The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Thursday, June 20, 2024 — 9:15 a.m. to 12:15 p.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.

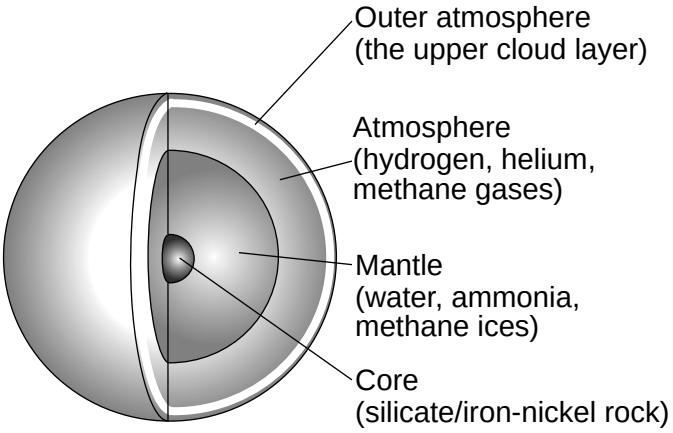
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

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 The diagrams below represent the atmosphere and inferred interior structure of the planet Uranus.



Which two factors caused the inferred layered structure of this planet in our solar system?

(1) gravity and eccentricity of the orbit
(2) gravity and density differences of materials
(3) period of rotation at equator and eccentricity of the orbit
(4) period of rotation at equator and density differences of materials

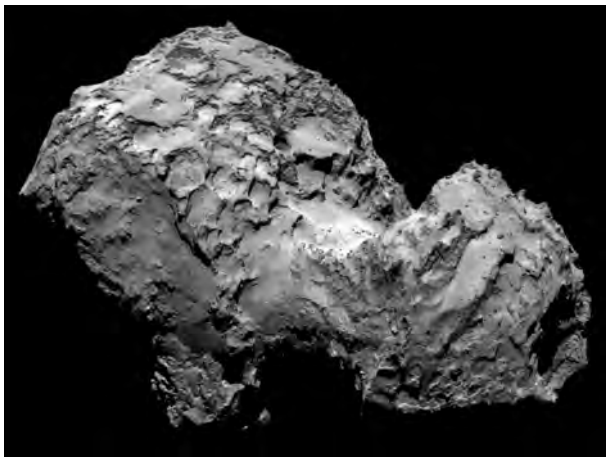
2 Which process occurring in the Sun produces energy by converting lighter hydrogen into heavier helium?

(1) radiation
(2) conduction
(3) radioactive decay
(4) nuclear fusion

3 Compared to the sizes and periods of revolution of the terrestrial planets, the Jovian planets have

(1) smaller sizes and shorter periods of revolution
(2) smaller sizes and longer periods of revolution
(3) larger sizes and shorter periods of revolution
(4) larger sizes and longer periods of revolution

4 The photograph below shows a dust-covered, icy object that has a highly elliptical orbit in our solar system.



This celestial object is most likely a

(1) comet that leaves a trail of particles in space
(2) meteor that leaves a trail of light across the sky
(3) moon that revolves around a planet
(4) planet that revolves around the Sun

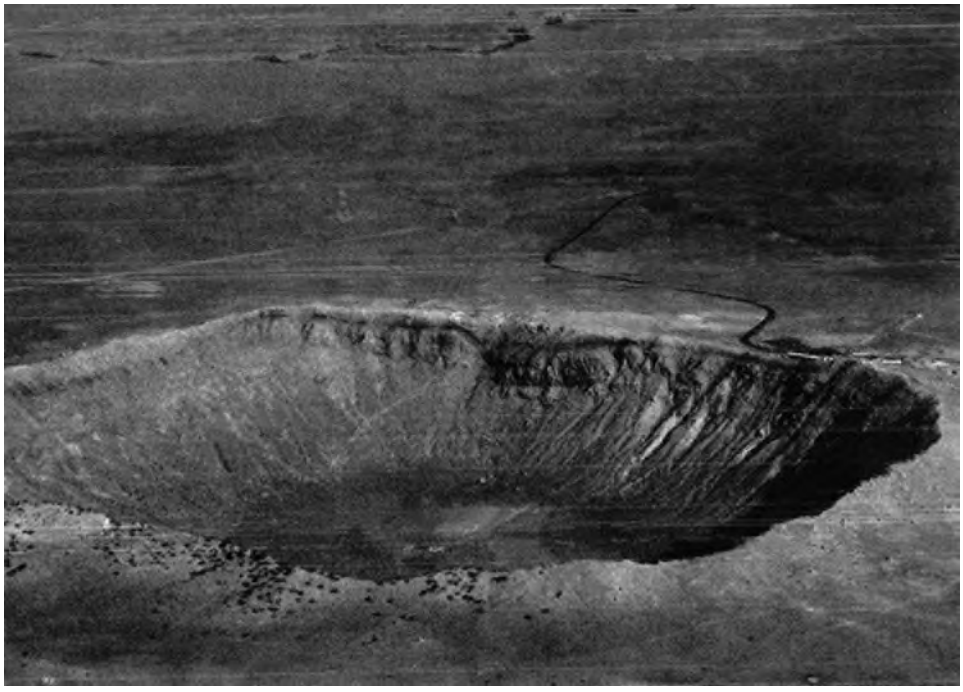
5 At which location will the Sun appear to pass directly overhead for an observer?

(1) northern Asia
(2) northern Australia
(3) southern Greenland
(4) southern Antarctica

6 The hydrosphere covers approximately

(1) 70% of Earth's atmosphere
(2) 70% of Earth's lithosphere
(3) 85% of Earth's atmosphere
(4) 85% of Earth's lithosphere

7 The photograph below shows a one-mile diameter feature on Earth's surface.



What is this feature, and how was it formed?

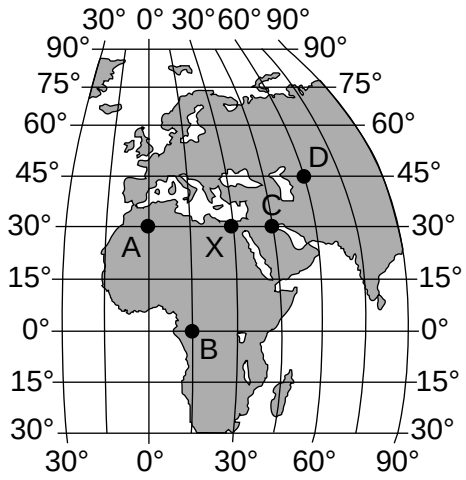
(1) dry kettle lake, formed from an impact event
(2) dry kettle lake, formed from a retreating glacier
(3) crater, formed from an impact event
(4) crater, formed from a retreating glacier

8 The time-lapse photograph below shows stars as they appear to move around the central star Polaris.

Polaris does *not* appear to move in the nighttime sky because Polaris is located

(1) in our solar system
(2) in our galaxy
(3) above Earth's axis of rotation
(4) above Earth's equator

9 The map below shows five locations, labeled *A*, *B*, *C*, *D*, and *X*, on Earth's surface. Solar noon is occurring at location *X*.



At which location is the time 2:00 p.m.?

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

10 Approximately how many degrees per day does Earth move in its orbit around the Sun?

(1) 1°/day
(2) 15°/day
(3) 24°/day
(4) 360°/day

11 Which motion explains why some constellations appear in the night sky only during specific seasons?

(1) The Sun revolves around Earth.
(2) Earth revolves around the Sun.
(3) Constellations revolve around Earth.
(4) Constellations revolve around the Sun.

12 What is the relative humidity when the air temperature is 20°C and the wet-bulb temperature is 11°C?

(1) 9%
(2) 2%
(3) 17%
(4) 30%

13 Earth's early atmosphere consisted of carbon dioxide, water vapor, hydrogen, and nitrogen. During this time in Earth's history, the first crust formed and was made of igneous rock. Based on this information, how did Earth's early atmosphere most likely form?

(1) outgassing from volcanic eruptions
(2) radioactive decay of igneous rock
(3) release of gases from plant life
(4) evaporation of ocean water

14 The subtropical jet streams are located in Earth's

(1) lower troposphere near 30° N and 30° S
(2) upper troposphere near 30° N and 30° S
(3) lower troposphere near 60° N and 60° S
(4) upper troposphere near 60° N and 60° S

15 The transfer of heat energy in the oceans due to density differences is best described as

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

16 Which list of Earth materials indicates an increasing order in the amount of energy needed to raise the temperatures of equal masses of the materials by 1°C?

(1) copper, iron, basalt
(2) basalt, iron, granite
(3) iron, copper, lead
(4) lead, basalt, granite

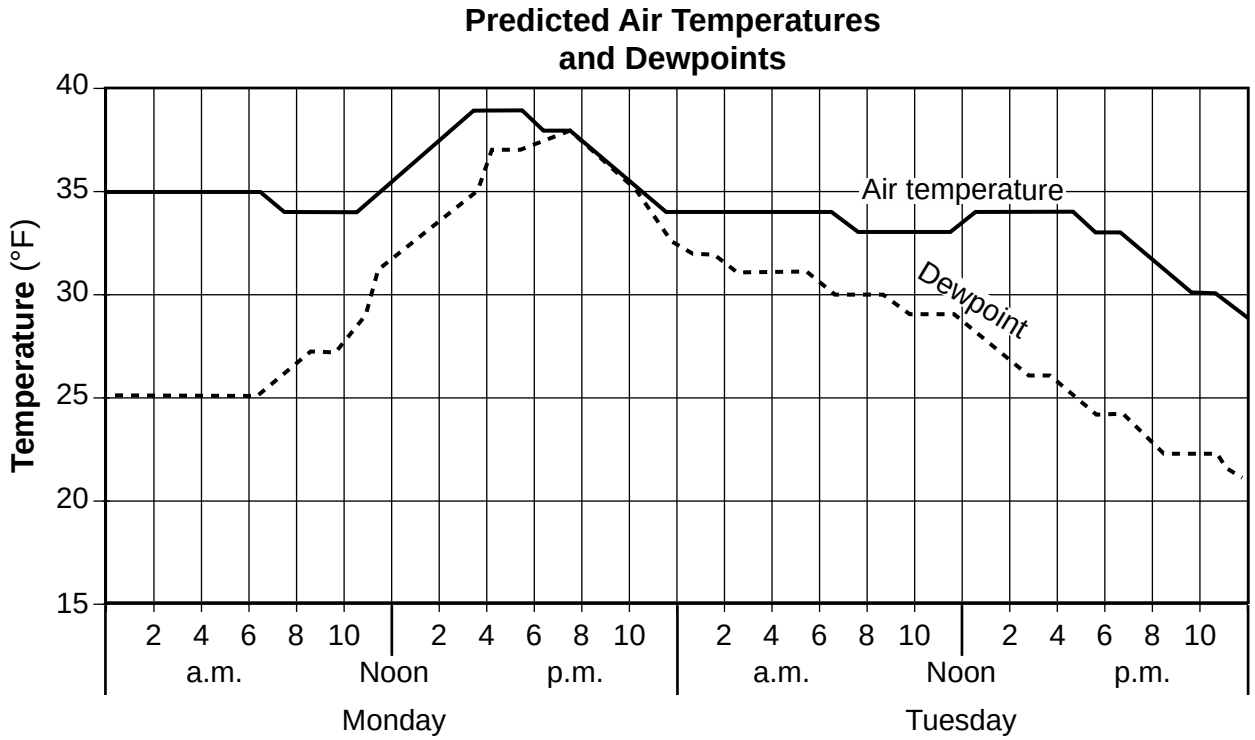
17 Which color and texture of surfaces with equal areas will have the *least* temperature increase when heated by the Sun?

(1) light color and smooth texture
(2) light color and rough texture
(3) dark color and smooth texture
(4) dark color and rough texture

18 Over the last 200 years, global warming is inferred to be primarily caused by

(1) strong El Niño conditions
(2) retreating glaciers
(3) an increase in greenhouse gases
(4) an increase in sea level

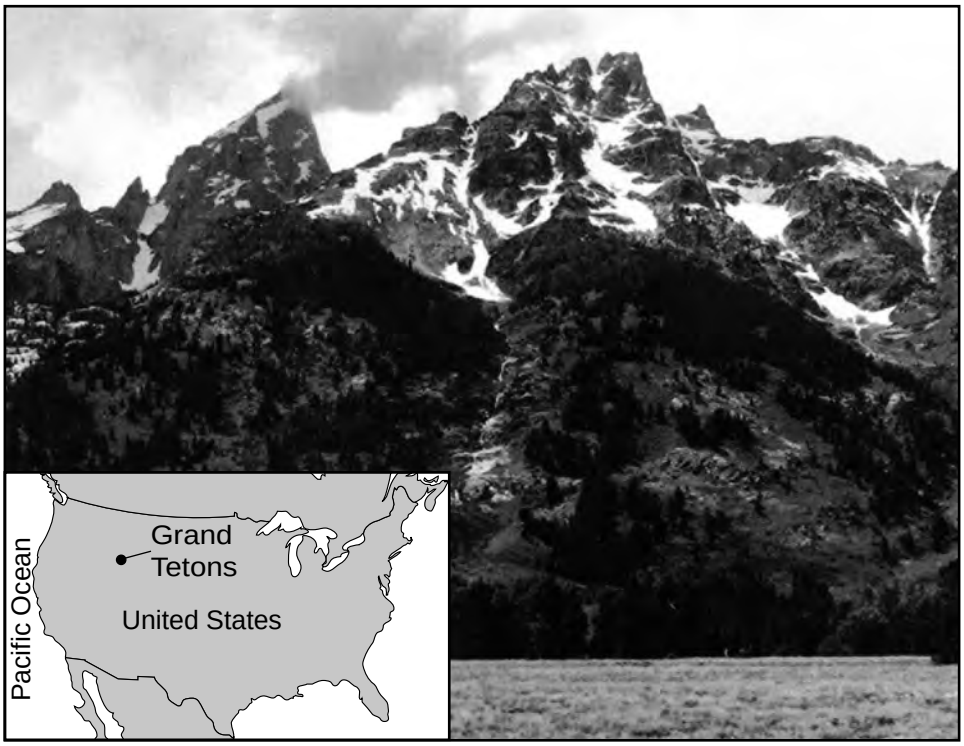
19 The graph below shows predicted air temperatures and dewpoints for a New York State location during a two-day period.



What is the day and time when precipitation will most likely occur at this location?

(1) Monday at 6:00 a.m.
(2) Monday at 8:00 p.m.
(3) Tuesday at 8:00 a.m.
(4) Tuesday at 6:00 p.m.

20 The photograph below shows a portion of the Grand Teton Mountains on a mid-July day. The inset map of the United States shows the location of the Grand Tetons.



Which factor is responsible for the snow seen on these mountains in July?

