

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

PHYSICAL SETTING
EARTH SCIENCE

Thursday, January 24, 2002 — 1:15 to 4:15 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.

Your answer booklet for Part B–2 and Part C is stapled in the center of this examination booklet. Open the examination booklet, carefully remove your answer booklet, and close the examination booklet. Then fill in the heading 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 answer sheet and 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.

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 Summer days in New York State are likely to be hotter than winter days because in summer

- (1) Earth is closer to the Sun
- (2) the number of sunspots increases
- (3) Earth's northern axis is tilted toward the Sun
- (4) the Sun gives off more energy

2 Which planet takes more time to complete one rotation on its axis than to complete one revolution around the Sun?

- (1) Mercury
- (2) Venus
- (3) Mars
- (4) Jupiter

3 Which observation provides the best evidence that Earth rotates?

- (1) The position of the planets among the stars changes during the year.
- (2) The location of the constellations in relationship to *Polaris* changes from month to month.
- (3) The length of the shadow cast by a flagpole at noontime changes from season to season.
- (4) The direction of swing of a freely swinging pendulum changes during the day.

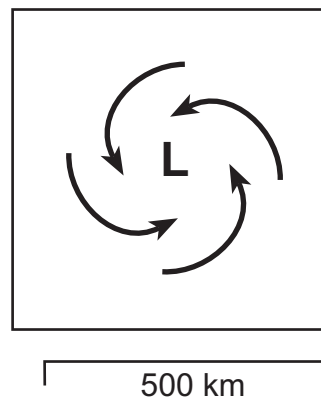
4 Which mineral is white or colorless, has a hardness of 2.5, and splits with cubic cleavage?

- (1) calcite
- (2) halite
- (3) pyrite
- (4) mica

5 Which radioactive isotope is most useful for determining the age of mastodont bones found in late Pleistocene sediments?

- (1) uranium-238
- (2) carbon-14
- (3) potassium-40
- (4) rubidium-87

6 A map view of surface air movement in a low-pressure system is shown below.



The air near the center of this low-pressure system usually will

- (1) evaporate into a liquid
- (2) reverse direction
- (3) rise and form clouds
- (4) squeeze together to form a high-pressure system

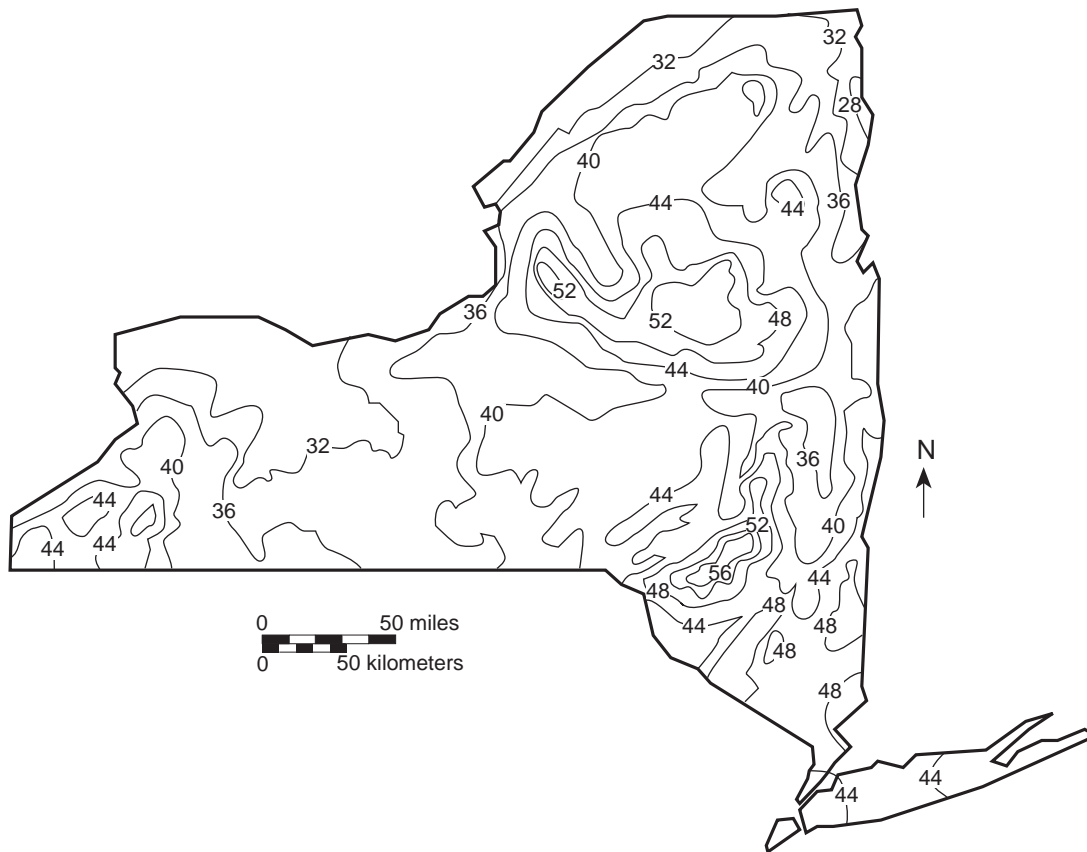
7 At which location will the highest altitude of the star *Polaris* be observed?

- (1) Equator
- (2) Tropic of Cancer
- (3) Arctic Circle
- (4) central New York State

8 Which star is cooler and many times brighter than Earth's Sun?

- (1) *Barnard's Star*
- (2) *Betelgeuse*
- (3) *Rigel*
- (4) *Sirius*

Base your answers to questions 9 and 10 on the field map below, which shows the average annual precipitation in New York State for the past 25 years. Isoline values represent inches per year.



9 Jamestown received more rainfall per year than Elmira. A reason for this difference is that Jamestown is located

- (1) closer to a large body of water
- (2) at a higher latitude
- (3) at a lower elevation
- (4) in the prevailing southerly wind belt

10 Which of these locations had the *lowest* average annual precipitation?

- (1) Kingston
- (2) New York City
- (3) Old Forge
- (4) Plattsburgh

11 Energy is transferred from the Sun to Earth mainly by

- (1) molecular collisions
- (2) density currents
- (3) electromagnetic waves
- (4) red shifts

13 Which factor has the greatest influence on the weathering rate of Earth's surface bedrock?

- (1) local air pressure
- (2) angle of insolation
- (3) age of the bedrock
- (4) regional climate

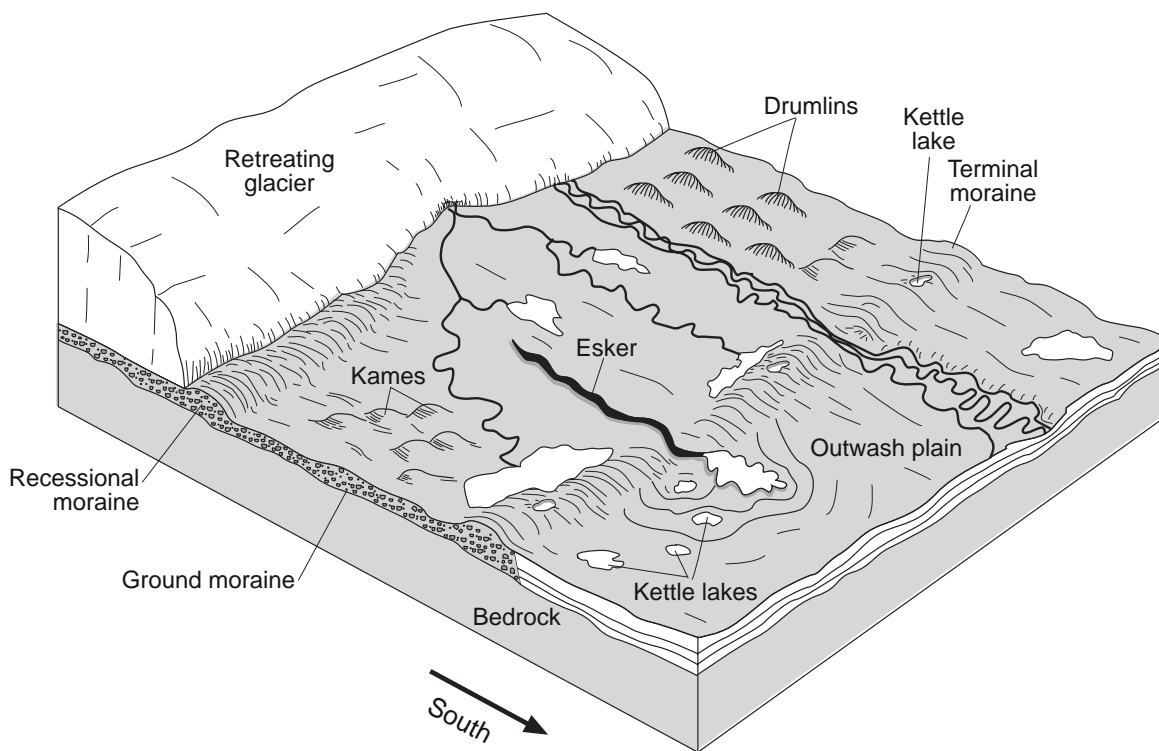
12 Which surface ocean current transports warm water to higher latitudes?

- (1) Labrador Current
- (2) Falkland Current
- (3) Gulf Stream
- (4) West Wind Drift

14 Compared to dull and rough rock surfaces, shiny and smooth rock surfaces are most likely to cause sunlight to be

- (1) reflected
- (2) refracted
- (3) scattered
- (4) absorbed

Base your answers to questions 15 through 17 on the block diagram below, which shows some of the landscape features formed as the most recent continental glacier melted and retreated across western New York State.



