The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Wednesday, August 20, 2025 — 8:30 to 11:30 a.m., only

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

Use your knowledge of Earth science to answer all questions in this examination. Before you begin this examination, you must be provided with the *2011 Edition Reference Tables for Physical Setting/Earth Science*. You will need these reference tables to answer some of the questions.

You are to answer all questions in all parts of this examination. You may use scrap paper to work out the answers to the questions, but be sure to record your answers on your answer sheet and in your answer booklet. A separate answer sheet for Part A and Part B–1 has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet. Record your answers to the Part A and Part B–1 multiple-choice questions on this separate answer sheet. Record your answers for the questions in Part B–2 and Part C in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

All answers in your answer booklet should be written in pen, except for graphs and drawings, which should be done in pencil.

When you have completed the examination, you must sign the declaration printed on 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 *2011 Edition Reference Tables for Physical Setting/Earth Science* must be available for you to use while taking this examination.

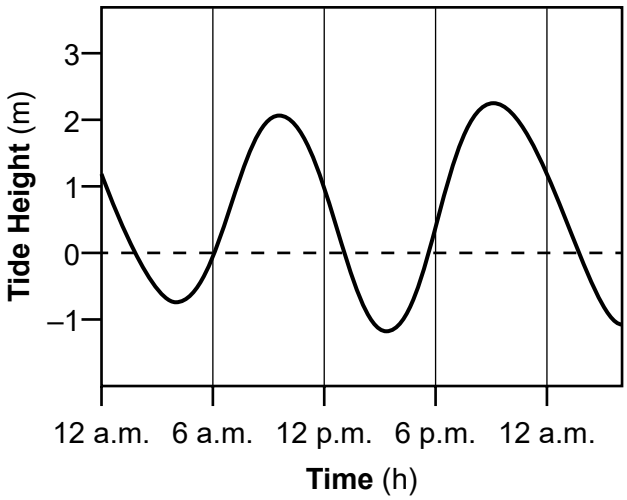
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part.

Directions (1–35): For *each* statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Earth Science*. Record your answers on your separate answer sheet.

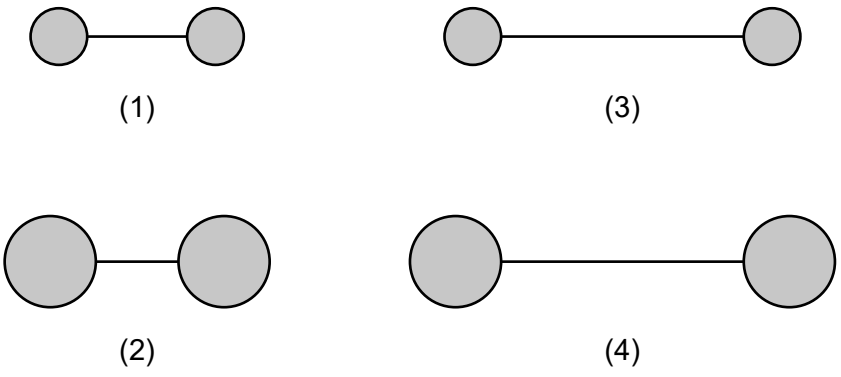
1 A graph of tidal height changes in sea level are shown below.



The number of hours from one low tide to the next low tide is approximately

(1) 6 h
(2) 12 h
(3) 18 h
(4) 24 h

2 The circles below represent celestial objects made of the same uniform material. The line represents the distance between them. Between which two objects is the gravitational attraction the greatest?



3 Observations of wavelengths of light emitted from most galaxies show a shift toward the

(1) red end of the visible spectrum, indicating that galaxies are moving away from Earth
(2) red end of the visible spectrum, indicating that galaxies are moving toward Earth
(3) blue end of the visible spectrum, indicating that galaxies are moving away from Earth
(4) blue end of the visible spectrum, indicating that galaxies are moving toward Earth

4 The direction of swing of a Foucault pendulum appears to change due to Earth's

(1) elliptical orbit
(2) spherical shape
(3) revolution
(4) rotation

5 To an observer in New York State, which statement best explains why some constellations viewed in the night sky in winter are different than some constellations viewed in the summer?

(1) Different seasonal constellations are visible as Earth orbits the Sun.
(2) Different seasonal constellations are visible as the Sun orbits Earth.
(3) Seasonal constellations orbit the Sun as Earth rotates.
(4) Seasonal constellations orbit the Sun as Earth revolves.

6 What is the approximate latitude and longitude of Binghamton, New York?

(1) 42°00′ south, 76°05′ east
(2) 42°05′ south, 75°55′ east
(3) 42°00′ north, 76°05′ west
(4) 42°05′ north, 75°55′ west

7 Earth's rate of revolution around the Sun is approximately

(1) 1 degree/hour
(2) 1 degree/day
(3) 15 degrees/hour
(4) 15 degrees/day

8 As the infiltration of water increases and becomes stored in the soil, the amount of groundwater

(1) decreases and the water table rises
(2) decreases and the water table lowers
(3) increases and the water table rises
(4) increases and the water table lowers

9 Equal volumes of water were poured through four well-sorted soil samples each containing differently sized particles. Which particle size would have the greatest amount of water retention?

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

10 Below are four steps involved in the formation of a cloud.

A. air expands and air temperature decreases
B. air rises upward through the atmosphere
C. air temperature equals the dew point
D. condensation of excess water vapor

What is the correct sequence of these steps involved in the formation of a cloud?

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

11 What is the dew point when the relative humidity is 86% and the dry bulb is 28°C?

(1) 25°C
(2) 26°C
(3) 27°C
(4) 28°C

12 Absorption of ultraviolet radiation by ozone gas, mainly found at altitudes between 15 and 30 kilometers, is responsible for warming which layer of Earth's atmosphere?

(1) troposphere
(2) stratosphere
(3) mesosphere
(4) thermosphere

13 Which forms of electromagnetic energy are listed from shortest to longest wavelength?

(1) ultraviolet, infrared, red light
(2) microwaves, blue light, gamma rays
(3) radio waves, infrared, violet light
(4) X-rays, green light, microwaves

14 Which list of properties explains why basalt absorbs more heat energy and heats up more quickly than an equal volume of water?

(1) light color, smooth surface, and low specific heat
(2) light color, rough surface, and high specific heat
(3) dark color, rough surface, and low specific heat
(4) dark color, smooth surface, and high specific heat

15 Which surface ocean current warms the east coast of South America?

(1) Brazil Current
(2) Falkland Current
(3) Gulf Stream Current
(4) Peru Current

16 Which New York State city is located on bedrock that is between 359 million years old and 416 million years old?

(1) Massena
(2) New York City
(3) Niagara Falls
(4) Elmira

17 The **X** shown on the map below represents a location in the state of Texas in North America.

This location was inferred to have been located on the equator approximately

(1) 75 million years ago
(2) 140 million years ago
(3) 260 million years ago
(4) 500 million years ago

18 Which two groups of life-forms became extinct during the same time?

(1) trilobites and graptolites
(2) gastropods and brachiopods
(3) euryptends and placoderm fish
(4) dinosaurs and ammonoids

19 Analysis of seismic waves are used for the determination of the

(1) frequency of past magnetic pole reversals
(2) magnitude of an earthquake
(3) rate of tectonic plate motion
(4) age of the Mid-Atlantic Ridge

20 Which hot spot is located on a divergent plate boundary?

(1) Hawaii Hot Spot
(2) Tasman Hot Spot
(3) Bouvet Hot Spot
(4) Canary Islands Hot Spot

21 Two variables that affect the rate of deposition of sediments in water are

(1) shape and density
(2) shape and luster
(3) hardness and density
(4) hardness and luster

22 Which two chemical elements do selenite gypsum, dolomite, and calcite all have in common?

(1) hydrogen and oxygen
(2) calcium and oxygen
(3) hydrogen and magnesium
(4) calcium and magnesium

