The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Tuesday, August 16, 2005 — 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 Compared to Earth's solar system, the universe is inferred to be

(1) younger and larger
(2) younger and smaller
(3) older and larger
(4) older and smaller

2 Terrestrial planets move more rapidly in their orbits than the Jovian planets because terrestrial planets are

(1) rotating on a tilted axis
(2) more dense
(3) more massive
(4) closer to the Sun

3 Which event is a direct result of Earth's revolution?

(1) the apparent deflection of winds
(2) the changing of the Moon phases
(3) the seasonal changes in constellations viewed in the night sky
(4) the daily rising and setting of the Sun

4 The cyclic rise and fall of ocean tides on Earth is primarily caused by Earth's rotation and the

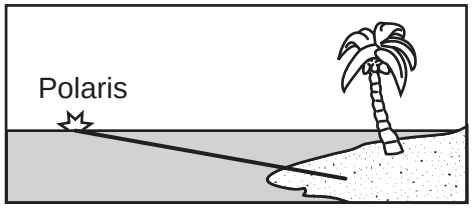
(1) temperature differences in ocean currents
(2) revolution of Earth around the Sun
(3) direction of Earth's planetary winds
(4) gravitational attraction of the Moon and the Sun

5 The apparent change in direction of a swinging Foucault pendulum is the result of the

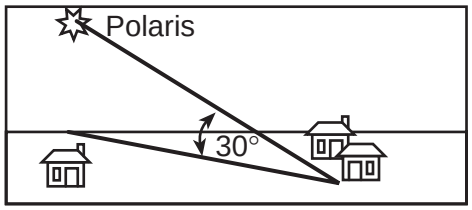
(1) rotation of Earth
(2) revolution of Earth
(3) tilt of Earth's axis
(4) shape of Earth's orbit

6 Which statement about *Polaris* is best illustrated by the diagrams shown below?

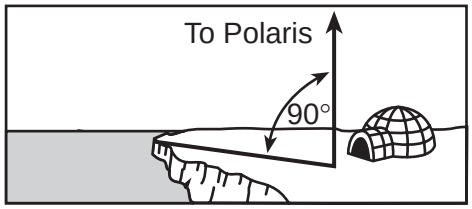
At Equator



At New Orleans, Louisiana



At North Pole



(1) *Polaris* is located in a winter constellation.
(2) *Polaris* is located at the zenith at each location.
(3) *Polaris'* apparent movement through the sky follows a south-to-north orientation.
(4) *Polaris'* altitude is equal to a location's latitude.

7 The diagram below represents the shape of the Milky Way Galaxy.

The Milky Way Galaxy is best described as

(1) elliptical
(2) irregular
(3) circular
(4) spiral

8 Compared to the temperature and luminosity of the star *Polaris*, the star *Sirius* is

(1) hotter and more luminous
(2) hotter and less luminous
(3) cooler and more luminous
(4) cooler and less luminous

9 The Big Bang Theory, describing the creation of the universe, is most directly supported by the

(1) redshift of light from distant galaxies
(2) presence of volcanoes on Earth
(3) apparent shape of star constellations
(4) presence of craters on Earth's Moon

10 Which process requires water to gain 540 calories of energy per gram?

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

11 Which geographic area is a common source region for cP air masses that move into New York State?

(1) southwestern United States
(2) central Canada
(3) the north Pacific Ocean
(4) the Gulf of Mexico

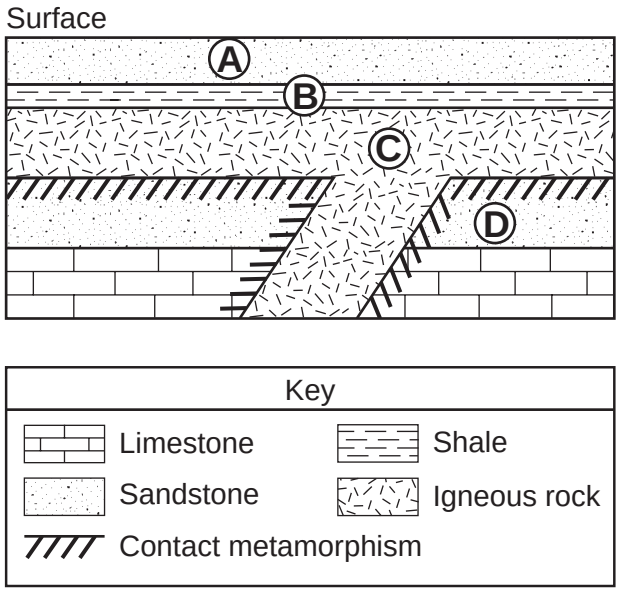
12 A parcel of air has a dry-bulb temperature of 24°C and a relative humidity of 55%. What is the dewpoint of this parcel of air?

(1) 6°C
(2) 14°C
(3) 24°C
(4) 29°C

13 Which statement can best be supported by the fossil record?

(1) Humans have lived on Earth throughout geologic history.
(2) The organisms on Earth have not changed.
(3) Most life-forms that existed on Earth have become extinct.
(4) Dinosaurs existed on Earth for more than 544 million years.

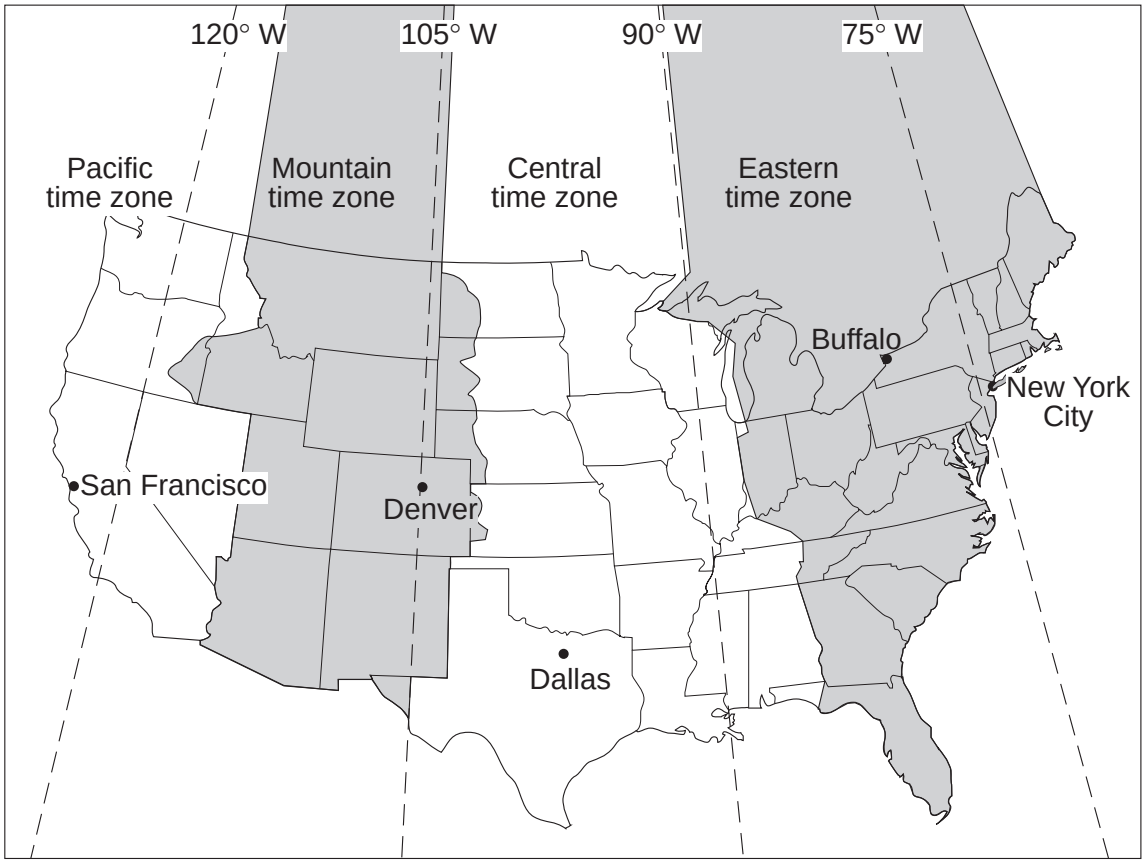
14 The diagram below shows a geologic cross section. Letters *A* through *D* represent different rock units.



Which sequence correctly shows the age of the lettered rock units, from oldest to youngest?

(1) $A \rightarrow B \rightarrow C \rightarrow D$
(2) $C \rightarrow D \rightarrow A \rightarrow B$
(3) $D \rightarrow B \rightarrow A \rightarrow C$
(4) $D \rightarrow C \rightarrow B \rightarrow A$

Base your answers to questions 15 and 16 on the United States time zone map shown below. The dashed lines represent meridians (lines of longitude).



15 If the time in Buffalo, New York, is 5 a.m., what time would it be in San Francisco, California?

(1) 8 a.m.
(2) 2 a.m.
(3) 3 a.m.
(4) 4 a.m.

16 The basis for the time difference between adjoining time zones is Earth's

(1) 1° per hour rate of revolution
(2) 1° per hour rate of rotation
(3) 15° per hour rate of revolution
(4) 15° per hour rate of rotation

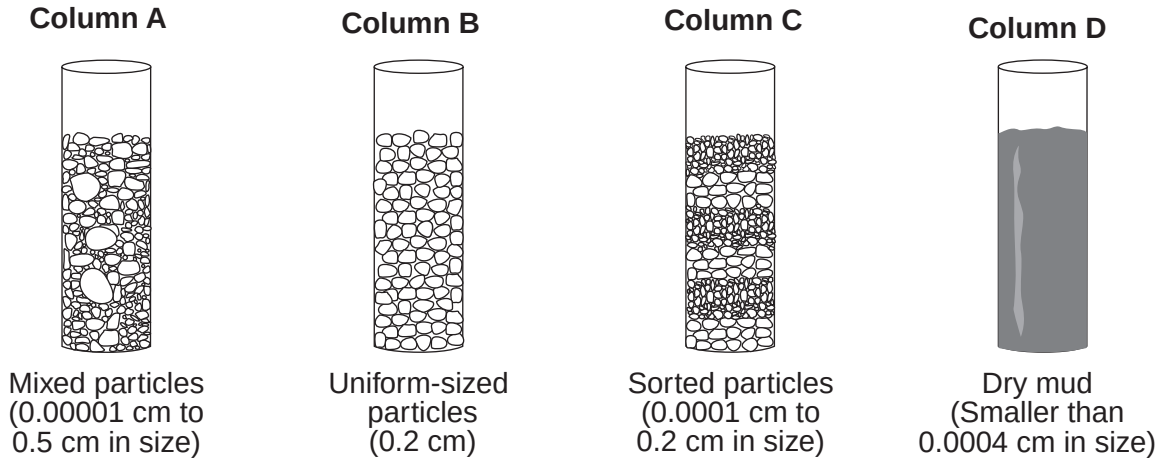
17 The table below shows some observed physical properties of a mineral.

Physical Property	Observation
color	white
hardness	scratched by the mineral calcite
distinguishing characteristic	feels greasy
cleavage/fracture	shows some definite flat surfaces

Based on these observations, the elements that make up this mineral's composition are

(1) sulfur and lead
(2) sulfur, oxygen, and hydrogen
(3) oxygen, silicon, hydrogen, and magnesium
(4) oxygen, silicon, aluminum, and iron

18 The columns *A*, *B*, *C*, and *D* shown below contain equal volumes of sediment.

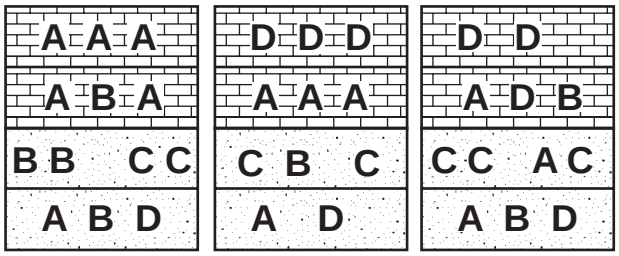


(Not drawn to scale)

When an equal volume of water is added to each column, the greatest rate of infiltration will occur in which column?

