

Answers Written By:

William Docekal

Science Teacher – Retired

STUDENTS

One of the best ways to raise your Earth Science regents grade is to diligently do four previous exams with complete comprehension. When you are done, you will have a working understanding of hundreds of questions and the supporting concepts. Many of the questions, in one way or another, will appear in this year's regents exam. This is the purpose of this review book. But the trick is to do the exams in earnest; taking your time, checking over our brief but concise explanations until it makes sense, and revisiting the ones you answer incorrectly days later to check your understanding of the correct answer.

Timing is essential. Don't wait until the last week. We suggest that you start working on these regents exams early, doing 20 to 30 questions a day. Star the ones you need to revisit, underline important information, and have a good knowledge of what is in the Reference Tables. We suggest that you use the reference tables found in the back of this booklet or one that your teacher might have provided for you. Many points can be gained by knowing where in the reference tables an answer is found.

So as the limestone said to the bedrock; don't take the regents for granite. Rather, work hard and your grade will improve.

The best to you.

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PHYSICAL SETTING REGENTS EARTH SCIENCE

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June 2016

Part A

Answer all questions in this part.

Directions (1–35): For *each* statement or question, write in the space provided the number of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Earth Science*.

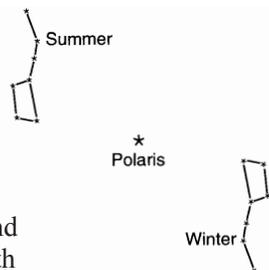
- Earth's approximate rate of revolution is
 - 1° per day
 - 15° per day
 - 180° per day
 - 360° per day
 1 _____
- Planetary winds in the Northern Hemisphere are deflected to the right due to the
 - Doppler effect
 - Coriolis effect
 - tilt of Earth's axis
 - polar front jet stream
 2 _____
- Which star is hotter, but less luminous, than *Polaris*?
 - Deneb*
 - Aldebaran*
 - Sirius*
 - Pollux*
 3 _____
- Which statement best explains why Earth and the other planets of our solar system became layered as they were being formed?
 - Gravity caused less-dense material to move toward the center of each planet.
 - Gravity caused more-dense material to move toward the center of each planet.
 - Materials that cooled quickly stayed at the surface of each planet.
 - Materials that cooled slowly stayed at the surface of each planet.
 4 _____
- Which conditions on Earth's surface will allow for the greatest amount of water to seep into the ground?
 - gentle slope and permeable
 - gentle slope and impermeable
 - steep slope and permeable
 - steep slope and impermeable
 5 _____
- The photograph shows a Foucault pendulum at a museum. The pendulum knocks over pins in a regular pattern as it swings back and forth. This pendulum movement, and the pattern of knocked-over pins, is evidence of Earth's
 - nearly spherical shape
 - gravitational attraction to the Sun
 - rotation on its axis
 - nearly circular orbit around the Sun
 6 _____



7. Earth's early atmosphere contained carbon dioxide, sulfur dioxide, hydrogen, nitrogen, water vapor, methane, and ammonia. These gases were present in the atmosphere primarily because
- (1) radioactive decay products produced in Earth's core were released from Earth's surface
 - (2) evolving Earth life-forms produced these gases through their activity
 - (3) Earth's growing gravitational field attracted these gases from space
 - (4) volcanic eruptions on Earth's surface released these gases from the interior

7 _____

8. The diagram represents the apparent positions of the Big Dipper, with respect to *Polaris*, as seen by an observer in New York State at midnight on the first day of summer and on the first day of winter.

