

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

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, August 16, 2006 — 12:30 to 3:30 p.m., only

This is a test of your knowledge of Earth science. Use that knowledge to answer all questions in this examination. Some questions may require the use of the *Earth Science Reference Tables*. The *Earth Science Reference Tables* are supplied separately. Be certain you have a copy of the 2001 edition of these reference tables before you begin the examination.

Your answer sheet for Part A and Part B–1 is the last page of this examination booklet. Turn to the last page and fold it along the perforations. Then, slowly and carefully, tear off your answer sheet and fill in the heading.

The answers to the questions in Part B–2 and Part C are to be written in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

You are to answer *all* questions in all parts of this examination according to the directions provided in the examination booklet. Record your answers to the Part A and Part B–1 multiple-choice questions on your separate answer sheet. Write your answers to the Part B–2 and Part C questions in your answer booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on your separate answer sheet and in your answer booklet.

When you have completed the examination, you must sign the statement printed at the end of your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet and answer booklet cannot be accepted if you fail to sign this declaration.

Notice. . .

A four-function or scientific calculator and a copy of the 2001 *Earth Science Reference Tables* must be available for you to use while taking this examination.

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

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

Part A

Answer all questions in this part.

Directions (1–35): For *each* statement or question, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *Earth Science Reference Tables*.

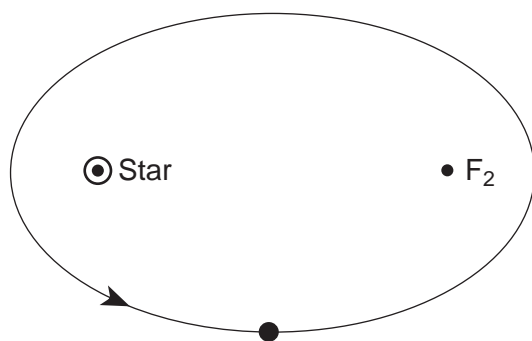
1 A Foucault pendulum appears to change its direction of swing over a period of several hours because of Earth's

- (1) rotation
- (2) revolution
- (3) tilted axis
- (4) gravity

2 The same side of the Moon always faces Earth because the

- (1) Moon's period of rotation is longer than its period of revolution around Earth
- (2) Moon's period of rotation is shorter than its period of revolution around Earth
- (3) Moon rotates once as it completes one revolution around Earth
- (4) Moon does not rotate as it completes one revolution around Earth

3 The diagram below shows the elliptical orbit of a planet revolving around a star. The star and F_2 are the foci of this ellipse.

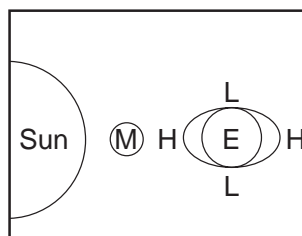


What is the approximate eccentricity of this ellipse?

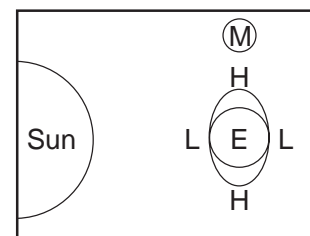
- (1) 0.22
- (2) 0.47
- (3) 0.68
- (4) 1.47

4 The diagrams below represent Earth's ocean tides at four different positions of the Moon. Which diagram shows the Moon position that will produce the highest high tides and the lowest low tides? (The diagrams are not drawn to scale.)

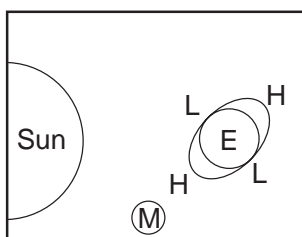
Key	
E = Earth	H = High tide
M = Moon	L = Low tide



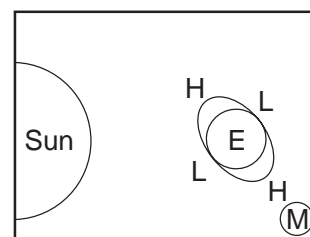
(1)



(3)



(2)



(4)

5 From which New York State location would *Polaris* be observed to have an altitude closest to 43° above the northern horizon?

- (1) Binghamton
- (2) Utica
- (3) Watertown
- (4) New York City

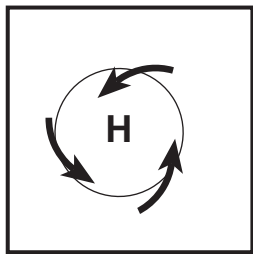
6 In October, observers in New York State looking due south at the night sky would see a different group of constellations than they had seen in March. What is the best explanation for this change in the night sky?

- (1) Constellations revolve around Earth.
- (2) Constellations revolve around the Sun.
- (3) The Sun revolves around the center of our galaxy.
- (4) Earth revolves around the Sun.

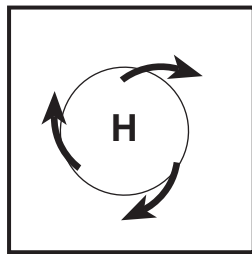
7 Which surface soil type has the *slowest* permeability rate and is most likely to produce flooding?

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

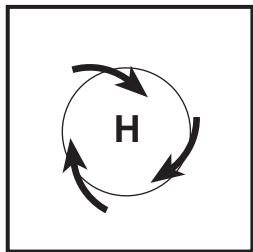
8 Which map best represents the surface wind pattern around a Northern Hemisphere high-pressure center?



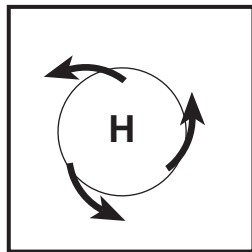
(1)



(3)



(2)

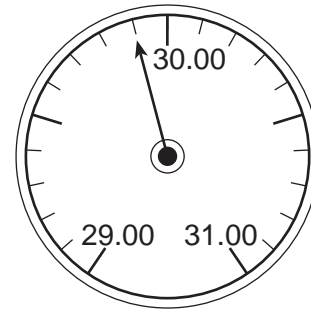


(4)

9 What is the relative humidity when the air temperature is 29°C and the wet-bulb temperature is 23°C?

- (1) 6%
- (2) 20%
- (3) 54%
- (4) 60%

10 The diagram below represents an aneroid barometer that shows the air pressure, in inches of mercury.



When converted to millibars, this air pressure is equal to

- (1) 1009.0 mb
- (2) 1012.5 mb
- (3) 1015.5 mb
- (4) 1029.9 mb

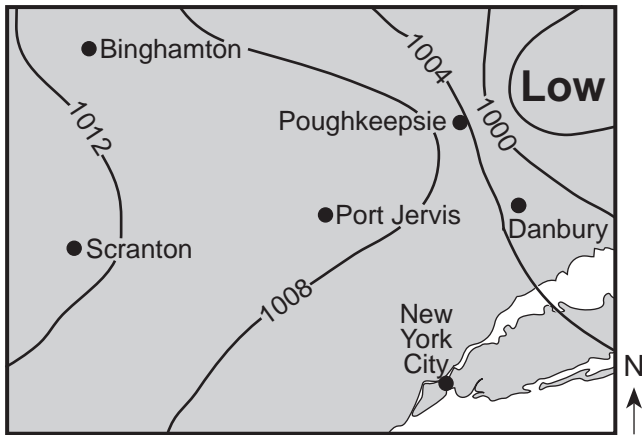
11 Great volcanic eruptions send dust and ash into the stratosphere. Weeks after such great eruptions, air temperatures are often

- (1) cooler than normal because the atmosphere is less transparent
- (2) cooler than normal because the atmosphere is more transparent
- (3) warmer than normal because the atmosphere is less transparent
- (4) warmer than normal because the atmosphere is more transparent

12 A P-wave takes 8 minutes and 20 seconds to travel from the epicenter of an earthquake to a seismic station. Approximately how long will an S-wave take to travel from the epicenter of the same earthquake to this seismic station?

- (1) 6 min 40 sec
- (2) 9 min 40 sec
- (3) 15 min 00 sec
- (4) 19 min 00 sec

Base your answers to questions 13 and 14 on the weather map below, which shows a low-pressure system centered near Poughkeepsie, New York. Isobars shown are measured in millibars.



13 Which city is most likely experiencing winds of the greatest velocity?

- (1) New York City (3) Poughkeepsie
- (2) Binghamton (4) Scranton

14 Surface winds are most likely blowing from

- (1) Danbury toward New York City
- (2) Poughkeepsie toward Scranton
- (3) Binghamton toward Danbury
- (4) Port Jervis toward Binghamton

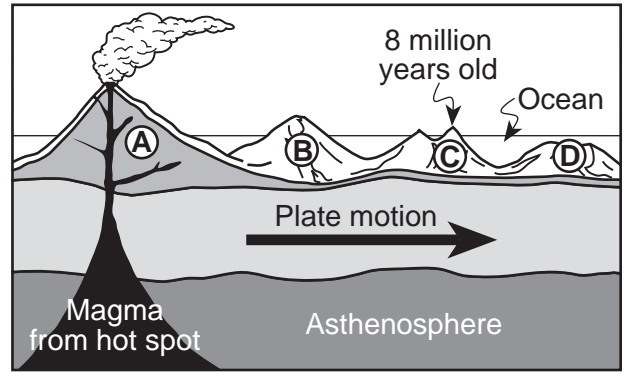
15 Scientists have inferred the structure of Earth's interior mainly by analyzing

- (1) the Moon's interior
- (2) the Moon's composition
- (3) Earth's surface features
- (4) Earth's seismic data

16 Which process transfers energy primarily by electromagnetic waves?

- (1) radiation (3) conduction
- (2) evaporation (4) convection

17 The cross section below shows the direction of movement of an oceanic plate over a mantle hot spot, resulting in the formation of a chain of volcanoes labeled A, B, C, and D. The geologic age of volcano C is shown.



What are the most likely geologic ages of volcanoes B and D?

- (1) B is 5 million years old and D is 12 million years old.
- (2) B is 2 million years old and D is 6 million years old.
- (3) B is 9 million years old and D is 9 million years old.
- (4) B is 10 million years old and D is 4 million years old.

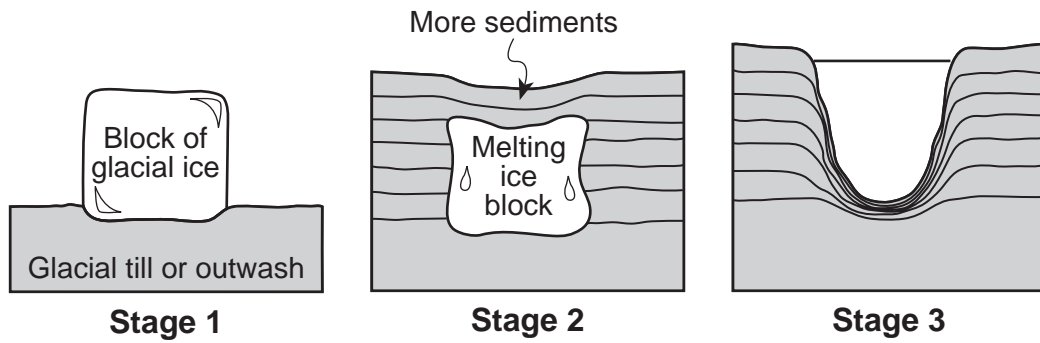
18 New York State landscape regions are identified and classified primarily by their

- (1) surface topography and bedrock structure
- (2) existing vegetation and type of weather
- (3) latitude and longitude
- (4) chemical weathering rate and nearness to large bodies of water

19 A stream flowing at a velocity of 75 centimeters per second can transport

- (1) clay, only
- (2) pebbles, only
- (3) pebbles, sand, silt, and clay, only
- (4) boulders, cobbles, pebbles, sand, silt, and clay