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

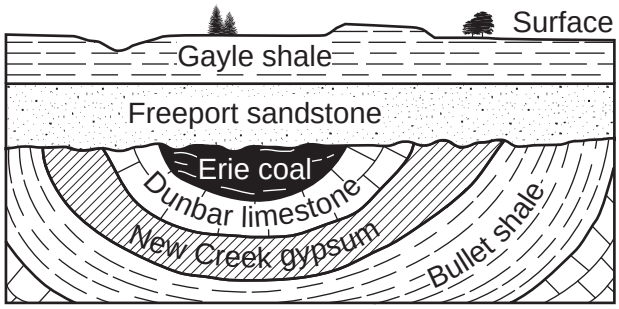
19 The three cross sections of sedimentary bedrock shown below represent widely separated surface exposures of layers that contain fossils. Letters *A*, *B*, *C*, and *D* represent four different marine fossils found in these rock layers.



Which letter best represents an index fossil?

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

20 The diagram below represents a geologic cross section of a portion of Earth's crust.



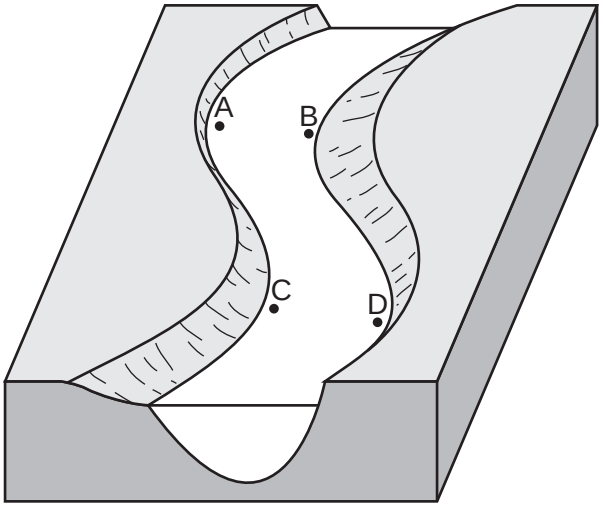
Folding and erosion occurred after the formation of the

(1) Gayle shale
(2) Freeport sandstone
(3) Erie coal, but before formation of Freeport sandstone
(4) Dunbar limestone, but before formation of Erie coal

21 The surface winds in a typical Northern Hemisphere high-pressure system are generally moving

(1) counterclockwise away from the high-pressure center
(2) counterclockwise toward the high-pressure center
(3) clockwise away from the high-pressure center
(4) clockwise toward the high-pressure center

Base your answers to questions 22 through 24 on the diagram below, which shows a meandering stream. Letters *A*, *B*, *C*, and *D* indicate locations on the streambed.



22 At which two locations is the rate of erosion greater than the rate of deposition?

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

23 What are the largest particles that this stream can transport when its velocity is 200 centimeters per second?

(1) silt (3) pebbles
(2) sand (4) cobbles

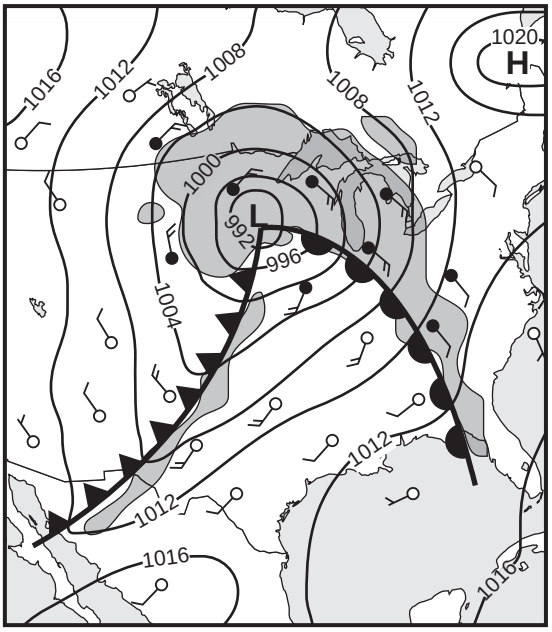
24 A decrease in the velocity of this stream will most likely cause an increase in

(1) the amount of sediment carried by the stream
(2) the size of the particles carried by the stream
(3) deposition within the stream channel
(4) abrasion of the stream channel

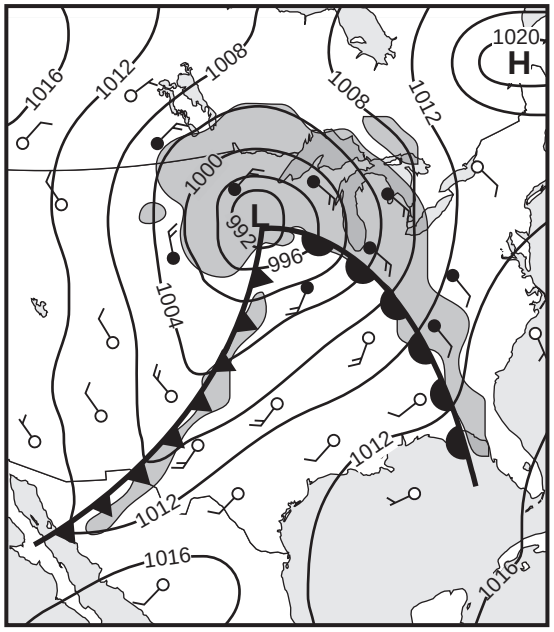
25 Beneath which surface location is Earth's crust the thinnest?

(1) East Pacific Ridge
(2) the center of South America
(3) Old Forge, New York
(4) San Andreas Fault

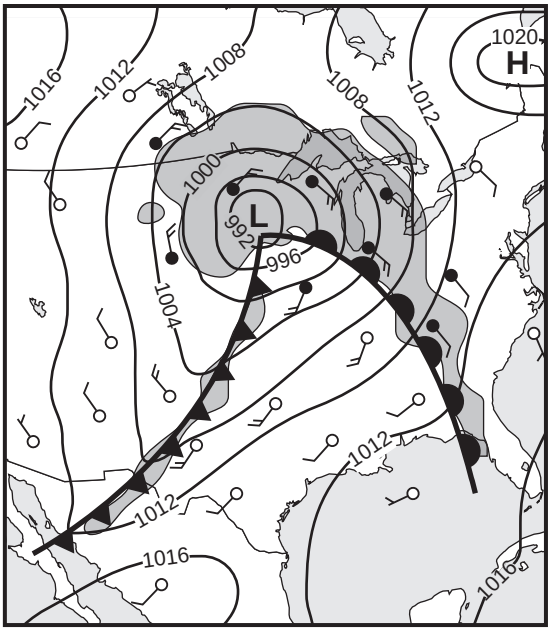
26 On which weather map do the front symbols best represent the direction of movement of the cold front and warm front associated with the low-pressure system shown on the map?



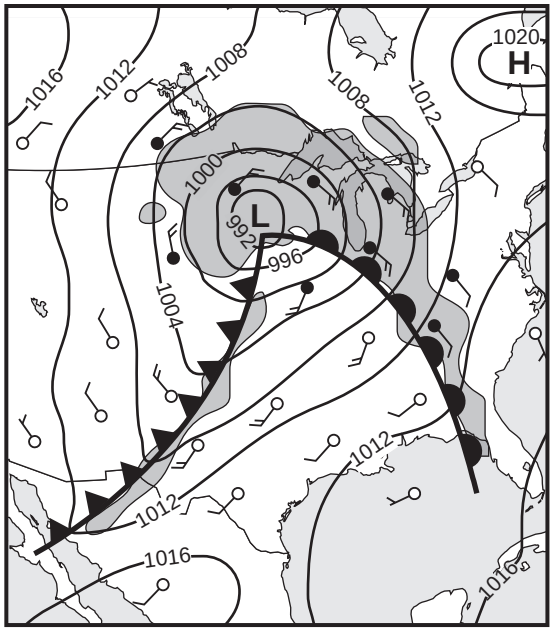
(1)



(3)

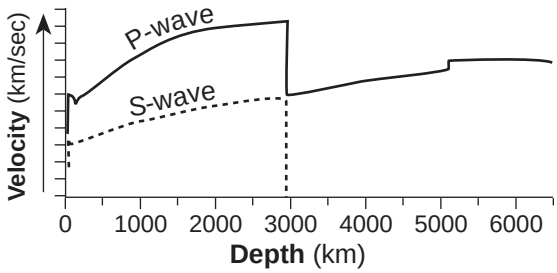


(2)

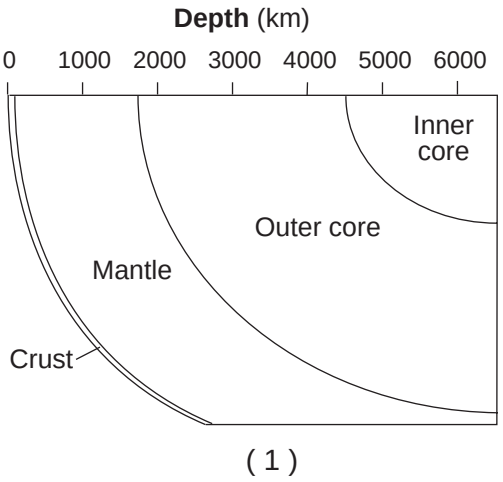


(4)

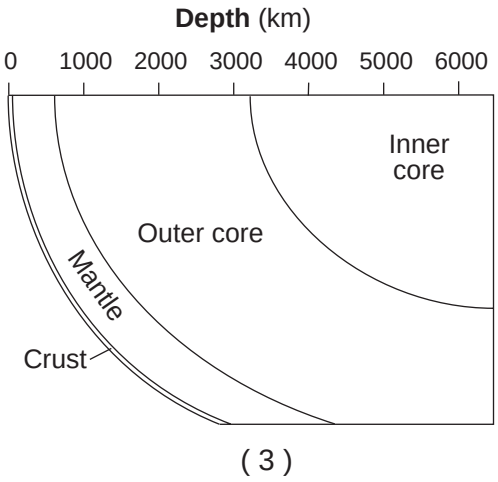
27 The graph below shows the different velocities of *P*-waves and *S*-waves through Earth's interior.



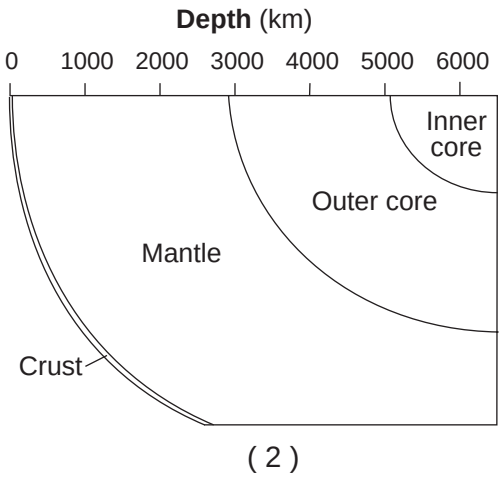
Which cross section best shows the inferred thickness of Earth's interior layers that cause these different velocities?



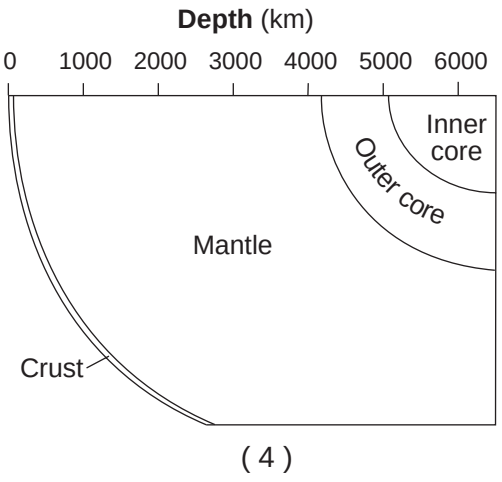
(1)



(3)

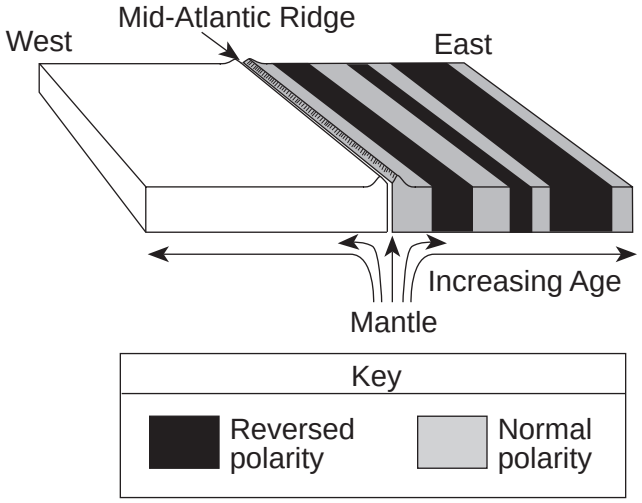


(2)

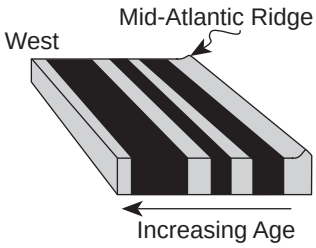


(4)

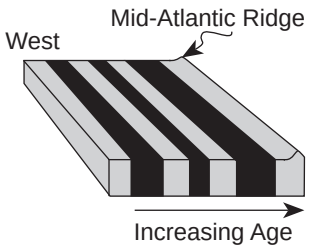
28 The diagram below represents the pattern of normal and reversed magnetic polarity and the relative age of the igneous bedrock composing the ocean floor on the east side of the Mid-Atlantic Ridge. The magnetic polarity of the bedrock on the west side of the ridge has been deliberately left blank.



