The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 25, 2006 — 9:15 a.m. to 12:15 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.

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 Which event takes the most time?

(1) one revolution of Earth around the Sun
(2) one revolution of Venus around the Sun
(3) one rotation of the Moon on its axis
(4) one rotation of Venus on its axis

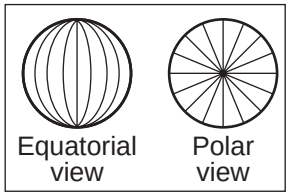
2 Compared to the Jovian planets in our solar system, Earth is

(1) less dense and closer to the Sun
(2) less dense and farther from the Sun
(3) more dense and closer to the Sun
(4) more dense and farther from the Sun

3 A Foucault pendulum appears to change its direction of swing due to the

(1) tilt of Earth's axis
(2) spin of Earth on its axis
(3) deflection of Earth's planetary winds
(4) movement of Earth in its orbit around the Sun

4 The lines on which set of views best represent Earth's latitude system?



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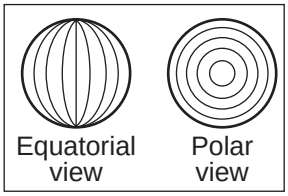

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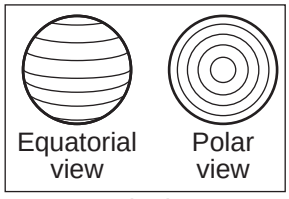

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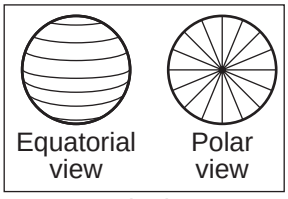

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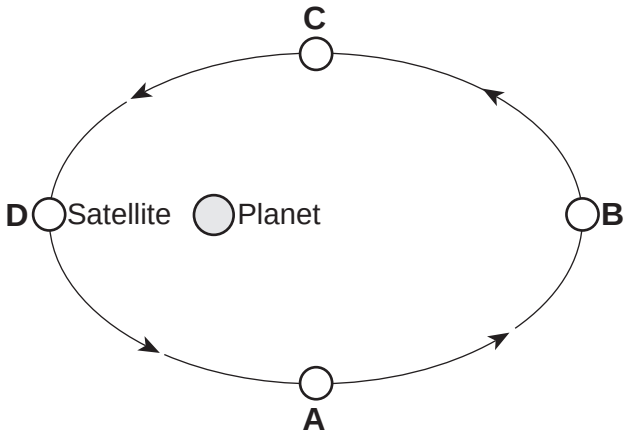
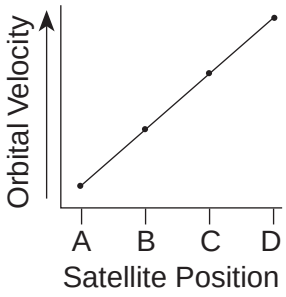
5 The diagram below shows a satellite in four different positions as it revolves around a planet.

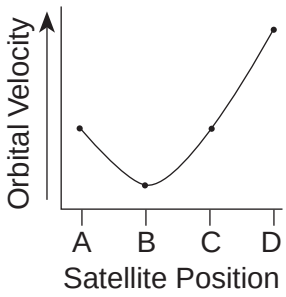


(Not drawn to scale)

Which graph best represents the changes in this satellite's orbital velocity as it revolves around the planet?



(1)



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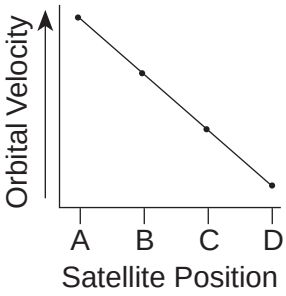

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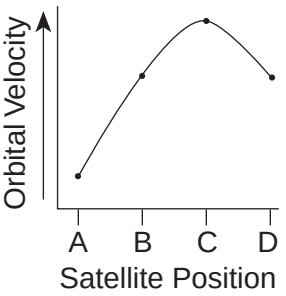


(4)

6 At which New York State location will an observer most likely measure the altitude of *Polaris* as approximately 42°?

(1) Jamestown
(2) Plattsburgh
(3) Oswego
(4) New York City

7 Which statement provides evidence that Earth revolves around the Sun?

(1) Winds at different latitudes are curved different amounts by the Coriolis effect.
(2) Different star constellations are visible from Earth at different seasons of the year.
(3) The Sun follows an apparent arc across the sky during the day.
(4) The stars appear to circle Earth during the night.

8 Compared to the surface temperature and luminosity of massive stars in the Main Sequence, the smaller stars in the Main Sequence are

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

9 Which factor most likely causes two cities at the same elevation and latitude to have different yearly average temperature ranges?

(1) rotation of Earth
(2) duration of insolation
(3) distance from a large body of water
(4) direction of prevailing winds

10 Which set of surface soil conditions on a hillside would result in the most infiltration of rainfall?

(1) gentle slope, saturated soil, no vegetation
(2) gentle slope, unsaturated soil, vegetation
(3) steep slope, saturated soil, vegetation
(4) steep slope, unsaturated soil, no vegetation

11 Scientists have inferred that Earth's original atmosphere was formed by the

(1) outgassing from Earth's interior
(2) erosion of Earth's surface
(3) decay of microorganisms in Earth's oceans
(4) radioactive decay of elements in Earth's core

12 Most New York State sandstone bedrock was formed

(1) in Earth's interior where temperatures exceeded the melting point of quartz
(2) on Earth's surface from the cooling of molten lava
(3) in a delta from sand grains deposited, buried, and cemented together by minerals
(4) in a desert when heat and metamorphic pressure caused quartz crystals to fuse together

13 Which statement best explains why no Permian-age bedrock is found in New York State?

(1) The extinction of many life-forms occurred at the end of the Permian Period.
(2) Only rocks of igneous origin formed in New York State during the Permian Period.
(3) Permian-age rocks have been metamorphosed and cannot be identified.
(4) Permian-age rocks were either eroded away or never formed in New York State.

14 A fossil shell contains 25% of the original amount of its carbon-14. Approximately how many years ago was this shell part of a living organism?

(1) 5,700 years ago
(2) 11,400 years ago
(3) 17,100 years ago
(4) 22,800 years ago

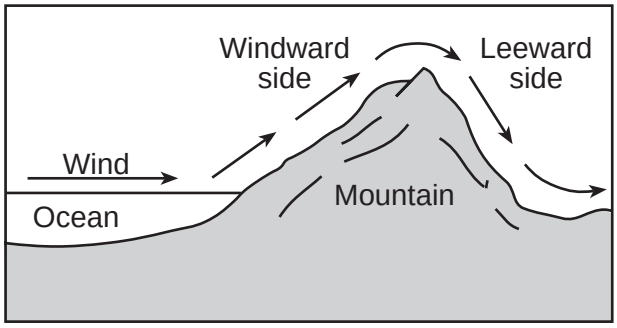
15 Which sequence shows the correct order of Earth's geologic time intervals from oldest to youngest?

(1) Archean → Mesozoic → Cenozoic → Paleozoic → Proterozoic
(2) Archean → Proterozoic → Paleozoic → Mesozoic → Cenozoic
(3) Cenozoic → Mesozoic → Paleozoic → Proterozoic → Archean
(4) Cenozoic → Paleozoic → Archean → Mesozoic → Proterozoic

16 In which direction do the surface winds blow around a high-pressure system in the Northern Hemisphere?

(1) clockwise and inward
(2) clockwise and outward
(3) counterclockwise and inward
(4) counterclockwise and outward

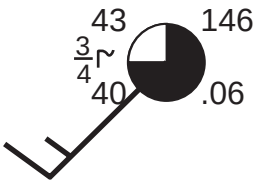
17 The cross section below shows the flow of winds over a mountain ridge.



The heaviest rainfall would most likely occur on which side of this mountain and in which type of air mass?

(1) on the leeward side, in a mP air mass
(2) on the leeward side, in a cT air mass
(3) on the windward side, in a mT air mass
(4) on the windward side, in a cP air mass

18 Various weather conditions at LaGuardia Airport in New York City are shown on the station model below.



What were the barometric pressure and weather conditions at the airport at the time of the observation?

(1) 914.6 mb of pressure and smog
(2) 914.6 mb of pressure and a clear sky
(3) 1014.6 mb of pressure and smog
(4) 1014.6 mb of pressure and a clear sky

19 The properties of an air mass are mostly determined by the

(1) rate of Earth's rotation
(2) direction of Earth's surface winds
(3) source region where the air mass formed
(4) path the air mass follows along a land surface

20 Which list correctly matches each instrument with the weather variable it measures?

(1) wind vane—wind speed
thermometer—temperature
precipitation gauge—relative humidity

(2) wind vane—wind direction
thermometer—dewpoint
psychrometer—air pressure

(3) barometer—relative humidity
anemometer—cloud cover
precipitation gauge—probability of precipitation

(4) barometer—air pressure
anemometer—wind speed
psychrometer—relative humidity

21 What is the difference between the dry-bulb temperature and the wet-bulb temperature when the relative humidity is 28% and the dry-bulb temperature is 0°C?

(1) 11°C
(2) 2°C
(3) 28°C
(4) 4°C

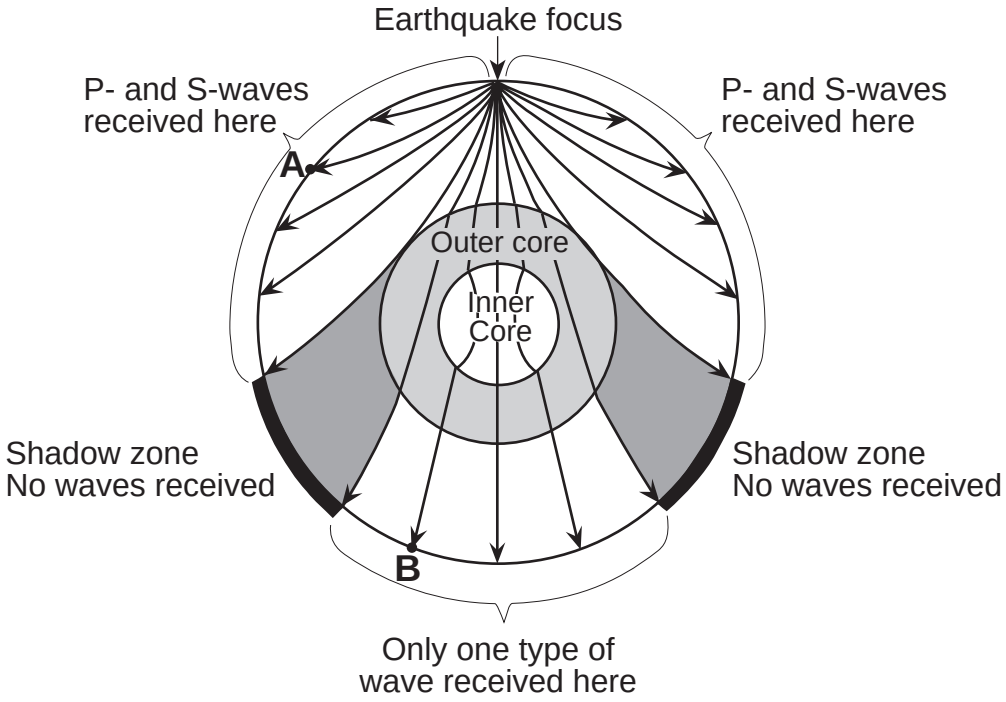
22 Based on the theory of plate tectonics, it is inferred that over the past 250 million years North America has moved toward the

(1) northwest
(2) southwest
(3) southeast
(4) northeast

23 According to tectonic plate maps, New York State is presently located

(1) at a convergent plate boundary
(2) above a mantle hot spot
(3) above a mid-ocean ridge
(4) near the center of a large plate

Base your answers to questions 24 and 25 on the cross-sectional view of Earth below, which shows seismic waves traveling from the focus of an earthquake. Points *A* and *B* are locations on Earth's surface.