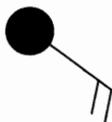


The change in the apparent position of the Big Dipper between the first day of summer and the first day of winter is best explained by Earth

- (1) rotating for 12 hours
- (2) rotating for 1 day
- (3) revolving for 6 months
- (4) revolving for 1 year

8 _____

9. The weather station model shown indicates that winds are coming from the



- (1) southeast at 10 knots
- (2) northwest at 10 knots
- (3) southeast at 20 knots
- (4) northwest at 20 knots

9 _____

10. Which type of air mass most likely has high humidity and high temperature?

- (1) cP
- (2) cT
- (3) mT
- (4) mP

10 _____

11. What is the relative humidity if the dry-bulb temperature is 16°C and the wet-bulb temperature is 10°C?

- (1) 45%
- (2) 33%
- (3) 14%
- (4) 4%

11 _____

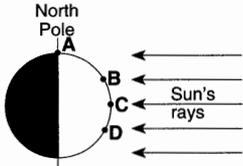
12. The table below shows the air temperature and dewpoint at each of four locations, *A*, *B*, *C*, and *D*.

Location	A	B	C	D
Air temperature (°F)	80	60	45	35
Dewpoint (°F)	60	43	35	33

Based on these measurements, which location has the greatest chance of precipitation?

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

12 _____

13. Which type of electromagnetic radiation has the shortest wavelength?
 (1) ultraviolet (2) gamma rays (3) radio waves (4) visible light 13 ____
14. Which gas is considered a major greenhouse gas?
 (1) methane (2) hydrogen (3) oxygen (4) nitrogen 14 ____
15. The diagram represents Earth and the Sun's incoming rays. Letters *A*, *B*, *C*, and *D* represent locations on Earth's surface. Which two locations are receiving the same intensity of insolation?
 (1) *A* and *B* (2) *B* and *C* (3) *C* and *D* (4) *D* and *B* 15 ____
- 
16. Most of the sand that makes up the sandstone found in New York State was originally deposited in which type of layers?
 (1) tilted (2) horizontal (3) faulted (4) folded 16 ____
17. The map shows the current location of New York State in North America. Approximately how many million years ago (mya) was this New York State region located at the equator?
 (1) 59 mya (3) 359 mya
 (2) 119 mya (4) 458 mya 17 ____
- 
18. Many scientists infer that one cause of the mass extinction of dinosaurs and ammonoids that occurred approximately 65.5 million years ago was
 (1) tectonic plate subduction of most of the continents
 (2) an asteroid impact that resulted in climate change
 (3) a disease spreading among many groups of organisms
 (4) severe damage produced by worldwide earthquakes 18 ____
19. During which geologic epoch do scientists infer that the earliest grasses first appeared on Earth?
 (1) Holocene (2) Pleistocene (3) Oligocene (4) Eocene 19 ____
20. What are the inferred pressure and temperature at the boundary of Earth's stiffer mantle and outer core?
 (1) 1.5 million atmospheres pressure and an interior temperature of 4950°C
 (2) 1.5 million atmospheres pressure and an interior temperature of 6200°C
 (3) 3.1 million atmospheres pressure and an interior temperature of 4950°C
 (4) 3.1 million atmospheres pressure and an interior temperature of 6200°C 20 ____

21. A seismic *P*-wave is recorded at 2:25 p.m. at a seismic station located 7600 kilometers from the epicenter of an earthquake. At what time did the earthquake occur?
 (1) 2:05 p.m. (2) 2:11 p.m. (3) 2:14 p.m. (4) 2:36 p.m. 21 ____

22. A seismic station recorded the *P*-waves, but no *S*-waves, from an earthquake because *S*-waves were
 (1) absorbed by Earth’s outer core
 (2) transmitted only through liquids
 (3) weak and detected only at nearby locations
 (4) not produced by this earthquake 22 ____

23. The Catskills of New York State are best described as a plateau, while the Adirondacks are best described as mountains. Which factor is most responsible for the difference in landscape classification of these two regions?
 (1) climate variations (3) vegetation type
 (2) bedrock structure (4) bedrock age 23 ____

24. An elongated hill that is composed of unsorted sediments deposited by a glacier is called
 (1) a delta (2) a drumlin (3) a sand dune (4) an outwash plain 24 ____

25. Which rock was subjected to intense heat and pressure but did *not* solidify from magma?
 (1) sandstone (2) schist (3) gabbro (4) rhyolite 25 ____