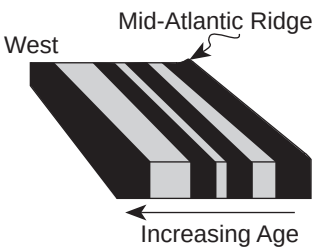
Which diagram best shows the magnetic pattern and relative age of the igneous bedrock on the west side of the ridge?



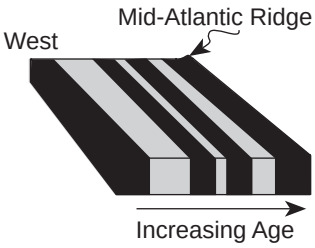
(1)



(2)



(3)



(4)

29 Which conditions normally can be found in Earth's asthenosphere, producing a partial melting of ultramafic rock?

(1) temperature = 1,000°C; pressure = 10 million atmospheres
(2) temperature = 2,000°C; pressure = 0.1 million atmospheres
(3) temperature = 3,500°C; pressure = 0.5 million atmospheres
(4) temperature = 6,000°C; pressure = 4 million atmospheres

30 Which color of the visible light spectrum could have a wavelength of 5.5×10^{-5} centimeter?

(1) green
(2) orange
(3) yellow
(4) red

31 Compared to the climate conditions of dry inland locations, the climate conditions of locations influenced by a nearby ocean generally result in

(1) hotter summers and colder winters, with a larger annual range of temperatures
(2) hotter summers and colder winters, with a smaller annual range of temperatures
(3) cooler summers and warmer winters, with a larger annual range of temperatures
(4) cooler summers and warmer winters, with a smaller annual range of temperatures

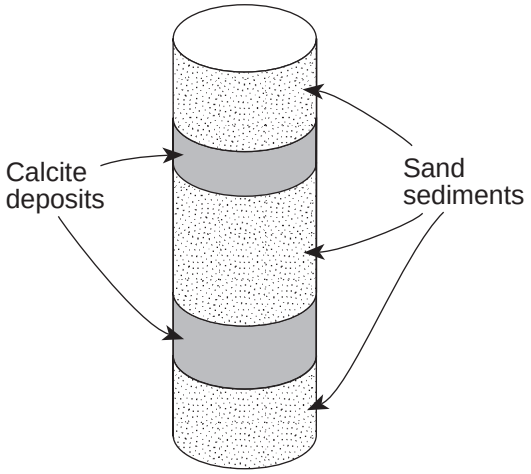
32 Biotite mica and muscovite mica have different chemical compositions. Compared to the magma from which biotite mica forms, the magma from which muscovite mica forms is usually

(1) more mafic and less dense
(2) more mafic and more dense
(3) more felsic and less dense
(4) more felsic and more dense

33 An increase in the amount of which atmospheric gas is thought to cause global climate warming?

(1) oxygen
(2) hydrogen
(3) nitrogen
(4) carbon dioxide

34 The diagram below shows a drill core of sediment that was taken from the bottom of a lake.



Which types of rock would most likely form from compaction and cementation of these sediments?

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

35 Which intrusive igneous rock could be composed of approximately 60% pyroxene, 25% plagioclase feldspar, 10% olivine, and 5% amphibole?

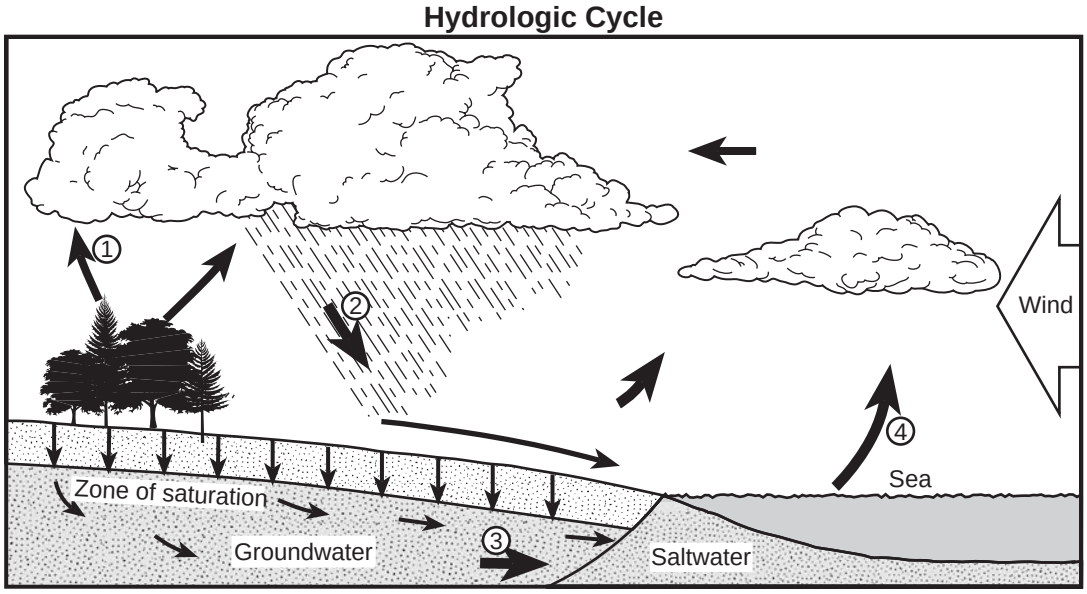
(1) granite
(2) rhyolite
(3) gabbro
(4) basalt

Part B–1

Answer all questions in this part.

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

Base your answers to questions 36 through 39 on the water cycle diagram shown below. Some arrows are numbered 1 through 4 and represent various processes.



36 Which numbered arrow best represents the process of transpiration?

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

37 The clouds have formed primarily because moist air

(1) rises, expands, and cools
(2) rises, expands, and warms
(3) sinks, compresses, and cools
(4) sinks, compresses, and warms

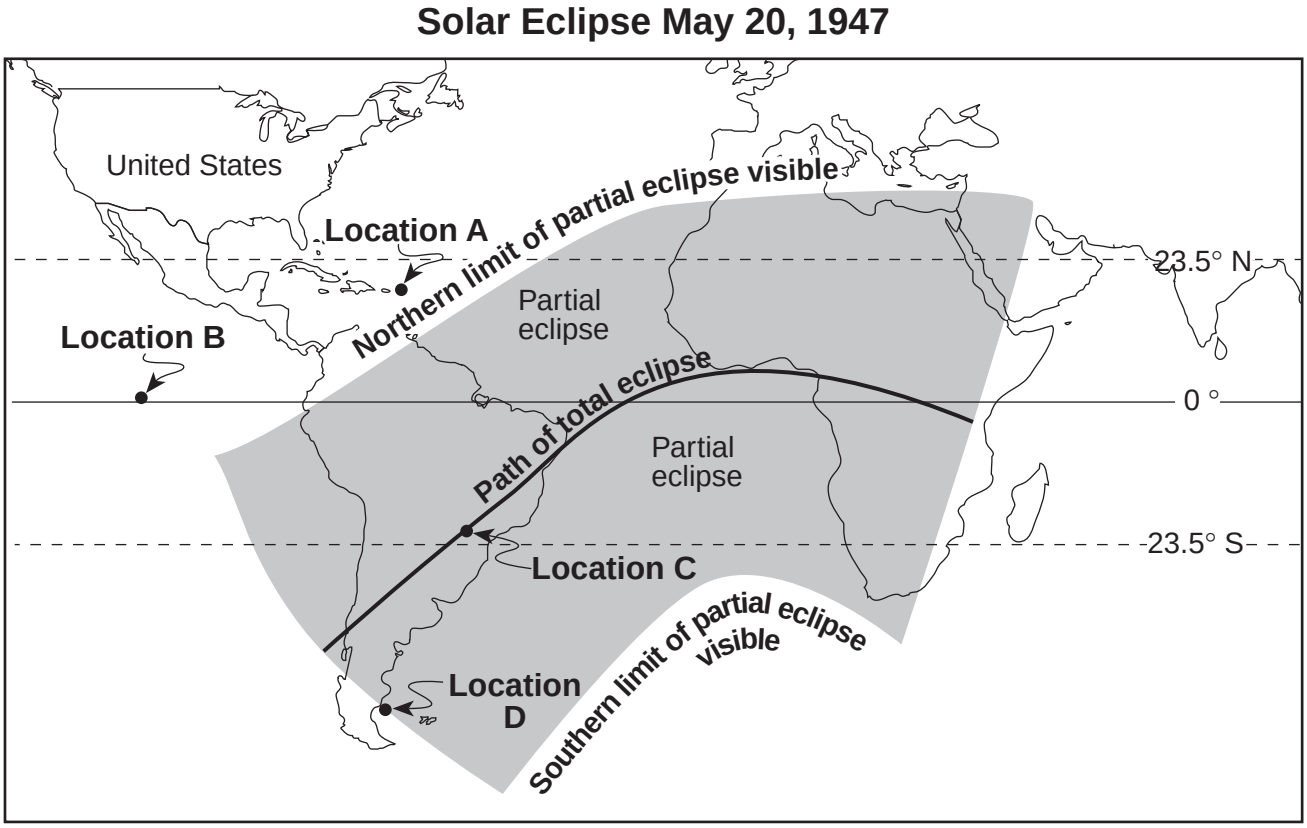
38 For infiltration to occur, the ground must be

(1) permeable and saturated
(2) permeable and not saturated
(3) impermeable and saturated
(4) impermeable and not saturated

39 Which atmospheric condition is most likely responsible for the wind blowing the clouds from the sea toward the land?

(1) high air temperature over the sea and low air temperature over the land
(2) high air pressure over the sea and low air pressure over the land
(3) low air density over the sea and high air density over the land
(4) low visibility over the sea and high visibility over the land

Base your answers to questions 40 through 42 on the world map below, which shows regions of Earth where a solar eclipse was visible on May 20, 1947. Locations *A*, *B*, *C*, and *D* are on Earth's surface.



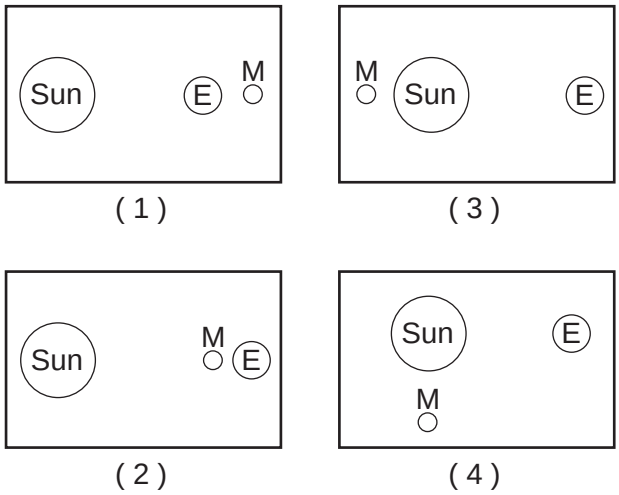
40 At which location could an observer have viewed this total solar eclipse if the skies were clear?

