The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
EARTH SCIENCE

Friday, June 17, 2022 — 1:15 to 4:15 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

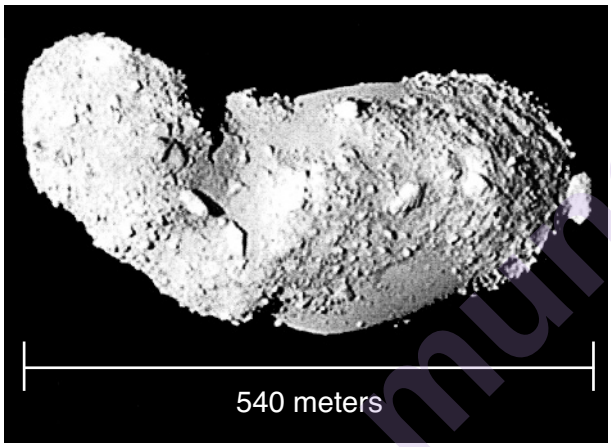
Answer all questions in this part.

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 Astronomers have determined that the star *Arcturus* has a surface temperature of 4560 K and a luminosity of 170. Based on these characteristics, *Arcturus* is classified as which type of star?

(1) giant
(2) supergiant
(3) white dwarf
(4) main sequence

2 The image below shows the near-Earth asteroid Itokawa.



Which surface feature would be created if Itokawa hit Earth's surface?

(1) volcanic crater
(2) impact crater
(3) mountain valley
(4) rift valley

3 The north end of Earth's axis of rotation points toward

(1) *Alpha Centauri*
(2) *Betelgeuse*
(3) *Polaris*
(4) *Spica*

4 What is the approximate percentage of Earth's surface that is covered by the hydrosphere?

(1) 10%
(2) 50%
(3) 70%
(4) 90%

5 The table below shows the times of high tides and low tides for a coastal location.

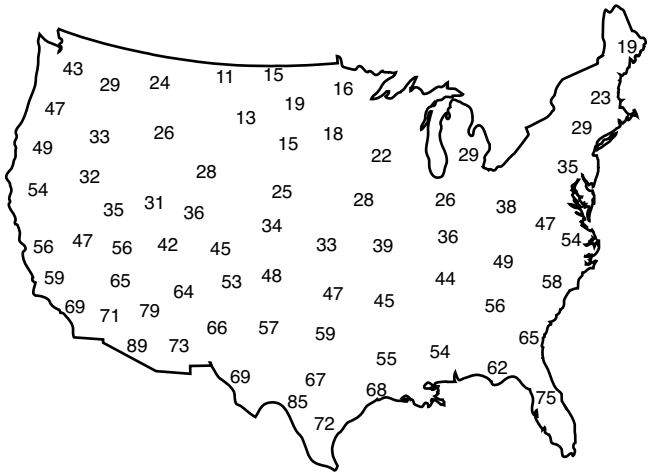
Tides

Type of Tide	Time
high	4:44 a.m.
low	11:07 a.m.
high	5:10 p.m.
low	11:33 p.m.

How much time occurred between the high tides on this day?

(1) approximately 6.5 hours
(2) a little less than 12 hours
(3) almost 12.5 hours
(4) a little more than 24 hours

6 The map below shows a weather variable recorded at the same time across the United States.



According to the data on the map, which weather variable was most likely recorded?

(1) wind speed in knots
(2) air pressure in millibars
(3) rainfall in inches in the last 6 hours
(4) air temperature in degrees Fahrenheit

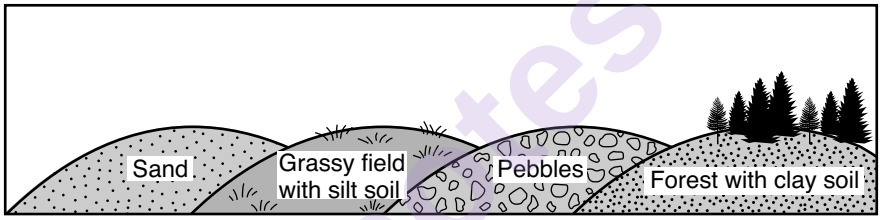
7 The table below shows the dates of peak activity of four meteor showers for five different years. Meteor showers are named for the constellations in which they appear to originate, as observed from Earth.

Name of Meteor Shower	Date of Peak Activity				
	2007	2008	2009	2014	2015
Quadrantids	January 3	January 4	January 3, 4	January 3, 4	January 3, 4
Lyrids	April 22	April 21, 22	April 21, 22	April 21, 22	April 21, 22
Perseids	August 13	August 12	August 12, 13	August 12, 13	August 12, 13
Orionids	October 21, 22	October 21	October 21, 22	October 21, 22	October 21, 22

Based on the data, the dates of these meteor showers appear to depend on the

(1) position of Earth in its orbit
(2) turning of Earth on its axis
(3) phase of the Moon during the month
(4) movement of meteors in their orbits

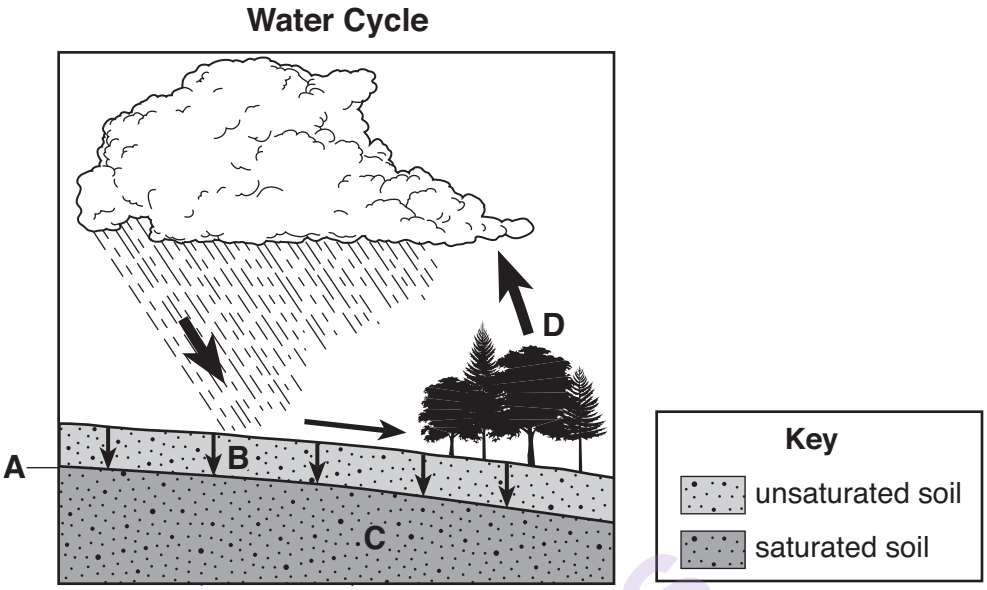
8 The diagram below represents four different land surfaces of equal area.



Which area would most likely have the greatest permeability as each area receives the same amount of rainfall?

(1) sand
(2) grassy field with silt soil
(3) pebbles
(4) forest with clay soil

9 The diagram below represents a portion of the water cycle. Letters *A*, *B*, *C*, and *D* represent processes or features related to the water cycle. Arrows represent movement of water.



Which table correctly matches these letters with the processes or features related to the water cycle?

Letter	Process or Feature
A	Groundwater
B	Precipitation
C	Water table
D	Evaporation

(1)

Letter	Process or Feature
A	Water table
B	Runoff
C	Groundwater
D	Precipitation

(3)

Letter	Process or Feature
A	Groundwater
B	Infiltration
C	Water table
D	Transpiration

(2)

Letter	Process or Feature
A	Water table
B	Infiltration
C	Groundwater
D	Transpiration

(4)

10 The leading edge of a thunderstorm reached Elmira, New York, at 1:00 p.m. This thunderstorm was moving eastward at 45 miles per hour. The leading edge of the thunderstorm most likely reached Binghamton, New York, at approximately

(1) 1:00 p.m.
(2) 2:00 p.m.
(3) 12:00 p.m.
(4) 4:00 p.m.