(1) elevation
(2) longitude
(3) latitude
(4) steep slopes

21 Which percentage of the radioactive potassium-40 in a sample will have decayed in 2.6×10^9 years?

(1) 25%
(2) 50%
(3) 75%
(4) 100%

22 Based on Earth's geologic history, which group of organisms has existed for the *shortest* amount of time?

(1) grasses
(2) dinosaurs
(3) birds
(4) humans

23 Oxygen first became a major part of Earth's atmosphere from the

(1) rifting in the Iapetus ocean
(2) life processes of cyanobacteria in the ocean
(3) extensive coal-forming forests
(4) breakdown of ozone by ultraviolet radiation

24 The letter *X* on the map below shows the location of the present state of Florida on the early continent of North America.

The region that is now Florida is inferred to have been positioned on the equator approximately

(1) 59 million years ago
(2) 119 million years ago
(3) 232 million years ago
(4) 458 million years ago

25 The division of geologic time into eras, periods, and epochs is based upon the

(1) appearance and extinction of life forms
(2) occurrences of widespread volcanic eruptions
(3) reversals in Earth's magnetic field
(4) major mountain-building events

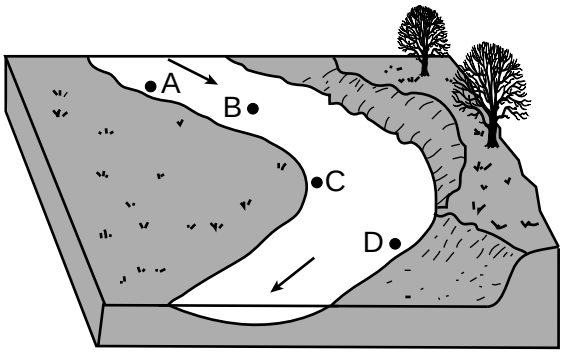
26 The first *P*-wave from an earthquake was recorded at 10:20:00 a.m. at a seismic station located 2200 km from the earthquake epicenter. At what time did the *S*-wave arrive?

(1) 10:12:00 a.m.
(2) 10:16:30 a.m.
(3) 10:23:30 a.m.
(4) 10:27:50 a.m.

27 Which two hot spots are located at plate boundaries?

(1) Iceland and Yellowstone
(2) Tasman and St. Helena
(3) Canary Island and Galapagos
(4) Easter Island and Bouvet

28 The block diagram below shows a portion of a meandering stream. Points *A*, *B*, *C*, and *D* are locations on the streambed. The arrows show the direction of stream flow.



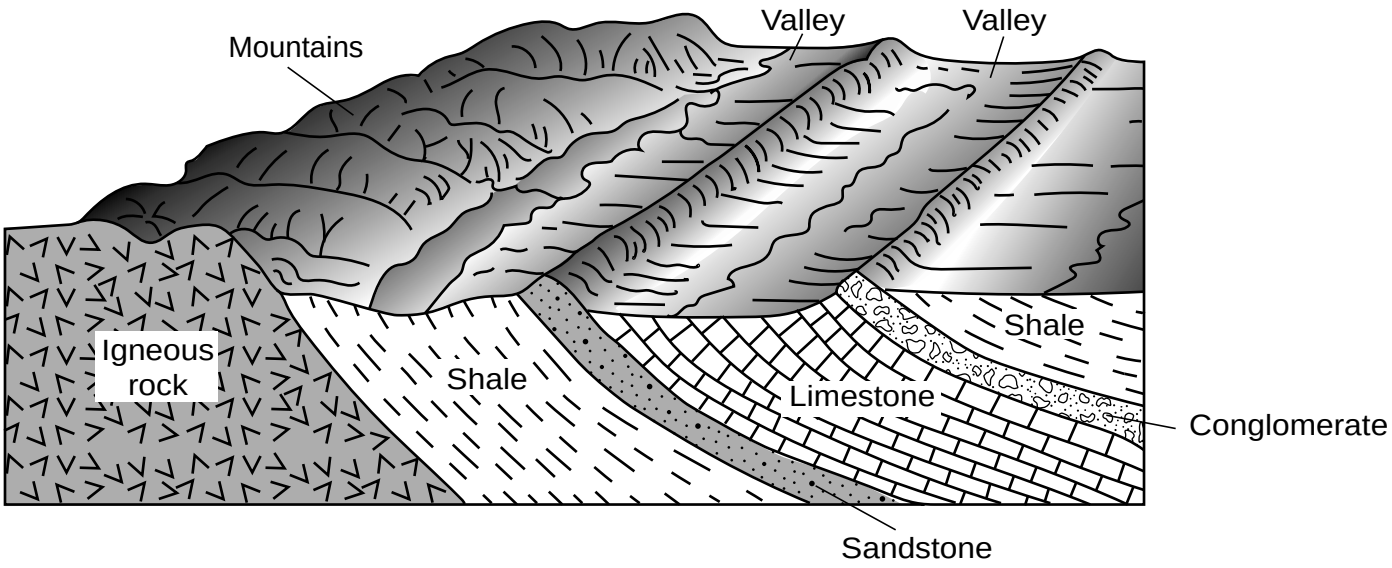
At which location is the greatest amount of deposition most likely occurring?

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

29 Instruments that record seismic waves on Mars allow scientists to infer the

(1) gravitational forces between Mars and its two moons
(2) percentage of minerals in the crust of Mars
(3) availability of surface water on Mars
(4) internal structure of Mars

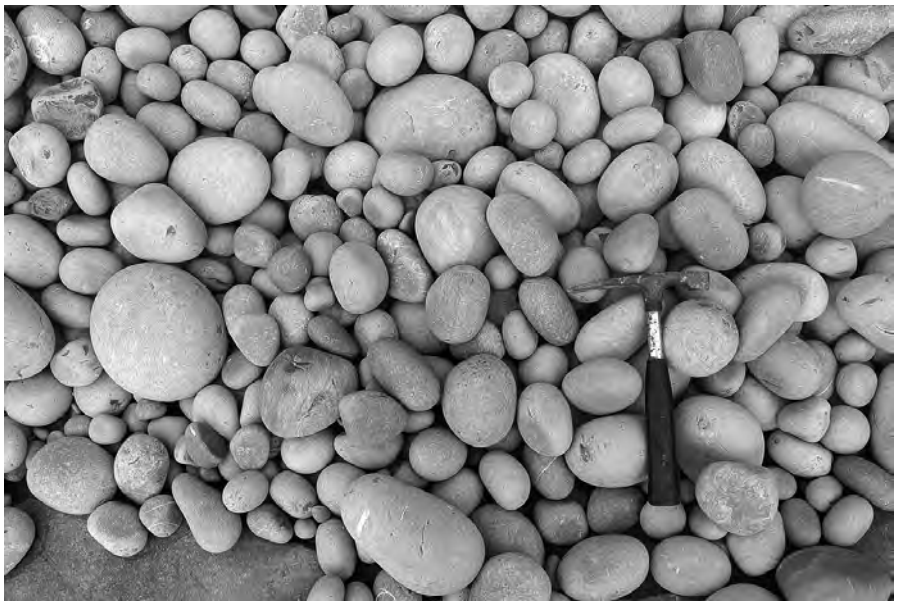
30 The block diagram below represents a landscape with two valleys.



The two valleys most likely formed because the shale and limestone bedrock

(1) are less resistant to weathering than the igneous, sandstone, and conglomerate bedrock
(2) are more resistant to weathering than the igneous, sandstone, and conglomerate bedrock
(3) have undergone shorter periods of weathering than the igneous, sandstone, and conglomerate bedrock
(4) have undergone longer periods of weathering than the igneous, sandstone, and conglomerate bedrock

31 The photograph below shows rocks found in England.

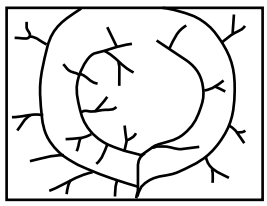


Which process most likely caused these rocks to become smooth and round over time?

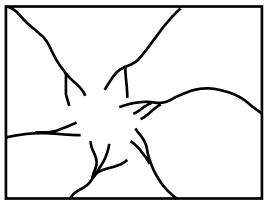
(1) abrasion in moving water
(2) dragging by a glacier
(3) sandblasting by wind
(4) downward movement by gravity

32 The photograph below shows a volcanic mountain.

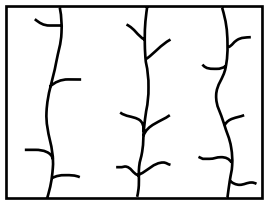
Which map best shows the most likely complete stream drainage pattern near the summit (top) of this mountain at the time of this photograph?



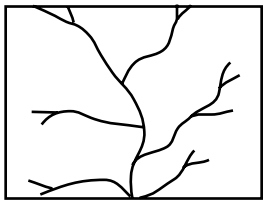
(1)



(3)

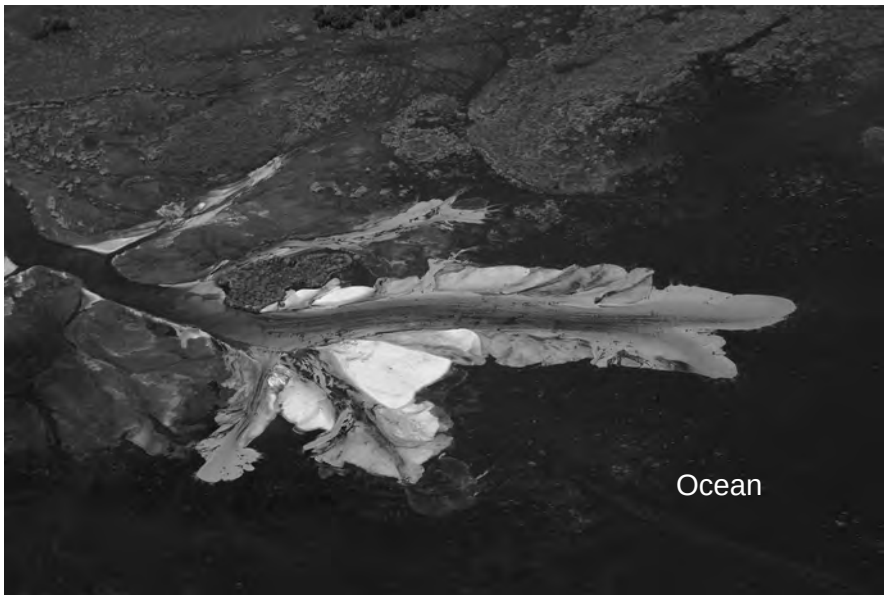


(2)



(4)

33 The aerial photograph below shows a landscape feature.



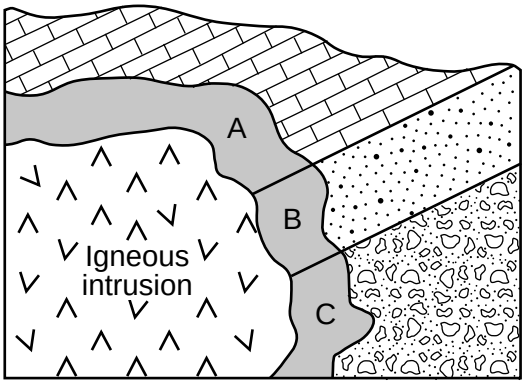
This landscape feature is a

(1) landslide formed by mass movement
(2) landslide formed by stream deposition
(3) delta formed by mass movement
(4) delta formed by stream deposition

34 What is the name and texture of a sedimentary rock composed of carbon?

(1) shale with a clastic texture
(2) shale with a bioclastic texture
(3) bituminous coal with a clastic texture
(4) bituminous coal with a bioclastic texture

35 The cross section below represents an igneous intrusion into sedimentary bedrock layers. Letters *A*, *B*, and *C* identify different rocks within the shaded zone of contact metamorphism.



Which metamorphic rocks are most likely formed in zones *A*, *B*, and *C*?

(1) *A* = marble, *B* = gneiss, *C* = schist
(2) *A* = marble, *B* = quartzite, *C* = metaconglomerate
(3) *A* = metaconglomerate, *B* = quartzite, *C* = marble
(4) *A* = metaconglomerate, *B* = schist, *C* = gneiss

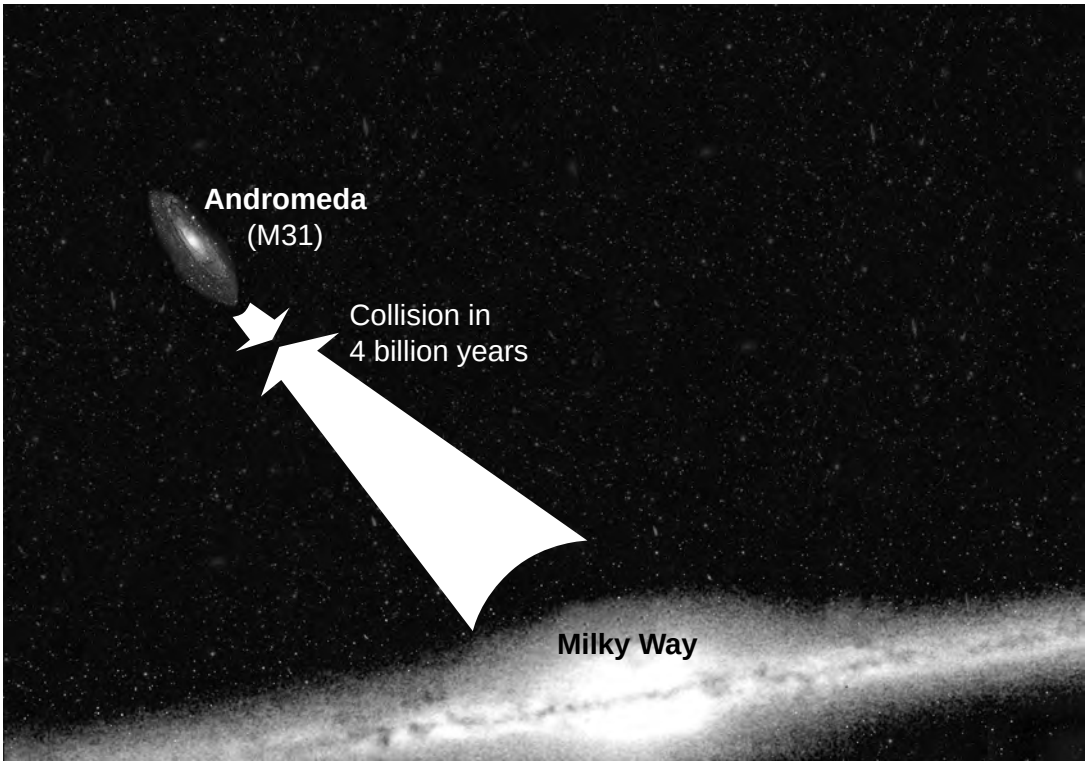
Part B–1

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 and 37 on the diagram below and on your knowledge of Earth science. The diagram represents the predicted collision between the Milky Way and its sister galaxy, Andromeda. The collision is predicted to begin in about four billion years. It will take an additional two billion years to completely merge these two galaxies into one galaxy.

