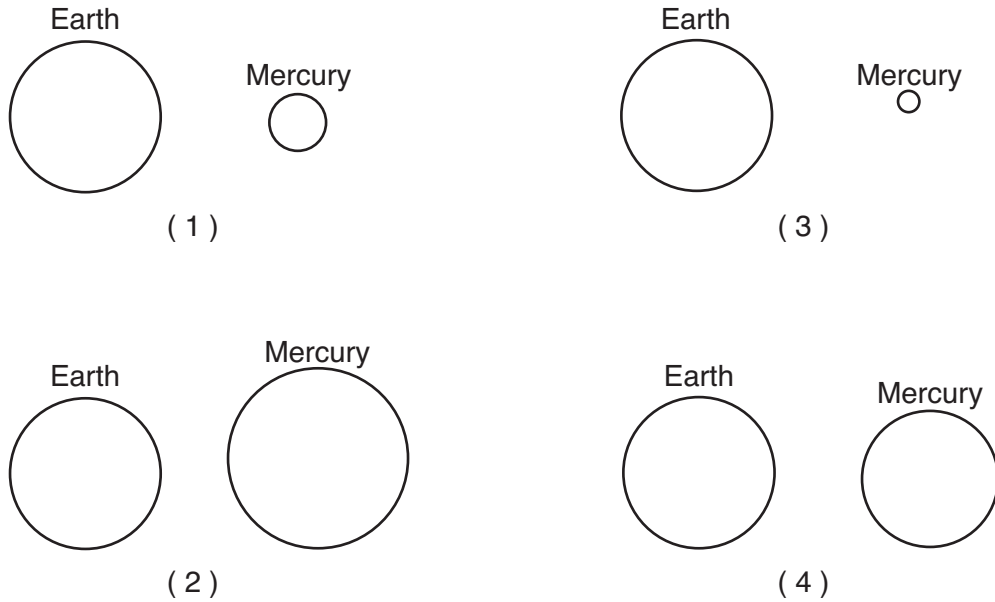
25 The diagram below shows air movement over a mountain.



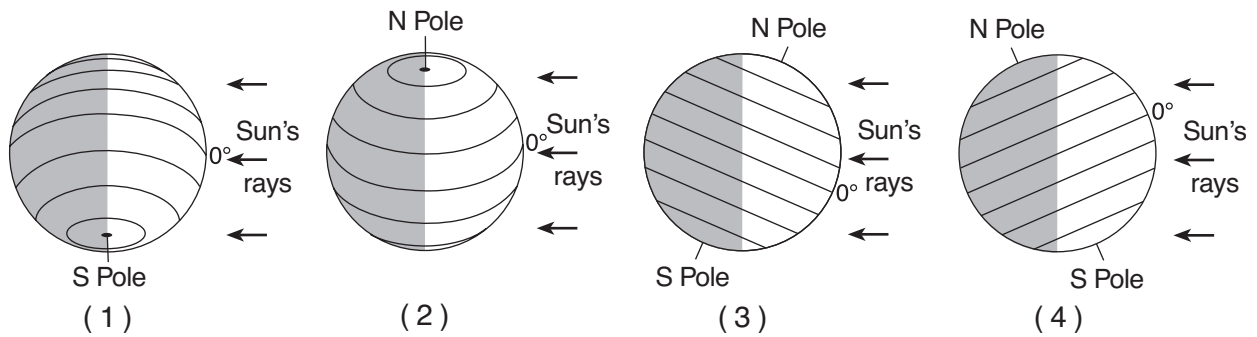
Compared to the climate on the windward side of the mountain, the climate on the leeward side of the mountain is

- (1) drier and warmer
 - (2) drier and cooler
 - (3) more humid and warmer
 - (4) more humid and cooler
- 26 Which factor has the greatest influence on the number of daylight hours that a particular Earth surface location receives?
- (1) longitude
 - (2) latitude
 - (3) diameter of Earth
 - (4) distance from the Sun
- 27 Energy is transferred from *Barnard's Star* to Earth mainly by
- (1) red shifts
 - (2) density currents
 - (3) conduction
 - (4) electromagnetic waves
- 28 A stream's velocity decreases from 100 cm/s to 5 cm/s. Which size sediment particles will still be transported by the stream?
- (1) pebbles, sand, silt, and clay
 - (2) sand, silt, and clay, only
 - (3) silt and clay, only
 - (4) clay, only

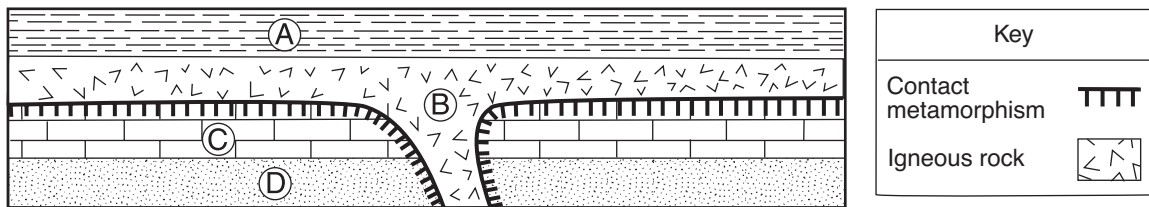
29 Which diagram most accurately represents the relative diameters of Earth and Mercury?



30 Which diagram represents the tilt of Earth's axis relative to the Sun's rays on December 15?



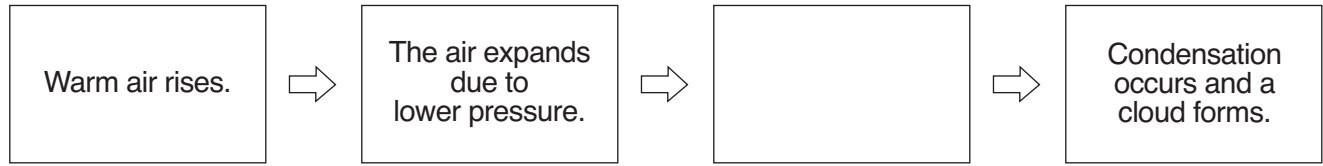
31 The cross section below shows four rock units, A, B, C, and D.



Which rock unit is youngest in age?

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

32 The incomplete flowchart below shows some of the changes that occur in warm air as it rises to form a cloud.



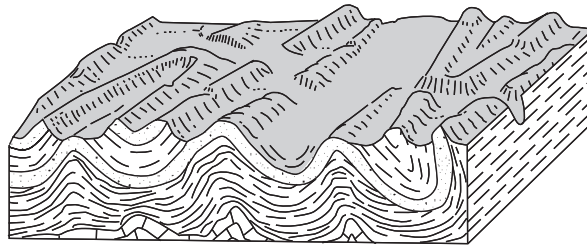
Which statement should be placed in the empty box to accurately complete the flowchart?

- (1) The air warms as it expands.
- (2) The air cools until it reaches the dewpoint.
- (3) The air's relative humidity decreases to zero.
- (4) The air enters the thermosphere.

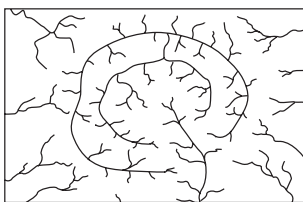
33 The highest surface wind speeds occur when there is a

- (1) 4-millibar air-pressure difference between two nearby locations
- (2) 4-millibar air-pressure difference between two distant locations
- (3) 20-millibar air-pressure difference between two nearby locations
- (4) 20-millibar air-pressure difference between two distant locations

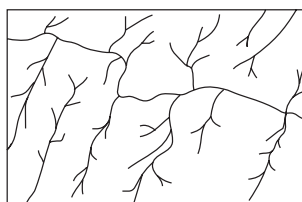
34 The block diagram below shows a portion of Earth's crust.



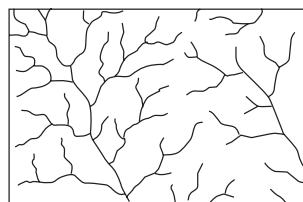
Which stream drainage pattern is most likely present on this crustal surface?



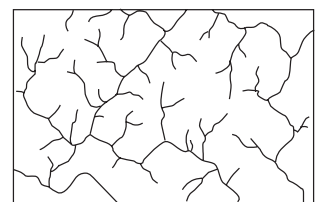
(1)



(2)

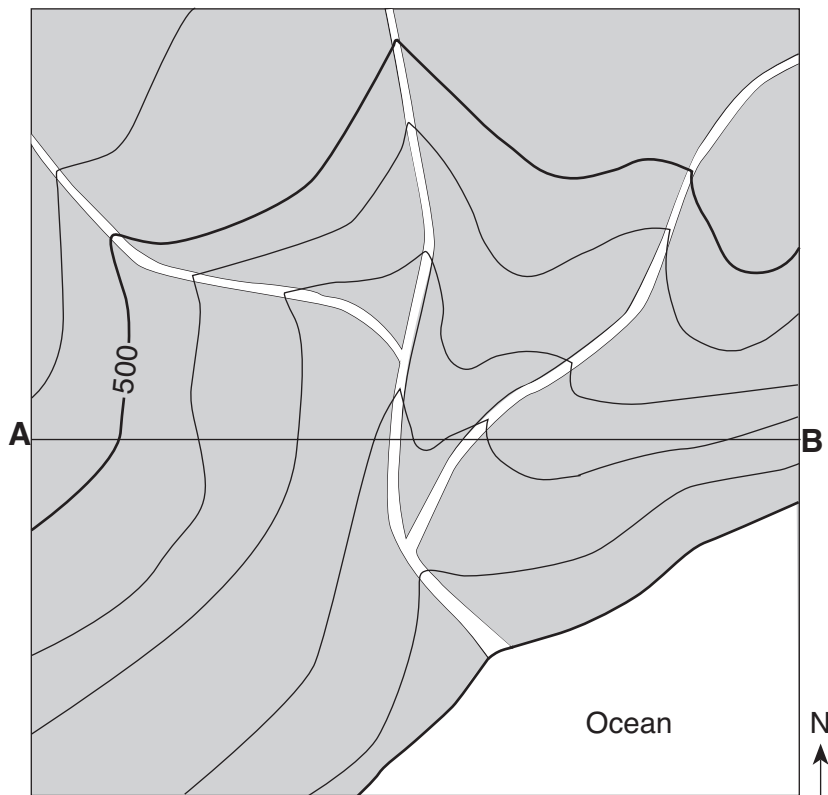


(3)



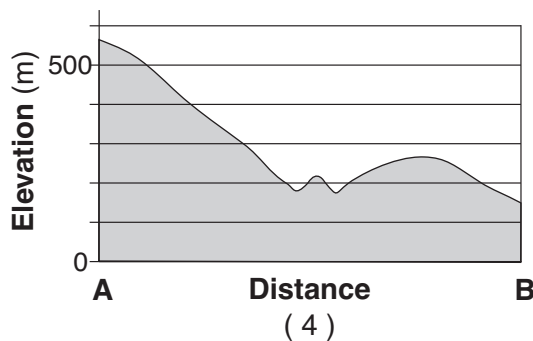
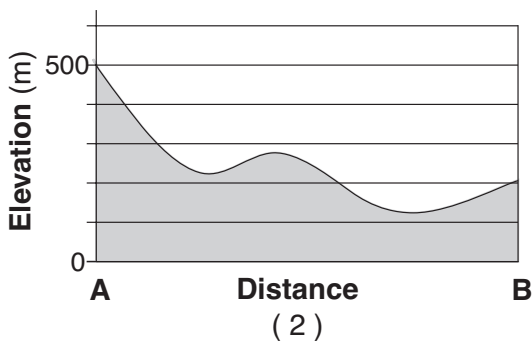
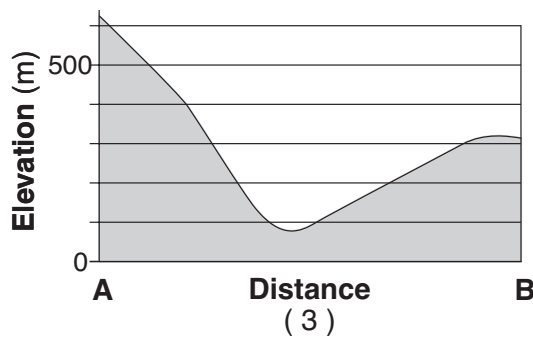
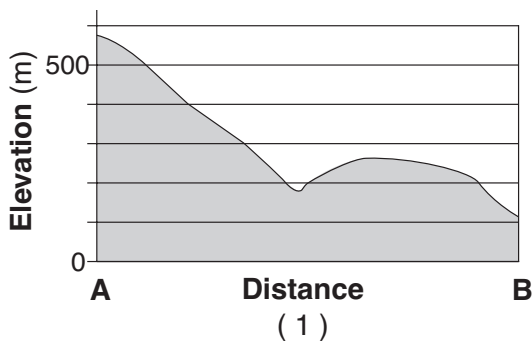
(4)

35 The contour map below shows elevations recorded in meters. Line *AB* is a reference line on the map.



Contour interval = 100 m

Which graph best represents the profile from point A to point B?

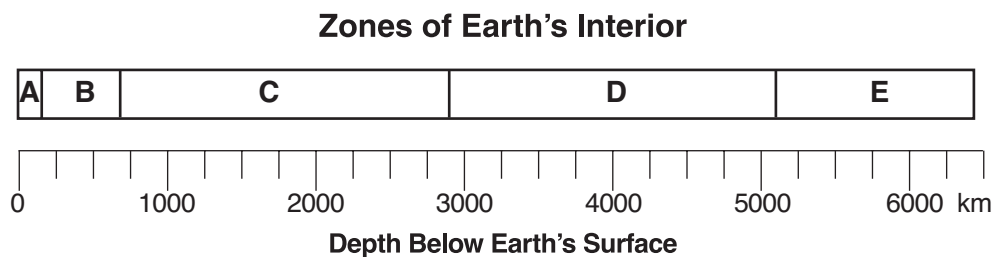


Part B-1

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 2010 Edition Reference Tables for Physical Setting/Earth Science. Record your answers on your separate answer sheet.

Base your answers to questions 36 through 40 on the diagram below, which represents zones of Earth's interior, identified by letters A through E. The scale shows depths below Earth's surface, measured in kilometers.