11 An air temperature of 30°C is equal to

(1) –1°F
(2) 68°F
(3) 83°F
(4) 86°F

12 The subtropical jet streams are fast flowing air currents located in the atmosphere about 10 kilometers above the surface of Earth. In which layer of the atmosphere are the subtropical streams located?

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

13 Which substance given off by a volcano is most likely to cause global cooling following a large volcanic eruption?

(1) carbon dioxide
(2) airborne ash
(3) water vapor
(4) methane

14 The table below shows general climate conditions of four different locations, *A*, *B*, *C*, and *D*.

Location	**Annual Temperature Range** (°C)	**Annual Precipitation** (cm)
A	–3 to 10	100
B	–15 to 4	70
C	0 to 16	50
D	10 to 28	165

In which location is chemical weathering probably greatest, based on these climate conditions?

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

15 The picture below shows a calorimeter being used to demonstrate a method of heat transfer. One cup is filled with hot water, and the other cup is filled with cold water. A metal bar extends through the lids into the water in both cups. Thermometers record changes in temperature.

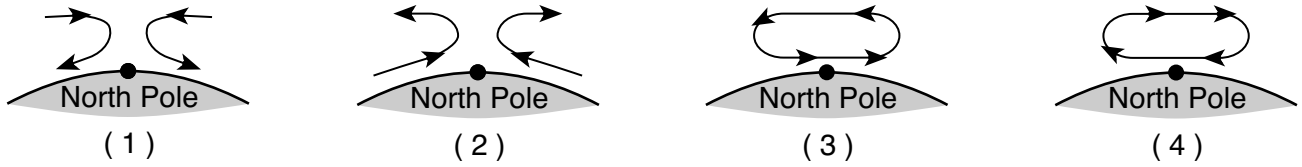
This calorimeter demonstrates the transfer of heat through the metal bar from

(1) cold water to hot water by conduction
(2) cold water to hot water by radiation
(3) hot water to cold water by conduction
(4) hot water to cold water by radiation

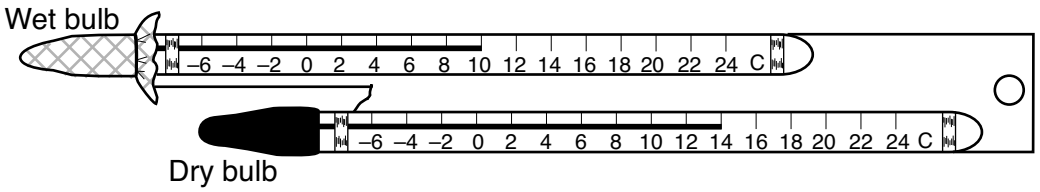
16 At the end of which geologic time period were the continents of South America and Africa joined together and entirely located south of the equator?

(1) Paleogene Period
(2) Jurassic Period
(3) Permian Period
(4) Devonian Period

17 Which atmospheric cross section best represents the general air circulation over the North Pole?



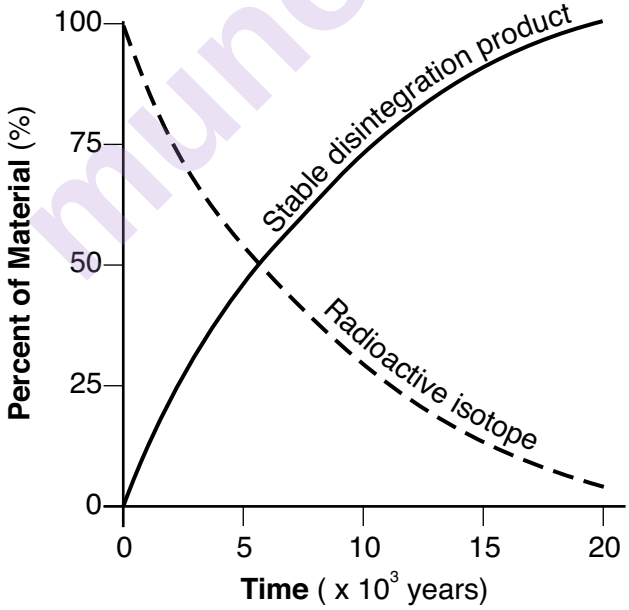
18 The diagram below represents a sling psychrometer.



Based on the wet-bulb temperature and the dry-bulb temperature, what is the approximate relative humidity?

(1) 6%
(2) 8%
(3) 30%
(4) 60%

19 The graph below represents the decay of a radioactive isotope into a stable disintegration product.



Which remains could be dated using this radioactive isotope?

(1) seeds from the earliest grasses
(2) mastodont bone
(3) feathers from the earliest birds
(4) Naples tree trunk

20 Block diagram *A* below represents normal surface ocean currents and the upwelling of colder water in the eastern Pacific Ocean. Block diagram *B* represents a reversal of surface ocean currents and decreased upwelling in the same region, initiating an El Niño event.

Diagram A
Normal Conditions

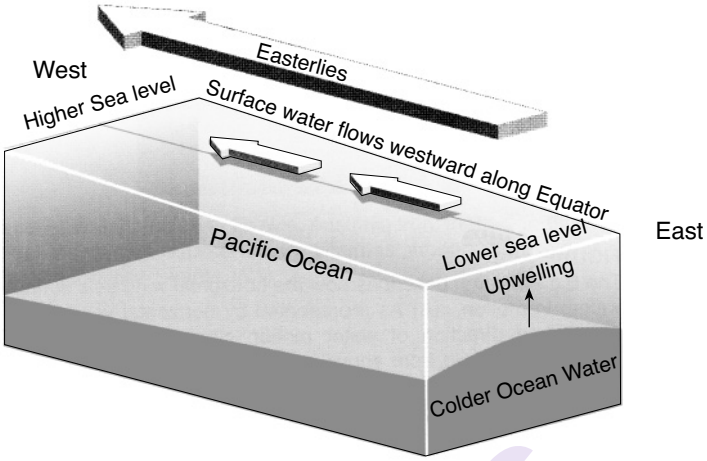
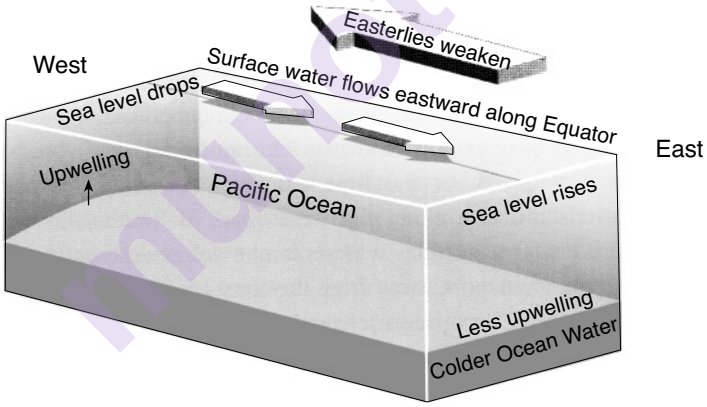


Diagram B
El Niño Conditions



Adapted from: Moran, Joseph. *Weather Studies: Introduction to Atmospheric Science*.