23 Which location will most likely have the *least* runoff during a rainstorm?

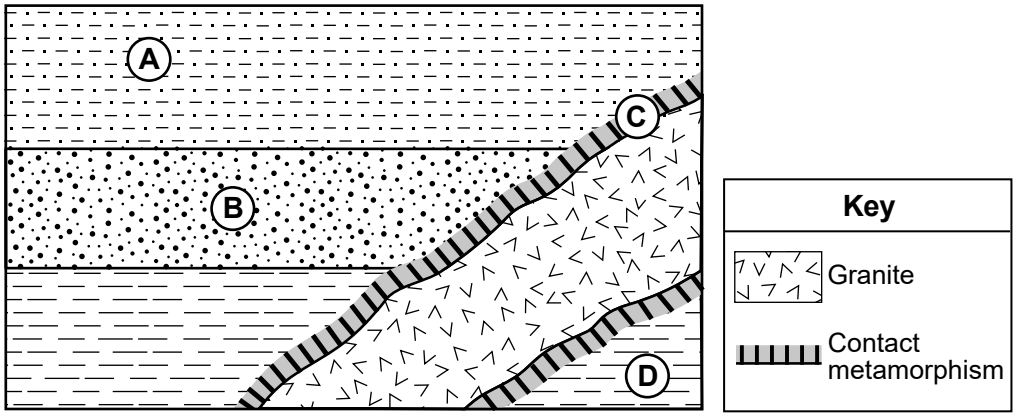
(1)

(3)

(2)

(4)

24 The cross section below shows rock units labeled *A*, *B*, *C*, and *D*, which have not been overturned.



(Not drawn to scale)

Which rock unit formed most recently?

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

25 The first *P*-wave created by an earthquake traveled for 7 minutes before it was recorded at a seismic station. Which table shows both the correct distance between this seismic station and the epicenter of the earthquake and the correct length of time between the arrivals of the first *P*-wave and the first *S*-wave, recorded at this station?

Distance to Epicenter (km)	**Time Between First *P*-wave and First *S*-wave** (minutes: seconds)
1900	3 minutes 0 seconds

(1)

Distance to Epicenter (km)	**Time Between First *P*-wave and First *S*-wave** (minutes: seconds)
4000	5 minutes 40 seconds

(3)

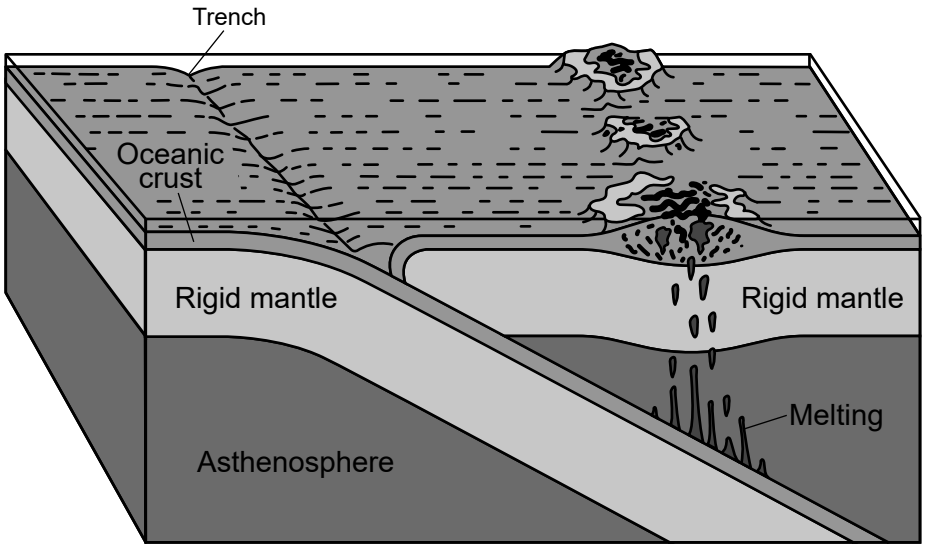
Distance to Epicenter (km)	**Time Between First *P*-wave and First *S*-wave** (minutes: seconds)
1900	6 minutes 40 seconds

(2)

Distance to Epicenter (km)	**Time Between First *P*-wave and First *S*-wave** (minutes: seconds)
4000	12 minutes 40 seconds

(4)

26 The block diagram below shows a tectonic plate boundary.

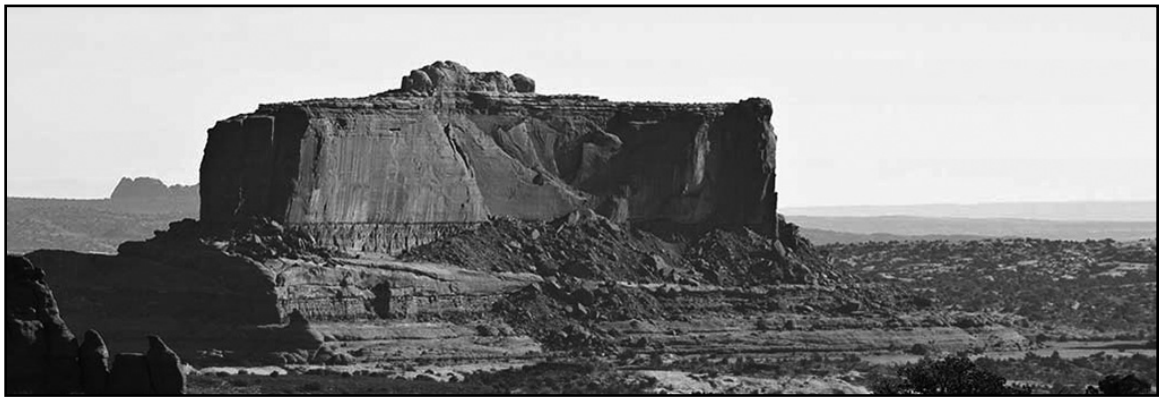


(Not drawn to scale)

This diagram best represents the boundary between which two tectonic plates?

(1) Scotia Plate and South American Plate
(2) Nazca Plate and Antarctic Plate
(3) African Plate and Indian-Australian Plate
(4) Philippine Plate and Pacific Plate

27 The photograph below shows a landscape feature found in southwestern United States.



Which type of climate most likely contributes to the continued formation of this landscape feature?

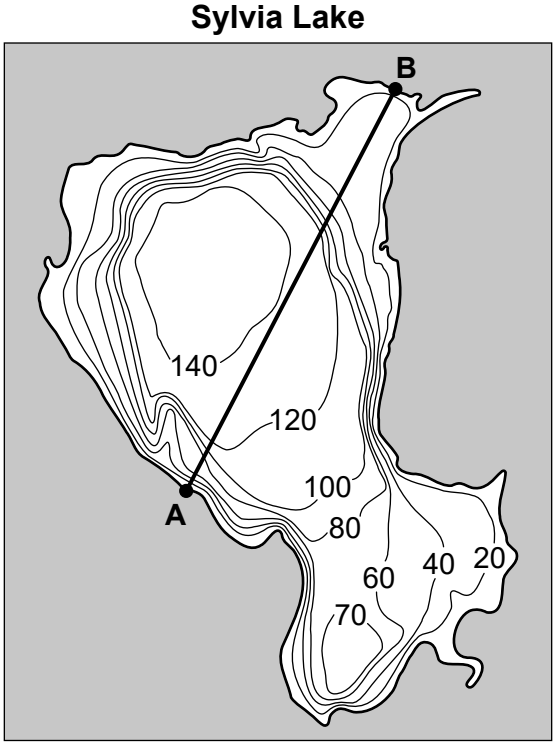
(1) arid and hot
(2) arid and cold
(3) humid and hot
(4) humid and cold

28 The photograph below shows a tree growing in a crack in exposed bedrock.

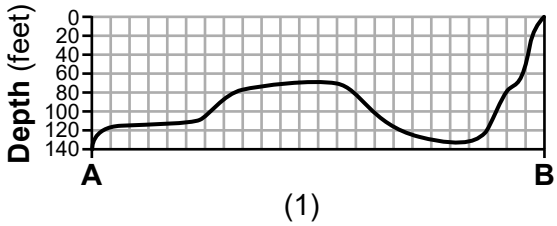
The rock breakage caused by this tree growth is an example of

(1) deforestation
(2) mass movement
(3) physical weathering
(4) chemical weathering

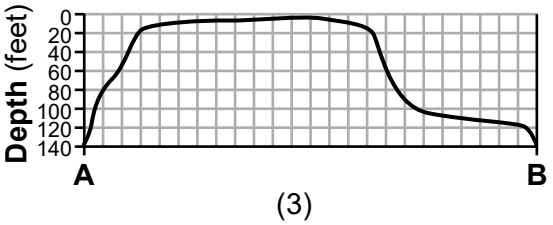
29 The map below shows Sylvia Lake, located in New York State. Isoline values indicate water depth in feet. Points *A* and *B* represent locations on the shoreline of Sylvia Lake.