Collision Scenario for the Milky Way and Andromeda Galaxies

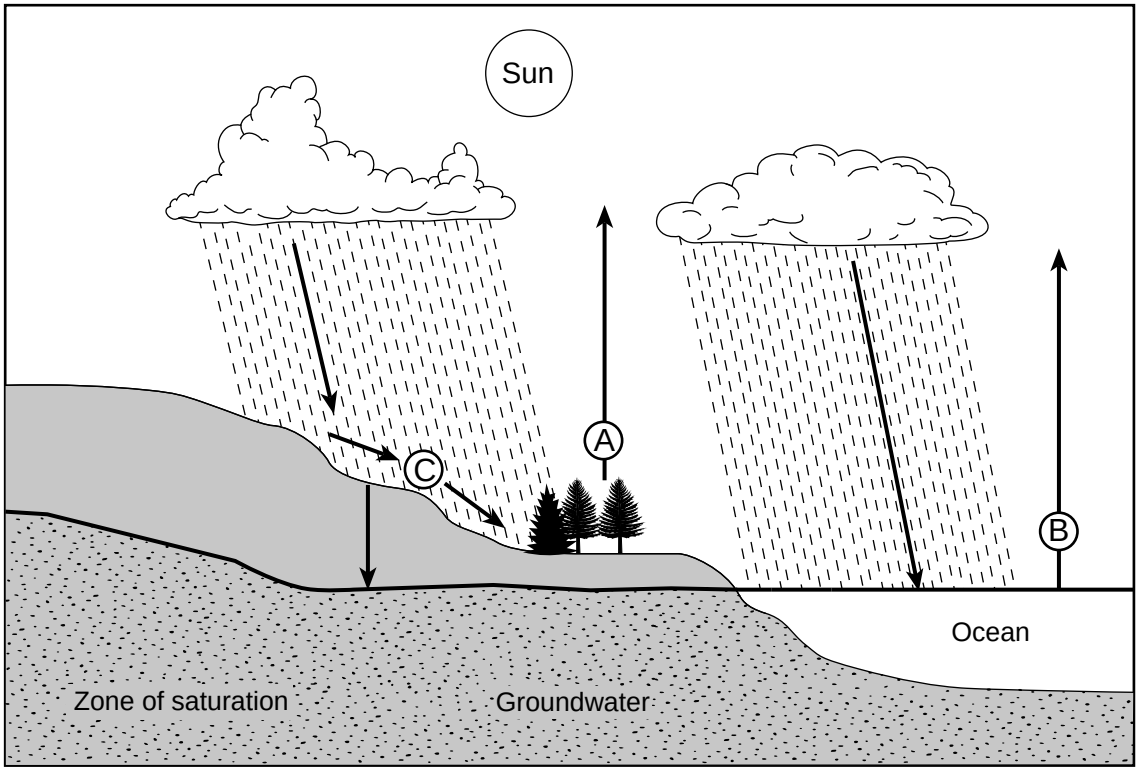


36 The gravitational force pulling the galaxies together is influenced by the
(1) mass of the stars and amount of cosmic background radiation
(2) mass of all the stars and the distance between the two galaxies
(3) ages of the stars and amount of cosmic background radiation
(4) ages of the stars and the distance between the two galaxies

37 The Andromeda Galaxy has a shape that is similar to the Milky Way Galaxy. The shape of the Andromeda Galaxy is best described as
(1) elliptical and is the only other galaxy in the universe
(2) elliptical and is one of the billions of other galaxies in the universe
(3) spiral and is the only other galaxy in the universe
(4) spiral and is one of billions of other galaxies in the universe

Base your answers to questions 38 through 40 on the diagram below and on your knowledge of Earth science. The diagram represents the water cycle. Letters *A* through *C* identify some processes. Arrows represent the movement of water.

The Water Cycle



38 Which process is represented by letter *A*?

(1) transpiration
(2) capillarity
(3) infiltration
(4) precipitation

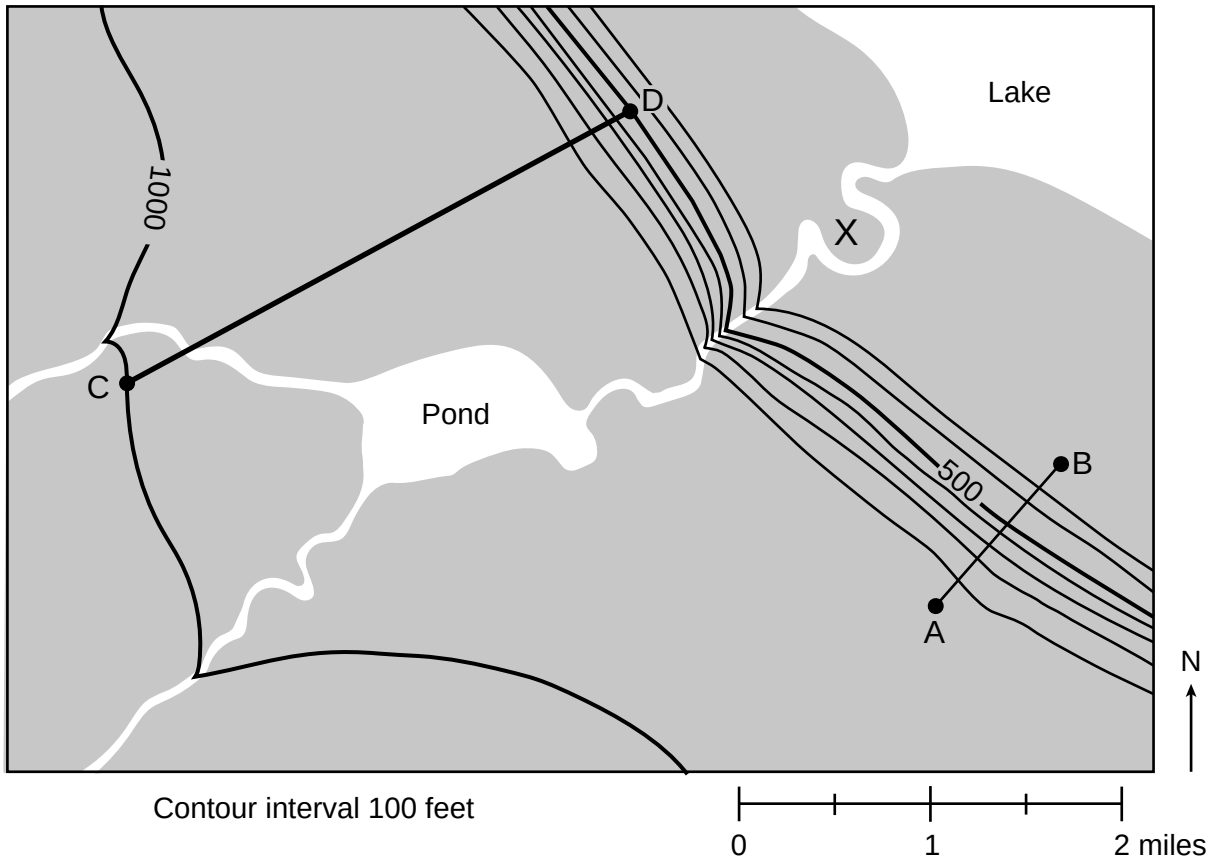
39 Which process and heat-energy exchange are represented by letter *B*?

(1) condensation; gain of 334 J/g
(2) condensation; release of 2260 J/g
(3) evaporation; gain of 2260 J/g
(4) evaporation; release of 334 J/g

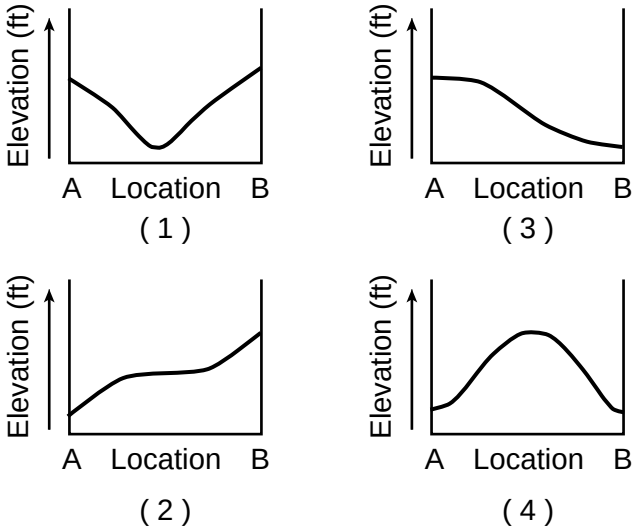
40 Which conditions would cause runoff at location *C* to *decrease*?

(1) decreased precipitation and decreased slope
(2) decreased precipitation and increased slope
(3) increased precipitation and decreased slope
(4) increased precipitation and increased slope

Base your answers to questions 41 through 44 on the topographic map below and on your knowledge of Earth science. Lines *AB* and *CD* are reference lines on the map. Elevations are shown in feet. Letter *X* represents a location on Earth's surface.



41 Which profile represents the most likely shape of the land between locations *A* and *B*?



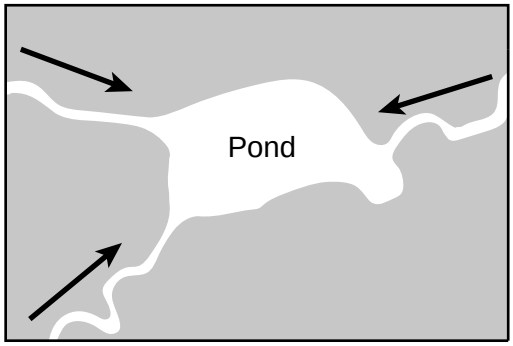
42 What is the approximate gradient, in feet per mile (ft/mi), from point *C* to point *D* on the map?

(1) 133 ft/mi
(2) 167 ft/mi
(3) 250 ft/mi
(4) 500 ft/mi

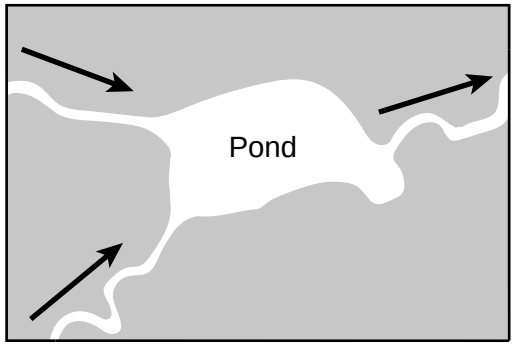
43 Letter *X* is located on which landscape feature?

(1) sandbar
(2) sand dune
(3) escarpment
(4) flood plain

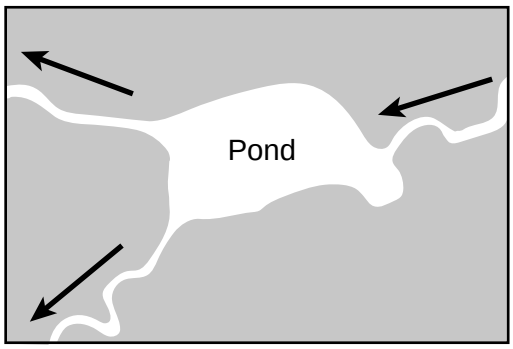
44 The arrows on which map best represent the direction of stream flow relative to the pond?



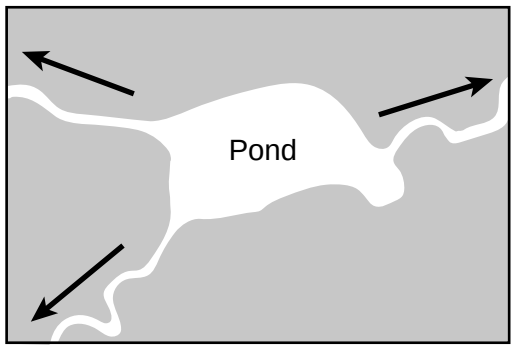
(1)



(3)

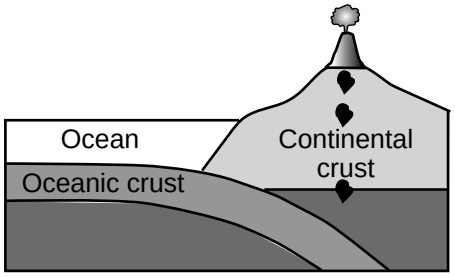


(2)

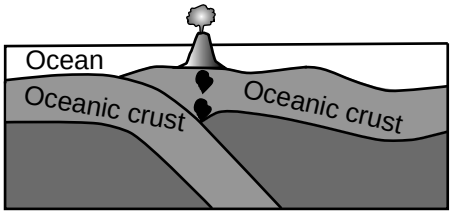


(4)

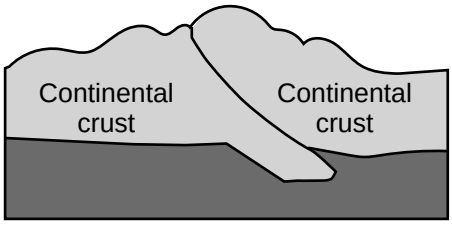
Base your answers to questions 45 through 47 on the cross sections below and on your knowledge of Earth science. The cross sections represent three plate boundaries labeled *A*, *B*, and *C*.



(A)



(B)

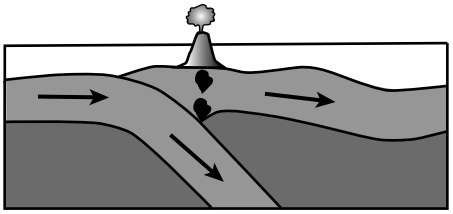


(C)

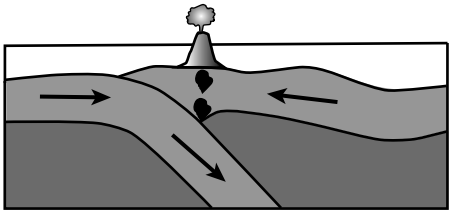
45 Compared to the density and thickness of the continental crust in diagram *A*, the oceanic crust is

(1) less dense and thinner
(2) less dense and thicker
(3) more dense and thinner
(4) more dense and thicker

46 Which diagram best represents the relative motion of the oceanic crust at plate boundary *B*?



(1)



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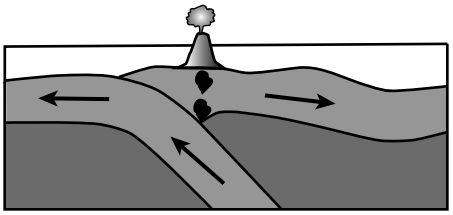
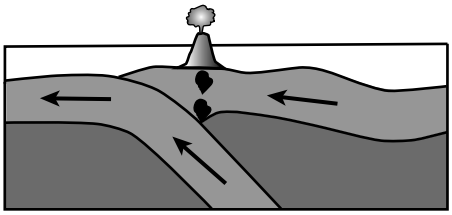


(2)



(4)

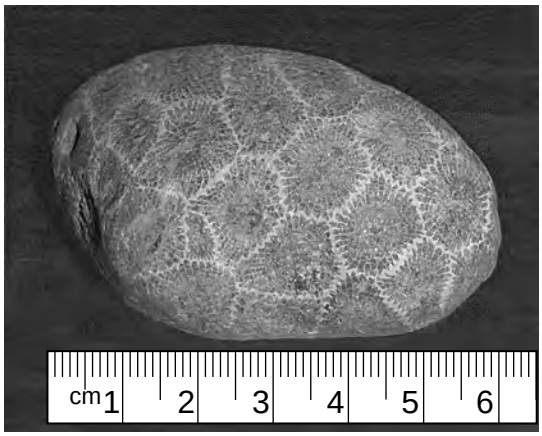
47 Which geologic surface feature is created at plate boundary *C*?