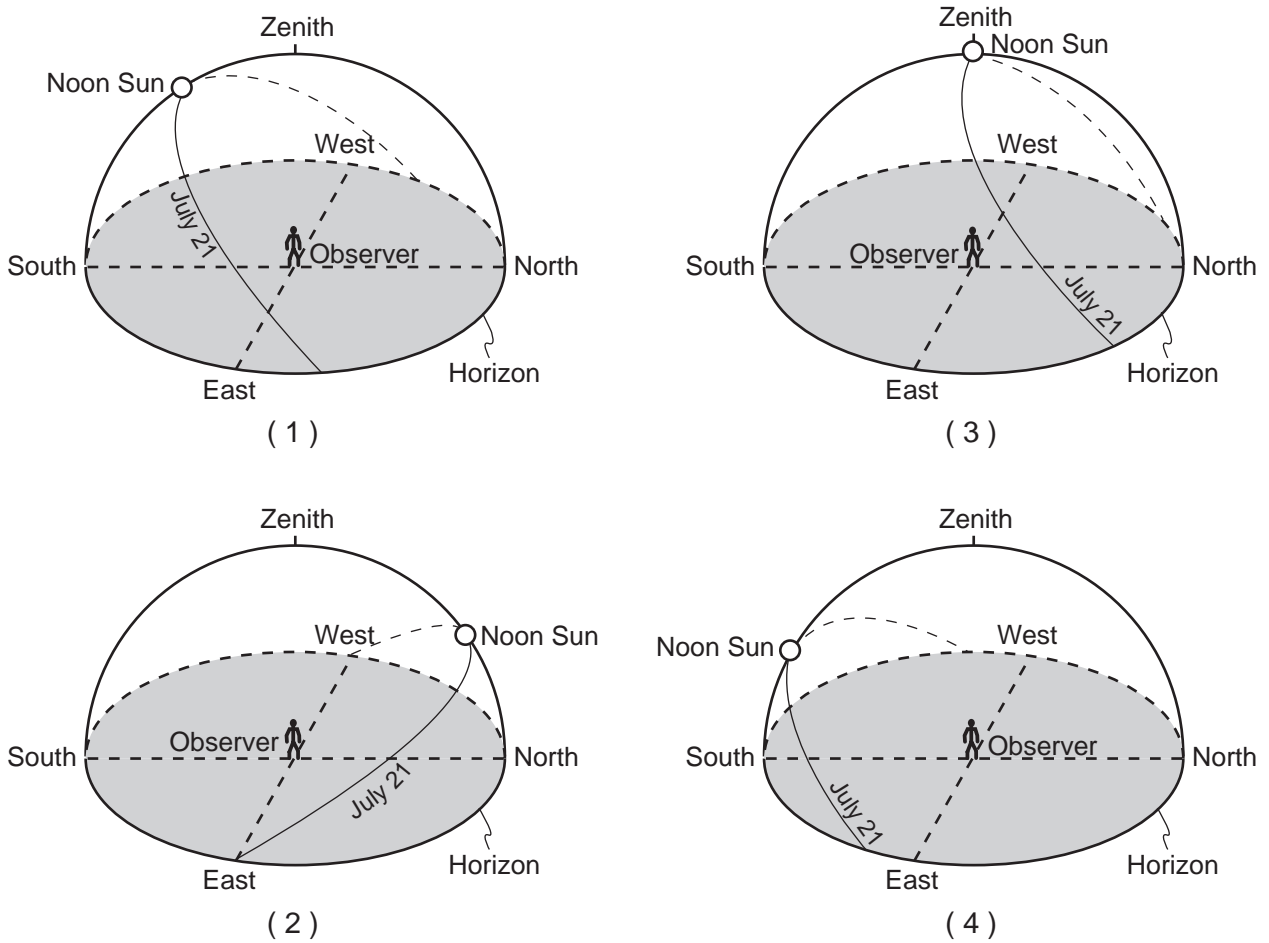
20 The cross sections below show a three-stage sequence in the development of a glacial feature.



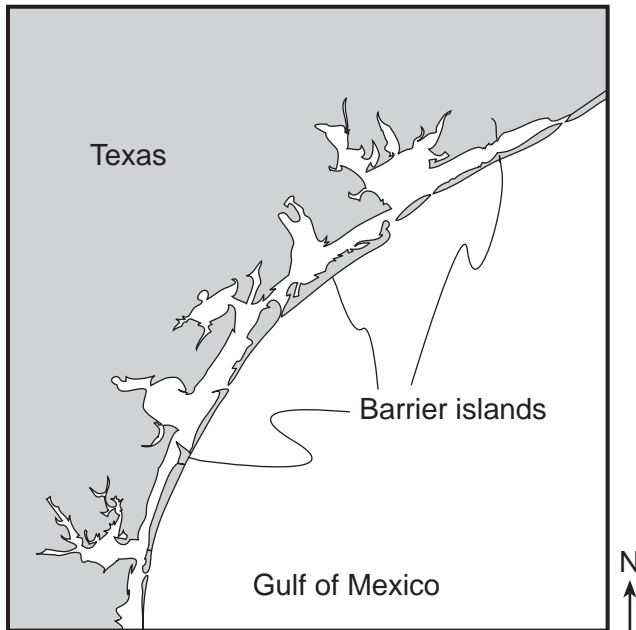
Which glacial feature has formed by the end of stage 3?

- (1) kettle lake
- (2) finger lake
- (3) drumlin
- (4) parallel scratches

21 Which diagram best shows the Sun's apparent path, as seen by an observer on July 21 in New York State?



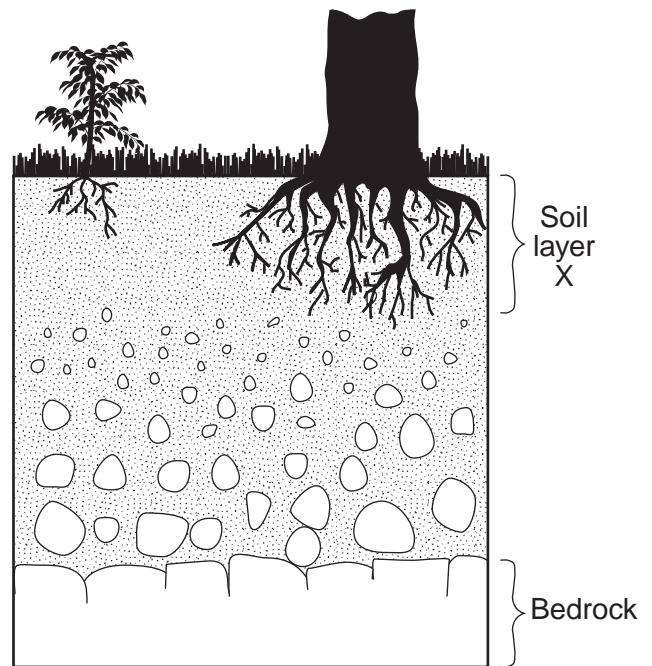
- 22 The map below shows barrier islands in the ocean along the coast of Texas.



Which agent of erosion most likely formed these barrier islands?

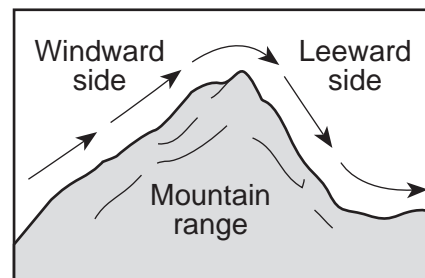
- (1) mass movement (3) streams
 (2) wave action (4) glaciers
- 23 What will be the most probable arrangement of rock particles deposited directly by a glacier?
- (1) sorted and layered
 (2) sorted and not layered
 (3) unsorted and layered
 (4) unsorted and not layered
- 24 Which two gases have been added to Earth's atmosphere in large amounts and are believed to have increased global warming by absorbing infrared radiation?
- (1) neon and argon
 (2) chlorine and nitrogen
 (3) hydrogen and helium
 (4) methane and carbon dioxide

- 25 The cross section below shows soil layer X, which was formed from underlying bedrock.



Which change would most likely cause soil layer X to increase in thickness?

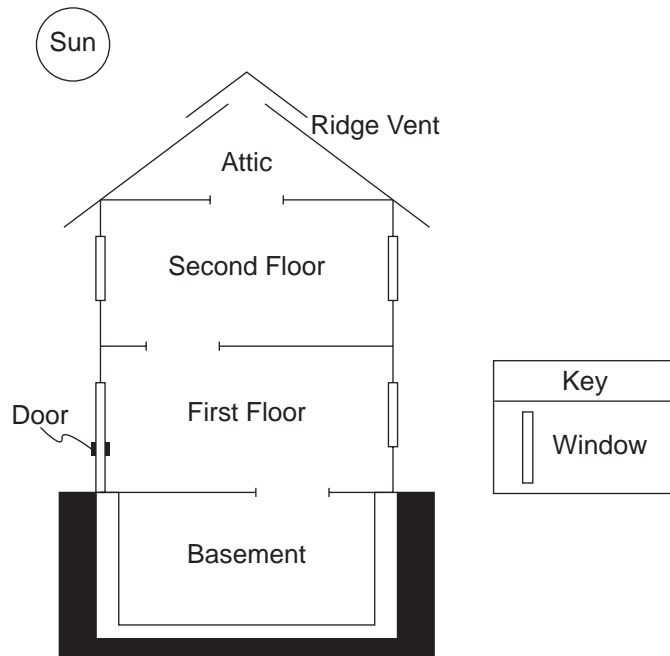
- (1) a decrease in slope
 (2) a decrease in rainfall
 (3) an increase in biologic activity
 (4) an increase in air pressure
- 26 The diagram below shows wind flowing over a mountain range.



As the wind flows down the leeward side of the mountain range, the air becomes

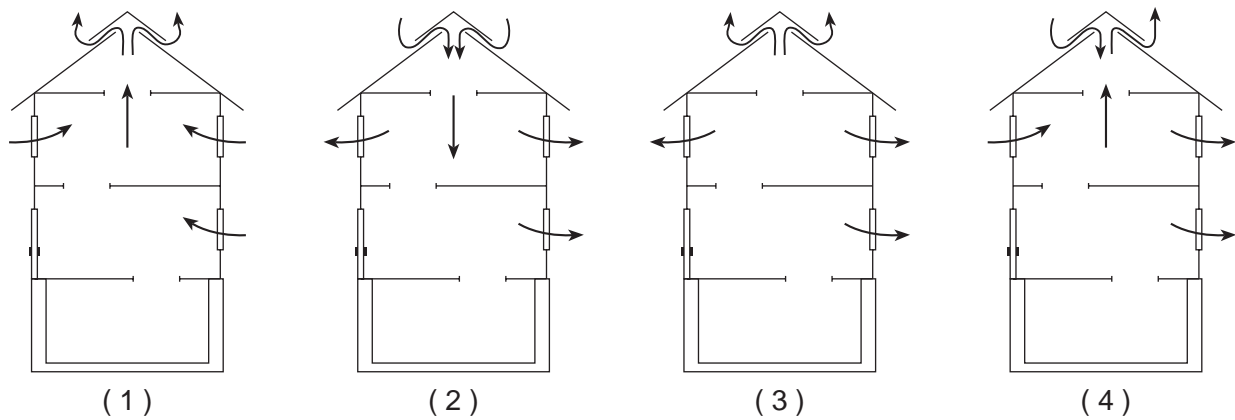
- (1) cooler and drier
 (2) cooler and wetter
 (3) warmer and drier
 (4) warmer and wetter

27 The cross section of a house is shown below. Open stairways allow air to move from one floor to another. The ridge vent is an opening in the roof that allows air to move in or out of the attic.



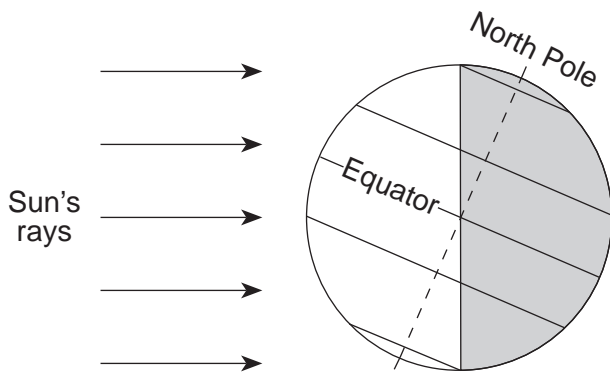
(Not drawn to scale)

During a windless summer day, the air inside this house is warmed by the Sun. In which cross section do the arrows show the most likely air movement when the windows are opened?



- 28 The ozone layer helps life on Earth because ozone
- (1) modifies the normal El Niño weather pattern
 - (2) reflects insolation from the Sun
 - (3) absorbs damaging ultraviolet radiation from the Sun
 - (4) deflects winds from a straight line to a curved path
- 29 Under identical conditions, which surface will reflect the greatest amount of insolation?
- (1) a basaltic sand beach
 - (2) a pine tree forest
 - (3) a glacial ice sheet
 - (4) a blacktop parking lot

30 The diagram below shows Earth on a particular day in its orbit around the Sun. The dashed line represents Earth's axis.



Which date is represented by the diagram?