15 During which geologic epoch did this glacier retreat from New York State?

- (1) Pleistocene
- (2) Eocene
- (3) Late Pennsylvanian
- (4) Early Mississippian

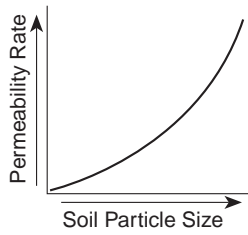
16 The moraines pictured in the block diagram were deposited directly by the glacier. The sediments within these moraines are most likely

- (1) sorted by size and layered
- (2) sorted by size and unlayered
- (3) unsorted by size and layered
- (4) unsorted by size and unlayered

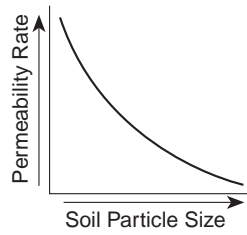
17 The shape of elongated hills labeled drumlins is most useful in determining the

- (1) age of the glacier
- (2) direction of glacial movement
- (3) thickness of the glacial ice
- (4) rate of glacial movement

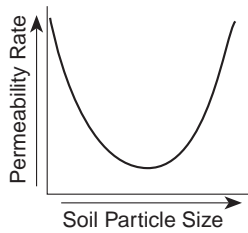
18 Which graph best represents the general relationship between soil particle size and the permeability rate of infiltrating rainwater?



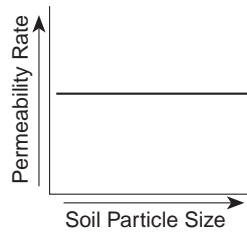
(1)



(3)

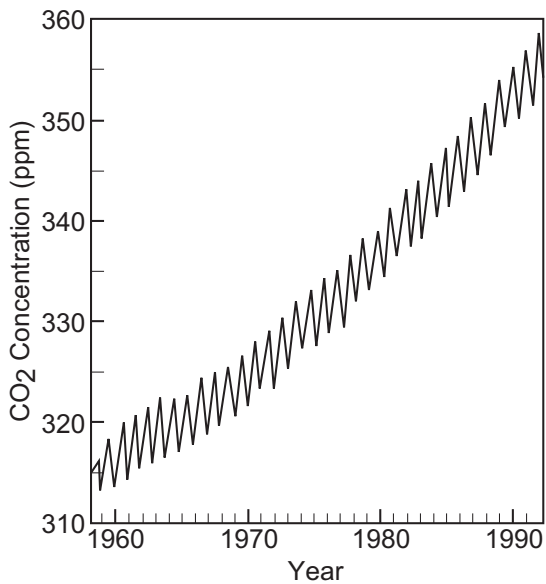


(2)



(4)

19 The graph below shows the change in carbon dioxide concentration in parts per million (ppm) in Earth's atmosphere from 1960 to 1990.



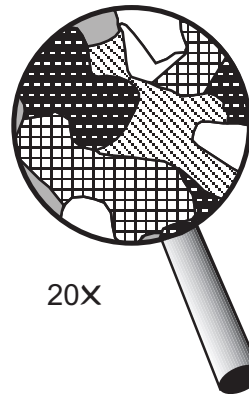
The most likely cause of the overall change in the level of carbon dioxide from 1960 to 1990 is an increase in the

- (1) number of violent storms
- (2) number of volcanic eruptions
- (3) use of nuclear power
- (4) use of fossil fuels

20 Liquid water can store more heat energy than an equal amount of any other naturally occurring substance because liquid water

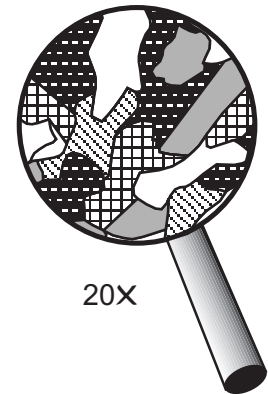
- (1) covers 71% of Earth's surface
- (2) has its greatest density at 4°C
- (3) has the higher specific heat
- (4) can be changed into a solid or a gas

21 The diagrams below show the crystals of four different rocks viewed through the same hand lens. Which crystals most likely formed from molten material that cooled and solidified most rapidly?



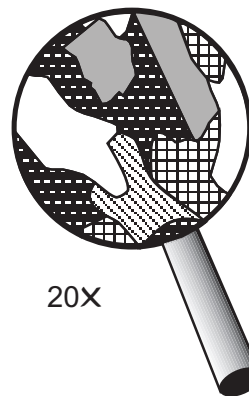
20X

(1)



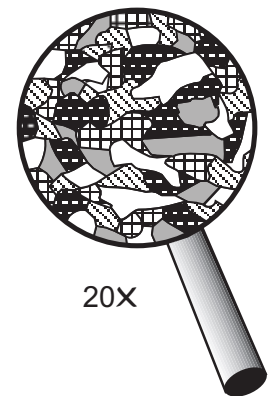
20X

(3)



20X

(2)

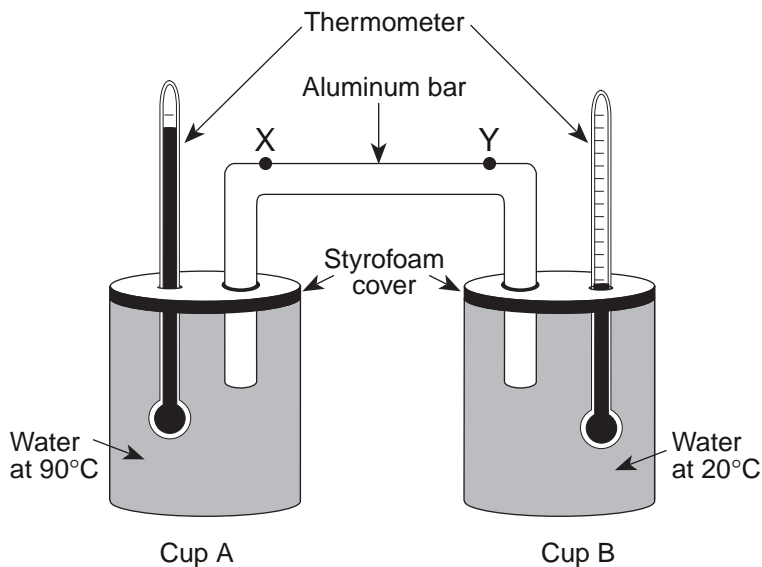


20X

(4)

Base your answers to questions 22 and 23 on the information about a laboratory procedure, diagram, and data table below.

Hot water at 90°C is poured into cup A. Cool water at 20°C is poured into cup B. Styrofoam covers are placed on the cups. An aluminum bar and a thermometer are placed through holes in each cover. Points X and Y are locations on the aluminum bar. The data table shows temperature readings taken every minute for 20 minutes.



	Temperature of Water (°C)	
Minute	Cup A	Cup B
0	90	20
1	88	20
2	86	20
3	85	21
4	83	21
5	82	22
6	81	22
7	80	22
8	79	22
9	78	23
10	77	23
11	76	23
12	75	23
13	74	23
14	73	23
15	72	24
16	71	24
17	70	24
18	69	24
19	68	25
20	67	25

22 Which change in the experiment would increase the heating rate of the water in cup B?

- (1) making the aluminum bar shorter between points X and Y
- (2) making the aluminum bar longer between points X and Y
- (3) keeping cup A covered, but uncovering cup B
- (4) keeping cup B covered, but uncovering cup A

23 The rate of temperature change for the water in cup A for the first 10 minutes was approximately

- (1) 0.77 C°/min
- (2) 1.3 C°/min
- (3) 7.7 C°/min
- (4) 13.0 C°/min

24 Which sedimentary rock is most likely to be changed to slate during regional metamorphism?

- (1) breccia
- (2) conglomerate
- (3) dolostone
- (4) shale

25 Which planet has an orbit with an eccentricity most similar to the eccentricity of the Moon's orbit around Earth?

- (1) Earth
- (2) Jupiter
- (3) Pluto
- (4) Saturn

Base your answers to questions 26 through 28 on the weather map of North America below. The map shows the location of a front and the air mass influencing its movement.



26 Which region is the probable source of the air mass labeled cP on the map?

- (1) central Canada
- (2) southwestern United States
- (3) North Atlantic Ocean
- (4) Gulf of Mexico

27 Which type of front and frontal movement is shown on the weather map?

- (1) cold front moving northwestward
- (2) cold front moving southeastward
- (3) warm front moving northwestward
- (4) warm front moving southeastward

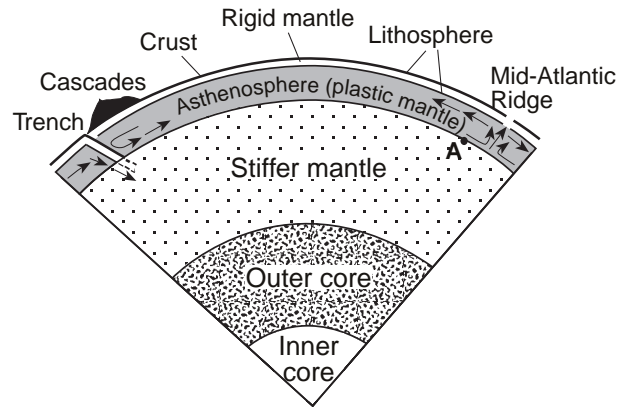
28 The cP air mass is identified on the basis of its temperature and

- (1) wind direction
- (2) cloud cover
- (3) moisture content
- (4) windspeed

29 Clouds usually form when

- (1) air temperature reaches the dewpoint
- (2) evaporation has warmed the surrounding air
- (3) relative humidity is 0%
- (4) condensation nuclei have been removed from the air

Base your answers to questions 30 and 31 on the diagram below, which shows a portion of Earth's interior. Point A is a location on the interface between layers.