(1) ocean trench
(2) rift valley
(3) volcanic mountain
(4) folded mountain

Base your answers to questions 48 through 50 on the passage and photograph below and on your knowledge of Earth science. The photograph shows a typical Petoskey stone.

Petoskey Stones

Petoskey stones are famous rock specimens found on beaches all around Lake Michigan, but especially on beaches near the city of Petoskey, Michigan. The stones are actually well-eroded pieces of coral reefs that were alive between 375 and 400 million years ago. At the time the coral animals were living and forming the reefs, the area was underwater and the coral, along with many other reef animals, thrived. Eventually, the ocean disappeared and the fossil reefs were uncovered. Advancing and retreating glaciers broke pieces off the fossil reefs, smoothed their edges, and distributed them throughout the area. Lake Michigan, along with the other Great Lakes, formed at the end of the Ice Age. Today, lake waves continue to distribute a seemingly endless supply of Petoskey stones, with their unique coral fossils, to the beaches around Lake Michigan.



(Actual size)

48 The coral that eventually became Petoskey stones were alive during which geologic time period?

(1) Permian
(2) Devonian
(3) Silurian
(4) Ordovician

49 Which New York State index fossil is in the same group of organisms as the Petoskey stone coral?

(1) *Lichenaria*
(2) *Platyceras*
(3) *Bothriolepis*
(4) *Cooksonia*

50 The Petoskey stone shown in the photograph is classified as a

(1) sand
(2) pebble
(3) cobble
(4) boulder

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 through 54 on the weather map in your answer booklet and on your knowledge of Earth science. The weather map shows air pressures in millibars (mb) at locations on and around the Florida Peninsula during Hurricane Wilma. Five isobars are shown.

51 On the map *in your answer booklet*, draw the 1000 mb and 1004 mb isobars. Extend the isobars to the edges of the map. [1]

52 Convert the air pressure of the lowest value isobar shown on the map from millibars to inches of mercury. [1]

53 Identify the weather instrument used to measure air pressure. [1]

54 Write the two-letter weather map symbol for the type of air mass in which this hurricane formed. [1]

Base your answers to questions 55 through 57 on the passage and data table below and on your knowledge of Earth science. The data table shows garnet coefficients and rock formation temperatures.

Using Garnet as a Geothermometer

A geothermometer mineral is a mineral with slight differences in composition that can be used to estimate the temperature at which some types of metamorphic rock form. Garnet is a geothermometer mineral because there are several kinds of garnet that contain different amounts of iron and magnesium. The "garnet coefficient" indicates the ratio of iron to magnesium found in the garnet. When the garnet coefficient is high, there is a greater percentage of iron compared to magnesium. The garnet coefficient is an indicator of the temperature at which a metamorphic rock formed.

Garnet Coefficient and Rock Formation Temperature

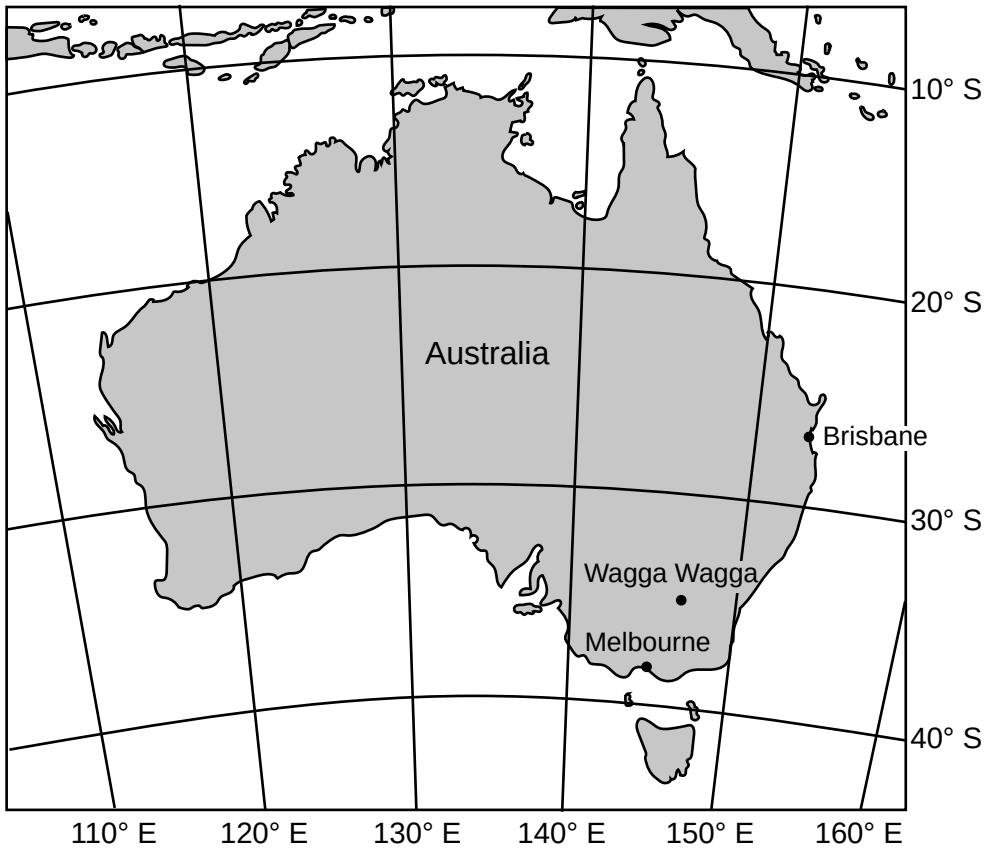
Garnet Coefficient	Temperature at Which Metamorphic Rock Formed (°C)
1.22	720
1.34	680
1.38	670
1.40	660
1.47	640
1.63	590
1.70	570

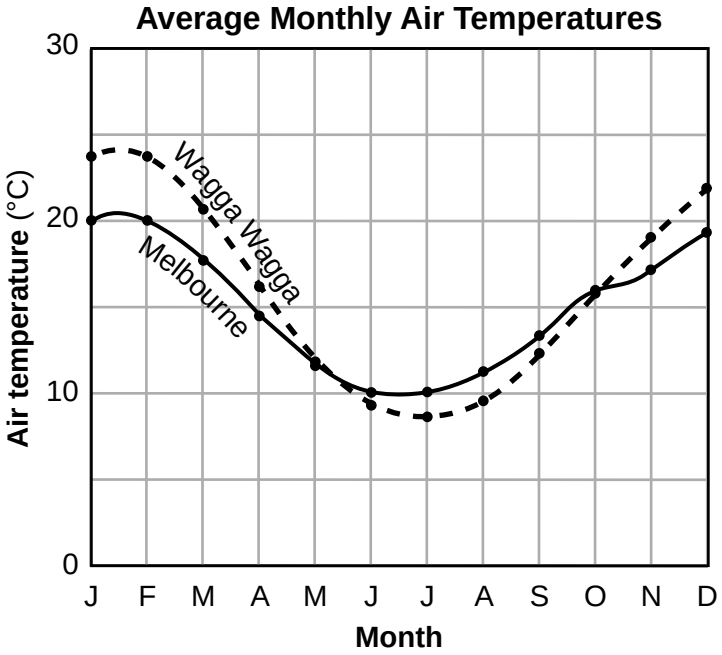
55 Determine the rock formation temperature for a rock sample with a garnet coefficient of 1.55. [1]

56 Describe the rock formation temperatures that are indicated when higher garnet coefficients are found. [1]

57 Identify *one* foliated metamorphic rock for which the garnet coefficient might be used to determine the temperature at which the rock formed. [1]

Base your answers to questions 58 and 59 on the map and graph below and on your knowledge of Earth science. The map of Australia shows the locations of three cities: Brisbane, Melbourne, and Wagga Wagga. The graph shows the average monthly air temperatures in Wagga Wagga and Melbourne, in degrees Celsius (°C).

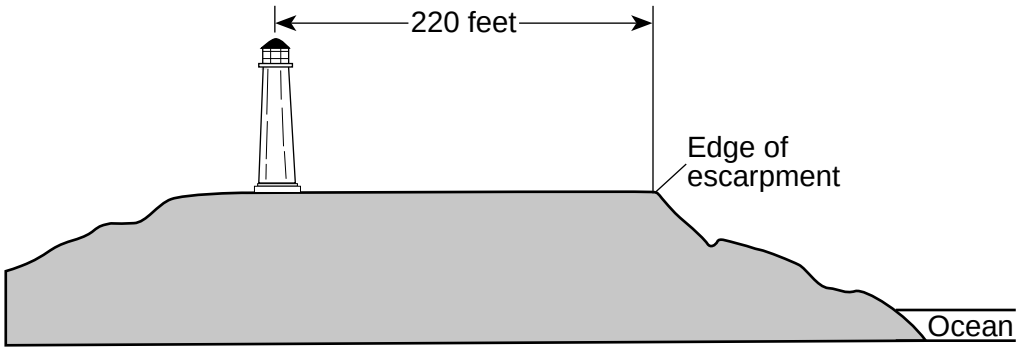




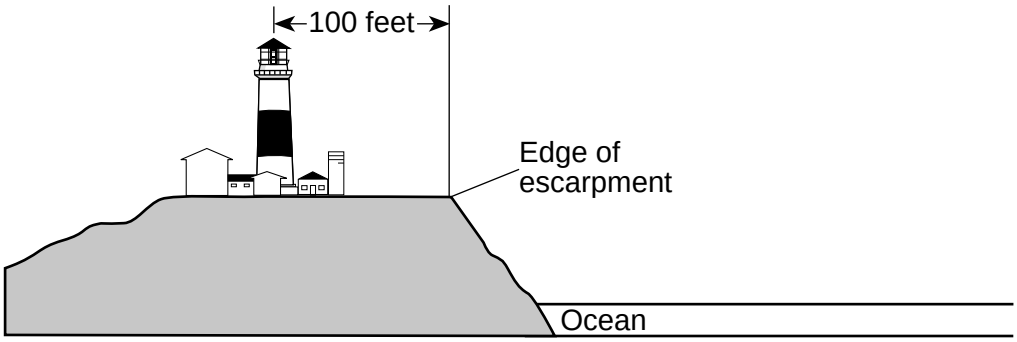
58 Compared to the average monthly air temperature curve for Melbourne, describe how the average monthly air temperature curve is different for a city in New York State. [1]

59 *In your answer booklet*, circle warm or cool to indicate the relative temperature of the ocean current that flows off the coast of Brisbane. State the name of this current. [1]

Base your answers to questions 60 through 62 on the cross sections below and on your knowledge of Earth science. The cross sections represent changes in the land at the Montauk Lighthouse between 1838 and 1988. The Montauk Lighthouse, built on unconsolidated sediments, is located on the easternmost tip of Long Island. The distance from the center of the lighthouse to the edge of the escarpment is indicated in each cross section.



Montauk Lighthouse - 1838



Montauk Lighthouse - 1988

60 Identify *one* agent of erosion that removed the sediment and changed the position of the escarpment between 1838 and 1988. [1]

61 Calculate the rate of erosion, in feet per year, between the lighthouse and the edge of the escarpment that occurred between 1838 and 1988. Express your answer to the *nearest tenth*. [1]

62 Describe *one* action that could be taken to slow down or prevent the future erosion of the land between the escarpment and the ocean. [1]

Base your answers to questions 63 through 65 on the data table below and on your knowledge of Earth science. The data table shows the Sun's altitude and the shadow length measured from the base of a five-meter-high pole on June 22 in Rochester, New York. During daylight savings time, clocks are set one hour ahead, so solar noon occurs at approximately 1:00 p.m.

Data Table

Time of Day (EDT)	**Altitude of Sun in Degrees** (°)	**Shadow Length in Meters** (m)
9:00 a.m.	35	7.1
10:00 a.m.	46	4.8
11:00 a.m.	56	3.3
12:00 p.m.	65	2.3
1:00 p.m.	70	1.8
2:00 p.m.	68	2.0
3:00 p.m.	60	2.9
4:00 p.m.	50	4.1
5:00 p.m.	40	6.0
6:00 p.m.	29	9.1

63 On the graph *in your answer booklet*, construct a line graph by plotting the altitude of the Sun for each time of day shown on the data table. Connect all ten plots with a line. The shadow-length data have already been plotted using the scale on the right. [1]

64 Based on the data table, describe the relationship between the altitude of the Sun and the length of the shadow. [1]

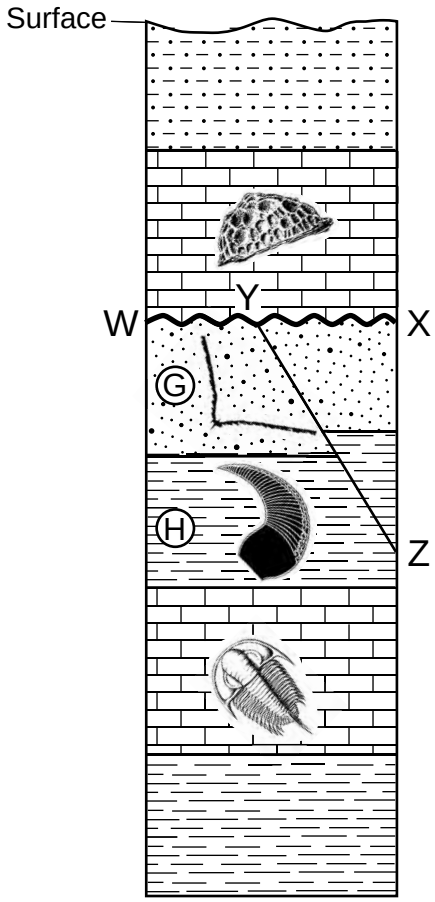
65 Based on the graph, determine the shadow length of the pole, in meters, at 4:30 p.m. [1]

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 and 67 on the cross section below and on your knowledge of Earth science. Letters *G* and *H* identify some rock layers. The wavy line *WX* indicates an unconformity, and line *YZ* indicates a fault. Index fossils are represented in some rock layers. Rock layers have *not* been overturned.



66 Identify the most likely geologic time period during which unconformity *WX* was forming. [1]

67 *In your answer booklet*, circle the term that best describes the relative age of fault *YZ* compared to layers *G* and *H*. Describe the evidence that infers this relative age. [1]

Base your answers to questions 68 through 71 on the data table and passage below, and on your knowledge of Earth science. The data table shows the location and characteristics of seven stars, numbered 1 through 7, found in the constellation Cygnus.