26. The map shows a stream drainage pattern where the streams radiate outward from the center. Which landscape feature would produce this stream drainage pattern?
 (1) steep cliff (3) volcanic mountain
 (2) glacial kettle lake (4) flat plain 26 ____



27. The map shows the area that, at one time, was covered by ancient Lake Bonneville. Evidence of ancient shorelines indicates that, near the end of the last ice age, Lake Bonneville existed in western Utah and eastern Nevada. The Great Salt Lake in Utah is a remnant of the former Lake Bonneville. Which material that was formerly on the bottom of Lake Bonneville is most likely exposed on the land surface today?
 (1) folded metamorphic bedrock
 (2) flat-lying evaporite deposits
 (3) coarse-grained coal beds
 (4) fine-grained layers of volcanic lava 27 ____



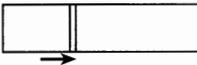
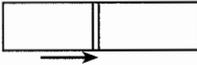
Part B-2

Answer all questions in this part.

Directions (51-65): Record your answers in the spaces provided. 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 data table below and on your knowledge of Earth science. The data table lists four constellations in which star clusters are seen from Earth. A star cluster is a group of stars near each other in space. Stars in the same cluster move at the same velocity. The length of the arrows in the table represents the amount of redshift of two wavelengths of visible light emitted by these star clusters.

Data Table

Constellation in which star cluster is seen from Earth	Redshift of two wavelengths of light absorbed by calcium	Distance from Earth (billion light years)	Velocity of star cluster moving away from Earth (km/s)
Ursa Major	Violet  Red	1.0	15,000
Corona Borealis	Violet  Red	1.4	22,000
Boötes	Violet  Red	2.5	39,000
Hydra	Violet  Red	4.0	61,000

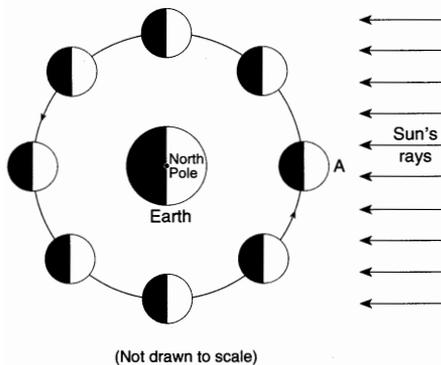
Note: One light year is the distance light travels in one year.

51. Describe the evidence shown by the light from these star clusters that indicates that these clusters are moving away from Earth. [1]

52. Write the chemical symbol for the element, shown in the table above, that absorbs the two wavelengths of light. [1] _____

53. Identify the name of the nuclear process that is primarily responsible for producing energy in stars. [1] _____

Base your answers to questions 54 through 57 on the diagram below and on your knowledge of Earth science. The diagram represents the Moon in eight positions in its orbit around Earth. One position is labeled *A*.



54. Circle the type of eclipse that may occur when the Moon is at position *A*. Explain why this type of eclipse may occur when the Moon is at this position. [1]