Warmer surface water builds up in the eastern Pacific Ocean during an El Niño event because the speed of the Easterlies

(1) decreases and upwelling decreases
(2) decreases and upwelling increases
(3) increases and upwelling decreases
(4) increases and upwelling increases

21 Ordovician-age crinoid fossils of tropical marine origin are found in the bedrock of the Hudson-Mohawk lowlands region of New York State. This provides evidence that New York State was once located at a

(1) lower latitude and lower elevation
(2) lower latitude and higher elevation
(3) higher latitude and lower elevation
(4) higher latitude and higher elevation

22 The photograph below shows the New York State fossil *Eurypterus remipes*.

Eurypterus fossils are most likely to be found in surface bedrock near

(1) Elmira
(2) Mt. Marcy
(3) Watertown
(4) Niagara Falls

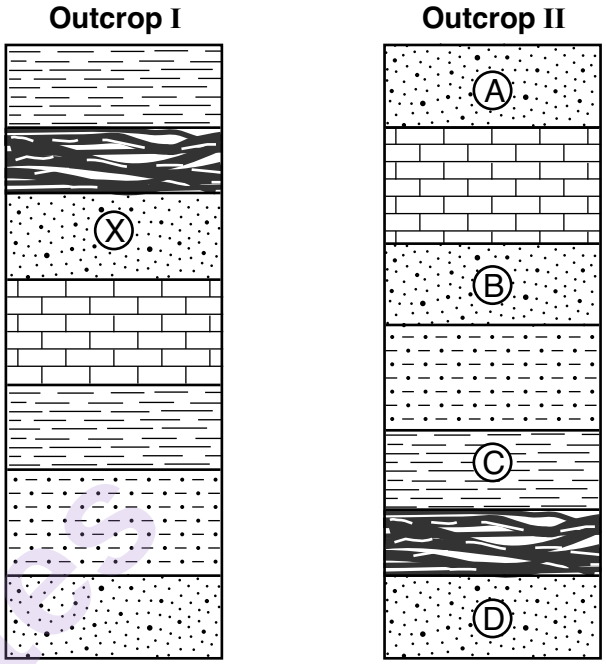
23 The study of fossil evidence suggests that humans

(1) lived on the continent of Pangaea
(2) lived at the same time as dinosaurs
(3) have existed for a very brief time in geologic history
(4) have existed during most of geologic time

24 What is occurring at the Southeast Indian Ridge?

(1) New oceanic crust is forming.
(2) Old oceanic crust is being destroyed.
(3) New continental crust is forming.
(4) Old continental crust is being destroyed.

25 The cross sections below represent two rock outcrops labeled I and II. Letters *A*, *B*, *C*, *D*, and *X* identify rock layers. The rock layers have not been overturned.



Which rock layer in outcrop II best correlates with layer *X* in outcrop I?

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

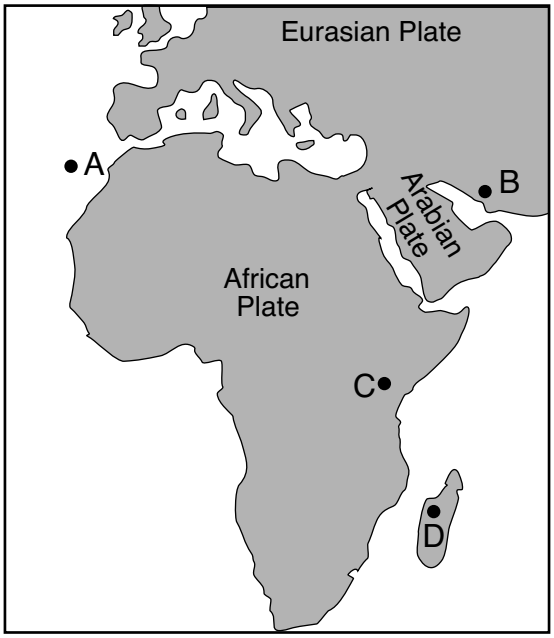
26 Which igneous rock formed from magma that cooled slowly and is composed of 5% amphibole, 8% biotite, 15% plagioclase feldspar, 37% quartz, and 35% potassium feldspar?

(1) rhyolite
(2) granite
(3) diorite
(4) scoria

27 A mudslide is most likely to occur on a hillslope having soil that is

(1) saturated with water and without vegetation
(2) saturated with water and covered by vegetation
(3) unsaturated and without vegetation
(4) unsaturated and covered by vegetation

28 The map below represents portions of three tectonic plates. Points *A* through *D* represent locations on Earth's surface.



Which location is closest to a zone of rifting?

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

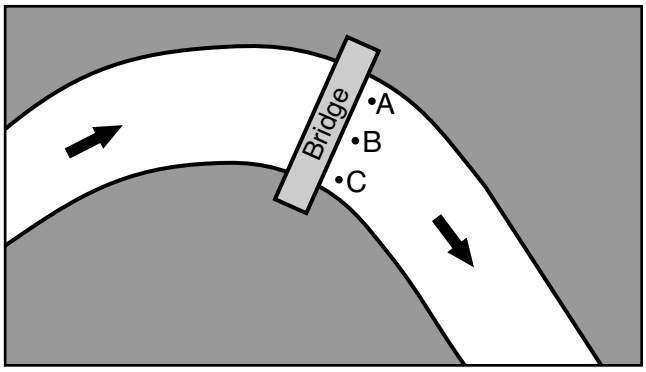
29 The table below shows the chemical formulas for four rock-forming minerals.

Mineral	Composition
Chalcopyrite	$CuFeS_2$
Fayalite	Fe_2SiO_4
Apatite	$Ca_5(PO_4)_3OH$
Barite	$BaSO_4$

Which mineral contains the two most abundant elements by mass in Earth's crust?

(1) chalcopyrite
(2) fayalite
(3) apatite
(4) barite

30 The map below represents a bridge over the meander of a stream. From the bridge, a student measures the stream velocity at locations *A*, *B*, and *C*.



Which table represents the most probable stream velocity recordings at each location?

Location	Velocity (cm/sec)
A	100
B	94
C	88

(1)

Location	Velocity (cm/sec)
A	100
B	88
C	94

(3)

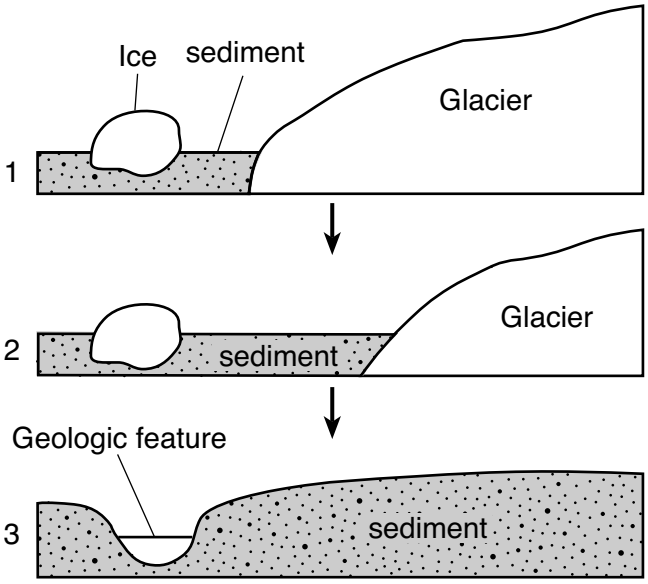
Location	Velocity (cm/sec)
A	88
B	94
C	100

(2)

Location	Velocity (cm/sec)
A	88
B	100
C	94

(4)

31 The sequence of diagrams below represent three stages in the formation of a geologic feature over time.



Which geologic feature is formed by this process?

(1) drumlin
(2) dune
(3) finger lake
(4) kettle lake

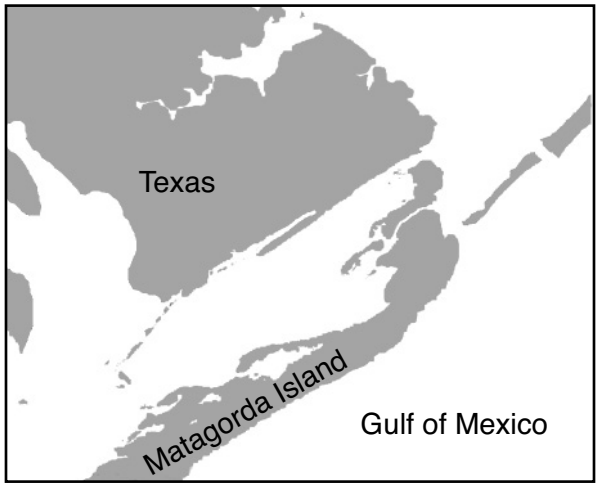
32 Which mineral has cleavage in two directions and is commonly used to manufacture ceramics?

(1) muscovite mica
(2) potassium feldspar
(3) fluorite
(4) olivine

33 A mixture of rounded pebbles and sand was deposited in a river. Over time, these sediments were compacted and cemented together to form the sedimentary rock

(1) conglomerate
(2) sandstone
(3) breccia
(4) shale

34 The map below shows a portion of Matagorda Island. This barrier island is located along the coast of Texas in the Gulf of Mexico.



Which agent of erosion is primarily responsible for the formation of Matagorda Island?