- (1) March 21
 - (2) June 21
 - (3) September 23
 - (4) December 21
- 31 Fossils of trilobites, graptolites, and eurypterids are found in the same bedrock layer in New York State. During which geologic time interval could this bedrock layer have formed?
- (1) Late Ordovician to Early Devonian
 - (2) Late Silurian to Early Cretaceous
 - (3) Early Permian to Late Jurassic
 - (4) Early Cambrian to Middle Ordovician

- 32 Wavy bands of light and dark minerals visible in gneiss bedrock probably formed from the
- (1) cementing together of individual mineral grains
 - (2) cooling and crystallization of magma
 - (3) evaporation of an ancient ocean
 - (4) heat and pressure during metamorphism
- 33 The table below shows the hardness of four common materials.

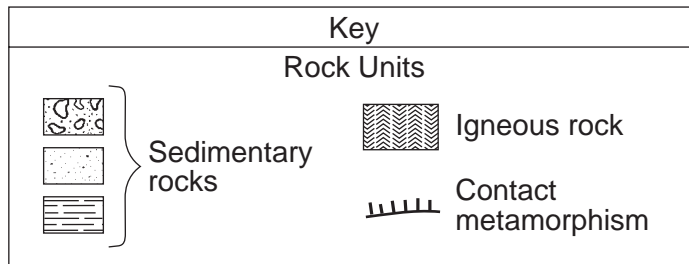
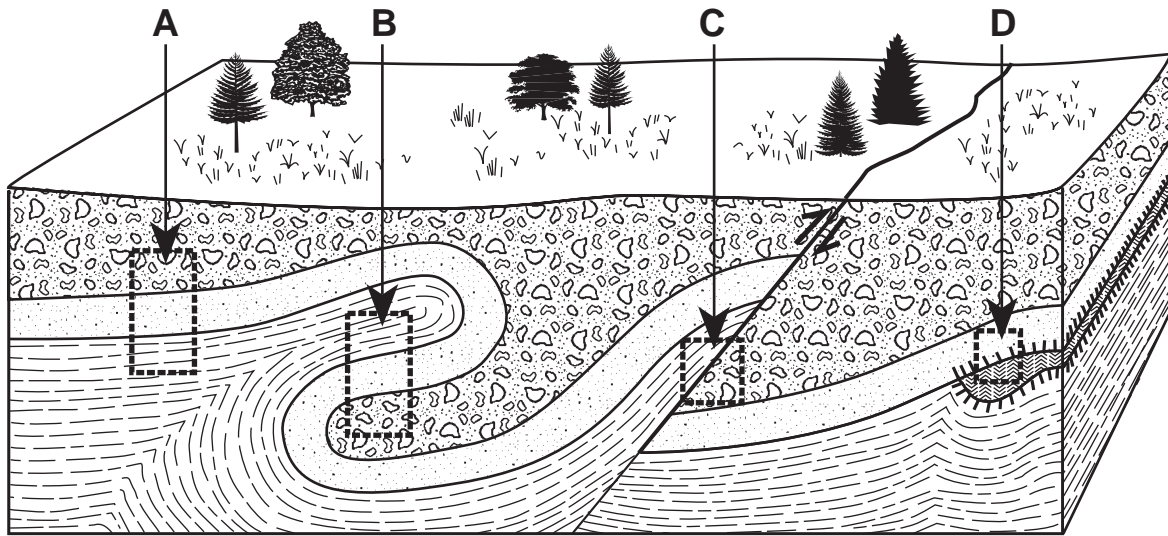
Hardness of Four Materials

Material	Hardness
human fingernail	2.5
copper penny	3.0
window glass	4.5
steel nail	6.5

Which statement best describes the hardness of the mineral dolomite?

- (1) Dolomite can scratch window glass, but cannot be scratched by a fingernail.
- (2) Dolomite can scratch window glass, but cannot be scratched by a steel nail.
- (3) Dolomite can scratch a copper penny, but cannot be scratched by a fingernail.
- (4) Dolomite can scratch a copper penny, but cannot be scratched by a steel nail.

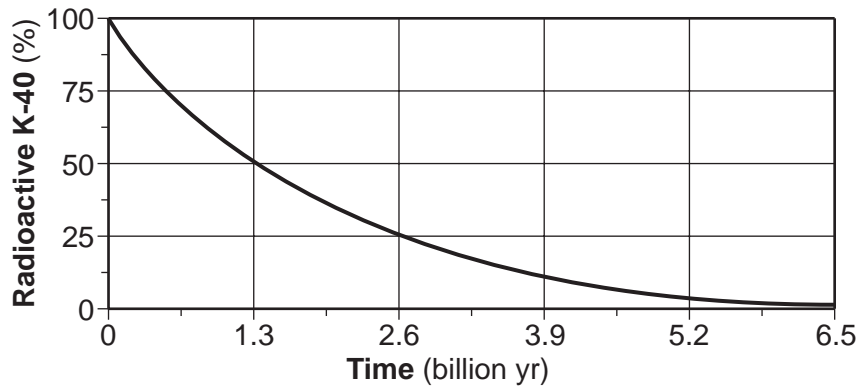
34 The block diagram below of a portion of Earth's crust shows four zones labeled A, B, C, and D outlined with dashed lines.



In which zone is a younger rock unit on top of an older rock unit?

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

35 The graph below shows the rate of decay of the radioactive isotope K-40 into the decay products Ar-40 and Ca-40.



Analysis of a basalt rock sample shows that 25% of its radioactive K-40 remained undecayed. How old is the basalt?

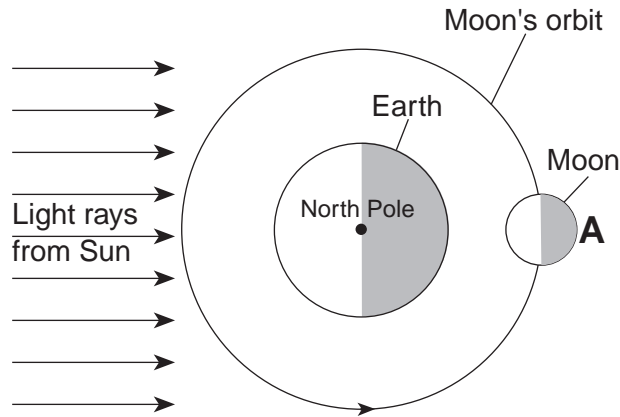
- | | |
|-----------------------|-----------------------|
| (1) 1.3 billion years | (3) 3.9 billion years |
| (2) 2.6 billion years | (4) 4.6 billion years |

Part B-1

Answer all questions in this part.

Directions (36–50): For each statement or question, write on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *Earth Science Reference Tables*.

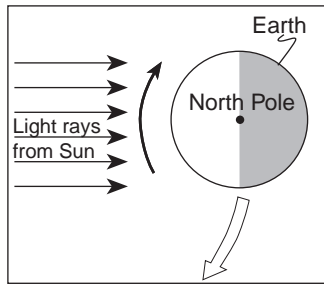
Base your answers to questions 36 and 37 on the diagram below, which shows the Moon, Earth, and the Sun's rays as viewed from space. Letter A indicates a certain position of the Moon in its orbit.



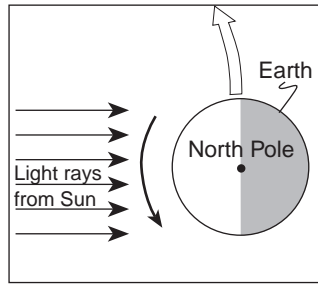
(Not drawn to scale)

36 Which diagram correctly shows the direction of Earth's rotation and revolution?

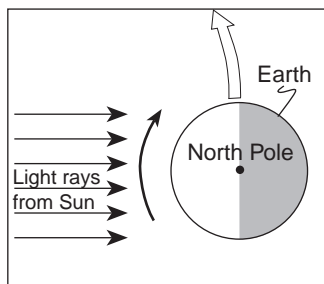
Key	
	Rotation
	Revolution



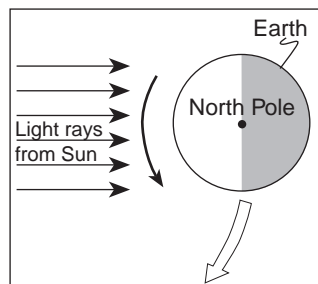
(1)



(3)

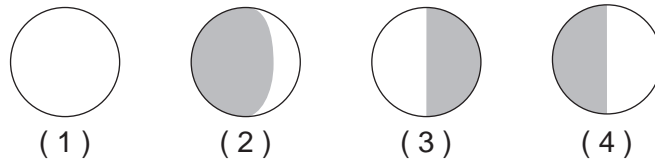


(2)



(4)

- 37 Which diagram represents the phase of the Moon, as seen by an observer on Earth, when the Moon is located at position A in its orbit?



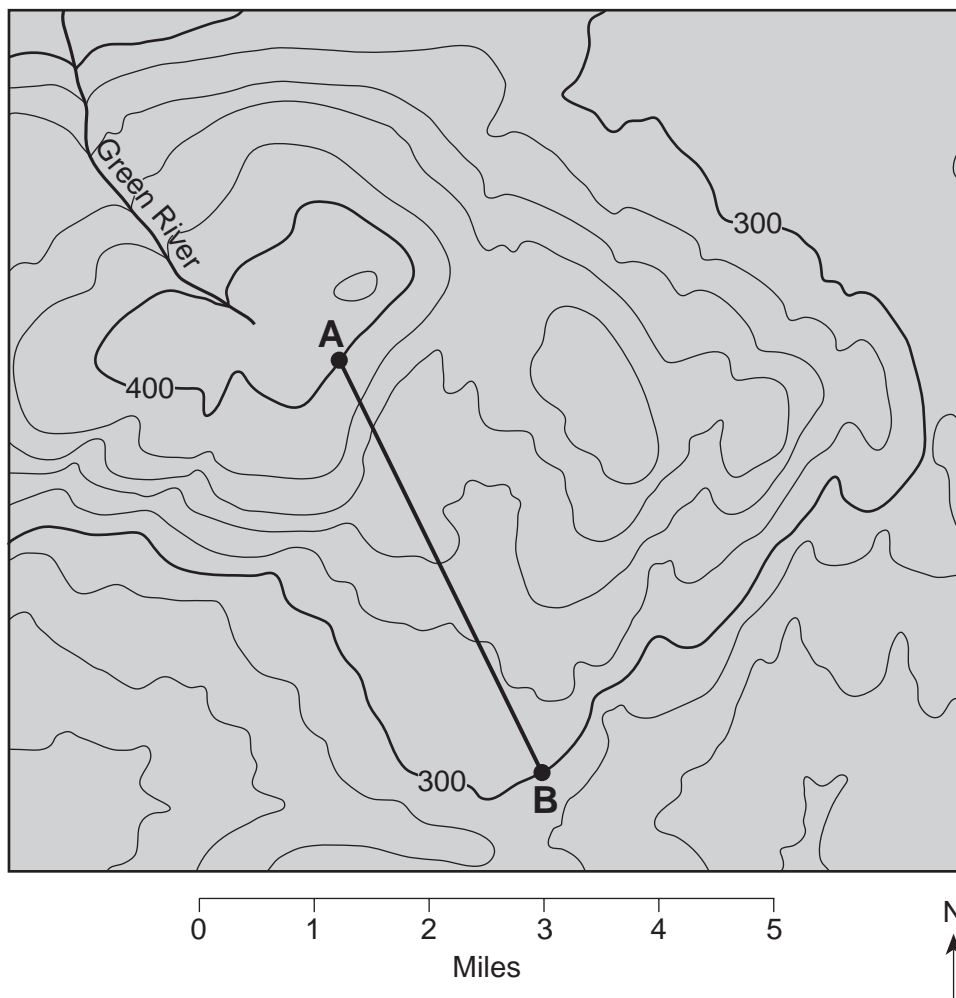
Base your answers to questions 38 through 40 on the passage below and on your knowledge of Earth science.

A Newly Discovered Planet

Scientists studying a Sun-like star named *Ogle-Tr-3* discovered a planet that is, on the average, 3.5 million kilometers away from the star's surface. The planet was discovered as a result of observing a cyclic decrease in the brightness of *Ogle-Tr-3* every 28.5 hours. The changing brightness is the result of the planet blocking some of the starlight when it is between *Ogle-Tr-3* and Earth. This observation allowed scientists to find not only the planet, but also to determine the planet's mass and density. The mass has been calculated to be approximately 159 times the mass of Earth. The planet is only 20% as dense as Jupiter. Scientists think that this low density is the result of being very close to *Ogle-Tr-3*.

