

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

EARTH SCIENCE

Friday, June 18, 1999 — 1:15 to 4:15 p.m., only

The last page of the booklet is the answer sheet. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

All of your answers are to be recorded on the separate answer sheet. For each question, decide which of the choices given is the best answer. Then on the answer sheet, in the row of numbers for that question, circle with pencil the number of the choice that you have selected. The sample below is an example of the first step in recording your answers.

SAMPLE: ① 2 3 4

If you wish to change an answer, erase your first penciled circle and then circle with pencil the number of the answer you want. After you have completed the examination and you have decided that all of the circled answers represent your best judgment, signal a proctor and turn in all examination material except your answer sheet. Then and only then, place an X in ink in each penciled circle. Be sure to mark only one answer with an X in ink for each question. No credit will be given for any question with two or more X's marked. The sample below indicates how your final choice should be marked with an X in ink.

SAMPLE: ⊗ 2 3 4

The *Earth Science Reference Tables*, which you may need to answer some questions in this examination, are supplied separately. Be certain you have a copy of the 1994 edition of these reference tables before you begin the examination.

When you have completed the examination, you must sign the statement printed at the end of the 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 cannot be accepted if you fail to sign this declaration.

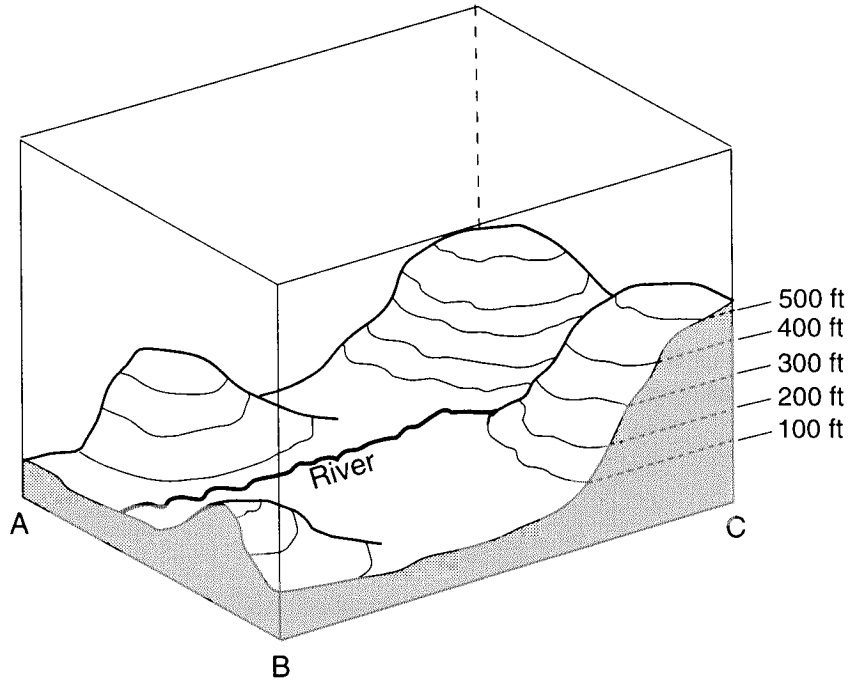
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

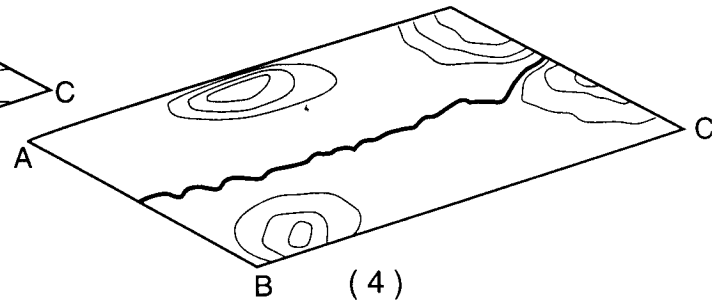
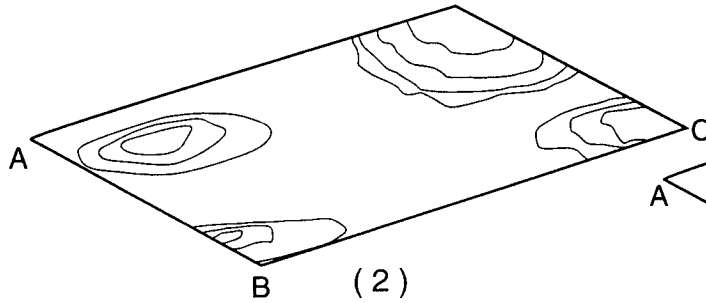
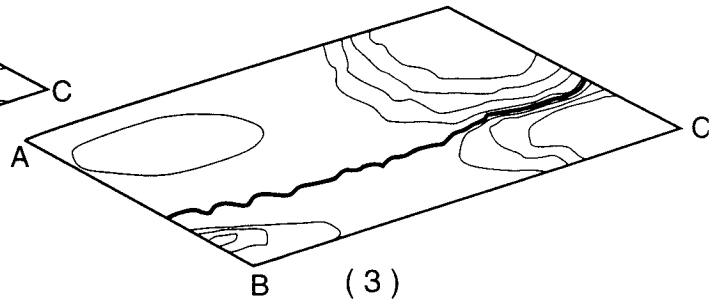
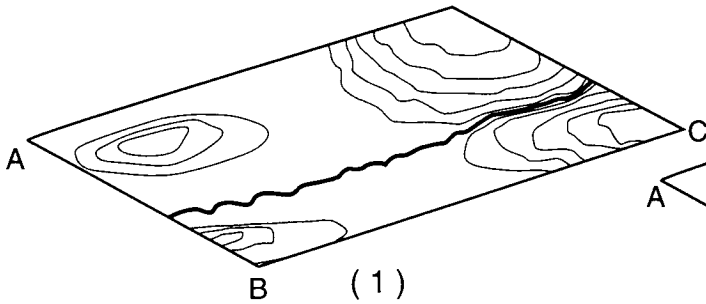
Answer all 55 questions in this part. [55]

Directions (1–55): For each statement or question, select the word or expression that, of those given, best completes the statement or answers the question. Record your answer on the separate answer sheet in accordance with the directions on the front page of this booklet. Some questions may require the use of the *Earth Science Reference Tables*.

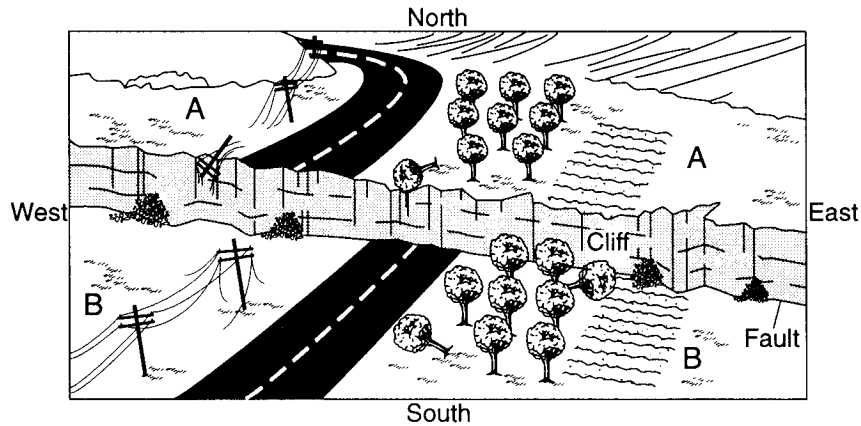
1 The diagram below is a three-dimensional model of a landscape region.



Which map view best represents the topography of this region?



- 2 The drawing below shows the effects of an earthquake on a small part of Earth's surface. Letters A and B indicate land on opposite sides of a cliff that formed along a fault during the earthquake.



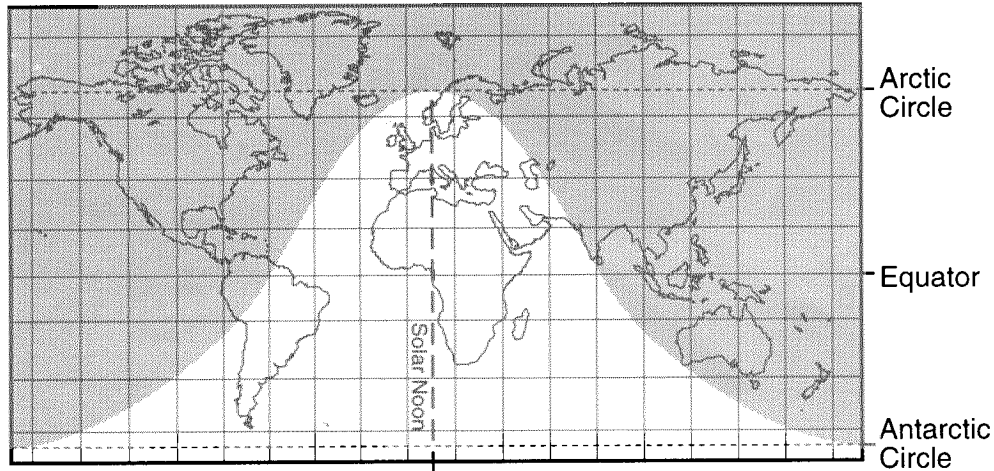
In relation to the position of side B, the movement of side A was

- | | |
|-------------------------|-------------------------|
| 1 eastward and downward | 3 westward and downward |
| 2 eastward and upward | 4 westward and upward |
-
- 3 Science investigators initially use classification systems to
- 1 extend their powers of observation
 - 2 make more accurate inferences
 - 3 organize their observations in a meaningful way
 - 4 make direct comparisons with standard units of measurement
- 4 Which process requires the most absorption of energy by water?
- 1 melting 1 gram of ice
 - 2 condensing 1 gram of water vapor
 - 3 vaporizing 1 gram of liquid water
 - 4 freezing 1 gram of liquid water
- 5 The circumference of Earth is approximately 40,000 kilometers at the Equator. What is Earth's approximate rate of rotation, in kilometers per hour, at the Equator?
- | | |
|-----------------|------------------|
| (1) 1,667 km/hr | (3) 16,667 km/hr |
| (2) 9,600 km/hr | (4) 66,000 km/hr |
- 6 As measured by an observer on Earth over the course of a year, the apparent diameter of the Moon will
- 1 decrease, only
 - 2 increase, only
 - 3 remain the same
 - 4 vary in a cyclic manner
- 7 Which diagram best shows the altitude of Polaris observed near Buffalo, New York?
- (1)

(3)
- (2)

(4)
- 8 An object's weight at sea level at 90° North latitude is slightly more than the weight of the same object at sea level at 0° latitude. Which statement about Earth can best be inferred from this evidence?
- 1 Earth's orbit is slightly elliptical.
 - 2 Earth's axis is tilted $23\frac{1}{2}^\circ$ to the plane of its orbit.
 - 3 Earth's shape is slightly bulged at the Equator.
 - 4 Earth rotates counterclockwise as viewed from above the Equator.

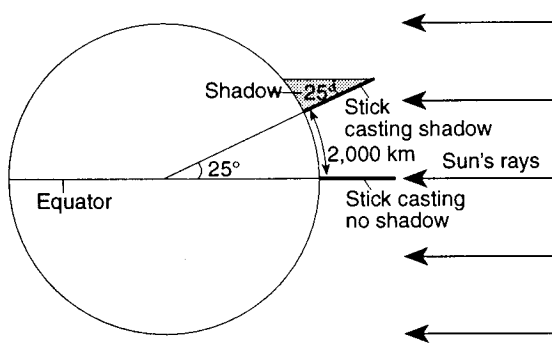
9 The shaded portion of the map below indicates areas of night and the unshaded portion indicates areas of daylight.



What day of the year is best represented by the map?

- | | |
|------------|----------------|
| 1 March 21 | 3 September 21 |
| 2 June 21 | 4 December 21 |

10 The diagram below shows information needed to use Eratosthenes' method to find the circumference of a planet. At noon, a vertical stick at the planet's equator casts no shadow. At a location farther north, another vertical stick casts a shadow that makes an angle of 25° with the rays of the Sun. The distance between the two sticks is 2,000 kilometers.



(Not drawn to scale)

What is the approximate circumference of this planet?