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

41 Which statement best describes the visibility of this eclipse from locations in New York State?

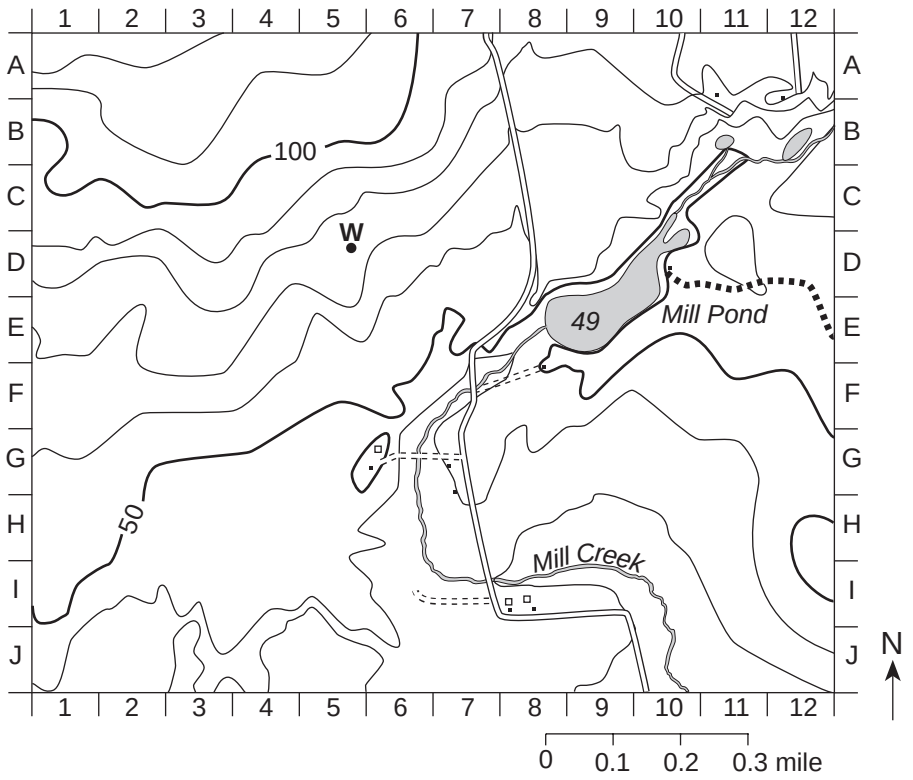
(1) A total eclipse was visible all day.
(2) A total eclipse was visible only from noon until sunset.
(3) A partial eclipse was visible only from noon until sunset.
(4) Neither a partial nor a total eclipse was visible.

42 Which diagram best represents the positions of Earth (*E*), the Sun, and the Moon (*M*) that created the solar eclipse? (Diagrams are not drawn to scale.)

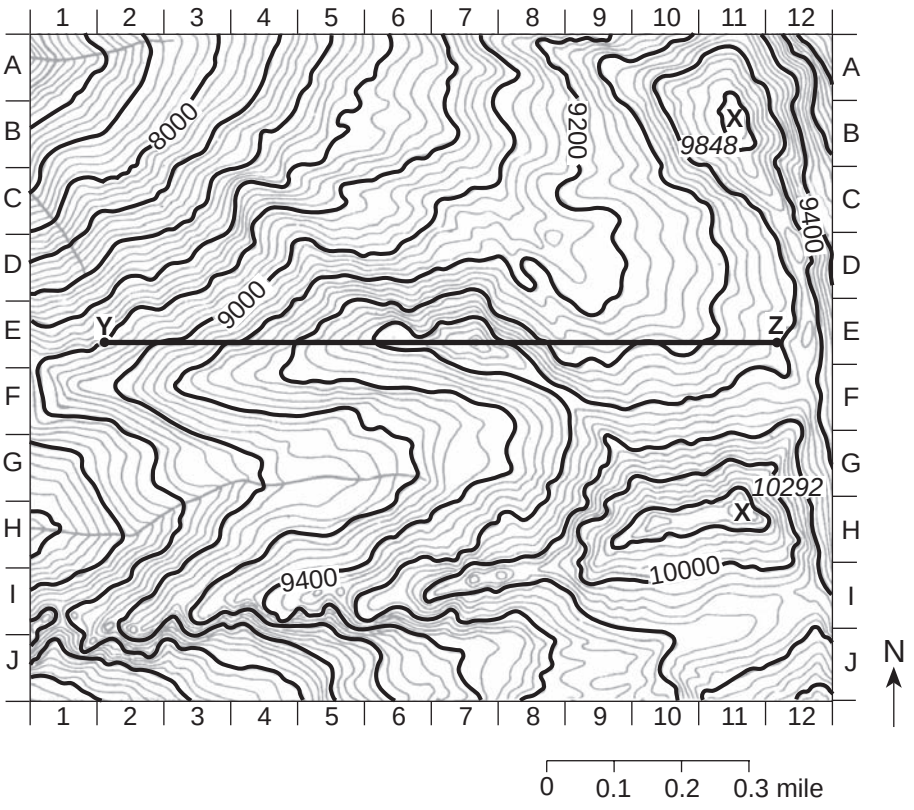


Base your answers to questions 43 through 46 on the two topographic maps below. A grid system of numbers and letters appears along the edge of each map to help locate features. Both maps show elevations in feet above sea level.

Map A



Map B



43 Which statement correctly describes one difference between these maps?

(1) Map *A* has a greater relief (elevation change between high and low locations) than map *B*.
(2) Map *A* represents a much larger surface area than map *B*.
(3) Map *A* shows more contour lines than map *B*.
(4) Map *A* generally shows gentler slopes than map *B*.

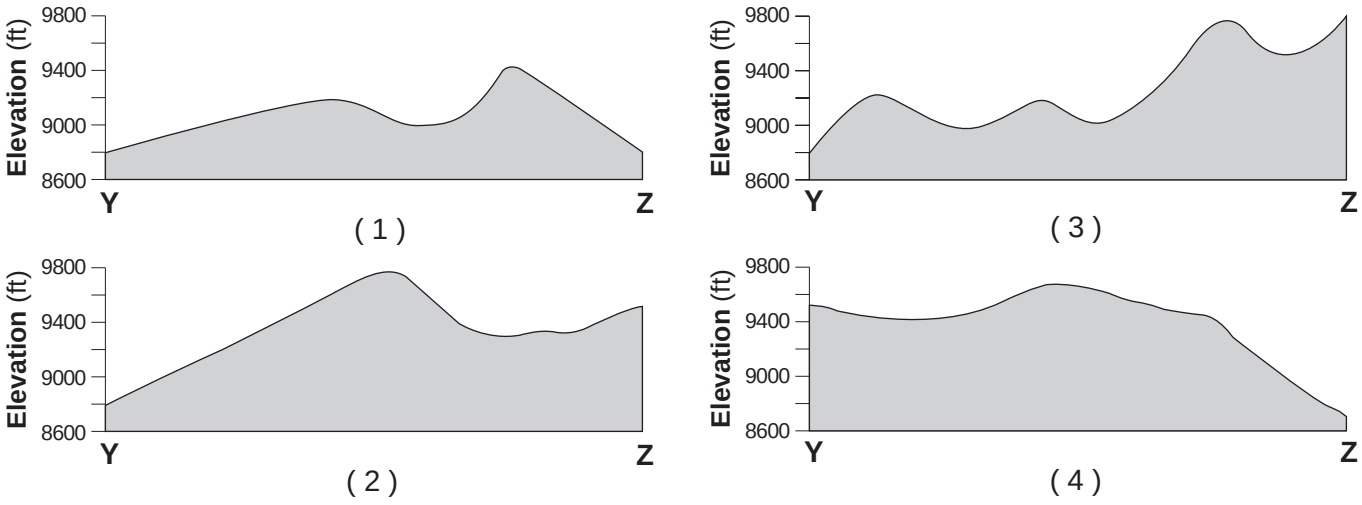
44 On map *B*, what is the approximate straight-line distance from the center of the *X* within grid area *B*–11 to the center of the *X* within grid area *H*–11?

(1) 0.3 mi
(2) 0.6 mi
(3) 1.2 mi
(4) 1.5 mi

45 Which direction is the stream mainly flowing within grid area *H*–1 on map *B*?

(1) northward
(2) southward
(3) eastward
(4) westward

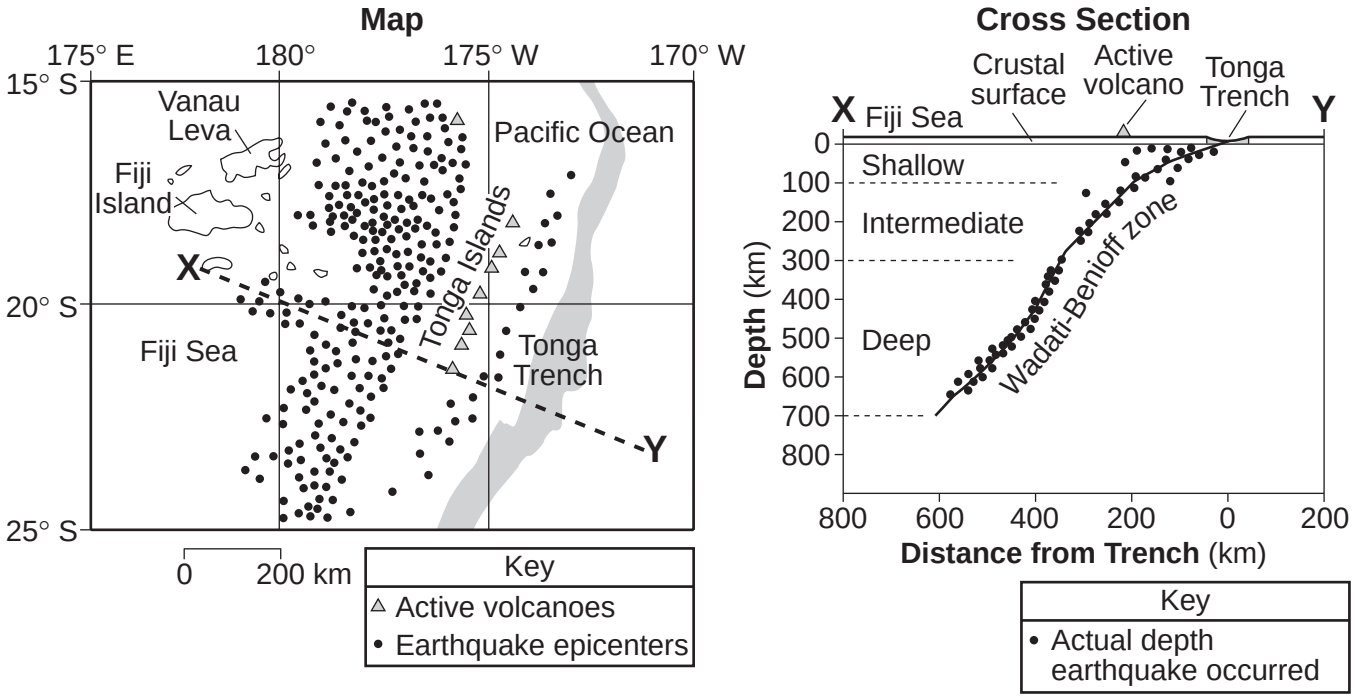
46 Which cross section best represents the topographic profile along the straight line from point *Y* to point *Z* on map *B*?



Base your answers to questions 47 through 50 on the information, map, and cross section below.

The map represents a portion of Earth's surface in the Pacific Ocean. The positions of islands, earthquake epicenters, active volcanoes, and the Tonga Trench are shown. Lines of latitude and longitude have been included.

The cross section shows earthquakes that occurred beneath line *XY* on the map. Depth beneath Earth's surface is indicated by the scale along the left side of the cross section, as are the range of depths for shallow, intermediate, and deep earthquakes. Distance from the trench is indicated by the scale along the bottom of the cross section.



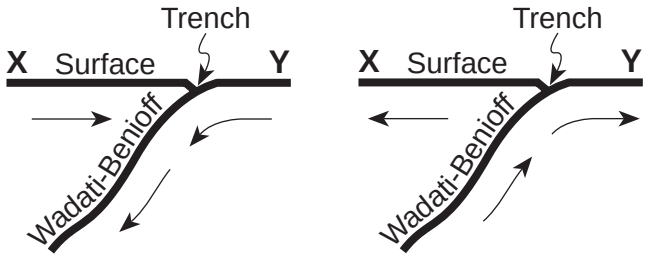
47 The Tonga Trench is located at the tectonic boundary between the Pacific Plate and the

(1) Antarctic Plate
(2) Philippine Plate
(3) Indian-Australian Plate
(4) Nazca Plate

48 The greatest number of earthquakes shown in the cross section occurred

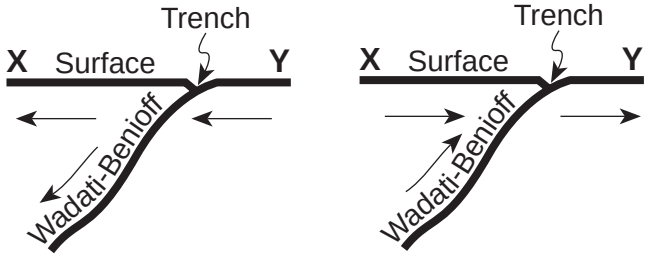
(1) at sea level
(2) between sea level and a depth of 100 km
(3) at a depth between 100 and 300 km
(4) at a depth between 300 and 600 km

49 Which cross section has arrows that best represent the relative motion of the crustal plates along the Wadati-Benioff zone beneath the Tonga Trench?