- 38 Compared to the period of revolution of Mercury and Venus, this newly discovered planet's period of revolution is
- (1) shorter than both Mercury's and Venus'
 - (2) longer than both Mercury's and Venus'
 - (3) shorter than Mercury's but longer than Venus'
 - (4) longer than Mercury's but shorter than Venus'
- 39 The density of the discovered planet has been estimated to be approximately
- | | |
|---------------------------|---------------------------|
| (1) 5.5 g/cm ³ | (3) 1.3 g/cm ³ |
| (2) 2.0 g/cm ³ | (4) 0.3 g/cm ³ |
- 40 The planet was discovered when it passed between Earth and the star *Ogle-Tr-3*. Which event in our solar system results from a similar type of alignment of the Moon between Earth and the Sun?
- | | |
|---------------------|-------------------|
| (1) summer solstice | (3) solar eclipse |
| (2) winter solstice | (4) lunar eclipse |
-

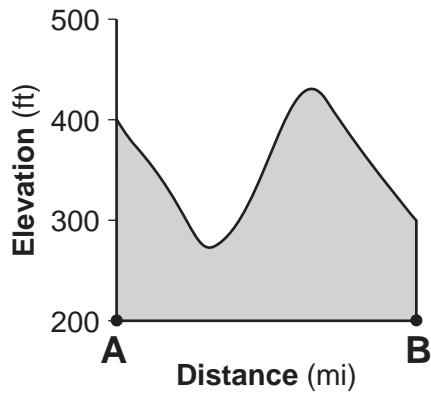
Base your answers to questions 41 through 44 on the topographic map below. Elevations are in feet. Points A and B are locations on the map.



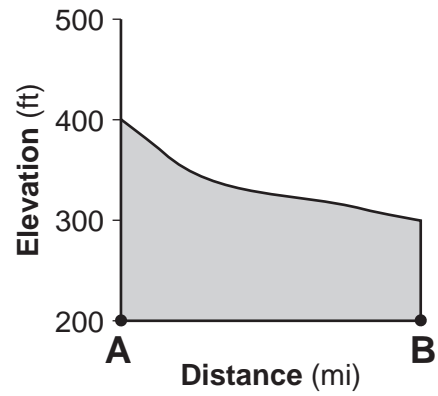
- 41 Toward which direction does the Green River flow?
- | | |
|---------------|---------------|
| (1) northeast | (3) southeast |
| (2) northwest | (4) southwest |

- 42 What is the gradient along the straight line between points A and B?
- | | |
|--------------|--------------|
| (1) 10 ft/mi | (3) 25 ft/mi |
| (2) 20 ft/mi | (4) 35 ft/mi |

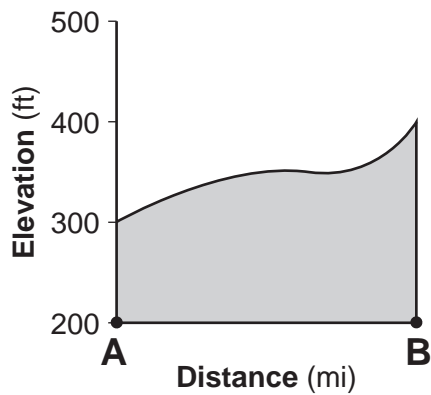
43 Which graph best represents the profile along line AB?



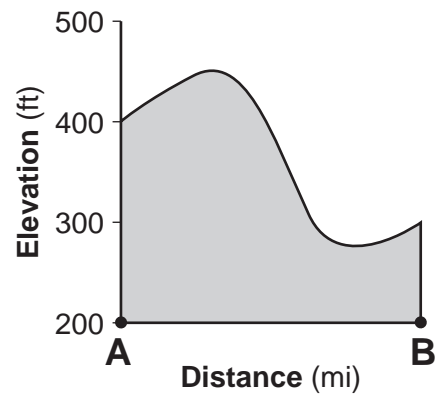
(1)



(3)



(2)

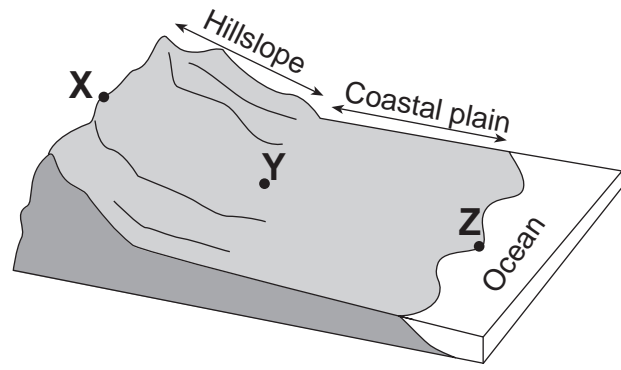


(4)

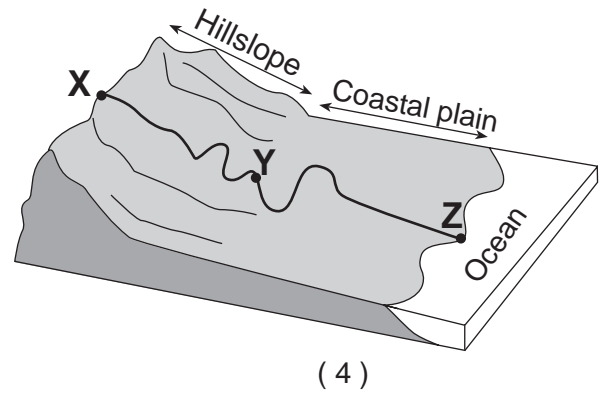
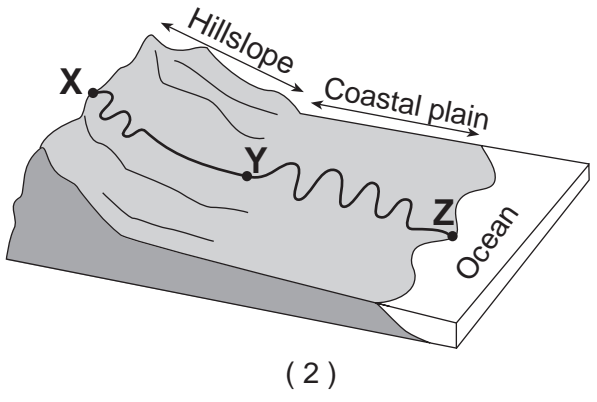
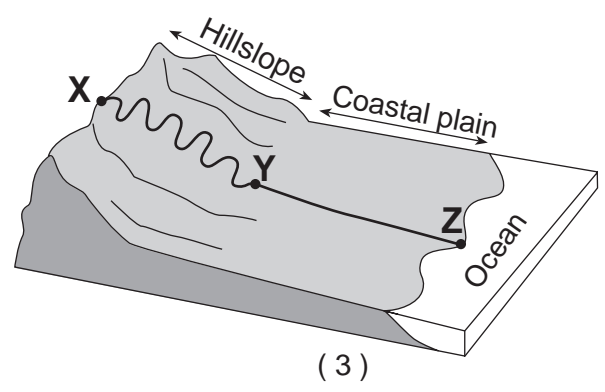
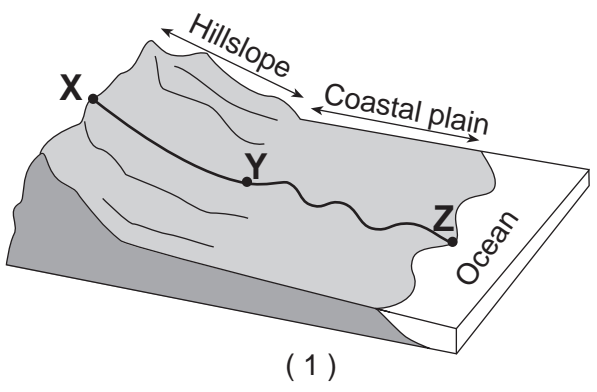
44 What evidence can be used to determine that the land surface in the northeast corner of the map is relatively flat?

- (1) a rapidly flowing river
- (2) a large region covered by water
- (3) the dark contour line labeled 300
- (4) the absence of many contour lines

Base your answers to questions 45 through 47 on the diagram below, which shows a coastal region in which the land slopes toward the ocean. Point X is near the top of the hill, point Y is at the base of the hill, and point Z is a location at sea level. The same type of surface bedrock underlies this entire region. A stream flows from point X through point Y to point Z. This stream is not shown in the diagram.

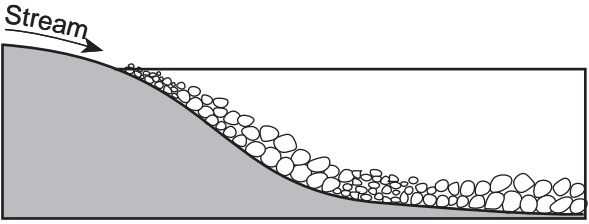


45 Which diagram best shows the most probable path of the stream flowing from point X to point Z?

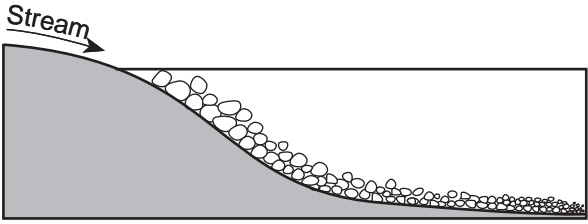


- 46 Compared to the stream velocity between point X and point Y, the stream velocity between point Y and point Z is most likely
- (1) greater, since the slope of the land decreases
 - (2) greater, since the slope of the land increases
 - (3) less, since the slope of the land decreases
 - (4) less, since the slope of the land increases

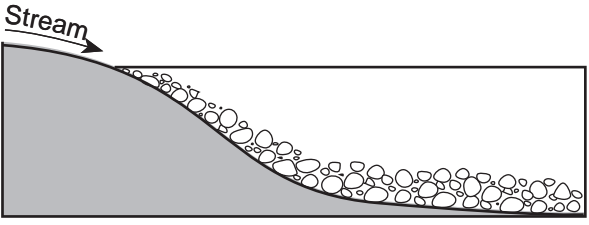
47 Which cross section best shows the pattern of sediments deposited by the stream as it enters the ocean near point Z?



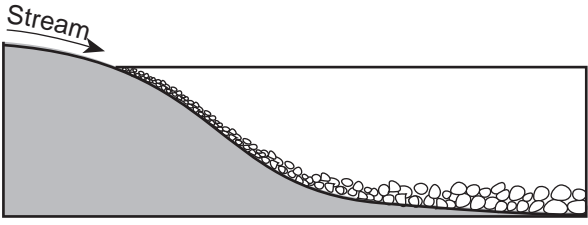
(1)



(3)



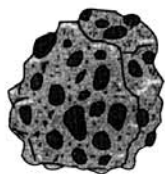
(2)



(4)



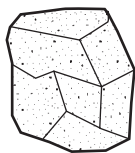
Base your answers to questions 48 through 50 on the drawings of six sedimentary rocks labeled A through F.



A
Conglomerate



B
Breccia



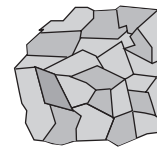
C
Sandstone



D
Shale



E
Limestone



F
Rock salt

48 Most of the rocks shown were formed by

- (1) volcanic eruptions and crystallization
- (2) compaction and/or cementation
- (3) heat and pressure
- (4) melting and/or solidification

49 Which two rocks are composed primarily of quartz, feldspar, and clay minerals?

- (1) rock salt and conglomerate
- (2) rock salt and breccia
- (3) sandstone and shale
- (4) sandstone and limestone

50 Which table shows the rocks correctly classified by texture?

Texture	clastic	bioclastic	crystalline
Rock	A, B, C, D	E	F

(1)

Texture	clastic	bioclastic	crystalline
Rock	A, C	B, E	D, F

(3)

Texture	clastic	bioclastic	crystalline
Rock	A, B, C	D	E, F

(2)

Texture	clastic	bioclastic	crystalline
Rock	A, B, F	E	C, D

(4)

Part B–2

Answer all questions in this part.