(1) streams
(2) moving ice
(3) wave action
(4) wind

35 A primary difference between sedimentary rocks and nonsedimentary rocks is that

(1) nonsedimentary rocks contain an abundance of fossils
(2) nonsedimentary rocks originate in regions of great heat and/or pressure
(3) sedimentary rocks are currently found only in marine locations
(4) sedimentary rocks are formed at plate boundaries

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 table below and on your knowledge of Earth science. The data table describes some types of limestone.

Types of Limestone

Limestone Name	Description
Chalk	thick accumulations of microscopic shells of tiny organisms with calcite cement
Coquina	poorly cemented shells and shell fragments
Coral	skeletons of coral organisms with calcite cement
Travertine	deposits left by hot springs or dripping water in caves

36 Which limestone is classified as inorganic?

(1) chalk
(2) coquina
(3) coral
(4) travertine

37 The photograph below shows one type of limestone described in the table.

daniellesdives.files.wordpress.com

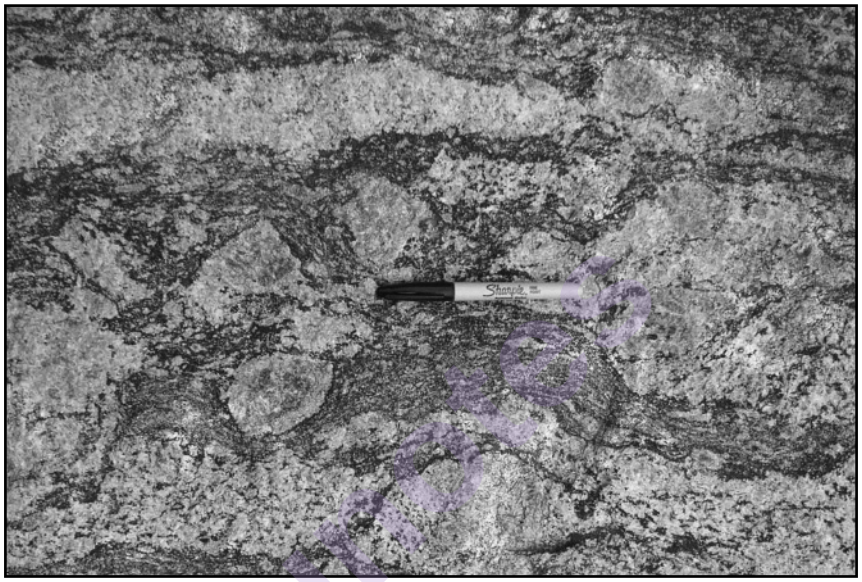
This type of limestone is best identified as

(1) chalk
(2) coquina
(3) coral
(4) travertine

Base your answers to questions 38 through 40 on the passage and photograph below and on your knowledge of Earth science. The photograph shows anorthositic gneiss bedrock from Whiteface Mountain in New York State.

Whiteface Mountain

Whiteface Mountain, located in the Mount Marcy region, is one of New York State's highest mountain peaks. Most of the surface bedrock on Whiteface is anorthositic gneiss made up of large, light-colored plagioclase feldspar crystals and dark mineral bands composed of amphibole, pyroxene, and garnet. The foliated crystal alignment in the gneiss was produced during a major tectonic event called the Grenville orogeny. Landslides have exposed steep slopes of this white and gray bedrock on the sides of Whiteface Mountain.



www.adkresearch.org

38 In the anorthositic gneiss, the mineral garnet is most likely observed in the

(1) dark bands, has a red color, and has a hardness of 7.0
(2) dark bands, has a silver color, and has a hardness of 3.0
(3) light bands, has a red color, and has a hardness of 3.0
(4) light bands, has a silver color, and has a hardness of 7.0

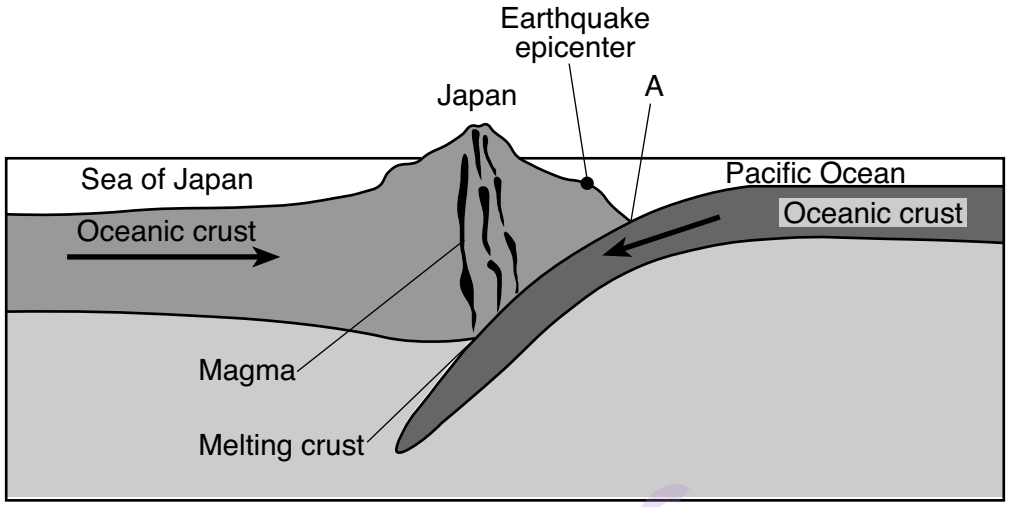
39 The texture of the gneiss indicates that the bedrock

(1) underwent contact metamorphism
(2) underwent regional metamorphism
(3) was bioclastic in origin
(4) was composed of compacted sediment

40 The altitude of *Polaris* as seen by an observer on Whiteface Mountain in the Mount Marcy region will be approximately

(1) 40°
(2) 44°
(3) 74°
(4) 90°

Base your answers to questions 41 through 43 on the cross section below and on your knowledge of Earth science. The cross section represents a section of Earth's lithosphere along the coast of Japan. The epicenter of a large magnitude earthquake that occurred on March 11, 2011 is indicated. Devastation occurred mainly in the low-lying coastal areas of Japan closest to the epicenter. Letter *A* represents a geologic feature.



(Not drawn to scale)

41 Which type of tectonic plate boundary is represented in the cross-section?

(1) complex
(2) transform
(3) convergent
(4) divergent

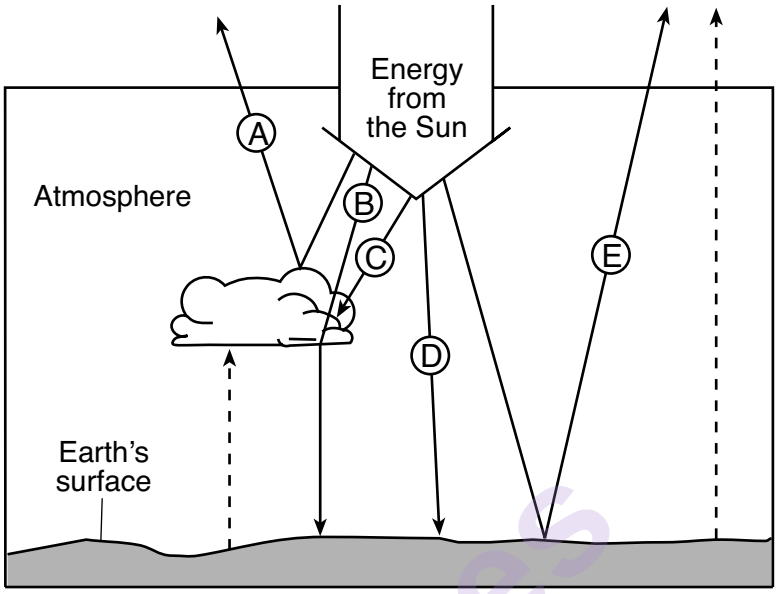
42 The geologic feature indicated by letter *A* is

(1) a hot spot
(2) an island arc
(3) an ocean trench
(4) an igneous intrusion

43 What most likely caused the major devastation along the flat coastal areas of Japan as a result of this earthquake?

(1) crustal downwarping
(2) lava flows
(3) landslides
(4) a tsunami

Base your answers to questions 44 through 46 on the cross section below and on your knowledge of Earth science. The cross section represents the effect of Earth's atmosphere on energy from the Sun. Arrows labeled *A*, *B*, *C*, *D*, and *E* represent some possible paths of this insolation. The dashed arrows represent energy reradiated from Earth's surface.