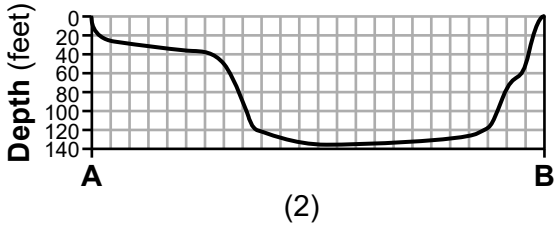
Which cross section represents an accurate profile of the bottom of Sylvia Lake between points *A* and *B*?



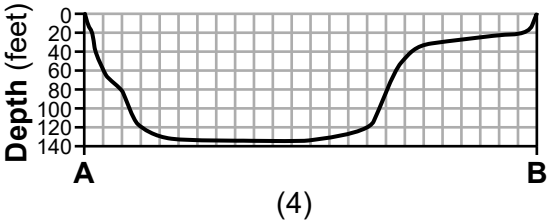
(1)



(3)



(2)



(4)

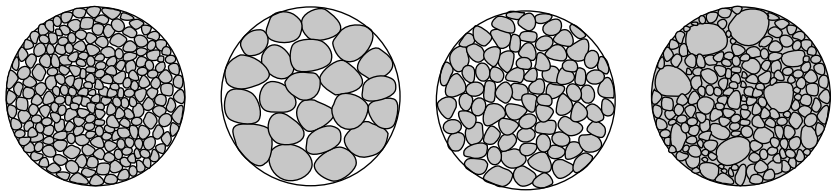
30 The photograph below shows a portion of the Niagara Escarpment.

Source: http://imgc.allpostersimages.com/images/P-488-488-90/75/7581/QUND300Z/posters/jack-brittain-niagara-escarpment.jpg

The Niagara Escarpment is best described as a

(1) river valley
(2) steep cliff
(3) glacial deposit
(4) mountain range

31 Which sediment sample was most likely deposited by a glacier?



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

(Drawn to scale)

32 The photograph below shows a series of sand dunes.

Which agent of erosion was most likely responsible for the formation of these sand dunes?

(1) wind
(2) glacier
(3) wave action
(4) running water

33 Which table correctly represents the type of metamorphism and the resulting textures as shale turns into gneiss?

Type of Metamorphism	Texture
Regional	Non-foliated

(1)

Type of Metamorphism	Texture
Regional	Foliated

(3)

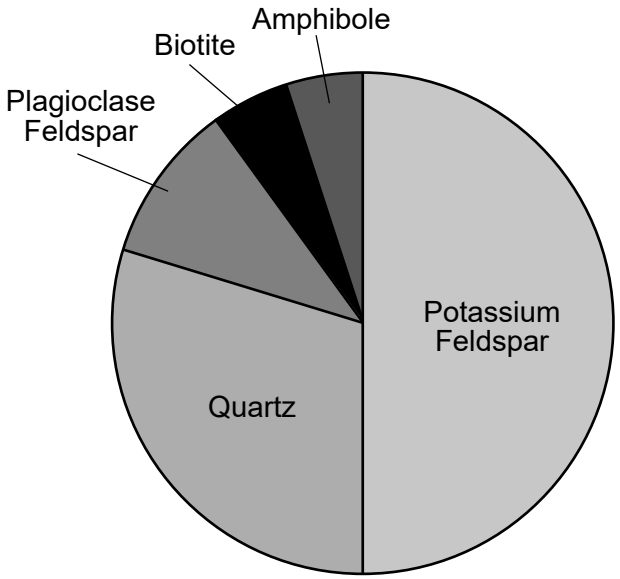
Type of Metamorphism	Texture
Contact	Non-foliated

(2)

Type of Metamorphism	Texture
Contact	Foliated

(4)

34 The pie chart below shows the percentage of each mineral found in a sample of an igneous rock that formed deep underground.



Which igneous rock is represented by the chart?

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

35 The photograph below shows a magnified view of a rock.

This rock was most likely produced by

(1) contact metamorphism
(2) compaction and cementation of sediments
(3) extreme heat and high pressure
(4) melting and solidification of magma

Part B–1

Answer all questions in this part.

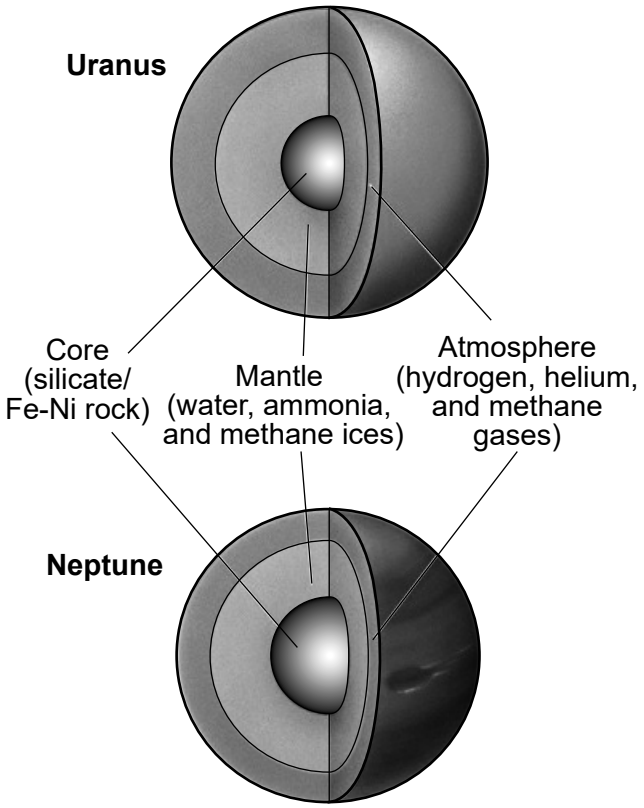
Directions (36–50): For *each* statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Earth Science*. Record your answers on your separate answer sheet.

Base your answers to questions 36 through 38 on the passage and diagram below and on your knowledge of Earth science. The diagram below represents a general model of the inferred interiors of Uranus and Neptune.

The Ice Giants

The Voyager 2 satellite passed Uranus in 1986 and Neptune in 1989. When astronomers examined the data, they realized the compositions of Uranus and Neptune were slightly different from the compositions of Jupiter and Saturn. As such, the term "gas giants" could no longer be used to describe Uranus and Neptune. Jupiter and Saturn are composed of mostly hydrogen and helium with only small cores of rock. In contrast to Jupiter and Saturn, data from Voyager 2 revealed that Uranus and Neptune are composed of smaller amounts of the elements hydrogen and helium, and contain a greater percentage of heavier elements such as oxygen, carbon, and nitrogen found in water, ammonia, and methane. While they are still Jovian planets, the term "ice giants" is now commonly used to describe Uranus and Neptune because scientists realized that these two planets were compositionally different from Jupiter and Saturn.

