

Name \_\_\_\_\_

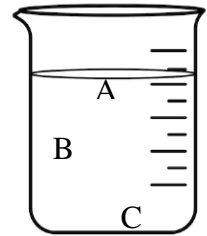
# THE ULTIMATE EARTH SCIENCE MIDTERM REVIEW PACKET

## Topic 1 - Measurement and Graphing

1. As the temperature of a body of air increases, its density \_\_\_\_\_ and the air will \_\_\_\_\_.  
(increases, decreases, remains the same?) (rise or sink?)

2. What is the density of liquid water? \_\_\_\_\_

3. If a sample of the mineral calcite (density = 2.3g/mL) was placed in a beaker of water, at which position would the calcite end up? Why?

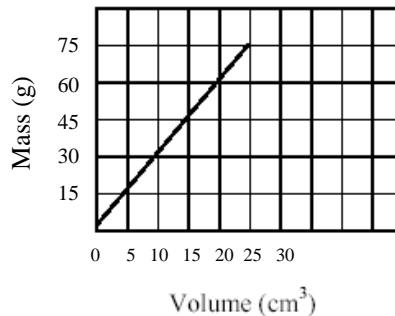


\_\_\_\_\_

4. If the mass of a sample of an unknown mineral is 35 grams and its volume is 8mL, what would the density of that substance be? (Show all work, round to the nearest tenths, and use correct units.)

5. If the density of galena is 7.6 g/mL, What would the mass of a 150mL sample of galena measure to be?

6. The graph to the right shows the masses and volumes for 3 pieces of the same substance. What is the density of the substance? (Show work below.)



7. Skill Check: ROUNDING NUMBERS

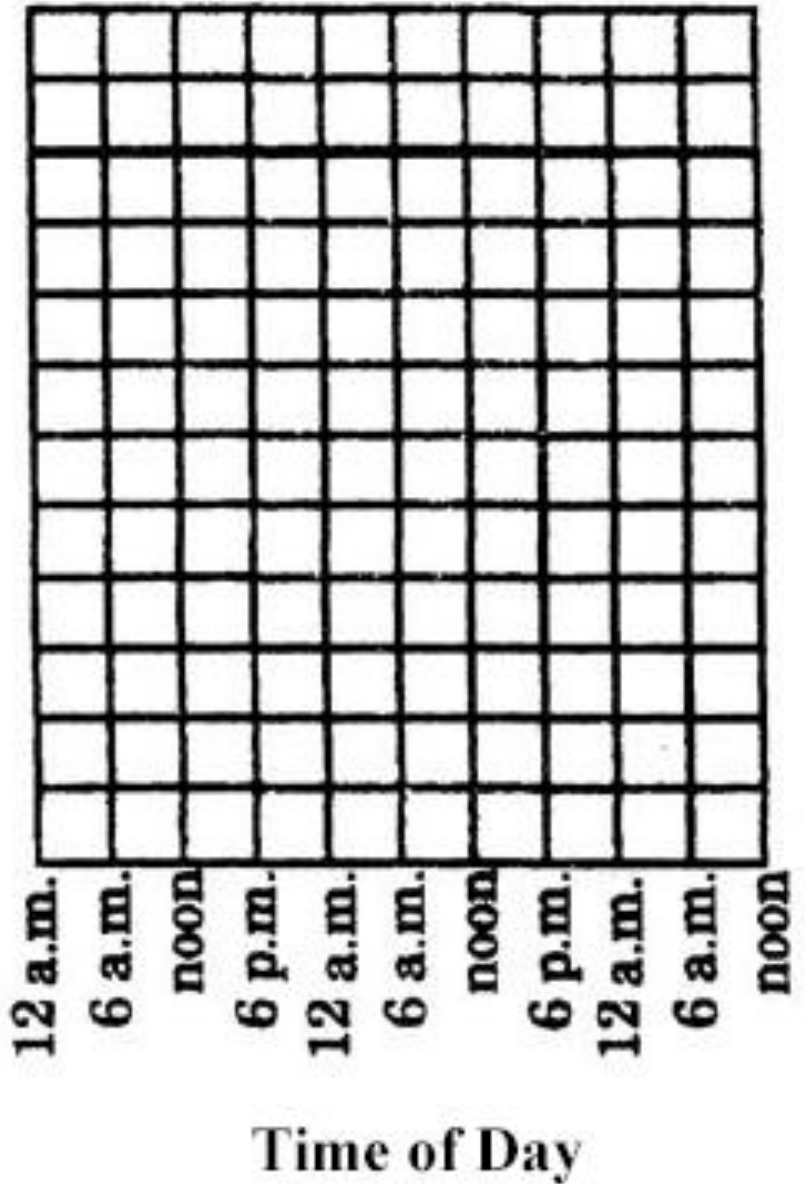
- a. Round 1.45 to the nearest tenth: \_\_\_\_\_
- b. Round .0765 to the nearest hundredth: \_\_\_\_\_
- c. Round .00278 to the nearest thousandth: \_\_\_\_\_
- d. Round 5.03 to the nearest tenth: \_\_\_\_\_
- e. Round 1.98 to the nearest tenth: \_\_\_\_\_

8. Constructing a graph according to proper format:

The data table shows the concentration of air pollutants per cubic centimeter for two days over an eastern city in the United States.