(Not drawn to scale)

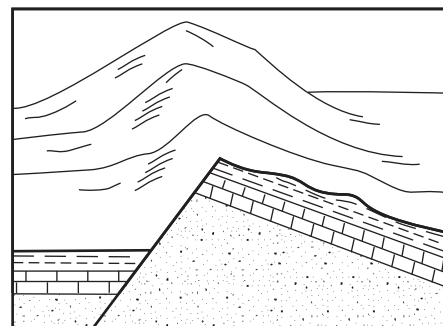
30 The arrows shown in the asthenosphere represent the inferred slow circulation of the plastic mantle by a process called

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

31 The temperature of rock at location A is approximately

- (1) 600°C
- (2) 1,000°C
- (3) 2,600°C
- (4) 3,000°C

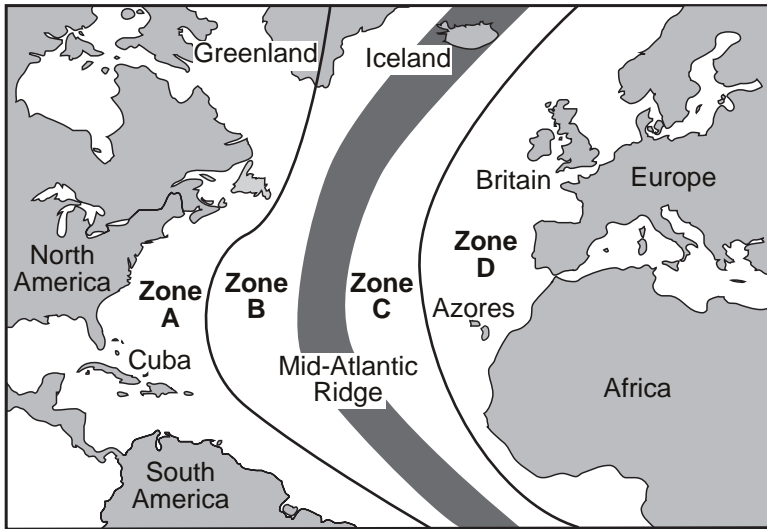
32 The diagram below shows the bedrock structure beneath a series of hills.



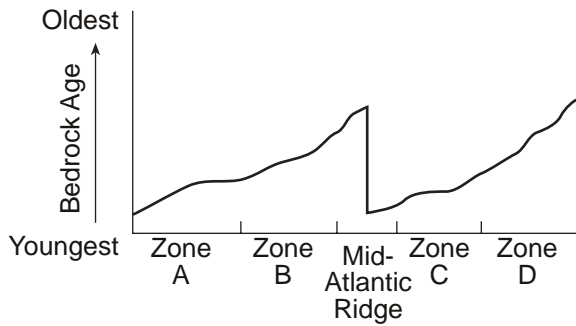
Which process was primarily responsible for forming the hills?

- (1) folding
- (2) faulting
- (3) deposition
- (4) vulcanism

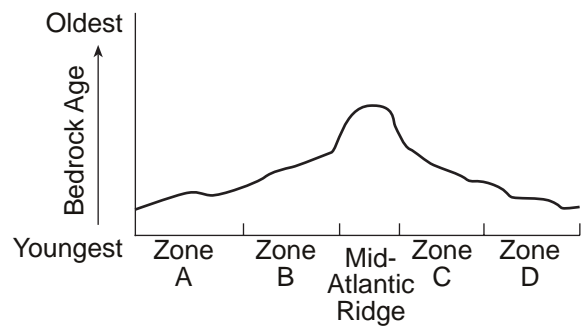
33 The map below shows the Atlantic Ocean divided into zones A, B, C, and D. The Mid-Atlantic Ridge is located between zones B and C.



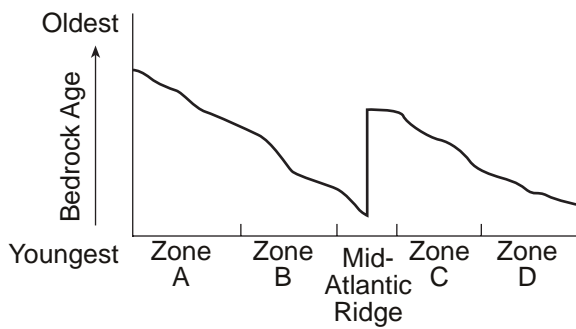
Which graph best represents the geologic age of the surface bedrock on the ocean bottom?



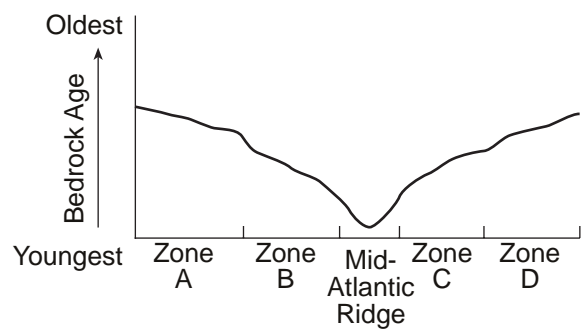
(1)



(3)



(2)



(4)

34 The table below describes the characteristics of three landscape regions, *A*, *B*, and *C*, found in the United States.

Landscape	Bedrock	Elevation/Slopes	Streams
<i>A</i>	Faulted and folded gneiss and schist	High elevation Steep slopes	High velocity Rapids
<i>B</i>	Layers of sandstone and shale	Low elevation Gentle slopes	Low velocity Meanders
<i>C</i>	Thick horizontal layers of basalt	Medium elevation Steep to gentle slopes	High to low velocity Rapids and meanders

Which list best identifies landscapes *A*, *B*, and *C*?

- (1) *A*—mountain, *B*—plain, *C*—plateau (3) *A*—plateau, *B*—mountain, *C*—plain
 (2) *A*—plain, *B*—plateau, *C*—mountain (4) *A*—plain, *B*—mountain, *C*—plateau

35 The Devonian-aged siltstone shown in the photograph below occurs as surface bedrock near Hamilton, New York.



0 _____ 2 cm

What does the presence of the fossils suggest about the Hamilton area during the Devonian?

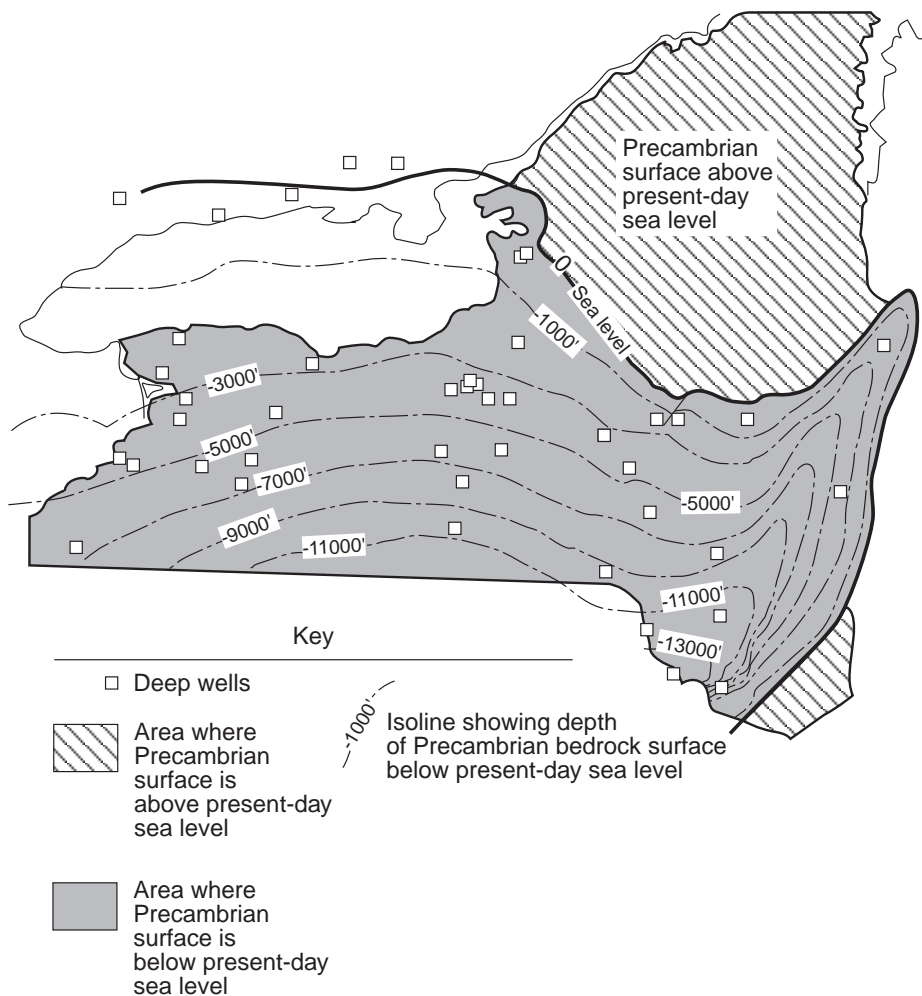
- (1) It had a terrestrial environment sometime between 443 and 418 million years ago.
 (2) It had a terrestrial environment sometime between 418 and 362 million years ago.
 (3) It had a marine environment sometime between 443 and 418 million years ago.
 (4) It had a marine environment sometime between 418 and 362 million years ago.

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 38 on the map below, which shows most of New York State. Isolines indicate the depth of the Precambrian bedrock surface below present-day sea level. Depths are in feet.