- 36 The Moho is a boundary located in zone
- (1) A (3) E
(2) B (4) D
- 37 What is the approximate thickness of zone C?
- (1) 650 km (3) 2250 km
(2) 1600 km (4) 2900 km
- 38 Which zone is characterized by partially melted rock and large-scale convection currents?
- (1) zone A (3) zone C
(2) zone B (4) zone E
- 39 Which zone of Earth's interior has a density closest to the densities of the other terrestrial planets?
- (1) zone A (3) zone C
(2) zone E (4) zone D
- 40 S-waves produced by an earthquake are transmitted through zones
- (1) A and B, but not zones C, D, and E (3) C, D, and E, but not zones A and B
(2) A, B, and C, but not zones D and E (4) D and E, but not zones A, B, and C
-

Base your answers to questions 41 through 43 on the data table below, which lists some properties of four minerals that are used as ores of zinc (Zn).

Mineral Property	Mineral			
	Smithsonite	Sphalerite	Willemite	Zincite
Composition	ZnCO ₃	ZnS	Zn ₂ SiO ₄	ZnO
Hardness	4–4.5	3.5–4	5.5	4
Density (g/cm ³)	4.4	4.0	4.0	5.6
Color	white, gray, green, blue, yellow	brown, yellow, red, green, black	white, yellow, green, reddish brown, black	deep red to orange yellow
Streak	white	white to yellow to brown	white	orange yellow

41 A mineral with a hardness of 5 would scratch

- (1) all four zinc minerals in the table
- (2) zincite, but not sphalerite, smithsonite, or willemite
- (3) zincite and sphalerite, but not smithsonite or willemite
- (4) zincite, sphalerite, and smithsonite, but not willemite

42 A sample of sphalerite has a mass of 176.0 grams. What is the volume of the sample?

- (1) 22.7 cm³
- (2) 31.4 cm³
- (3) 40.0 cm³
- (4) 44.0 cm³

43 Which mineral belongs in the same mineral group as quartz and olivine?

- (1) zincite
- (2) willemite
- (3) sphalerite
- (4) smithsonite

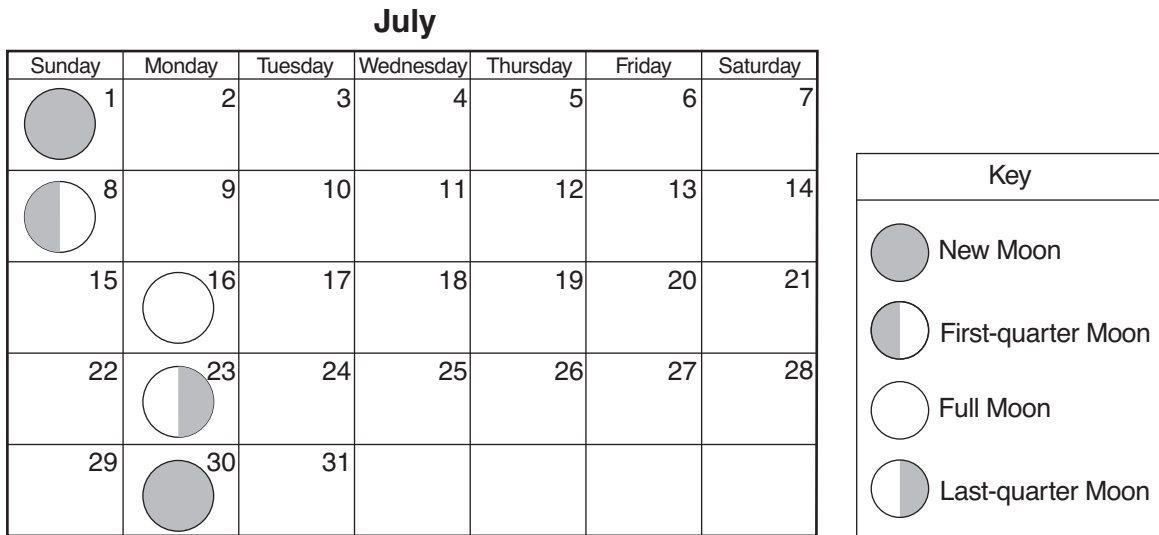
Base your answers to questions 44 through 46 on the map below, which shows a portion of the continent of North America and outlines the Mississippi River watershed. Points *A*, *B*, *C*, *D*, and *E* represent locations on Earth's surface.



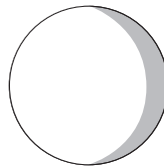
Key	
—	Mississippi watershed boundary

- 44 At which location would the Mississippi River's discharge most likely be the greatest?
- | | |
|--------------|--------------|
| (1) <i>A</i> | (3) <i>C</i> |
| (2) <i>B</i> | (4) <i>D</i> |
- 45 Sediments deposited by the river at location *B* are best described as
- | | |
|----------------------------|------------------------------|
| (1) sorted and layered | (3) unsorted and layered |
| (2) sorted and not layered | (4) unsorted and not layered |
- 46 Which landform is produced at location *E* where the Mississippi River enters the Gulf of Mexico?
- | | |
|---------------|----------------------|
| (1) a drumlin | (3) an escarpment |
| (2) a delta | (4) an outwash plain |

Base your answers to questions 47 through 50 on the calendar below, which shows the month of July of a recent year. The dates of major Moon phases, as seen in New York State, are shown.



47 The diagram below represents the phase of the Moon observed from New York State one night during the month of July.



On which date was this phase of the Moon visible from New York State?

- (1) July 4
- (3) July 19
- (2) July 11
- (4) July 26

48 On which date will the next first-quarter Moon phase occur?

- (1) August 6
- (3) August 16
- (2) August 10
- (4) August 22

49 Eclipses do *not* occur every month because the Moon's

- (1) rate of rotation is 15° each hour
- (2) orbit is inclined to Earth's orbit
- (3) period of revolution is 27.3 days
- (4) period of rotation and period of revolution are the same

50 Why does the Moon's gravity have a greater effect on Earth's ocean tides than the Sun's gravity?

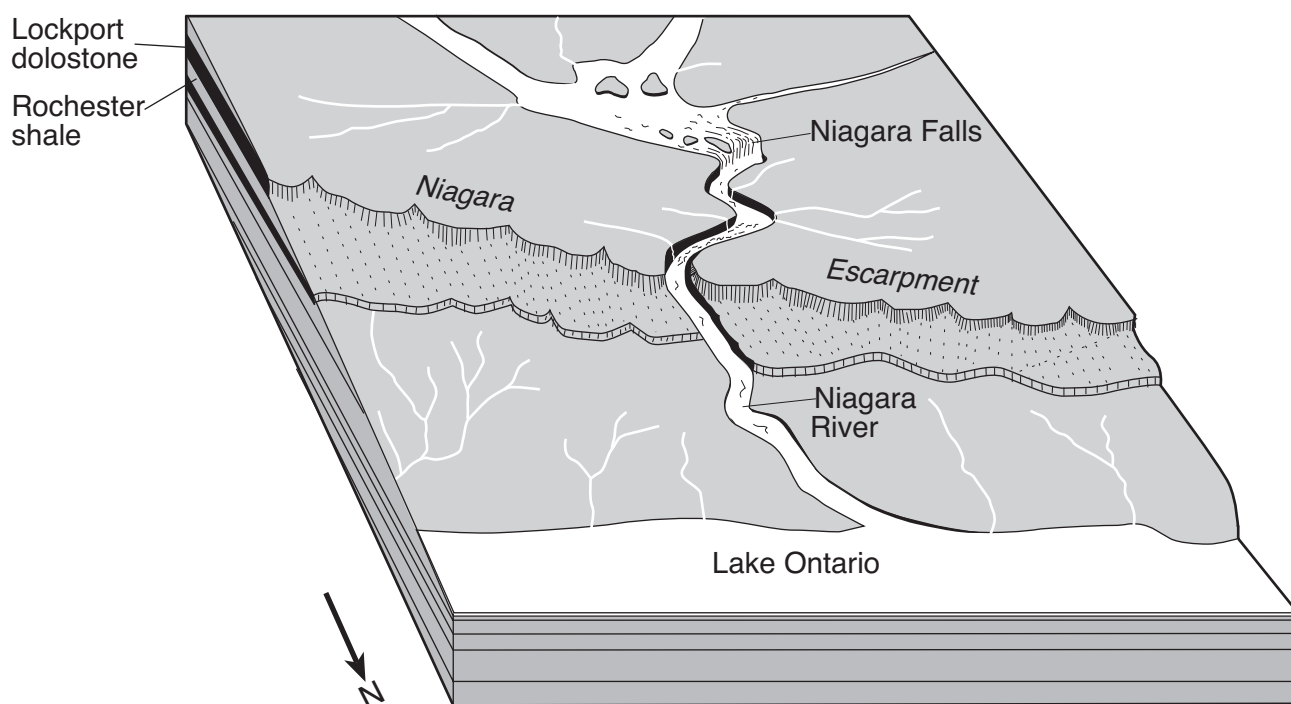
- (1) The Sun is composed mostly of gases.
- (2) The Sun's gravity influences more planets.
- (3) The Moon has a greater mass.
- (4) The Moon is much closer to Earth.

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 *2010 Edition Reference Tables for Physical Setting/Earth Science*.

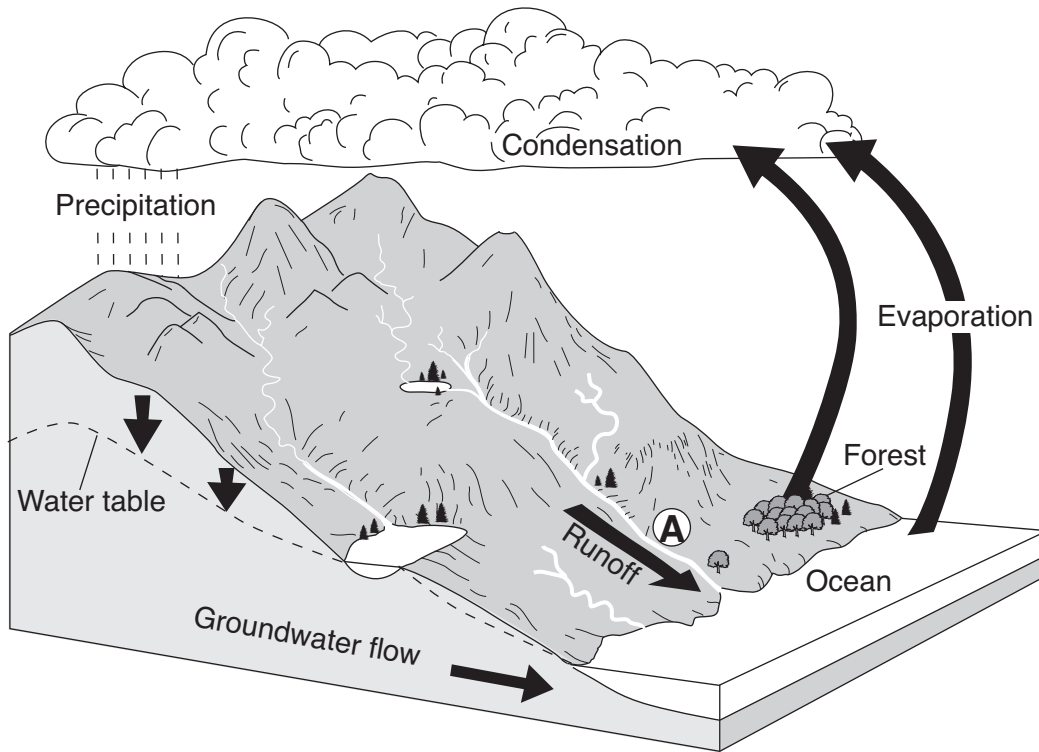
Base your answers to questions 51 and 52 on the block diagram and information below. The diagram is of the Niagara Falls region as viewed from the north.



The Niagara River began to flow over the Niagara Escarpment about 12,000 years ago when the last Pleistocene ice sheet melted and retreated north from the Niagara Escarpment. Since that time, Niagara Falls has eroded upriver, leaving a deep, steep-sided valley that is 11,000 meters long. The top bedrock layer of the escarpment is the Lockport dolostone which lies above the Rochester shale. The shale is more easily weathered than the dolostone. This causes the dolostone to be undercut. As a result, the dolostone breaks off in large blocks that tumble to the base of Niagara Falls.

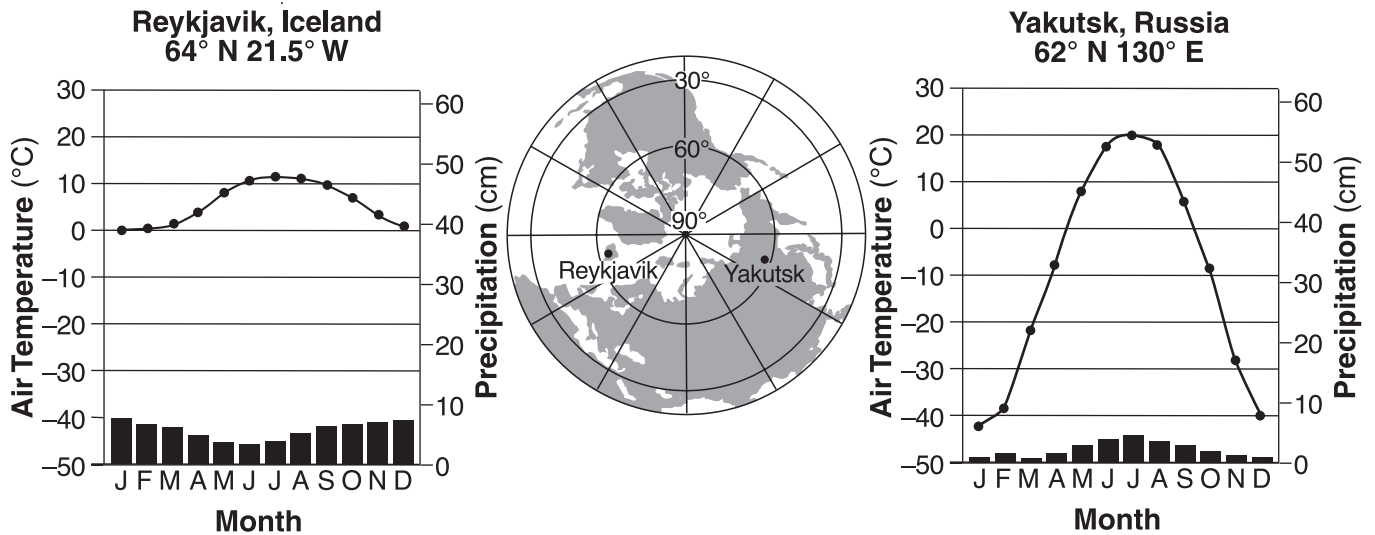
- 51 In which New York State landscape region is Niagara Falls located? [1]
- 52 Toward which compass direction is the location of Niagara Falls likely to move in the future? [1]
-

Base your answers to questions 53 through 55 on the diagram below, which represents Earth's water cycle. The arrows represent some water cycle processes. Letter A indicates a surface location on Earth.