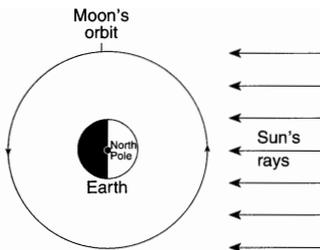
Circle one: lunar eclipse solar eclipse

Explanation: _____

55. The accompanying diagram represents one phase of the Moon as observed from New York State.



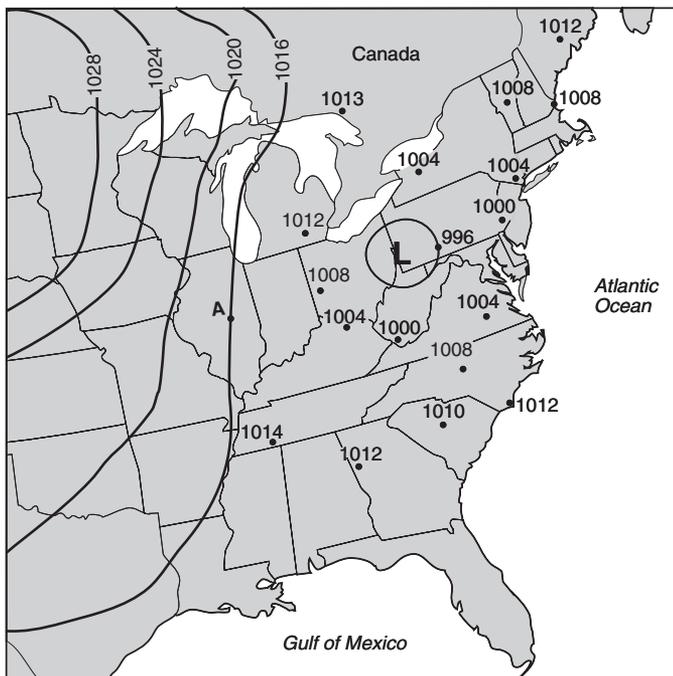
On the diagram, place an **X** on the Moon's orbit to represent the Moon's position when this phase was observed. [1]



56. State the number of days needed for the Moon to show a complete cycle of phases from one full Moon to the next full Moon when viewed from New York State. [1] _____ days

57. Explain why the Moon's revolution and rotation cause the same side of the Moon to always face Earth. [1]

Base your answers to questions 58 through 61 on the weather map below and on your knowledge of Earth science. The weather map shows atmospheric pressures, recorded in millibars (mb), at locations around a low-pressure center (L) in the eastern United States. Isobars indicate air pressures in the western portion of the mapped area. Point A represents a location on Earth's surface.



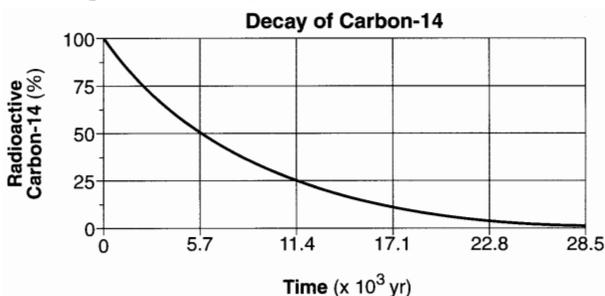
58. On the weather map above, draw the 1012 millibar and the 1008 millibar isobars. Extend the isobars to the east coast of the United States. [1]

59. Identify the weather instrument that was used to measure the air pressures recorded on the map. [1] _____

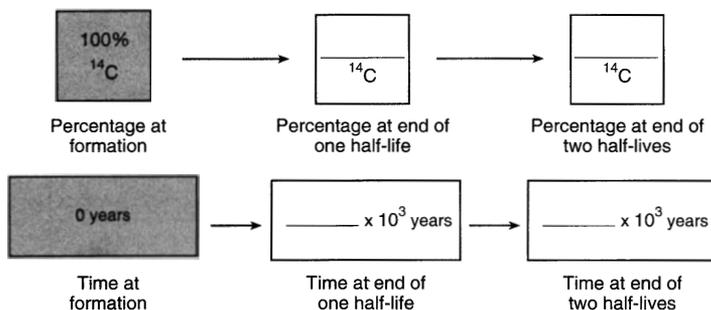
60. Identify the compass direction toward which the center of the low-pressure system will move if it follows a typical storm track. [1]

61. Convert the air pressure at location A from millibars to inches of mercury. [1] _____ in of Hg

Base your answers to questions 62 through 65 on the graph below and on your knowledge of Earth science. The graph shows the rate of decay of the radioactive isotope carbon-14 (^{14}C).