Location and Characteristics of Seven Stars in Cygnus

Star Number	Star Name	Celestial Longitude (hours)	Celestial Latitude (degrees)	Temperature (K)	Luminosity
1	Deneb	20.7	45	8500	197,000
2	Sadr	20.3	40	5800	60,000
3	Delta Cygni	19.8	45	9800	180
4	Epsilon Cygni	20.8	34	4800	60
5	Eta Cygni	20	35	4840	54
6	Alberio	19.5	28	4400	950
7	Tabby's Star	20.1	44	6200	1.5

The Mystery of Tabby's Star

Located in the constellation of Cygnus, there is a mysterious star named Tabby's Star that has a constant luminosity, but has a brightness that appears to change in a cyclic manner. A team of astronomers has developed a plausible explanation for this change. A dust cloud with a variable thickness has an approximate 700-day period of revolution around Tabby's Star. Why dust? Astronomers observed that a portion of the electromagnetic spectrum having wavelengths just shorter than visible light is blocked out, causing a decrease in apparent brightness. While astronomers don't know the origin of the dust cloud around Tabby's Star, dust unevenly spaced in its orbit around the star would explain this cyclic dimming of Tabby's Star.

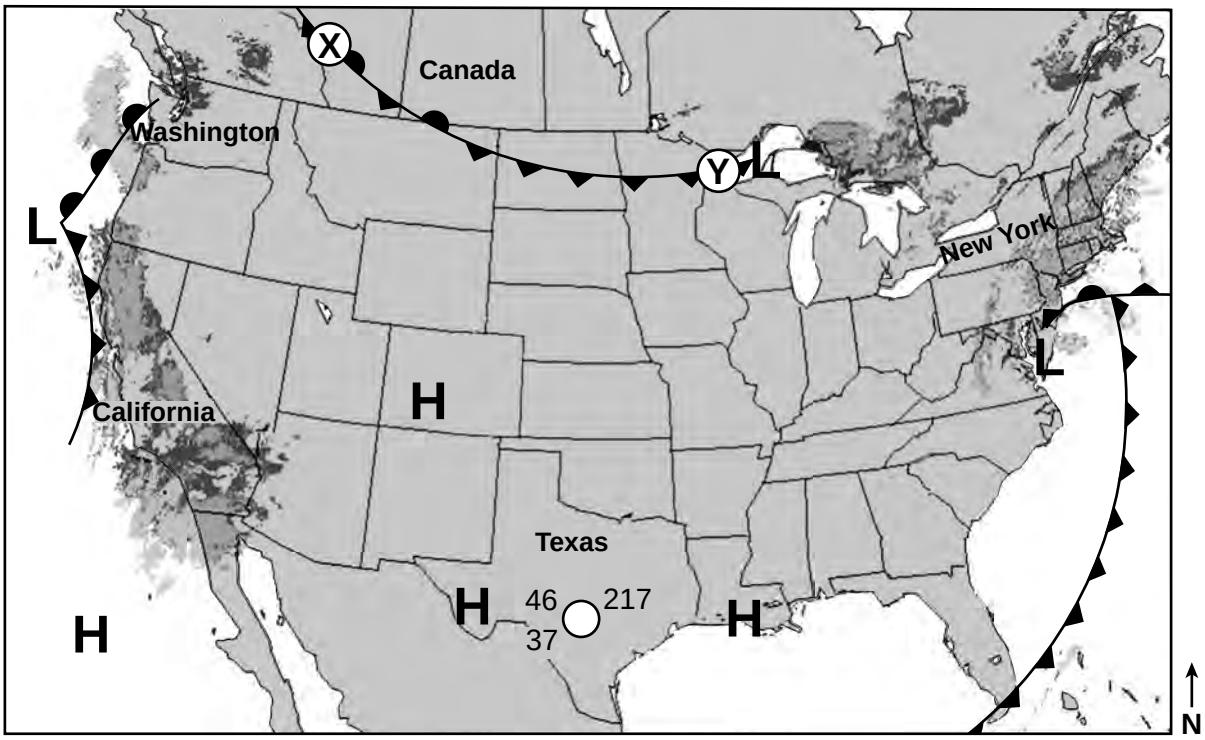
68 On the grid *in your answer booklet*, plot the positions of stars 1 through 6. Record the star number of *each* star beside the plot. In order to create the correct shape of Cygnus, connect the plots with *two* lines: the first line connects the plots numbered 1-2-5-6; the second line connects the plots numbered 4-2-3. This position of Tabby's Star, number 7, has been indicated with a $\oplus$. [1]

69 Identify the planet in our solar system that has a period of revolution most similar to the dust cloud orbiting Tabby's Star. [1]

70 State the name of the shortwave electromagnetic energy that is mostly blocked out by the dust cloud orbiting Tabby's Star. [1]

71 Complete the table *in your answer booklet* by identifying the color and classification for *two* of the stars in the constellation of Cygnus based on temperature and luminosity shown in the table. Color and classification for Deneb have been completed as an example. [1]

Base your answers to questions 72 through 74 on the weather map below and on your knowledge of Earth science. The weather map shows the high (**H**) and low (**L**) pressure centers and fronts across the United States on a January morning. The darker gray shaded areas show radar images of precipitation. A partial station model represents weather conditions in southern Texas. Two different types of fronts are represented along the line from *X* to *Y*.



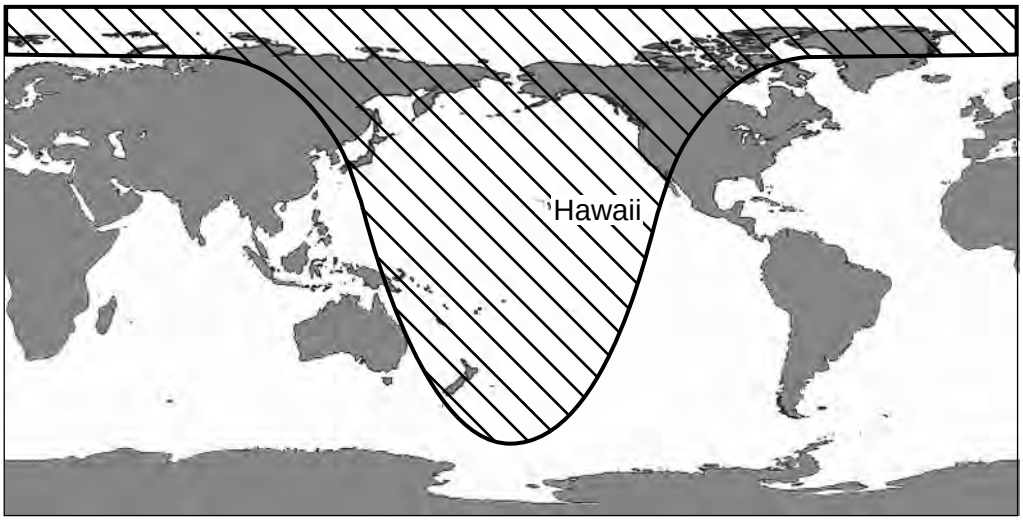
72 Identify the *two* fronts represented along line *XY*. [1]

73 Identify the compass direction toward which the low-pressure system located just south of New York State will move if it follows a normal storm track. [1]

74 Complete the table *in your answer booklet* by filling in the values for the *four* weather variables that are represented by the station model. [1]

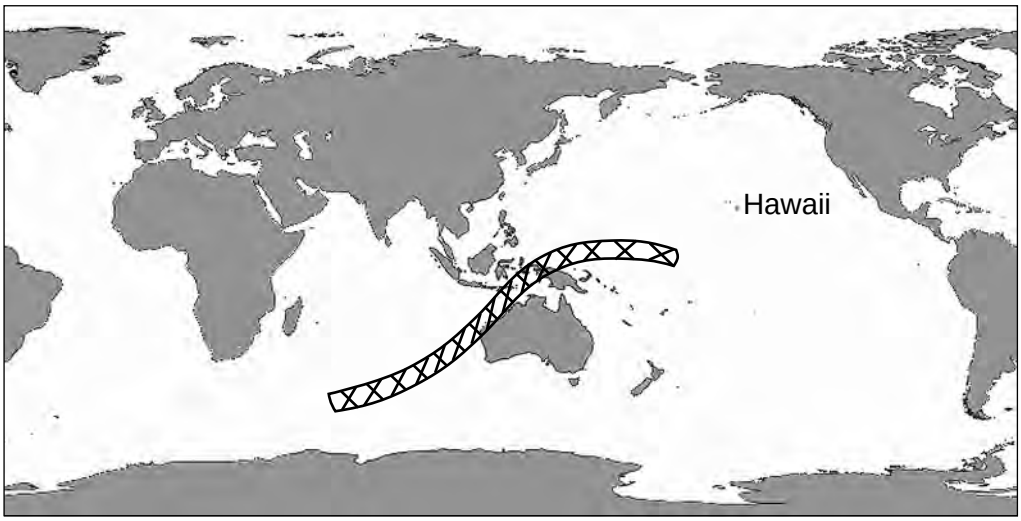
Base your answers to questions 75 and 76 on the maps and data table below and on your knowledge of Earth science. Map 1 shows the area where a total lunar eclipse was visible on November 8, 2022. Map 2 shows the area where a total solar eclipse was visible on April 20, 2023. The data table shows the date, type, and duration of totality for each total eclipse that has occurred or will occur at a specific location during the years 2022 through 2025.

Map 1 - November 8, 2022



Key
Area where the total lunar eclipse was visible

Map 2 - April 20, 2023



Key
Area where the total solar eclipse was visible

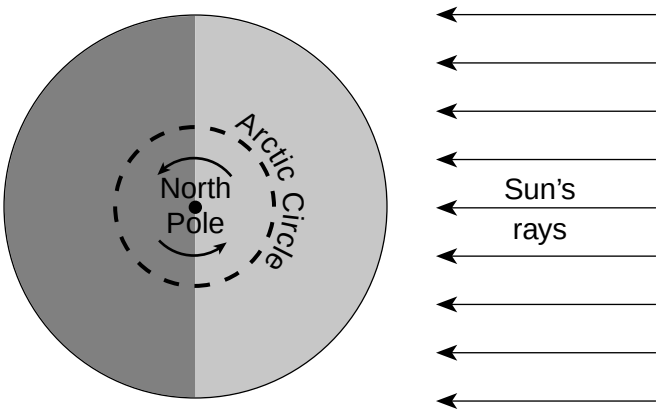
Total Eclipses 2022–2025

Date	Type of Eclipse	Duration of Totality
May 16, 2022	lunar	1 hour 25 minutes
November 8, 2022	lunar	1 hour 25 minutes
April 20, 2023	solar	1 minute 16 seconds
April 8, 2024	solar	4 minutes 28 seconds
March 14, 2025	lunar	1 hour 5 minutes
September 7, 2025	lunar	1 hour 22 minutes

75 Determine whether each of the eclipses shown on the maps were visible or not visible to an observer in Hawaii. *In your answer booklet*, circle "visible" or "not visible" on the line next to the date of each eclipse. [1]

76 On the diagram *in your answer booklet*, place an **X** on the Moon's orbit to indicate the position of the Moon on September 7, 2025. [1]

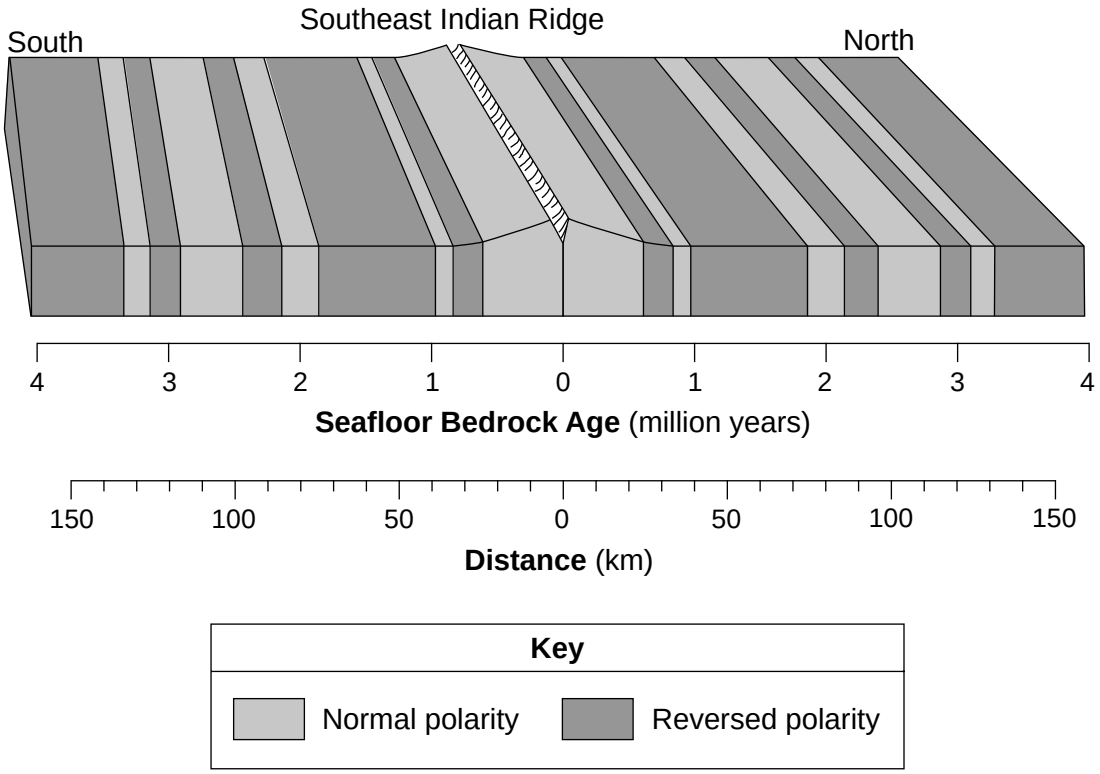
Base your answers to questions 77 and 78 on the diagram below and on your knowledge of Earth science. The diagram represents a North polar view of Earth as viewed from space on September 23. The curved arrows indicate the direction of Earth's rotation.



77 State the number of degrees Earth's axis is tilted to a line perpendicular to the plane of its orbit. [1]

78 Explain why a Foucault pendulum located on the Arctic Circle appears to change direction as it swings. [1]

Base your answers to questions 79 through 81 on the block diagram below and on your knowledge of Earth science. The diagram represents the magnetic orientation of the seafloor bedrock on both sides of the Southeast Indian Ridge. The age of the igneous bedrock and its distance, in kilometers, from the ridge center are shown.



79 Determine the age and the magnetic orientation of the seafloor bedrock located 80 kilometers south of the ridge center. [1]

80 Identify the *two* tectonic plates that are diverging at the Southeast Indian Ridge. [1]

81 Explain, in terms of cooling rate, why surface oceanic crust forming at this ocean ridge is most likely basalt instead of gabbro. [1]

Base your answers to questions 82 through 85 on the passage and photograph below and on your knowledge of Earth science. The photograph shows a Herkimer diamond located in a cavity in dolostone.

Herkimer Diamonds

Herkimer "diamonds" are actually quartz crystals that are double terminated (pointed at both ends) and found within exposed outcrops of dolostone around the Mohawk River Valley. The dolostone was formed about 500 million years ago in a shallow sea that was filled with sediment from the eroded ancient Adirondack Mountains to the north. While buried, cavities were formed in the dolostone by the slightly acidic ocean water. As sediment buried the rock, crystals grew in the cavities, slowly creating quartz crystals of exceptional clarity. The quartz crystals in the cavities are believed to have formed during the Carboniferous Period.