- | | |
|---------------|---------------|
| (1) 18,800 km | (3) 36,200 km |
| (2) 28,800 km | (4) 50,000 km |

11 During how many days of a calendar year is the Sun directly overhead at noon in New York State?

- | | |
|-----------------|--------------|
| (1) only 1 day | (3) 365 days |
| (2) only 2 days | (4) 0 days |

12 A barefoot student steps on a hot concrete surface. Most of the heat transferred to the student's skin by this contact is by the process of

- | | |
|--------------|----------------|
| 1 convection | 3 vaporization |
| 2 conduction | 4 radiation |

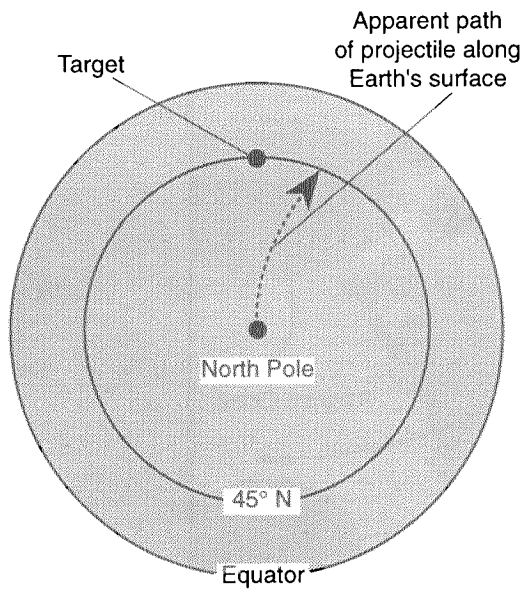
13 In the visible spectrum, which color has the longest wavelength?

- | | |
|---------|----------|
| 1 red | 3 orange |
| 2 green | 4 violet |

14 How do the rates of warming and cooling of land surfaces compare to the rates of warming and cooling of ocean surfaces?

- 1 Land surfaces warm faster and cool more slowly.
- 2 Land surfaces warm more slowly and cool faster.
- 3 Land surfaces warm faster and cool faster.
- 4 Land surfaces warm more slowly and cool more slowly.

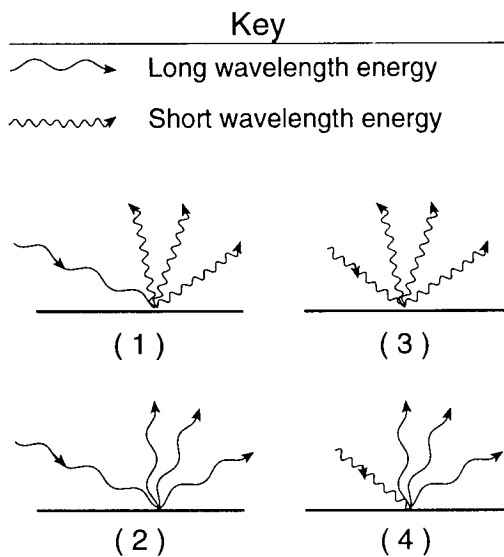
15 The diagram below shows the apparent path of a projectile fired from Earth's North Pole toward a target located at 45° North latitude.



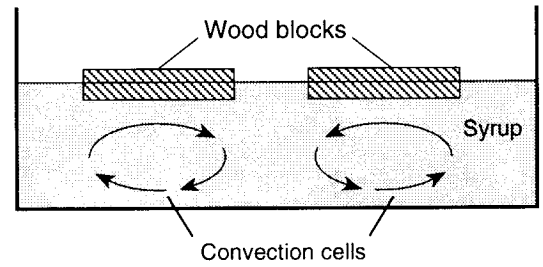
The apparent curving of the projectile's path, as seen by observers on Earth, is caused mainly by

- 1 prevailing winds
- 2 convection currents
- 3 Earth's rotation
- 4 gravitational forces

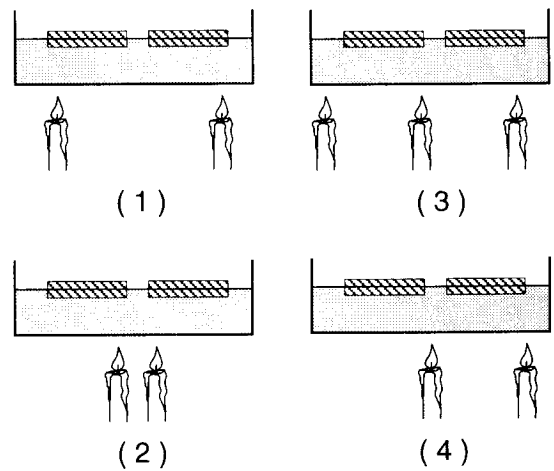
16 Which diagram best represents the wavelength of most of the sunlight energy absorbed and the wavelength of infrared energy reradiated by the roof of a building at 2 p.m. on a clear summer day?



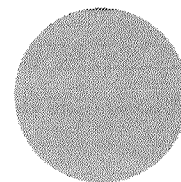
17 A student set up the activity shown in the diagram below to demonstrate how convection cells in Earth's mantle could cause crustal plates to converge.



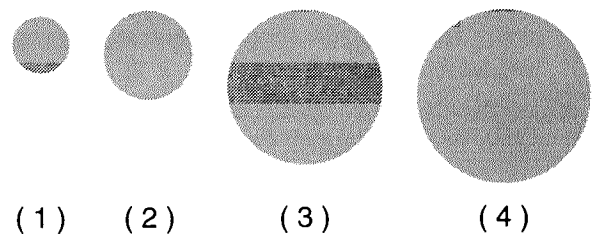
Which diagram shows the best placement of heat sources to cause the blocks to converge?



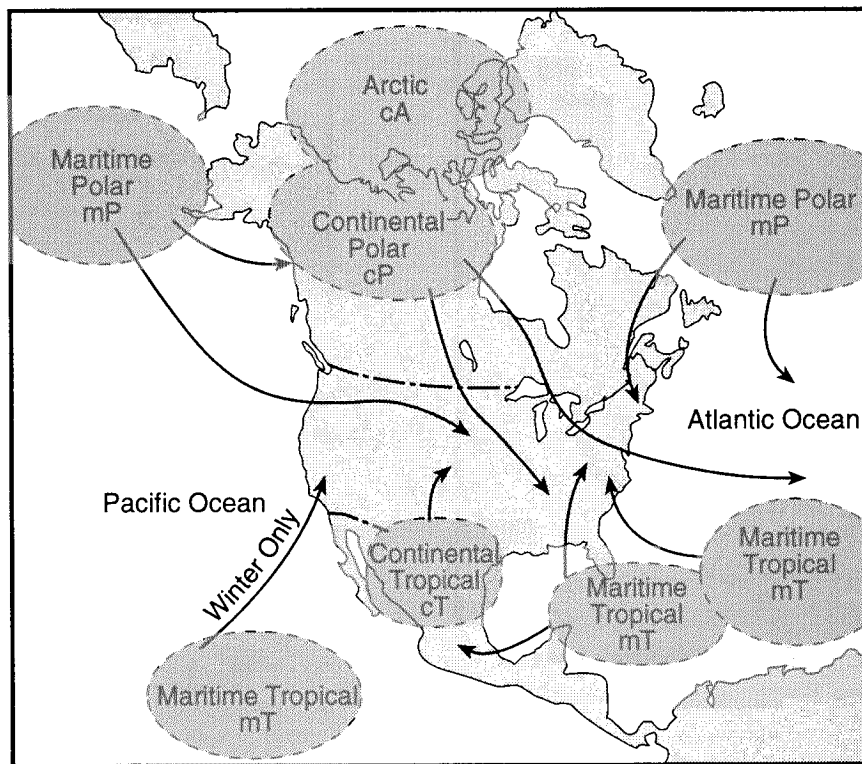
18 The diagram below represents Earth.



Which diagram best represents Mars, drawn to the same scale?



Base your answers to questions 19 and 20 on the map below, which shows North American air-mass source regions, the resulting air-mass names, and typical air-mass tracks.



- 19 A maritime polar air mass approaching New York State would most likely bring
- 1 cool, moist air from the north
 - 2 warm, moist air from the south
 - 3 cool, dry air from the southeast
 - 4 warm, dry air from the southwest

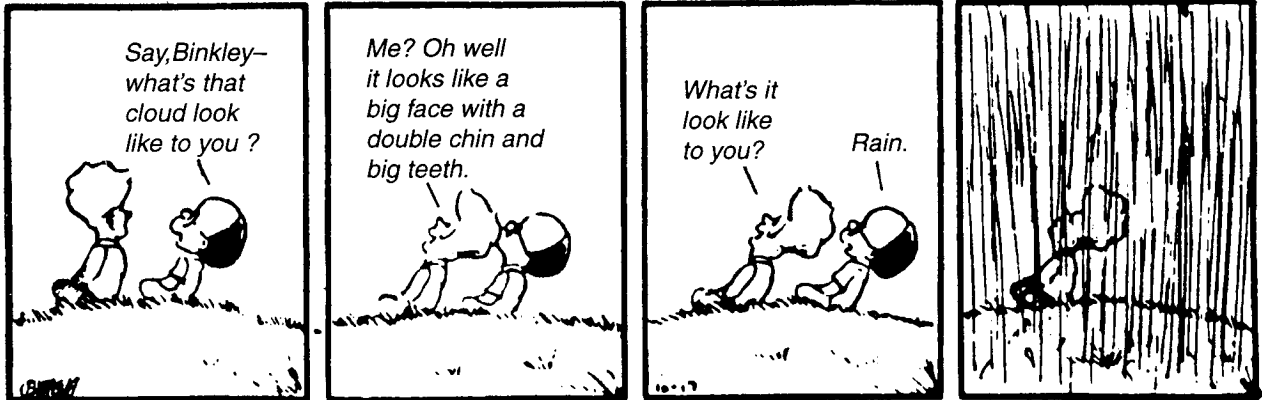
- 20 Polar air-mass characteristics differ from tropical air-mass characteristics primarily because the source regions differ in their
- | | |
|---------------------|-------------|
| 1 nearness to land | 3 latitude |
| 2 nearness to water | 4 longitude |

- 21 Which type of climate has the greatest amount of rock weathering caused by frost action?
- 1 a dry climate in which temperatures remain below freezing
 - 2 a dry climate in which temperatures alternate from below freezing to above freezing
 - 3 a wet climate in which temperatures remain below freezing
 - 4 a wet climate in which temperatures alternate from below freezing to above freezing

- 22 The *Generalized Bedrock Geology Map of New York State* provides evidence that water flows from Lake Erie into Lake Ontario by showing that Lake Ontario
- 1 is north of Lake Erie
 - 2 is deeper than Lake Erie
 - 3 has a larger surface area than Lake Erie
 - 4 has a lower surface elevation than Lake Erie

23 The cartoon below shows a humorous view of a weather phenomenon.

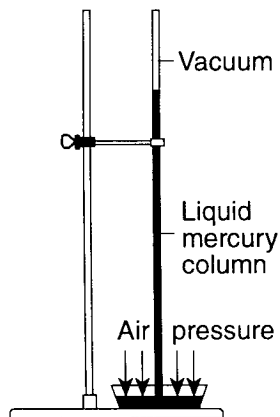
BLOOM COUNTY / By Berke Breathed



Rain fell from the cloud because

- 1 too few condensation nuclei were in the cloud
- 2 the cloud's water droplets combined and became large enough to fall
- 3 evaporation in the upper portion of the cloud caused the cloud to become smaller and "squeezed" water out
- 4 the temperature in the cloud rose above the dewpoint

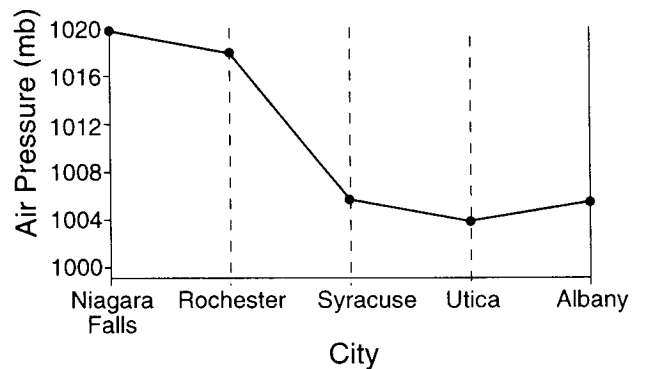
24 A mercury barometer that is used to measure air pressure is shown below.



A decrease in the height of the mercury column usually indicates the approach of a

- 1 low-pressure system and stormy weather
- 2 low-pressure system and clear weather
- 3 high-pressure system and stormy weather
- 4 high-pressure system and clear weather

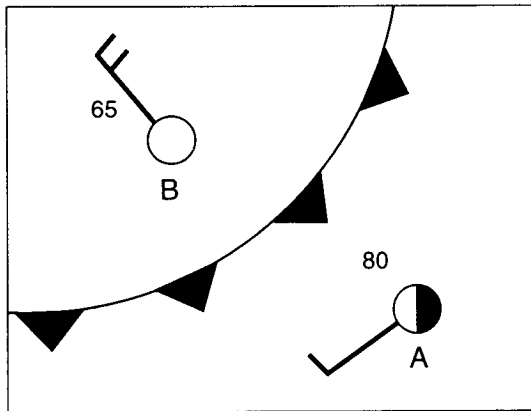
25 The graph below shows the air pressure recorded at the same time at several locations between Niagara Falls and Albany.