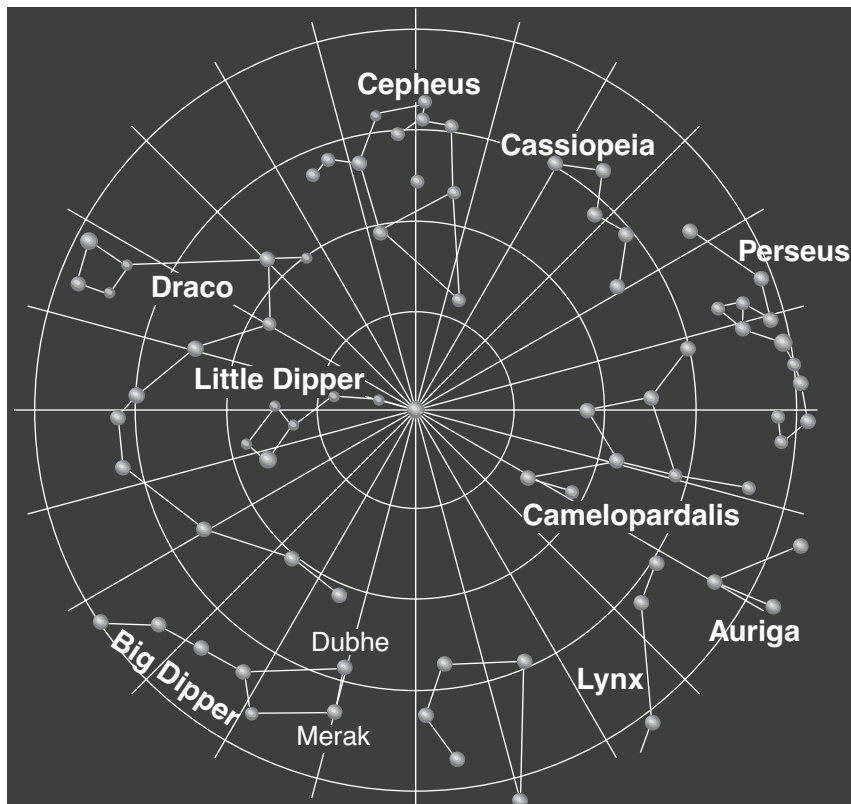
- 53 Other than evaporation, which water cycle process transfers large amounts of water vapor into the atmosphere from the forest? [1]
- 54 Describe *one* surface condition change at location A that would *decrease* the rate of runoff. [1]
- 55 How many joules (J) of heat energy are released by each gram of water vapor that condenses to form cloud droplets? [1]
-

Base your answers to questions 56 through 59 on the graphs and map below. The map shows a view of Earth from above the North Pole. Points on the map indicate the positions of Reykjavik, Iceland, and Yakutsk, Russia. The graphs show average monthly air temperature (line graphs) and amount of precipitation (bar graphs) for both locations.



- 56 Write the two-letter weather map symbol for an air mass that originates over Yakutsk. [1]
- 57 Explain why Reykjavik has cooler summers and warmer winters than Yakutsk. [1]
- 58 Describe *one* way the yearly precipitation in Yakutsk differs from that in Reykjavik. [1]
- 59 Identify *one* warm and *one* cool ocean current that affect the climate of Iceland. [1]
-

Base your answers to questions 60 through 65 on the star chart below, which shows the locations of several constellations visible in the night sky. These constellations appear to move counterclockwise around the star in the center of the chart. Straight lines are at 15-degree intervals. *Merak* and *Dubhe* are two stars in the Big Dipper.



(Not drawn to scale)

- 60 Identify the star located in the center of this star chart. [1]
- 61 How many degrees would the star directly below the “ss” in Cassiopeia appear to move in 3 hours? [1]
- 62 Which Earth motion causes the apparent daily movement of these constellations? [1]
- 63 Complete the table *in your answer booklet* by identifying the classification of the star *Dubhe*. The classification for the star *Merak* has been provided as an example. [1]
- 64 The stars *Merak* and *Dubhe* are located within the same galaxy as our Sun. Identify the galaxy in which these stars are located. [1]
- 65 On the chart of the night sky *in your answer booklet*, place an **X** to indicate the location of the Big Dipper at the same time of night 6 months later. [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 *2010 Edition Reference Tables for Physical Setting/Earth Science*.

Base your answers to questions 66 through 68 on the table below, which shows information about five large objects in the Kuiper Belt. The Kuiper Belt is located approximately 30 to 1000 astronomical units (AU) from the Sun. An astronomical unit is the average distance between Earth and the Sun, 149.6 million kilometers.

Kuiper Belt Data

Kuiper Belt Objects	Orbit Characteristics			Approximate Equatorial Diameter (km)
	Closest Distance to the Sun (AU)	Farthest Distance from the Sun (AU)	Eccentricity	
Varuna	40.47	45.13	0.053	900
Eris	37.77	97.56	0.442	2400
Quaoar	41.92	45.28	0.039	1260
Sedna	76.15	975.05	0.855	1500
Ixion	30.04	49.36	0.243	1065

66 The diagram *in your answer booklet* shows the orbits of some of the planets in our solar system. The approximate average distances from the Sun, in astronomical units, are indicated. On the diagram, place an **X** to show the closest distance of Ixion to the Sun. [1]

67 On the graph *in your answer booklet*, construct a bar graph of the equatorial diameter of each of the Kuiper Belt objects listed in the table. The diameter of Earth's Moon has been graphed for comparison. [1]

68 Identify the Kuiper Belt object with the longest period of revolution and state the evidence that supports that conclusion. [1]

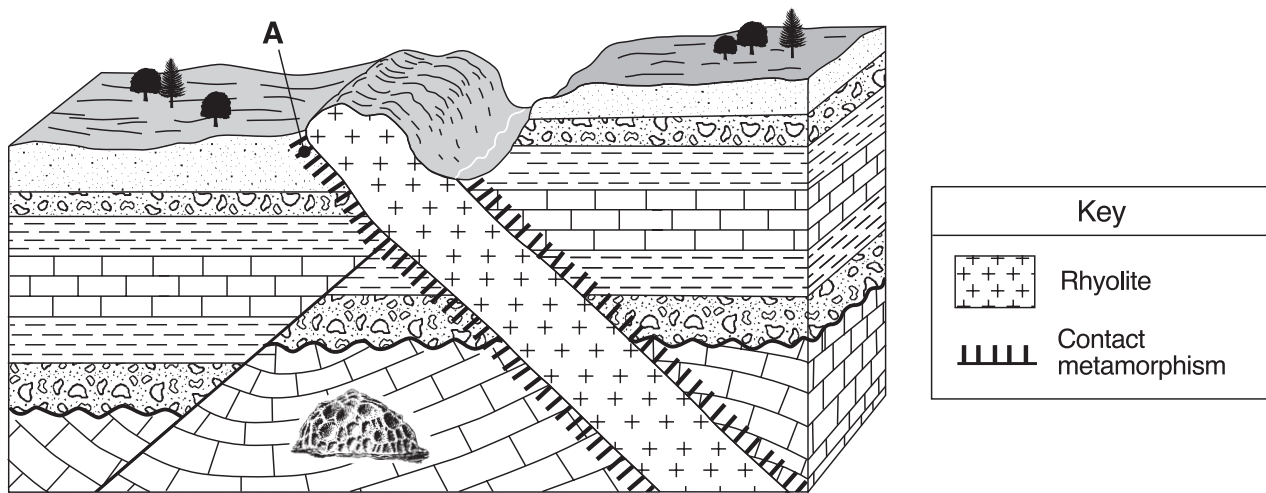
69 On the weather station model *in your answer booklet*, using the proper format, record the *four* weather conditions shown below. [1]

Dewpoint: 48°F
Air pressure: 998.3 mb
Wind: from the southeast
Wind speed: 10 knots

Base your answers to questions 70 through 74 on the two maps in your answer booklet. Map 1 shows air temperatures in the United States and Mexico, recorded in °F, at the points shown on the map. Map 2 shows the location of a low-pressure system at the time these air temperatures were measured. An occluded front extends from the center of the low-pressure system (L) to point A. Lines AB and AC are two other frontal boundaries. Two air masses are shown. The storm system later moved toward New York State and produced an ice storm.

- 70 On map 1 in your answer booklet, draw the 32°F isotherm. [1]
- 71 On map 2 in your answer booklet, draw weather front symbols on the correct sides of both line AB and line AC to show the most probable type and direction of movement of each front. [1]
- 72 Describe the general surface wind pattern associated with the low-pressure system shown on map 2. [1]
- 73 Explain what caused the center of this low-pressure system to move toward New York State. [1]
- 74 State *one* action New York State residents should have taken to prepare for the approaching ice storm. [1]

Base your answers to questions 75 through 79 on the block diagram below, which shows rock units that have not been overturned. Point A is located in the zone of contact metamorphism. A New York State index fossil is shown in one of the rock units.



(Not drawn to scale)

- 75 State the evidence shown by the block diagram that supports the inference that the fault is older than the rhyolite. [1]
- 76 Identify the geologic time period when the index fossil shown in the block diagram was a living organism. [1]
- 77 Identify the crystal size of the minerals in rhyolite and explain what this size indicates about the rate of cooling of the magma from which it formed. [1]
- 78 Identify the metamorphic rock that most likely formed at point A. [1]
- 79 Describe *one* piece of evidence that would indicate that the valley shown on the surface of the block diagram had been eroded and deepened by a glacier. [1]

Base your answers to questions 80 through 85 on the passage and map below. The map shows the volcanic island, Krakatau, before and after the 1883 eruption.

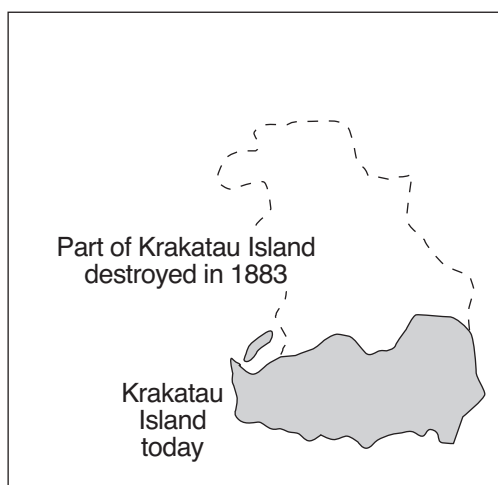
Krakatau

On August 27, 1883, one of the largest volcanic eruptions ever recorded in history occurred. Krakatau, a volcanic island nearly 800 meters in height, located at 6° S 105.5° E, exploded. Two-thirds of the island was destroyed by the blast. Blocks of pumice produced by the eruption were found floating in the ocean for months afterward.

Tsunamis produced by the eruption reached heights of 40 meters as they came ashore on nearby islands. These destructive waves traveled 6360 kilometers in just 12 hours. Over 36,000 people died and 165 coastal villages were destroyed.

Volcanic ash was blasted into the atmosphere to heights between 36 and 48 kilometers. Global temperatures cooled as the ash traveled on air currents around the world.

Volcanic Island of Krakatau



- 80 The diagram *in your answer booklet* shows where Krakatau formed, then exploded. Draw *one* arrow on *each* lithospheric plate to show the relative direction that both plates are moving to produce this type of volcano. [1]
- 81 The diagram *in your answer booklet* represents an average size person standing next to a tall building. Draw a horizontal line across the building to show the maximum height of the tsunami waves produced by the 1883 eruption of Krakatau. [1]
- 82 Determine the rate the tsunamis traveled across the ocean. Label your answer with the correct units. [1]
- 83 Identify the layer of the atmosphere into which the highest volcanic ash was blasted from the Krakatau eruption. [1]
- 84 Explain how the volcanic ash from the Krakatau eruption caused global temperatures to decrease. [1]
- 85 Describe the texture and density of pumice that allowed the blocks of pumice to float on the ocean. [1]
-

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

PHYSICAL SETTING
EARTH SCIENCE

Friday, June 17, 2011 — 1:15 to 4:15 p.m., only

Use your knowledge of Earth science to answer all questions in this examination. Before you begin this examination, you must be provided with the *2010 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. 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 *2010 Edition Reference Tables for Physical Setting/Earth Science* 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

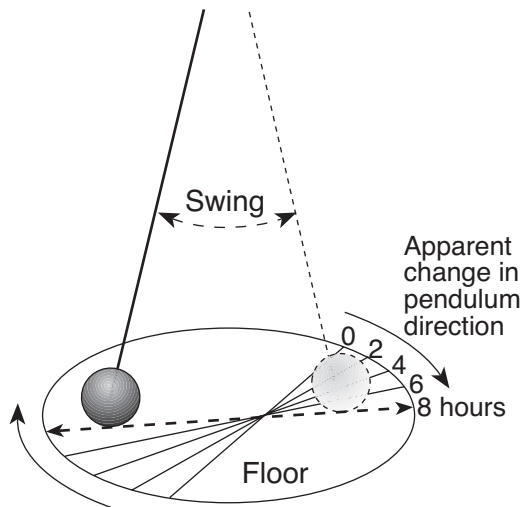
Answer all questions in this part.

Directions (1–35): For each statement or question, 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 2010 Edition Reference Tables for Physical Setting/Earth Science. Record your answers on your separate answer sheet.

1 Why do the planets in our solar system have a layered internal structure?

- (1) All planets cooled rapidly after they formed.
- (2) The Sun exerts a gravitational force on the planets.
- (3) Each planet is composed of materials of different densities.
- (4) Cosmic dust settled in layers on the planets' surfaces.

2 The diagram below shows a large pendulum in motion over an 8-hour period.



What is the main reason the pendulum appears to change its direction of swing over time?