Inferred Interiors of Uranus and Neptune



36 What caused the interior layering of Uranus and Neptune during their formation?

(1) density differences and gravity
(2) density differences and radioactive decay
(3) tidal forces and gravity
(4) tidal forces and radioactive decay

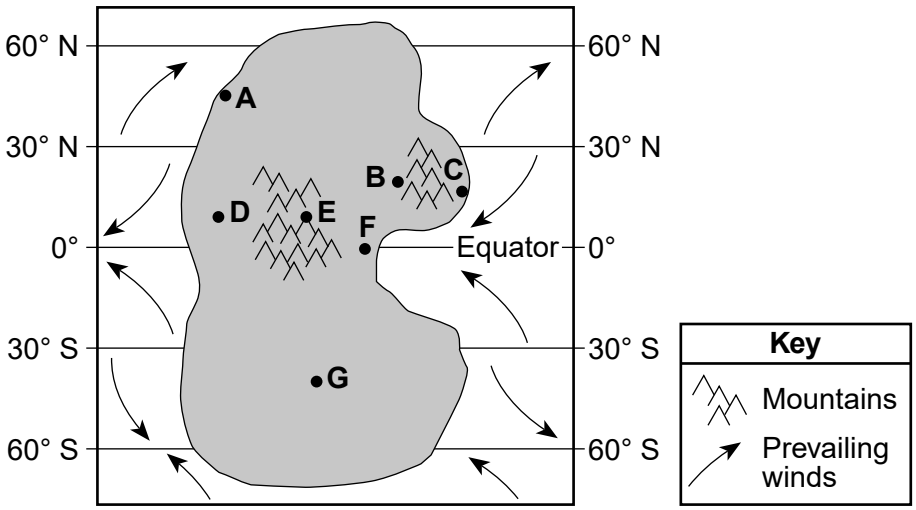
37 Compared to the mantles of the ice giants, the mantle of Earth is

(1) less dense and composed of smaller amounts of water
(2) less dense and composed of smaller amounts of rock
(3) more dense and composed of greater amounts of water
(4) more dense and composed of greater amounts of rock

38 Which Jovian planet has the slowest orbital velocity and why?

(1) Jupiter because of its distance from the Sun
(2) Jupiter because of its mass
(3) Neptune because of its distance from the Sun
(4) Neptune because of its mass

Base your answers to questions 39 through 41 on the map below and on your knowledge of Earth science. The map represents an imaginary continent on an Earth-like planet. Two mountain ranges and seven locations, *A* through *G*, are shown.



39 The climate at location *E* is most likely

(1) cool due to its higher elevation
(2) cool due to its higher latitude
(3) warm due to its higher elevation
(4) warm due to its higher latitude

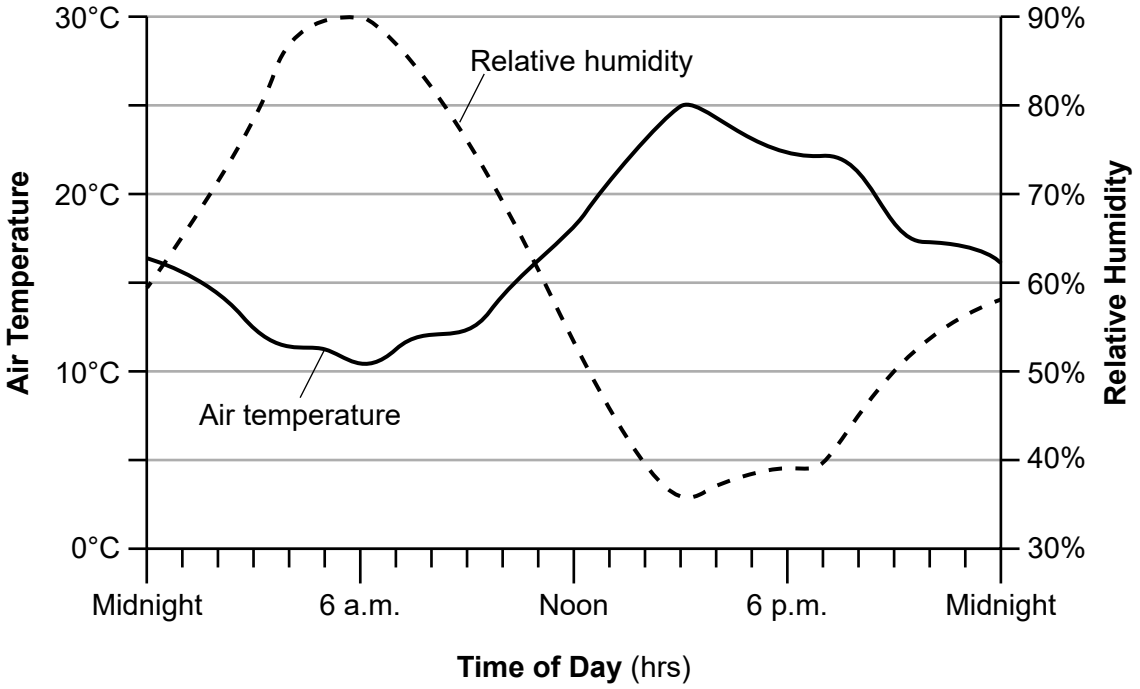
40 Compared to the climate at location *G*, the climate at location *F* will most likely be

(1) cooler and drier
(2) cooler and more humid
(3) warmer and drier
(4) warmer and more humid

41 Which location will most likely have the greatest annual temperature range?

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

Base your answers to questions 42 through 44 on the graph below and on your knowledge of Earth science. The graph shows air temperature and relative humidity recorded over a 24-hour period at a location near Albany, New York.



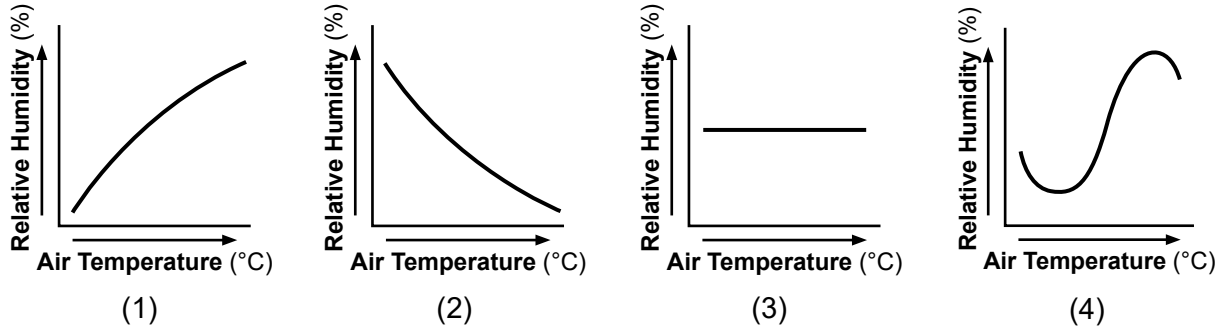
42 The air temperature at noon is closest to

(1) 12°C
(2) 17°C
(3) 54°C
(4) 67°C

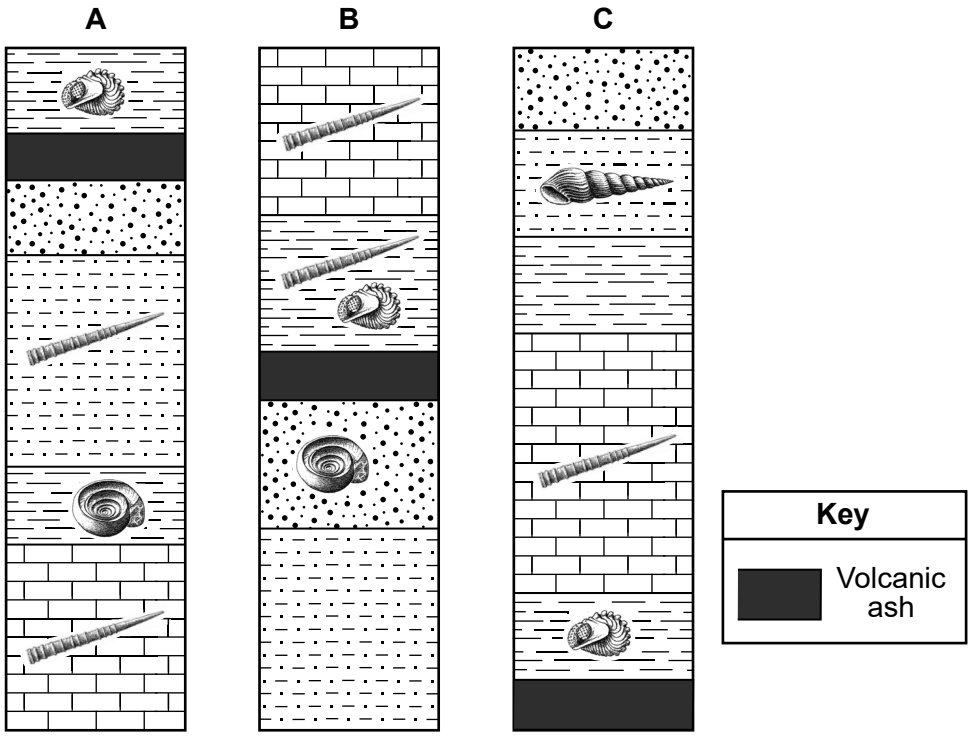
43 Which instrument was used to determine the relative humidity?