(1)

(3)



(2)

(4)

50 The latitude and longitude of the center of Vanau Leva is closest to

(1) 17° N 179° W
(2) 17° N 181° W
(3) 17° S 179° E
(4) 17° S 181° E

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.*

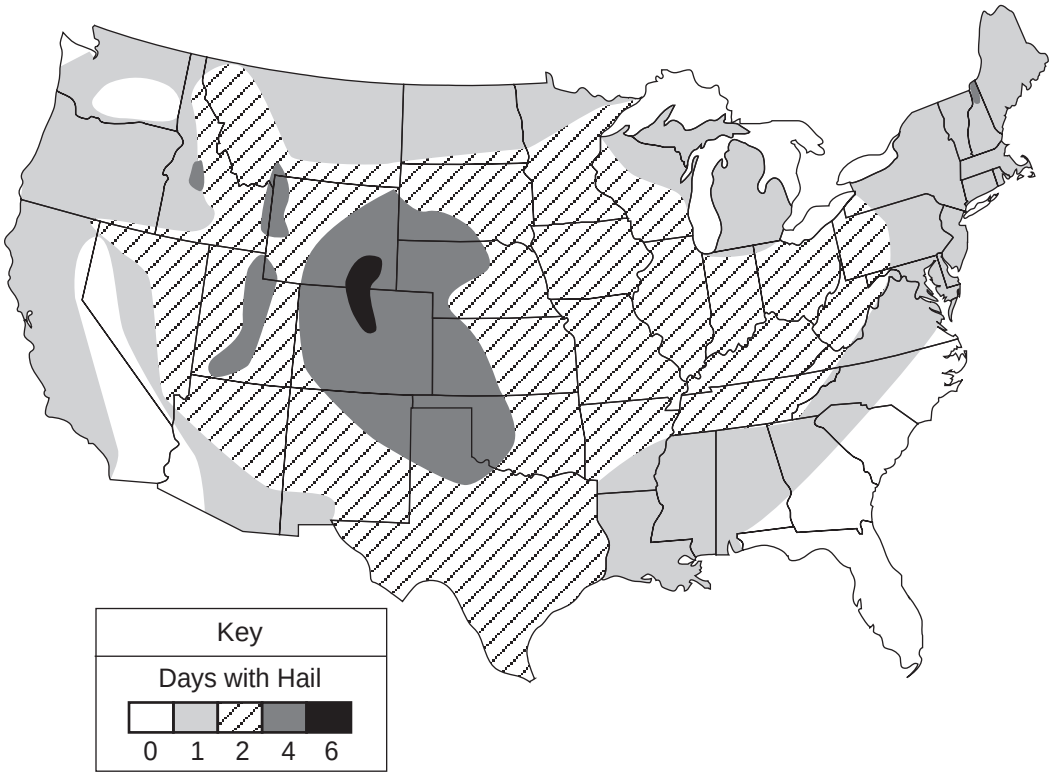
Base your answers to questions 51 through 55 on the data table and map below and on your knowledge of Earth science. The data table shows the altitude of the top of a thunderstorm cloud and the probability of hail being formed for a location in New York State. The map shows the average number of days per year hail strikes the ground in different regions of the United States.

Data Table

Altitude of the Top of a Thunderstorm Cloud (km)	**Probability of Hail Formation** (%)
13	50
15	75
17	100

MAP

(Average number of days that hail strikes the ground each year)



51 Describe the relationship between the altitude of the top of a thunderstorm cloud and the probability that hail will be produced by that cloud. [1]

52 Into which atmospheric temperature zone (layer) above New York State would the top of a thunderstorm cloud extend to have a 100% probability of hail? [1]

53 State the average number of days per year that Syracuse, New York, will experience hail. [1]

54 The table below shows weather conditions recorded in Syracuse, New York, at the time of a severe hailstorm.

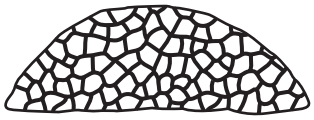
Wind direction	from the northwest
Wind speed	20 knots
Visibility	$\frac{1}{4}$ mile
Present weather	hail
Amount of cloud cover	100%
Barometric pressure	990.0 millibars

On the weather map station model *in your answer booklet*, use the correct symbols and proper format to indicate the *six* weather conditions shown in the table. [2]

55 State *one* way that humans could protect themselves from harm if a severe hail warning is issued for their locality. [1]

Base your answers to questions 56 through 59 on the geologic time line shown in your answer booklet. Letters *a* through *g* on the time line indicate specific reference points in geologic time.

56 Place an **X** on the geologic time line *in your answer booklet,* so that the center of the **X** shows the time that the coral index fossil *Lichenaria* shown below existed on Earth. [1]

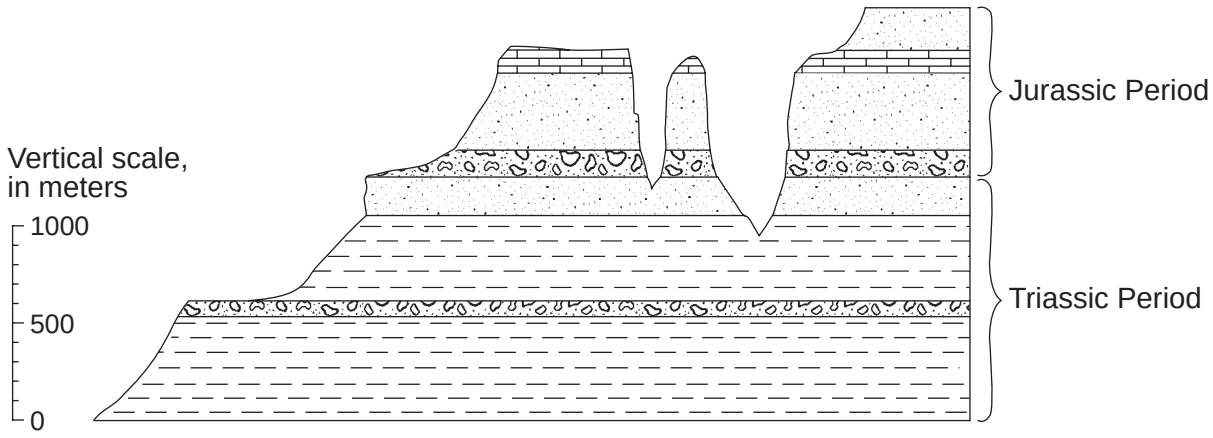


57 Letter *a* indicates a specific time during which geologic period? [1]

58 Identify the mountain building event (orogeny) that was occurring in eastern North America at the time represented by letter *g*. [1]

59 Identify *one* letter that indicates a time for which there is no rock record in New York State. [1]

Base your answers to questions 60 and 61 on the geologic cross section shown below and on your knowledge of Earth science. The cross section shows the surface of a landscape region in the southwestern United States and indicates the age, type, and thickness of the bedrock.



60 State *one* characteristic, other than the horizontal bedrock structure, shown in the cross section that supports the idea that this region is correctly classified as a plateau landscape. [1]

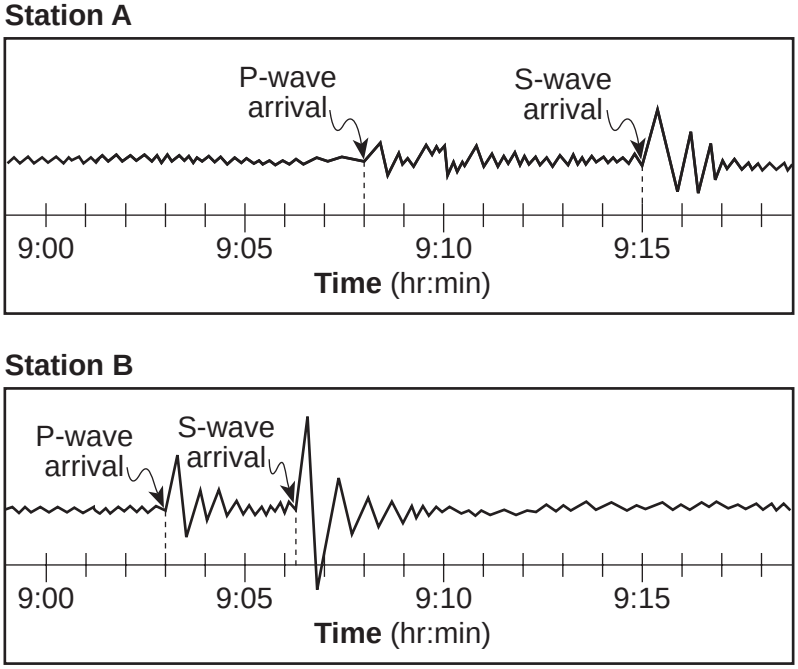
61 Which New York State landscape region has surface bedrock of the same geologic age as the surface bedrock shown in this cross section? [1]

---

62 The diagram *in your answer booklet* represents a beaker of water that is being heated. As the colored dye pellet dissolves, the dye will show the movement of water in the beaker. On the diagram, draw arrows in the water to show the direction the colored dye will move when the water is heated as shown. [1]

Base your answers to questions 63 and 64 on the diagram below, which shows two seismogram tracings, at stations *A* and *B*, for the same earthquake. The arrival times of the *P*-waves and *S*-waves are indicated on each tracing.

Seismogram Tracings



63 Explain how the seismic tracings recorded at station *A* and station *B* indicate that station *A* is farther from the earthquake epicenter than station *B*. [1]

64 Seismic station *A* is located 5,400 kilometers from the epicenter of the earthquake. How much time would it take for the first *S*-wave produced by this earthquake to reach seismic station *A*? [1]

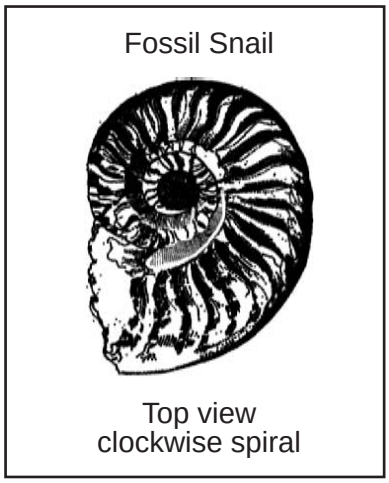
Part C

Answer all questions in this part.

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

65 The diagram *in your answer booklet* shows the average distance between the Sun and Earth drawn to a scale of 1 centimeter = 100,000,000 kilometers. Using this same scale, place a small dot representing Jupiter along the line to indicate how far Jupiter would be from the Sun, and label the dot "Jupiter." [1]

Base your answers to questions 66 and 67 on the diagram and information below about fossil snails and on your knowledge of Earth science.



Snails have lived in most of the world's oceans over a period of hundreds of millions of years. Paleontologists discovered that in warm, tropical waters more snails have shells that, when viewed from the top, spiral outward in a *clockwise* direction. In cool or cold waters, more snails have shells that spiral outward in a *counterclockwise* direction. Both clockwise- and counterclockwise-spiraled snail fossils have been found in New York State bedrock.

66 In a slab of rock that contains many fossil snails, what evidence would lead geologists to conclude that the slab was formed in a tropical climate? [1]

67 State *one* reason bedrock that formed in tropical regions is found in New York State. [1]

Base your answers to questions 68 through 70 on the data table below, which shows the average date of the first breakup of ice on the Tanana River at Nenana, Alaska (65° N 149° W). The average date of the first ice breakup is shown for four decades.