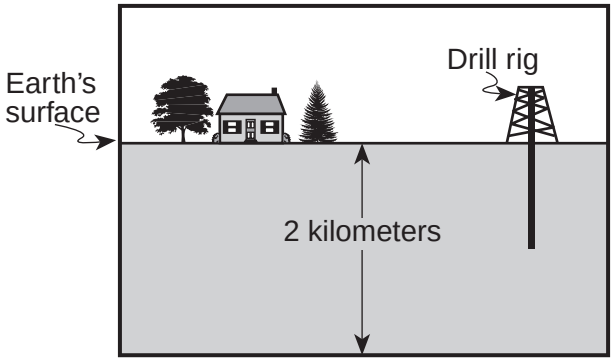
24 Which statement best explains why only one type of seismic wave was recorded at location *B*?

(1) *S*-waves cannot travel through the liquid outer core.
(2) *S*-waves cannot travel through the liquid inner core.
(3) *P*-waves cannot travel through the solid outer core.
(4) *P*-waves cannot travel through the solid inner core.

25 A seismic station located at point *A* is 5400 kilometers away from the epicenter of the earthquake. If the arrival time for the *P*-wave at point *A* was 2:00 p.m., the arrival time for the *S*-wave at point *A* was approximately

(1) 1:53 p.m.
(2) 2:07 p.m.
(3) 2:09 p.m.
(4) 2:16 p.m.

26 The cross section below shows a drill rig used to collect rock samples from below Earth's surface.



(Not drawn to scale)

The rock samples collected from the bottom of the drill hole came from which Earth layer?

(1) lithosphere
(2) hydrosphere
(3) asthenosphere
(4) stiffer mantle

27 Which sequence shows the order in which landscape regions are crossed as an airplane flies in a straight course from Albany, New York, to Massena, New York?

(1) plateau → plain → mountain
(2) plateau → mountain → plain
(3) plain → mountain → plain
(4) mountain → plain → plateau

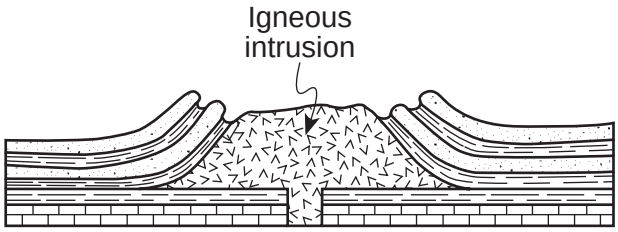
28 Why are Precambrian gneiss cobbles and boulders commonly found on top of the surface bedrock in the Catskills?

(1) The surface bedrock of the Catskills is composed of Precambrian gneiss.
(2) The surface bedrock of the Catskills has been overturned.
(3) Many meteorites composed of gneiss have landed in the Catskills.
(4) Glaciers transported these rocks from the Adirondacks to the Catskills.

29 Which component of Earth's atmosphere is classified as a greenhouse gas?

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

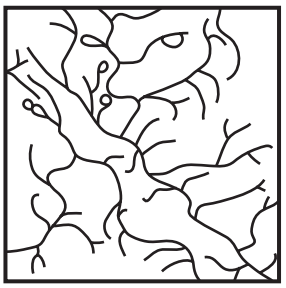
30 The cross section below shows the rock structure of a deeply eroded, domed mountain region.



(Not drawn to scale)

Which map shows the stream drainage pattern that will most likely develop as the bedrock is weathered and eroded from this igneous dome?

(1)



(3)

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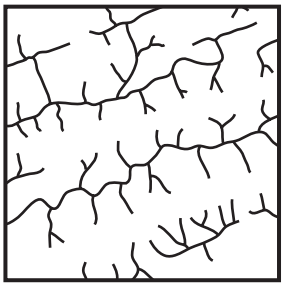
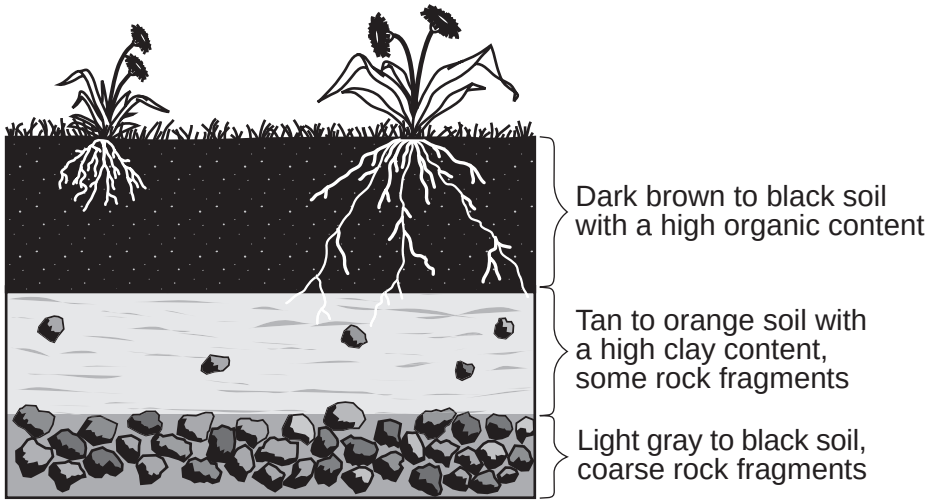


(4)

31 The cross section below shows layers of soil.



Which two processes produced the layer of dark brown to black soil?

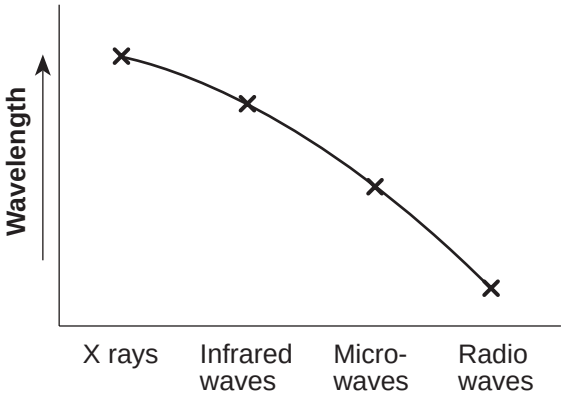
(1) melting and solidification of magma
(2) erosion and uplifting
(3) weathering and biologic activity
(4) compaction and cementation

32 Equal volumes of the four samples shown below were placed outside and heated by energy from the Sun's rays for 30 minutes.

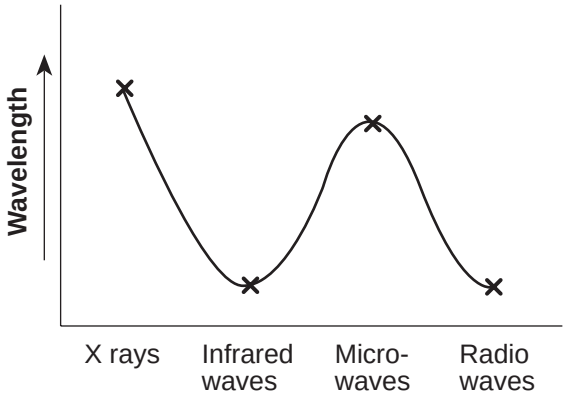
The surface temperature of which sample increased at the *slowest* rate?

(1) water
(2) copper pennies
(3) basaltic sand
(4) iron fragments

33 Which graph best represents the relative wavelengths of the different forms of electromagnetic energy?



(1)



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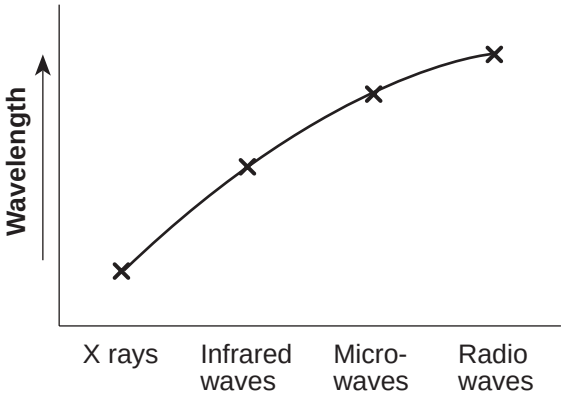

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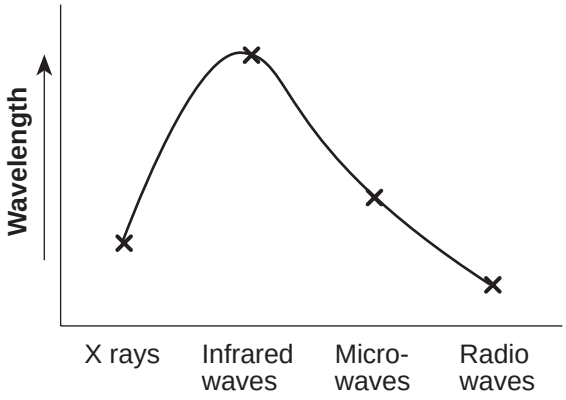


(4)

34 The three statements below are observations of the same rock sample:

- The rock has intergrown crystals from 2 to 3 millimeters in diameter.
- The minerals in the rock are gray feldspar, green olivine, green pyroxene, and black amphibole.
- There are no visible gas pockets in the rock.