(1) psychrometer
(2) barometer
(3) anemometer
(4) wind vane

44 Which graph best represents the relationship between air temperature and relative humidity shown in this data?



Base your answers to questions 45 through 47 on the cross sections below and on your knowledge of Earth science. The cross sections represent three rock outcrops, labeled *A*, *B*, and *C*, several kilometers apart. The outcrops have *not* been overturned. Some rock layers contain fossils.



45 Which rock layer is the youngest?

(1) limestone layer in outcrop *A*
(2) limestone layer in outcrop *B*
(3) sandstone layer in outcrop *A*
(4) sandstone layer in outcrop *C*

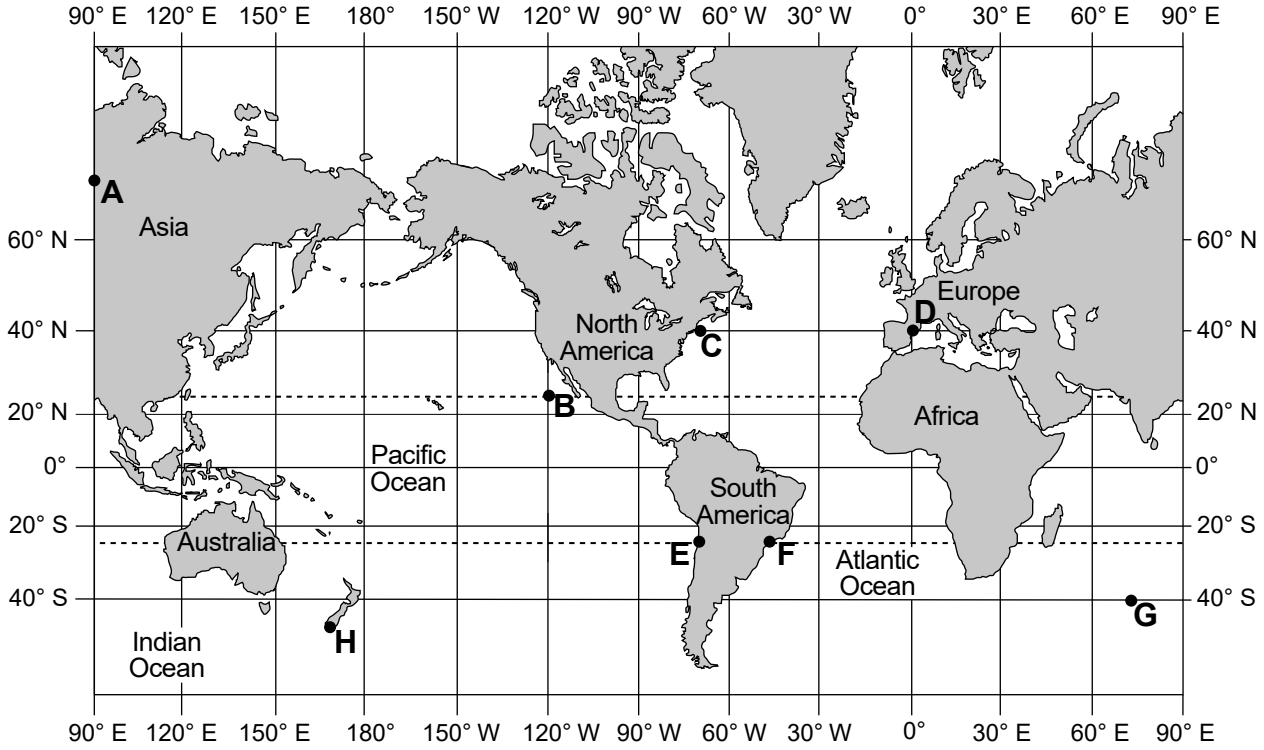
46 Which fossil in these three outcrops would be the best index fossil?

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

47 Which rock layers formed from the deposition of land-derived sediments with a uniform particle size of 0.001 centimeters in diameter?

(1) limestone
(2) sandstone
(3) siltstone
(4) shale

Base your answers to questions 48 through 50 on the map below and on your knowledge of Earth science. Letters *A* through *H* are locations on Earth's surface.



48 At which location would the angle of the noon Sun on December 21 have the greatest altitude?

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

49 The approximate difference in time between an observer located at position *B* and an observer located at position *D* is

(1) 10 hours
(2) 8 hours
(3) 6 hours
(4) 4 hours

50 A different number of daylight hours are received at locations *A* and *G* in January, primarily because of

(1) Earth's rate of revolution
(2) Earth's rate of rotation
(3) the difference in longitude
(4) the tilt of Earth on its axis

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 *2011 Edition Reference Tables for Physical Setting/Earth Science*.

Base your answers to questions 51 and 52 on the passage below and on your knowledge of Earth science.

Major Minerals of New York State

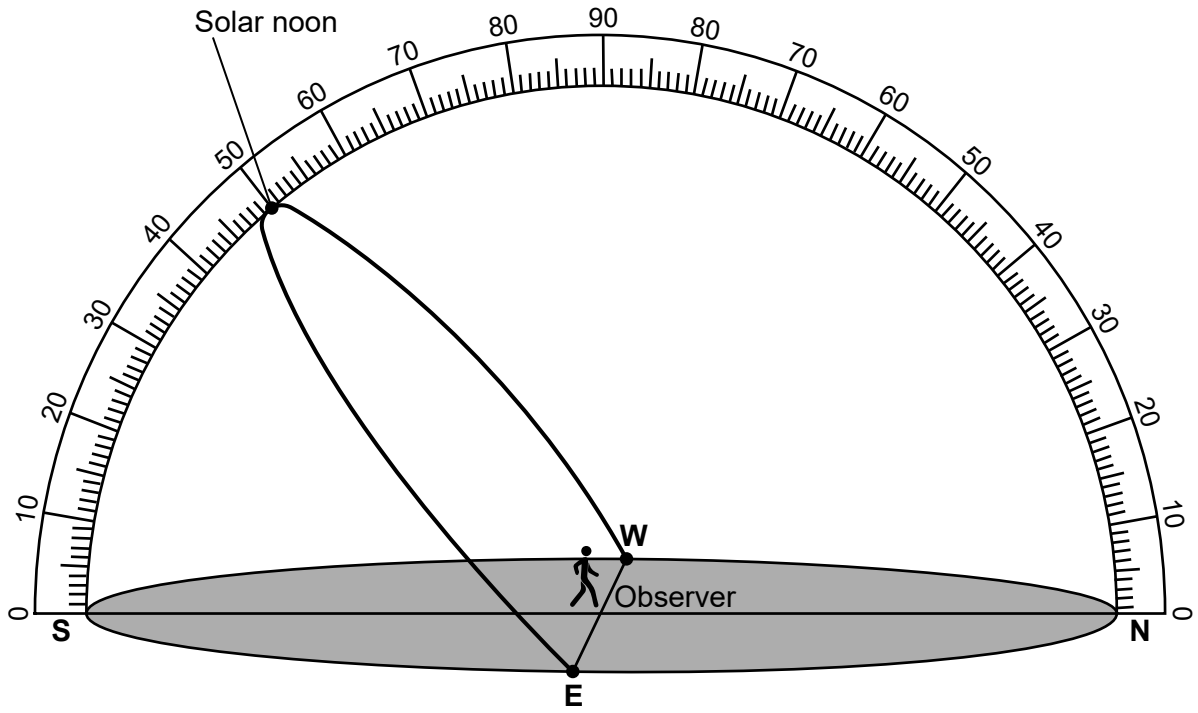
Hundreds of different kinds of minerals can be found throughout New York State. However, only a few are common, and these are mainly found in the Adirondack Mountains and the Allegheny Plateau. Most Adirondack minerals occur in metamorphic rocks. The mineral garnet, New York State's gemstone, has been mined in the Adirondacks for nearly 150 years. Other minerals found in the Adirondacks are magnetite, graphite, talc, galena, wollastonite (a silicate mineral with many industrial uses), and tourmaline (a silicate gemstone of many colors).