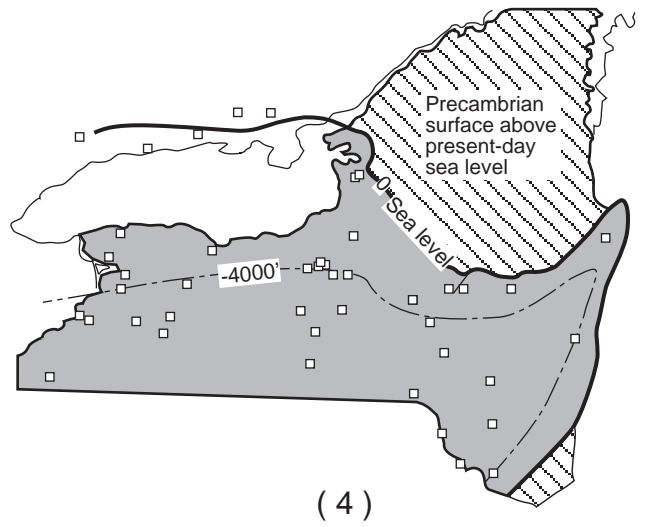
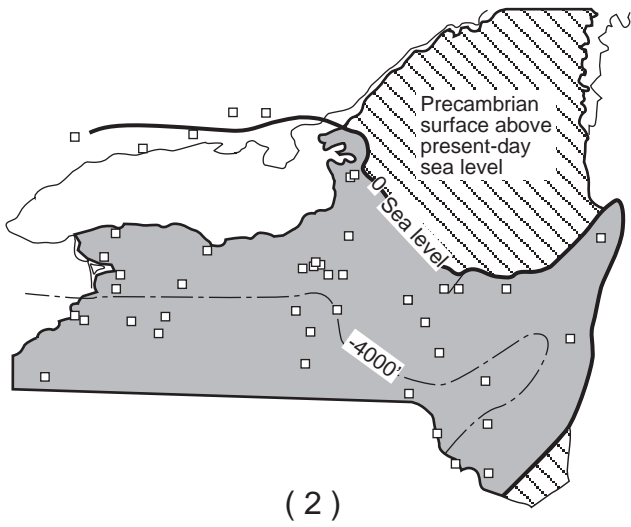
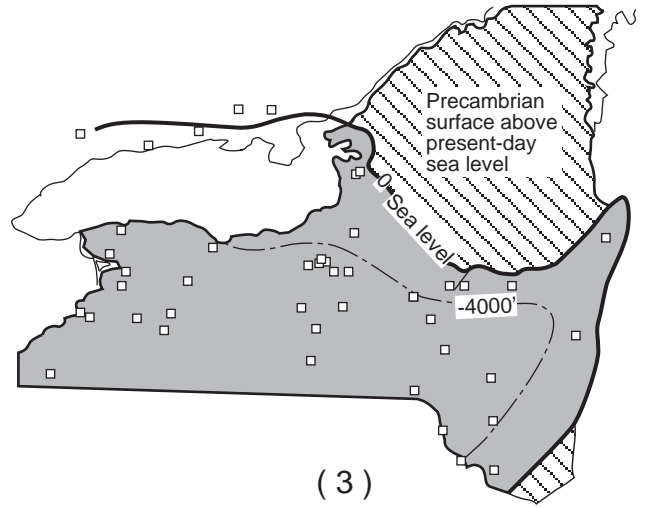
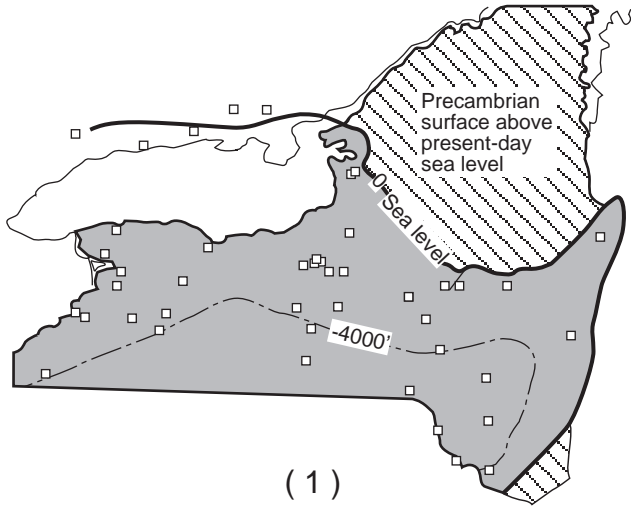
36 According to the map, in which two present-day New York State landscape regions is the most Precambrian bedrock likely to be exposed on the land surface?

- (1) Erie-Ontario Lowlands and Tug Hill Plateau
- (2) Allegheny Plateau and Catskills
- (3) Adirondack Mountains and Hudson Highlands
- (4) Hudson-Mohawk Lowlands and Champlain Lowlands

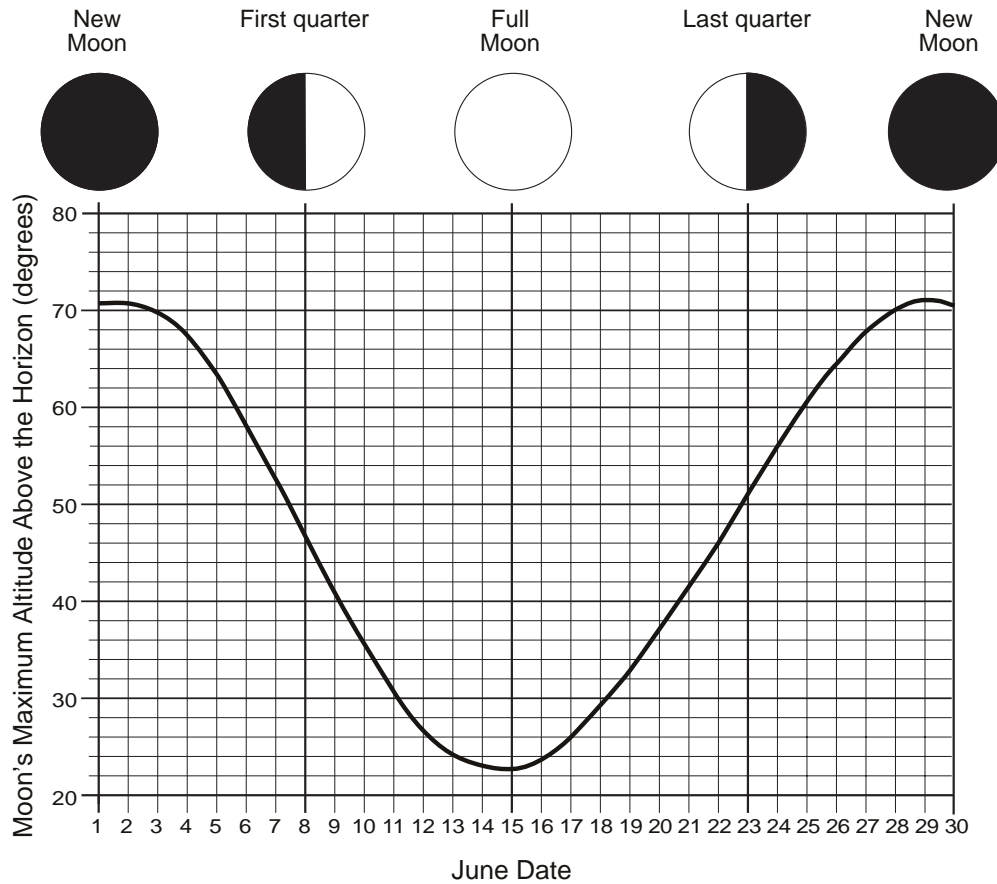
37 What is the geologic age of most of the bedrock covering the Precambrian rock in present-day New York State?

- (1) Paleozoic
- (2) Cenozoic
- (3) Mesozoic
- (4) Archean

38 Which map best shows the location of the -4,000-foot isoline?



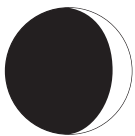
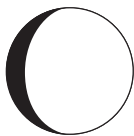
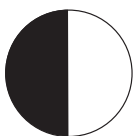
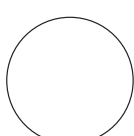
Base your answers to questions 39 through 42 on the graph below, which shows the maximum altitude of the Moon, measured by an observer located at a latitude of 43° N during June in a particular year. The names and appearance of the four major Moon phases are shown at the top of the graph, directly above the date on which the phase occurred.



39 What was the maximum altitude of the Moon on June 22?

- (1) 40° (3) 46°
 (2) 43° (4) 50°

40 Which diagram best represents the Moon's phase observed on June 11?

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

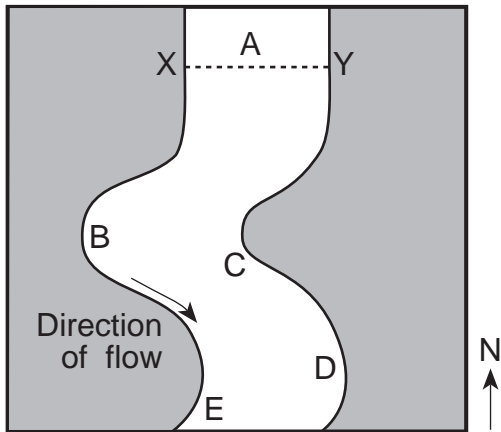
41 Which city is closest in latitude to the location where these observations were made?

- (1) Binghamton (3) Albany
 (2) New York City (4) Syracuse

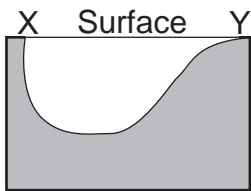
42 Which terms describe both the changes in the maximum altitude of the Moon and the changes in the Moon's phases over a period of several years?

- (1) cyclic and predictable
 (2) cyclic and unpredictable
 (3) noncyclic and predictable
 (4) noncyclic and unpredictable

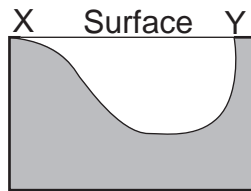
Base your answers to questions 43 through 45 on the map below, which shows a portion of a stream in New York State that flows southward. Letters A through E represent locations in the stream. Line XY is the location of a cross section.