This rock sample is most likely

(1) sandstone
(2) gabbro
(3) granite
(4) phyllite

35 Most rock gypsum is formed by the

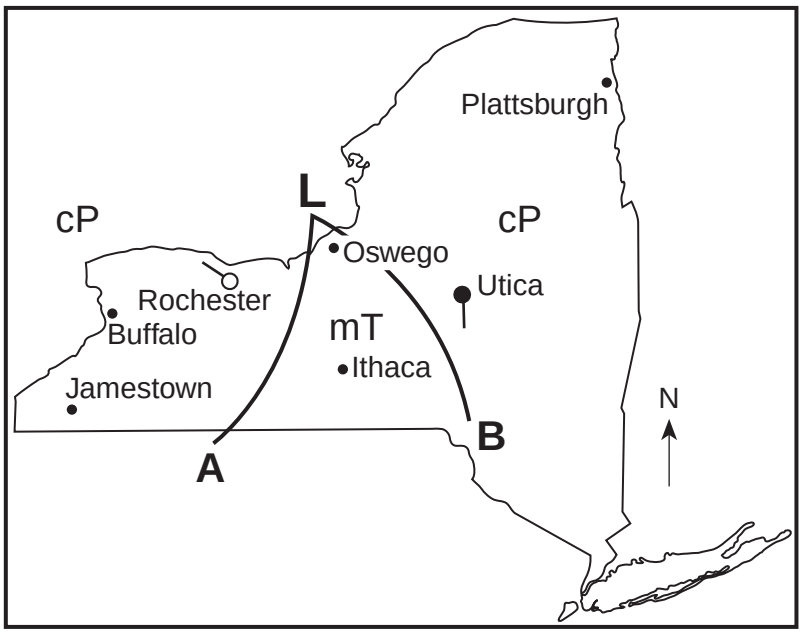
(1) heating of previously existing foliated bedrock
(2) cooling and solidification of lava
(3) compaction and cementation of shells and skeletal remains
(4) chemical precipitation of minerals from seawater

Part B–1

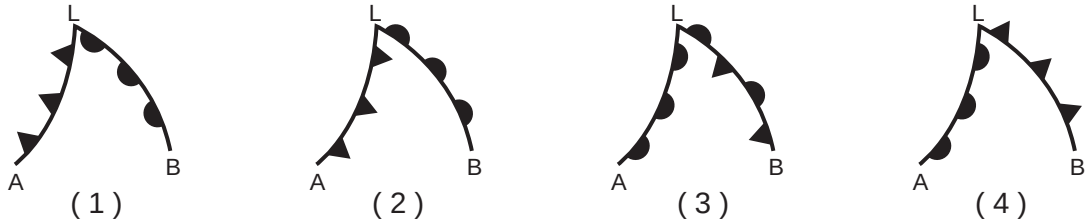
Answer all questions in this part.

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 weather map below and on your knowledge of Earth science. The weather map shows a typical low-pressure system and associated weather fronts labeled *A* and *B*. The L indicates the center of the low-pressure system. A few New York State cities are shown. Symbols cP and mT represent different air masses. The wind direction at Utica and Rochester is shown on the station models.



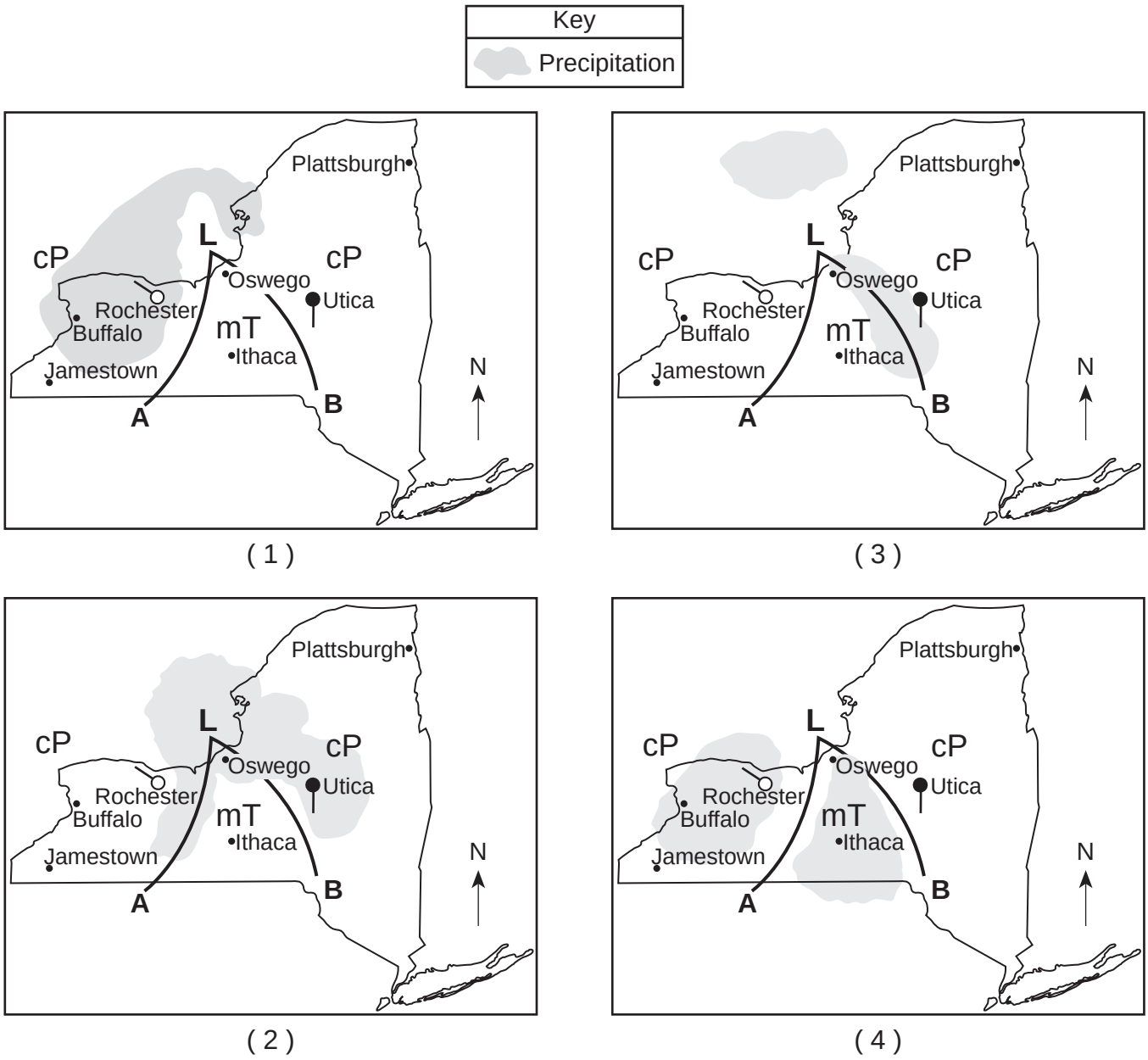
36 Which front symbols are drawn correctly, based on the air masses shown?



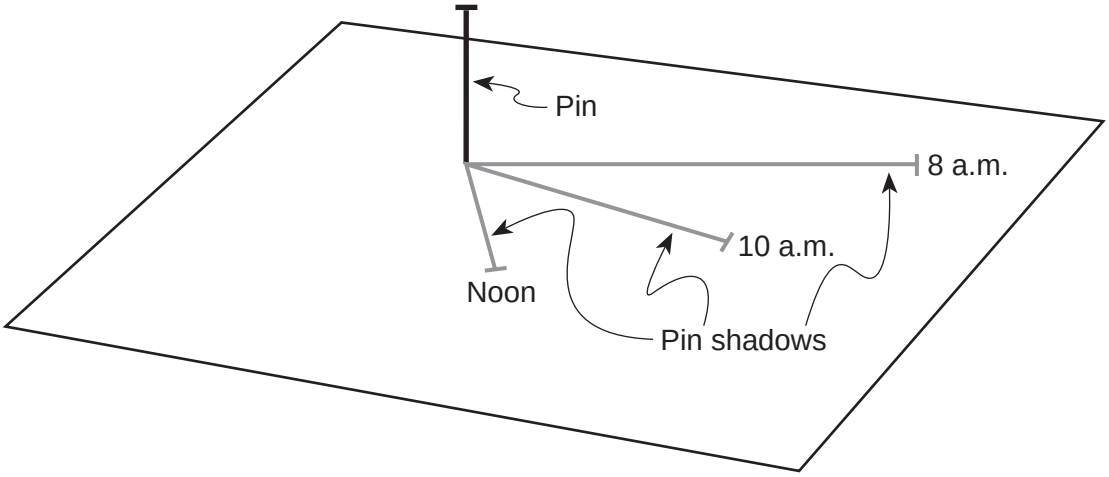
37 If this weather system is following a normal storm track, the center of this low is most likely moving toward which city?

(1) Buffalo
(2) Ithaca
(3) Utica
(4) Plattsburgh

38 Which map shows the regions that are most likely experiencing the precipitation associated with this weather system?

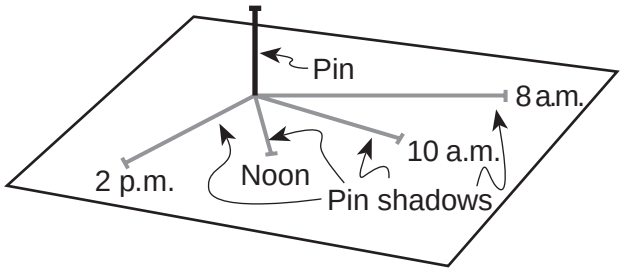


Base your answers to questions 39 through 41 on the diagram below and on your knowledge of Earth science. The diagram shows a pin perpendicular to a card. The card was placed outdoors in the sunlight on a horizontal surface. The positions of the pin's shadow on the card were recorded several times on March 21 by an observer in New York State.

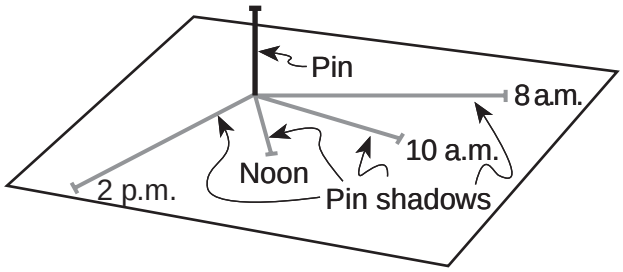


(Drawn to scale)

39 Which diagram best represents the length of the pin's shadow at 2 p.m. on March 21?



(1)



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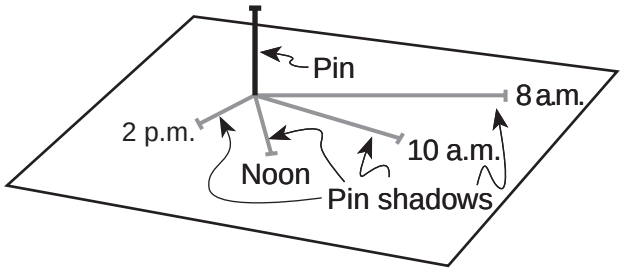