Directions (51–64): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

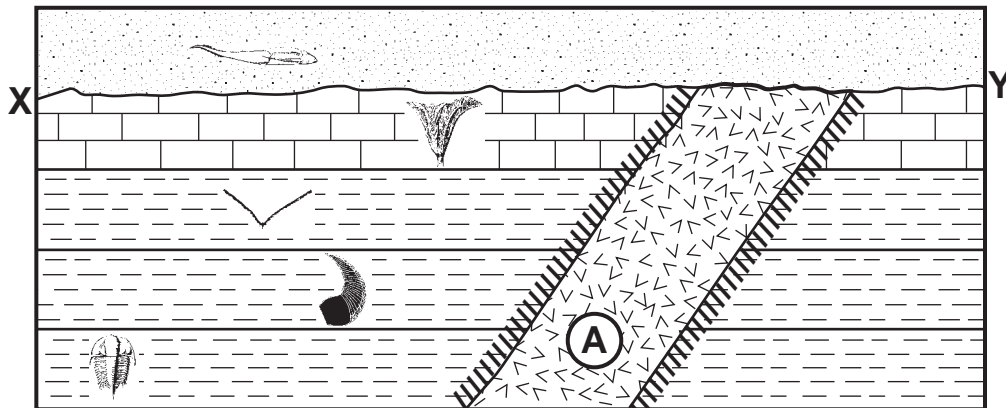
Base your answers to questions 51 through 53 on the passage below and on your knowledge of Earth science.

The Future of the Sun

Hydrogen gas is the main source of fuel that powers the nuclear reactions that occur in the Sun. But just like many sources of fuel, the hydrogen is in limited supply. As the hydrogen gas is used up, scientists predict that the helium created as an end product of earlier nuclear reactions will begin to fuel new nuclear reactions. When this happens, the Sun is expected to become a red giant star with a radius that would extend out past the orbit of Venus and possibly out as far as Earth's orbit. Earth will probably not survive this change in the Sun's size. But no need to worry at this time. The Sun is not expected to expand to this size for a few billion years.

- 51 Identify the nuclear reaction referred to in this passage that combines hydrogen gas to form helium and produces most of the Sun's energy. [1]
- 52 On the diagram of the planets and the Sun's surface *in your answer booklet*, draw a vertical line to represent the inferred location of the Sun's surface when it becomes a red giant star. [1]
- 53 Explain why a red giant star, similar to *Aldebaran*, has a greater luminosity than the Sun. [1]
-

Base your answers to questions 54 through 58 on the geologic cross section below and on your knowledge of Earth science. The cross section shows New York State index fossils in rock layers that have not been overturned. Rock unit A is an igneous intrusion and line XY represents an unconformity.

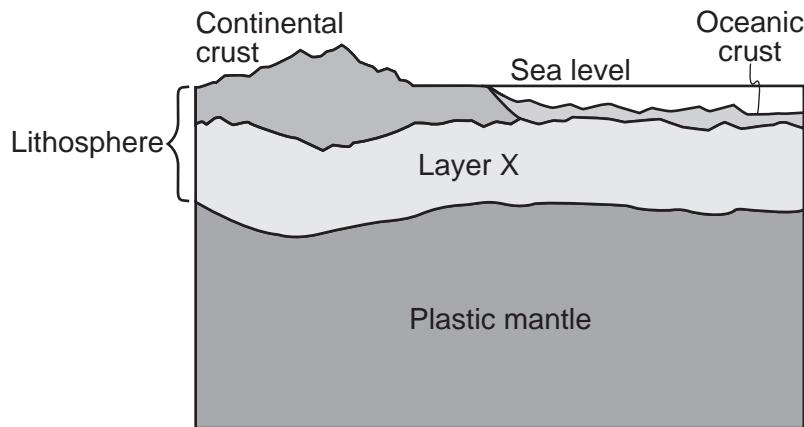


Key	
Index Fossils	
	<i>Bothriolepis</i>
	<i>Ctenocrinus</i>
	<i>Dicellograptus</i>
	<i>Valcouroceras</i>
	<i>Elliptocephala</i>

Key	
Rock Units	
	Sedimentary rocks

- 54 Based on fossil evidence, determine the geologic period during which the unconformity formed. [1]
- 55 Identify the coral index fossil that would most likely be found in the same layer as the index fossil *Ctenocrinus*. [1]
- 56 Each index fossil existed for a relatively short geologic time interval. State *one* other characteristic that each fossil must have to be considered an index fossil. [1]
- 57 Describe the type of depositional environment in which the fossilized organisms lived. [1]
- 58 Identify *one* piece of evidence shown in this cross section that indicates that the igneous intrusion, A, is older than the sandstone layer. [1]

Base your answers to questions 59 through 61 on the cross section below and on your knowledge of Earth science. The cross section shows a portion of Earth's interior. Layer X is part of Earth's interior.



(Not drawn to scale)

- 59 Identify the texture and relative density of the granitic bedrock of the continental crust and the basaltic bedrock of the oceanic crust. [2]
- 60 The minerals biotite and amphibole may be found in igneous bedrock of both the oceanic crust and the continental crust. Identify *two* other minerals commonly found in the basaltic oceanic crust. [1]
- 61 Identify the part of Earth's lithosphere represented by layer X. [1]
-

Base your answers to questions 62 through 64 on the map in your answer booklet, which shows the generalized surface bedrock for a portion of New York State that appears in the *Earth Science Reference Tables*.

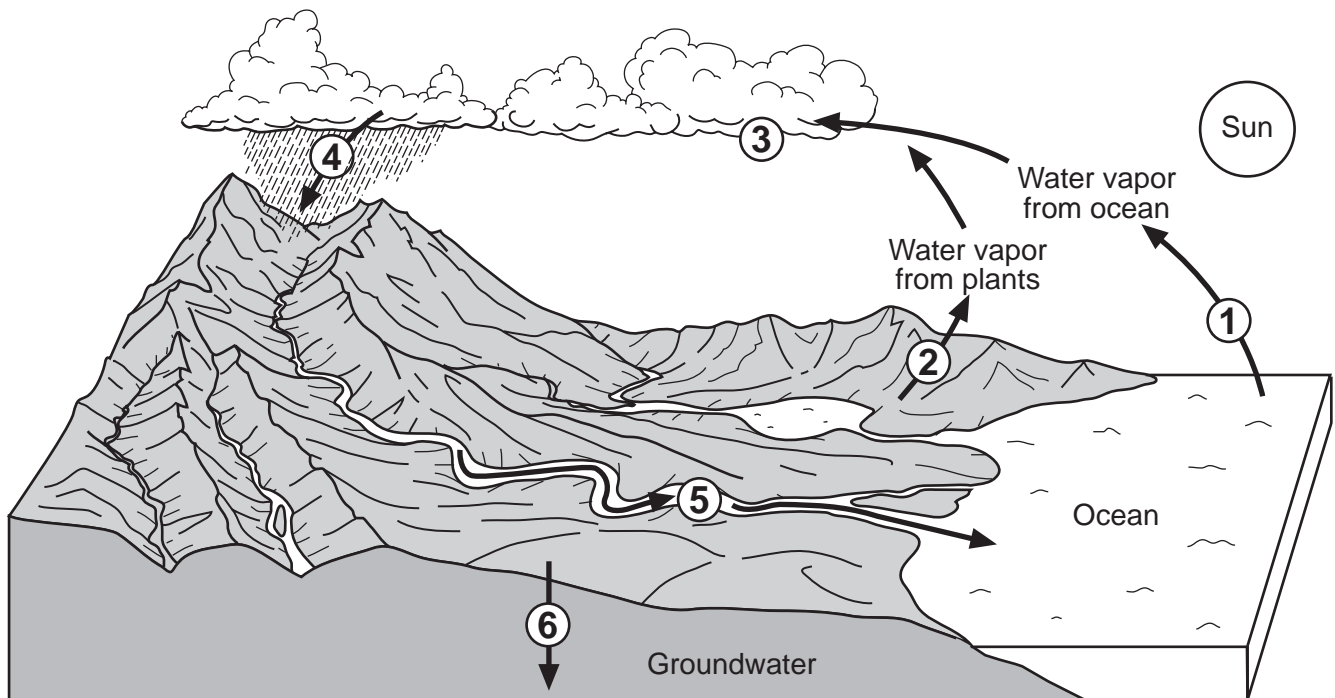
- 62 Place an **X** on the map to represent a location in the Tug Hill Plateau landscape region. [1]
- 63 State the longitude of Mt. Marcy, New York, to the *nearest degree*. The units and compass direction must be included in your answer. [1]
- 64 Identify the geologic age and name of the surface metamorphic bedrock found at Mt. Marcy. [1]
-

Part C

Answer all questions in this part.

Directions (65–82): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

- 65 Part of which generalized New York State landscape region is drained by the Susquehanna River and its tributaries? [1]
- 66 The diagram below shows a model of the water cycle. The arrows show the movement of water molecules through the water cycle. The circled numbers represent the processes that occur as the water molecules reach the different stages of the water cycle.



Complete the table in *your answer booklet* by identifying the name of the water cycle process occurring at *each* number. [2]

Base your answers to questions 67 through 71 on the passage below and on your knowledge of Earth science. The passage describes a tornado produced from a thunderstorm that moved through a portion of New York State on May 31, 1998.

New York Tornado

A small tornado formed and moved through the town of Apalachin, New York, at 5:30 p.m., producing winds between 40 and 72 miles per hour. The tops of trees were snapped off, and many large limbs fell to the ground. The path of the destruction measured up to 200 feet wide. At 5:45 p.m., the tornado next moved through the town of Vestal where winds ranged between 73 and 112 miles per hour. Many people experienced personal property damage as many homes were hit with flying material.

At 6:10 p.m., the tornado moved close to Binghamton, producing winds between 113 and 157 miles per hour. A 1000-foot television tower was pushed over, and many heavy objects were tossed about by the strong winds. Then the tornado lifted off the ground for short periods of time and bounced along toward the town of Windsor. At 6:15 p.m., light damage was done to trees as limbs fell and small shallow-rooted trees were pushed over in Windsor.

The tornado increased in strength again at 6:20 p.m. as it moved into Sanford. Some homes were damaged as their roof shingles and siding were ripped off. One mobile home was turned over on its side.

The tornado moved through the town of Deposit at 6:30 p.m., creating a path of destruction 200 yards wide. The tornado skipped along hilltops, touching down occasionally on the valley floors. However, much damage was done to homes as the tornado's winds reached their maximum speeds of 158 to 206 miles per hour. The tornado weakened and sporadically touched down after leaving Deposit. By 7:00 p.m., the tornado had finally ended its $1\frac{1}{2}$ -hour rampage.

- 67 On the map *in your answer booklet*, draw the path of the tornado and the direction the tornado moved, by following the directions below. [2]
- Place an **X** through the point for *each of the six* towns mentioned in the passage.
 - Connect the **Xs** with a line in the order that each town was mentioned in the passage.
 - Place an arrow at one end of your line to show the direction of the tornado's movement.
- 68 The tornado mentioned in this passage was produced by cold, dry air from Canada quickly advancing into warm, moist air already in place over the northeastern United States. List the two-letter air-mass symbols that would identify *each* of the two air masses responsible for producing this tornado. [1]
- 69 Which type of front was located at the boundary between the advancing cold, dry air mass and the warm, moist air mass? [1]

- 70 Using the Fujita Scale shown below and the information in the passage, complete the table *in your answer booklet*, by assigning an F-Scale number for the tornado as it passed through each town given in the table. [1]

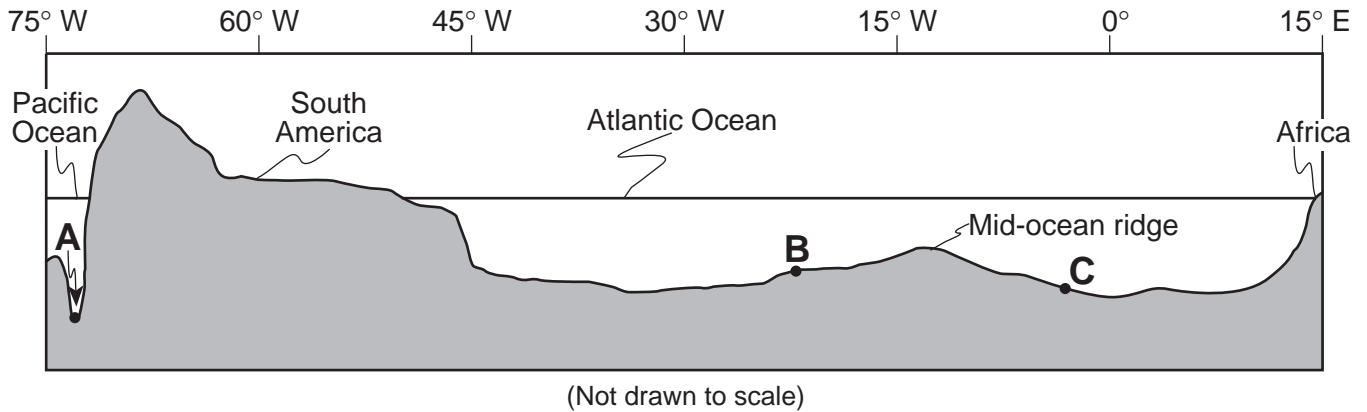
Fujita Scale

F-Scale Number	Wind Speed (mph)	Type of Damage Done
F-0	40–72	some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards
F-1	73–112	peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed
F-2	113–157	considerable damage; roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated
F-3	158–206	roof and some walls torn off well-constructed homes; trains overturned; most trees in forest uprooted
F-4	207–260	well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated
F-5	261–318	strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel-reinforced concrete structures badly damaged