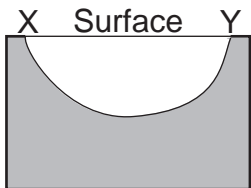
- 43 At which two locations in this stream is deposition normally dominant over erosion?
- (1) A and D (3) C and E
 (2) B and E (4) D and C
- 44 Where this stream's velocity decreases from 300 to 200 centimeters per second, which size sediment will be deposited?
- (1) cobbles (3) silt
 (2) sand (4) clay
- 45 Which cross section along line XY best represents the shape of the stream bottom?



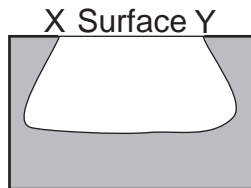
(1)



(3)

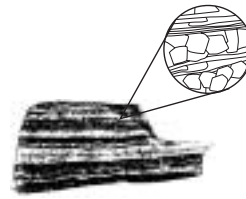


(2)



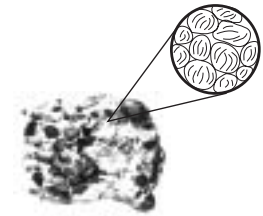
(4)

Base your answers to questions 46 and 47 on the pictures of four rocks shown below. Magnified views of the rocks are shown in the circles.



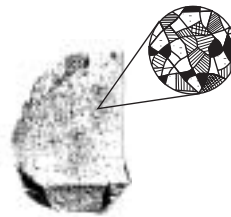
Rock 1

Bands of coarse intergrown crystals of various sizes



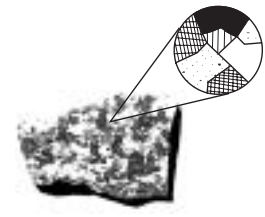
Rock 2

Particles of 0.01-cm to 1.0-cm size cemented together



Rock 3

Intergrown crystals less than 0.1 cm in size



Rock 4

Intergrown crystals, mostly 2.0 cm in size

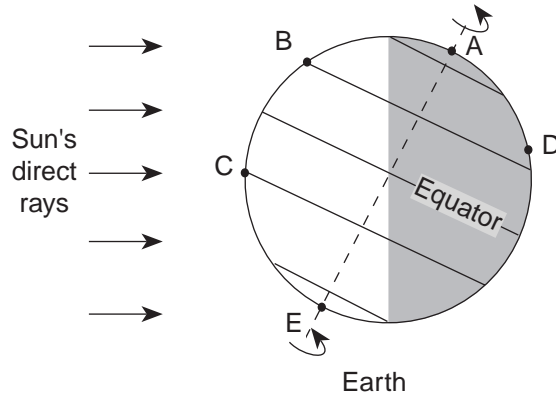
- 46 Which rock is metamorphic and shows evidence of foliation?

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

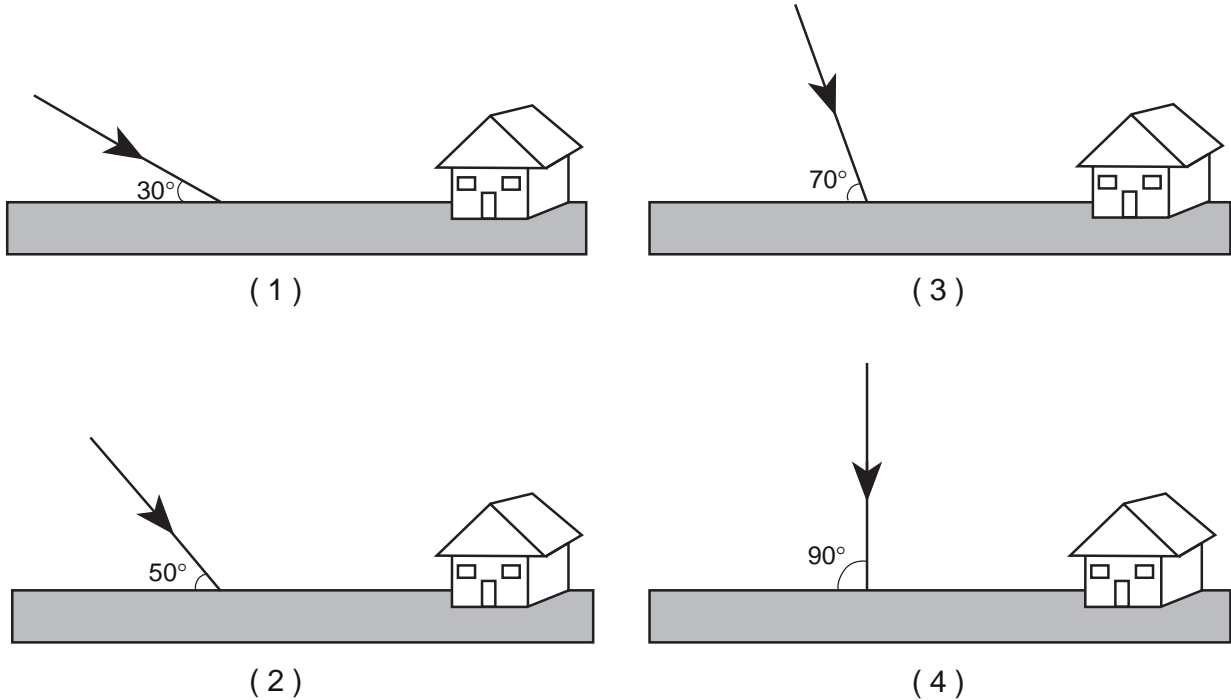
- 47 What do all four rock samples have in common?

- (1) They show cleavage.
 (2) They contain minerals.
 (3) They are organically formed.
 (4) They formed on Earth's surface.

Base your answers to questions 48 through 50 on the diagram below, which shows the tilt of Earth on its axis in relation to the Sun on one particular day. Points A through E are locations on Earth's surface. Point D is located in New York State. The dashed line represents Earth's axis.



48 Which diagram best represents the angle of the Sun's rays received at location C at noon on this day?



49 What is the latitude of location A?

- | | |
|-----------------------------|-----------------------------|
| (1) 0° | (3) $63\frac{1}{2}^\circ$ S |
| (2) $23\frac{1}{2}^\circ$ N | (4) 90° N |

50 On this day, which location has the greatest number of hours of daylight?

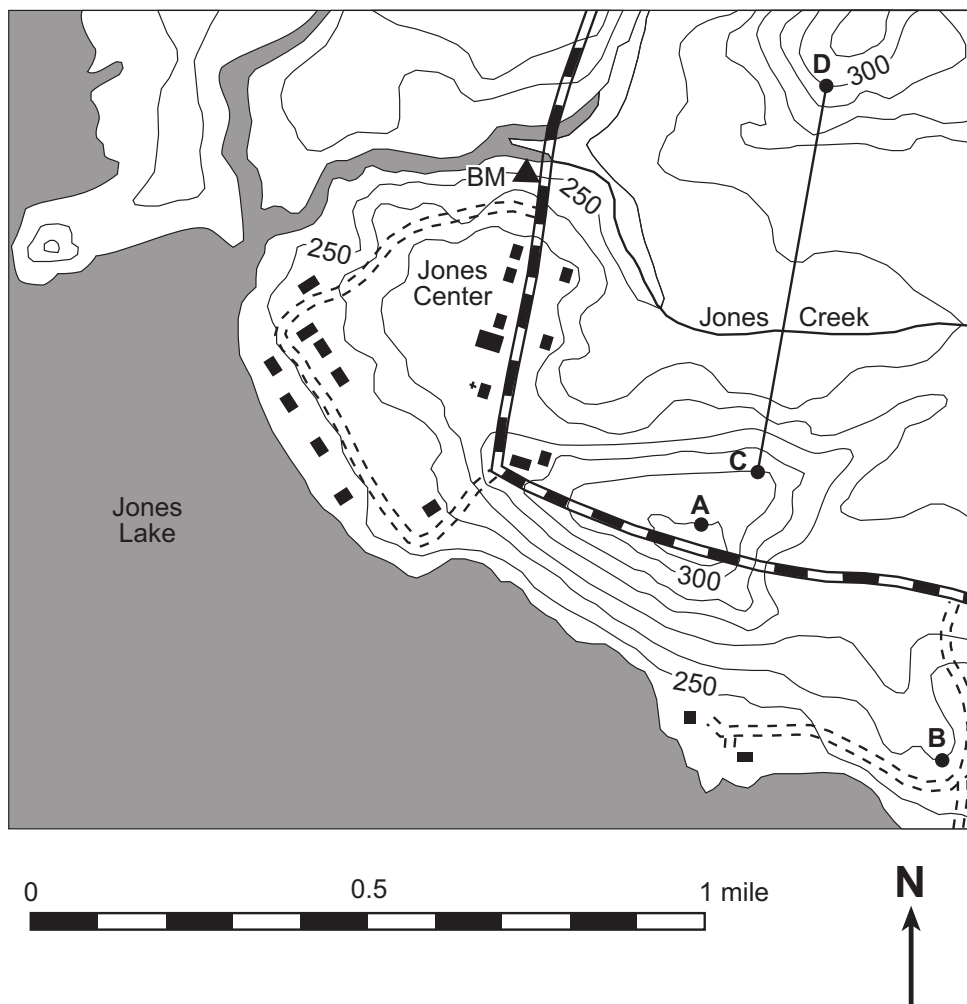
- | | |
|-------|-------|
| (1) E | (3) C |
| (2) B | (4) D |

Part B-2

Answer all questions in this part.

Directions (51-58): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables*.

Base your answers to questions 51 through 53 on the topographic map below. Points A through D are locations on the map. Elevations are in feet.