- (1) tilt of Earth on its axis
 - (2) rotation of Earth on its axis
 - (3) revolution of Earth in its orbit
 - (4) speed of Earth in its orbit
- 3 On which day of the year does the Sun reach the greatest altitude at solar noon in New York City?
- (1) June 21
 - (2) July 21
 - (3) August 21
 - (4) September 21

4 Cosmic background radiation provides direct evidence for the origin of

- (1) the universe
- (2) our solar system
- (3) Earth's ozone layer
- (4) Earth's earliest atmosphere

5 Planetary winds and ocean currents are deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere due to

- (1) seasonal changes
- (2) plate tectonics
- (3) the Doppler effect
- (4) the Coriolis effect

6 What is the approximate altitude of *Polaris* at Syracuse, New York?

- (1) 43°
- (2) 47°
- (3) 76°
- (4) 90°

7 Most rocks that form from fragmental rock particles are classified as

- (1) extrusive igneous
- (2) intrusive igneous
- (3) clastic sedimentary
- (4) chemical sedimentary

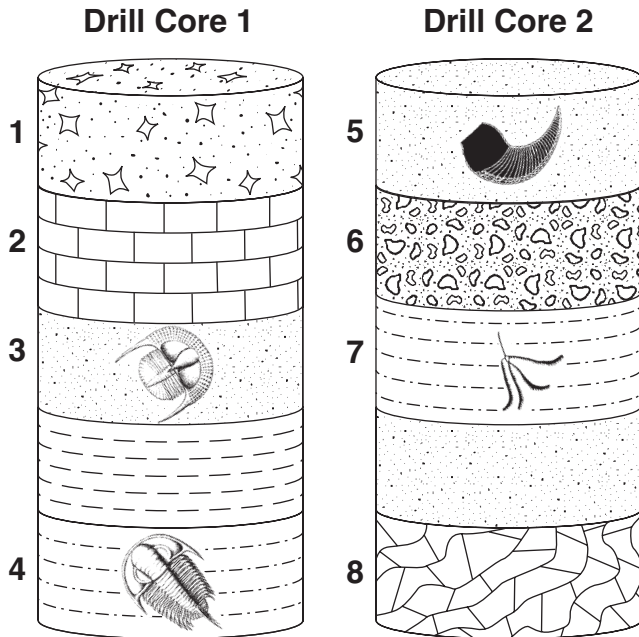
8 Which group of organisms has the shortest record of life on Earth?

- (1) eurypterids
- (2) graptolites
- (3) birds
- (4) placoderm fish

9 What is inferred to be the main source of the free oxygen that first entered Earth's atmosphere?

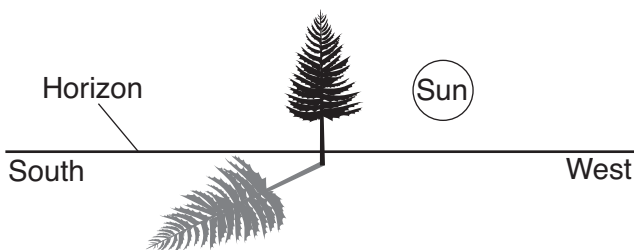
- (1) meteorite impacts releasing oxygen
- (2) oxygen-producing organisms
- (3) melting of glacial ice into hydrogen and oxygen
- (4) radioactive decay of rocks containing oxygen

- 10 The drill-core samples below were taken from two locations 1000 kilometers apart. Rock layers 1 through 8 have been labeled. Some index fossils are shown in the layers.



Which numbered layers most likely formed at the same time?

- (1) 1 and 6 (3) 3 and 5
 (2) 2 and 8 (4) 4 and 7
- 11 A tree in New York State casts a shadow as shown in the diagram below.



What time of day and season are represented by the diagram?

- (1) early morning in winter
 (2) early morning in summer
 (3) late afternoon in winter
 (4) late afternoon in summer

- 12 Near which two latitudes are most of Earth's major deserts located?

- (1) 0° and 90° N (3) 30° N and 30° S
 (2) 30° S and 60° S (4) 60° S and 60° N

- 13 How much of an 800-gram sample of potassium-40 will remain after 3.9×10^9 years of radioactive decay?

- (1) 50 grams (3) 200 grams
 (2) 100 grams (4) 400 grams

- 14 Thin layers of volcanic ash act as excellent time markers in the correlation of bedrock because volcanic ash

- (1) is easily eroded and lasts only a short time on Earth's surface
 (2) stays in the atmosphere for millions of years
 (3) is deposited over millions of years
 (4) falls to Earth over a large area in a short period of time

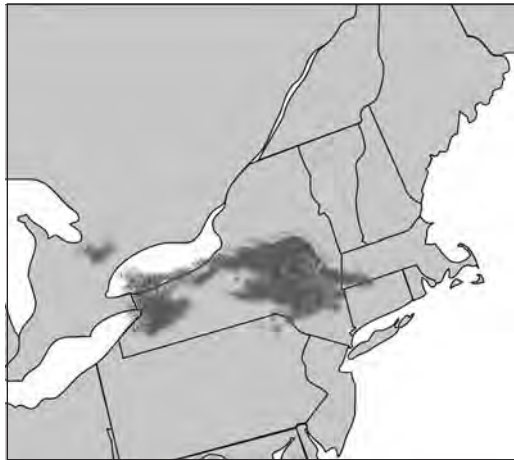
- 15 Evidence indicates that 251 million years ago a mass extinction of many life-forms occurred on Earth. Which form of life became extinct at this time?

- (1) trilobites (3) mammoths
 (2) dinosaurs (4) eurypterids

- 16 What is the dewpoint when the air temperature is 26°C and the relative humidity is 77%?

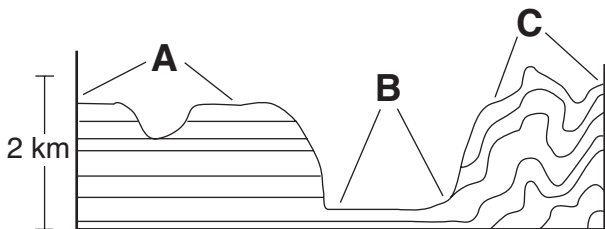
- (1) 3°C (3) 22°C
 (2) 20°C (4) 23°C

- 17 On the map below, dark-gray areas represent regions of lake-effect snow on a December day.



Which New York State location appears to be experiencing a lake-effect snowstorm?

- (1) New York City (3) Plattsburgh
 (2) Utica (4) Watertown
- 18 The cross section below shows the general bedrock structure of an area containing three different landscape regions, A, B, and C.

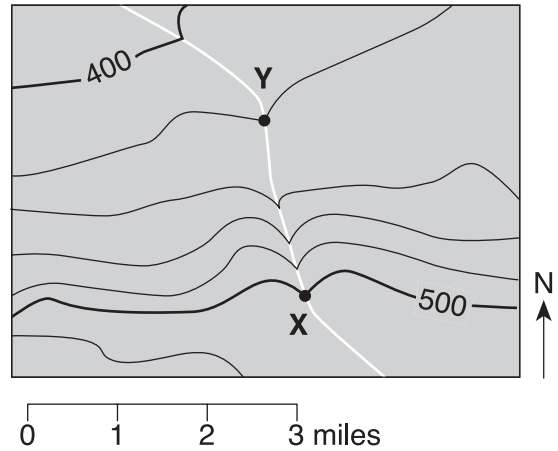


(Not drawn to scale)

Which list correctly identifies the type of landscapes represented by letters A, B, and C?

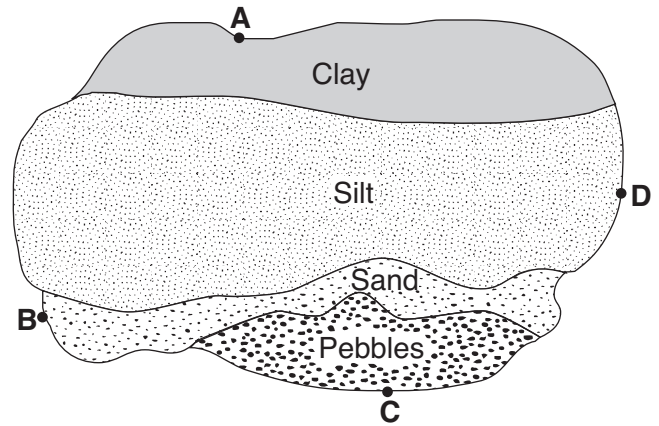
- (1) A = plain, B = plateau, C = mountain
 (2) A = mountain, B = plateau, C = plain
 (3) A = mountain, B = plain, C = plateau
 (4) A = plateau, B = plain, C = mountain
- 19 In New York State, the surface bedrock of the Catskills consists mainly of
- (1) weakly consolidated gravels and sands
 (2) quartzites, dolostones, marbles, and schists
 (3) conglomerates, red sandstones, basalt, and diabase
 (4) limestones, shales, sandstones, and conglomerates

- 20 The topographic map below shows a stream crossing several contour lines and passing through points X and Y. Elevations are measured in feet.



What is the approximate gradient between point X and point Y?

- (1) 10 ft/mi (3) 40 ft/mi
 (2) 20 ft/mi (4) 80 ft/mi
- 21 The map below shows an overhead view of sediments that have accumulated at the bottom of a lake. Points A through D represent locations on the shoreline of the lake.



A river most likely flows into the lake nearest to location

- (1) A (3) C
 (2) B (4) D
- 22 An increase in which gas in Earth's atmosphere will most significantly increase global temperatures?
- (1) methane (3) nitrogen
 (2) oxygen (4) hydrogen

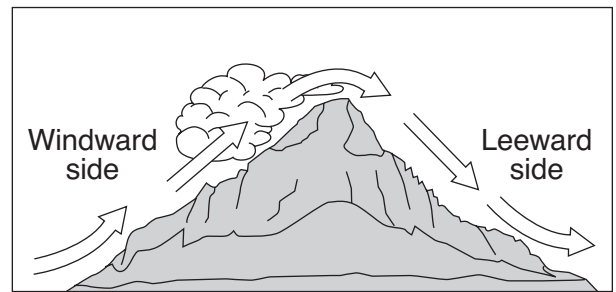
23 The topographic map below shows two hills located in upstate New York.



Which agent of erosion is most responsible for the shape of these hills?

- | | |
|-------------|--------------|
| (1) wind | (3) waves |
| (2) gravity | (4) glaciers |
- 24 During an El Niño event, surface water temperatures increase along the west coast of South America. Which weather changes are likely to occur in this region?
- (1) decreased air temperature and decreased precipitation
 - (2) decreased air temperature and increased precipitation
 - (3) increased air temperature and increased precipitation
 - (4) increased air temperature and decreased precipitation

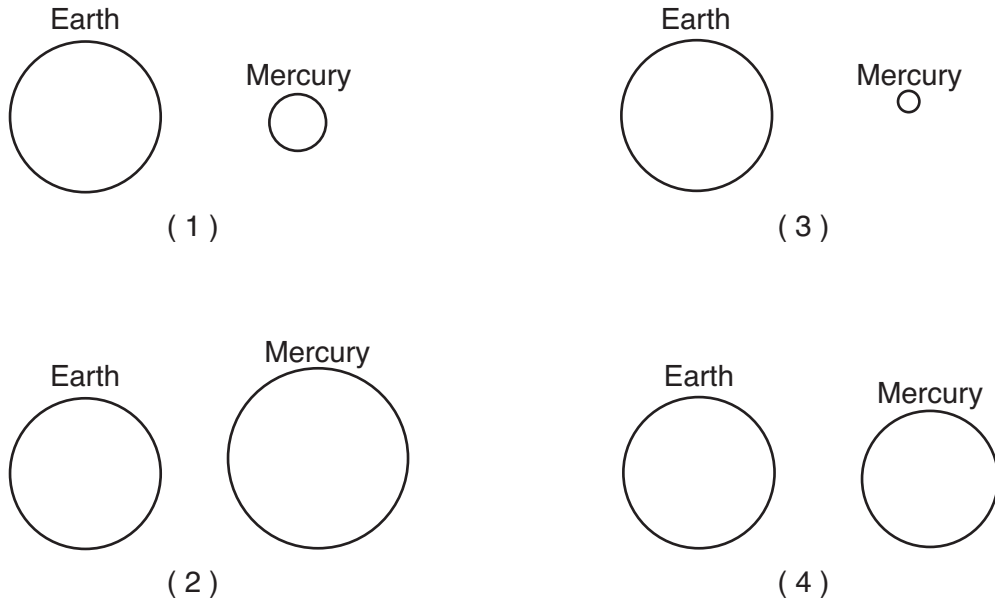
25 The diagram below shows air movement over a mountain.



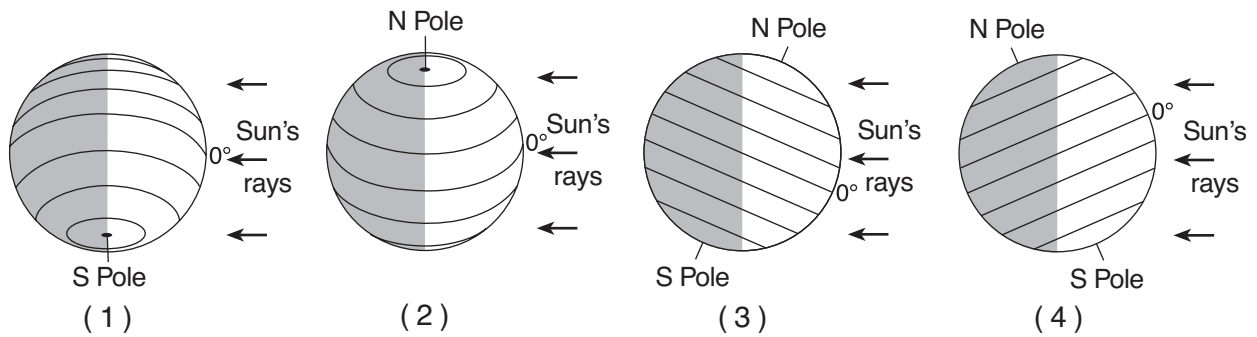
Compared to the climate on the windward side of the mountain, the climate on the leeward side of the mountain is

- (1) drier and warmer
 - (2) drier and cooler
 - (3) more humid and warmer
 - (4) more humid and cooler
- 26 Which factor has the greatest influence on the number of daylight hours that a particular Earth surface location receives?
- (1) longitude
 - (2) latitude
 - (3) diameter of Earth
 - (4) distance from the Sun
- 27 Energy is transferred from *Barnard's Star* to Earth mainly by
- (1) red shifts
 - (2) density currents
 - (3) conduction
 - (4) electromagnetic waves
- 28 A stream's velocity decreases from 100 cm/s to 5 cm/s. Which size sediment particles will still be transported by the stream?
- (1) pebbles, sand, silt, and clay
 - (2) sand, silt, and clay, only
 - (3) silt and clay, only
 - (4) clay, only

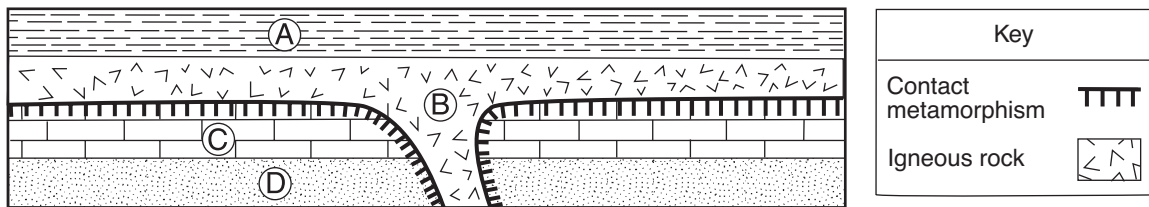
29 Which diagram most accurately represents the relative diameters of Earth and Mercury?