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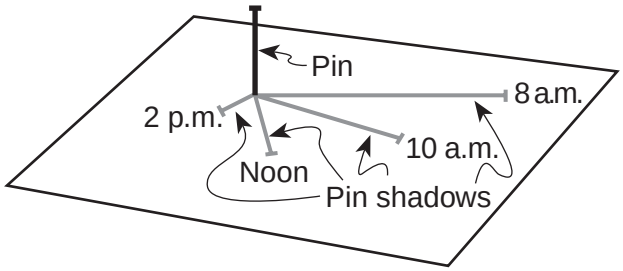
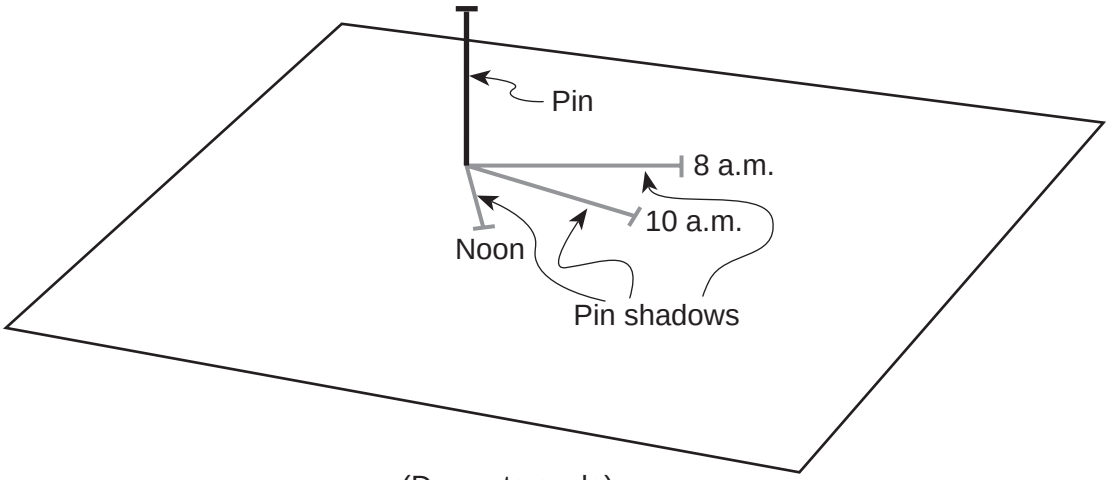


(4)

40 The changing location of the pin's shadow on March 21 is caused by

(1) the Sun's rotation
(2) the Sun's revolution
(3) Earth's rotation
(4) Earth's revolution

41 On June 21, the card and pin were placed in the same position as they were on March 21. The diagram below shows the positions of the pin's shadow.



(Drawn to scale)

Which statement best explains the decreased length of each shadow on June 21?

(1) The Sun's apparent path varies with the seasons.
(2) The Sun's distance from Earth varies with the seasons.
(3) The intensity of insolation is lower on June 21.
(4) The duration of insolation is shorter on June 21.

Base your answers to questions 42 through 46 on the two tables below and on your knowledge of Earth science. Table 1 shows the composition, hardness, and average density of four minerals often used as gemstones. Table 2 lists the minerals in Moh's Scale of Hardness from 1 (softest) to 10 (hardest).

Table 1

Gemstone Mineral	Composition	Hardness	Average Density (g/cm^3)
emerald	$Be_3Al_2(Si_6O_{18})$	7.5–8	2.7
sapphire	Al_2O_3	9	4.0
spinel	$MgAl_2O_4$	8	3.8
zircon	$ZrSiO_4$	7.5	4.7

KEY	
Al = aluminum	O = oxygen
Be = beryllium	Si = silicon
Mg = magnesium	Zr = zirconium

Table 2

Moh's Scale of Hardness
1 talc
2 gypsum
3 calcite
4 fluorite
5 apatite
6 feldspar
7 quartz
8 topaz
9 corundum
10 diamond

42 Part of a gemstone's value is based on the way the gemstone shines in reflected light. The way a mineral reflects light is described as the mineral's

(1) fracture
(2) hardness
(3) luster
(4) streak

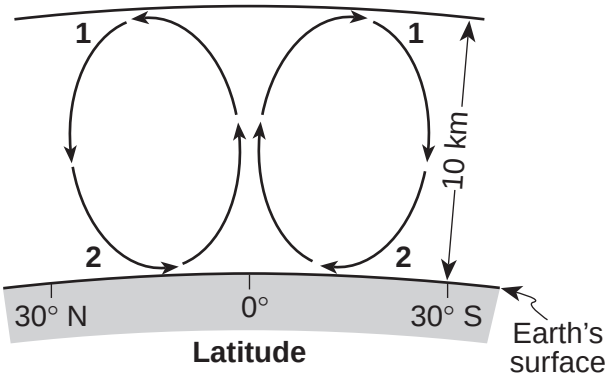
43 Sapphire is a gemstone variety of which mineral on Moh's scale of hardness?
(1) corundum
(2) diamond
(3) fluorite
(4) topaz

44 If the mass of a spinel crystal is 9.5 grams, what is the volume of this spinel crystal?
(1) 0.4 cm^3
(2) 2.5 cm^3
(3) 5.7 cm^3
(4) 36.1 cm^3

45 The hardness and density of each gemstone is based primarily on the gemstone's
(1) internal arrangement of atoms
(2) geologic time of formation
(3) oxygen content
(4) natural abundance

46 Which gemstone minerals contain the two most abundant elements by mass in Earth's crust?
(1) emerald and spinel
(2) emerald and zircon
(3) sapphire and spinel
(4) sapphire and zircon

Base your answers to questions 47 through 50 on the cross section below and on your knowledge of Earth science. The cross section shows the general movement of air within a portion of Earth's atmosphere located between 30° N and 30° S latitude. Numbers 1 and 2 represent different locations in the atmosphere.



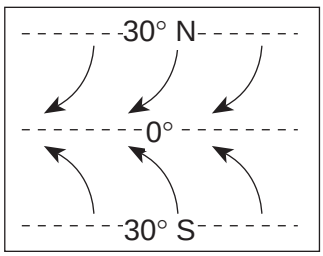
(Not drawn to scale)

47 Which temperature zone layer of Earth's atmosphere is shown in the cross section?
(1) troposphere
(2) stratosphere
(3) mesosphere
(4) thermosphere

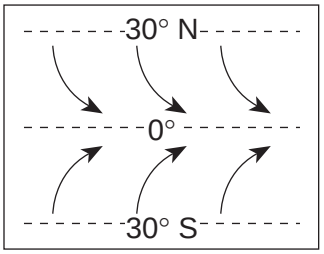
48 The air movement shown in the cross section is due to the process of
(1) condensation
(2) conduction
(3) evaporation
(4) convection

49 What is the approximate percentage by volume of oxygen present in Earth's atmosphere at location 2?
(1) 10%
(2) 21%
(3) 33%
(4) 46%

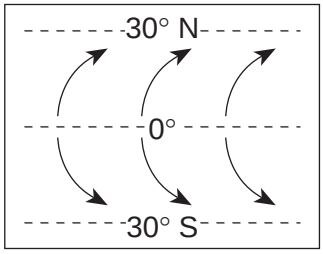
50 Which map best shows the surface movement of winds between 30° N and 30° S latitude?



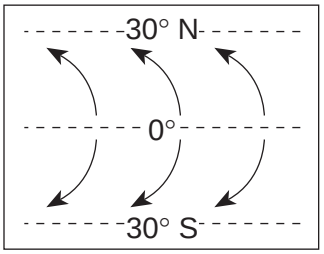
(1)



(3)



(2)



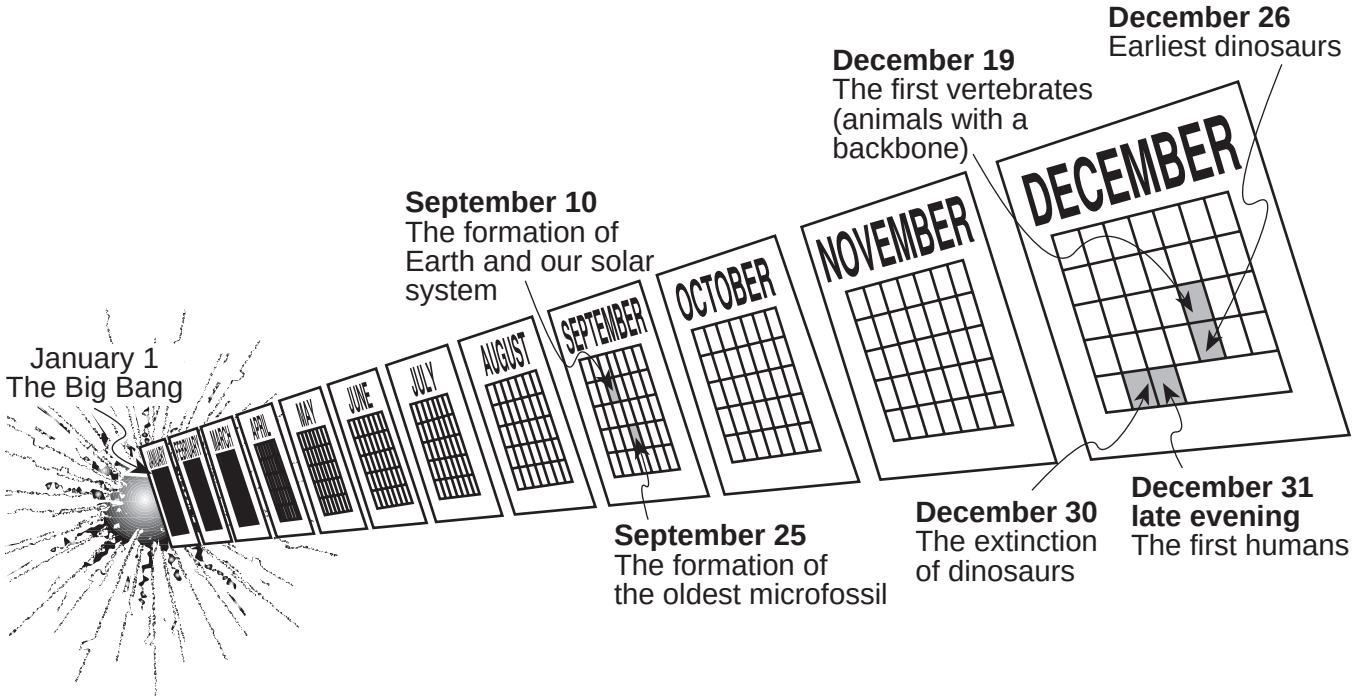
(4)

Part B–2

Answer all questions in this part.

Directions (51–65): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Earth Science Reference Tables.*

Base your answers to questions 51 and 52 on the calendar model shown below of the inferred history of the universe and on your knowledge of Earth science. The 12-month time line begins with the Big Bang on January 1 and continues to the present time, which is represented by midnight on December 31. Several inferred events and the relative times of their occurrence have been placed in the appropriate locations on the time line.



51 State *one* piece of evidence used by scientists to support the theory that the Big Bang event occurred. [1]

52 How many million years of Earth's geologic history elapsed between the event that occurred on September 10 and the event that occurred on September 25 in this model? [1]

Base your answers to questions 53 through 56 on the world map in your answer booklet and on your knowledge of Earth science. The map shows major earthquakes and volcanic activity occurring from 1996 through 2000. Letter *A* represents a volcano on a crustal plate boundary.