The Allegheny Plateau contains Silurian-age bedrock below the surface that is economically important. These rocks are a source of halite. Some of these deposits are "mined" today by pumping water underground to dissolve the halite and then pumping the salty water back up where evaporation causes the halite to precipitate and form crystals.

51 From the Adirondack minerals named in the passage, identify one mineral with a metallic luster and one mineral with a nonmetallic luster. [1]

52 Most garnet mined in New York State is used as an abrasive for products such as sand paper. Identify the primary mineral property that makes garnet particularly useful for this purpose. [1]

Base your answers to questions 53 through 55 on the diagram below and on your knowledge of Earth science. The diagram represents the position of the noon Sun along its apparent daily path as seen by an observer in the United States on September 23.



53 Identify the Sun's altitude at solar noon. [1]

54 State the number of daylight hours at this location on the date shown. [1]

55 Identify the motion of Earth that causes the Sun's apparent daily path through the sky. [1]

Base your answers to questions 56 through 59 on the data table below and on your knowledge of Earth science. The data table below shows the decay of a radioactive isotope over a period of years.

Radioactive Isotope Decay

Time (years)	**Percentage of Radioactive Material Remaining** (%)
0	100.0
5700	50.00
11,400	25.00
17,100	12.50
22,800	6.250
28,500	3.125

56 On the grid *in your answer booklet*, plot the percent of radioactive material remaining for each time shown in the data table. Connect *all six* plots with a line. [1]

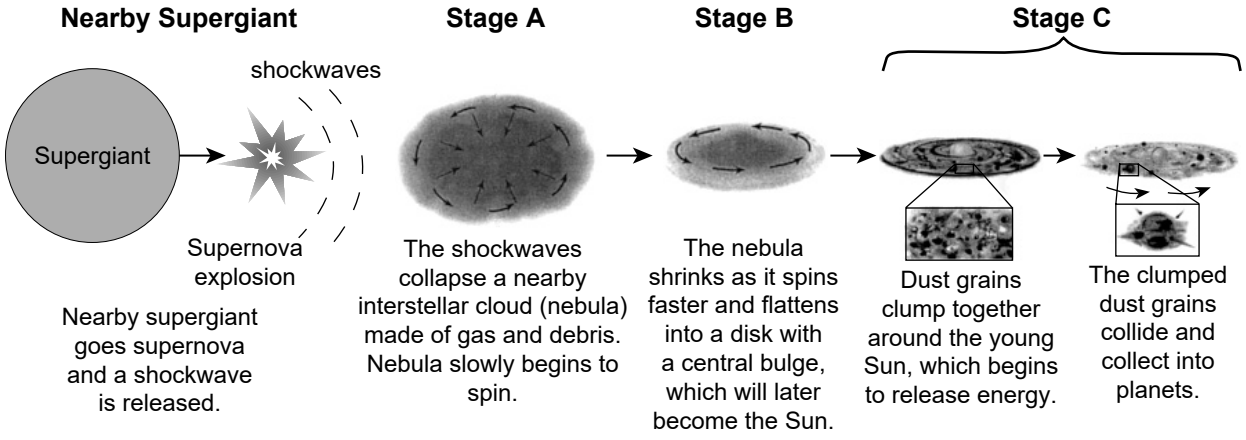
57 Identify this radioactive isotope. [1]

58 Identify the number of years that have passed if only 1.5625% of the radioactive material remains. [1]

59 Explain why this radioactive material would *not* be used to confirm the age of a sample believed to be 1 million years old. [1]

Base your answers to questions 60 through 62 on the diagram below and on your knowledge of Earth science. The diagram represents three stages, labeled *A*, *B*, and *C*, in the inferred formation of our solar system following the explosion of a nearby supergiant.

Inferred Formation of Our Solar System



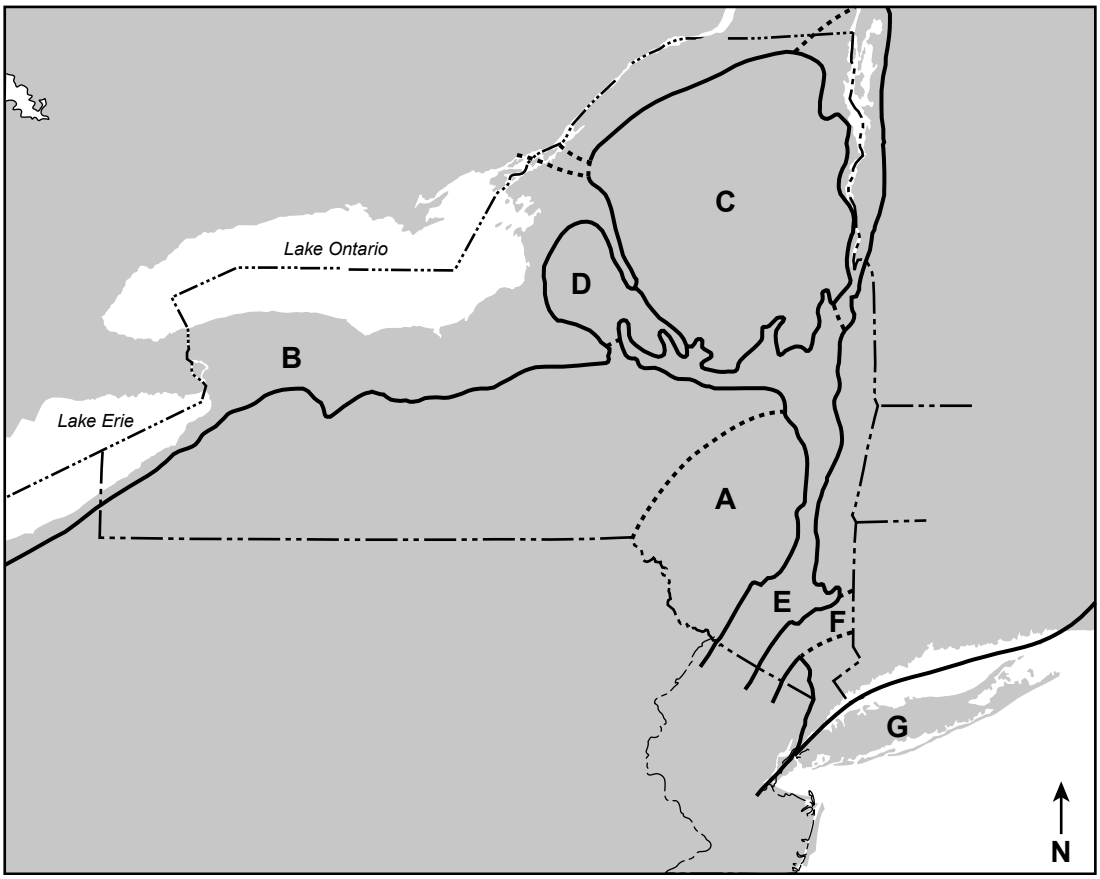
(Not drawn to scale)

60 State the name of *one* star that could undergo a supernova explosion. [1]

61 Identify the nuclear process the young Sun begins to undergo in stage *C* to release energy. [1]

62 State the name and shape of the galaxy in which the stages shown in the diagram occurred. [1]

Base your answers to questions 63 through 65 on the map below and your knowledge of Earth science. The map shows generalized landscape regions of New York State. Selected landscape regions are labeled *A* through *G*.