62. Complete the flow chart below by filling in the boxes to indicate the percentage of carbon-14 remaining and the time that has passed at the end of each half-life. [1]



63. Identify the decay product formed by the disintegration of carbon-14. [1]

64. Explain why carbon-14 *cannot* be used to accurately determine the age of organic remains that are 1,000,000 years old. [1]

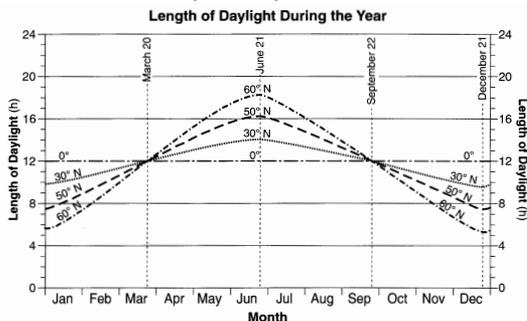
65. State the name of the radioactive isotope that has a half-life that is approximately the same as the estimated time of the origin of Earth. [1]

Part C

Answer all questions in this part.

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

Base your answers to questions 66 through 69 on the graph below and on your knowledge of Earth science. The graph shows changes in hours of daylight during the year at the latitudes of 0°, 30° N, 50° N and 60° N.



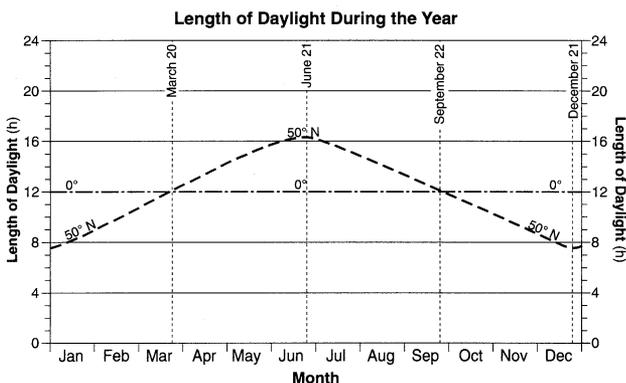
66. Estimate the number of daylight hours that occur on January 1 at 40° N latitude. [1]

_____ h

67. Identify the latitude shown on the graph that has the earliest sunrise on June 21. Include the units and compass direction in your answer. [1]

68. Explain why all four latitudes have the same number of hours of daylight on March 20 and September 22. [1]

69. The graph below shows a curve for the changing length of daylight over the course of one year that occurs for an observer at 50° N latitude. Draw a line to show the changing length of daylight over the course of one year that occurs for an observer at 50° S latitude. [1]



PHYSICAL SETTING

EARTH SCIENCE

ANSWERS

AND

EXPLANATIONS

An Earth Science Reference Table is quoted throughout this section. The Earth Science Reference Tables can be found in the back of this booklet.

June 2016

Part A

1. 1 The Earth takes 365.26 days to complete one revolution (see the Solar System Data chart – Period of Revolution). One complete orbit makes a full circle, equaling 360 degrees. Therefore, the Earth's orbital speed is very close to 1 degree per day. Remember, the Earth's rotational speed is $15^{\circ}/\text{hr}$.
2. 2 The rotation of the Earth causes the Coriolis effect. The Coriolis effect is the curvature path of objects that travel long distances over our planet. This force is most noticeable on the path of winds, air masses, and ocean currents. In the Northern Hemisphere, the deflection is to the right of the traveling path. The Coriolis effect is noticeable diagrammed in the Ocean Surface Currents map and in the Planetary Wind and Moisture Belts in the Troposphere map.
3. 3 Open to the Characteristics of Stars chart. Sirius is positioned lower on the Luminosity scale than Polaris. This makes Sirius appear less brilliant in the night sky compared to Polaris. The temperature of Sirius is greater (just under 10,000 K) than that of Polaris (6,000 K), as shown by the Surface Temperature axis.
4. 2 Open to the Inferred Properties of Earth's Interior chart. On the right side are given the density ranges of the different layers of our planet. In the early stages of formation, our planet and other terrestrial planets were composed of hot liquids. During this stage, the liquid materials separated according to their density, with the denser substances sinking deeper towards the center of the planet. This produced a layered internal structure as the planet cooled and started to solidify.
5. 1 Permeable indicates that water can pass through (infiltrate) the ground material. For this to happen, the water must be free to flow downward through the pore spaces of the sediment and cracks in the bedrock. On a permeable gentle slope, water has time to infiltrate the ground if the ground is not saturated. Due to gravity, water on steeper slopes moves faster, reducing infiltration resulting in more runoff.
6. 3 A long heavy swing pendulum (Foucault pendulum) will appear to change direction over time. This apparent change in direction is caused by the Earth rotating under it. This is one of the acceptable proofs that the Earth rotates.
7. 4 The early atmosphere was formed during the Archean Eon (see Geologic History of NYS chart, left side) as gases within the Earth were vented by volcanic activities. This process is referred to as outgassing, creating the Earth's early poisonous, non-oxygen atmosphere.
8. 3 Due to the motion of revolution, the Earth travels in its orbit 180 degrees in 6 months. Therefore, in 6 months, the Earth is opposite in its orbit, and constellations that are visible throughout the year (like the Big Dipper) are view in a different position in the night sky. It is the motion of revolution that causes many constellations to be visible only in the winter (e.g., Orion) and others constellations to be visible in the summer. These are called seasonal constellations.
9. 3 Open to the Key to Weather Map Symbols – Station Model Explanation chart. The wind direction is the direction the wind is coming from, and on a station model it is represented by the shaft. The wind speed is represented by feathers placed on the shaft. A whole feather equals 10 knots, and a half feather equals 5 knots.