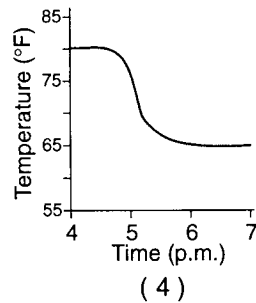
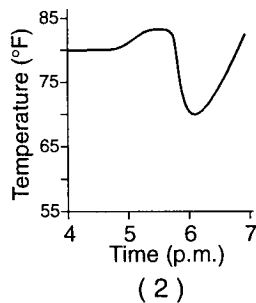
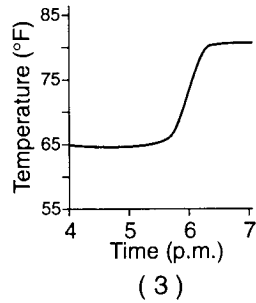
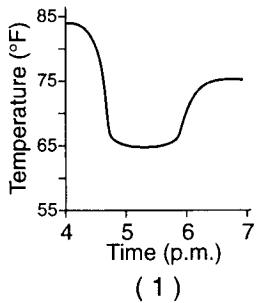
Based on the information in this graph, the wind velocity is probably greatest between which two cities?

- 1 Niagara Falls and Rochester
- 2 Rochester and Syracuse
- 3 Syracuse and Utica
- 4 Utica and Albany

26 The map below shows partial weather conditions for weather stations *A* and *B* at 4 p.m. A weather front is located between the two stations.



Which graph represents the temperature change that will most likely occur at station *A* as the front passes in the next three hours?



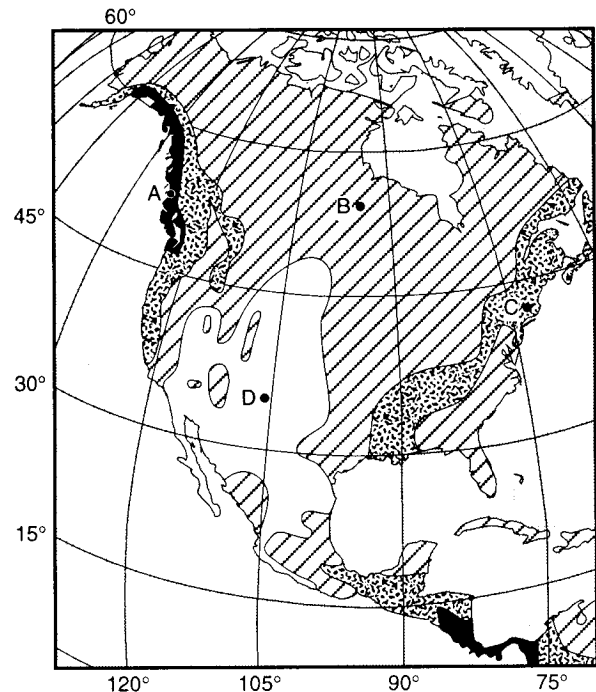
27 The percentage of open space between grains of soil is called the soil's

- 1 permeability
- 2 porosity
- 3 discharge
- 4 capillarity

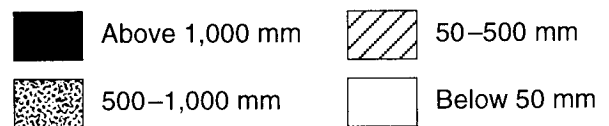
28 Which current is a cool ocean current that flows completely around Earth?

- 1 California Current
- 2 Gulf Stream
- 3 West Wind Drift
- 4 North Equatorial Current

29 The map below shows the annual amount of surface runoff in part of the Northern Hemisphere.



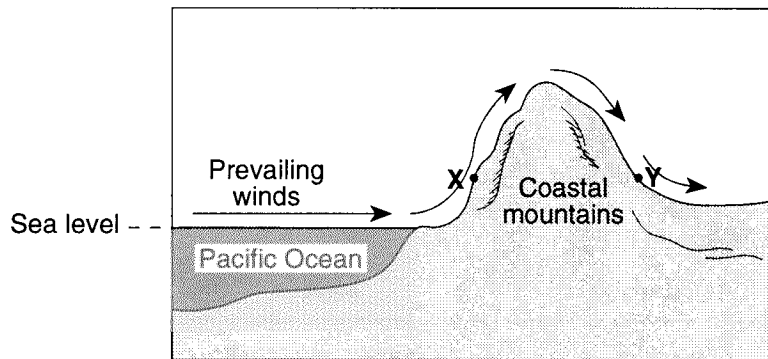
Key



At which point on the map does the amount of precipitation exceed by the greatest amount both the actual evapotranspiration and the infiltration of water into the ground?

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

- 30 The cross section below represents a portion of the coastal mountains in the western United States. Location X is near the shore of the Pacific Ocean, and location Y is on the eastern slope of the mountains. Prevailing winds are from west to east.



(Not drawn to scale)

Compared to the climate at location X, the climate at location Y is

- | | |
|---------------------|---------------------|
| 1 warmer and drier | 3 cooler and drier |
| 2 warmer and wetter | 4 cooler and wetter |

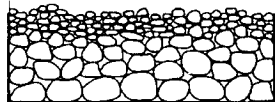
- 31 What is the largest particle that can generally be transported by a stream moving at 200 centimeters per second?

- | | |
|-----------|----------|
| 1 boulder | 3 pebble |
| 2 cobble | 4 sand |

- 32 Quartz particles of varying sizes are dropped at the same time into deep, calm water. Which cross section best represents the settling pattern of these particles?



(1)



(3)



(2)

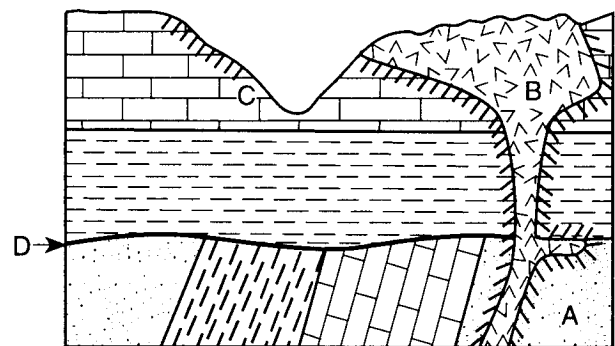


(4)

- 33 Which agent of erosion formed the long U-shaped valleys now occupied by the Finger Lakes in central New York State?

- | | |
|---------------|------------------|
| 1 glacial ice | 3 ocean currents |
| 2 wind | 4 running water |

- 34 The cross section below represents bedrock that has been changed by several geologic events.



Key



Igneous rock



Sandstone



Limestone



Shale

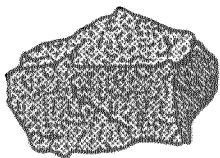
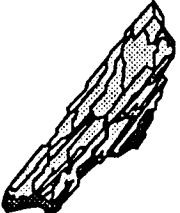

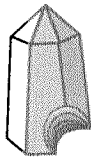

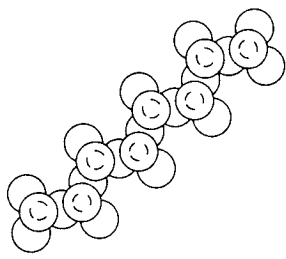
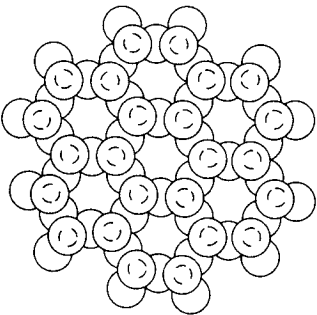
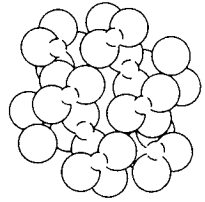


Contact metamorphism

Which geologic event happened most recently?

- 1 tilting of rock A
- 2 intrusion of rock B
- 3 formation of the unconformity at D
- 4 erosion of rocks B and C

35 The table below provides information about four common silicate minerals.

← Increased Sharing of Oxygen →			
			
Olivine	Hornblende	Mica	Quartz
Breaks into irregular grains	Cleaves into splinters	Cleaves easily into thin sheets	Fractures unevenly
			
Single tetrahedra (no oxygens shared by adjoining tetrahedra)	Single chains of tetrahedra (2 oxygens shared by adjoining tetrahedra)	Sheets of tetrahedra (3 oxygens shared by adjoining tetrahedra)	Networks of tetrahedra (all oxygens shared by adjoining tetrahedra)

Key

- Oxygen atom
 ○ Silicon atom located under an oxygen atom

Which conclusion is best supported by the information in this table?

- 1 The shape of the tetrahedral unit controls the shape of the broken mineral.
- 2 The arrangement of the tetrahedral units controls the mineral breakage pattern.
- 3 The percent of shared oxygen controls the size of the mineral crystal.
- 4 The type of atoms present controls how much oxygen is shared.

36 A seismograph records the arrival of a *P*-wave at 11:13 a.m. If the earthquake occurred 4,000 kilometers from the recording station, when did the earthquake occur?

- (1) 11:06 a.m.
- (2) 11:11 a.m.
- (3) 11:13 a.m.
- (4) 11:20 a.m.

37 At which depth below Earth's surface is the density most likely 9.5 grams per cubic centimeter?

- (1) 1,500 km
- (2) 2,000 km
- (3) 3,500 km
- (4) 6,000 km

38 The table below shows the chemical composition of some common minerals found in rocks of the lithosphere.

Mineral	Chemical Composition
Hematite	Fe_2O_3
Calcite	CaCO_3
Quartz	SiO_2
Potassium feldspar	KAISi_3O_8

As indicated by its chemical composition, which mineral could have formed when CO_2 (carbon dioxide) combined with another substance?

- 1 potassium feldspar 3 quartz
 2 hematite 4 calcite

39 Although more than 2,000 minerals have been identified, 90% of Earth's lithosphere is composed of the 12 minerals listed below.

Rock-Forming Minerals	
feldspar	augite
quartz	garnet
mica	magnetite
calcite	olivine
hornblende	pyrite
kaolinite	talc

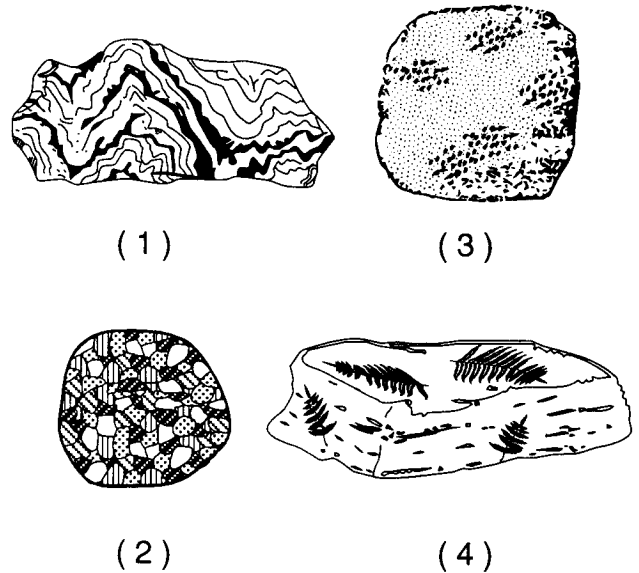
The best explanation for this fact is that most rocks

- 1 are monomineralic
 2 are composed of recrystallized minerals, only
 3 have a number of minerals in common
 4 have a 10% nonmineral composition

40 Deep, parallel grooves and scratches (striations) are found on the surface of some limestone bedrock in New York State. These scratches and grooves suggest that the surface was

- 1 abraded by windblown sand
 2 scraped by rocks in a continental glacier
 3 eroded by a meandering stream
 4 cracked by the evaporation of a warm, shallow sea

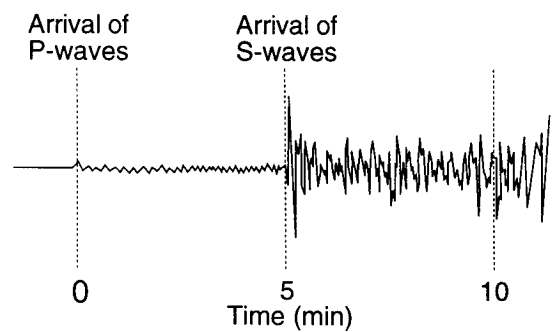
41 Which rock sample is most likely a foliated metamorphic rock?



42 Which statement best describes the formation of an intrusive igneous rock?

- 1 Magma solidifies slowly, resulting in a coarse-grained texture.
 2 Magma solidifies slowly, resulting in a fine-grained texture.
 3 Magma solidifies rapidly, resulting in a glassy texture.
 4 Magma solidifies rapidly, resulting in a clastic texture.