Source: "Herkimer Diamonds" Geology.com

Herkimer Diamond in Dolostone Cavity

82 Identify the chemical composition of the quartz that makes up a Herkimer diamond. [1]

83 Identify *one* physical characteristic of a Herkimer diamond, other than its color, that allows it to be used in jewelry. [1]

84 Identify the orogeny that was responsible for the metamorphism of bedrock now exposed in the Adirondack Mountains. [1]

85 *In your answer booklet*, circle the term that describes the relative age of the Herkimer diamonds compared to the relative age of the dolostone. Explain how the evidence cited in the reading passage supports your answer. Use the terms Herkimer diamonds and dolostone in your explanation. [1]

P.S./EARTH SCIENCE

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Thursday, June 20, 2024 — 9:15 a.m. to 12:15 p.m., only

ANSWER BOOKLET

Student . . . . . .

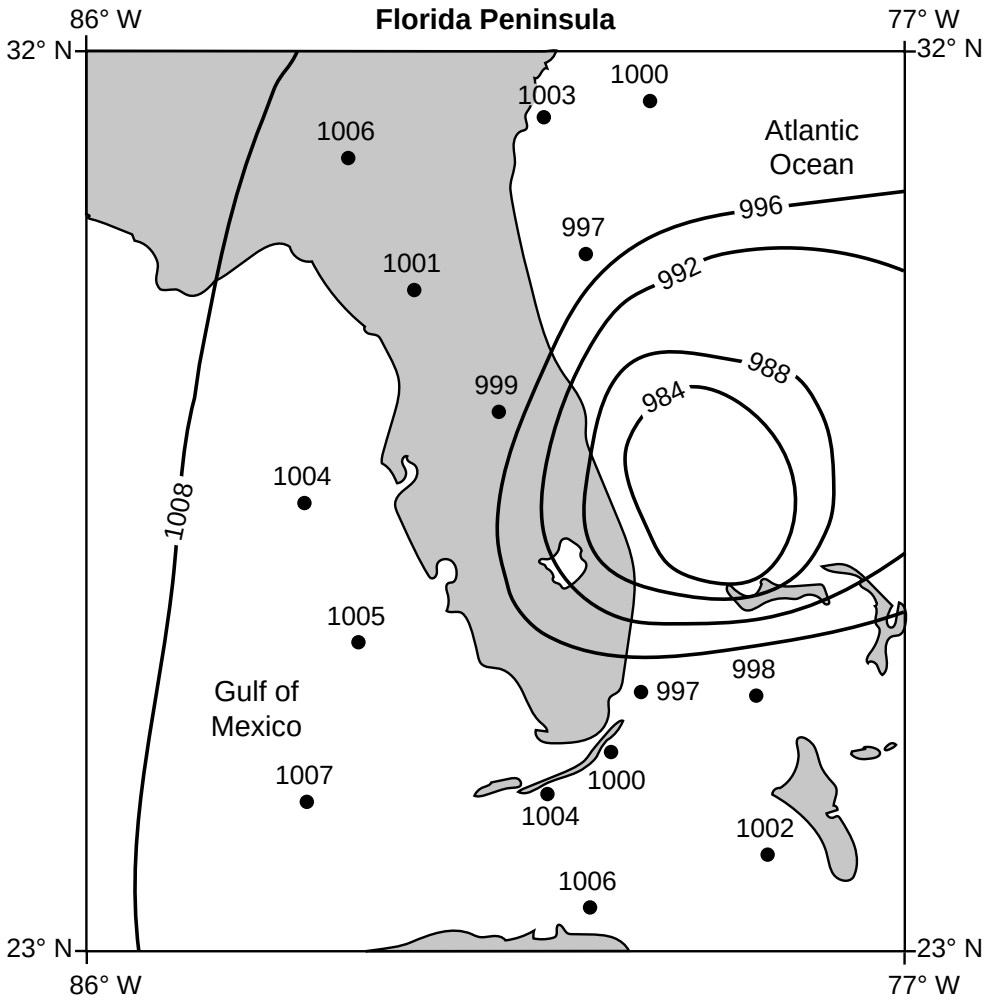
Teacher . . . . . .

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

Record your answers for Part B–2 and Part C in this booklet.

Part B–2

51



52 _____ **in of Hg**

53 _____

54 _____

55 _____ **°C**

56 _____

_____

57 _____

58 _____

_____

59 Circle one: warm cool

Ocean current: _____

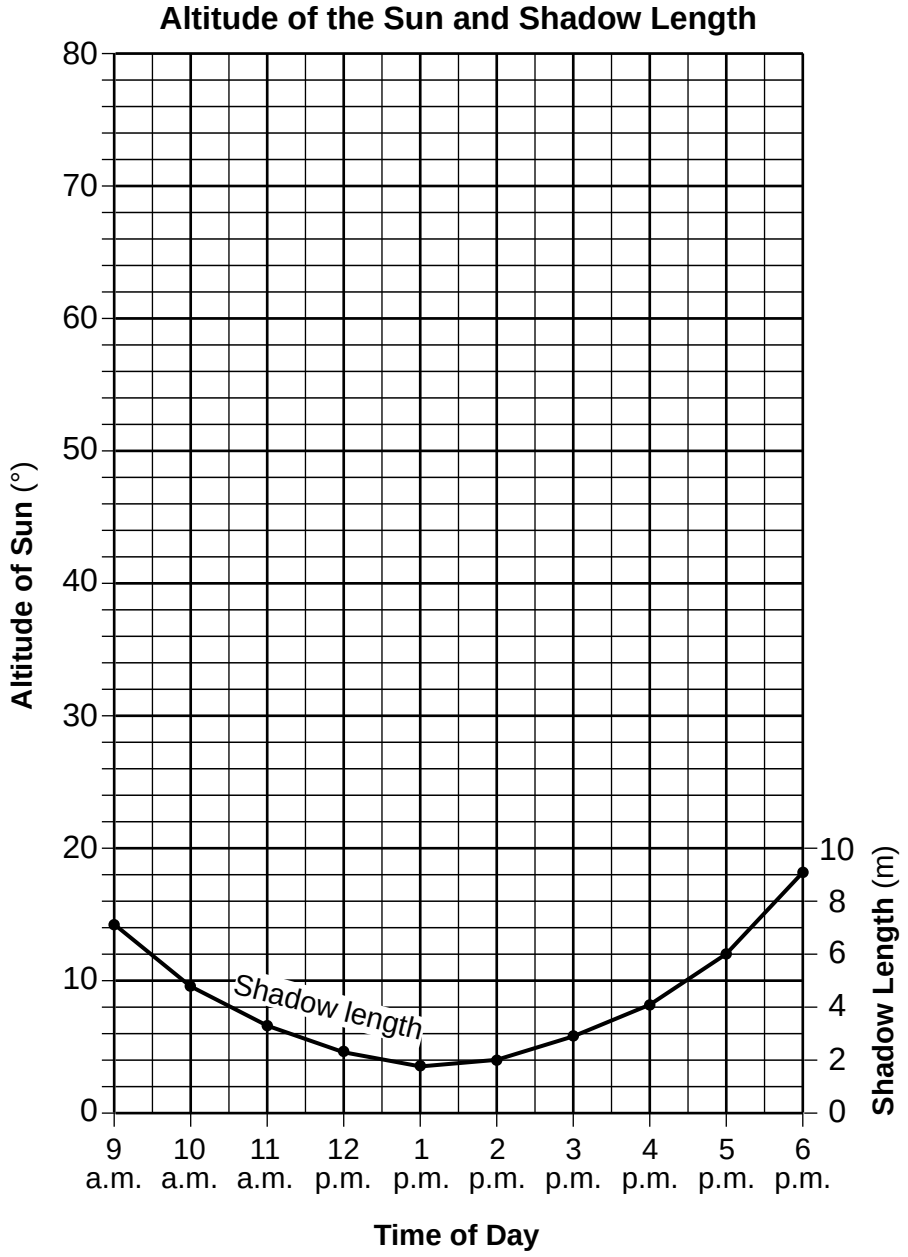
60 _____

61 _____ **ft/yr**

62 _____

_____

63


Altitude of the Sun and Shadow Length
Altitude of Sun (°)
80
70
60
50
40
30
20
10
0
Shadow length
Shadow Length (m)
10
8
6
4
2
0
9 a.m.
10 a.m.
11 a.m.
12 p.m.
1 p.m.
2 p.m.
3 p.m.
4 p.m.
5 p.m.
6 p.m.
Time of Day

64 _____

_____

65 _____ **m**

Part C

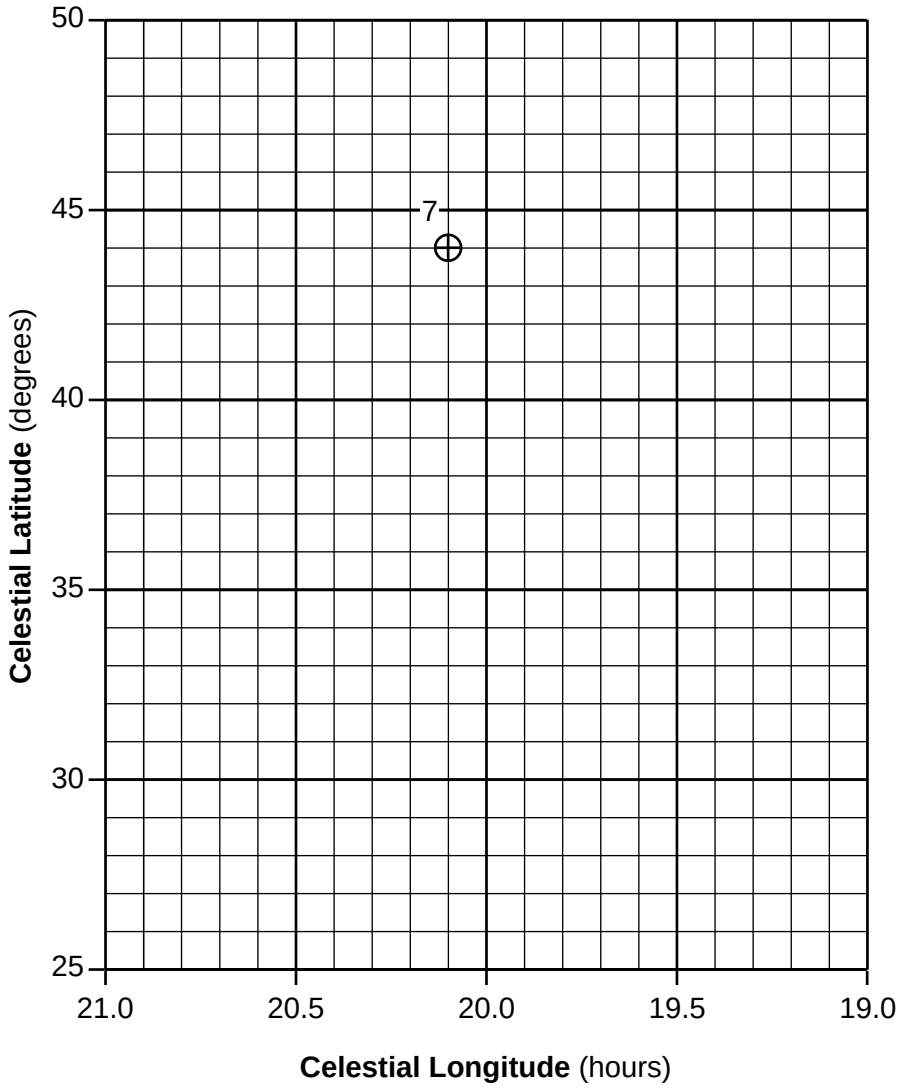
66 _____ **Period**

67 Relative age of *YZ* (circle one): Younger Older Same Age

Evidence: _____

_____

68



69 _____

70 _____

71

Selected Stars in Cygnus	Color	Classification
Deneb	White	Supergiant
Alberio		
Tabby's Star		

72 _____ and _____

73 _____

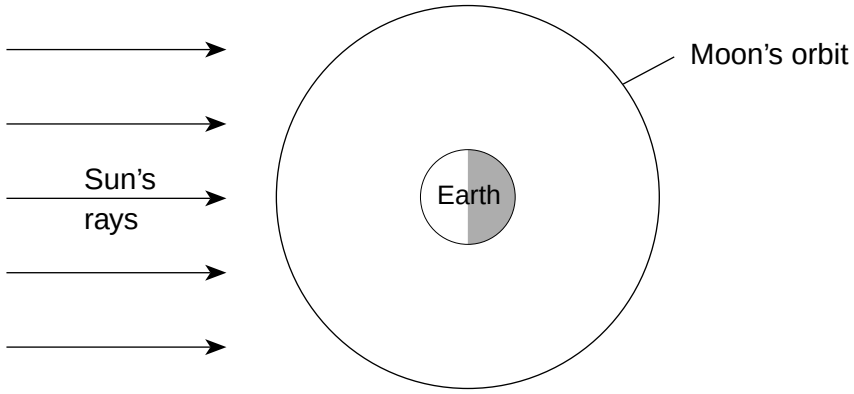
74

Weather Variable	Value
Cloud cover	%
Air temperature	°F
Dewpoint	°F
Barometric pressure	mb

75 November 8, 2022 lunar eclipse (circle one): visible not visible

April 20, 2023 solar eclipse (circle one): visible not visible

76



(Not drawn to scale)

77_____ °

78 _____

_____

79 Age: _____ **million years**

Magnetic orientation:_____ **polarity**

80 _____**Plate** and _____**Plate**

81 _____

_____

82 _____

83 _____

84 _____ **orogeny**

85 Relative age of Herkimer diamonds (circle one): Younger Older The Same

Evidence: _____

_____

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The State Education Department / The University of the State of New York