30 Which diagram represents the tilt of Earth's axis relative to the Sun's rays on December 15?



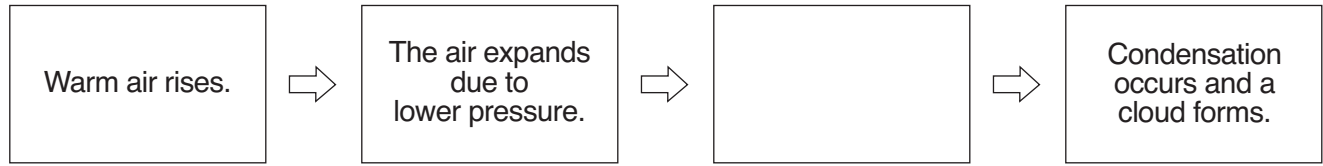
31 The cross section below shows four rock units, A, B, C, and D.



Which rock unit is youngest in age?

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

32 The incomplete flowchart below shows some of the changes that occur in warm air as it rises to form a cloud.



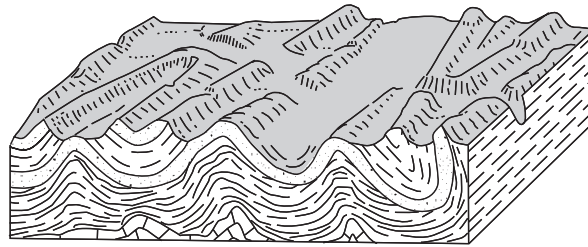
Which statement should be placed in the empty box to accurately complete the flowchart?

- (1) The air warms as it expands.
- (2) The air cools until it reaches the dewpoint.
- (3) The air's relative humidity decreases to zero.
- (4) The air enters the thermosphere.

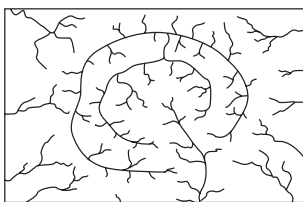
33 The highest surface wind speeds occur when there is a

- (1) 4-millibar air-pressure difference between two nearby locations
- (2) 4-millibar air-pressure difference between two distant locations
- (3) 20-millibar air-pressure difference between two nearby locations
- (4) 20-millibar air-pressure difference between two distant locations

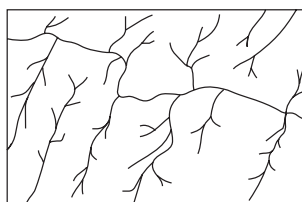
34 The block diagram below shows a portion of Earth's crust.



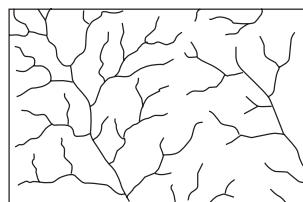
Which stream drainage pattern is most likely present on this crustal surface?



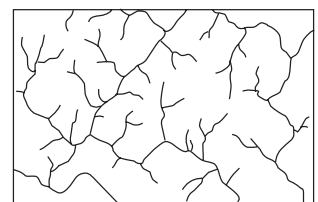
(1)



(2)

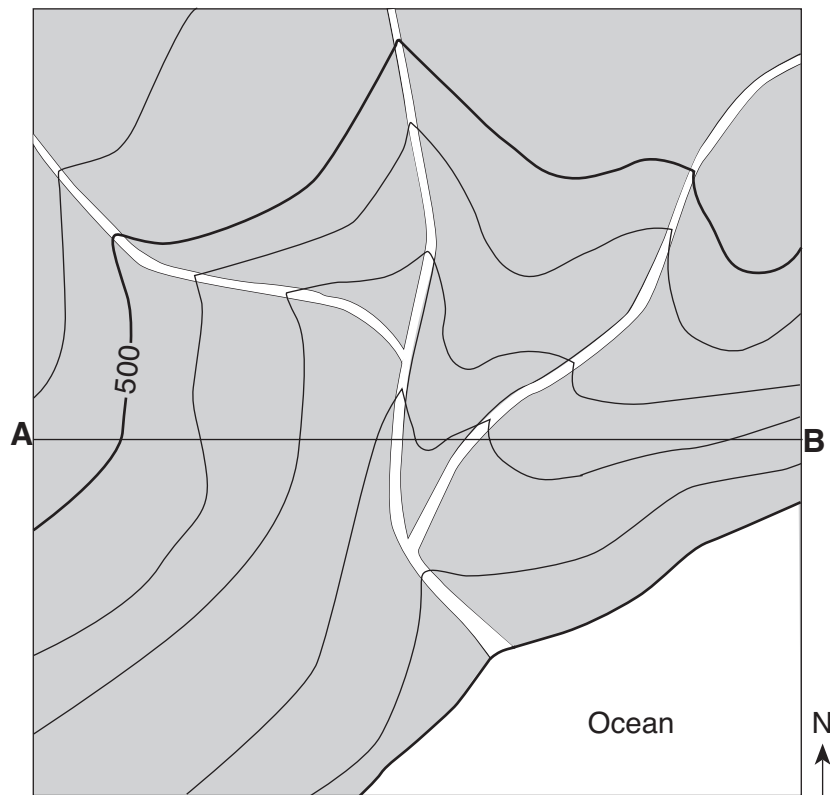


(3)



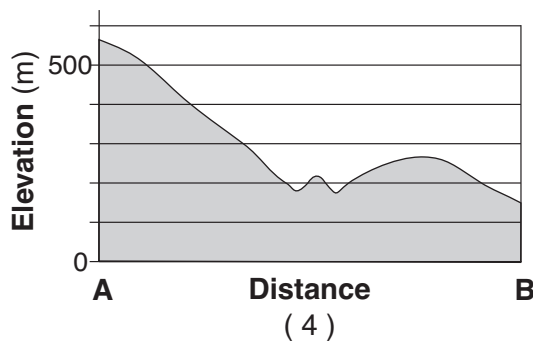
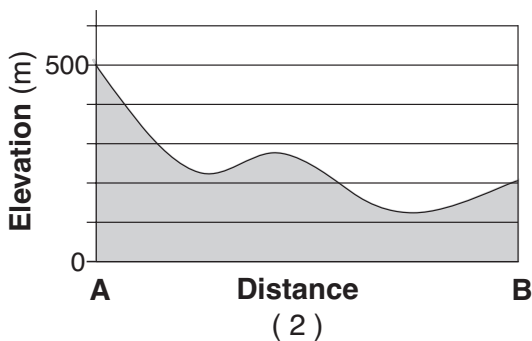
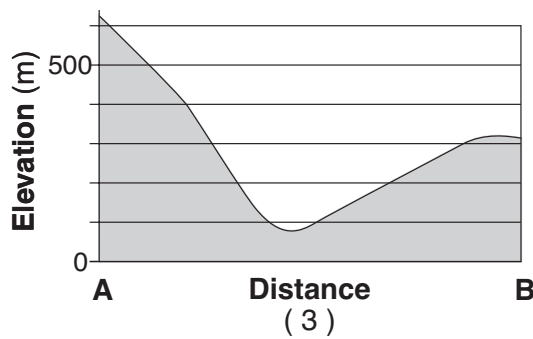
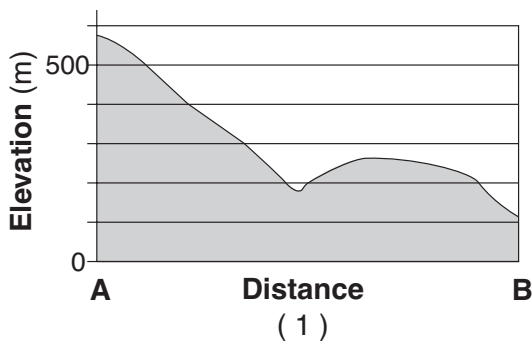
(4)

35 The contour map below shows elevations recorded in meters. Line *AB* is a reference line on the map.



Contour interval = 100 m

Which graph best represents the profile from point A to point B?

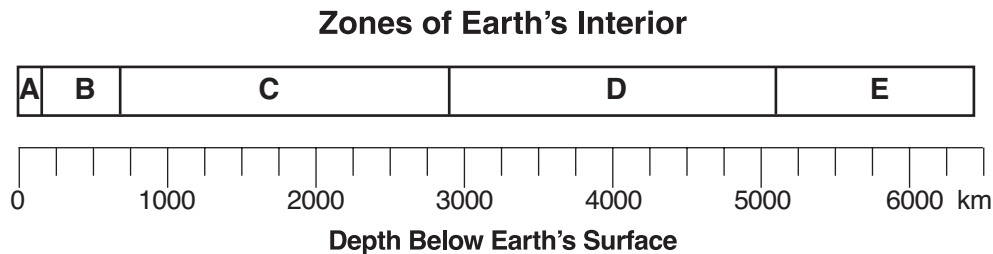


Part B-1

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 *2010 Edition Reference Tables for Physical Setting/Earth Science*. Record your answers on your separate answer sheet.

Base your answers to questions 36 through 40 on the diagram below, which represents zones of Earth's interior, identified by letters *A* through *E*. The scale shows depths below Earth's surface, measured in kilometers.



- 36 The Moho is a boundary located in zone
- (1) *A* (3) *E*
(2) *B* (4) *D*
- 37 What is the approximate thickness of zone *C*?
- (1) 650 km (3) 2250 km
(2) 1600 km (4) 2900 km
- 38 Which zone is characterized by partially melted rock and large-scale convection currents?
- (1) zone *A* (3) zone *C*
(2) zone *B* (4) zone *E*
- 39 Which zone of Earth's interior has a density closest to the densities of the other terrestrial planets?
- (1) zone *A* (3) zone *C*
(2) zone *E* (4) zone *D*
- 40 S-waves produced by an earthquake are transmitted through zones
- (1) *A* and *B*, but not zones *C*, *D*, and *E* (3) *C*, *D*, and *E*, but not zones *A* and *B*
(2) *A*, *B*, and *C*, but not zones *D* and *E* (4) *D* and *E*, but not zones *A*, *B*, and *C*
-

Base your answers to questions 41 through 43 on the data table below, which lists some properties of four minerals that are used as ores of zinc (Zn).

Mineral Property	Mineral			
	Smithsonite	Sphalerite	Willemite	Zincite
Composition	ZnCO ₃	ZnS	Zn ₂ SiO ₄	ZnO
Hardness	4–4.5	3.5–4	5.5	4
Density (g/cm ³)	4.4	4.0	4.0	5.6
Color	white, gray, green, blue, yellow	brown, yellow, red, green, black	white, yellow, green, reddish brown, black	deep red to orange yellow
Streak	white	white to yellow to brown	white	orange yellow

41 A mineral with a hardness of 5 would scratch

- (1) all four zinc minerals in the table
- (2) zincite, but not sphalerite, smithsonite, or willemite
- (3) zincite and sphalerite, but not smithsonite or willemite
- (4) zincite, sphalerite, and smithsonite, but not willemite

42 A sample of sphalerite has a mass of 176.0 grams. What is the volume of the sample?

- (1) 22.7 cm³
- (2) 31.4 cm³
- (3) 40.0 cm³
- (4) 44.0 cm³

43 Which mineral belongs in the same mineral group as quartz and olivine?

- (1) zincite
- (2) willemite
- (3) sphalerite
- (4) smithsonite




Base your answers to questions 44 through 46 on the map below, which shows a portion of the continent of North America and outlines the Mississippi River watershed. Points *A*, *B*, *C*, *D*, and *E* represent locations on Earth's surface.







Key
— Mississippi watershed boundary

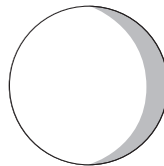
- 44 At which location would the Mississippi River's discharge most likely be the greatest?
- | | |
|--------------|--------------|
| (1) <i>A</i> | (3) <i>C</i> |
| (2) <i>B</i> | (4) <i>D</i> |
- 45 Sediments deposited by the river at location *B* are best described as
- | | |
|----------------------------|------------------------------|
| (1) sorted and layered | (3) unsorted and layered |
| (2) sorted and not layered | (4) unsorted and not layered |
- 46 Which landform is produced at location *E* where the Mississippi River enters the Gulf of Mexico?
- | | |
|---------------|----------------------|
| (1) a delta | (3) an escarpment |
| (2) a drumlin | (4) an outwash plain |
-

Base your answers to questions 47 through 50 on the calendar below, which shows the month of July of a recent year. The dates of major Moon phases, as seen in New York State, are shown.

July						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
 1	2	3	4	5	6	7
 8	9	10	11	12	13	14
15	 16	17	18	19	20	21
22	 23	24	25	26	27	28
29	 30	31				

Key	
	New Moon
	First-quarter Moon
	Full Moon
	Last-quarter Moon

47 The diagram below represents the phase of the Moon observed from New York State one night during the month of July.



On which date was this phase of the Moon visible from New York State?