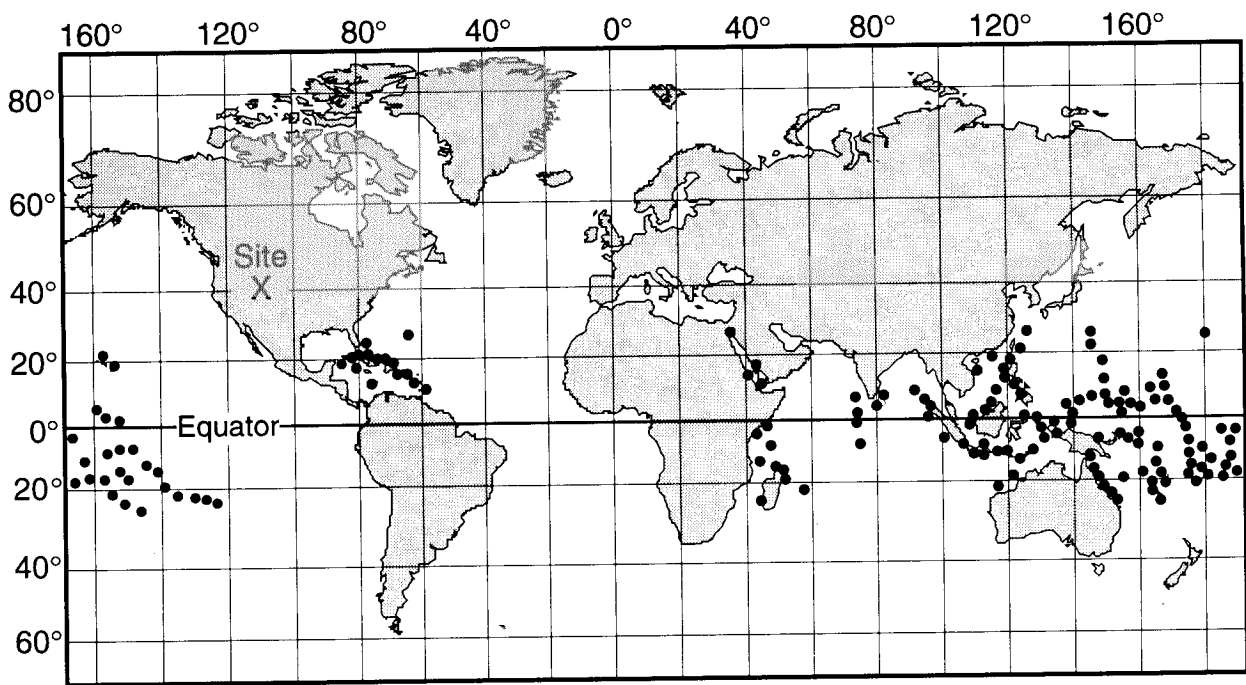
43 The diagram below shows data received at a seismic station following an earthquake.



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

- (1) 1,300 km (3) 3,400 km
 (2) 2,600 km (4) 5,000 km

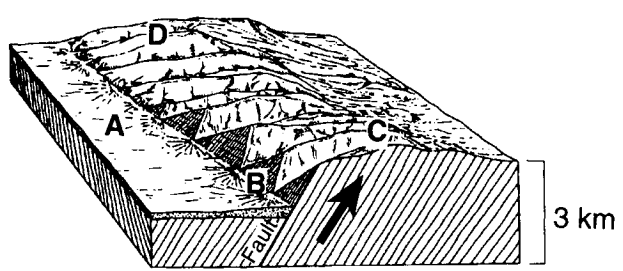
44 The dots on the map below show the present locations of living coral reefs. Site X indicates an area of fossil coral reefs preserved in rocks formed during the Jurassic Period.



Which inference is best supported by this map?

- 1 The climate at site X during the Jurassic Period was colder than the present climate at site X.
- 2 The coral at site X evolved from ocean-dwelling animals into land-dwelling animals after the Jurassic Period.
- 3 Site X has drifted southward since the Jurassic Period.
- 4 Site X was covered by warm ocean water during the Jurassic Period.

45 The block diagram below represents a portion of the surface of Earth's crust.



Which letter is located on the boundary between two landscape regions?

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

46 Trilobite fossils were recently discovered in Himalayan Mountain bedrock. During which geologic period could this bedrock have been formed?

- | | |
|--------------|------------|
| 1 Tertiary | 3 Triassic |
| 2 Cretaceous | 4 Cambrian |

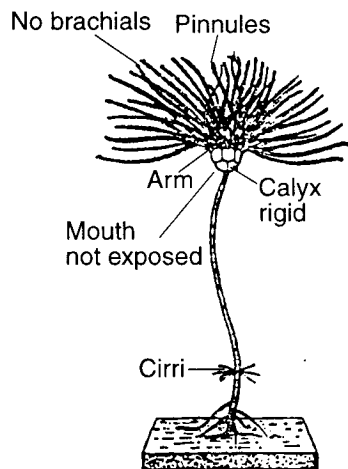
47 What is the geologic age of the surface bedrock of most of the Allegheny Plateau landscape region in New York State?

- | | |
|------------|--------------|
| 1 Cambrian | 3 Silurian |
| 2 Devonian | 4 Ordovician |

Base your answers to questions 48 and 49 on the table below. The table shows the characteristics and geological range of the four general fossil types of one kind of echinoderm called crinoids.

Crinoid Fossil Type	Mouth and Food Grooves	Calyx	Calyx Plates	Arms	Geologic Time Range
Camerata	Not exposed	Rigid	Some brachials	Pinnules	Ordovician to Permian
Flexibilia	Exposed	Flexible	Some brachials	No pinnules	Ordovician to Mississippian
Inadunata	Not exposed	Rigid	No brachials	With or without pinnules	Ordovician to Triassic
Articulata	Exposed	Flexible	With or without brachials	Pinnules	Triassic to Recent

48 Which type of crinoid is shown below?



- | | |
|--------------|--------------|
| 1 Camerata | 3 Inadunata |
| 2 Flexibilia | 4 Articulata |

49 Evidence shown on the chart suggests that most crinoid types

- 1 are extinct
- 2 lacked a mouth
- 3 had a rigid calyx
- 4 lived during the Cambrian

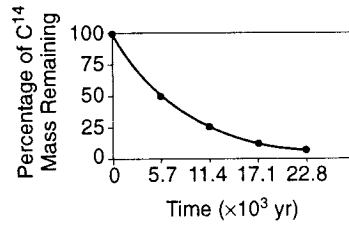
50 What happens to *P*-waves and *S*-waves from a crustal earthquake when the waves reach Earth's outer core?

- (1) *S*-waves are transmitted through the outer core, but *P*-waves are not transmitted.
- (2) *P*-waves are transmitted through the outer core, but *S*-waves are not transmitted.
- (3) Both *P*-waves and *S*-waves are transmitted through the outer core.
- (4) Neither *P*-waves nor *S*-waves are transmitted through the outer core.

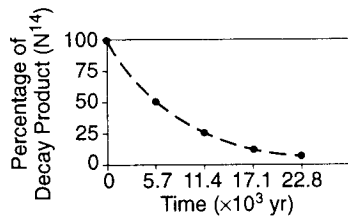
51 Evidence found in igneous rocks suggests that, through geologic time, Earth's magnetic poles have

- 1 maintained their present positions
- 2 corresponded exactly with Earth's geographic poles
- 3 maintained constant strength
- 4 reversed their magnetic polarities

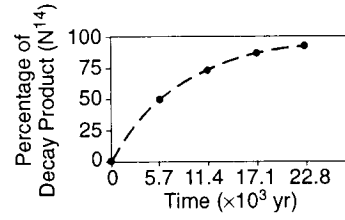
52 A graph of the radioactive decay of carbon-14 is shown below.



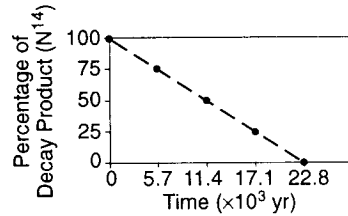
Which graph correctly shows the accumulation of nitrogen-14, the decay product of carbon-14, over the same period?



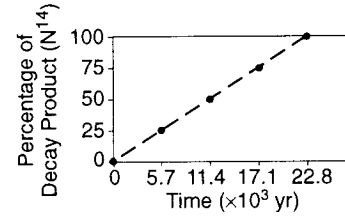
(1)



(3)

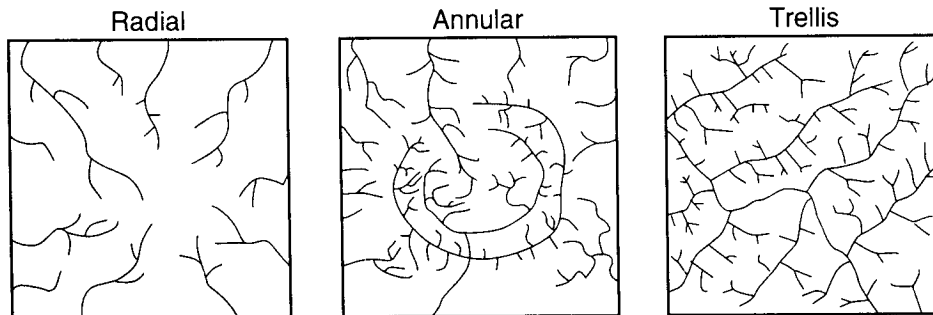


(2)



(4)

53 The maps below represent three different stream drainage patterns.



Which statement is generally true of these three drainage patterns?

- 1 All are controlled by underlying bedrock structure.
- 2 All are in the old-age stage of stream development.
- 3 All are located in semiarid regions.
- 4 All are located in areas where deposition is greater than erosion.

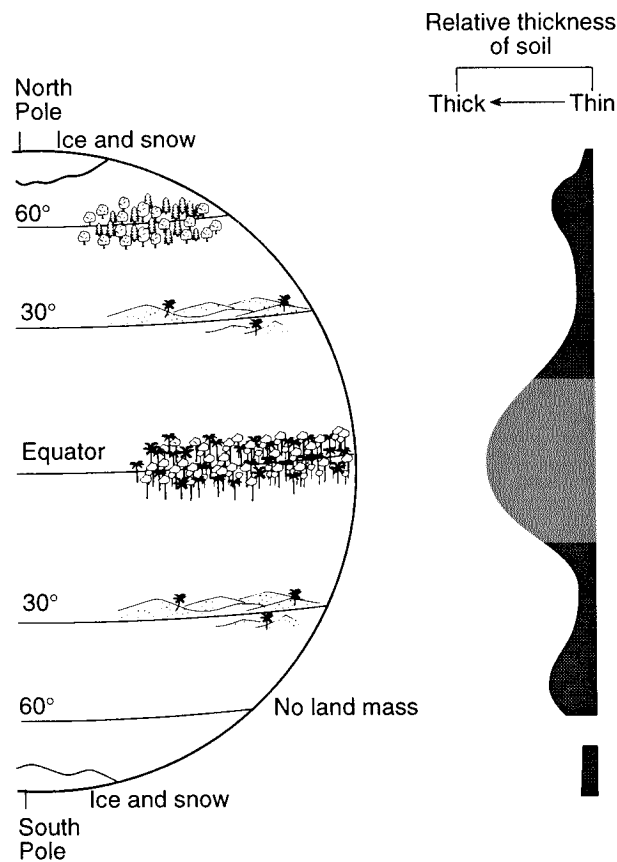
54 The table below shows characteristics of three landscape regions, X, Y, and Z.

Landscape Region	Relief	Bedrock
X	Great relief, high peaks, deep valleys	Many types, including igneous and metamorphic rocks; nonhorizontal structure
Y	Moderate to high relief	Flat layers of sedimentary rock or lava flows
Z	Very little relief, low elevations	Many types and structures

Which terms, when substituted for X, Y, and Z, best complete the table?

- (1) X = mountains, Y = plains, Z = plateaus
- (2) X = plateaus, Y = mountains, Z = plains
- (3) X = plains, Y = plateaus, Z = mountains
- (4) X = mountains, Y = plateaus, Z = plains

55 The diagram below shows the relative thickness of soil and major vegetation at various latitudes on Earth.



The development of thick soils is most closely associated with areas that have a

- 1 small amount of vegetation and low yearly precipitation
- 2 small amount of vegetation and high yearly precipitation
- 3 large amount of vegetation and low yearly precipitation
- 4 large amount of vegetation and high yearly precipitation

Part II

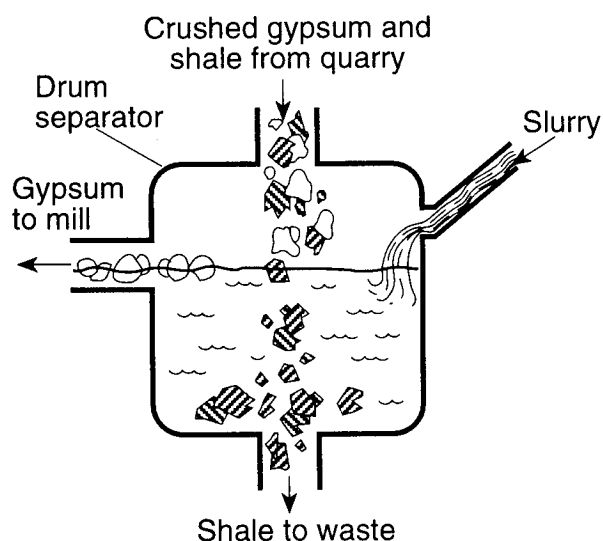
This part consists of ten groups, each containing five questions. Choose seven of these ten groups. Be sure that you answer all five questions in each group chosen. Record the answers to these questions on the separate answer sheet in accordance with the directions on the front page of this booklet. [35]

Group 1

If you choose this group, be sure to answer questions 56–60.