- 51 Explain briefly how the map can be used to determine that Jones Creek is flowing westward into Jones Lake. [1]
- 52 Determine the gradient from point A to point B by following the directions below.
- a Write the equation for determining the gradient.
 - b Substitute data from the map into the equation. [1]
 - c Calculate the gradient and label it with the proper units. [2]
- 53 On the grid provided in *your answer booklet*, construct a profile of the land surface between point C and point D by following the directions below.
- a Plot the elevations along line CD by marking with a dot *each* point where an isoline is crossed by line CD. [1]
 - b Connect the dots to complete the profile. [1]

Base your answers to questions 54 through 56 on the data table below. The table shows the elevation and average annual precipitation at ten weather stations, A through J, located along a highway that passes over a mountain.

Data Table

Weather Station	Elevation (m)	Average Annual Precipitation (cm)
A	1,350	20
B	1,400	24
C	1,500	50
D	1,740	90
E	2,200	170
F	1,500	140
G	800	122
H	420	60
I	300	40
J	0	65

Symbol Chart

Key for Average Annual Precipitation	
0–25 cm	
26–75 cm	
76–127 cm	
128–170 cm	

- 54 On the grid provided in your answer booklet, graph the data shown on the data table by following the directions below.
- a* Mark the grid with a point showing the elevation of *each* weather station. [1]
- b* Surround *each* point with the proper symbol from the symbol chart to show the amount of average annual precipitation for the weather station. [1]
- 55 State the relationship between the elevation of weather stations A through E and the average annual precipitation at these weather stations. [1]
- 56 Although stations C and F are at the same elevation, they have very different amounts of average annual precipitation. Explain how the prevailing wind direction might cause this difference. [1]
-

57 Tectonic plate boundaries may be classified as divergent, convergent, or transform. For *each* location listed in the data table *in your answer booklet*, place an **X** in the proper column to indicate the type of plate boundary at that location. [2]

58 The following weather data was collected at Boonville, New York.

Air temperature	65°F
Dewpoint	64°F
Visibility	2 miles
Present weather	drizzle
Wind direction	from the west
Wind speed	5 knots
Amount of cloud cover	100%
Barometric pressure	996.2 millibars

On the station model provided *in your answer booklet*, using the proper format, record:

- the amount of cloud cover [1]
 - the barometric pressure [1]
 - the symbol for the present weather [1]
-

Part C

Answer all questions in this part.

Directions (59–72): 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 59 through 61 on the paragraph below, which provides background information regarding recent fossil discoveries in Canada.

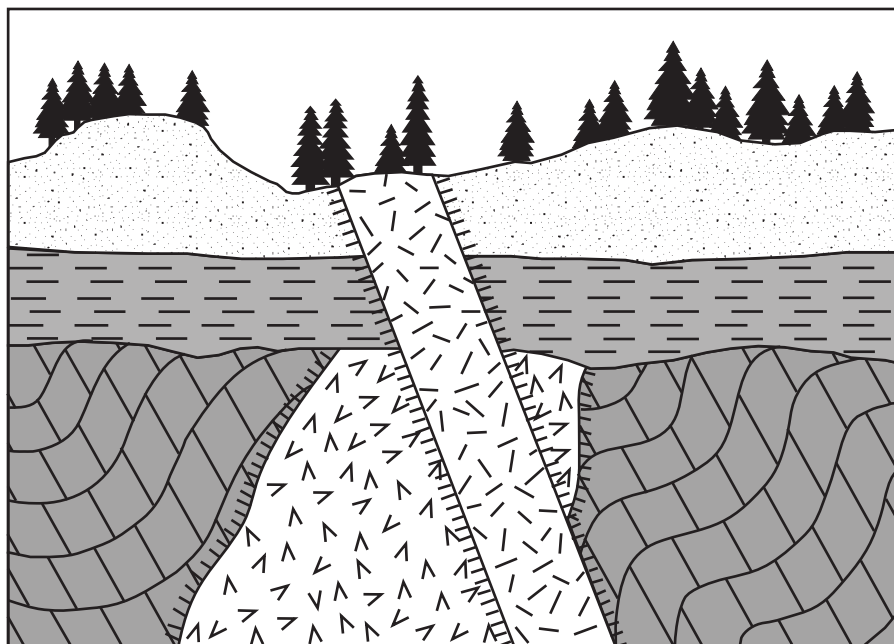
Scientific evidence indicates that the earliest mammals may have evolved approximately 225 million years ago from an ancient reptile group called the therapsids. For millions of years afterward, early mammals and therapsids coexisted until the therapsids apparently became extinct 165 million years ago. However, geologists have recently found a fossil they believe to be a therapsid that is only 60 million years old. They found the fossil, which they have named *Chronoperates paradoxus* (paradoxical time-wanderer), near Calgary in Canada. This find suggests that for 105 million years after the apparent extinction of the therapsids, a few of the reptiles continued to live in a narrow geographic range in Canada.

59 According to fossil evidence, during which geologic period did the earliest mammals appear on Earth? [1]







60 Explain briefly why *Chronoperates paradoxus* would *not* be a good index fossil. [1]

61 State one method geologists could have used to determine that *Chronoperates paradoxus* lived 60 million years ago. [1]

Base your answers to questions 62 and 63 on the information and diagram below. The diagram represents a cliff of exposed bedrock that was investigated by an Earth science class.



Key to Rock Symbols

 Sandstone	 Folded limestone	 Granite
 Basalt	 Shale	 Contact metamorphism

After the students examined the cliff, they made three correct inferences about the geologic history of the bedrock.

Inference 1: The shale layer is older than the basaltic intrusion.

Inference 2: The shale layer is older than the sandstone layer.

Inference 3: An unconformity exists directly under the shale layer.

62 Explain how *each* inference is supported by evidence shown in the diagram. [3]

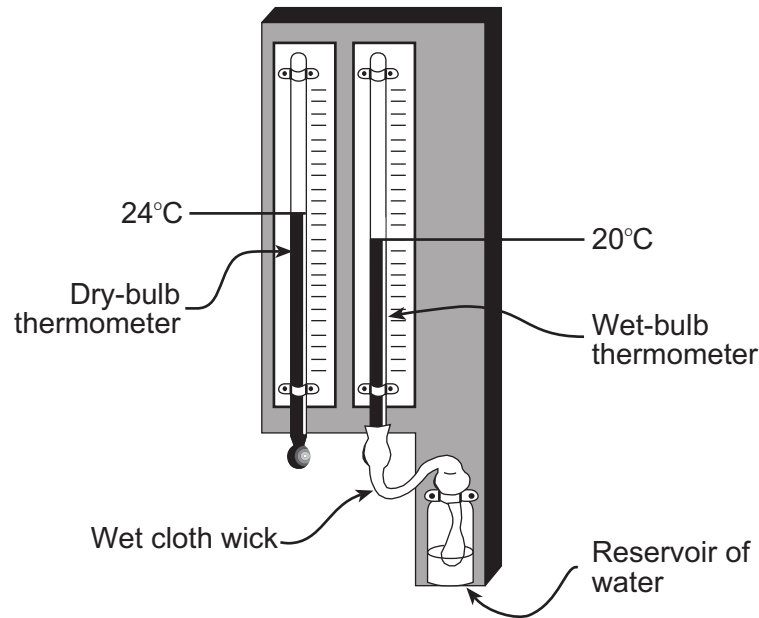
63 Students compared samples of the granite and basalt. State one observable characteristic other than crystal size that makes granite different from basalt. [1]

64 A seismic station in Massena, New York, recorded the arrival of the first *P*-wave at 1:30:00 (1 hour, 30 minutes, 00 seconds) and the first *S*-wave from the same earthquake at 1:34:30.

a Determine the distance, in kilometers, from Massena to the epicenter of this earthquake. [1]

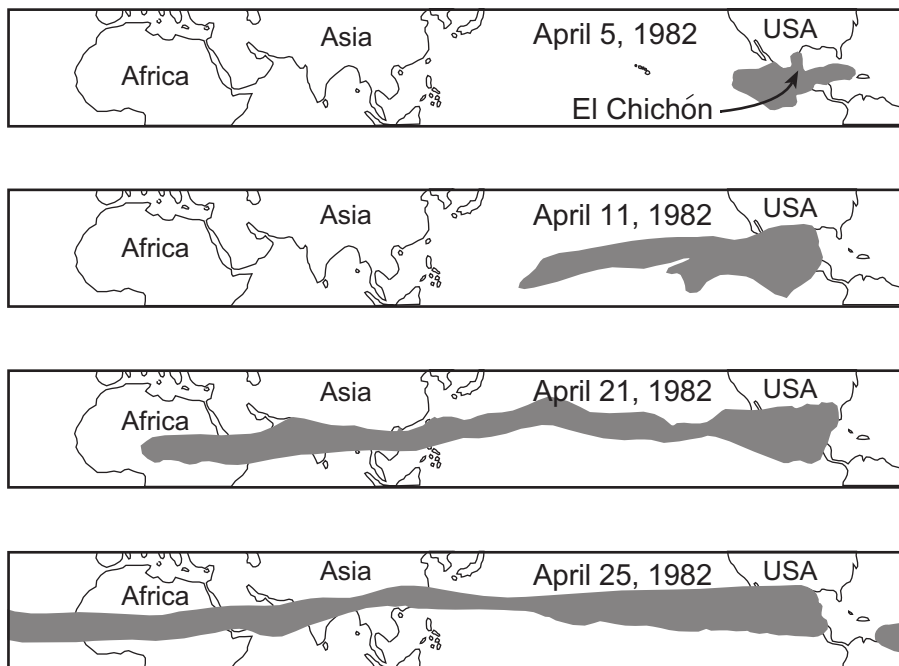
b State what additional information is needed to determine the location of the epicenter of this earthquake. [1]

Base your answers to questions 65 through 67 on the diagram below, which shows a hygrometer located on a wall in a classroom. The hygrometer's temperature readings are used by the students to determine the relative humidity of the air in the classroom.