- (1) July 4
- (2) July 11
- (3) July 19
- (4) July 26

48 On which date will the next first-quarter Moon phase occur?

- (1) August 6
- (2) August 10
- (3) August 16
- (4) August 22

49 Eclipses do *not* occur every month because the Moon's

- (1) rate of rotation is 15° each hour
- (2) orbit is inclined to Earth's orbit
- (3) period of revolution is 27.3 days
- (4) period of rotation and period of revolution are the same

50 Why does the Moon's gravity have a greater effect on Earth's ocean tides than the Sun's gravity?

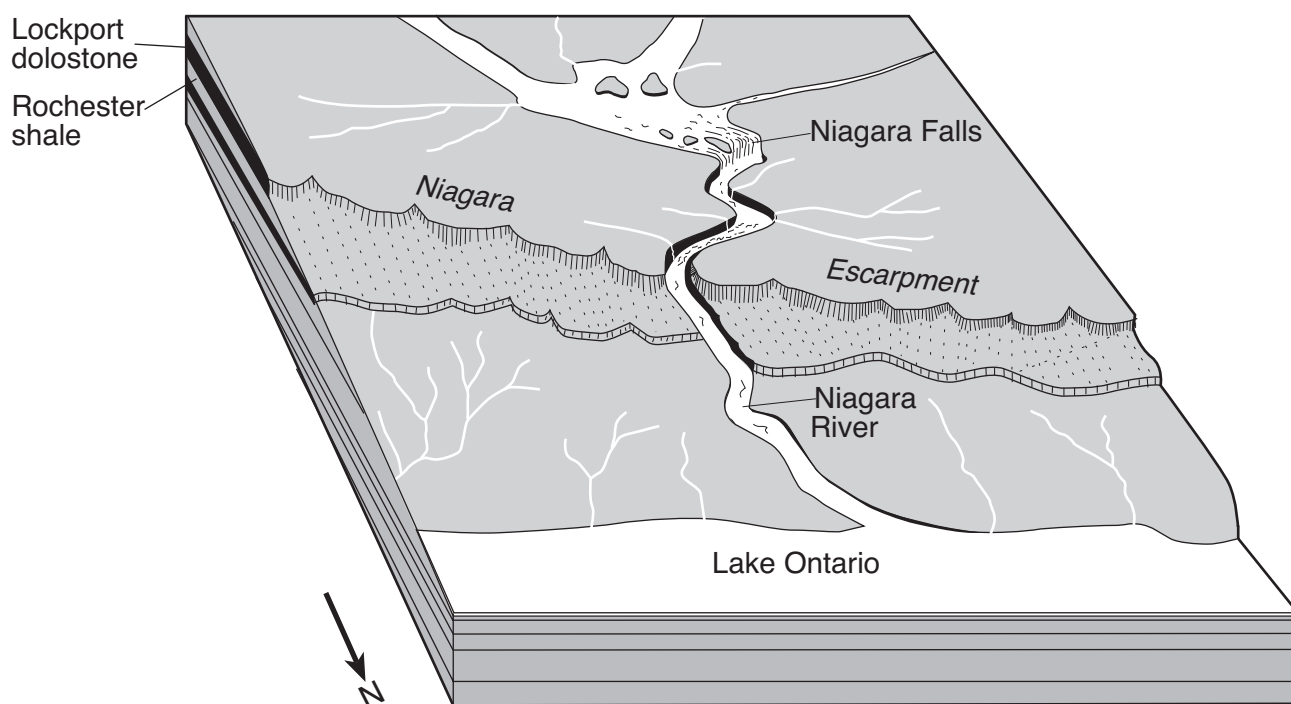
- (1) The Sun is composed mostly of gases.
- (2) The Sun's gravity influences more planets.
- (3) The Moon has a greater mass.
- (4) The Moon is much closer to Earth.

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 *2010 Edition Reference Tables for Physical Setting/Earth Science*.

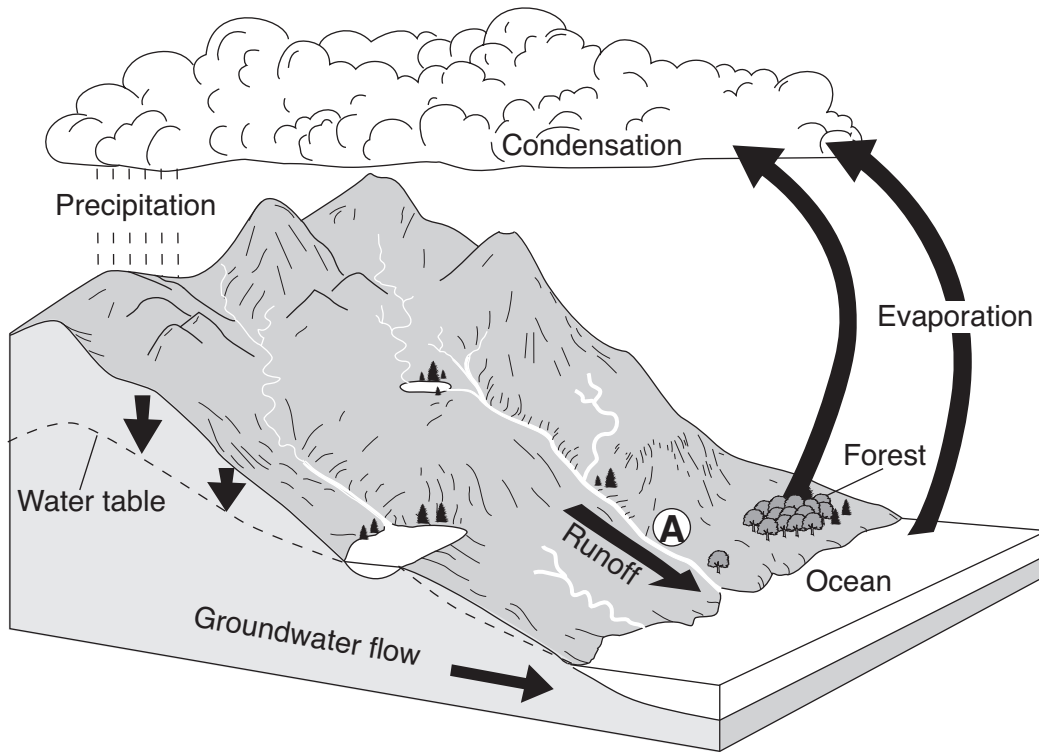
Base your answers to questions 51 and 52 on the block diagram and information below. The diagram is of the Niagara Falls region as viewed from the north.



The Niagara River began to flow over the Niagara Escarpment about 12,000 years ago when the last Pleistocene ice sheet melted and retreated north from the Niagara Escarpment. Since that time, Niagara Falls has eroded upriver, leaving a deep, steep-sided valley that is 11,000 meters long. The top bedrock layer of the escarpment is the Lockport dolostone which lies above the Rochester shale. The shale is more easily weathered than the dolostone. This causes the dolostone to be undercut. As a result, the dolostone breaks off in large blocks that tumble to the base of Niagara Falls.

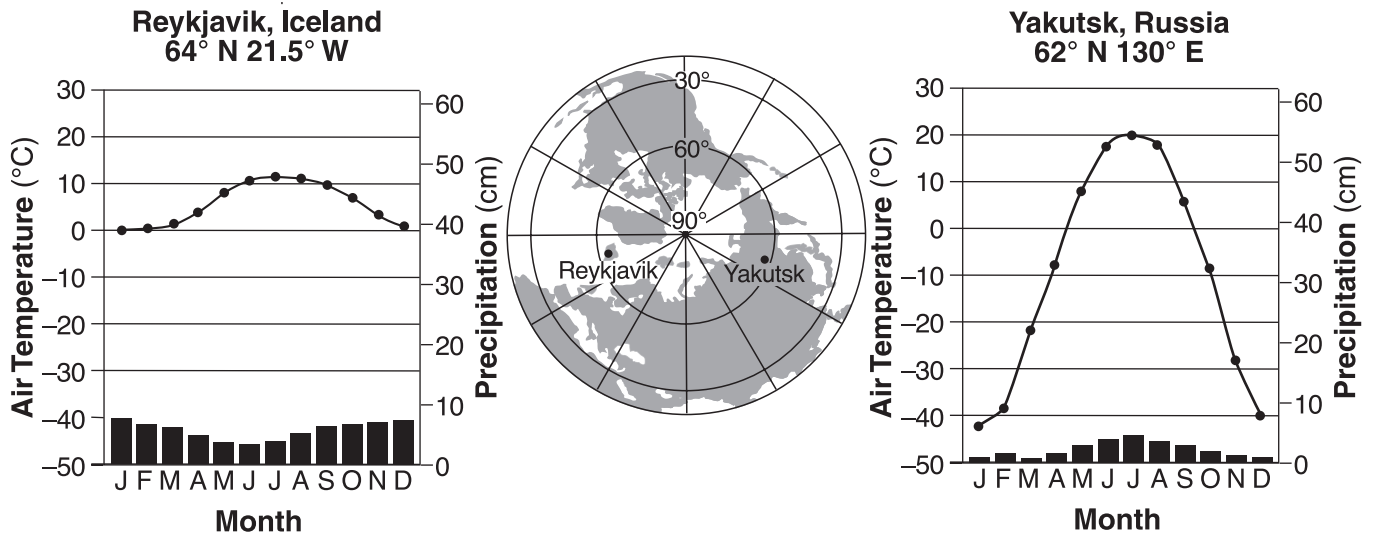
- 51 In which New York State landscape region is Niagara Falls located? [1]
- 52 Toward which compass direction is the location of Niagara Falls likely to move in the future? [1]
-

Base your answers to questions 53 through 55 on the diagram below, which represents Earth's water cycle. The arrows represent some water cycle processes. Letter A indicates a surface location on Earth.



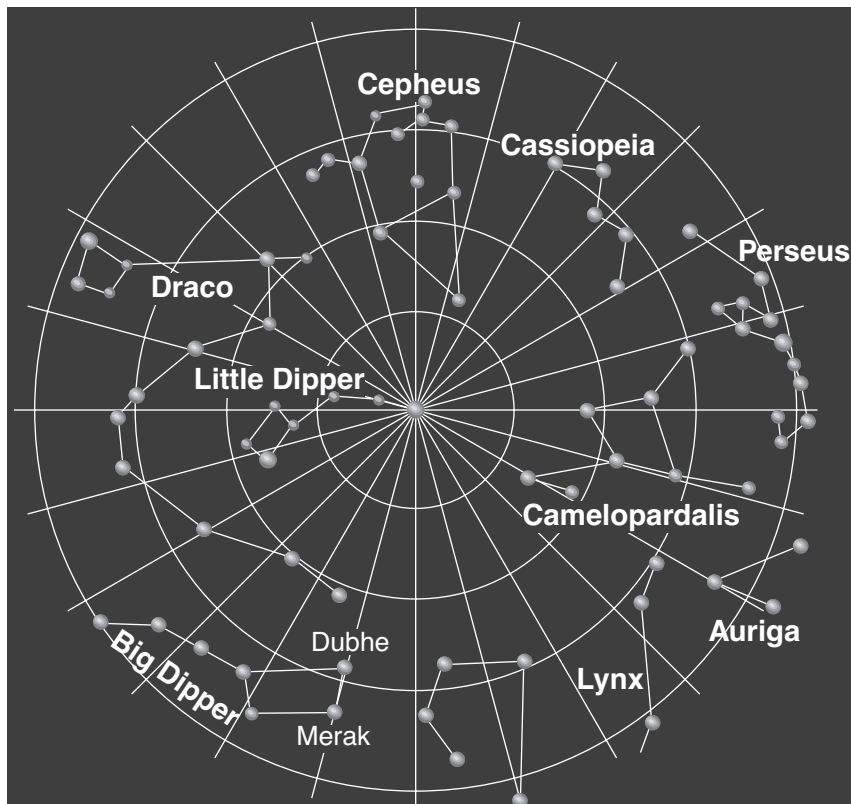
- 53 Other than evaporation, which water cycle process transfers large amounts of water vapor into the atmosphere from the forest? [1]
- 54 Describe *one* surface condition change at location A that would *decrease* the rate of runoff. [1]
- 55 How many joules (J) of heat energy are released by each gram of water vapor that condenses to form cloud droplets? [1]
-

Base your answers to questions 56 through 59 on the graphs and map below. The map shows a view of Earth from above the North Pole. Points on the map indicate the positions of Reykjavik, Iceland, and Yakutsk, Russia. The graphs show average monthly air temperature (line graphs) and amount of precipitation (bar graphs) for both locations.



- 56 Write the two-letter weather map symbol for an air mass that originates over Yakutsk. [1]
- 57 Explain why Reykjavik has cooler summers and warmer winters than Yakutsk. [1]
- 58 Describe *one* way the yearly precipitation in Yakutsk differs from that in Reykjavik. [1]
- 59 Identify *one* warm and *one* cool ocean current that affect the climate of Iceland. [1]
-

Base your answers to questions 60 through 65 on the star chart below, which shows the locations of several constellations visible in the night sky. These constellations appear to move counterclockwise around the star in the center of the chart. Straight lines are at 15-degree intervals. *Merak* and *Dubhe* are two stars in the Big Dipper.



(Not drawn to scale)

- 60 Identify the star located in the center of this star chart. [1]
- 61 How many degrees would the star directly below the “ss” in Cassiopeia appear to move in 3 hours? [1]
- 62 Which Earth motion causes the apparent daily movement of these constellations? [1]
- 63 Complete the table *in your answer booklet* by identifying the classification of the star *Dubhe*. The classification for the star *Merak* has been provided as an example. [1]
- 64 The stars *Merak* and *Dubhe* are located within the same galaxy as our Sun. Identify the galaxy in which these stars are located. [1]
- 65 On the chart of the night sky *in your answer booklet*, place an **X** to indicate the location of the Big Dipper at the same time of night 6 months later. [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 *2010 Edition Reference Tables for Physical Setting/Earth Science*.

Base your answers to questions 66 through 68 on the table below, which shows information about five large objects in the Kuiper Belt. The Kuiper Belt is located approximately 30 to 1000 astronomical units (AU) from the Sun. An astronomical unit is the average distance between Earth and the Sun, 149.6 million kilometers.