Base your answers to questions 56 through 60 on the *Earth Science Reference Tables*, the diagram and data tables below, and your knowledge of Earth science.

The diagram shows a process that is used to separate gypsum from shale on the basis of density. Crushed rock is dropped into a mixture of liquid and small particles, called a slurry. The data tables show the mass and volume of three samples of gypsum and three samples of shale after they were separated by this process.



Gypsum		
Sample	Mass (g)	Volume (cm ³)
1	2.0	1
2	8.0	4
3	16.0	8

Shale		
Sample	Mass (g)	Volume (cm ³)
1	3.0	1
2	12.0	4
3	18.0	6

56 What is the average density of the three samples of gypsum?

- (1) 0.5 g/cm³ (3) 3.0 g/cm³
 (2) 2.0 g/cm³ (4) 8.7 g/cm³

57 Since gypsum floats in the slurry and shale sinks in the slurry, which sequence shows the substances arranged in order from the least dense to the most dense?

- 1 shale, gypsum, slurry
 2 gypsum, slurry, shale
 3 shale, slurry, gypsum
 4 slurry, gypsum, shale

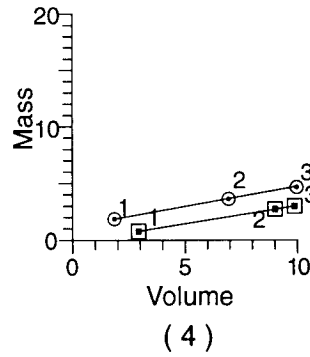
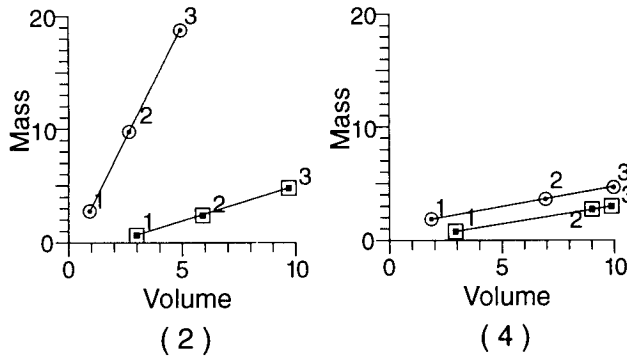
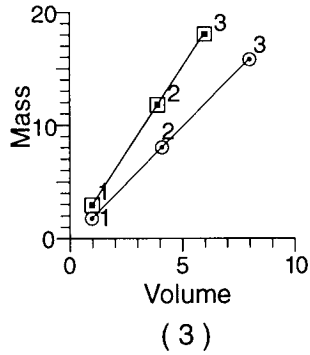
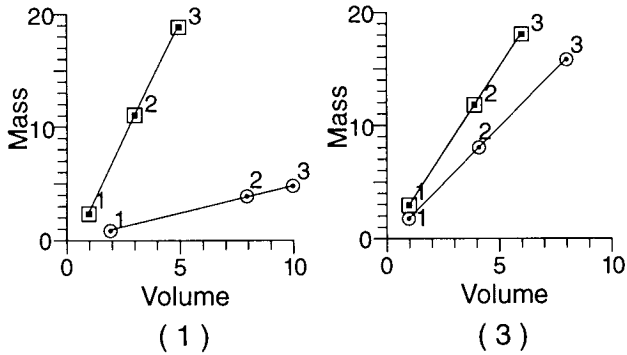
58 In addition to the difference in density, how else are shale and gypsum different?

- 1 Shale is an evaporite and gypsum is composed of land-derived sediments.
 2 Shale is a mineral and gypsum is a rock.
 3 Shale is nonsedimentary and gypsum is sedimentary.
 4 Shale is clastic and gypsum is nonclastic.

59 Which graph best represents the mass and volume of the gypsum and shale samples?

Key

▣ Shale samples ○ Gypsum samples



60 A student weighs sample 3 of the shale and incorrectly determines the mass to be 16 grams. Which equation should be used to calculate the student's percentage of error (percent deviation)?

1 percentage of error = $\frac{18-16}{18} \times 100$

2 percentage of error = $\frac{18-16}{16} \times 100$

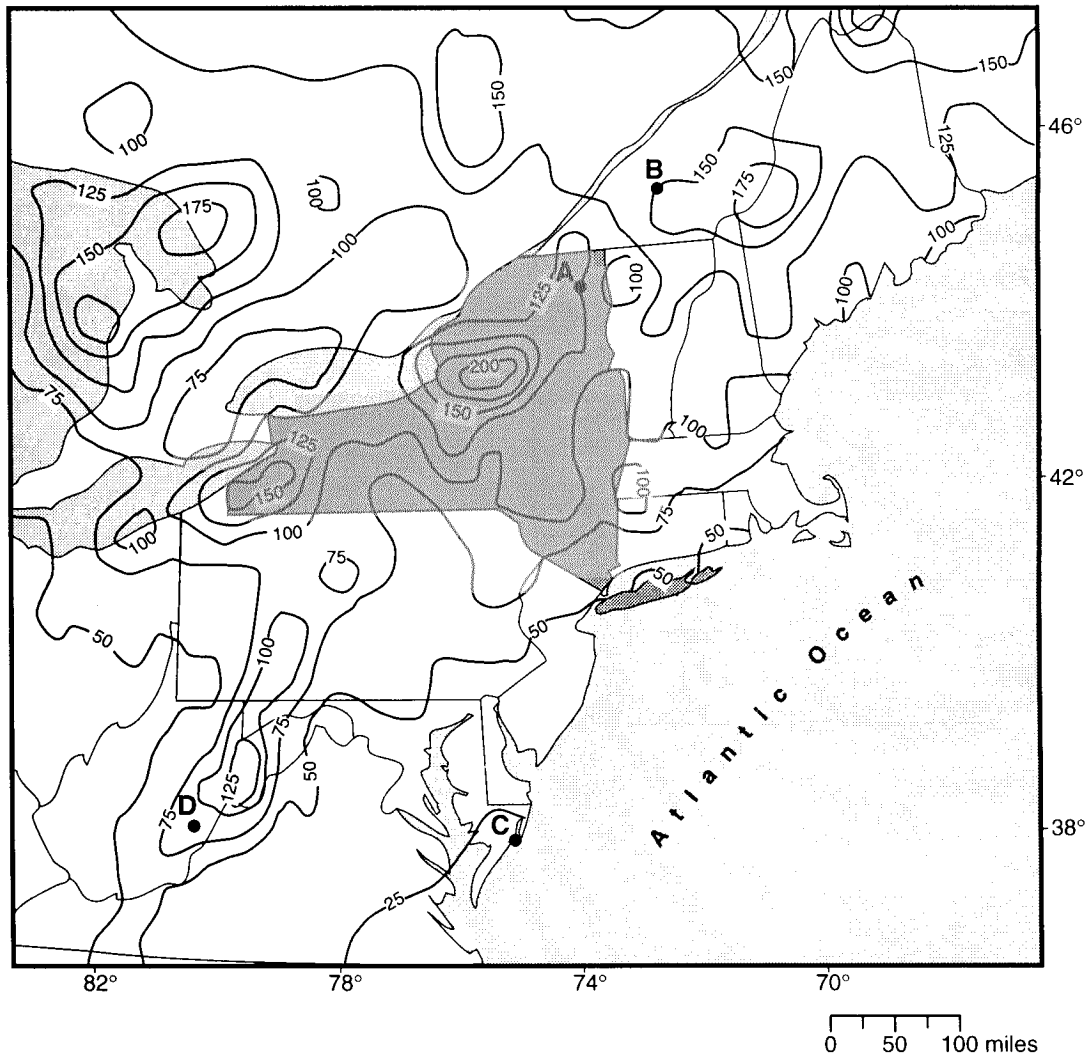
3 percentage of error = $\frac{18}{16} \times 100$

4 percentage of error = $\frac{16}{18} \times 100$

Group 2

If you choose this group, be sure to answer questions 61–65.

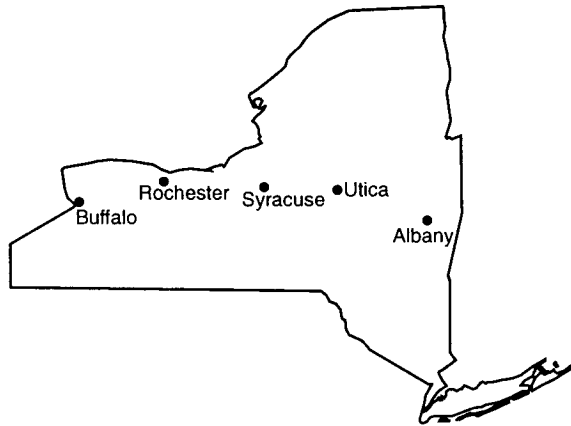
Base your answers to questions 61 through 65 on the *Earth Science Reference Tables*, the map below, and your knowledge of Earth science. The map shows a portion of the eastern United States with New York State shaded. The isolines on the map indicate the average yearly total snowfall, in inches, recorded over a 20-year period. Points A through D are locations on Earth's surface. Latitude and longitude coordinates are shown along the border of the map.



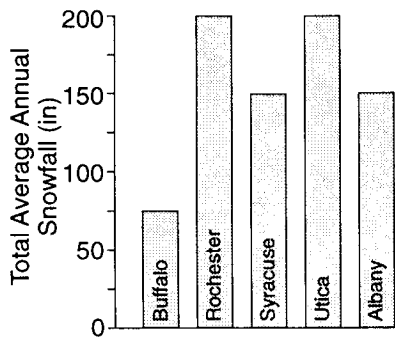
- 61 The latitude and longitude coordinates indicate that this map covers an area that is located
- 1 south of the Equator and west of the Prime Meridian
 - 2 south of the Equator and east of the Prime Meridian
 - 3 north of the Equator and west of the Prime Meridian
 - 4 north of the Equator and east of the Prime Meridian

- 62 The greatest portion of which New York State landscape region averages more than 175 inches of snowfall each year?
- 1 Atlantic Coastal Plain
 - 2 Adirondack Mountains
 - 3 Allegheny Plateau
 - 4 Tug Hill Plateau

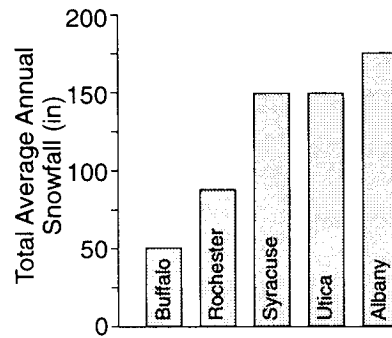
63 The diagram below shows the location of five cities in New York State.



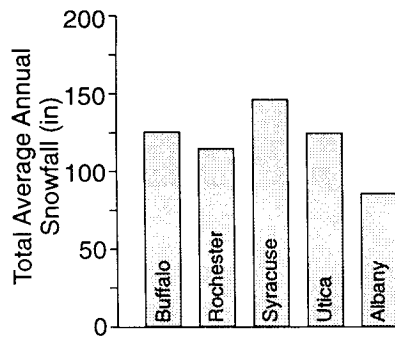
Which graph best represents the total average annual snowfall for each of the five cities?