44 Which arrows represent reflected insolation?

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

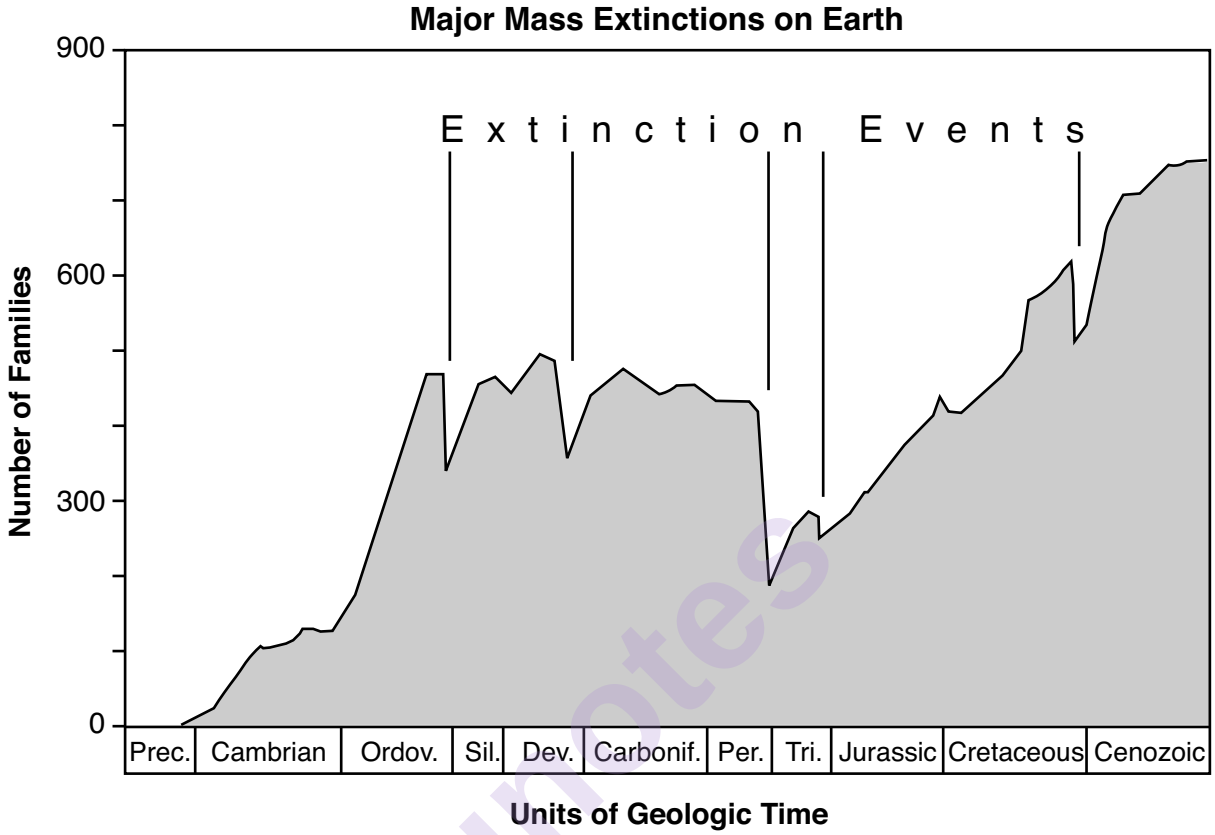
45 Compared to path *D*, the amount of energy reaching Earth's surface following path *B* is likely

(1) less, because atmospheric transparency is less
(2) less, because atmospheric transparency is greater
(3) more, because atmospheric transparency is less
(4) more, because atmospheric transparency is greater

46 Which type of surface material absorbs and reradiates the greatest amount of energy?

(1) white with a smooth texture
(2) white with a rough texture
(3) dark with a smooth texture
(4) dark with a rough texture

Base your answers to questions 47 and 48 on the graph below and on your knowledge of Earth science. The graph shows the number of families (groups of closely related species) represented in the fossil record and five major mass extinction events in Earth's history.



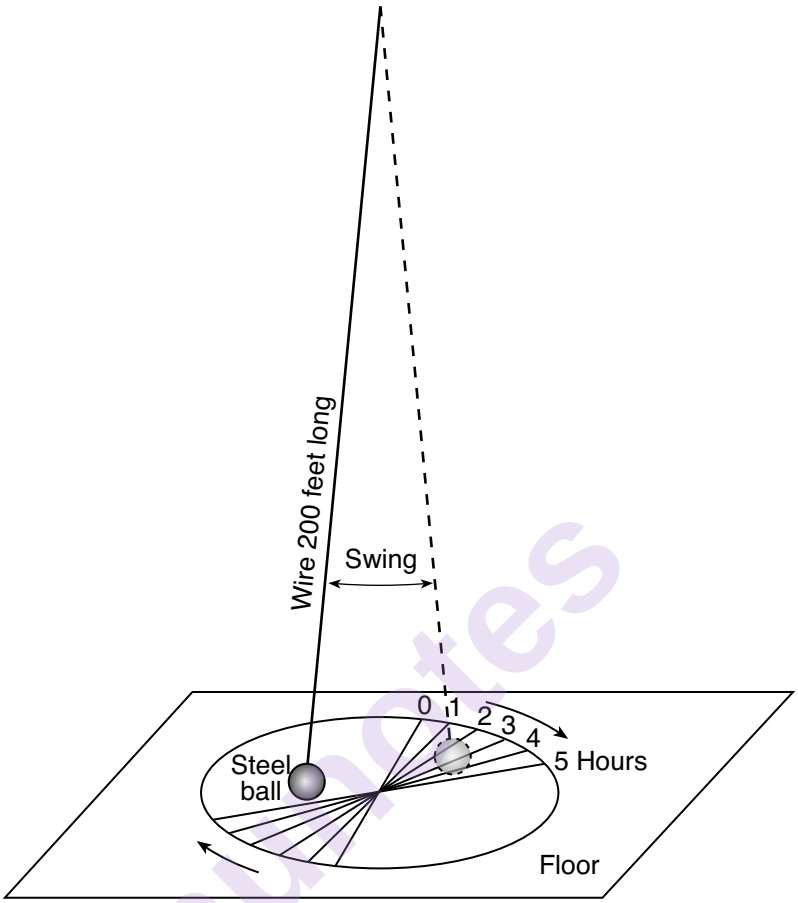
47 Which group of living organisms survived all five major mass extinctions?

(1) ammonoids
(2) brachiopods
(3) graptolites
(4) trilobites

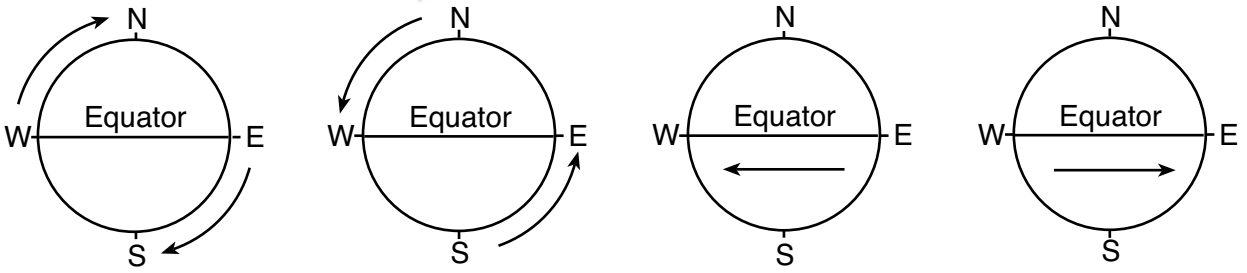
48 One group of organisms that existed on Earth before 550 million years ago was

(1) sharks
(2) insects
(3) Ediacaran fauna
(4) Burgess shale fauna

Base your answers to questions 49 and 50 on the diagram below and on your knowledge of Earth science. The diagram represents the apparent change in direction of the swing of a scientific device over a period of five hours. This device provides evidence of Earth's rotation.