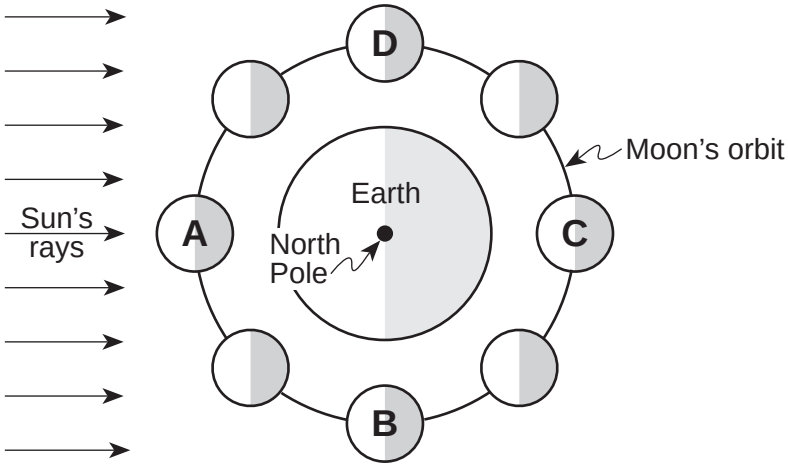
53 *In your answer booklet*, place an **X** on the map to show the location of the Nazca Plate. [1]

54 Explain why most major earthquakes are found in specific zones instead of being randomly scattered across Earth's surface. [1]

55 Identify the source of the magma for the volcanic activity in Hawaii. [1]

56 Identify the type of plate movement responsible for the presence of the volcano at location *A*. [1]

Base your answers to questions 57 through 59 on the diagram below, which shows the Moon's orbit around Earth. Four positions of the Moon are represented by letters *A*, *B*, *C*, and *D*. Earth's North Pole is labeled. The shaded areas on Earth and the Moon represent night.



(Not drawn to scale)

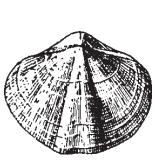
57 What motion of the Moon results in the Moon phases as viewed from Earth? [1]

58 A total solar eclipse sometimes occurs when the Moon is at position *A*. Explain why a total solar eclipse does *not* occur every time the Moon is at position *A*. [1]

59 State *one* season that begins when the line separating day and night passes through Earth's North Pole, as shown in this diagram. [1]

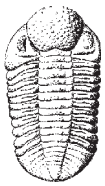
Base your answers to questions 60 through 62 on the table of index fossils shown below and on your knowledge of Earth science.

Table of Index Fossils



Eospirifer

Manticoceras



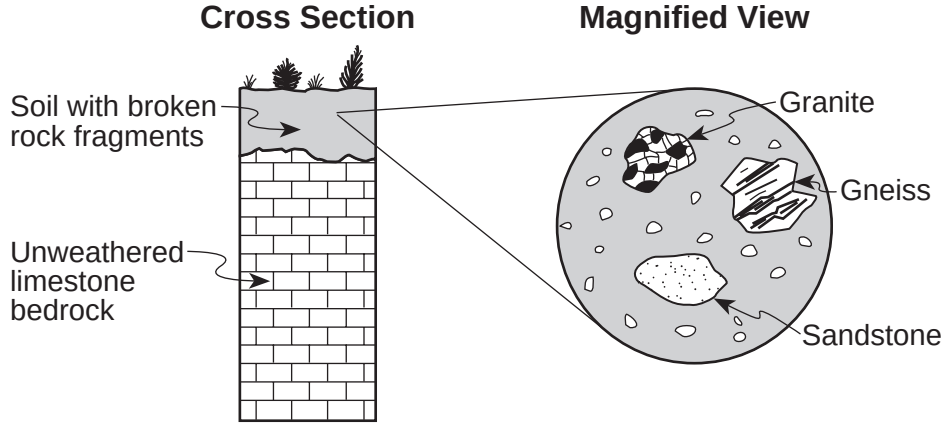
Phacops

60 During what geologic time period did the oldest index fossil shown in this table exist? [1]

61 State *one* characteristic of a good index fossil. [1]

62 Complete the classification table *in your answer booklet* by filling in the general fossil group name for *each* index fossil. [1]

Base your answers to questions 63 through 65 on the cross section below, which shows an area near Watertown, New York. The top layer of soil contains broken rock fragments. A representative sample of this layer has been magnified.



63 Identify *one* mineral that could be found in all three rock fragments shown in the magnified view. [1]

64 State *one* observable characteristic, other than mineral composition, that could help identify the gneiss fragment. [1]

65 Rocks and minerals are natural resources that are mined in New York State. State *one* negative impact that should be considered before mining these natural resources. [1]

Part C

Answer all questions in this part.

Directions (66–83): 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 66 through 68 on the information below, which describes the past and present climate of Antarctica, and on your knowledge of Earth science.

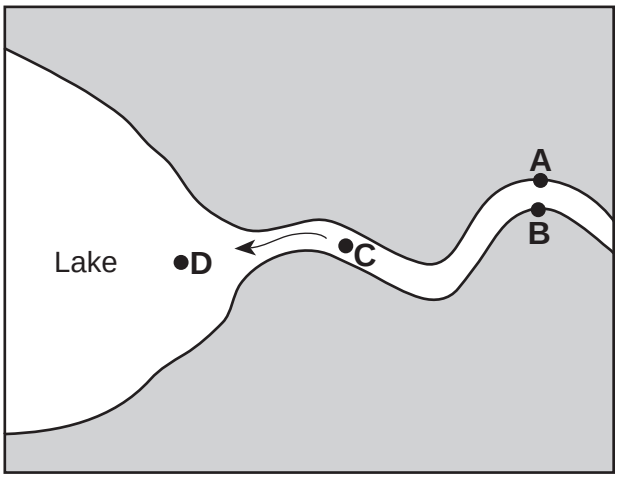
Antarctica's ice sheet has an average thickness of 6600 feet and holds approximately 70% of Earth's freshwater. Ice layers in Antarctica preserve information about Earth's history. Fossil evidence found in the bedrock of this continent shows that Antarctica was once tropical and is a potential source of untapped natural resources. Antarctica is now a frozen desert with very little snowfall.

66 Explain why Antarctica's cold climate is responsible for its very low amount of yearly precipitation. [1]

67 What evidence is preserved in Antarctica that provides information about Earth's past climates? [1]

68 Scientists are concerned that the Antarctic ice may melt as the result of global warming. State *one* effect that this melting would most likely have on Long Island, New York. [1]

Base your answers to questions 69 through 73 on the map below, which shows a meandering stream as it enters a lake. Points *A* through *D* represent locations in the stream.



69 In the box *in your answer booklet*, draw a cross-sectional view of the general shape of the stream bottom between points *A* and *B*. The water surface line has already been drawn. [1]

70 State the relationship between stream velocity and the size of the sediment the stream can carry. [1]

71 Describe how the size and shape of most pebbles change when the pebbles are transported in a stream over a great distance. [1]

72 The stream velocity at point *C* is 100 centimeters per second and the stream velocity at point *D* is 40 centimeters per second. Identify *one* sediment particle most likely being deposited between points *C* and *D*. [1]

73 Deposition is affected by particle density. On the grid *in your answer booklet*, draw a line to show the relationship between particle density and settling rate. [1]

Base your answers to questions 74 through 77 on the passage below, the map in your answer booklet, and your knowledge of Earth science. The map shows ocean depths, measured in meters, off the coast of Massachusetts. Points *A*, *B*, and *C* represent locations on the ocean floor. The Stellwagen Bank discussed in the passage is lightly shaded and labeled on the map.

The Stellwagen Bank

One of the most exciting adventures for a visitor to Cape Cod, Massachusetts, is going on a whale watch. Large boats leave port two to three times each day carrying passengers to a specific location in the Atlantic Ocean to see the whales. How do the captains of the boats know where to find the whales?

The answer is simple. They look for the whales over an area known as the Stellwagen Bank, which is a large undersea deposit of unsorted sand and gravel. The Stellwagen Bank is inferred by scientists to have formed during the Pleistocene Epoch from the slow retreat of massive Ice Age glaciers across this area. Today, cool ocean currents come from the north and flow up and over the Stellwagen Bank. These currents bring nutrients to the surface from deep in the ocean, providing food for oceanic phytoplankton (small plants). Small ocean creatures and fish feed on the phytoplankton. Whales can be found in abundance at the Stellwagen Bank feeding on the many ocean life-forms.

74 Most whale watching takes place at 42° 25′ N and 70° 25′ W. On the map *in your answer booklet*, place an **X** at this location. [1]

75 Identify the most probable cold ocean current causing the upwelling of nutrients over the Stellwagen Bank. [1]

76 What evidence indicates that the ocean floor has a steep slope at point *C*? [1]

77 Calculate the average ocean-floor gradient between point *A* and point *B*. Label your answer with the correct units. [2]

Base your answers to questions 78 through 80 on the data table below and on your knowledge of Earth science. Iridium is an element rarely found in Earth's lithosphere but commonly found in asteroids. The data table shows the abundance of iridium, in parts per billion (ppb), found in a rock core sample taken in Carlsbad, New Mexico.

Iridium Abundance in a Rock Core Sample

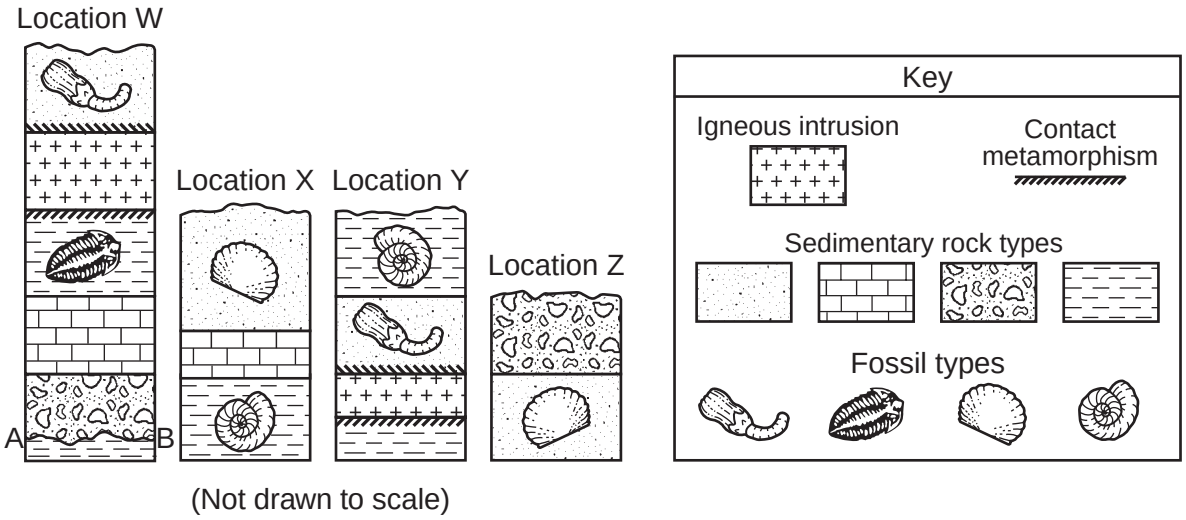
Depth Below Earth's Surface (m)	**Iridium Abundance** (ppb)
0	0
50	0
100	0.5
105	0.5
113	0.5
115	13.5
119	0.5
120	0.25
128	0.25
135	0

78 On the grid *in your answer booklet*, construct a line graph of iridium abundance at various depths. Place an **X** to show the iridium abundance at *each* depth shown on the data table. Connect the **X**s with a line. [2]

79 The high concentration of iridium in this rock core sample has been matched to rock layers that have been dated to the geologic time when dinosaur extinction from an asteroid impact may have occurred. Between which two geologic time periods did this inferred extinction occur? [1]

80 Other than iridium in the rock layers, what surface feature was most likely created when this asteroid impacted Earth's crust? [1]

Base your answers to questions 81 through 83 on the cross sections below, which show widely separated outcrops at locations *W*, *X*, *Y*, and *Z*. The rock layers have not been overturned. Line *AB* in the cross section at location *W* represents an unconformity. Fossils are shown in some of the layers.