Kuiper Belt Data

Kuiper Belt Objects	Orbit Characteristics			Approximate Equatorial Diameter (km)
	Closest Distance to the Sun (AU)	Farthest Distance from the Sun (AU)	Eccentricity	
Varuna	40.47	45.13	0.053	900
Eris	37.77	97.56	0.442	2400
Quaoar	41.92	45.28	0.039	1260
Sedna	76.15	975.05	0.855	1500
Ixion	30.04	49.36	0.243	1065

66 The diagram *in your answer booklet* shows the orbits of some of the planets in our solar system. The approximate average distances from the Sun, in astronomical units, are indicated. On the diagram, place an **X** to show the closest distance of Ixion to the Sun. [1]

67 On the graph *in your answer booklet*, construct a bar graph of the equatorial diameter of each of the Kuiper Belt objects listed in the table. The diameter of Earth's Moon has been graphed for comparison. [1]

68 Identify the Kuiper Belt object with the longest period of revolution and state the evidence that supports that conclusion. [1]

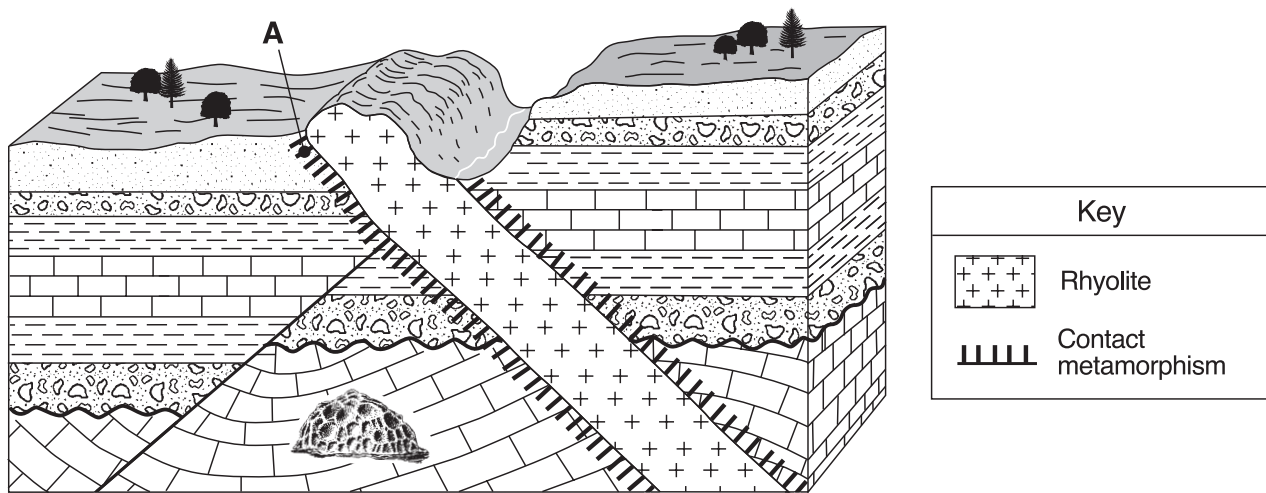
69 On the weather station model *in your answer booklet*, using the proper format, record the *four* weather conditions shown below. [1]

Dewpoint: 48°F
Air pressure: 998.3 mb
Wind: from the southeast
Wind speed: 10 knots

Base your answers to questions 70 through 74 on the two maps in your answer booklet. Map 1 shows air temperatures in the United States and Mexico, recorded in °F, at the points shown on the map. Map 2 shows the location of a low-pressure system at the time these air temperatures were measured. An occluded front extends from the center of the low-pressure system (L) to point A. Lines AB and AC are two other frontal boundaries. Two air masses are shown. The storm system later moved toward New York State and produced an ice storm.

- 70 On map 1 in your answer booklet, draw the 32°F isotherm. [1]
- 71 On map 2 in your answer booklet, draw weather front symbols on the correct sides of both line AB and line AC to show the most probable type and direction of movement of each front. [1]
- 72 Describe the general surface wind pattern associated with the low-pressure system shown on map 2. [1]
- 73 Explain what caused the center of this low-pressure system to move toward New York State. [1]
- 74 State *one* action New York State residents should have taken to prepare for the approaching ice storm. [1]

Base your answers to questions 75 through 79 on the block diagram below, which shows rock units that have not been overturned. Point A is located in the zone of contact metamorphism. A New York State index fossil is shown in one of the rock units.



(Not drawn to scale)

- 75 State the evidence shown by the block diagram that supports the inference that the fault is older than the rhyolite. [1]
- 76 Identify the geologic time period when the index fossil shown in the block diagram was a living organism. [1]
- 77 Identify the crystal size of the minerals in rhyolite and explain what this size indicates about the rate of cooling of the magma from which it formed. [1]
- 78 Identify the metamorphic rock that most likely formed at point A. [1]
- 79 Describe *one* piece of evidence that would indicate that the valley shown on the surface of the block diagram had been eroded and deepened by a glacier. [1]

Base your answers to questions 80 through 85 on the passage and map below. The map shows the volcanic island, Krakatau, before and after the 1883 eruption.

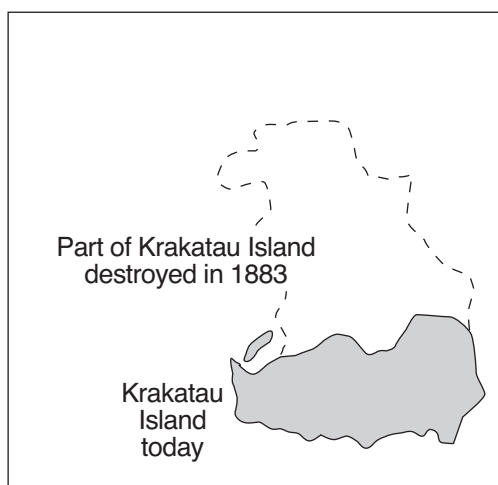
Krakatau

On August 27, 1883, one of the largest volcanic eruptions ever recorded in history occurred. Krakatau, a volcanic island nearly 800 meters in height, located at 6° S 105.5° E, exploded. Two-thirds of the island was destroyed by the blast. Blocks of pumice produced by the eruption were found floating in the ocean for months afterward.

Tsunamis produced by the eruption reached heights of 40 meters as they came ashore on nearby islands. These destructive waves traveled 6360 kilometers in just 12 hours. Over 36,000 people died and 165 coastal villages were destroyed.

Volcanic ash was blasted into the atmosphere to heights between 36 and 48 kilometers. Global temperatures cooled as the ash traveled on air currents around the world.

Volcanic Island of Krakatau



- 80 The diagram *in your answer booklet* shows where Krakatau formed, then exploded. Draw *one* arrow on *each* lithospheric plate to show the relative direction that both plates are moving to produce this type of volcano. [1]
- 81 The diagram *in your answer booklet* represents an average size person standing next to a tall building. Draw a horizontal line across the building to show the maximum height of the tsunami waves produced by the 1883 eruption of Krakatau. [1]
- 82 Determine the rate the tsunamis traveled across the ocean. Label your answer with the correct units. [1]
- 83 Identify the layer of the atmosphere into which the highest volcanic ash was blasted from the Krakatau eruption. [1]
- 84 Explain how the volcanic ash from the Krakatau eruption caused global temperatures to decrease. [1]
- 85 Describe the texture and density of pumice that allowed the blocks of pumice to float on the ocean. [1]
-

FOR TEACHERS ONLY

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

PS-ES PHYSICAL SETTING/EARTH SCIENCE

Friday, June 17, 2011 — 1:15 to 4:15 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/apda/> 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 3	10 3	19 4	28 2
2 2	11 3	20 3	29 1
3 1	12 3	21 3	30 4
4 1	13 2	22 1	31 1
5 4	14 4	23 4	32 2
6 1	15 1	24 3	33 3
7 3	16 3	25 1	34 2
8 4	17 2	26 2	35 4
9 2	18 4	27 4	

Part B-1

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

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.

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 handscoring, 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/apda/> on Friday, June 17, 2011. 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.

Beginning in June 2011, schools are no longer 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 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 maximum of 15 credits for this part.

51 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- Erie-Ontario Lowlands
- Erie-Ontario plains
- interior lowlands

52 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- S
- south
- SE
- SW

53 [1] Allow 1 credit for transpiration *or* sublimation.

54 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- a decrease in slope
- increased vegetation
- increased infiltration
- a more permeable surface

55 [1] Allow 1 credit for 2260 J.

56 [1] Allow 1 credit for cA *or* cP.

Note: Do *not* allow credit if the letters are reversed. Allow credit whether or not capital letters are used.

- 57 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Reykjavik has a maritime climate.
 - The ocean around Iceland moderates Reykjavik’s climate.
 - Reykjavik is located near a large body of water which heats and cools more slowly than inland locations.
 - Yakutsk is located farther inland.
- 58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Yakutsk receives less precipitation during the year than Reykjavik.
 - Yakutsk receives more of its precipitation in summer than in winter.
 - Yakutsk receives a higher percentage of precipitation as snowfall.
- 59 [1] Allow 1 credit for *two* correct responses. Acceptable responses include, but are not limited to:
- Warm: Norwegian Current *or* North Atlantic Current
Cool: East Greenland Current
- 60 [1] Allow 1 credit for *Polaris or* North Star.
- 61 [1] Allow 1 credit for 45°.
- 62 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- rotation
 - Earth spinning on its axis
- 63 [1] Allow 1 credit.

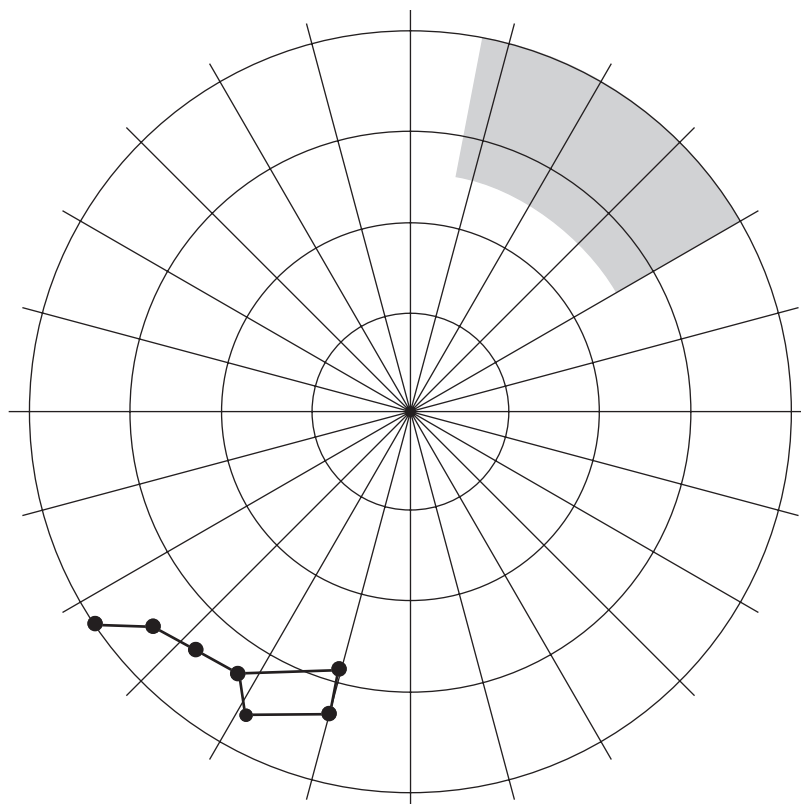
Example of a 1-credit response:

Star	Luminosity	Temperature (K)	Classification
<i>Merak</i>			
<i>Dubhe</i>			giant

- 64 [1] Allow 1 credit for the Milky Way.

65 [1] Allow 1 credit if the center of the **X** is drawn within the shaded area shown.

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



Part C

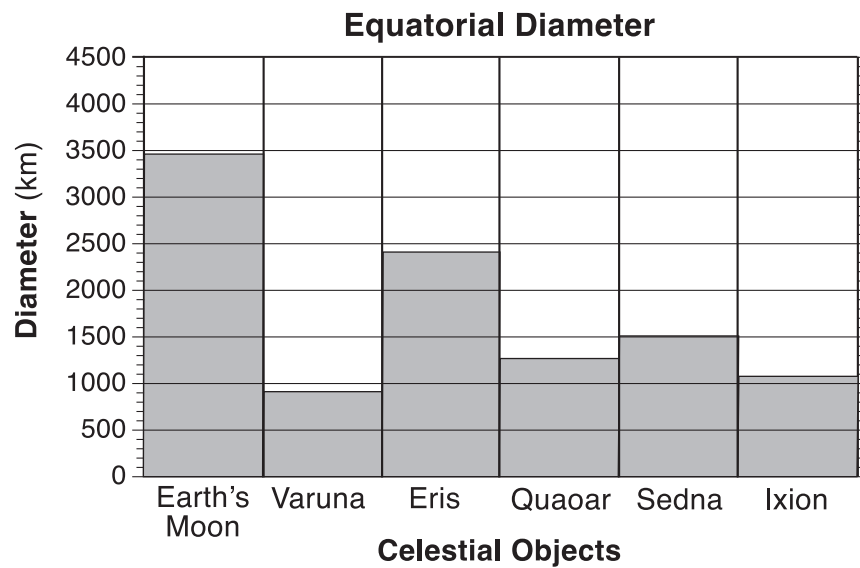
Allow a maximum of 20 credits for this part.

66 [1] Allow 1 credit if the center of the **X** is drawn anywhere on the orbit of Neptune ± 2 mm.

67 [1] Allow 1 credit if *all* bars are correctly graphed ± 100 km.

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

Example of a 1-credit graph:



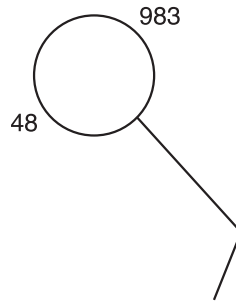
68 [1] Allow 1 credit for Sedna *and* acceptable evidence. Acceptable evidence includes, but is not limited to:

- Sedna is the farthest from the Sun at its closest approach.
- Sedna travels the farthest away from the Sun.
- Its average distance from the Sun is greatest.

69 [1] Allow 1 credit if *all four* weather variables are correctly located in the proper format.

Note: Allow credit for a wind-speed feather drawn at the end, and on either side, of the wind-direction line.