Data Table

Decade	Average Date of First Ice Breakup
1960–1969	May 7
1970–1979	May 5
1980–1989	May 4
1990–1999	April 29

68 On the grid *in your answer booklet*, construct a bar graph of the average date of the first ice breakup for *each* decade shown on the data table. [1]

69 State *one* possible climate change responsible for the difference in the average dates of the first ice breakups shown by the data table. [1]

70 Explain why the number of daylight hours on May 5 for an observer located at Nenana, Alaska, will be different than the number of daylight hours for an observer located at New York, New York (41° N 73° 45' W). [1]

---

71 Complete the table *in your answer booklet*, by listing *three* agents of erosion and identifying *one* characteristic surface feature formed by *each* agent of erosion. [2]

Base your answers to questions 72 and 73 on the diagram *in your answer booklet*, which represents an asteroid's elliptical orbit around the Sun. The dashed line is the major axis of the ellipse.

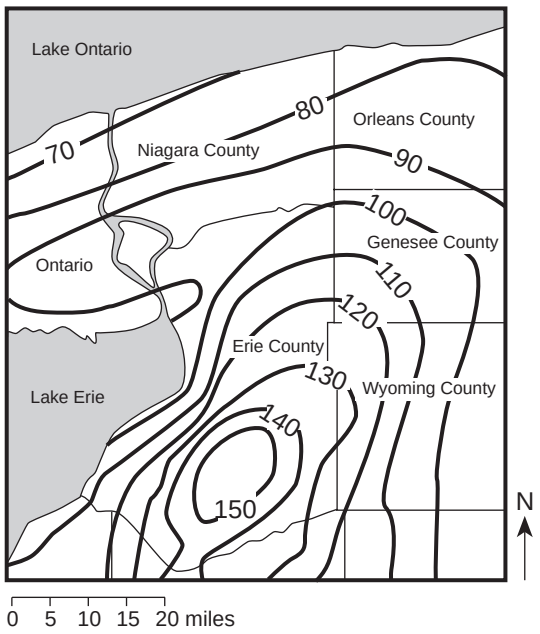
72 Place a circle, **O**, on the orbital path where the velocity of the asteroid would be the least. [1]

73 The Sun is located at one focal point of the orbit. Place an **X** on the diagram at the location of the second focal point. [1]

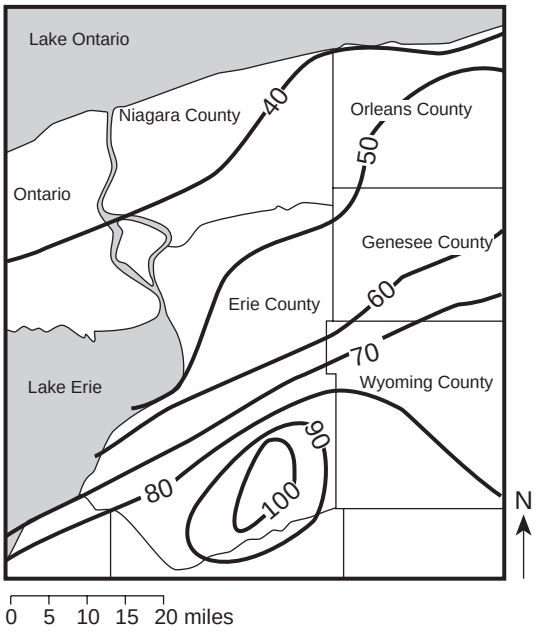
Base your answers to questions 74 through 77 on the three western New York State snowfall maps below and on your knowledge of Earth science. The three maps represent three different winter seasons. The isolines show the total inches of snowfall received each winter season. Some western New York State counties are labeled on each map. The dotted line *AB* has been drawn on the 1991–1992 winter season map.

Total Inches of Snowfall Received

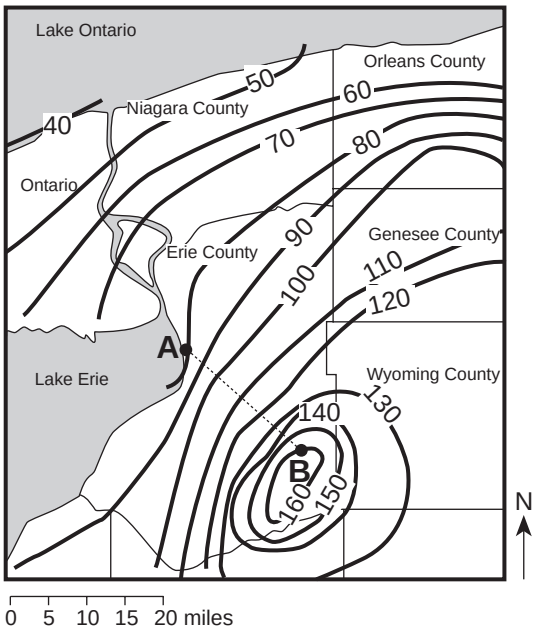
1985–1986 Winter Season



1990–1991 Winter Season



1991–1992 Winter Season



74 Calculate the average snowfall gradient along the dotted line between points *A* and *B* on the 1991–1992 winter season map, and label your answer with the correct units. [2]

75 Once the surface of Lake Erie completely freezes over with ice, the amount of snow from each snowstorm is usually reduced. Explain why a covering of ice on Lake Erie may cause the amount of snow from snowstorms to be reduced. [1]

76 On the grid *in your answer booklet*, draw a line graph to show the general relationship between the amount of snowfall recorded in northern Erie County with the amount of snowfall recorded in southern Erie County, as shown on the three snowfall maps. [1]

77 On the map *in your answer booklet* that shows the total inches of snowfall received at various locations for the 1984–1985 winter season, draw the 120-inch snowfall isoline. [1]

Base your answers to questions 78 and 79 on the passage below and on your knowledge of Earth science.

Radiocarbon Dating

Radioactive carbon-14 (C^{14}), because of its short half-life, is used for the absolute dating of organic remains that are less than 70,000 years old.

Carbon-14 is an isotope of carbon that is produced in Earth's upper atmosphere. High-energy cosmic rays from the Sun hit nitrogen-14 (N^{14}), producing radioactive C^{14}. This C^{14} is unstable and will eventually change back into N^{14} through the process of radioactive decay. The proportions of C^{14} and ordinary C^{12} in Earth's atmosphere remain approximately constant.

Radioactive C^{14}, just like ordinary C^{12}, can combine with oxygen to make carbon dioxide. Plants use CO_2 during photosynthesis. The proportion of C^{14} to C^{12} in the cells and tissues of living plants is the same as the proportion of C^{14} to C^{12} in the atmosphere. After plants die, no new C^{14} is taken in because there is no more photosynthesis. Meanwhile, the C^{14} in the dead plant keeps changing back to N^{14}, so there is less and less C^{14}. The longer the plant has been dead, the less C^{14} is found in the plant. The age of organic remains can be found by comparing how much C^{14} is still in the organic remains to how much C^{14} is in a living organism.

78 Radioactive C^{14} was used to determine the geologic age of old wood preserved in a glacier. The amount of C^{14} in the old wood is half the normal amount of C^{14} currently found in the wood of living trees. What is the geologic age of the old wood? [1]

79 State *one* difference between dating with the radioactive isotope C^{14} and dating with the radioactive isotope uranium-238 (U^{238}). [1]

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

Great Balls of Fire

The Earth's predicted near-miss with asteroid XF11 in the year 2028 has once again focused attention on the fear that a large asteroid or comet hitting our planet could trigger a global catastrophe.

To back this up, every article and television program about XF11 boldly asserted that the dinosaur extinction was caused by a giant asteroid impacting into the Earth 65 million years ago. This has typically been accompanied by a picture of frightened dinosaurs looking skyward at a huge flaming meteorite streaking across the horizon. This scenario is so widely accepted that few commentators bother to question it any more. There is, however, much evidence to suggest that an asteroid may not have hit the Earth 65 million years ago and that, even if it did, it did not cause the mass extinction of life attributed to it. There is also the possibility that dinosaurs may not have been around to witness it!

by Paul Chambers
http://www.forteantimes.com/articles/111_asteroid.shtml (6/98)

80 If an asteroid struck Earth 65 million years ago, what surface feature was most likely created by this asteroid impact? [1]

81 Identify *one* geologic process occurring on Earth that could have hidden or even destroyed this inferred impact feature. [1]

82 Explain how an asteroid impact may have been able to cause a worldwide mass extinction of dinosaurs. [1]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Tuesday, August 16, 2005 — 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.

Signature

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Tuesday, August 16, 2005 — 12:30 to 3:30 p.m., only

ANSWER BOOKLET

☐ Male

Student . . . . . Sex: ☐ Female

Teacher . . . . . .

School . . . . . Grade . . . . . .

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

	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)	
	Final Score (from conversion chart)	

Raters' Initials:

Rater 1 . . . . . **Rater 2** . . . . . .

Part B–2

For Raters Only

51 _____

_____ **51**

52 _____ **52**

53 _____ **days/yr** **53**

For Raters Only

54

Station Model

54 ☐

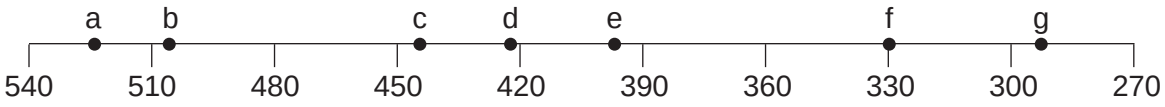
55 _____

_____

55 ☐

56

Geologic Time Line (millions of years ago)



56 ☐

57 _____ **Period** **57** ☐

58 _____ **Orogeny** **58** ☐

59 _____ **59** ☐

60 _____

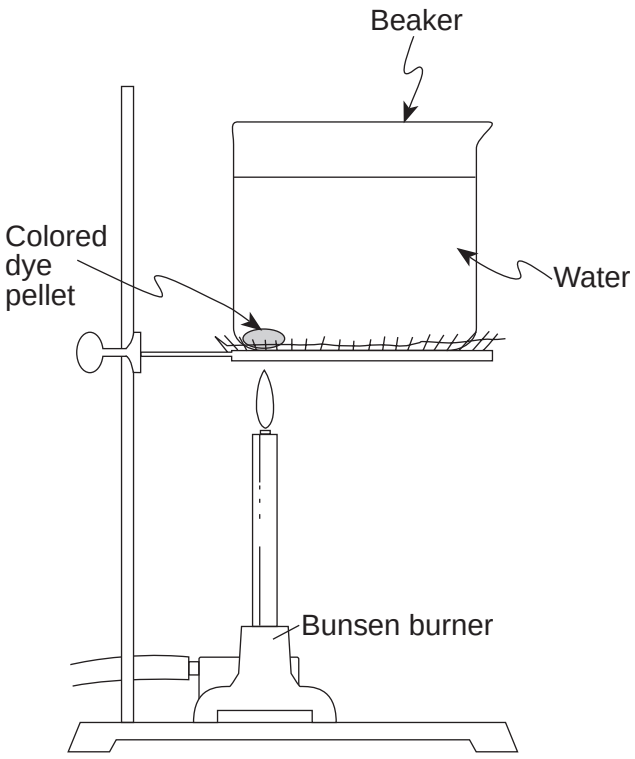
_____

60 ☐

61 _____ **61** ☐

For Raters Only

62



62 ☐

63 _____

_____ 63 ☐

_____

64 _____ **min** _____ **sec** 64 ☐

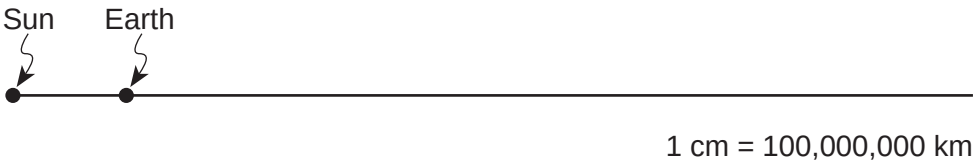
☐

Total Score for Part B–2

Part C

For Raters Only

65



65 ☐

66 _____

_____

66 ☐

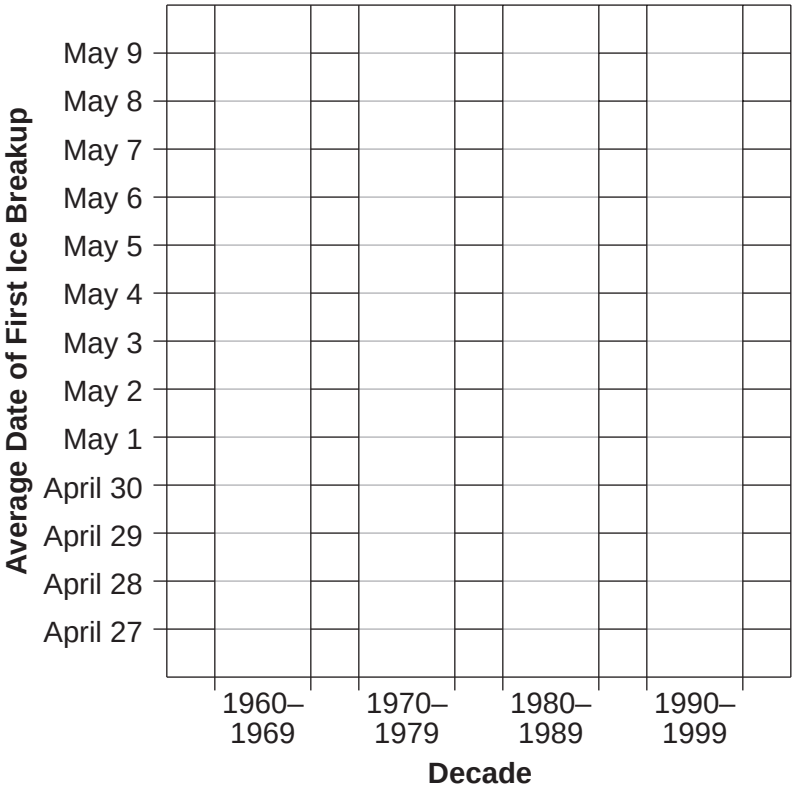
67 _____

_____

67 ☐

For Raters Only

68



68 ☐

69 _____

69 ☐

_____

70 _____

70 ☐

_____

_____

[OVER]