Regents Examination in Physical Setting/Earth Science – June 2024

Scoring Key: Parts A and B-1 (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Physical Setting/Earth Science	June '24	**1**	2	MC	1	1
Physical Setting/Earth Science	June '24	**2**	4	MC	1	1
Physical Setting/Earth Science	June '24	**3**	4	MC	1	1
Physical Setting/Earth Science	June '24	**4**	1	MC	1	1
Physical Setting/Earth Science	June '24	**5**	2	MC	1	1
Physical Setting/Earth Science	June '24	**6**	2	MC	1	1
Physical Setting/Earth Science	June '24	**7**	3	MC	1	1
Physical Setting/Earth Science	June '24	**8**	3	MC	1	1
Physical Setting/Earth Science	June '24	**9**	4	MC	1	1
Physical Setting/Earth Science	June '24	**10**	1	MC	1	1
Physical Setting/Earth Science	June '24	**11**	2	MC	1	1
Physical Setting/Earth Science	June '24	**12**	4	MC	1	1
Physical Setting/Earth Science	June '24	**13**	1	MC	1	1
Physical Setting/Earth Science	June '24	**14**	2	MC	1	1
Physical Setting/Earth Science	June '24	**15**	2	MC	1	1
Physical Setting/Earth Science	June '24	**16**	1	MC	1	1
Physical Setting/Earth Science	June '24	**17**	1	MC	1	1
Physical Setting/Earth Science	June '24	**18**	3	MC	1	1
Physical Setting/Earth Science	June '24	**19**	2	MC	1	1
Physical Setting/Earth Science	June '24	**20**	1	MC	1	1
Physical Setting/Earth Science	June '24	**21**	3	MC	1	1
Physical Setting/Earth Science	June '24	**22**	4	MC	1	1
Physical Setting/Earth Science	June '24	**23**	2	MC	1	1
Physical Setting/Earth Science	June '24	**24**	3	MC	1	1
Physical Setting/Earth Science	June '24	**25**	1	MC	1	1
Physical Setting/Earth Science	June '24	**26**	3	MC	1	1
Physical Setting/Earth Science	June '24	**27**	4	MC	1	1
Physical Setting/Earth Science	June '24	**28**	3	MC	1	1
Physical Setting/Earth Science	June '24	**29**	4	MC	1	1
Physical Setting/Earth Science	June '24	**30**	1	MC	1	1
Physical Setting/Earth Science	June '24	**31**	1	MC	1	1
Physical Setting/Earth Science	June '24	**32**	3	MC	1	1
Physical Setting/Earth Science	June '24	**33**	4	MC	1	1
Physical Setting/Earth Science	June '24	**34**	4	MC	1	1
Physical Setting/Earth Science	June '24	**35**	2	MC	1	1
Physical Setting/Earth Science	June '24	**36**	2	MC	1	1
Physical Setting/Earth Science	June '24	**37**	4	MC	1	1
Physical Setting/Earth Science	June '24	**38**	1	MC	1	1
Physical Setting/Earth Science	June '24	**39**	3	MC	1	1
Physical Setting/Earth Science	June '24	**40**	1	MC	1	1
Physical Setting/Earth Science	June '24	**41**	3	MC	1	1
Physical Setting/Earth Science	June '24	**42**	2	MC	1	1
Physical Setting/Earth Science	June '24	**43**	4	MC	1	1
Physical Setting/Earth Science	June '24	**44**	3	MC	1	1
Physical Setting/Earth Science	June '24	**45**	3	MC	1	1
Physical Setting/Earth Science	June '24	**46**	3	MC	1	1
Physical Setting/Earth Science	June '24	**47**	4	MC	1	1
Physical Setting/Earth Science	June '24	**48**	2	MC	1	1
Physical Setting/Earth Science	June '24	**49**	1	MC	1	1
Physical Setting/Earth Science	June '24	**50**	2	MC	1	1

Regents Examination in Physical Setting/Earth Science – June 2024

Scoring Key: Parts B-2 and C (Constructed-Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Physical Setting/Earth Science	June '24	**51**		CR	1	1
Physical Setting/Earth Science	June '24	**52**		CR	1	1
Physical Setting/Earth Science	June '24	**53**		CR	1	1
Physical Setting/Earth Science	June '24	**54**		CR	1	1
Physical Setting/Earth Science	June '24	**55**		CR	1	1
Physical Setting/Earth Science	June '24	**56**		CR	1	1
Physical Setting/Earth Science	June '24	**57**		CR	1	1
Physical Setting/Earth Science	June '24	**58**		CR	1	1
Physical Setting/Earth Science	June '24	**59**		CR	1	1
Physical Setting/Earth Science	June '24	**60**		CR	1	1
Physical Setting/Earth Science	June '24	**61**		CR	1	1
Physical Setting/Earth Science	June '24	**62**		CR	1	1
Physical Setting/Earth Science	June '24	**63**		CR	1	1
Physical Setting/Earth Science	June '24	**64**		CR	1	1
Physical Setting/Earth Science	June '24	**65**		CR	1	1
Physical Setting/Earth Science	June '24	**66**		CR	1	1
Physical Setting/Earth Science	June '24	**67**		CR	1	1
Physical Setting/Earth Science	June '24	**68**		CR	1	1
Physical Setting/Earth Science	June '24	**69**		CR	1	1
Physical Setting/Earth Science	June '24	**70**		CR	1	1
Physical Setting/Earth Science	June '24	**71**		CR	1	1
Physical Setting/Earth Science	June '24	**72**		CR	1	1
Physical Setting/Earth Science	June '24	**73**		CR	1	1
Physical Setting/Earth Science	June '24	**74**		CR	1	1
Physical Setting/Earth Science	June '24	**75**		CR	1	1
Physical Setting/Earth Science	June '24	**76**		CR	1	1
Physical Setting/Earth Science	June '24	**77**		CR	1	1
Physical Setting/Earth Science	June '24	**78**		CR	1	1
Physical Setting/Earth Science	June '24	**79**		CR	1	1
Physical Setting/Earth Science	June '24	**80**		CR	1	1
Physical Setting/Earth Science	June '24	**81**		CR	1	1
Physical Setting/Earth Science	June '24	**82**		CR	1	1
Physical Setting/Earth Science	June '24	**83**		CR	1	1
Physical Setting/Earth Science	June '24	**84**		CR	1	1
Physical Setting/Earth Science	June '24	**85**		CR	1	1

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2024 Regents Examination in Physical Setting/Earth Science** will be posted on the Department's web site at https://www.nysedregents.org/EarthScience/ on the day of the examination. Conversion charts provided for the previous administrations of the Physical Setting/Earth Science examination must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

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

PHYSICAL SETTING/EARTH SCIENCE

Thursday, June 20, 2024 — 9:15 a.m. to 12:15 p.m., only

RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 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. Check this web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Directions to the Teacher

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

Allow 1 credit for each correct response.

At least two science teachers must participate in the scoring of the Part B–2 and Part C open-ended questions on a student's paper. 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 more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

Students' responses must be scored strictly according to the 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. Do not attempt to correct the student's work by making insertions or changes of any kind. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the space provided. The student's score for the Earth Science Performance Test should be recorded in the space provided. Then the student's raw scores on the written test and the performance test should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Thursday, June 20, 2024. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart may change from one administration 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.

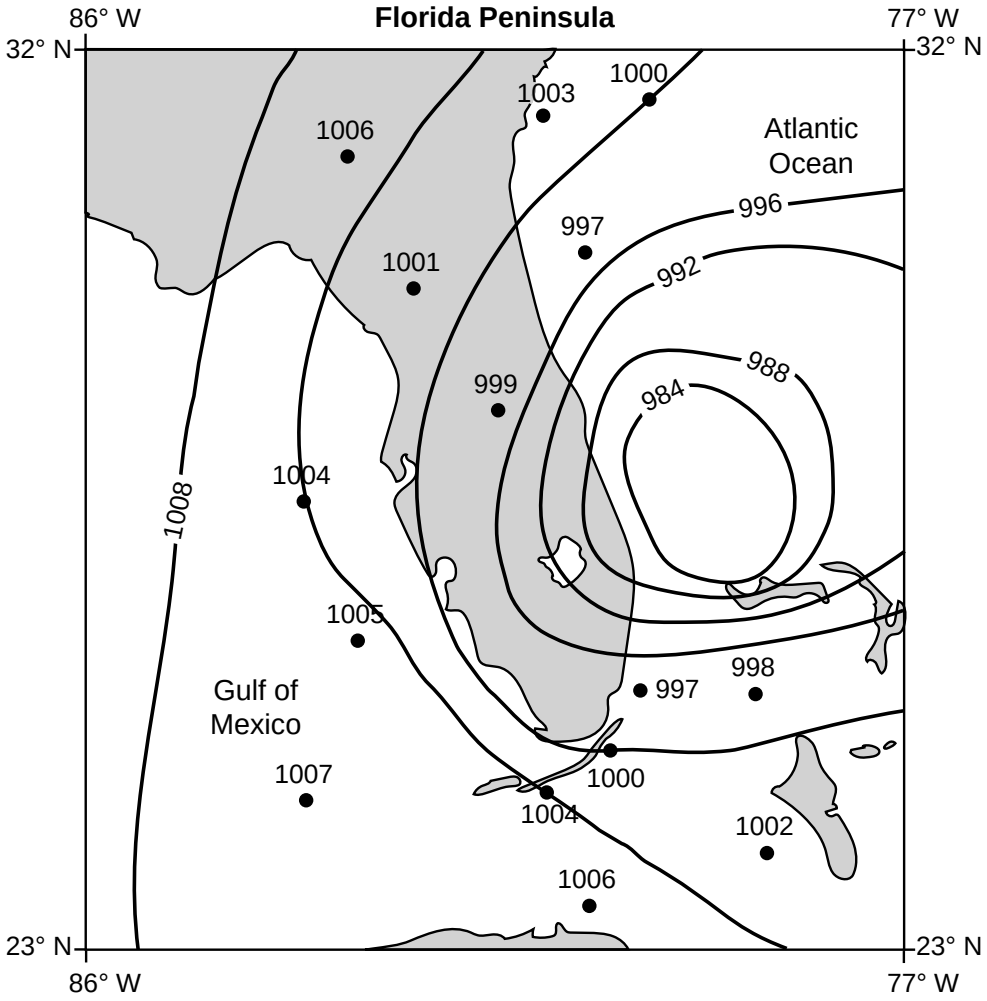
Part B–2

Allow a maximum of 15 credits for this part.

To ensure the accuracy of overlays, select a printer setting such as *full*, *actual size*, or *100%* when printing this document. Do ***not*** select the *fit to page* setting.

51 [1] Allow 1 credit if *both* the 1000 mb and 1004 mb isobars are correctly drawn to the edges of the map. The isobars must pass through or touch both 1000 dots and *both* 1004 dots. If additional isobars are drawn, all isobars must be correct to receive credit.

Example of a 1-credit response:



52 [1] Allow 1 credit for any value from 29.05 to 29.06 in of Hg.

53 [1] Allow 1 credit for barometer *or* barograph.

54 [1] Allow 1 credit for mT. Allow credit for either uppercase *or* lowercase letters.

Note: Do *not* allow credit if air-mass letters are reversed, such as Tm or TM.
For students who used the Spanish edition, either exclusively or in conjunction with the English edition of the exam, allow credit for the correct two-letter air-mass symbol as it appears in either the English or Spanish *2011 Edition Reference Tables for Physical Setting/Earth Science*.

55 [1] Allow 1 credit for any value great than 590°C but less than 640°C.

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

— Garnet coefficients are higher when rock formation temperature is lower.

— Higher temperatures result in lower garnet coefficients.

— inverse relationship/negative correlation

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

— phyllite

— schist

— gneiss

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

— The warmest temperatures occur in June, July, and August and the coldest temperatures occur in December, January, and February for a city in New York State.

— The curve would be opposite of Melbourne's curve.

— Temperatures would increase until July then decrease.

— The line would generally go up to the middle of the graph, then down.

— The range of temperatures on the curve would be greater for a location in New York State.

Note: Do *not* allow credit for "it is cold in the winter and/or warm in the summer" because it is always cold in the winter and warm in the summer, this alone does not explain that the seasons are reversed for these locations.

59 [1] Allow 1 credit for circling warm *and* identifying the East Australia/East Australia Current as the ocean current.

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

— wave action/ocean waves

— mass movement/gravity

— rainwater runoff

— groundwater seepage

— wind

61 Allow 1 credit for 0.8 *or* .8 ft/yr.

62 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Add large boulders along the shoreline around the lighthouse.

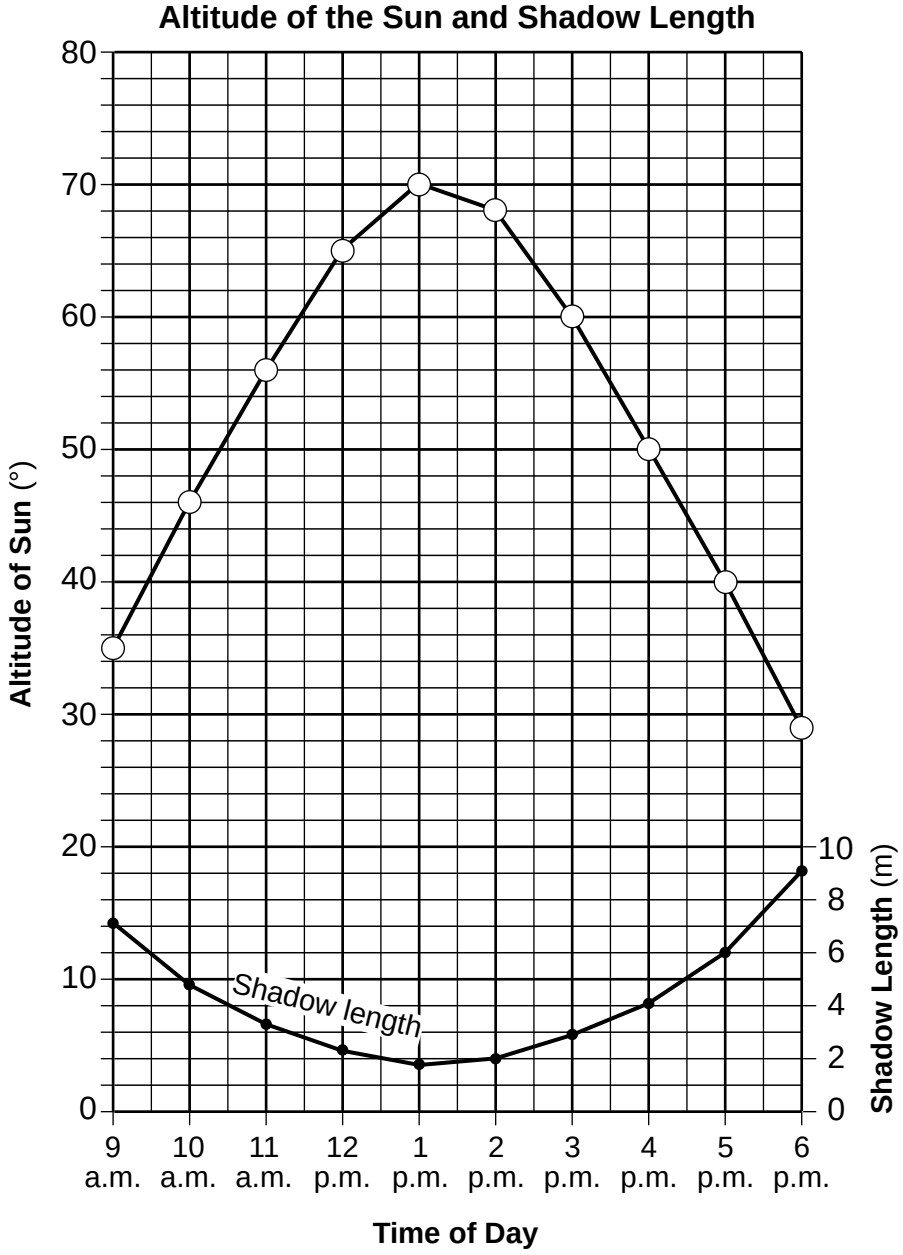
— Build barriers to stop waves from affecting the coastal areas.

— Plant more trees and vegetation to hold the soil in place.

— Build a seawall or jetty.