10. 3 Open to the Key to Weather Map Symbols and locate the Air Masses section. An mT air mass will have its source area (where it originates) over water (maritime = m) and in a warm (tropical = T) area. The Gulf of Mexico is a major region that produces mT air masses with these characteristics of being relatively warm and moist, producing high humidity along with high temperatures, especially in the summer. Eventually many of these mT air masses travel up the east coast, affecting our weather.
11. 1 Open to the Relative Humidity (RH) table. The wet-bulb temperature is 10°C and the dry-bulb temperature is 16°C, making a difference of 6°C. From the RH table, go down the 6°C Difference column until it intersects the Dry-Bulb Temperature row of 16°C. At this intersection point the RH is 45%.
12. 4 When the air temperature (dry-bulb temperature) and the dewpoint temperature are equal, the air is saturated making the relative humidity 100%. At location D, because both the air temperature and dewpoint temperature are 35°F, the air is saturated with water vapor (RH = 100%), making the greatest chance for precipitation.
13. 2 Open to the Electromagnetic Spectrum chart. As one moves to the left on this chart, wavelengths decrease. Gamma rays, being the farthest to the left, have the shortest wavelength of all electromagnetic radiation.
14. 1 Greenhouse gases trap Earth’s infrared radiation resulting in higher atmospheric temperatures. Recognized major greenhouse gases are carbon dioxide and methane.
15. 4 Latitude has the greatest influence on the intensity (strength) of insolation (sunlight). Positions B and D are equal distances from the equator and both would experience the same intensity of insolation. Position A is on the North Pole and would experience the least intense rays, while position C, being on the equator, would have the most intense rays.
16. 2 Open to the Scheme for Sedimentary Rock Identification chart and the Rock Cycle in Earth’s Crust chart. These charts show that sandstone is a sedimentary rock whose sand-size sediments have been deposited and have undergone compaction and/or cementation. Most deposited sediments are originally deposited horizontally, especially when released in a quiet body of water. Later in geologic time, these horizontal sedimentary strata may experience tilting, folding, or faulting.
17. 3 Open to the Geologic History of NYS table. In the Inferred Positions of Earth’s Landmasses it shows NYS very close to the equator 359 mya – at the end of the Devonian Period. This inferred position is supported by tropical marine fossils (like coral) being found in in upstate NY rock layers dating from the Devonian Period.
18. 2 Open to the Geologic History of NYS table. On the right side of the Epoch column, locate the given time scale which is in millions of years (mya). Move down this scale stopping at the 65.5 mya. Here at the end of the Mesozoic Era, in the Life on Earth column, it states “Mass extinction of dinosaurs, ammonoids,...” Geologists have found evidences that a large asteroid impact occurred during this time period. A large asteroid impact would throw up much ash and dust into the atmosphere causing a drastic change to global climate, leading to mass extinction of many life forms.