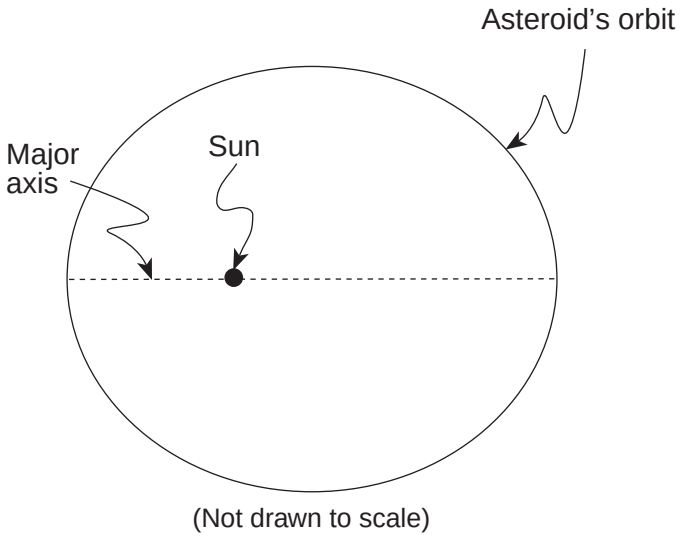
For Raters Only

71

Agent of Erosion	Surface Feature Formed
(1)	
(2)	
(3)	

71 ☐

72 and 73



72 ☐

73 ☐

74 Gradient = _____ 74 ☐

75 _____

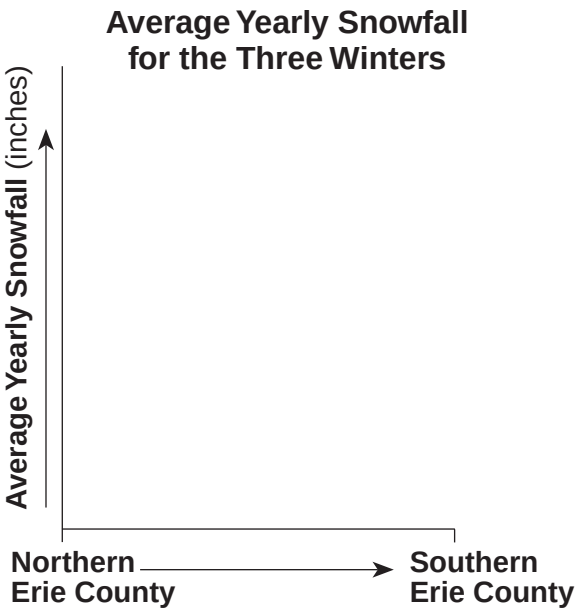
_____

_____ 75 ☐

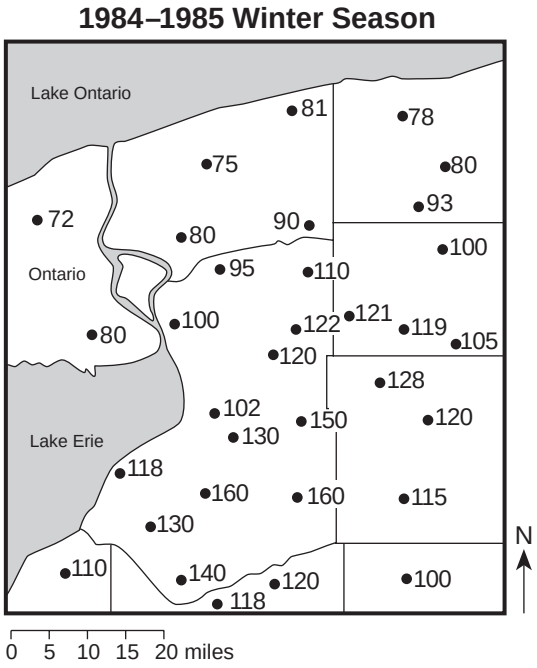
[6]

For Raters Only

76



77



78 _____ **yr**

79 _____

_____

76 ☐

77 ☐

78 ☐

79 ☐

For Raters Only

80 _____ **80** ☐

81 _____ **81** ☐

82 _____

_____ **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

Tuesday, August 16, 2005 — 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. Visit the site http://www.emsc.nysed.gov/osa/ and select the link "Latest Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

Part A and Part B–1
Allow 1 credit for each correct response

Part A

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

Part B–1

36 . . . . **1**	44 . . . . **2**
37 . . . . **1**	45 . . . . **4**
38 . . . . **2**	46 . . . . **2**
39 . . . . **2**	47 . . . . **3**
40 . . . . **3**	48 . . . . **4**
41 . . . . **4**	49 . . . . **1**
42 . . . . **2**	50 . . . . **3**
43 . . . . **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 Booklet for Scoring Regents Examinations in the Sciences*.

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

On the detachable answer sheet for Part A and Part B–1, indicate by means of a 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 Tuesday, August 16, 2005. 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 in the scoring key for that administration be used to determine the student's final score. The chart in this scoring key is usable only for this administration of the examination.

Part B–2

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

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

— The higher the altitude of the top of the cloud, the greater the probability that hail will be produced.

— direct relationship

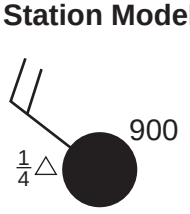
52 [1] Allow 1 credit for **stratosphere**.

53 [1] Allow 1 credit for one day per year.

54 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 2 credits if five or six weather conditions are correctly indicated, using the proper format.
- Allow 1 credit if only three or four weather conditions are correctly indicated, using the proper format.

A 2-credit response is shown below:



Note: Feathers may be placed on either side of the staff.

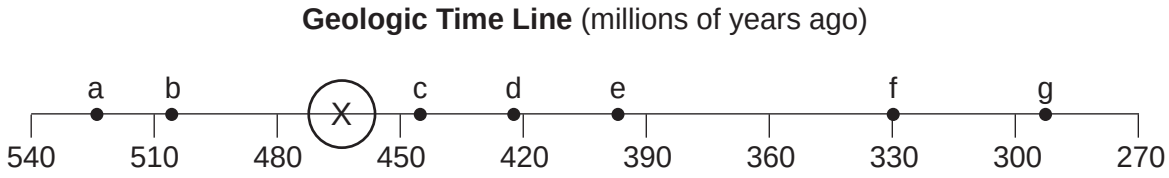
Do *not* allow credit for numbers with units.

55 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Seek indoor shelter.

— If indoors, stay away from windows.

56 [1] Allow 1 credit if the center of the **X** falls within the circle shown on the time line below.



57 [1] Allow 1 credit for **Cambrian** Period**.**

58 [1] Allow 1 credit for **Appalachian** Orogeny *or* **Alleghanian** Orogeny.

59 [1] Allow 1 credit for ***f*** *or* ***g***.

60 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The landscape has a high relief.

— There is a large difference in elevation between the top and bottom rocks in the cross section.

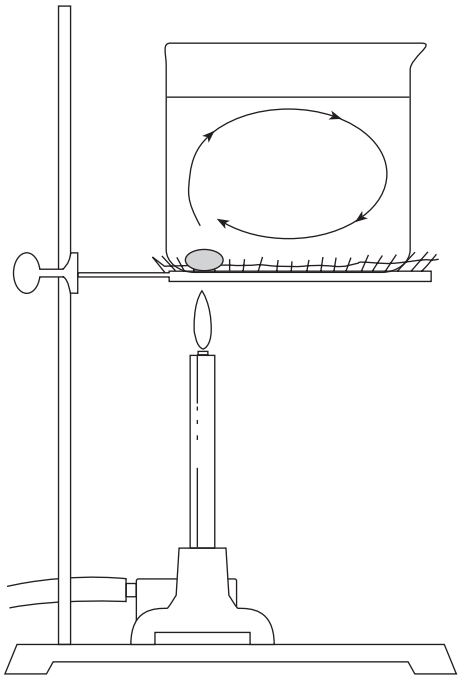
— steep slopes

— high elevation

61 [1] Allow 1 credit for **Newark Lowlands**.

62 [1] Allow 1 credit for arrows that exhibit clockwise convective circulation.

Example of a 1-credit response:



63 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The arrival time of the *P*-wave at station A is later than the arrival time of the *P*-wave at station *B*.

— The arrival time difference between the *P*-wave and *S*-wave is greater at station *A*.

— The amplitudes of the *P*-wave and *S*-wave tracings are greater on the seismogram at station *B*.

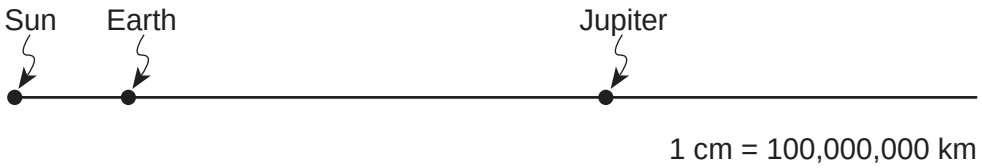
64 [1] Allow 1 credit for 15 minutes 50 seconds (±10 seconds).

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 if the center of the dot for Jupiter is 7.8 (±0.4) cm from the center of the Sun and the dot is labeled.

A 1-credit response is shown below:



Allow credit if a symbol other than a dot is used to correctly locate and label the position of Jupiter.

66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Clockwise spiral snail shells are found in greater numbers.

— more clockwise fossil shells than counterclockwise

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

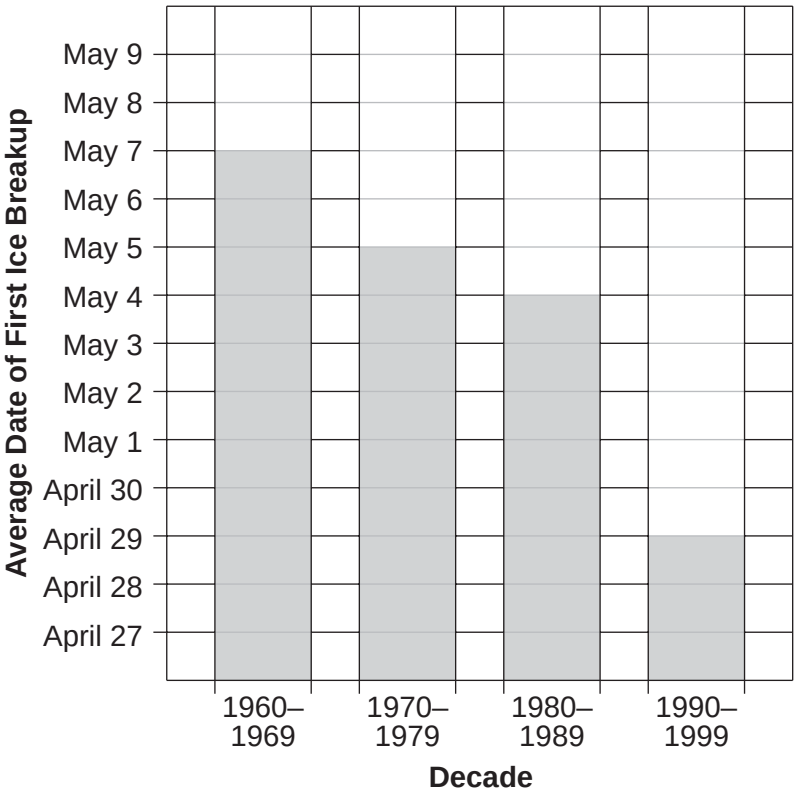
— New York State experienced a warmer climate when it was located closer to the Equator.