63 [1] Allow 1 credit if the centers of *all ten* plots are within or touch the circles shown and are correctly connected with a line that passes within or touches each circle.

Note: Allow credit if the line does *not* pass through the student plots, but is still within or touching the circles.
It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.



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

— As the altitude of the Sun increases, the shadow length decreases.

— When the Sun gets higher, the shadow gets shorter.

— inverse *or* negative relationship/negative correlation

65 [1] Allow 1 credit for any value from 5.0 m to 5.1 m.

Part C

Allow a maximum of 20 credits for this part.

66 [1] Allow 1 credit for Silurian *or* Devonian or Ordovician Period.

67 [1] Allow 1 credit for *both* circling younger and describing correct evidence. Acceptable responses include, but are not limited to:

— Fault *YZ* displaces both rock layers *G* and *H*.

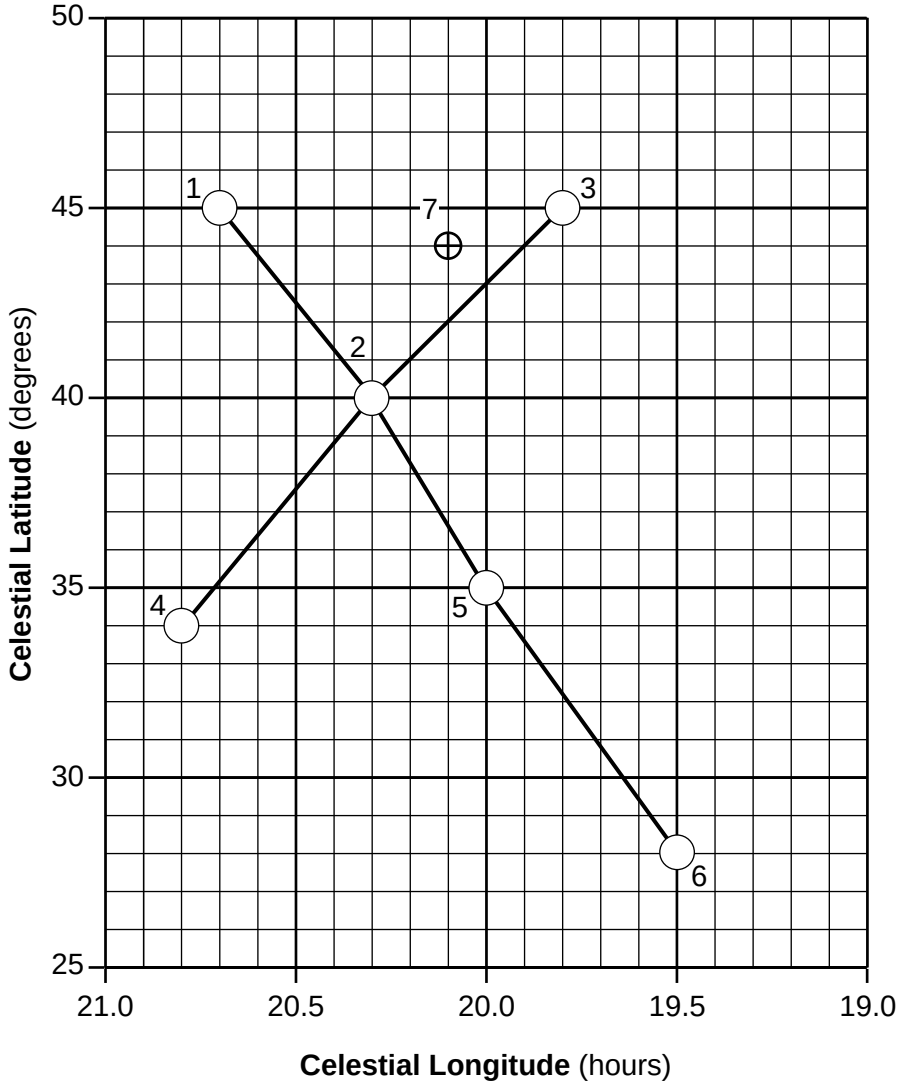
— The fault has cut across these two preexisting rock layers.

— The fault illustrates the Law of Crosscutting Relationships.

68 [1] Allow 1 credit if the centers of *all six* student plots are within or touch the circles shown and are correctly numbered. *All six* plots must be correctly connected with *two* separate lines that pass within or touch each circle as shown below.

Note: Allow credit if the lines do not pass through student plots, but are still within or touching the circles.
It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.

Example of a 1-credit response:



69 [1] Allow 1 credit for Mars.

70 [1] Allow 1 credit for ultraviolet or UV.

71 [1] Allow 1 credit for correctly completing the table as shown below.

Selected Stars in Cygnus	Color	Classification
Deneb	White	Supergiant
Alberio	Yellow *or* Orange *or* Yellow-orange	Giant
Tabby's Star	Yellow *or* Yellow-white	Main Sequence

72 [1] Allow 1 credit for stationary front *and* cold front.

73 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— northeast/NE

— north northeast/NNE

— eastward/E

— east northeast/ENE

74 [1] Allow 1 credit if *all four* values are correct, as shown in the table below.

Weather Variable	Value
Cloud cover	0 %
Air Temperature	46 °F
Dewpoint	37 °F
Barometric pressure	1021.7 mb

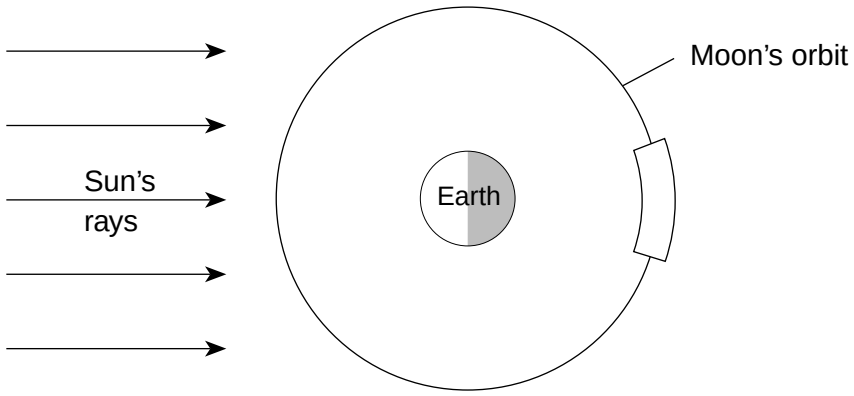
75 [1] Allow 1 credit if *both* responses are correctly circled, as shown below:

November 8, 2022 lunar eclipse: (visible) not visible

April 20, 2023 solar eclipse: visible (not visible)

76 [1] Allow 1 credit if the center of the **X** is within or touches the clear band shown below.

Note: Allow credit if a symbol other than an **X** is used.
It is recommended that an overlay of the same scale as the student answer sheet be used to ensure reliability in rating.



(Not drawn to scale)

77 [1] Allow 1 credit for 23.5° or $23\frac{1^{\circ}}{2}$.

Note: Do *not* allow credit if a compass direction is included in the student's response.

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

— The pendulum swings in the same direction or plane above a spinning Earth.

— A Foucault pendulum appears to change direction of swing as Earth rotates beneath it.

— Earth is rotating.

79 [1] Allow 1 credit for any value from 1.9 to 2.1 million years for age and normal polarity for magnetic orientation.

80 [1] Allow 1 credit for Antarctic Plate and Indian-Australian Plate (Indo-Australian Plate).

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

— The molten rock cools rapidly, forming basalt.

— Basalt cools very rapidly.

— Magma cools quickly when it reaches the surface.

— Gabbro forms when magma cools slowly deep underground.

— It cools quickly.

— fast cooling rate

Note: Do *not* allow credit for "small crystal size" or "basalt has a fine texture" alone because the cooling time determines the texture/crystal size, *not* that the texture/crystal size determines the cooling time.

82 [1] Allow 1 credit for SiO_2 *or* silicon dioxide.

83 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— hardness

— crystal shape *or* double-terminated crystal

— glassy luster *or* reflectivity

— clarity

Note: Do *not* allow credit for "Herkimer diamonds are the hardest mineral" because true diamonds are the hardest mineral.
Do *not* allow credit for "valuable" or "rare" because these are not physical characteristics.

84 [1] Allow 1 credit for Grenville orogeny.

85 [1] Allow 1 credit for *both* circling younger and citing correct evidence. Acceptable responses include, but are not limited to:

— Herkimer diamonds formed during the Carboniferous Period, which is long after the dolostone formation.

— Dolostone formed 500 million years ago, and the Herkimer diamonds formed between 359 and 299 years ago.

— Herkimer diamonds formed in cavities that were formed earlier in the dolostone by the acidic ocean.

— Cambrian dolostones are older than Carboniferous Herkimer diamonds.

Regents Examination in Physical Setting/Earth Science

June 2024

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score forthe June 2024 Regents Examination in Physical Setting/Earth Science* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Thursday, June 20, 2024. 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.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

June 2024 Physical Setting/Earth Science			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	21	42, 61, 63	68
Math Key Idea 2	19, 26	41, 52, 55, 56, 64	78
Math Key Idea 3	9, 10		
Science Inquiry Key Idea 1	11, 30	36, 58	67, 78, 81, 83
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	3, 5, 10, 12, 14, 16, 21, 22, 23, 24, 25, 26, 27, 34, 35	39, 42, 45, 46, 48, 49, 50, 52, 54, 57, 59, 61	66, 69, 70, 71, 72, 74, 80, 81, 82, 84
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1		53	69, 85
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1	19, 28, 33	38	77
Key Idea 2	1, 4, 5, 7, 8, 9, 12, 19, 20, 24, 28, 30, 31, 32, 33, 35	36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 50, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 65	66, 67, 68, 71, 72, 73, 74, 75, 76, 79
Key Idea 3	16	50	
Key Idea 4			
Key Idea 5	4, 18, 19, 21, 31, 35	40, 55, 64, 65	73, 76, 78, 85
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2		62	
Standard 4			
Key Idea 1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 22, 23, 24, 25	36, 37, 38, 39, 40, 47, 48, 49, 63, 64, 65	66, 67, 68, 69, 71, 75, 76, 77, 78, 84, 85
Key Idea 2	12, 14, 15, 16, 17, 18, 19, 20, 21, 26, 27, 28, 29, 30, 31, 32, 33	41, 42, 43, 44, 45, 46, 50, 51, 52, 53, 54, 58, 59, 60, 61, 62	70, 72, 73, 74, 79, 80
Key Idea 3	34, 35	55, 56, 57	81, 82, 83
Reference Tables			
ESRT 2011 Edition (Revised)	3, 5, 10, 12, 14, 16, 21, 22, 23, 24, 25, 26, 27, 34, 35	39, 42, 45, 46, 48, 49, 50, 52, 54, 57, 59, 61	66, 69, 70, 71, 72, 74, 80, 81, 82, 84

The State Education Department / The University of the State of New York

Regents Examination in Physical Setting/Earth Science – June 2024

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

(Not to be used for the Braille Edition)

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 9 and Total Written Test Score of 65 would receive a final examination score of 85.

Total Performance Test Score

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

Final Examination Scores
Regents Examination in Physical Setting/Earth Science – June 2024 – continued

Total Performance Test Score

Total Written Test Score	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
44	70	70	70	69	69	68	67	67	66	65	64	63	62	60	59	57	55
43	69	69	69	68	68	67	67	66	65	64	63	62	61	60	58	56	54
42	69	68	68	67	67	66	66	65	64	63	62	61	60	59	57	55	54
41	68	67	67	67	66	65	65	64	63	62	61	60	59	58	56	55	53
40	67	67	66	66	65	65	64	63	63	62	61	60	58	57	55	54	52
39	66	66	65	65	64	64	63	62	62	61	60	59	57	56	54	53	51
38	65	65	64	64	64	63	62	62	61	60	59	58	57	55	54	52	50
37	63	63	63	62	62	61	61	60	59	58	57	56	55	54	52	50	48
36	63	62	62	61	61	60	60	59	58	57	56	55	54	53	51	49	48
35	62	61	61	61	60	60	59	58	57	57	55	54	53	52	50	49	47
34	61	61	60	60	59	59	58	57	57	56	55	54	52	51	49	48	46
33	59	59	58	58	58	57	56	56	55	54	53	52	51	49	48	46	44
32	58	58	58	57	57	56	56	55	54	53	52	51	50	48	47	45	43
31	58	57	57	56	56	55	55	54	53	52	51	50	49	48	46	44	43
30	56	56	55	55	54	54	53	52	51	51	50	48	47	46	44	43	41
29	55	55	54	54	53	53	52	51	51	50	49	48	46	45	43	42	40
28	54	54	53	53	52	52	51	51	50	49	48	47	46	44	43	41	39
27	52	52	52	51	51	50	50	49	48	47	46	45	44	43	41	39	37
26	52	51	51	50	50	49	49	48	47	46	45	44	43	42	40	38	37
25	50	50	49	49	48	48	47	46	46	45	44	43	41	40	38	37	35
24	49	49	48	48	47	47	46	45	45	44	43	42	40	39	37	36	34
23	47	47	47	46	46	45	44	44	43	42	41	40	39	37	36	34	32
22	46	46	46	45	45	44	44	43	42	41	40	39	38	37	35	33	31
21	45	44	44	44	43	43	42	41	40	40	38	37	36	35	33	32	30
20	44	44	43	43	42	42	41	40	40	39	38	37	35	34	32	31	29
19	42	42	41	41	41	40	39	39	38	37	36	35	34	32	31	29	27
18	41	41	41	40	40	39	39	38	37	36	35	34	33	31	30	28	26
17	40	39	39	38	38	37	37	36	35	34	33	32	31	30	28	26	25
16	39	39	38	38	37	37	36	35	34	34	33	31	30	29	27	26	24
15	37	37	36	36	35	35	34	34	33	32	31	30	29	27	26	24	22
14	35	35	35	34	34	33	33	32	31	30	29	28	27	26	24	22	20
13	35	34	34	33	33	32	32	31	30	29	28	27	26	25	23	21	20
12	33	33	32	32	31	31	30	29	29	28	27	26	24	23	21	20	18
11	31	31	30	30	30	29	28	28	27	26	25	24	23	21	20	18	16
10	30	30	30	29	29	28	27	27	26	25	24	23	22	20	19	17	15
9	29	28	28	27	27	26	26	25	24	23	22	21	20	19	17	15	14
8	27	27	26	26	25	25	24	23	23	22	21	20	18	17	15	14	12
7	26	26	25	25	24	24	23	22	22	21	20	19	18	16	15	13	11
6	24	24	24	23	23	22	22	21	20	19	18	17	16	14	13	11	9
5	23	22	22	21	21	20	20	19	18	17	16	15	14	13	11	9	8
4	21	21	20	20	19	19	18	17	17	16	15	14	12	11	9	8	6
3	19	19	19	18	18	17	16	16	15	14	13	12	11	9	8	6	4
2	18	18	18	17	17	16	16	15	14	13	12	11	10	9	7	5	3
1	17	16	16	16	15	14	14	13	12	11	10	9	8	7	5	4	2
0	15	15	14	14	13	13	12	11	11	10	9	8	6	5	3	2	0