49 Which diagram represents the correct direction of Earth's rotation?



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

50 Approximately how many degrees does Earth rotate on its axis over this five-hour period?

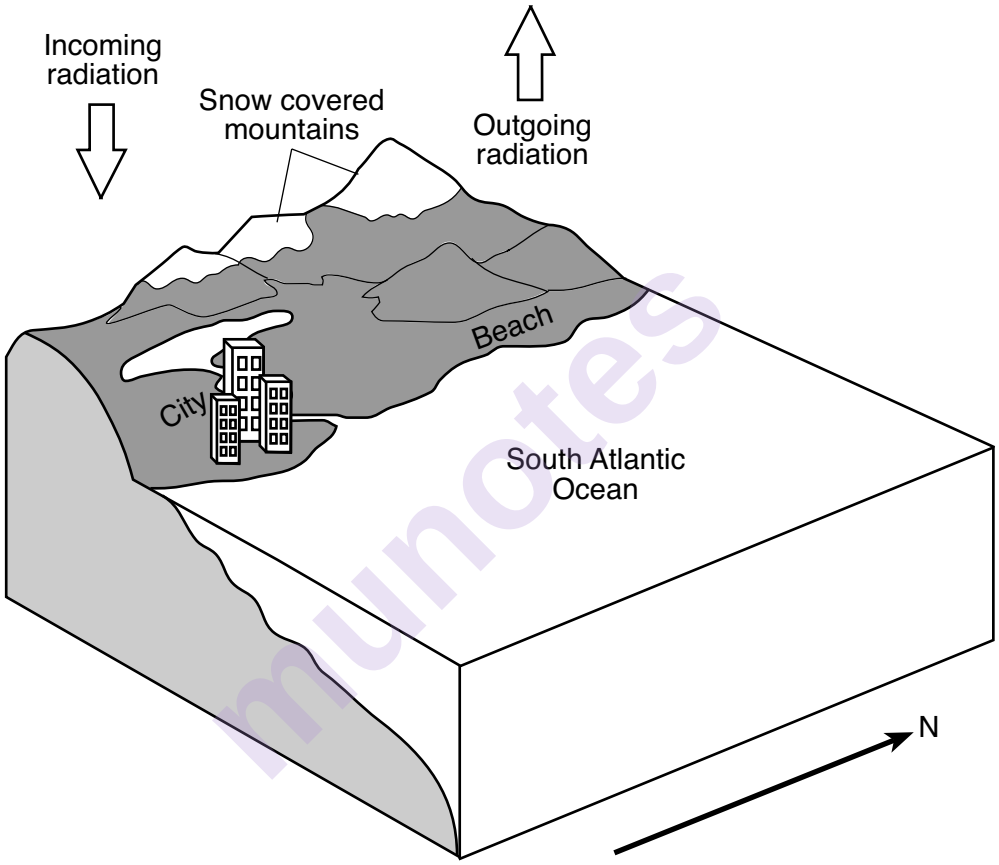
(1) 15°
(2) 45°
(3) 75°
(4) 90°

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 53 on the block diagram below and on your knowledge of Earth science. The block diagram represents an east coast location near the southern tip of South America. Arrows represent incoming and outgoing radiation.



(Not drawn to scale)

51 Other than latitude, identify the climate factor that produces the cold temperatures responsible for the snow-covered mountains. [1]

52 Complete the table *in your answer booklet* by using terms to describe how the relative daytime air temperature and the relative daytime air pressure over the beach and ocean are different in the summer months. [1]

53 On the set of axes *in your answer booklet*, draw a line that generally represents the average monthly air temperatures from January to December at the Southern Hemisphere city shown in the diagram. [1]

Base your answers to questions 54 through 57 on the passage below, the map *in your answer booklet*, and on your knowledge of Earth science. The partially completed isoline map shows the highest one-day total rainfall values that are predicted to occur at least once in 100 years for New York State. Isolines for the 4.5-inch, 5.0-inch, and 8.0-inch rainfall values have been drawn.

> Extreme precipitation events, like those predicted to occur once every 100 years, as shown on the map, can produce local and widespread flooding. These floods can damage property, affect water quality, and pose a danger to humans. Climate scientists have been collecting precipitation data for many years and are able to make estimates of extreme rainfall events. Scientists are observing that these extreme precipitation events are now occurring with greater frequency than in the past.

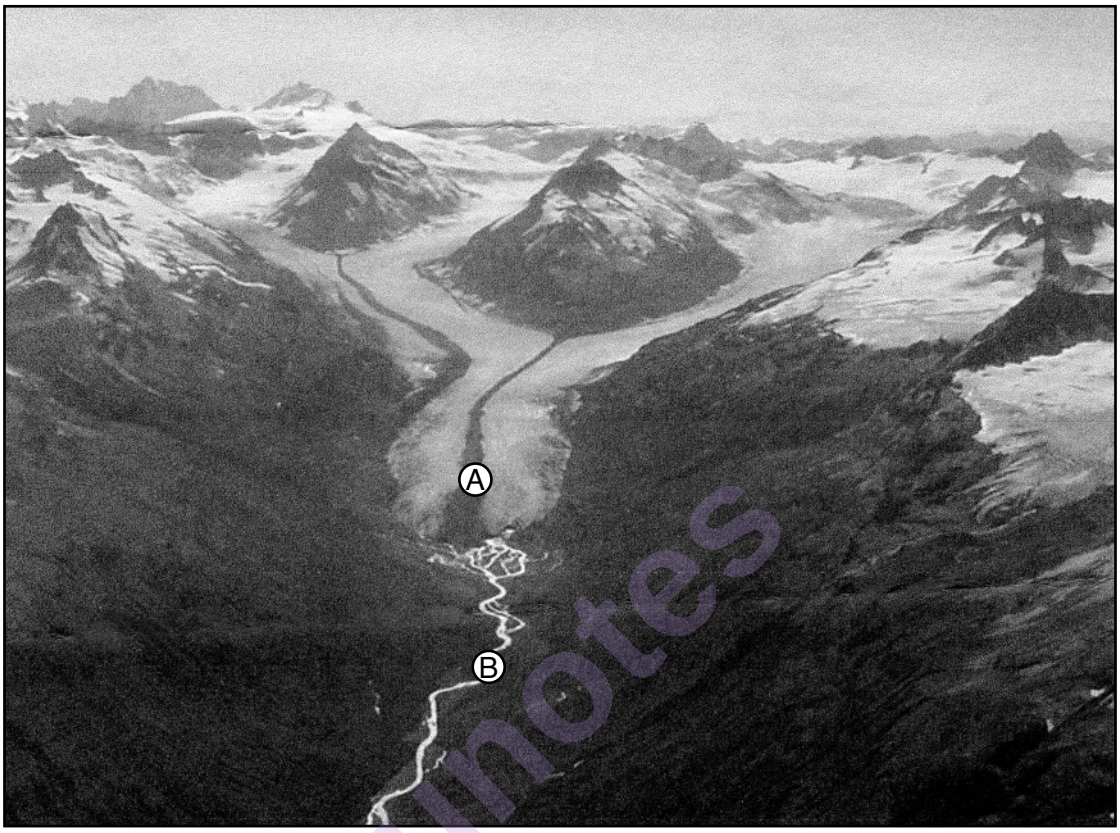
54 On the map *in your answer booklet*, draw the 5.5-inch, 6.0-inch, and 6.5-inch isolines. Extend the isolines to the edges of New York State. [1]

55 Identify the amount of rainfall, in inches (in), that is predicted to occur at Oswego, New York, for the highest rainfall event occurring once in 100 years. [1]

56 Identify *two* New York State landscape regions with the highest predicted rainfall value for an event occurring once in 100 years. [1]

57 Explain why urban areas are more likely to experience flooding from extreme rainfall events than rural areas. [1]

Base your answers to questions 58 through 60 on the photograph below and on your knowledge of Earth science. The photograph shows a glacier located in the Chugach Mountains of Alaska. Letter *A* indicates a moraine. The glacier previously flowed down the entire valley. The lower portion of this valley is now occupied by a stream. Letter *B* represents a location within the stream.