63 Two topographic maps using the same contour interval and the same scale were made to show the elevations of landscape regions *B* and *C*. Describe how the spacing between the contour lines in landscape region *B* would differ from the spacing between the contour lines in landscape region *C*. [1]

64 Identify the New York State river that flows from landscape region *C* through landscape regions *E* and *F*. [1]

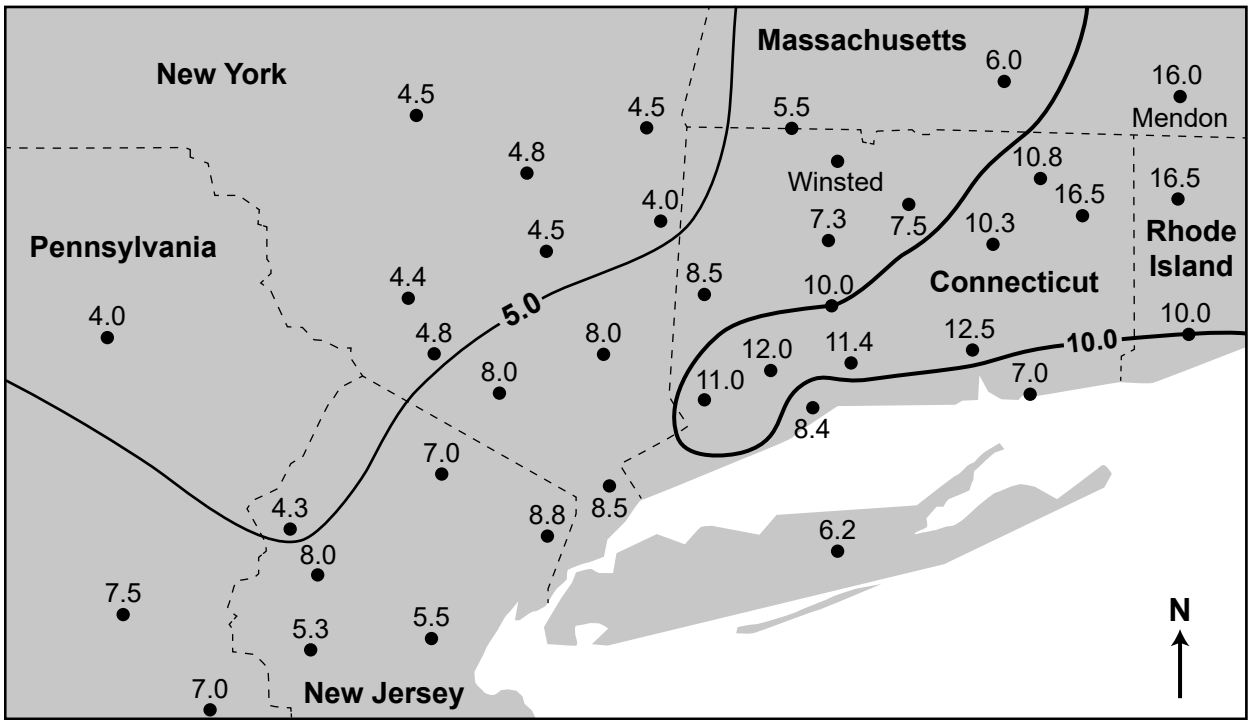
65 Write the letter of the landscape region composed of mostly Pleistocene-age moraines and glacial outwash plains. [1]

Part C

Answer all questions in this part.

Directions (66–85): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Earth Science*.

Base your answers to questions 66 through 68 on the map below and on your knowledge of Earth science. The map shows snowfall totals in inches in the northeastern United States from a single winter storm that ended on March 4, 2019. The dots on the map indicate where snowfall measurements were taken. The 5.0-inch and 10.0-inch snowfall isolines are shown on the map. The locations of Winsted, Connecticut, and Mendon, Massachusetts, are indicated.

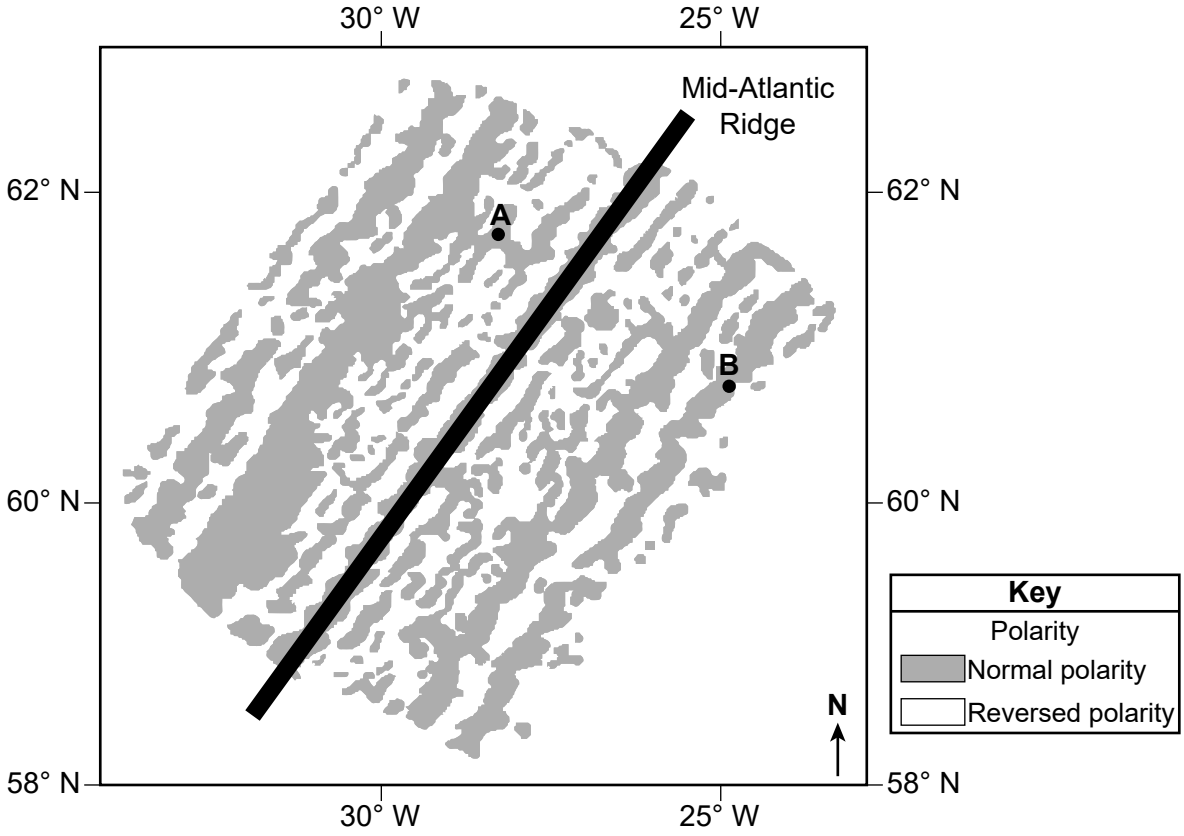


66 This storm was the result of the interaction of an mT air mass with a cP air mass. Describe the moisture and temperature characteristics of the mT air mass. [1]

67 Identify the snowfall amount most likely recorded in Winsted, Connecticut, due to this snowstorm. [1]

68 The snowfall recorded at Mendon, Massachusetts, occurred over a 10-hour period. Calculate the snowfall rate in inches per hour. [1]

Base your answers to questions 69 through 71 on the map below and on your knowledge of Earth science. The map shows the bands of normal and reversed magnetic polarity of a portion of the ocean-floor bedrock just southwest of the Iceland Hot Spot on both sides of the Mid-Atlantic Ridge. Letters *A* and *B* represent locations on the ocean floor of two tectonic plates.