81 Determine the relative geologic age of the four fossils by correlating the rock layers between these outcrops. *In your answer booklet*, number the fossils from 1 to 4 in order of relative age, with 1 as the oldest and 4 as the youngest. [1]

82 What evidence shown in the outcrop at location *W* suggests that the igneous intrusion occurred after both fossils were deposited at location *W*? [1]

83 Identify *two* of the processes involved in the formation of the unconformity represented by line *AB* in the cross section at location *W*. [1]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 25, 2006 — 9:15 a.m. to 12:15 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.

Tear Here

Signature

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, January 25, 2006 — 9:15 a.m. to 12:15 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

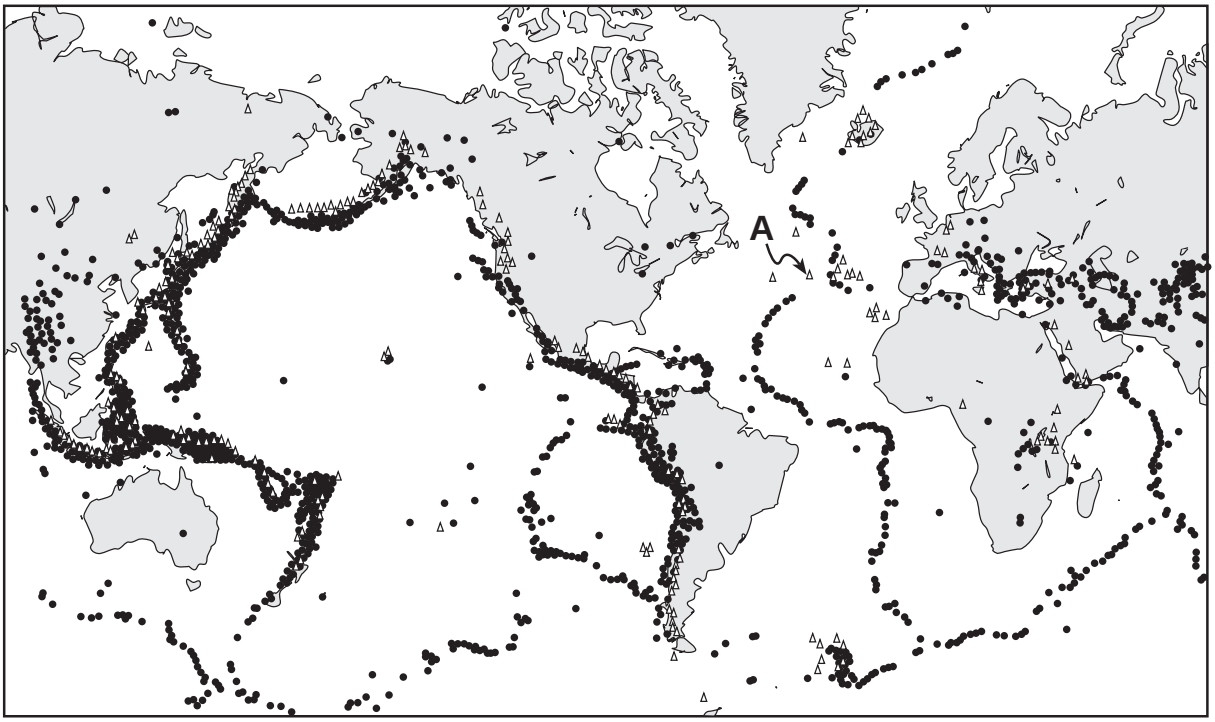
51 _____

_____ **51**

52 _____ **million years** **52**

For Raters Only

53



53 ☐

54 _____

54 ☐

_____

55 _____

55 ☐

56 _____

56 ☐

[2]

For Raters Only

57 _____ 57 ☐

58 _____ 58 ☐

_____

59 _____ 59 ☐

60 _____ **Period** 60 ☐

61 _____ 61 ☐

62

Fossil Classification

Index Fossil	*Eospirifer*	*Manticoceras*	*Phacops*
General Fossil Group			

62 ☐

63 _____ 63 ☐

64 _____ 64 ☐

65 _____ 65 ☐

_____

☐

Total Score for Part B–2

Part C

For Raters Only

66 _____

_____

67 _____

68 _____

_____

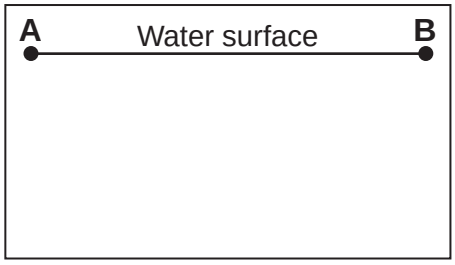
66 ☐

67 ☐

68 ☐

For Raters Only

69



69 ☐

70 _____

_____

70 ☐

71 Size: _____

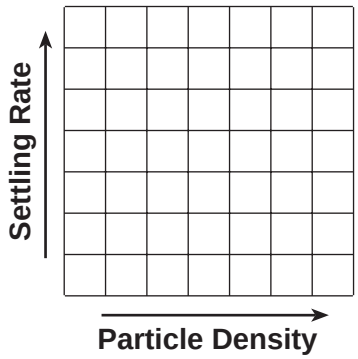
Shape: _____

71 ☐

72 _____

72 ☐

73



73 ☐

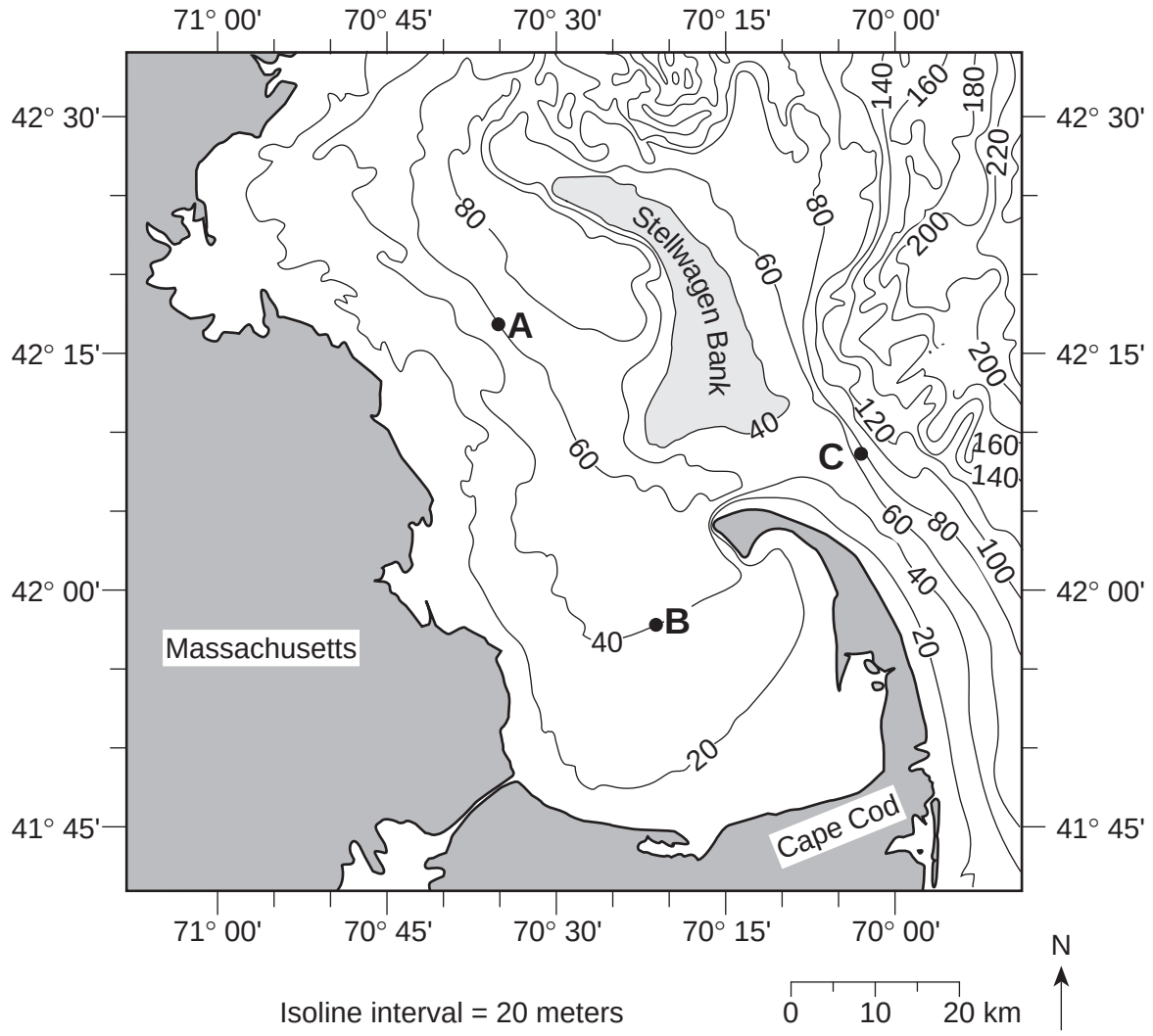
[5]

[OVER]