58 Describe the arrangement of sediments found within the moraine indicated by letter *A*. [1]

59 Identify the name of the largest particles that can be transported by the stream at letter *B* if the stream velocity is 20 centimeters per second. [1]

60 Describe the cross-sectional shape of the valley created by this glacier. [1]

Base your answers to questions 61 through 63 on the data table below, on the map *in your answer booklet*, and on your knowledge of Earth science. The data table shows the date, location, barometric pressure, and wind speed at the center of Hurricane Irma at 12 noon from September 7 through September 11, 2017. The map *in your answer booklet* shows the latitude and longitude coordinates and a portion of the southeast United States and the Caribbean.

Hurricane Irma Data Table

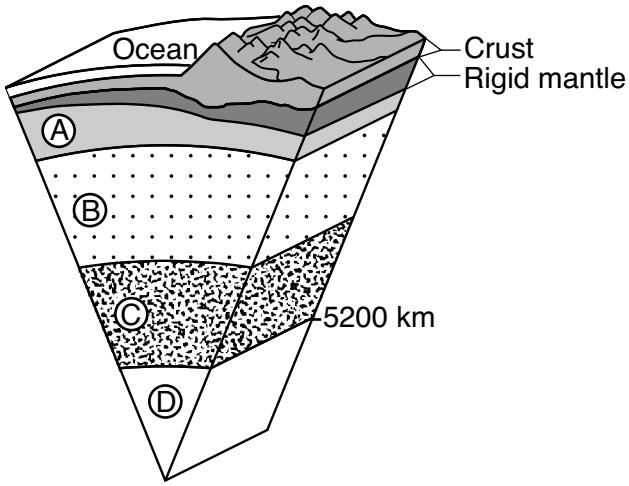
Date	**Latitude**	**Longitude**	**Barometric Pressure** (mb)	**Wind Speed** (knots)
Sept. 7	20° N	69° W	921	157
Sept. 8	22° N	75° W	927	130
Sept. 9	23° N	80° W	937	113
Sept. 10	25° N	82° W	929	118
Sept. 11	30° N	83° W	970	61

61 On the map *in your answer booklet*, plot the latitude and longitude locations of Hurricane Irma that are listed in the data table. Connect *all five* plots with a line. [1]

62 Describe the general relationship between the barometric pressure and wind speed for Hurricane Irma. [1]

63 According to the information in the data table, identify the name of the warm ocean current that caused Hurricane Irma to strengthen on Sept. 10. [1]

Base your answers to questions 64 and 65 on the model below and on your knowledge of Earth science. The model represents a cross-sectional view from Earth's surface to its center. Four layers of Earth's interior are labeled *A*, *B*, C, and *D*. The depth below Earth's surface of the boundary between *C* and *D*, measured from Earth's surface, is indicated.



(Not drawn to scale)

64 Determine the inferred pressure, in million atmospheres, and temperature, in °C, within Earth's interior at the boundary between layers *B* and *C*. [1]

65 *In your answer booklet*, circle the inferred state of matter of layer *D* and name the *two* major elements that make up the composition of layer *D*. [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 weather map *in your answer booklet*, on the data table below, and on your knowledge of Earth science. The map shows the center of a low-pressure system (**L**). Lines *XY* and *XZ* represent two fronts associated with this low-pressure system. Points *R*, *S*, and *T* represent locations on Earth's surface. The data table lists weather conditions at these three locations.

Weather Data

Weather Condition	Location R	Location S	Location T
Temperature (°F)	65	55	82
Dewpoint (°F)	64	36	72
Cloud cover (%)	100	0	50
Wind from the	E	NW	SW
Wind speed (knots)	10	20	10

66 On the weather map *in your answer booklet*, draw weather-front symbols on the correct sides of *both* line *XY* and line *XZ* to show the most probable type and direction of each moving front. [1]

67 On the weather station model *in your answer booklet*, using the proper format, record the *five* weather conditions shown in the data table for location *R*. [1]

68 Identify the compass direction toward which the center of this low-pressure system will move if it follows a normal storm track. [1]

Base your answers to questions 69 and 70 on the diagram *in your answer booklet*, which shows Earth on June 21, when the Northern Hemisphere experiences the most hours of daylight in a 24-hour period. The shaded area represents nighttime.

69 On the diagram *in your answer booklet*, place an **X** on Earth's surface at the latitude where the vertical ray of the Sun would be directly overhead on June 21. [1]

70 State *one* cause for the different lengths of daylight shown on June 21 at these different northern latitudes. [1]

Base your answers to questions 71 through 74 on the passage and photographs below and on your knowledge of Earth science. The photographs show two celestial objects before, during, and after a total solar eclipse that was observed in Kingston, Tennessee at 2:37 p.m., on August 21, 2017, taken from a fixed position.

Solar Eclipses and the Saros Cycle

Solar eclipses occur between two and five times a year somewhere on Earth, but are rare for any one location. The plane of the Moon's orbit is tilted approximately 5° to Earth's orbit around the Sun. So, even though the Moon is in the correct phase, New Moon, to produce a solar eclipse, the Moon's shadow usually falls above or below Earth's position in its orbit. To produce a total solar eclipse, the Moon in its orbit must be at or near its closest point to Earth, making it appear large enough to cover the Sun. Solar eclipses follow specific, cyclic patterns called Saros Cycles. A Saros Cycle lasts 18 years, 11 days, and 8 hours. Since eight hours is approximately one-third of Earth's daily rotation, it takes three Saros Cycles (54 years and 34 days) for a solar eclipse to return to the same section of Earth.

Total Solar Eclipse G. Meyer

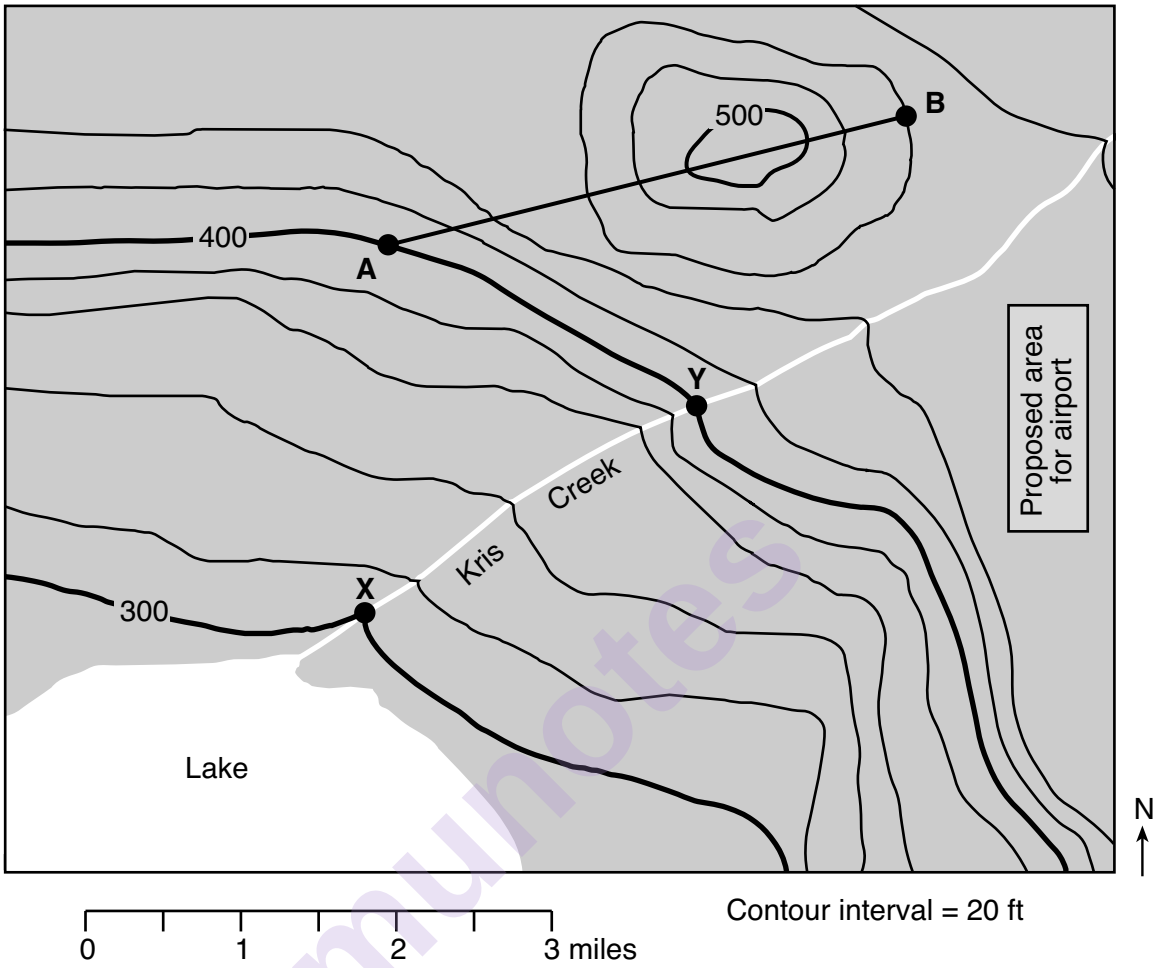
71 On the diagram *in your answer booklet*, place an **X** on the Moon's orbit to indicate the Moon's position on August 21, 2017. [1]