- 71 Calculate the tornado’s average rate of travel, in miles per minute, between Vestal and Windsor, by using the equation below. Express your answer to the *nearest tenth*. [1]

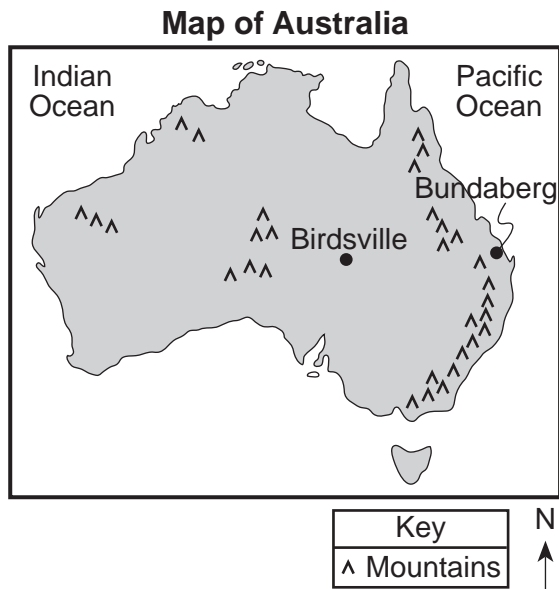
$$\text{tornado's rate of travel} = \frac{\text{distance between Vestal and Windsor (miles)}}{\text{time (minutes)}}$$

Base your answers to questions 72 through 74 on the cross section below, which shows the major surface features of Earth along 25° S latitude between 75° W and 15° E longitude. Points A, B, and C represent locations on Earth's crust.



- 72 Identify the crustal feature located at point A. [1]
- 73 Identify the tectonic plate motion that is causing an increase in the distance between South America and Africa. [1]
- 74 Bedrock samples were taken at the mid-ocean ridge and points B and C. On the grid in your answer booklet, draw a line to show the relative age of the bedrock samples between these locations. [1]
-

Base your answers to questions 75 through 79 on the map and data tables below. The map shows the location of Birdsville and Bundaberg in Australia. Data table 1 shows the average monthly high temperatures for Birdsville. Data table 2 includes the latitude and longitude, elevation above sea level, and the average rainfall in January for Birdsville and Bundaberg.



Data Table 1
Average Monthly High Temperatures for Birdsville, Australia

Month	Temperature (°C)
January	39
February	38
March	35
April	30.5
May	25
June	22
July	21
August	23.5
September	28
October	32.5
November	36
December	38

Data Table 2
Information about Two Australian Cities

City	Latitude (° S)	Longitude (° E)	Elevation (m)	Average January Rainfall (mm)
Birdsville	25.9	139.4	47	25
Bundaberg	24.9	152.4	14	105

- 75 On the grid in your answer booklet, plot with an **X** the average monthly high temperatures for Birdsville, Australia. Connect the **Xs** with a line. The average monthly high temperatures for Bundaberg have already been plotted on the graph for you. [1]
- 76 State *one* factor that could account for the difference between the average high temperatures recorded in December for Birdsville and Bundaberg. [1]
- 77 State *one* reason for the difference in the average January rainfall for Birdsville and Bundaberg. [1]
- 78 Explain why Bundaberg will experience solar noon before Birdsville each day. [1]
- 79 On the map in your answer booklet, draw the 30° S latitude line. [1]
-

Base your answers to questions 80 through 82 on the passage below and on your knowledge of Earth science.

Asteroids

Most known asteroids are found orbiting the Sun approximately halfway between the orbits of Mars and Jupiter, in a vast ring known as the Asteroid Belt. Occasionally, though, an asteroid leaves this orbit belt and moves into a more eccentric orbit that brings it into the inner solar system. This sudden change may be caused by an impact with another asteroid or by the gravitational pull of Jupiter or Mars.

The closest known near-Earth collision was in 1994, when asteroid 1994 XL1 came within the Moon's orbit at a distance of 100,000 kilometers from Earth. Earth had missed hitting this asteroid by a mere 52 minutes. This asteroid was only about 15 hours away from Earth when it was first noticed. Only 30 feet in diameter, 1994 XL1 was 100,000 times fainter than an object that could be seen with the naked eye. Each year other asteroids are spotted coming close to Earth.

Evidence on Earth indicates that some asteroids have come close enough to be drawn into Earth by gravitational attraction. A 110-mile-wide crater discovered by oil geologists under the Yucatan Peninsula and the Gulf of Mexico is one such piece of evidence. This crater is closely linked to the extinction of the dinosaurs. Some scientists estimate that a 10-mile-wide asteroid caused this crater.

- 80 Approximately how many million kilometers from the Sun is the Asteroid Belt? [1]
- 81 State *one* probable reason why asteroid 1994 XL1 was so close to Earth before being spotted by astronomers. [1]
- 82 Some scientists believe an asteroid impact on Earth caused the extinction of the last of the dinosaurs. How many million years ago did this asteroid impact occur? [1]
-

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, August 16, 2006 — 12:30 to 3:30 p.m., only

ANSWER SHEET

Student Sex: Male Female Grade

Teacher School

Record your answers to Part A and Part B-1 on this answer sheet.

Part A

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

Part A Score

Part B-1

- 36 44
- 37 45
- 38 46
- 39 47
- 40 48
- 41 49
- 42 50
- 43

Part B-1 Score

Write your answers to Part B-2 and Part C in your answer booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Tear Here

Signature

PHYSICAL SETTING EARTH SCIENCE

Wednesday, August 16, 2006 — 12:30 to 3:30 p.m., only

ANSWER BOOKLET

Student Sex: Male
 Female
 Teacher
 School Grade

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

<input type="text"/>		Performance Test Score (Maximum Score: 23)
Part	Maximum Score	Student's Score
A	35	_____
B-1	15	_____
B-2	15	_____
C	20	_____
Total Written Test Score (Maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
Raters' Initials:		
Rater 1 Rater 2		

Part B-2

51 _____

52

Order of Planets from the Sun

(Distances are not drawn to scale)

53 _____

For Raters Only

51

52

53

**For Raters
Only**

54 _____ **Period**

54

55 _____

55

56 _____

56

57 _____

57

58 _____

58

59 Granitic Bedrock

Texture: _____

Density: _____

Basaltic Bedrock

Texture: _____

Density: _____

59

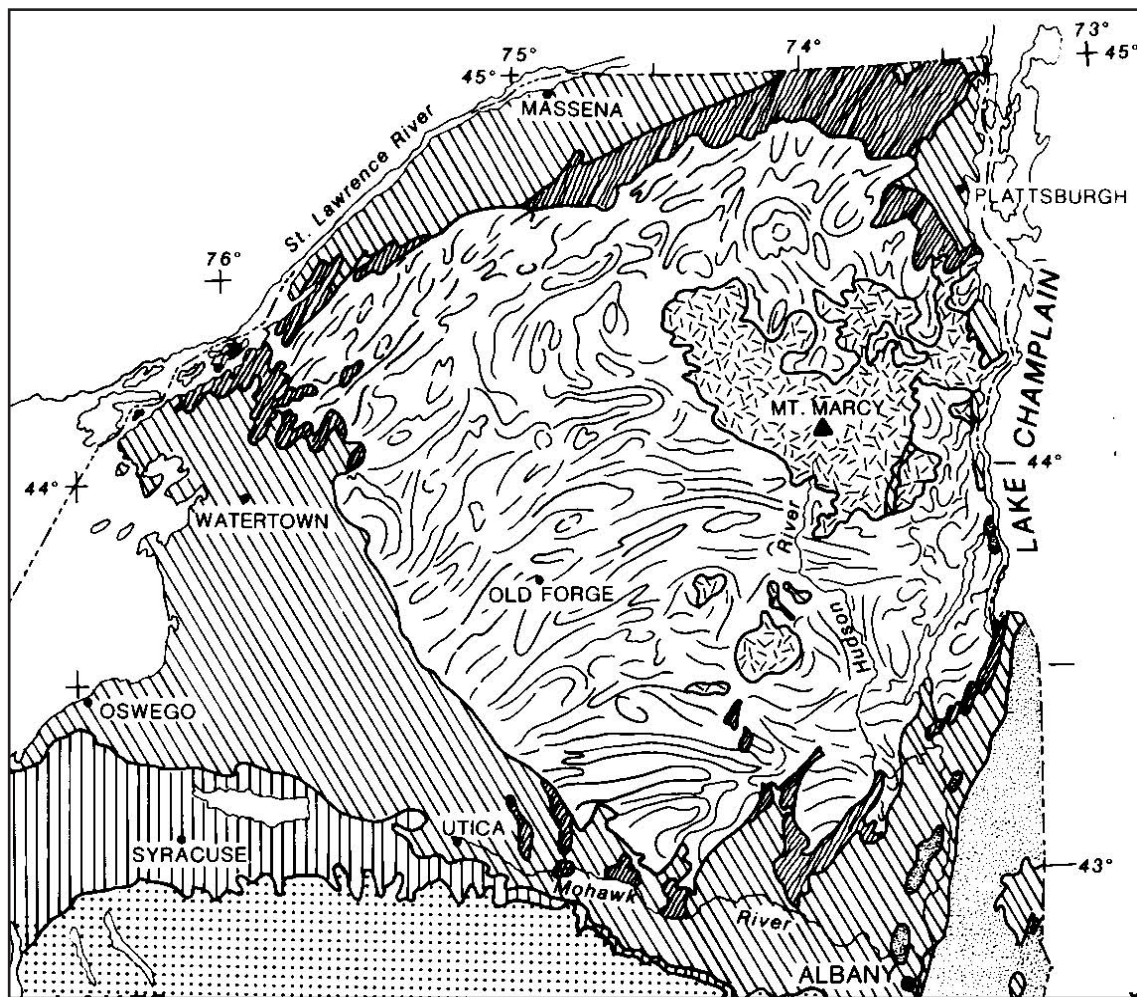
60 _____ and _____

60

61 _____

61

62



62

63 Longitude: _____

63

64 Geologic age: _____

64

Name of Bedrock: _____

Total Score for Part B-2

Part C

65 _____

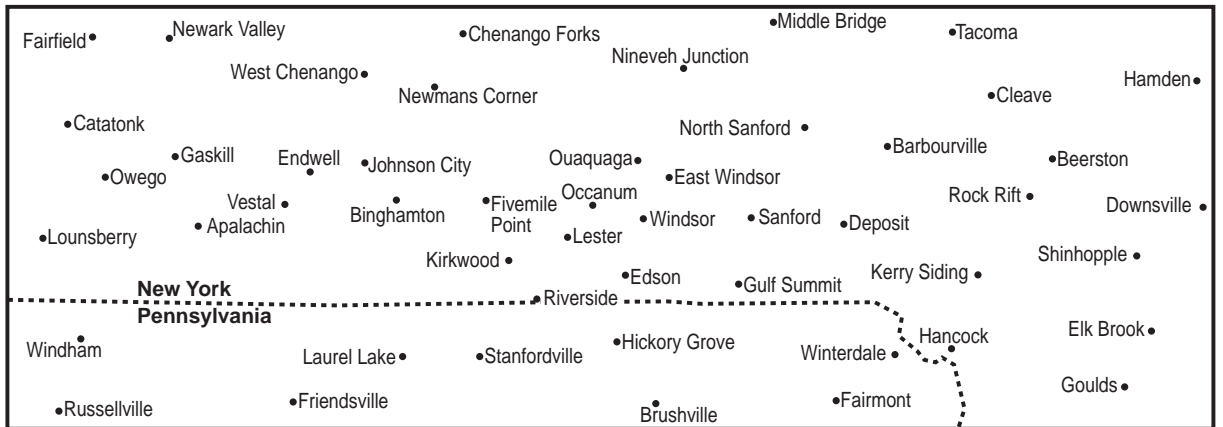
65

66

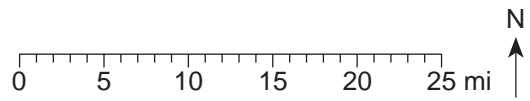
Number	Water Cycle Process
1	
2	
3	
4	
5	
6	