For Raters Only

74

Whale Watchers' Map



74 ☐

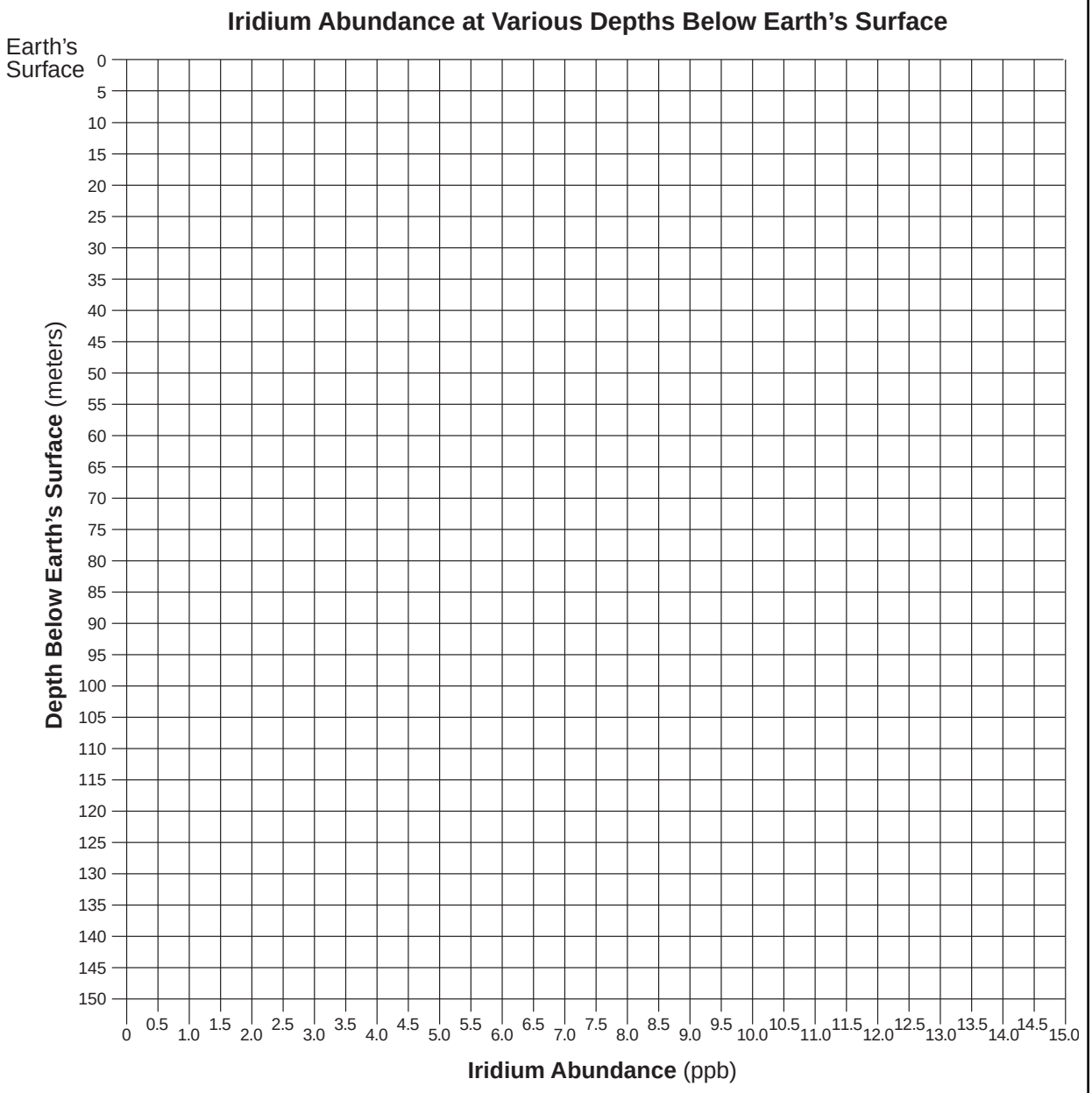
75 _____ **Current** **75** ☐

76 _____ **76** ☐

77 Gradient = _____ **77** ☐

For Raters Only

78



78 ☐

79 _____ **Period** and _____ **Period** **79** ☐

80 _____ **80** ☐

For Raters Only

81




_____ _____ _____ _____

81 ☐

82 _____

_____

82 ☐

83 Process 1: _____

Process 2: _____

83 ☐

☐

Total Score for Part C

FOR TEACHERS ONLY

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

PS–ES PHYSICAL SETTING/EARTH SCIENCE

Wednesday, January 25, 2006 — 9:15 a.m. to 12:15 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 1	13 4	25 2
2 3	14 2	26 1
3 2	15 2	27 3
4 2	16 2	28 4
5 3	17 3	29 2
6 1	18 3	30 2
7 2	19 3	31 3
8 3	20 4	32 1
9 3	21 4	33 2
10 2	22 1	34 2
11 1	23 4	35 4
12 3	24 1	

Part B–1

36 2	44 2
37 4	45 1
38 2	46 2
39 1	47 1
40 3	48 4
41 1	49 2
42 3	50 1
43 1	

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 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.

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 that will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Wednesday, January 25, 2006. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

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

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

Part B–2

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

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

— Cosmic background radiation remains.

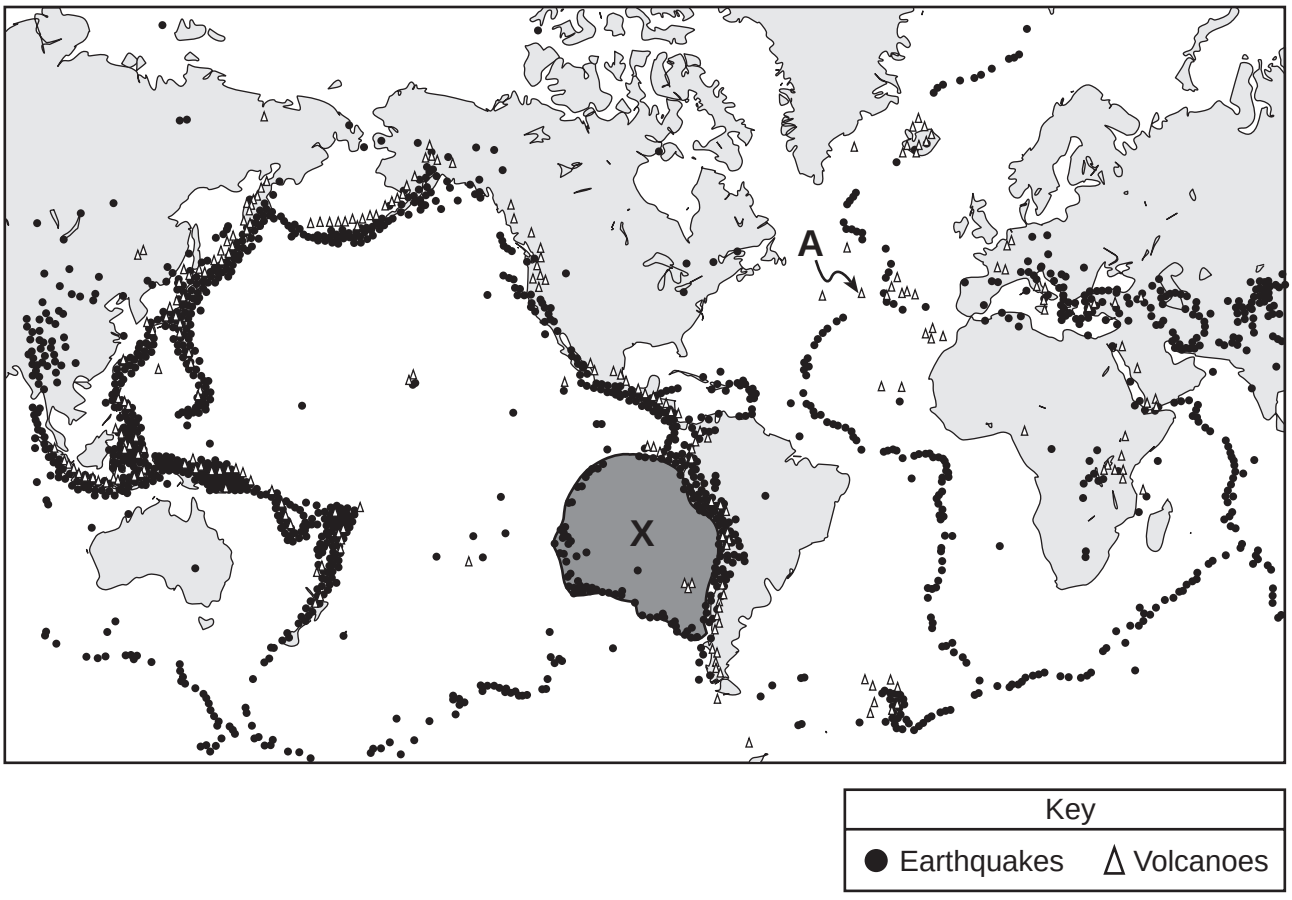
— There is a redshift in the light from stars in distant galaxies.

— the apparent expansion of the universe

— More-distant stars are moving away from Earth at a greater rate than nearby stars.

52 [1] Allow 1 credit for 1300 (±200) million years.

53 [1] Allow 1 credit if the center of the student-drawn **X** is located somewhere on the Nazca Plate shaded below.



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

— Most major earthquakes occur at tectonic plate boundaries.

— Most earthquakes occur at the location of major fault zones.

— Crustal movement at plate boundaries causes frequent earthquake activity.

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

— a hot spot

— a magma plume

— the mantle

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

— divergent

— diverging lithospheric plates

— seafloor spreading

— rifting

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

— revolution

— The Moon orbits Earth.

— The Moon travels around Earth.

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

— The Moon's shadow misses Earth.

— The Moon orbits in a different plane than Earth.

— The Moon's orbit is tilted.

— The Moon's shadow does not reach Earth.

59 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— spring

— fall

— autumn

60 [1] Allow 1 credit for Silurian Period.

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

— existed for a short geologic time

— widespread geographically

62 [1] Allow 1 credit if *all* three fossil groups are correctly identified as shown below.

Fossil Classification

Index Fossil	*Eospirifer*	*Manticoceras*	*Phacops*
General Fossil Group	Brachiopod	Ammonoid	Trilobite

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

— quartz

— feldspar

— amphibole

— mica

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The fragment shows light and dark banding.

— banded foliation

— layering of minerals

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

— Rocks and minerals are nonrenewable resources.

— Mining can result in pollution of the land, water, and air in the region.

— Mining can result in the removal of topsoil.

— danger to miners

— destruction of natural habitats

— landscape destruction

Part C

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

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

— Cold air holds very little water vapor.

— Very little evaporation takes place in Antarctica.

— Antarctica is in a region where air is sinking, therefore, clouds seldom form.

— Very little precipitation occurs in a high-pressure area.

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

— fossils

— volcanic dust

— pollen

— trapped gases

— microbes

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

— Sea level would most likely rise.

— The shape of Long Island would change.

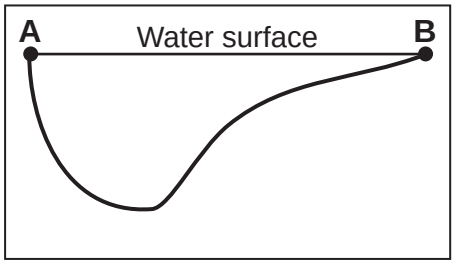
— submergence

— Long Island would become smaller.

— Buildings would be flooded.

69 [1] Allow 1 credit if the student's cross section shows that the water is deeper near point *A*.

Example of a 1-credit response:



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

— a direct relationship

— As the stream velocity increases, the stream can carry bigger sediment.

71 [1] Allow 1 credit if *both* the size and shape changes are correctly described. Acceptable responses include, but are not limited to:

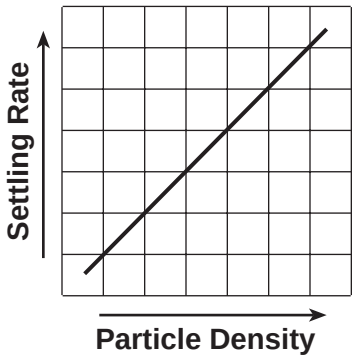
— Size: The pebbles become smaller.
The size of the pebbles decreases.