72 The plane of the Moon's orbit is tilted approximately 5° to Earth's orbit around the Sun. Explain how the tilt of the Moon's orbit prevents a solar eclipse from occurring every month. [1]

73 Predict the next year after 2017 when the total solar eclipse path associated with this Saros Cycle will return to the same section of Earth. [1]

74 State the number of days that it takes the Moon to go from one New Moon phase to the next New Moon phase as viewed from Earth. [1]

Base your answers to questions 75 through 78 on the topographic map below and on your knowledge of Earth science. The map shows features and contour lines in the region of a proposed airport. Line *AB* is a reference line on the map. Points *X* and *Y* represent surface locations along a creek. Elevations are shown in feet.



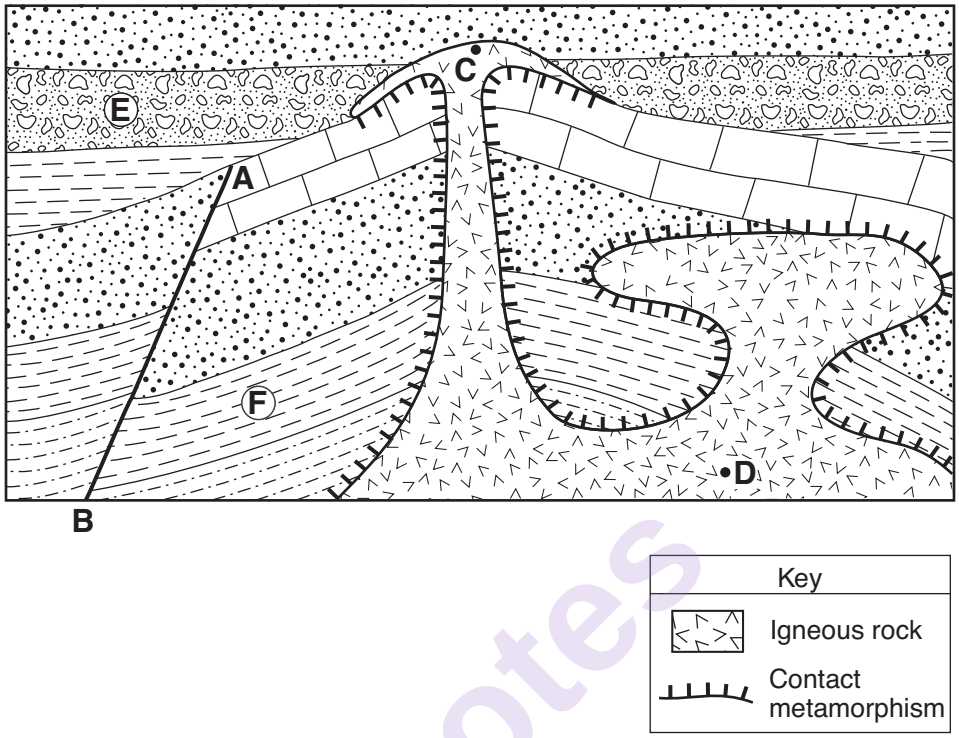
75 On the grid *in your answer booklet*, construct a topographic profile along line *AB* by plotting the elevation of each contour line that crosses line *AB*. Points *A* and *B* have been plotted. Connect *all nine* plots with a line from *A* to *B* to complete the profile. [1]

76 Calculate the gradient along Kris Creek between locations *X* and *Y*. Label your answer with the correct units. [1]

77 Describe how the contour lines provide evidence that the land is flat enough for an airport of this size to be built at the proposed location. [1]

78 Identify the general compass direction toward which Kris Creek flows. [1]

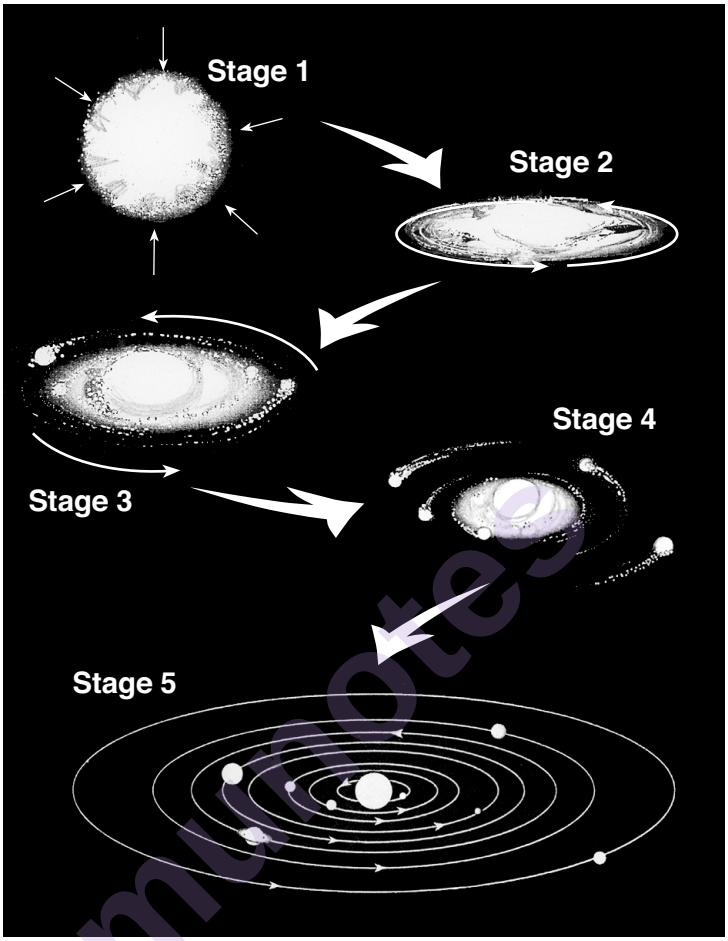
Base your answers to questions 79 and 80 on the cross section below and on your knowledge of Earth science. The cross section shows several rock units. Line *AB* indicates a fault. Points *C* and *D* are locations within the igneous rock unit. Circled letters *E* and *F* represent two of the sedimentary rock layers.



79 Describe *one* piece of evidence in the cross section indicating that the igneous rock at location *C* is extrusive. [1]

80 List fault *AB*, rock unit *E*, and rock unit *F* in order from oldest to youngest. [1]

Base your answers to questions 81 through 85 on the diagram below and on your knowledge of Earth science. The diagram represents five inferred stages in the formation of our solar system. Stage 1 represents a contracting gas cloud. Stages 2 through 4 represent the gas cloud flattening into a spinning disk as planets formed around our Sun. Stage 5 represents the final stage in the formation of the solar system.



(Not drawn to scale)

81 Identify the force that was primarily responsible for contracting the gas cloud in stage 1. [1]

82 State the number of million years ago (mya) for the estimated time of origin of our solar system. [1]

83 Identify the nuclear process occurring within the Sun at stage 5 that converts mass into great amounts of energy. [1]

84 Compared to the terrestrial planets that formed closer to the Sun, describe *two* characteristics that are different for the Jovian planets that formed farther from the Sun. [1]

85 Identify the planet in stage 5 that has a period of rotation greater than its period of revolution. [1]

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