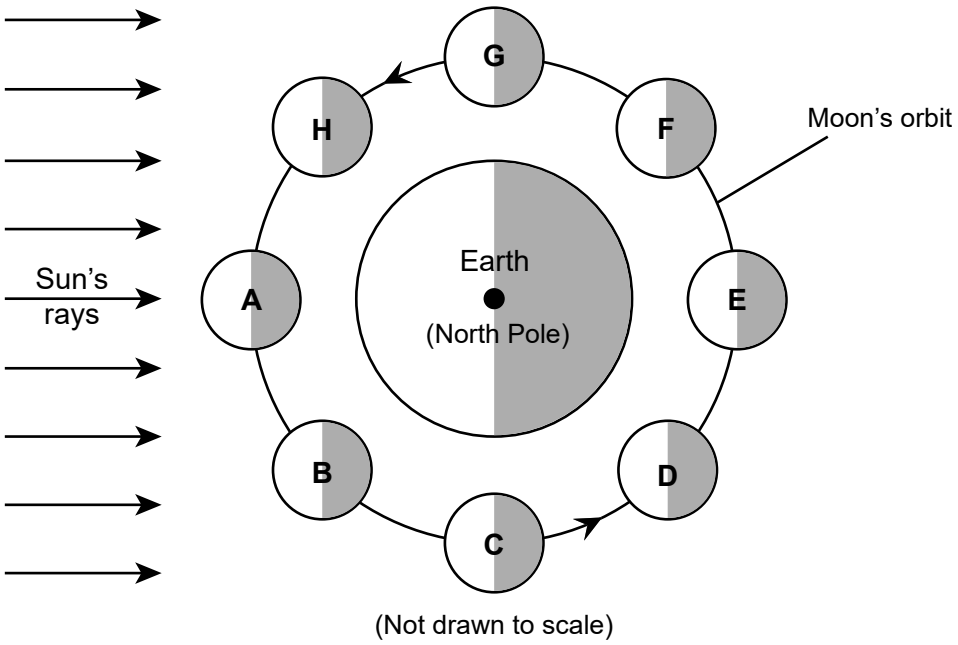


69 Identify the names of the tectonic plates on which *A* and *B* are located. [1]

70 *In your answer booklet*, circle the term that best indicates the age of surface bedrock at location *A* relative to the age of surface bedrock at location *B*. Describe the evidence that supports your answer. [1]

71 Describe the relative tectonic plate motion that produced this pattern of magnetic polarity. [1]

Base your answers to questions 72 through 75 on the diagram below and on your knowledge of Earth science. The diagram represents the Moon at eight positions, *A* through *H*, in its orbit around Earth. The shaded parts of the Moon and Earth represent darkness.



72 Identify the lettered position of the Moon where a lunar eclipse could be observed from Earth. [1]

73 State the number of days required for one complete cycle of Moon phases. [1]

74 Identify the mean distance of the Moon from Earth in million kilometers. [1]

75 Describe the actual shape of the Moon's orbit. [1]

Base your answers to questions 76 through 79 on the passage and map below and on your knowledge of Earth science. The map shows the location of the Totten Glacier in Antarctica.

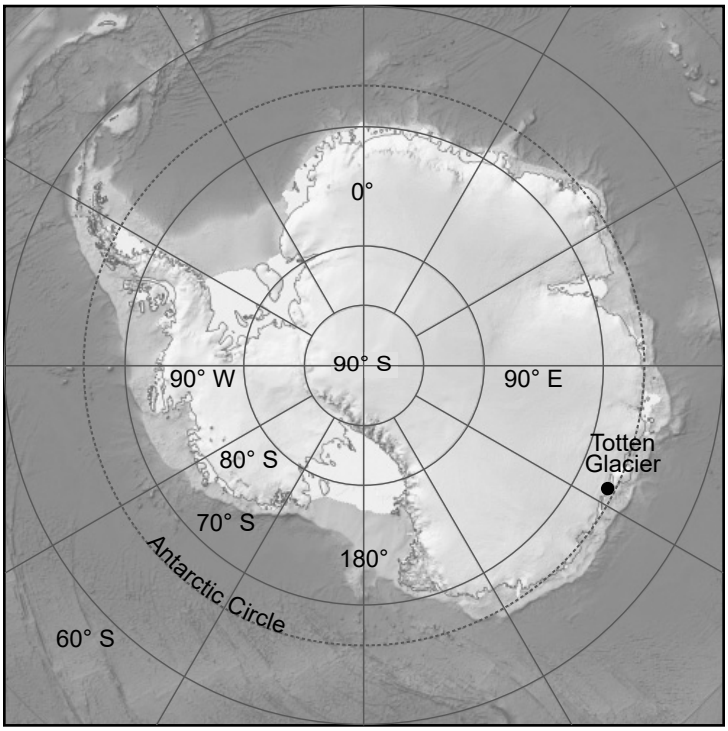
Antarctic Warming

Antarctica contains about 90% of Earth's ice. Portions of Antarctica are covered with ice sheets that are nearly three miles thick. These ice sheets are inferred to have formed approximately 10 million years ago.

Warming global temperatures and warming ocean waters have caused the rate of glacial melting to increase. This is occurring to one of the biggest glaciers on Antarctica's east coast, the Totten Glacier, which could raise global sea levels by 12.6 feet alone if all its ice melted.

Scientists are currently trying to determine the actual rate at which the ice in Antarctica is being lost. Snowfall, which adds to ice buildup, must also be considered in this determination. However, most of Antarctica is a polar desert, receiving only small amounts of snow annually.

Location of Totten Glacier in Antarctica



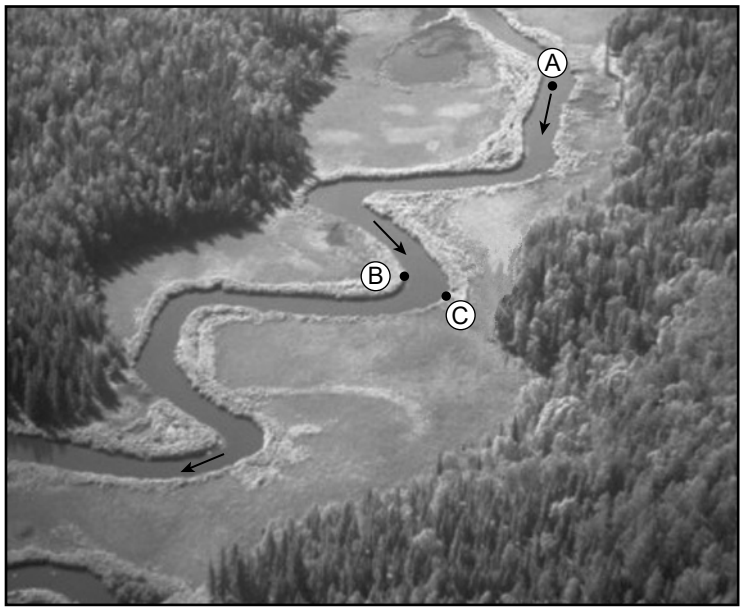
76 Identify the geologic period and epoch when the 3-mile-thick ice sheets in Antarctica are inferred to have formed. [1]

77 Describe the general relationship between increasing average global temperatures and sea level height. [1]

78 Identify *two* major greenhouse gases that contribute to global warming. [1]

79 *In your answer booklet*, place one check mark (✓) in the box to show the dominant type of air pressure that is located over the South Pole (90° S) that causes desert-like conditions. Also, place another check mark in the box that identifies the general direction of vertical air movement over the South Pole. [1]

Base your answers to questions 80 through 83 on the photograph below and on your knowledge of Earth science. The photograph shows the landscape features associated with a meandering stream. Point *A* represents a location in the stream. Points *B* and *C* represent locations on the edges of the stream. The arrows indicate the direction of stream flow.



80 The velocity of the stream at location *A* is 5 centimeters per second (cm/s). Identify the names of *all* the particle sizes that are carried by the stream at location *A*. [1]

81 Explain why location *C*, located on the outside of a meander curve, is likely to experience more erosion than location *B*. [1]

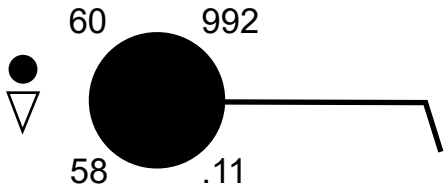
82 State the name of the large flat landscape area found on both sides of the stream. [1]

83 Describe the change in the stream's discharge and velocity during a spring snow melt. [1]

Base your answers to questions 84 and 85 on the map in your answer booklet and on your knowledge of Earth science. The map shows a low-pressure system in the eastern part of the United States. Line *AB* and line *AC* represent two frontal boundaries. Letter Z is a location on Earth's surface. Air masses are labeled.

84 On the map *in your answer booklet*, draw the correct front symbols along line *AB* and along line *AC*, to represent the types of fronts and their direction of movement. [1]

85 Below is the station model found at location Z. Complete the table *in your answer booklet* by recording the weather data shown on the station model for location Z. [1]



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