— Shape: The pebbles become rounder.
The pebbles become more spherical.

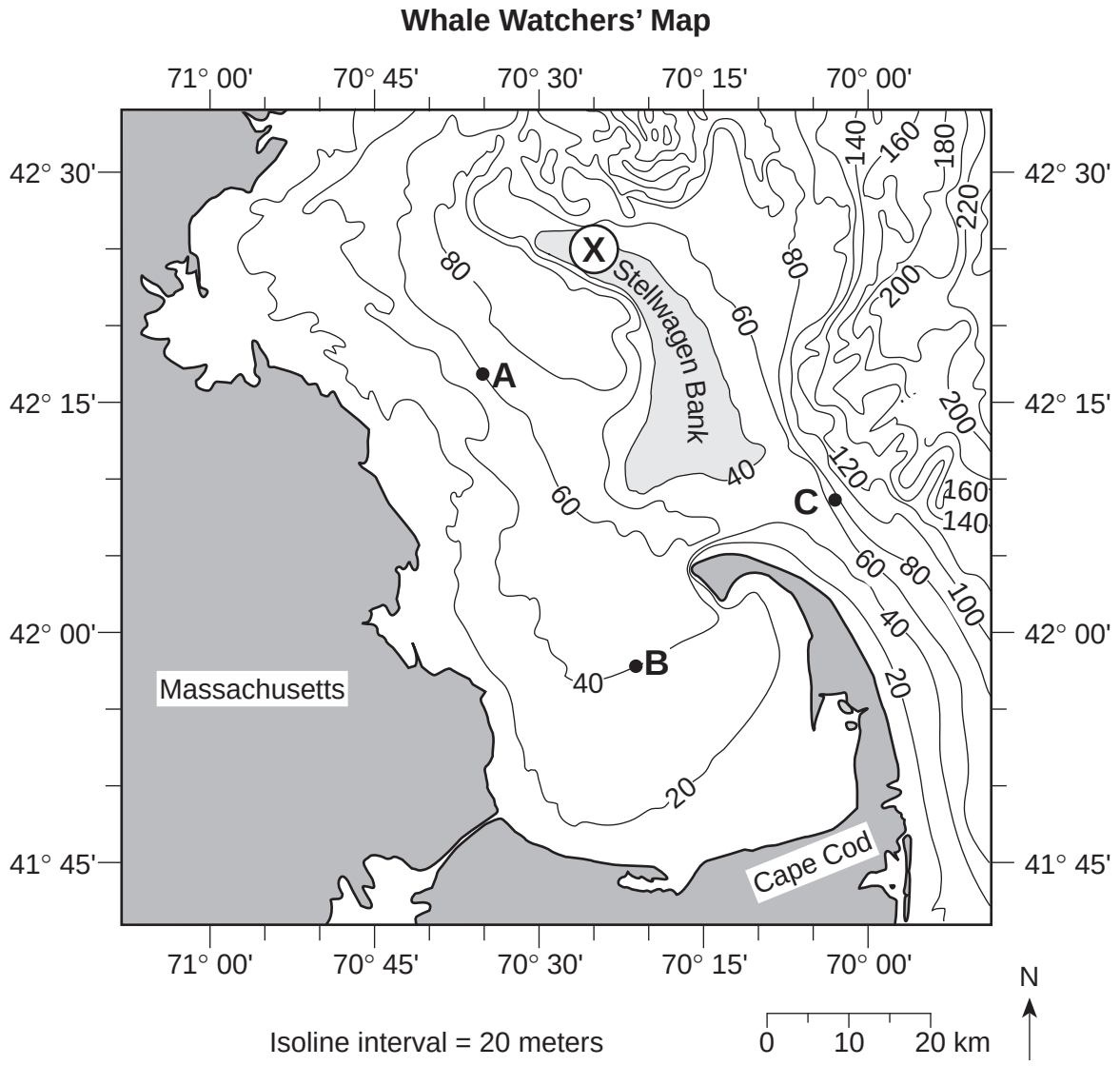
72 [1] Allow 1 credit for pebbles or sand.

73 [1] Allow 1 credit for a straight or curved line that shows a direct relationship.

Example of a 1-credit response:



74 [1] Allow 1 credit if the center of the student-drawn **X** is within the circle shown below.



75 [1] Allow 1 credit for Labrador Current.

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

— Isolines are close together.

77 [2] Allow 1 credit for the value 0.5 (±0.02) or .5 (±0.02).

and

Allow 1 credit for the correct units. Acceptable responses include, but are not limited to:

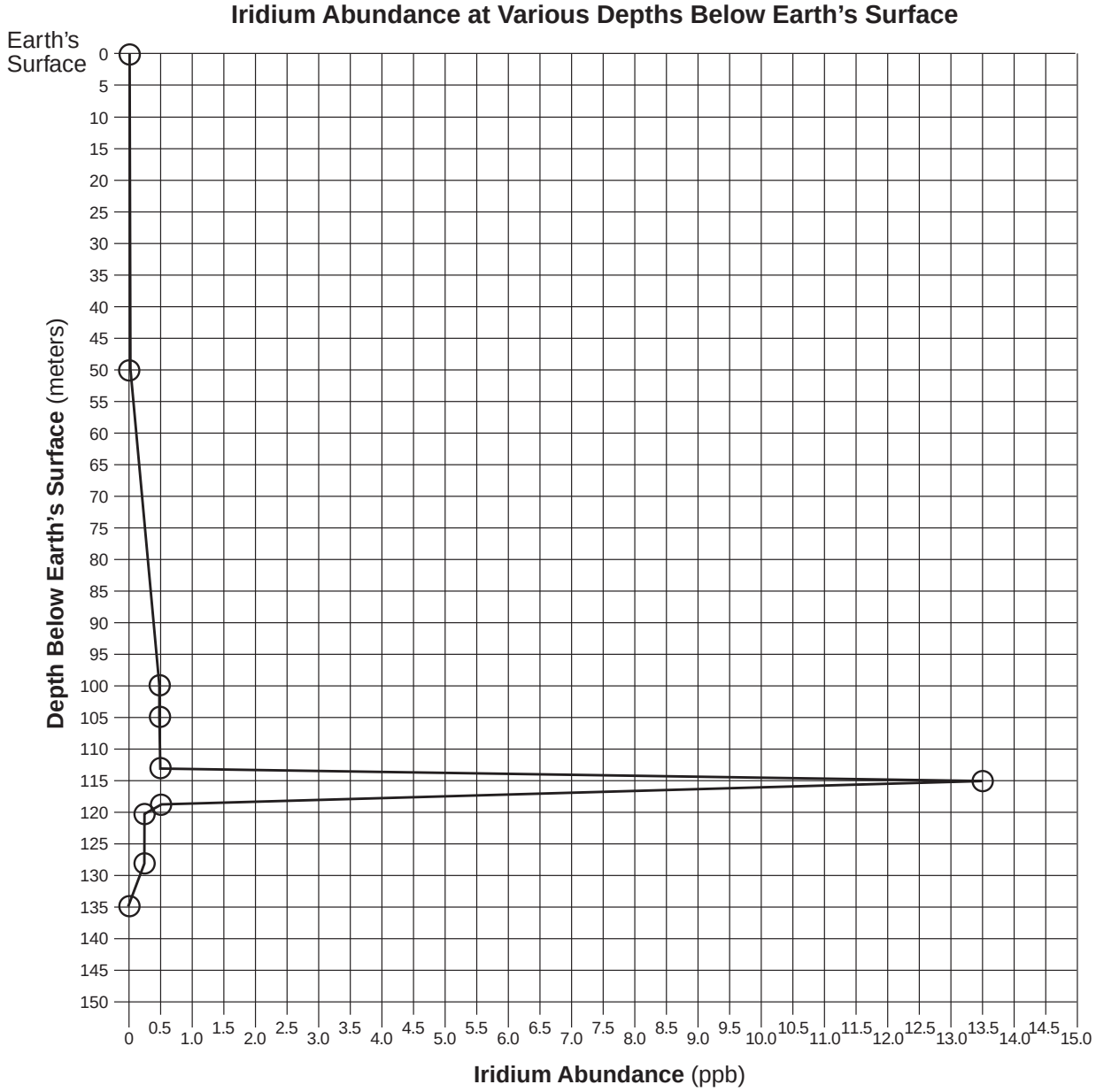
— meters/kilometer
— m/km

78 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 2 credits if the center of all ten **X**s are within the circles shown on the graph below, and the **X**s are correctly connected with a line.
- Allow 1 credit if only seven to nine centers of the **X**s are within the circles shown on the graph below, and the **X**s are correctly connected with a line.

or

- Allow 1 credit if the center of all ten **X**s are within the circles shown on the graph below, but the **X**s are not correctly connected with a line.



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

— Cretaceous Period and Tertiary Period

— Paleogene Period and Cretaceous Period

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

— crater

— large ocean waves

— impact crater

— large hole

81 [1] Allow 1 credit for the correct response shown below.

2

1

4

3

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

— contact metamorphism

— Contact metamorphism is shown in both the sandstone and shale layers.

— An igneous intrusion is younger than the bedrock it intrudes.

83 [1] Allow 1 credit for a response that includes any *two* of the processes involved in forming an unconformity. Acceptable responses include, but are not limited to:

— uplift

— weathering

— erosion

— submergence

— deposition

— burial

The *Chart for Determining the Final Examination Score for the January 2006 Regents Examination in Physical Setting/Earth Science* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Wednesday, January 25, 2006. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Earth Science must NOT be used to determine students' final scores for this administration.

Map to Core Curriculum

January 2006 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		44	73,77,78
Math Key Idea 2	5,8,25,33	52	
Math Key Idea 3	14		76
Science Inquiry Key Idea 1		36,40,41,46,61	66,68,71,80,83
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	1,6,8,15,21,22	36,49,50,62,64	67,70,72,75,79
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1			
Key Idea 2	4,17,18,24,26, 30,32	36,37,38,39,40, 41,47,48,50,53, 54,55,56,57,58, 59,60,63	69,74,76,81,82
Key Idea 3		43,51	
Key Idea 4			
Key Idea 5	5	54	81
Key Idea 6			
Standard 7			
Key Idea 1		65	
Key Idea 2			
Standard 4			
Key Idea 1	1,2,3,4,5,6,7,8, 10,11,12,13,14, 15	39,40,41,49,51, 52,57,58,59,60, 61,62	67,74,78,79,80, 81,82,83
Key Idea 2	9,16,17,18,19,20, 21,22,23,24,25, 26,27,28,29,30, 31,32,33	36,37,38,47,48, 50,53,54,55,56	66,68,69,70,71, 72,73,75,76,77
Key Idea 3	34,35	42,43,44,45,46, 63,64,65	
Reference Tables			
ESRT 2001 Edition	1,6,8,12,14,15, 18,21,22,23,25, 26,27,32,33,34, 35	44,47,49,50,52, 53,54,55,56,60, 62,63,64	70,72,75,77,79

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