- 65 Based on the temperature readings shown in this diagram, determine the relative humidity of the air in the classroom. [1]
- 66 Besides relative humidity, identify another weather variable of the air in the classroom that may be determined by using both temperature readings on the hygrometer. [1]
- 67 Describe how water evaporating from the wick attached to the wet-bulb thermometer lowers the temperature reading of that thermometer. [1]
-
- 68 An Earth science class is preparing a booklet on emergency preparedness. State one safety measure that should be taken to minimize danger from *each* of the following threats. [3]
- a Thunderstorm
 - b Tornado
 - c Volcanic eruption

Base your answers to questions 69 through 72 on the maps below, which show the spread of a volcanic ash cloud from the 1982 eruption of El Chichón in Mexico, as seen from weather satellites.



69 Identify the direction toward which the ash cloud spread from April 5 to April 25. [1]

70 State what caused the main ash cloud to spread in the pattern shown on the map of April 25, 1982. [1]

71 State the most likely effect of the ash cloud on the temperature of areas under the cloud on April 25, 1982. [1]

72 As the ash cloud moved away from El Chichón, some ash particles fell back to Earth.

a Describe how the size of the particles affected the pattern of deposition. [1]

b Describe how the density of the particles affected the pattern of deposition. [1]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Thursday, January 24, 2002 — 1:15 to 4:15 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

**PHYSICAL SETTING
EARTH SCIENCE**

Thursday, January 24, 2002 — 1:15 to 4:15 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

a

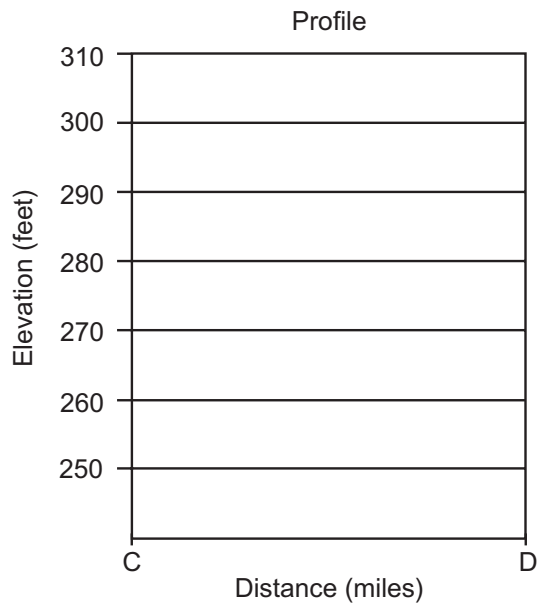
b

52 *b*

c

c

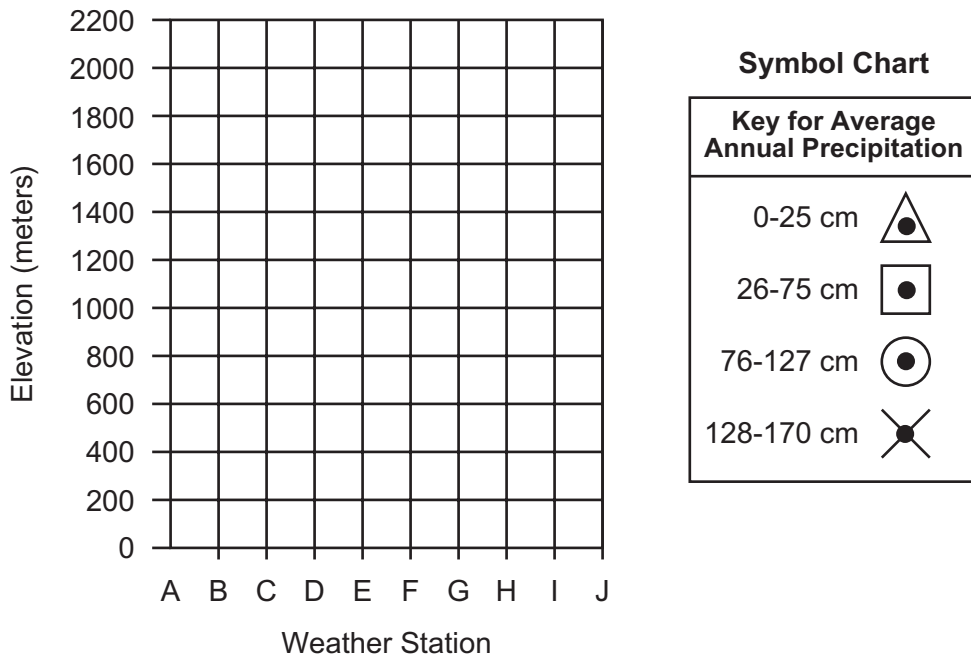
53 a-b



53 a

b

54 a-b



54 a

b

55

55

56

56

For Raters
Only

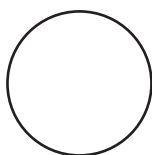
57

Plate Boundaries Data Table

Location	Type of Plate Boundary		
	Divergent	Convergent	Transform
East Pacific Ridge			
Aleutian Trench			
West side of the South American Plate			
San Andreas Fault			

57

58 Station Model



58

Total Score for Part B-2

Part C

59 _____ Period

59

60 _____

60

61 _____

61

62 Inference 1: _____

62(1)

Inference 2: _____

(2)

Inference 3: _____

(3)

63 _____

63

**For Raters
Only**

64 *a* _____ km

64a

b _____

b

65 _____ %

65

66 _____

66

67 _____

67

68 *a* _____

68a

b _____

b

c _____

c

69 _____

69

70 _____

70

71 _____

71

72 *a* _____

72a

b _____

b

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

Thursday, January 24, 2002 — 1:15 to 4:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

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

Part A and Part B-1
Allow 1 credit for each correct response.

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

Directions to the Teacher

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

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.

Students' responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide. 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 printed at the end of this Scoring Key and Rating Guide. 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 for a correct response. Acceptable responses include, but are not limited to, these examples:

Contour lines bend upstream where they cross a stream. They bend east along Jones Creek.

Water flows from higher to lower elevations, and Jones Creek is higher in elevation on the east side of the map.

- 52 [3] **a** Allow no credit for writing the equation.

b Allow 1 credit for correctly substituting both acceptable measurements into the equation given in part *a*. The student need *not* record the units. Acceptable responses include, but are not limited to, these examples:

$$\text{gradient} = \frac{310 \text{ ft} - 260 \text{ ft}}{0.5 \text{ mi}}$$

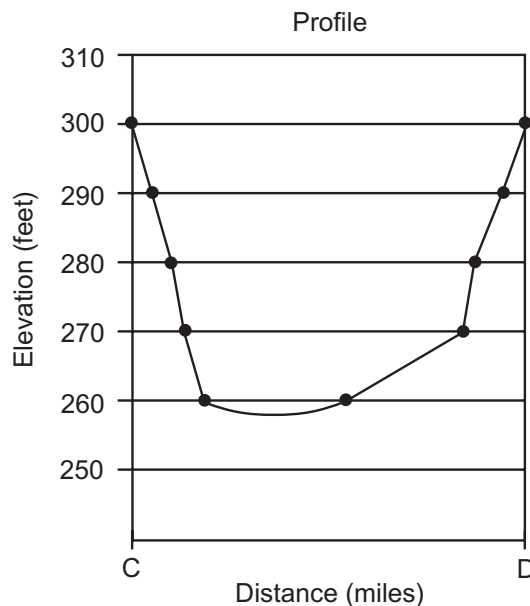
$$g = \frac{50 \text{ ft}}{0.5 \text{ mi}}$$

- c** Allow 1 credit for correctly calculating the gradient value of **100** [± 5].

and

Allow 1 credit for recording the proper units of **ft/mi**.

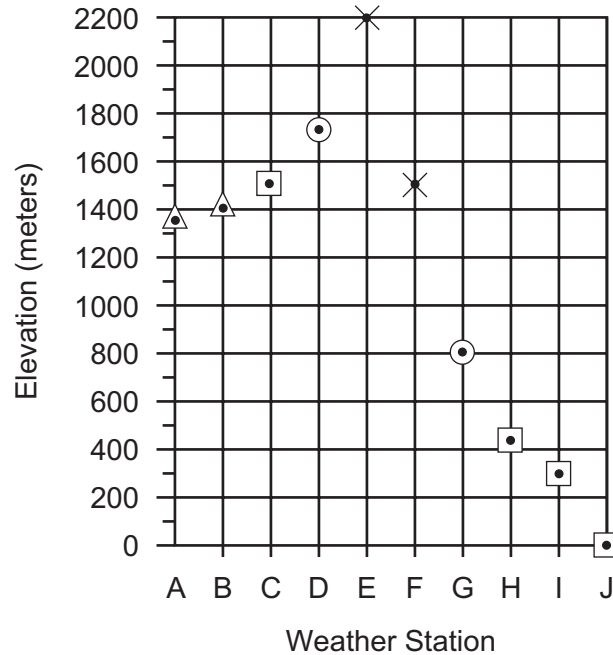
- 53 [2]



a Allow 1 credit if seven to ten points are correctly plotted.

b Allow 1 credit for correctly connecting all the plotted points. The bottom of the valley must extend below 260 feet.

54 [2]



a Allow 1 credit if seven to ten elevations are correctly plotted (± 50 m).

b Allow 1 credit for surrounding each point with the correct symbol.

55 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

As elevation increases from A to E, precipitation increases.

direct relationship

56 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

C is on the leeward side.

Prevailing winds cause air to rise at location F, creating more clouds and causing heavier rainfall.

57 [2]

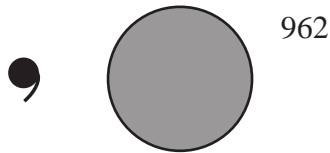
Plate Boundaries Data Table

Location	Type of Plate Boundary		
	Divergent	Convergent	Transform
East Pacific Ridge	X		
Aleutian Trench		X	
West side of the South American Plate		X	
San Andreas Fault			X

Allow 2 credits if three or four boundaries are identified correctly.