Example of a 1-credit response:

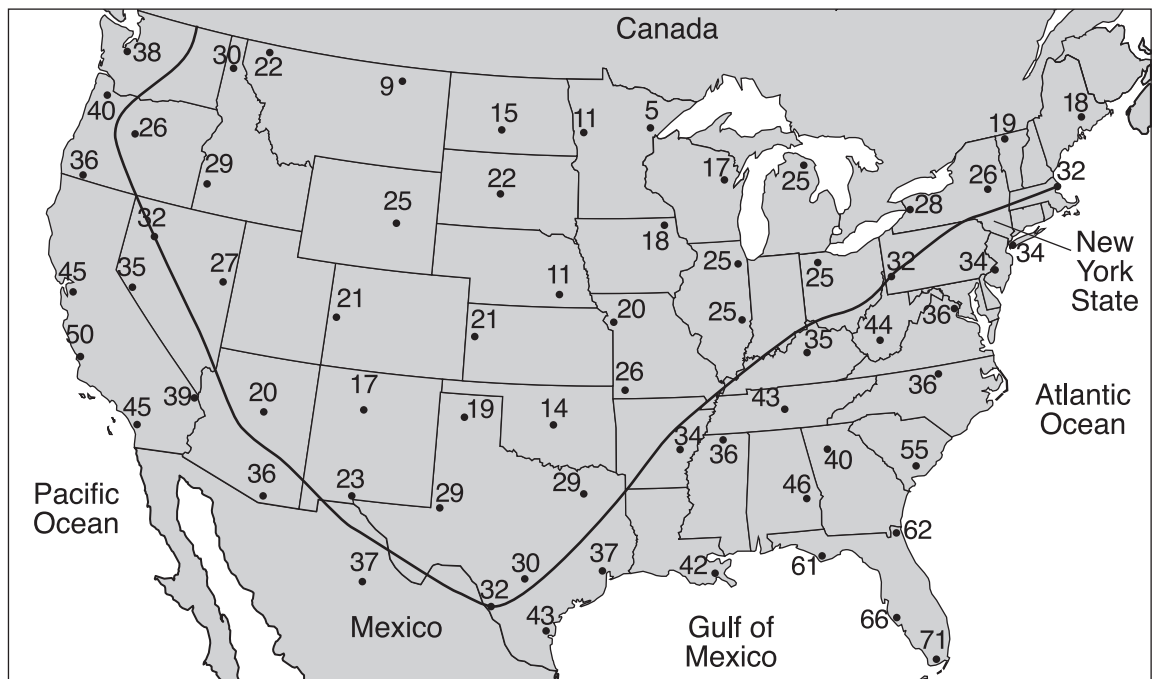


70 [1] Allow 1 credit for a correctly drawn 32°F isotherm. The line must pass through the points for 32°F. If additional isotherms are drawn, all isotherms must be correct to receive credit.

Note: Allow credit if the isoline extends to the edge of the map.

Example of a 1-credit response:

Map 1—Temperatures (°F)

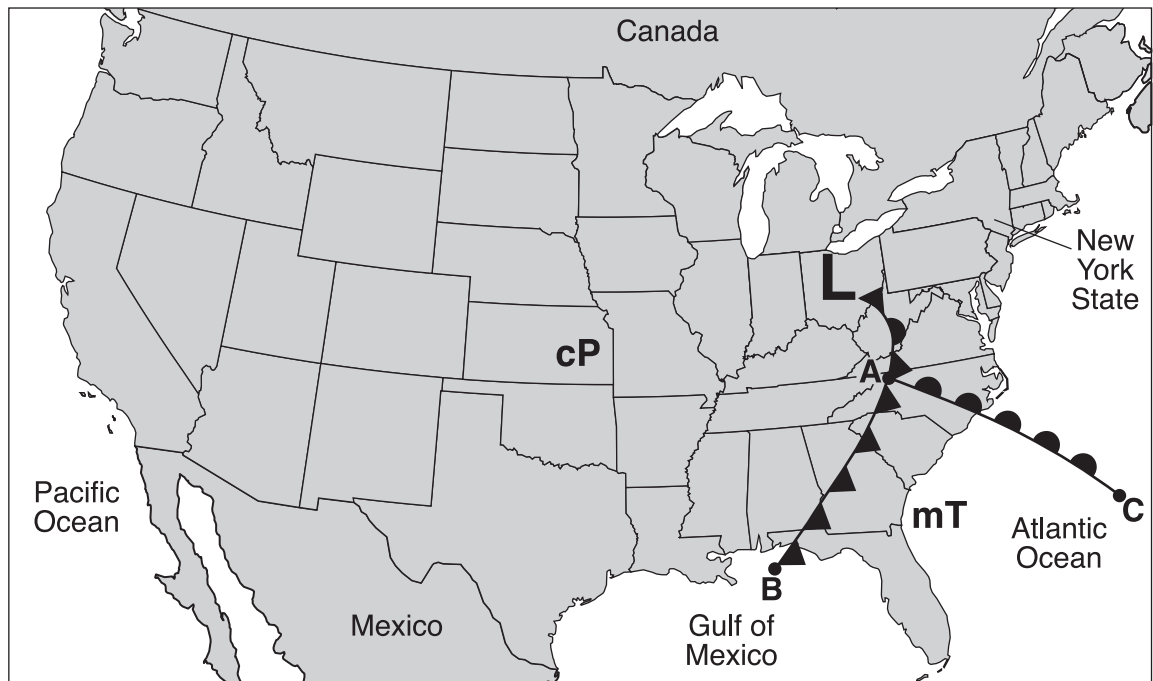


71 [1] Allow 1 credit for the placement of the correct symbol facing in the correct direction for both fronts.

Note: Allow credit even if symbols are *not* shaded in.

Example of a 1-credit response:

Map 2–Weather Fronts



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

- Winds are moving counterclockwise.
- Winds are moving inward toward the low-pressure center.
- in and counterclockwise

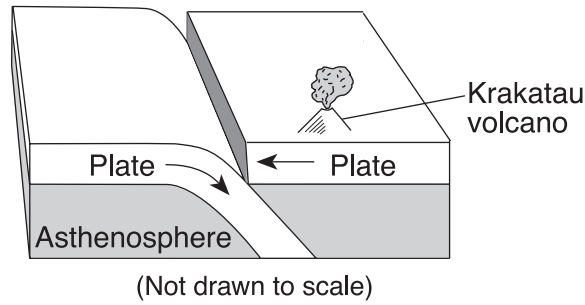
73 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- Prevailing winds blow toward the northeast.
- New York State is located in the southwesterly wind belt.
- The jet stream moved the low-pressure system in that direction.
- prevailing winds
- Winds are moving the system northeast.

- 74** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- Residents should have purchased extra supplies, such as food and water.
 - Residents should have obtained battery-powered radios, flashlights, and/or candles.
 - Rock salt or de-icing pellets should have been obtained to clear ice from sidewalks and driveways.
 - Check to make sure enough fuel for heat is on hand to last several days.
 - People who have emergency generators should check to make sure they are working properly.
- 75** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The intrusion has not been broken and offset.
 - The igneous rhyolite cuts across the fault.
- 76** [1] Allow 1 credit for Devonian Period.
- 77** [1] Allow 1 credit for the correct crystal size *and* an acceptable explanation. Acceptable responses include, but are not limited to:
- Crystal size:
- fine grained
 - less than 1-mm crystal size
- Explanation:
- The magma cooled rapidly.
 - It cooled over a short period of time.
- 78** [1] Allow 1 credit for quartzite *or* hornfels.
- 79** [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The valley is U-shaped.
 - The valley has grooved, scratched, and polished bedrock.

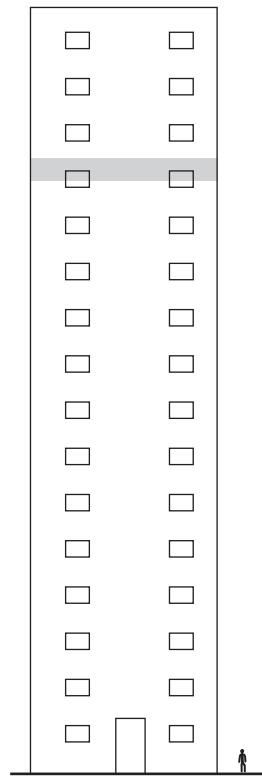
80 [1] Allow 1 credit if *both* arrows show the plates coming toward each other.

Example of a 1-credit response:



81 [1] Allow 1 credit for correctly indicating the maximum height of the tsunami wave on the building, within the shaded region shown below.

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



Scale: 1 centimeter = 5 meters

- 82 [1] Allow 1 credit for 530 *and* the correct units. Acceptable units include, but are not limited to:
- kilometers/hour
 - km/h

Note: Allow credit for a correct calculation expressed in other acceptable units, i.e., 8.8 kilometers/minute.

- 83 [1] Allow 1 credit for stratosphere.

- 84 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- The ash particles blocked out the Sun's rays.
 - Dust particles reflect the Sun's rays.
 - Less insolation reached Earth's surface.

- 85 [1] Allow 1 credit if the texture *and* density are correct. Acceptable responses include, but are not limited to:

Texture:

- vesicular
- filled with gas pockets

Note: Do *not* accept glassy, only.

Density:

- low density
- density less than 1 g/cm³
- less dense than water

Regents Examination in Physical Setting/Earth Science

June 2011

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

The *Chart for Determining the Final Examination Score for the June 2011 Regents Examination in Physical Setting/Earth Science* will be posted on the Department's web site at: <http://www.p12.nysed.gov/apda/> on Friday, June 17, 2011. 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

June 2011 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	20	42, 55, 61	67, 81, 82
Math Key Idea 2	13, 16, 28, 35	37, 44, 50, 58, 63, 65	66, 83
Math Key Idea 3	33		68
Science Inquiry Key Idea 1	2, 4, 5, 9, 10, 14, 22, 23, 27, 30, 31, 35	38, 41, 43, 46, 49, 57, 62	71, 73, 75, 77, 79, 80, 84, 85
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3			
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1	17, 21		
Key Idea 2			
Key Idea 3			74
Standard 6			
Key Idea 1	14, 24, 25, 26, 30, 32, 34	40, 44, 45, 49, 50, 52, 53, 64	68, 71, 77, 79, 80, 84
Key Idea 2	2, 6, 7, 8, 10, 11, 12, 15, 17, 18, 19, 21, 23, 25, 28, 29, 30, 31, 32, 34, 35	36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 63, 65	66, 67, 69, 70, 71, 72, 75, 76, 78, 79, 80, 81, 83, 85
Key Idea 3	29, 35		81
Key Idea 4			
Key Idea 5	6, 11, 21, 24, 25, 26, 33	45, 47, 48, 52, 58, 61, 65	70, 71, 72, 73
Key Idea 6			
Standard 7			
Key Idea 1	22		
Key Idea 2			74
Standard 4			
Key Idea 1	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 29, 30, 31	47, 48, 49, 50, 53, 54, 55, 60, 61, 62, 63, 64, 65	66, 67, 68, 75, 76
Key Idea 2	12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 32, 33, 34, 35	36, 37, 38, 39, 40, 44, 45, 46, 51, 52, 56, 57, 58, 59	69, 70, 71, 72, 73, 74, 79, 80, 81, 82, 83, 84
Key Idea 3	7	41, 42, 43	77, 78, 85
Reference Tables			
ESRT 2010 Edition (Revised)	6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 18, 19, 20, 27, 28, 29, 31	36, 37, 38, 39, 40, 42, 43, 51, 55, 56, 59, 63	68, 69, 71, 73, 76, 77, 78, 80, 81, 82, 83, 85

Regents Examination in Physical Setting/Earth Science – June 2011

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	95	95	94	94	93	93	92	91	91	90	89	88	86	85	83	82	80
	75	94	94	93	93	92	92	91	90	90	89	88	87	86	84	83	81	79
	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	89	89	88	88	87	87	86	85	85	84	83	82	80	79	77	76	74
	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	85	84	84	84	83	82	82	81	80	79	78	77	76	75	73	72	70	
59	84	84	83	83	82	82	81	80	80	79	78	77	75	74	72	71	69	
58	83	83	82	82	81	81	80	79	79	78	77	76	74	73	71	70	68	
57	82	82	81	81	81	80	79	79	78	77	76	75	74	72	71	69	67	
56	81	81	81	80	80	79	78	78	77	76	75	74	73	71	70	68	66	
55	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	75	75	74	74	73	73	72	71	70	69	68	67	65	64	62	60	
48	75	74	74	73	73	72	72	71	70	69	68	67	66	65	63	61	60	
47	74	73	73	72	72	71	71	70	69	68	67	66	65	64	62	60	59	
46	73	73	72	72	71	71	70	69	68	68	67	65	64	63	61	60	58	
45	72	72	71	71	70	70	69	68	68	67	66	65	63	62	60	59	57	
44	71	71	70	70	69	69	68	68	67	66	65	64	63	61	60	58	56	

**Final Examination Scores
June 2011 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	70	70	70	69	69	68	67	67	66	65	64	63	62	60	59	57	55
42	69	69	69	68	68	67	67	66	65	64	63	62	61	60	58	56	54
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	66	66	65	65	64	64	63	62	62	61	60	59	57	56	54	53	51
38	65	65	64	64	64	63	62	62	61	60	59	58	57	55	54	52	50
37	64	64	64	63	63	62	61	61	60	59	58	57	56	54	53	51	49
36	63	63	63	62	62	61	61	60	59	58	57	56	55	54	52	50	48
35	63	62	62	61	61	60	60	59	58	57	56	55	54	53	51	49	48
34	61	61	60	60	59	59	58	57	57	56	55	54	52	51	49	48	46
33	60	60	59	59	58	58	57	56	56	55	54	53	52	50	49	47	45
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	57	56	56	55	55	54	54	53	52	51	50	49	48	47	45	43	42
29	56	56	55	55	54	54	53	52	51	51	50	48	47	46	44	43	41
28	55	55	54	54	53	53	52	51	51	50	49	48	46	45	43	42	40
27	53	53	53	52	52	51	50	50	49	48	47	46	45	43	42	40	38
26	52	52	52	51	51	50	50	49	48	47	46	45	44	43	41	39	37
25	51	50	50	50	49	48	48	47	46	45	44	43	42	41	39	38	36
24	50	50	49	49	48	48	47	46	46	45	44	43	41	40	38	37	35
23	49	49	48	48	47	47	46	45	45	44	43	42	40	39	37	36	34
22	47	47	47	46	46	45	44	44	43	42	41	40	39	37	36	34	32
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	40	40	39	39	38	38	37	36	35	34	33	32	31	29	27	26
16	40	39	39	38	38	37	37	36	35	34	33	32	31	30	28	26	25
15	38	38	37	37	36	36	35	34	34	33	32	31	29	28	26	25	23
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