66

67



67



For Raters Only

68 _____ and _____

68

69 _____ front

69

70

Town	F-Scale Number
Vestal	
Windsor	
Sanford	
Deposit	

70

71 rate = _____ mi/min

71

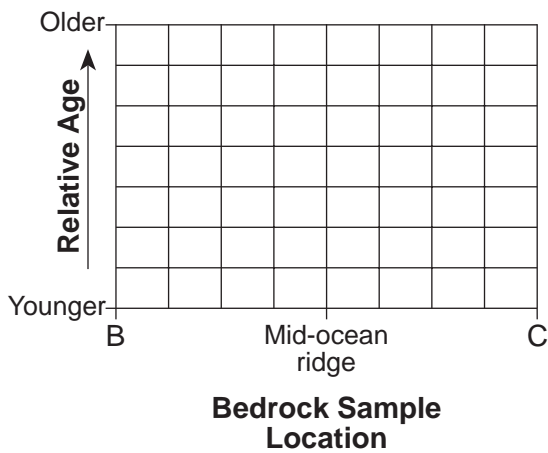
72 _____

72

73 _____

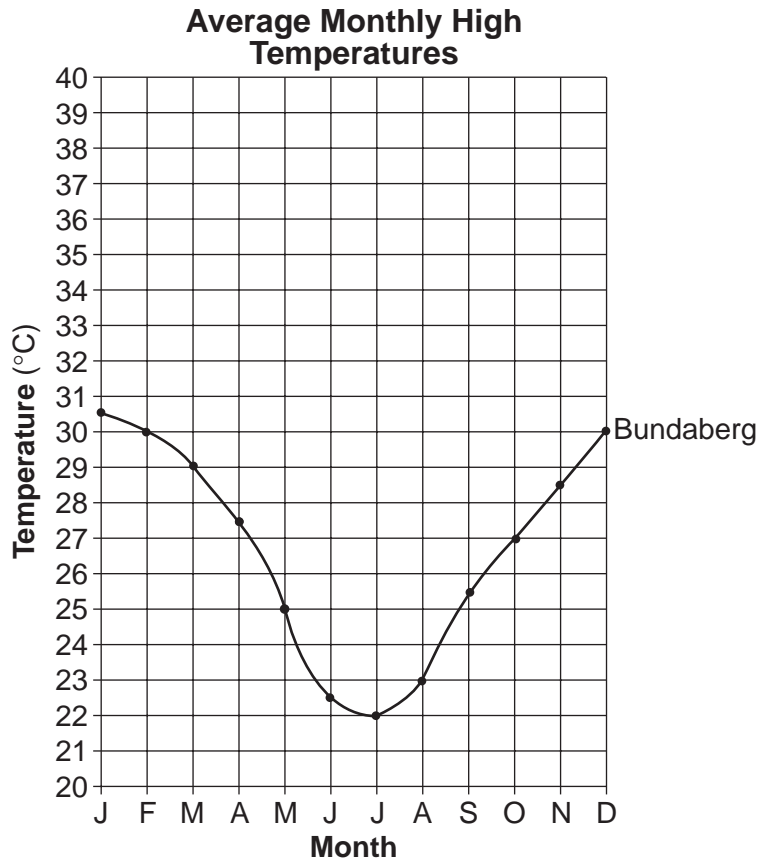
73

74



74

75



75

76

76

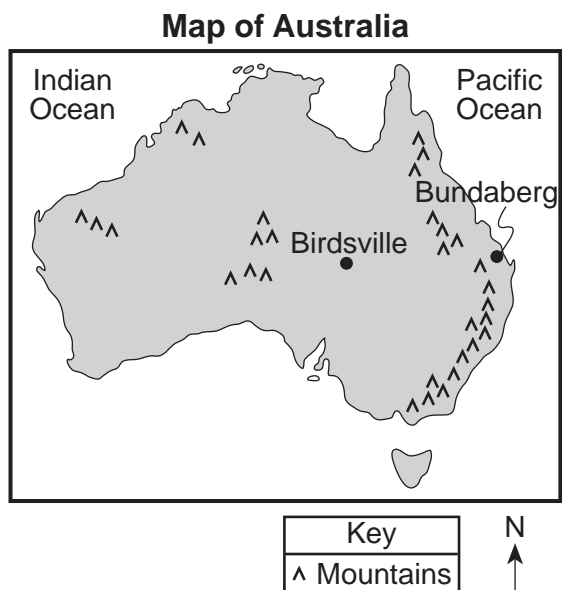
77

77

78

78

79



79

80 _____ million km

80

81 _____

81

82 _____ million yr

82

Total Score for Part C

FOR TEACHERS ONLY

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

PS-ES PHYSICAL SETTING/EARTH SCIENCE

Wednesday, August 16, 2006 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

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

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

Part A and Part B-1

Allow 1 credit for each correct response.

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

Directions to the Teacher

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

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

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

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

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

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

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet and then should add these four scores and enter the total in the box labeled "Total Written Test Score." The student's score for the Earth Science Performance Test should be entered in the space provided. Then, the student's raw scores on the performance test and written test should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Wednesday, August 16, 2006. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

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

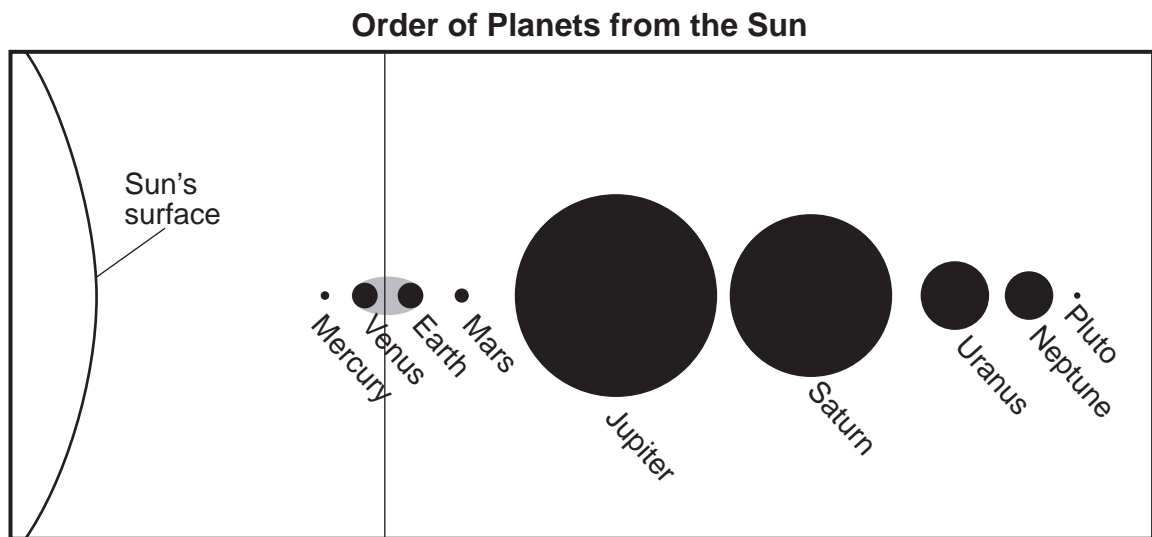
Because scaled scores corresponding to raw scores in the conversion chart may change from one examination to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Part B–2

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

- 51 [1] Allow 1 credit for fusion *or* nuclear fusion.
- 52 [1] Allow 1 credit for a vertical line drawn anywhere through the shaded area shown below. The line does *not* have to be perfectly vertical.

Example of a 1-credit response:



(Distances are not drawn to scale)

- 53 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
- *Aldebaran* is larger than the Sun.
 - The Sun is smaller than *Aldebaran*.

54 [1] Allow 1 credit for Devonian Period.

55 [1] Allow 1 credit for *Pleurodictyum*.

56 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— widespread geographic distribution

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

— The organisms lived in a shallow sea.

— They lived in a marine environment.

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

— There is no contact metamorphism between rock unit A and the sandstone.

— An unconformity exists between the igneous intrusion and sandstone layer.

59 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 2 credits if all four responses are correct. Acceptable responses include, but are not limited to:

Granitic bedrock

Texture:

- coarse
- nonvesicular

Density:

- low density
- 2.7 g/cm^3

Basaltic bedrock

Texture:

- fine
- vesicular or nonvesicular

Density :

- high density
- 3.0 g/cm^3

- Allow 1 credit if only two or three of the responses for the textures and densities are correct.

60 [1] Allow 1 credit if *both* minerals are correct. Acceptable responses include, but are not limited to:

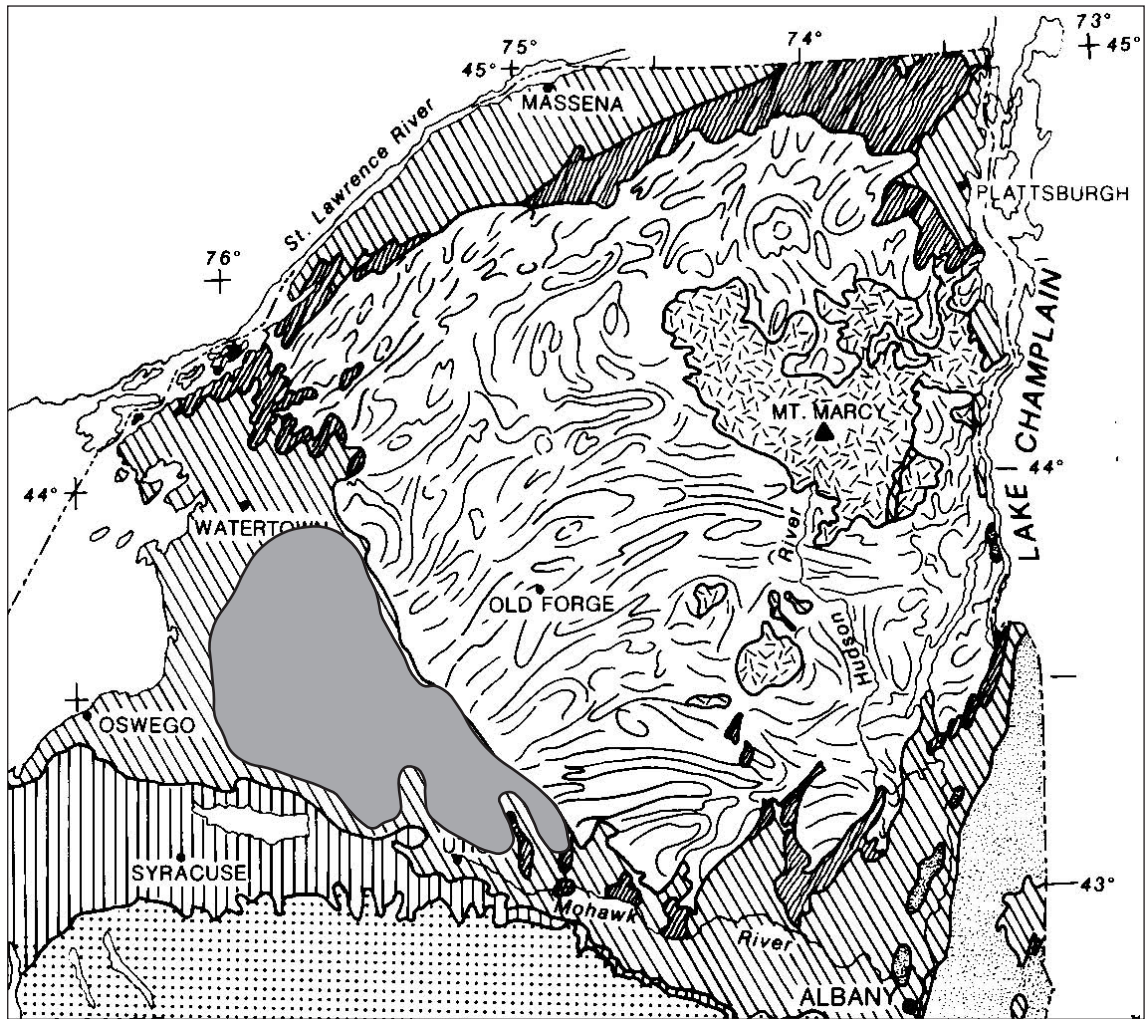
- olivine
- pyroxene *or* augite
- plagioclase *or* plagioclase feldspar

Note: Do *not* accept “feldspar” only.