Allow only 1 credit if only one or two boundaries are identified correctly.

58 [3]



Allow 1 credit for full shading of the circle.

and

Allow 1 credit for **962** written in the proper location. Allow no credit if a decimal point or mb label is used.

and

Allow 1 credit for the drizzle symbol (●) drawn in the proper location.

Part C

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

- 59** [1] Allow 1 credit for **Triassic** Period.
- 60** [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, this example:
They have only been found in a narrow geographic range.
- 61** [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:
Use the law of superposition to compare the age with the age of other nearby fossils and/or rock layers.
radioactive age dating (not C-14)
- 62** [3] Allow 3 credits, 1 credit for each correct response. Acceptable responses include, but are not limited to, these examples:
Inference 1: An igneous intrusion is younger than the bedrock it intrudes.
The basalt metamorphosed the shale.
Inference 2: The shale layer is below the sandstone layer.
Younger sedimentary bedrock is normally found on top of older sedimentary bedrock.
Inference 3: The limestone layers are folded and tilted but the shale layer is not folded and is horizontal.
The shale layer is not metamorphosed by the granite.
There is an irregular (erosional) surface between the shale and the limestone.
- 63** [1] Allow 1 credit for **differences in mineral composition, density, or color.**
- 64** [2] **a** Allow 1 credit for **3,000 km** (± 200 km).
b Allow 1 credit for **data from two additional seismic stations.**
- 65** [1] Allow 1 credit for **69%**.
- 66** [1] Allow 1 credit for **dewpoint.**

- 67** [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:
- Evaporation is a cooling process.
 - Water evaporating from a wet wick takes energy from the wet-bulb thermometer.
- 68** [3] Allow 3 credits, 1 credit for each correct response. Acceptable responses include, but are not limited to, these examples:
- a** Seek indoor shelter.
 - Avoid high ground.
 - Stay in your car.
 - b** Go to the cellar or the safest interior room.
 - Stay away from windows.
 - Open house windows.
 - c** Evacuate the area.
 - Move away from sites directly downhill from the volcano.
- 69** [1] Allow 1 credit for a response that describes a westward movement. Acceptable responses include, but are not limited to, these examples:
- toward Asia (Africa)
 - westward across the Pacific Ocean
- 70** [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:
- prevailing or planetary winds
 - the spin of Earth and the Coriolis effect on wind direction
- 71** [1] Allow 1 credit for **temperatures decreased**.
- 72** [2] **a** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, this example:
- Larger particles fell closer to the volcano.
- b** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, this example:
- More dense particles fell closer to the volcano.

Regents Examination in Physical Setting/Earth Science —January 2002

Chart for Determining the Final Examination Score

(Use for January 2002 examination only.)

To determine the student's final examination score, locate the student's total performance test score across the top of the chart and the student's total written test score down the side of the chart. The point where those two scores intersect is the student's final examination score. For example, a student receiving a total performance test score of 14 and a total written test score of 68 would receive a final examination score of 82.

Total Performance Test Score

		23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Total Written Test Score	85	100	99	98	97	97	97	97	96	96	95	95	94	94	93	92	92	91	90	90	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	98	97	96	96	95	95	95	94	94	93	93	92	92	91	90	89	89	88	88	87	86	85	84	83
	82	98	97	95	95	95	95	94	94	93	93	92	92	91	91	90	89	89	88	87	86	86	85	84	83
	81	97	96	95	94	94	94	93	93	93	92	92	91	91	90	89	89	88	87	86	86	85	84	83	82
	80	96	95	94	94	93	93	93	92	92	91	91	90	90	89	89	88	87	86	86	85	84	83	82	81
	79	95	94	93	93	93	92	92	91	91	91	90	90	89	88	88	87	86	86	85	84	83	82	81	80
	78	95	94	92	92	92	91	91	91	90	90	89	89	88	88	87	86	86	85	84	83	82	82	81	80
	77	94	93	92	91	91	91	90	90	89	89	89	88	87	87	86	86	85	84	83	82	82	81	80	79
	76	93	92	91	90	90	90	89	89	88	88	87	87	86	85	85	84	83	82	82	81	80	79	78	77
	75	92	91	90	90	89	89	89	88	88	87	87	86	86	85	85	84	83	82	82	81	80	79	78	77
	74	91	90	89	89	89	88	88	87	87	86	86	85	84	84	83	82	82	81	80	79	78	77	76	75
	73	91	90	88	88	88	87	87	87	86	86	85	85	84	84	83	82	81	81	80	79	78	78	76	75
	72	90	89	87	87	87	87	86	86	85	85	84	84	83	83	82	81	81	80	79	78	78	77	76	75
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	70	88	87	86	86	85	85	85	84	84	83	83	82	82	81	81	80	79	78	78	77	76	75	74	73
	69	87	86	85	85	84	84	84	83	83	82	82	81	81	80	80	79	78	78	77	76	75	74	73	72
	68	86	85	84	84	84	83	83	83	82	82	81	81	80	80	79	78	77	77	76	75	74	73	72	71
	67	86	85	83	83	83	82	82	82	81	81	80	80	79	79	78	77	77	76	75	74	73	73	71	71
	66	85	84	82	82	82	82	81	81	80	80	79	79	78	78	77	76	76	75	74	73	73	72	71	70
	65	84	83	82	81	81	81	80	80	79	79	79	78	78	77	76	76	75	74	73	72	72	71	70	69
	64	83	82	81	80	80	80	80	79	79	78	78	77	77	76	75	74	74	73	72	72	71	71	70	69
	63	82	81	80	80	79	79	79	78	78	77	77	76	76	75	74	74	73	72	72	71	70	69	68	67
62	81	80	79	79	78	78	78	77	77	76	76	75	75	74	74	73	72	71	71	70	69	68	67	66	
61	80	79	78	78	77	77	77	76	76	75	75	74	74	73	73	72	71	71	70	69	68	67	66	65	
60	79	78	77	77	77	76	76	76	75	75	74	74	73	73	72	71	70	70	69	68	67	66	65	64	
59	79	78	76	76	76	75	75	75	74	74	73	73	72	72	71	70	70	69	68	67	66	66	64	64	
58	78	77	75	75	75	75	74	74	73	73	72	72	71	71	70	69	69	68	67	66	66	65	64	63	
57	77	76	75	74	74	74	73	73	72	72	72	71	70	70	69	69	68	67	66	65	65	64	63	62	
56	76	75	74	73	73	73	72	72	71	71	71	70	70	69	68	68	67	66	65	64	64	63	62	61	
55	75	74	73	72	72	72	71	71	71	70	70	69	69	68	67	67	66	65	64	64	63	62	61	60	
54	74	73	72	71	71	71	71	70	70	69	69	68	68	67	66	66	65	64	63	63	62	61	60	59	
53	73	72	71	71	70	70	70	69	69	68	68	67	67	66	65	65	64	63	63	62	61	60	59	58	
52	72	71	70	70	69	69	69	68	68	67	67	66	66	65	64	64	63	62	62	61	60	59	58	57	
51	71	70	69	69	68	68	68	67	67	66	66	65	65	64	64	63	62	61	61	60	59	58	57	56	
50	70	69	68	68	67	67	67	66	66	65	65	64	64	63	63	62	61	61	60	59	58	57	56	55	
49	69	68	67	67	66	66	66	65	65	64	64	63	63	62	62	61	60	60	59	58	57	56	55	54	
48	68	67	66	66	65	65	65	64	64	64	63	62	62	61	61	60	59	59	58	57	56	55	54	53	
47	67	66	65	65	65	64	64	63	63	63	62	62	61	60	60	59	58	58	57	56	55	54	53	52	
46	66	65	64	64	64	63	63	62	62	62	61	61	60	59	59	58	57	57	56	55	54	53	52	51	
45	65	64	63	63	63	62	62	62	61	61	60	60	59	59	58	57	56	56	55	54	53	52	51	50	
44	64	63	62	62	62	61	61	61	60	60	59	59	58	58	57	56	55	55	54	53	52	51	50	49	
43	63	62	61	61	61	60	60	60	59	59	58	58	57	57	56	55	54	54	53	52	51	50	49	48	
42	62	61	60	60	60	59	59	59	58	58	57	57	56	56	55	54	53	53	52	51	50	49	48	47	

Regents Examination in Physical Setting/Earth Science —January 2002
Chart for Determining the Final Examination Score
(Use for January 2002 examination only.)

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

Map to Core Curriculum

January 2002 Physical Setting/ Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	23	52b,52c	
Math Key Idea 2		44,45,52b,52c,55	64a,65
Math Key Idea 3	7		64b
Sci. Inq Key Idea 1		40	60
Sci. Inq Key Idea 2			
Sci. Inq Key Idea 3		41,46,47,50,57	59,60,61,62,63,70, 72a,72b
Eng. Des. Key Idea 1	22		
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1		43, 57	66,67,72a,72b
Key Idea 2		36,37,38,39,48,49, 50,51,53a,53b, 54a,54b,56,58	64a,69
Key Idea 3		51	64a,72a,72b
Key Idea 4			67
Key Idea 5	19	42,48,50	62
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2	10		68,71
Standard 4			
Performance Indicator 1	1,2,3,5,7,8,15,18, 25,35	37,39,40,41,42,49	59,60,61,62
Performance Indicator 2	6,9,10,11,12,13, 14,16,17,19,20,22, 23,26,27,28,29,30, 31,32,33,34	36,38,43,44,45, 48,50,51,52b, 52c,53a,53b,54a, 54b,55,56,57,58	64a,64b,65,66,67,68, 69,70,71,72a, 72b
Performance Indicator 3	4,21,24	46,47	63
Reference Tables			
ESRT 2001 edition	2,4,5,8,10,12,15, 23,24,25,26,27, 31,35	36,37,41,44,46, 52b,52c,57,58	59,63,64a,65,66,70