— The North American Plate has drifted northward from the equator region over time.

— New York State used to be in the tropics.

68 [1] Allow 1 credit if all four bars are correctly drawn.

A 1-credit response is shown below:



Note: Do *not* allow credit if the student constructs a line graph.

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

— The climate appears to have warmed.

— Average yearly temperature increased.

Allow credit for a response that is consistent with the student's graph in question 68.

70 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— They are at different latitudes.

— Nenana is located farther from the equator.

— The Sun's apparent daily path is longer in Nenana on May 5th.

— The tilt of Earth's axis causes a longer period of daylight in Nenana.

71 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 2 credits for correctly listing *three* agents of erosion and identifying a characteristic surface feature formed by each of the three agents of erosion.

- Allow 1 credit for correctly listing only *two* agents of erosion and identifying a characteristic surface feature formed by each of the two agents of erosion.

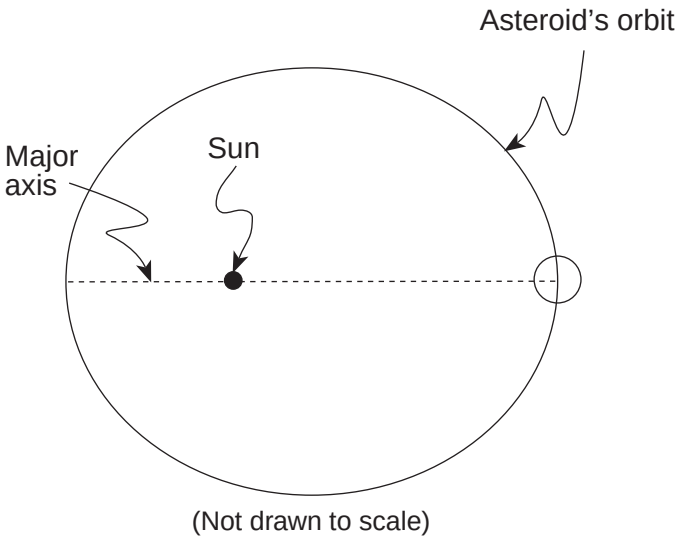
or

Allow 1 credit for correctly listing three agents of erosion even if the surface feature is incorrectly identified.

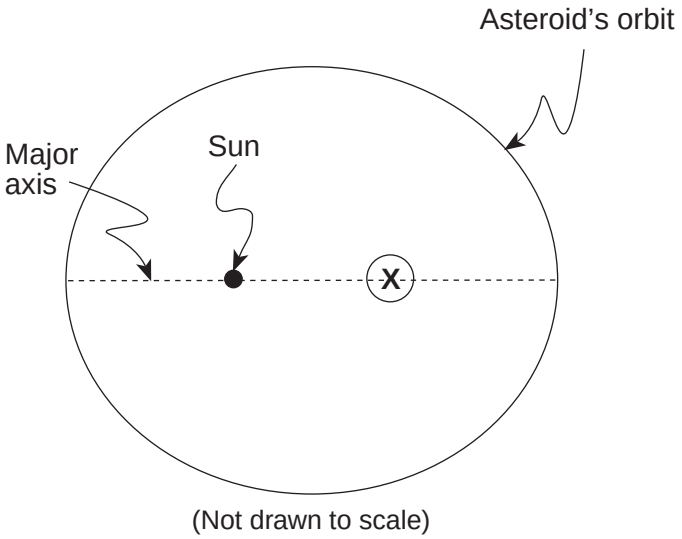
Acceptable responses include, but are not limited to:

Agent of Erosion	Surface Feature Formed
Waves	beach, sandbars, barrier islands
Wind	loss of topsoil, dunes
Glacier	U-shaped valley, moraines, drumlins
Running water (streams)	V-shaped valley, deltas, meanders
Mass movement	landslides, slumps

72 [1] Allow 1 credit if the center of the circle is within the circle shown.



73 [1] Allow 1 credit if the center of the **X** is within the circle shown.



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

74 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for **4** *or* **4.0** (±0.2).
- Allow 1 credit for the correct unit. Acceptable responses include, but are not limited to:

  — inches/mile

  — in/mi

75 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

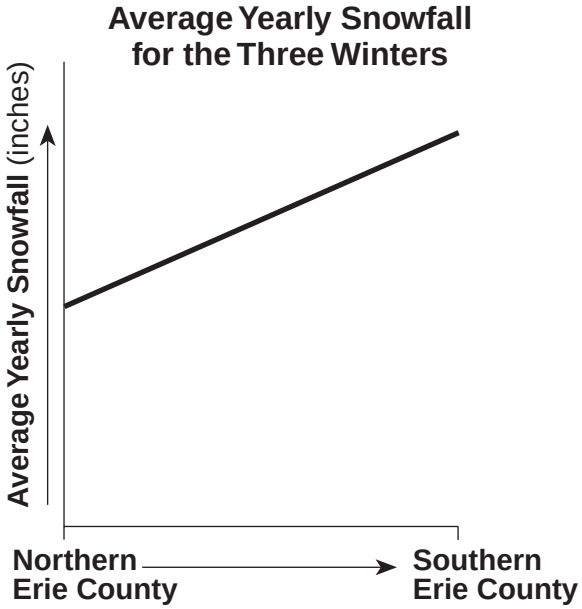
— When Lake Erie is covered with ice, the air moving over it will pick up less moisture.

— Less evaporation will take place.

— When Lake Erie is covered with ice, the air is heated less.

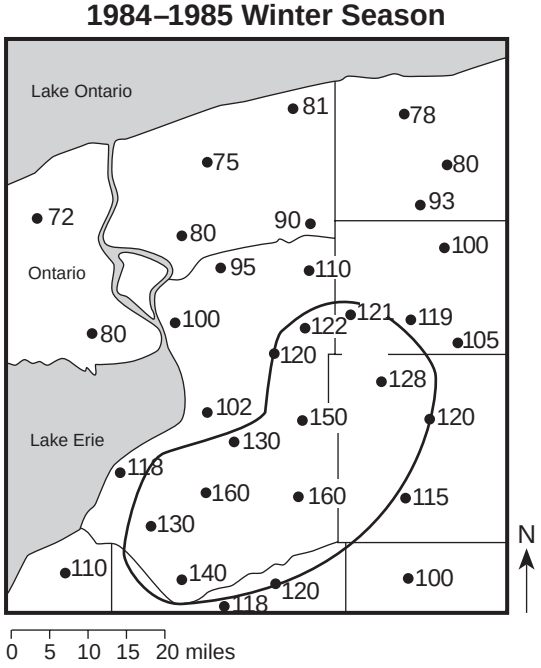
76 [1] Allow 1 credit if the line graph shows that southern Erie County has more snowfall than northern Erie County.

Example of a 1-credit response:



77 [1] Allow 1 credit for a correctly drawn 120-inch snowfall isoline.

Example of a 1-credit response:



Note: If additional isolines are drawn, all isolines must be correct to receive credit.

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

— 5,700 years

— 5.7×10^3 years

79 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— U^{238} has a longer half-life.

— U^{238} can be used to date older geologic events.

— C^{14} is used to date organic remains while U^{238} is not.

80 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— crater

— impact crater

— large hole

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

— deposition of sediment

— erosion

— subduction

— volcanic lava flow

— weathering

82 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Dust that was thrown into Earth's atmosphere caused a change in Earth's climate.

— The impact caused fires that killed plants and animals.

— Dust from the impact blocked sunlight that cooled Earth and caused many green plants to die.

Map to Core Curriculum

August 2005 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
STANDARD 1			
Math Key Idea 1			68,70,74
Math Key Idea 2	22	48,51,52,56,60	
Math Key Idea 3			65,72
Science Inquiry Key Idea 1			
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	14,26,32,33	37,54,61,63	66
Engineering Design Key Idea 1			
STANDARD 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
STANDARD 6			
Key Idea 1			69,76,77,81,82
Key Idea 2	7,10,11,13,15,16, 17,18,24,26	36,37,38,39,40, 41,42,43,44,45, 46,47,48,49,50, 53,54,60,62,63	66,68,71,78,79
Key Idea 3		44,56,57,58,59	65
Key Idea 4			
Key Idea 5		64	72,73,75,78,79
Key Idea 6			
STANDARD 7			
Key Idea 1			
Key Idea 2		55	
STANDARD 4			
Key Idea 1	1,2,3,4,5,6,7,8,9, 10,11,12,13,14, 15,16,18	36,37,38,39,41, 50,56,57,58,59	65,66,67,72,73, 76,78,79,80,82
Key Idea 2	17,19,20,21,22, 23,24,25,26,27, 28,29,30,31,34	40,42,43,44,45, 46,47,48,49,50, 51,52,53,54,55, 60,61,62,63,64	68,69,70,71,74, 75,77,81
Key Idea 3	32,33,35		81
REFERENCE TABLES			
ESRT 2001 Edition	8,12,14,20,21,22, 23,25,27,29,32, 33,34,35	47,52,53,54,56, 57,58,59,61,63	65,67,68,72,73

University of the State of New York
State Education Department

Regents Examination in Earth Science – August 2005

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 85.

Total Performance Test Score

Total Written 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
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	97	96	95	95	95	94	94	94	93	93	92	92	91	90	90	89	88	88	87	86	85	84	83	82
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	96	95	94	93	93	93	92	92	91	91	91	90	89	89	88	87	87	86	85	84	84	83	82	81
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	94	93	92	92	91	91	91	90	90	89	89	88	88	87	86	86	85	84	84	83	82	81	80	79
74	93	92	91	91	90	90	90	89	89	88	88	87	87	86	86	85	84	83	83	82	81	80	79	78
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	92	91	90	90	90	89	89	88	88	88	87	87	86	85	85	84	83	83	82	81	80	79	78	77
71	92	90	89	89	89	88	88	88	87	87	86	86	85	85	84	83	83	82	81	80	79	78	77	77
70	91	90	88	88	88	88	87	87	86	86	85	85	84	84	83	82	82	81	80	79	78	78	77	76
69	90	89	88	87	87	87	86	86	86	85	85	84	83	83	82	82	81	80	79	78	78	77	76	75
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	88	87	86	86	85	85	85	84	84	83	83	82	82	81	80	80	79	78	78	77	76	75	74	73
65	87	86	85	85	84	84	84	83	83	82	82	81	81	80	80	79	78	78	77	76	75	74	73	72
64	86	85	84	84	84	83	83	83	82	82	81	81	80	79	79	78	77	77	76	75	74	73	72	71
63	86	85	83	83	83	82	82	82	81	81	80	80	79	79	78	77	77	76	75	74	73	72	72	71
62	85	84	82	82	82	82	81	81	80	80	79	79	78	78	77	76	76	75	74	73	72	72	71	70
61	84	83	82	81	81	81	80	80	80	79	79	78	77	77	76	76	75	74	73	72	72	71	70	69
60	83	82	81	80	80	80	80	79	79	78	78	77	77	76	75	75	74	73	72	72	71	70	69	68
59	83	82	81	80	80	80	80	79	79	78	78	77	77	76	75	75	74	73	72	72	71	70	69	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	73	72	72	72	71	71	71	70	70	69	69	68	68	67	66	66	65	64	63	62	61	60	60
49	74	73	71	71	71	71	70	70	69	69	68	68	67	67	66	65	65	64	63	62	61	61	60	59
48	73	72	71	70	70	70	69	69	69	68	68	67	66	66	65	65	64	63	62	61	61	60	59	58
47	72	71	70	69	69	69	68	68	68	67	67	66	66	65	64	64	63	62	61	61	60	59	58	57
46	71	70	69	69	68	68	68	67	67	66	66	65	65	64	63	63	62	61	61	60	59	58	57	56
45	70	69	68	68	67	67	67	66	66	65	65	64	64	63	63	62	61	61	60	59	58	57	56	55
44	69	68	67	67	67	66	66	66	65	65	64	64	63	62	62	61	60	60	59	58	57	56	55	54

Total Performance Test Score

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