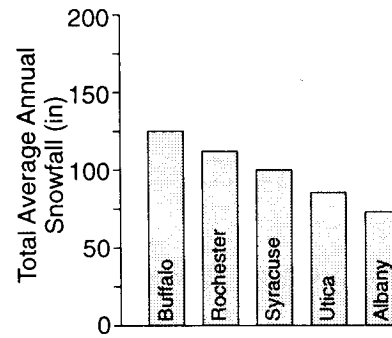
City
(1)



City
(3)



City
(2)



City
(4)

64 Location C has a lower average yearly snowfall than location D primarily because location C has a

- 1 coastal location
- 2 higher longitude
- 3 higher elevation
- 4 different prevailing wind direction

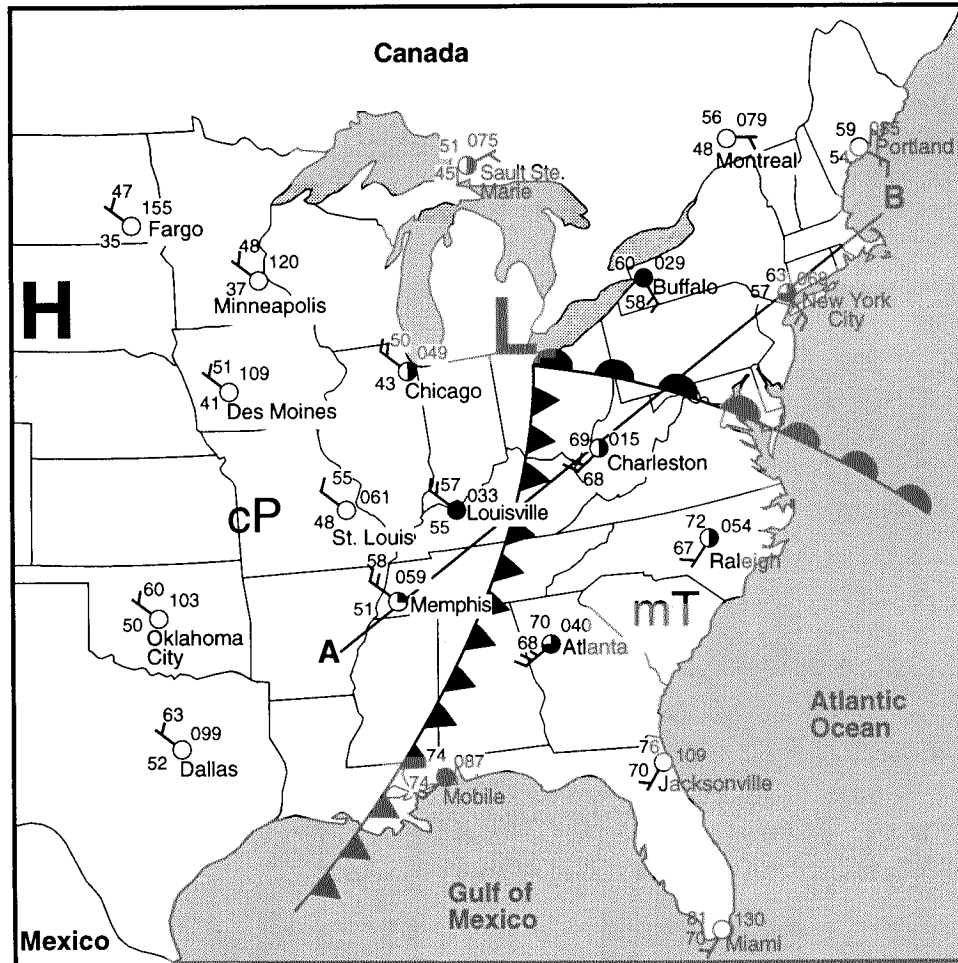
65 What is the approximate average yearly total snowfall gradient between locations A and B?

- | | |
|----------------|----------------|
| (1) 0.25 in/mi | (3) 0.40 in/mi |
| (2) 2.50 in/mi | (4) 4.00 in/mi |

Group 3

If you choose this group, be sure to answer questions 66–70.

Base your answers to questions 66 through 70 on the *Earth Science Reference Tables*, the weather map below, and your knowledge of Earth science. The map shows weather systems over the central and eastern United States and weather data for several cities.



66 Which city has the greatest wind velocity?

- | | |
|------------------------|--------------------|
| 1 Louisville, Kentucky | 3 Dallas, Texas |
| 2 Chicago, Illinois | 4 Atlanta, Georgia |

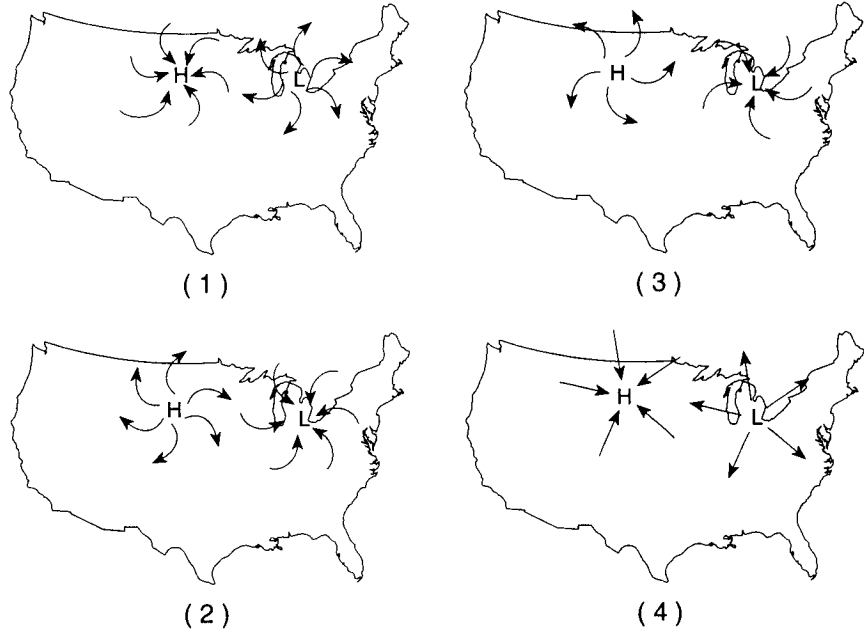
67 Which city has the highest relative humidity?

- 1 Mobile, Alabama
- 2 Minneapolis, Minnesota
- 3 Miami, Florida
- 4 Memphis, Tennessee

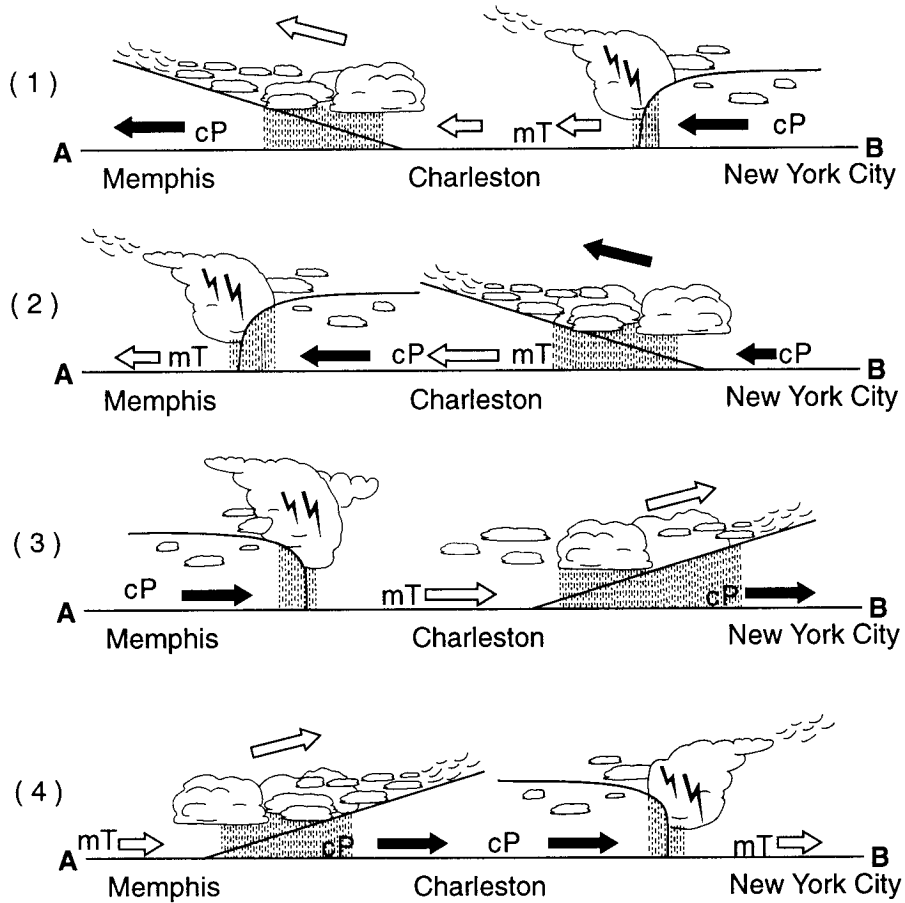
68 If the low-pressure center shown on the map follows a typical storm track, the system will move toward the

- | | |
|-------------|-------------|
| 1 northeast | 3 southeast |
| 2 northwest | 4 southwest |

69 Which map correctly shows the movement of surface air associated with the high-pressure and low-pressure systems?



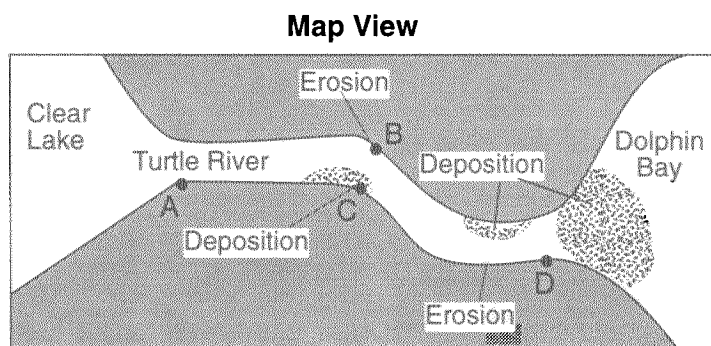
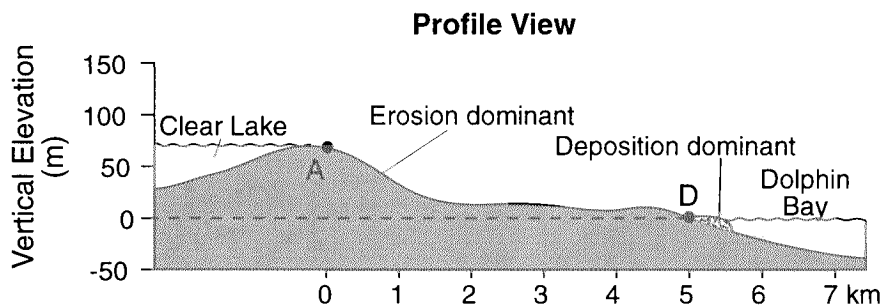
70 Which cross-sectional diagram of the lower atmosphere along line AB best represents the fronts and the movement of air masses?



Group 4

If you choose this group, be sure to answer questions 71–75.

Base your answers to questions 71 through 75 on the *Earth Science Reference Tables*, the diagrams below, and your knowledge of Earth science. The diagrams show two views of the same river flowing from a lake to an ocean bay.



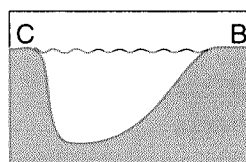
71 The deposition in Dolphin Bay near location *D* is caused mainly by

- 1 the increased wave action within Dolphin Bay
- 2 the presence of a meander in Turtle River just above Dolphin Bay
- 3 the difference in salt content in the waters of Clear Lake and Dolphin Bay
- 4 a decrease in the current velocity of Turtle River as it enters Dolphin Bay

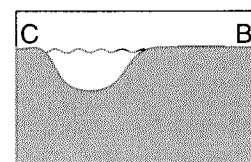
72 How do the size and the density of the particles deposited in Dolphin Bay generally change as distance from the shoreline increases?

- 1 Both size and density decrease.
- 2 Both size and density increase.
- 3 Size decreases and density increases.
- 4 Size increases and density decreases.

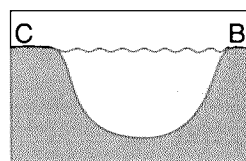
73 Which diagram best represents the profile of the river bottom between points *C* and *B*?



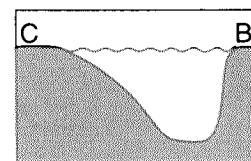
(1)



(3)



(2)



(4)

74 Which change will occur if the volume (discharge) of Turtle River increases?

- 1 Downcutting will decrease and riverbank erosion will increase.
- 2 Downcutting will increase and riverbank erosion will decrease.
- 3 Both downcutting and riverbank erosion will decrease.
- 4 Both downcutting and riverbank erosion will increase.