61 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- rigid mantle
- uppermost part of the mantle

- 62 [1] Allow 1 credit if the center of the **X** is located within the shaded area shown. Also allow credit if a symbol other than **X** is used.



- 63 [1] Allow 1 credit for 74° W. The correct unit and compass direction must be included in the answer.
- 64 [1] Allow 1 credit if *both* the name of the geologic age and the name of the bedrock are correct. Acceptable responses include, but are not limited to:

Geologic age: — Proterozoic
 — Middle Proterozoic
 — Precambrian
 — about 1000 million years

Name of bedrock: — anorthosite
 — anorthositic

Part C

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

65 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- Allegheny Plateau
- Appalachian Plateau (uplands)
- Catskills

66 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 2 credits if five or six processes are correctly identified.
- Allow 1 credit if only three or four processes are correctly identified.

Example of a 2-credit response:

Number	Water Cycle Process
1	evaporation
2	transpiration
3	condensation
4	precipitation
5	runoff
6	infiltration

67 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

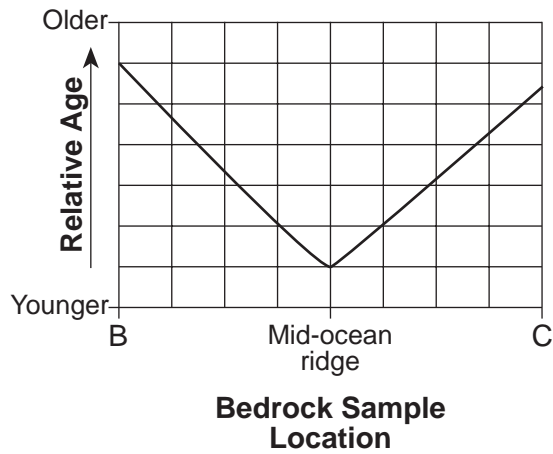
- trench
- Peru-Chile trench
- a subduction zone
- a convergent boundary
- a fault

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

- divergence
- seafloor spreading

69 [1] Allow 1 credit for a correctly drawn line. The line may be curved or straight, and the lowest point should be at the mid-ocean ridge.

Example of a 1-credit response:



70 [2] Allow a maximum of 2 credits, allocated as follows:

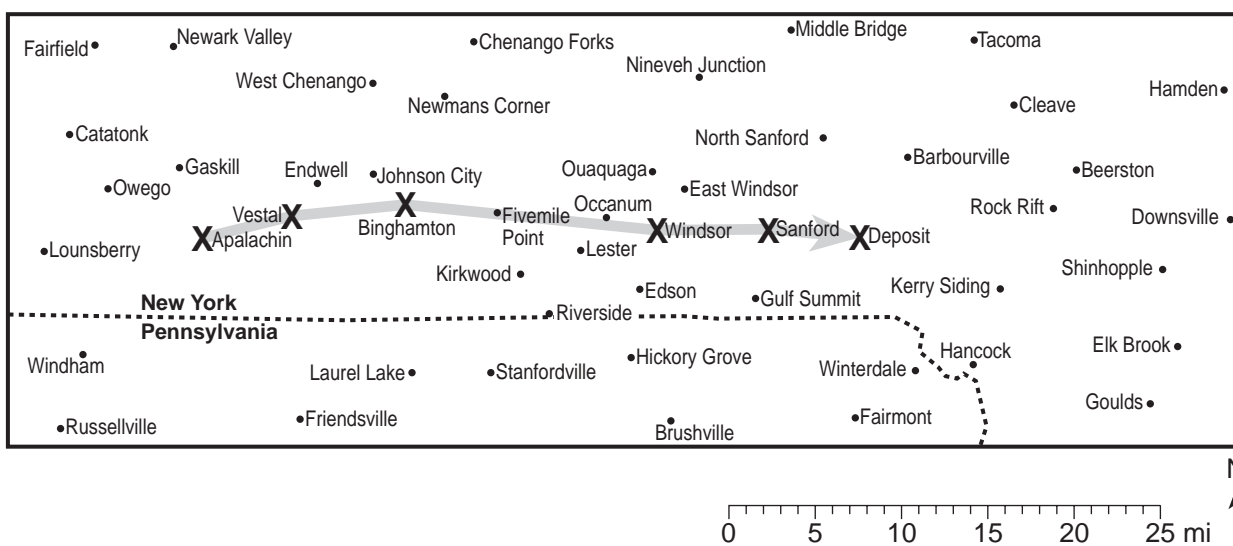
- Allow 2 credits if an **X** is correctly placed on *each* of the six towns, and a line correctly connects the six towns in the order described in the article. The arrow should point eastward and does not need to be at the end of the line.
- Allow 1 credit if an **X** is correctly placed on only four or five towns, and a line correctly connects the four or five towns in the order described in the article. The arrow should point eastward and does not need to be at the end of the line.

or

- Allow 1 credit if an **X** is correctly placed on *each* of the six towns, but the line and/or the arrow has been incorrectly drawn or omitted.

Note: Also allow credit if a symbol other than **X** is used.

Example of a 2-credit response:



71 [1] Allow 1 credit for *two* correct responses. Allow credit for either upper- or lower-case letters. For example, allow credit for MT or Mt or mt or mT. Acceptable responses include, but are not limited to:

- cP and mT
- mT and cP
- mT and cA
- cA and mT

Note: Do *not* allow credit if the letters are reversed, e.g., Tm.

72 [1] Allow 1 credit for cold front.

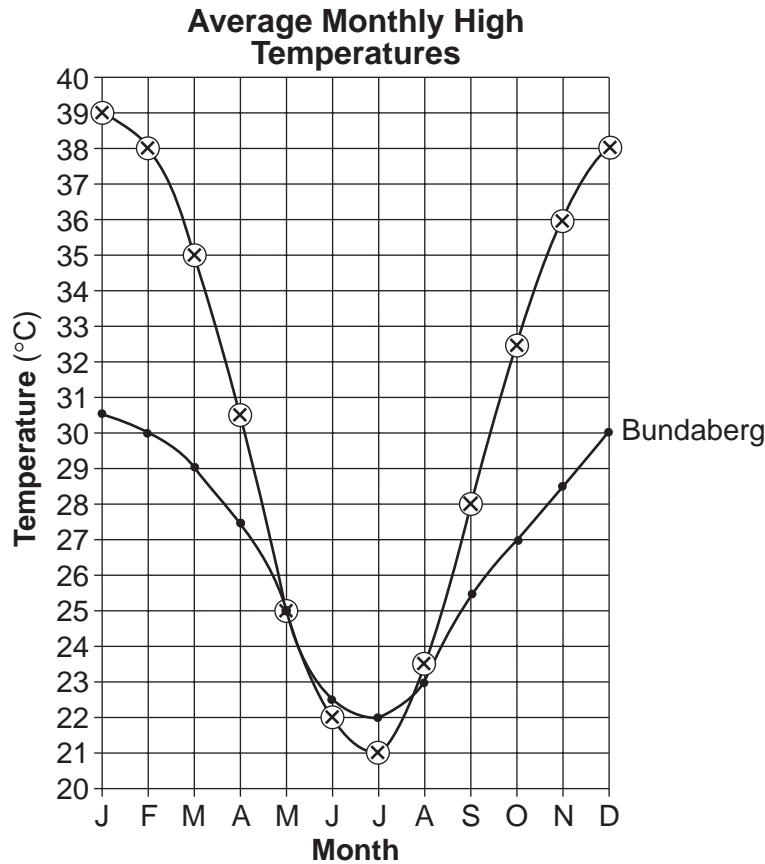
73 [1] Allow 1 credit if three or four classifications are correct, as shown below.

Town	F-Scale Number
Vestal	1
Windsor	0
Sanford	1
Deposit	3

74 [1] Allow 1 credit for 0.7 mi/m.

- 75 [1] Allow 1 credit if the centers of ten, eleven, or twelve plotted **Xs** are within the circles shown and the **Xs** are correctly connected with a line.

Example of a 1-credit response:



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

- Birdsville is located inland near the center of the continent.
- Bundaberg is located near a large body of water (the ocean) that moderates climate temperatures.

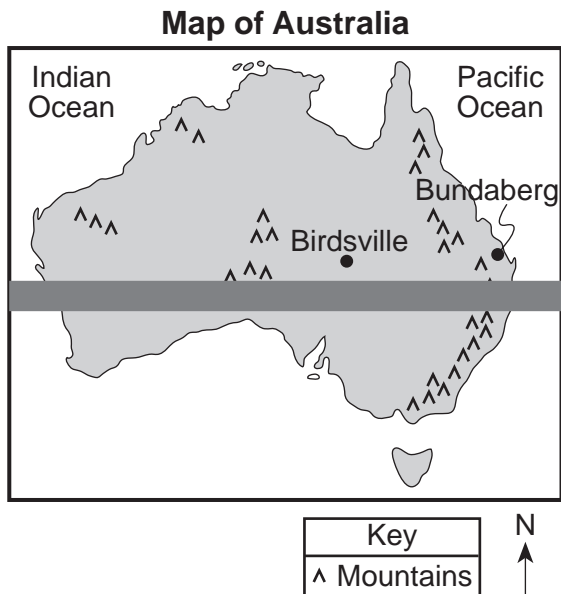
- 77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- Bundaberg is located near the ocean.
- Birdsville is located inland.
- The warm ocean current affects the climate of Bundaberg.
- Bundaberg is located on the windward side of the mountain.

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

- Bundaberg is located east of Birdsville.
- Birdsville is west of Bundaberg.
- Earth rotates west to east.

79 [1] Allow 1 credit for drawing a horizontal line at 30° S latitude within the shaded area shown below.



80 [1] Allow 1 credit for any value from 400 to 600 million km.

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

- Asteroid 1994 XL1 was very small.
- The asteroid was 100,000 times fainter than the naked eye could see.
- Asteroid 1994 XL1 was dark colored.

82 [1] Allow 1 credit for 65 million yr.

The *Chart for Determining the Final Examination Score for the August 2006 Regents Examination in Physical Setting/Earth Science* will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Wednesday, August 16, 2006. 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.

The *Teacher Evaluation of State Examinations* forms will be posted on the same web site. Please select the link "Teacher Evaluation Forms" and then the examination title to complete the evaluation form for the *August 2006 Regents Examination in Physical Setting/Earth Science*.

Map to Core Curriculum

August 2006 Physical Setting/ Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	3	39,42	69,74,75
Math Key Idea 2	12,35	38,46,53	
Math Key Idea 3			
Science Inquiry Key Idea 1		40,56	76,77,78
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	5,9,19,31,32	48,49,50,51,54,59, 60,62,63,64	66,70,80,81,82
Engineering Design. Key Idea 1			
Standard 2			
Key Idea 1			71,72
Key Idea 2			81
Key Idea 3			
Standard 6			
Key Idea 1	7,17,23,26	44,47,57,58	65,76,78
Key Idea 2	10,13,14,17,20,21, 23,25,26,27,30,34, 38	36,37,41,43,45,47, 54,55,58,61,63,64	67,68,70,77,79
Key Idea 3	33		70
Key Idea 4			
Key Idea 5	17	52	66
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4			
Performance Indicator 1	1,2,3,4,5,6,7,21,31, 34,35	36,37,38,39,40,51, 52,53,54,55,56,57, 58,63,64	71,78,79,80,81,82
Performance Indicator 2	8,9,10,11,12,13,14, 15,16,17,18,19,20, 22,23,24,25,26,27, 28,29,30	41,42,43,44,45,46, 47,48,59,61,62	65,67,68,69,70,71,72,73, 74,75,76,77
Performance Indicator 3	32,33	48,49,60	
Reference Tables			
ESRT 2001 edition	3,5,7,9,10,12,19, 31,32,33	38,39,42,48,49,50, 53,54,55,59,60,61, 62,63,64	65,67,68,71,79,80,82

Regents Examination in Earth Science – August 2006

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

To determine the student's final score, locate the student's Total Performance Test Score across the top of the chart and the Total Written Test Score down the side of the chart. The point where the two scores intersect is the student's final examination score. For example, a student receiving a Total Performance Test Score of 10 and Total Written Test Score of 72 would receive a final examination score of 86.

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

**Total Performance Test Score
August 2006 Examination in Earth Science – continued**

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