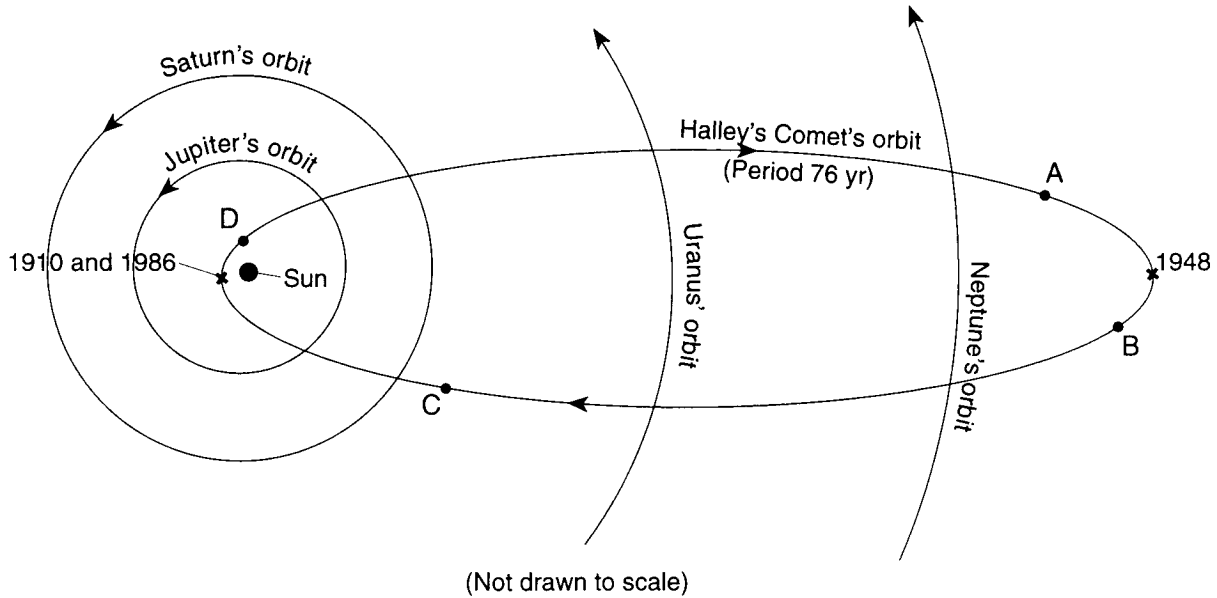
75 If no further uplift occurs within the mapped area over the next 200 years, the average gradient of the riverbed between points A and D will

- 1 decrease, only
 - 2 increase, only
 - 3 decrease, then increase
 - 4 remain the same
-

Group 5

If you choose this group, be sure to answer questions 76–80.

Base your answers to questions 76 through 80 on the *Earth Science Reference Tables*, the diagram below, and your knowledge of Earth science. The diagram represents the orbits of four planets and Halley's Comet. The period of revolution is shown for the comet. The orbital positions of Halley's Comet are shown for the years 1910, 1948, and 1986.



76 The solar system model shown in the diagram is best classified as

- 1 geocentric
- 2 heliocentric
- 3 topographic
- 4 lunar

77 At which of these points in its orbit does Halley's Comet have the greatest orbital velocity?

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

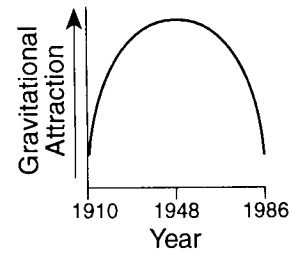
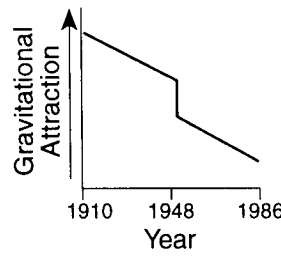
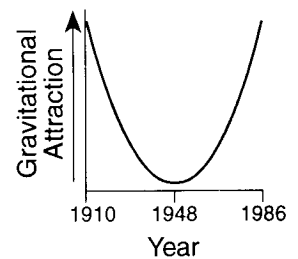
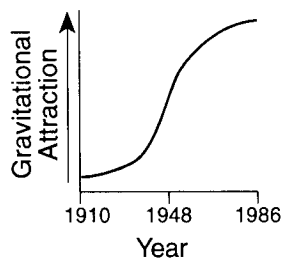
78 The period of time each of these planets takes to orbit the Sun depends on its average

- 1 distance from the Sun
- 2 equatorial diameter
- 3 density
- 4 rate of rotation

79 Halley's Comet should be nearest the Sun again during the year

- (1) 2024
- (2) 2040
- (3) 2062
- (4) 2100

80 Which graph best represents the gravitational attraction between the Sun and Halley's Comet from 1910 to 1986?



Group 6

If you choose this group, be sure to answer questions 81–85.

Base your answers to questions 81 through 85 on the *Earth Science Reference Tables*, the table below, and your knowledge of Earth science. The table is a summary of soil water budget information for four United States cities, represented by letters W, X, Y, and Z. Symbols in the table indicate water budget activity during each month.

City	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
W	R	R	U	U/D	D	D	D	D	D	D	D	R
X	S	S	S	S	S	U	U/D	D	D	R	R	R/S
Y	S	S	S	S	U	U	U	U/D	D	R	R	R/S
Z	S	S	S	S	U	U	R	R/S	S	S	S	S

KEY:

- U = water usage
- U/D = usage ends and deficit begins
- D = water deficit
- R = water recharge
- R/S = recharge ends and surplus begins
- S = water surplus

81 For which city did ground-water storage become full in August?

- | | |
|-------|-------|
| (1) W | (3) Y |
| (2) X | (4) Z |

82 The water budgets of cities X and Y have

- 1 surplus, but no deficit
- 2 deficit, but no surplus
- 3 surplus and deficit, but no recharge and usage
- 4 usage, deficit, recharge, and surplus

83 Which conditions caused the moisture deficits in these water budgets?

- 1 Precipitation was more than potential evapotranspiration, and ground storage was empty.
- 2 Precipitation was more than potential evapotranspiration, and ground storage was full.
- 3 Precipitation was less than potential evapotranspiration, and ground storage was empty.
- 4 Precipitation was less than potential evapotranspiration, and ground storage was full.

84 What is the most likely moisture source for these soil water budgets?

- | | |
|-----------------|----------------|
| 1 nearby lakes | 3 ground water |
| 2 precipitation | 4 runoff |

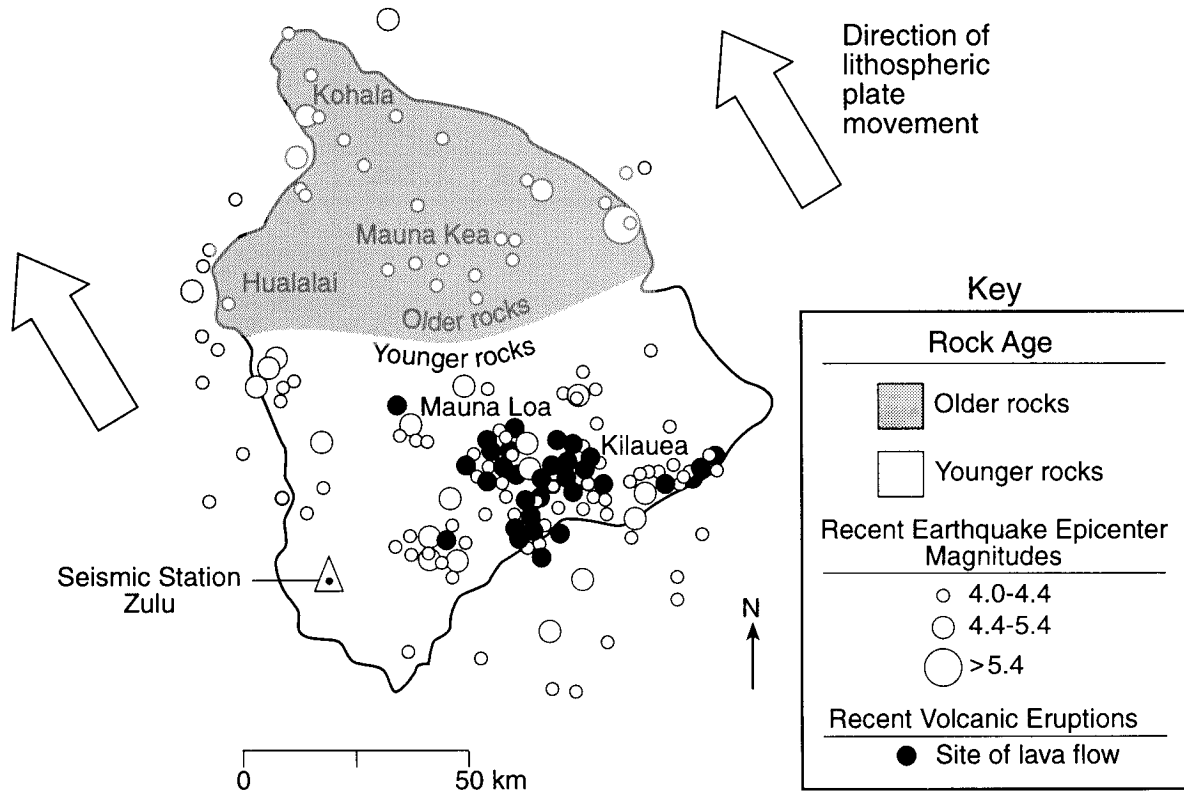
85 The four cities have their highest potential evapotranspiration values in July. Which statement best explains this observation?

- 1 The lowest temperatures occur in July.
- 2 The highest temperatures occur in July.
- 3 The ground-water storage capacity is lowest in July.
- 4 The ground-water storage capacity is highest in July.

Group 7

If you choose this group, be sure to answer questions 86–90.

Base your answers to questions 86 through 90 on the *Earth Science Reference Tables*, the map below, and your knowledge of Earth science. The map shows the island of Hawaii (approximately 20° N 157° W) and the locations of recent volcanic eruptions and earthquake epicenters. The volcanic eruptions are inferred to be caused by the movement of the lithospheric plate over a hot spot in the mantle below.



86 Where are earthquakes on and around Hawaii located?

- 1 along shorelines, only
- 2 in the ocean, only
- 3 in older rocks, only
- 4 scattered across the area

87 Rock collected from the side of Kilauea Volcano has the following mineral composition: 5% plagioclase feldspar, 68% pyroxene, 25% olivine, and 2% hornblende. What type of rock is this?

- | | |
|------------|--------------|
| 1 andesite | 3 rhyolite |
| 2 scoria | 4 peridotite |

88 Which inference concerning the distribution of earthquakes and recent volcanic eruptions on this island is most accurate?

- 1 Earthquakes and recent volcanic eruptions are located mainly along the boundary between the older rocks and the younger rocks.
- 2 Recent volcanic eruptions are more common than earthquakes.
- 3 Many earthquakes occur near recent volcanic eruptions.
- 4 Earthquakes and recent volcanic eruptions rarely occur in the same areas.

89 A scientist wants to film underwater volcanic activity that is forming a new island in the Hawaiian Island chain. In which direction from Hawaii should she concentrate her efforts?

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

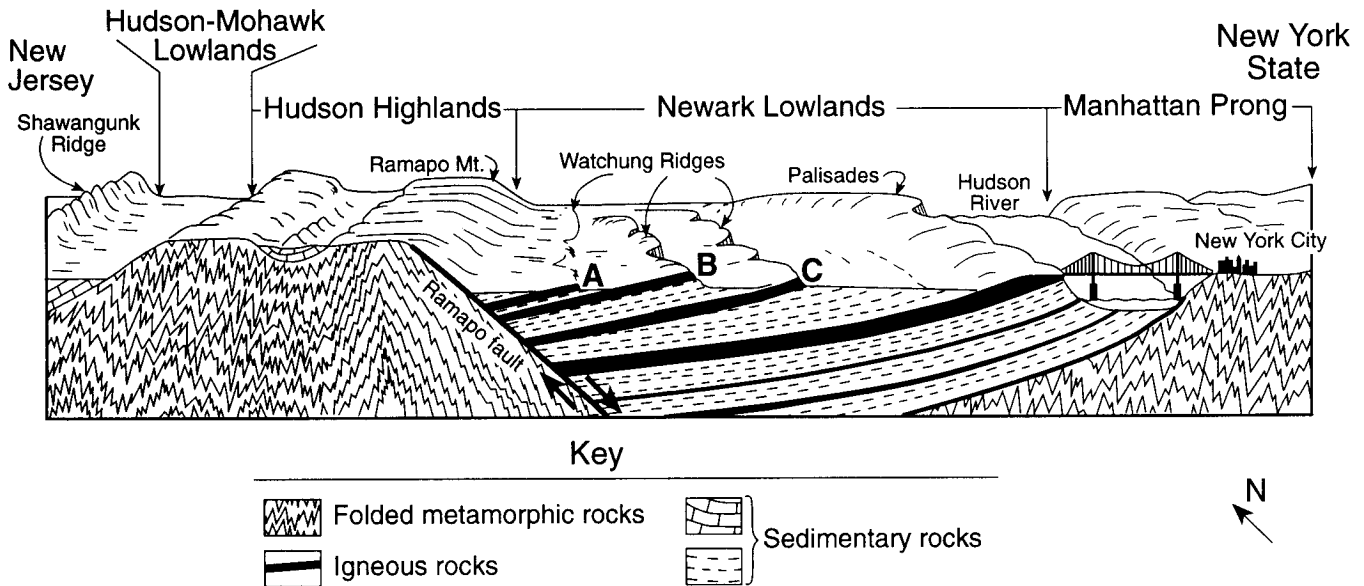
90 Hawaii is located near the middle of which tectonic plate?

- 1 Philippine plate
 - 2 Nazca plate
 - 3 North American plate
 - 4 Pacific plate
-

Group 8

If you choose this group, be sure to answer questions 91–95.

Base your answers to questions 91 through 95 on the *Earth Science Reference Tables*, the diagram below, and your knowledge of Earth science. The diagram is a geologic cross section of the rocks that underlie parts of southern New York State and northern New Jersey. Landscape regions are indicated across the top of the diagram.



91 The portion of New York City shown in the geologic cross section is located in which landscape region?

- 1 Hudson Highlands
- 2 Manhattan Prong
- 3 Newark Lowlands
- 4 Atlantic Coastal Plain

92 Which inference explains the existence of the ridges and valleys of the Newark Lowlands?

- 1 The igneous rocks are more resistant to weathering and erosion than the sedimentary rocks are.
- 2 The sedimentary rocks are more resistant to weathering and erosion than the igneous rocks are.
- 3 Both the sedimentary and the igneous rocks are highly resistant to weathering and erosion.
- 4 Neither the sedimentary nor the igneous rocks are resistant to weathering and erosion.

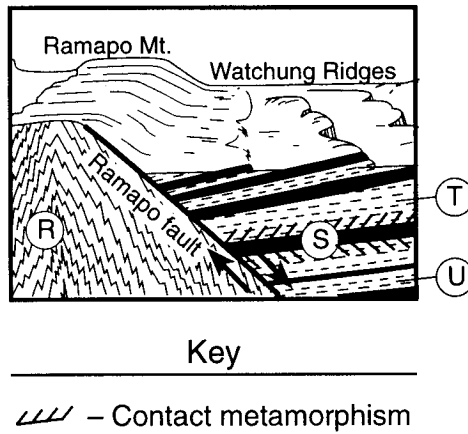
93 The boundaries between the landscape regions represented in the cross section are marked by

- 1 a fault, only
- 2 a change in rock type, only
- 3 a fault, or a change in rock type and rock structure, only
- 4 a fault, or a change in rock type, rock structure, and surface elevation

94 Which important New York State fossil is most likely to be found in the Triassic Age rocks in the Newark Lowlands?

- | | |
|--------------|----------------------|
| 1 eurypterid | 3 <i>Coelophysis</i> |
| 2 mastodont | 4 Naples tree |

95 A more detailed view of the Ramapo fault region is shown below.



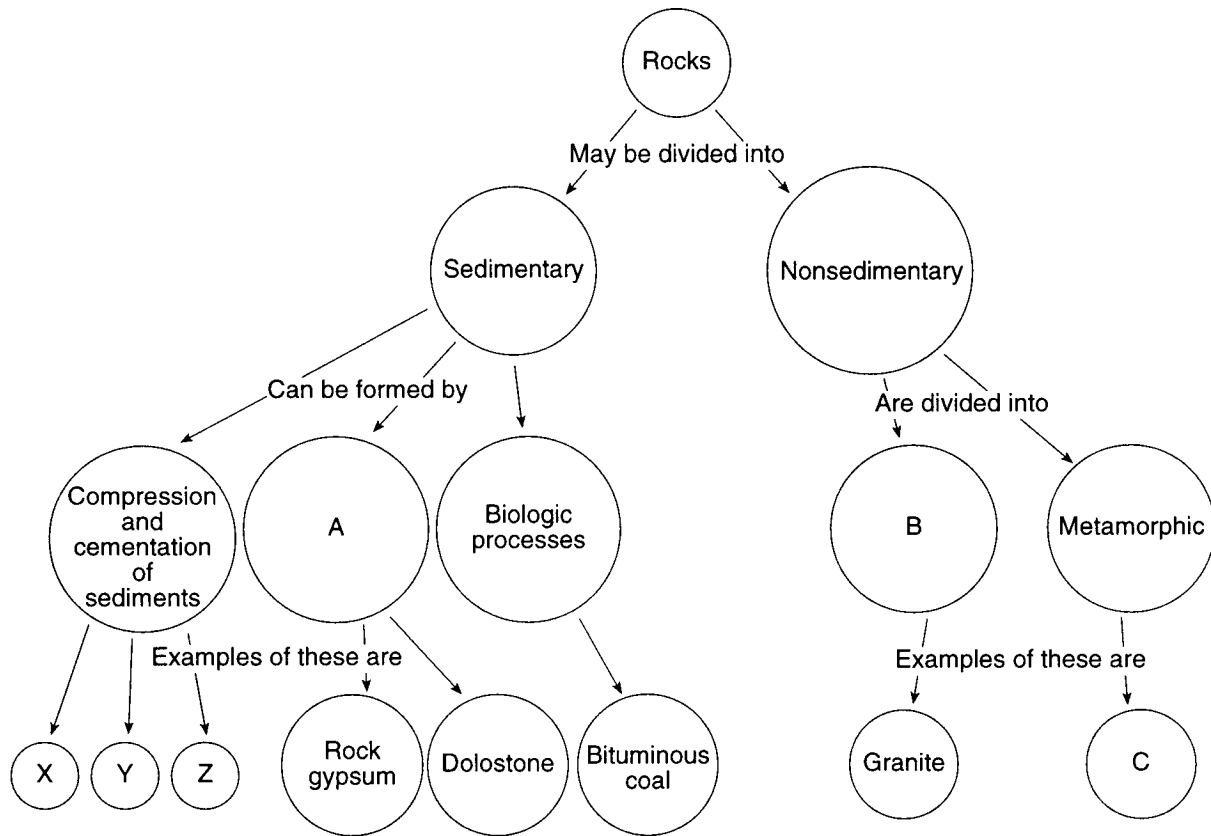
The geologic evidence shown in the diagram indicates that

- 1 rock *S* is older than rock *T*
 - 2 rock *T* is older than rock *U*
 - 3 rock *S* is older than rock *R*
 - 4 rock *R* is older than the Ramapo fault
-

Group 9

If you choose this group, be sure to answer questions 96–100.

Base your answers to questions 96 through 100 on the *Earth Science Reference Tables*, the diagram below, and your knowledge of Earth science. The diagram represents a scheme for classifying rocks. The letters A, B, C and X, Y, Z represent missing labels.



96 Which processes would form the type of rock that is represented by circle B?

- 1 deposition and compaction
- 2 weathering and erosion
- 3 melting and solidification
- 4 faulting and folding

97 If the rock in circle C formed from limestone, it would be called

- | | |
|-------------------|-------------|
| 1 schist | 3 marble |
| 2 anthracite coal | 4 quartzite |

98 Dolostone and granite are similar because both are

- | | |
|-----------------|---------------|
| 1 monomineralic | 3 foliated |
| 2 clastic | 4 crystalline |

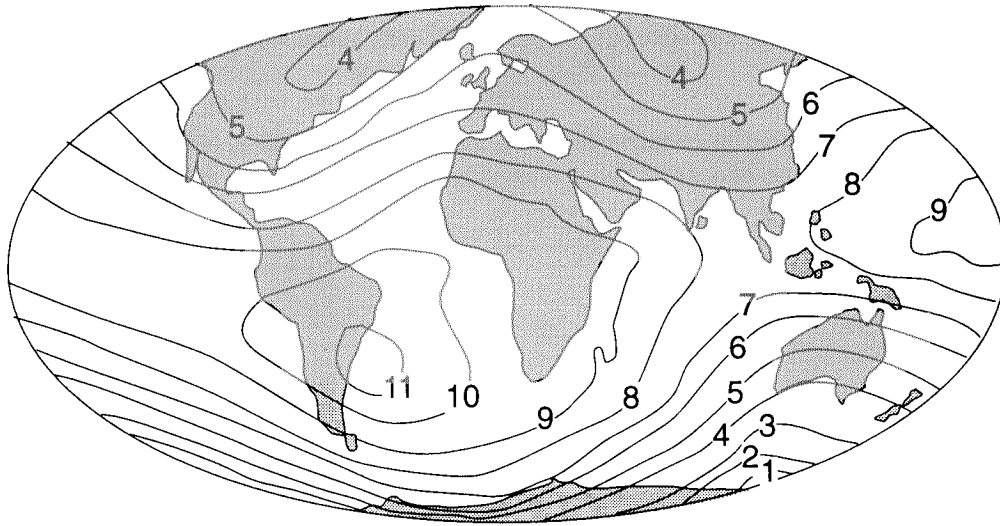
99 Which rocks could be represented by circles X, Y, and Z?

- 1 sandstone, conglomerate, and siltstone
- 2 bituminous coal, slate, and schist
- 3 anthracite coal, metaconglomerate, and rock salt
- 4 breccia, gneiss, and rhyolite

100 The classification of rocks into sedimentary or nonsedimentary groups is based primarily on the rocks'

- | | |
|-----------|---------|
| 1 origin | 3 color |
| 2 density | 4 age |

105 The isoline map below shows the variations in relative strength of Earth's magnetic field from 1 (strong) to 11 (weak).



Which of Earth's tectonic plates has the *weakest* magnetic field strength?

- | | |
|------------------------|------------------------|
| 1 South American plate | 3 North American plate |
| 2 African plate | 4 Pacific plate |
-

Part II (35 credits)

Answer the questions in only seven of the ten groups in this part. Be sure to mark the answers to the groups of questions you choose in accordance with the instructions on the front cover of the test booklet. Leave blank the three groups of questions you do not choose to answer.

Tear Here

Group 1				
56	1	2	3	4
57	1	2	3	4
58	1	2	3	4
59	1	2	3	4
60	1	2	3	4

Group 2				
61	1	2	3	4
62	1	2	3	4
63	1	2	3	4
64	1	2	3	4
65	1	2	3	4

Group 3				
66	1	2	3	4
67	1	2	3	4
68	1	2	3	4
69	1	2	3	4
70	1	2	3	4

Group 4				
71	1	2	3	4
72	1	2	3	4
73	1	2	3	4
74	1	2	3	4
75	1	2	3	4

Group 5				
76	1	2	3	4
77	1	2	3	4
78	1	2	3	4
79	1	2	3	4
80	1	2	3	4

Group 6				
81	1	2	3	4
82	1	2	3	4
83	1	2	3	4
84	1	2	3	4
85	1	2	3	4

Group 7				
86	1	2	3	4
87	1	2	3	4
88	1	2	3	4
89	1	2	3	4
90	1	2	3	4

Group 8				
91	1	2	3	4
92	1	2	3	4
93	1	2	3	4
94	1	2	3	4
95	1	2	3	4

Group 9				
96	1	2	3	4
97	1	2	3	4
98	1	2	3	4
99	1	2	3	4
100	1	2	3	4

Group 10				
101	1	2	3	4
102	1	2	3	4
103	1	2	3	4
104	1	2	3	4
105	1	2	3	4

Tear Here

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

Signature

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

EARTH SCIENCE

Friday, June 18, 1999 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Part I Credits
Part II Credits
Performance Test Credits
Total (Official Regents) Examination Mark
Reviewer's Initials:

Tear Here

Student Sex: Male Female

Teacher School

Grade (circle one) 8 9 10 11 12

Record all of your answers on this answer sheet in accordance with the instructions on the front cover of the test booklet.

Part I (55 credits)

- | | | | |
|-------------------|-------------------|-------------------|-------------------|
| 1 1 2 3 4 | 16 1 2 3 4 | 31 1 2 3 4 | 46 1 2 3 4 |
| 2 1 2 3 4 | 17 1 2 3 4 | 32 1 2 3 4 | 47 1 2 3 4 |
| 3 1 2 3 4 | 18 1 2 3 4 | 33 1 2 3 4 | 48 1 2 3 4 |
| 4 1 2 3 4 | 19 1 2 3 4 | 34 1 2 3 4 | 49 1 2 3 4 |
| 5 1 2 3 4 | 20 1 2 3 4 | 35 1 2 3 4 | 50 1 2 3 4 |
| 6 1 2 3 4 | 21 1 2 3 4 | 36 1 2 3 4 | 51 1 2 3 4 |
| 7 1 2 3 4 | 22 1 2 3 4 | 37 1 2 3 4 | 52 1 2 3 4 |
| 8 1 2 3 4 | 23 1 2 3 4 | 38 1 2 3 4 | 53 1 2 3 4 |
| 9 1 2 3 4 | 24 1 2 3 4 | 39 1 2 3 4 | 54 1 2 3 4 |
| 10 1 2 3 4 | 25 1 2 3 4 | 40 1 2 3 4 | 55 1 2 3 4 |
| 11 1 2 3 4 | 26 1 2 3 4 | 41 1 2 3 4 | |
| 12 1 2 3 4 | 27 1 2 3 4 | 42 1 2 3 4 | |
| 13 1 2 3 4 | 28 1 2 3 4 | 43 1 2 3 4 | |
| 14 1 2 3 4 | 29 1 2 3 4 | 44 1 2 3 4 | |
| 15 1 2 3 4 | 30 1 2 3 4 | 45 1 2 3 4 | |

Record your answers for Part II on the back of this sheet.

Tear Here