- a. On the vertical axis, make an appropriate scale for pollutants in parts/cm<sup>3</sup>. Label the axis.
- b. Using the data from the table, plot the points and construct a line graph of pollutants/cm<sup>3</sup>.

Data Table		Time	Poll/cm <sup>3</sup>
Monday, May 1st		12 a.m. ....	20,000
		6 a.m. ....	40,000
		noon .....	30,000
		6 p.m. ....	60,000
Tuesday, May 2nd		12 a.m. ....	38,000
		6 a.m. ....	50,000
		noon .....	41,000
		6 p.m. ....	68,000
	12 a.m. ....	40,000	



9. According to the graph, approximately how many pollutants would be in the air at 3:00pm on Monday?

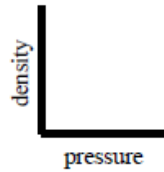
\_\_\_\_\_

10. Fact: As pressure exerted on a substance increases, the density of that substance increases.

Sketch a graph line to illustrate this relationship.

What type of relationship is this known as?

\_\_\_\_\_

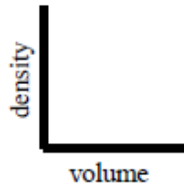


11. Fact: No matter what size (volume) an object made up of one material is, the density of that object will remain the same.

Sketch a graph line to illustrate this relationship.

What type of relationship is this known as?

\_\_\_\_\_

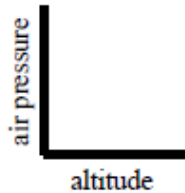


12. Fact: As altitude above the Earth's surface increases, the atmospheric pressure decreases.

Sketch a graph line to illustrate this relationship.

What type of relationship is this known as?

\_\_\_\_\_



13. Give 3 examples of cyclic changes:

\_\_\_\_\_

14. Give 3 examples of noncyclic changes:

\_\_\_\_\_

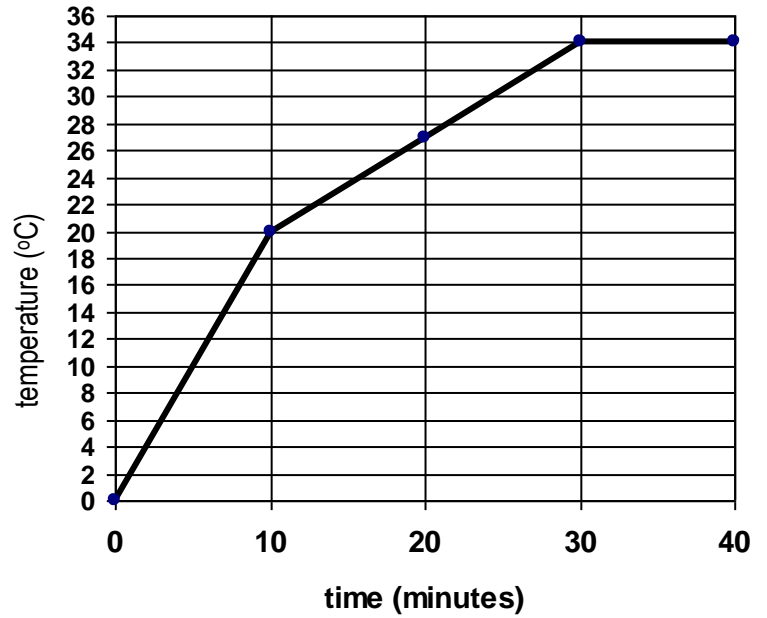
15. What does the term *rate of change* mean?

\_\_\_\_\_

16. The elevation of a hill was measured over the course of 150 years. The initial measurement of the hill showed that it had an elevation of 360 meters above seas level, but the most recent measurement indicated that the hill's elevation is now 348 meters above sea level. What is the rate of change in elevation of this hill?

*(Write formula, substitute data, round to the nearest tenths, and use correct units.)*

17. What is the rate of temperature change that occurred between 10 and 30 minutes?  
 (Write formula, substitute data, round to the nearest tenths, and use correct units.)



18. The graph below shows the changes in height of ocean water over the course of 1 day at one Earth location

- a. What kind of change does the pattern of data on the graph illustrate?

\_\_\_\_\_

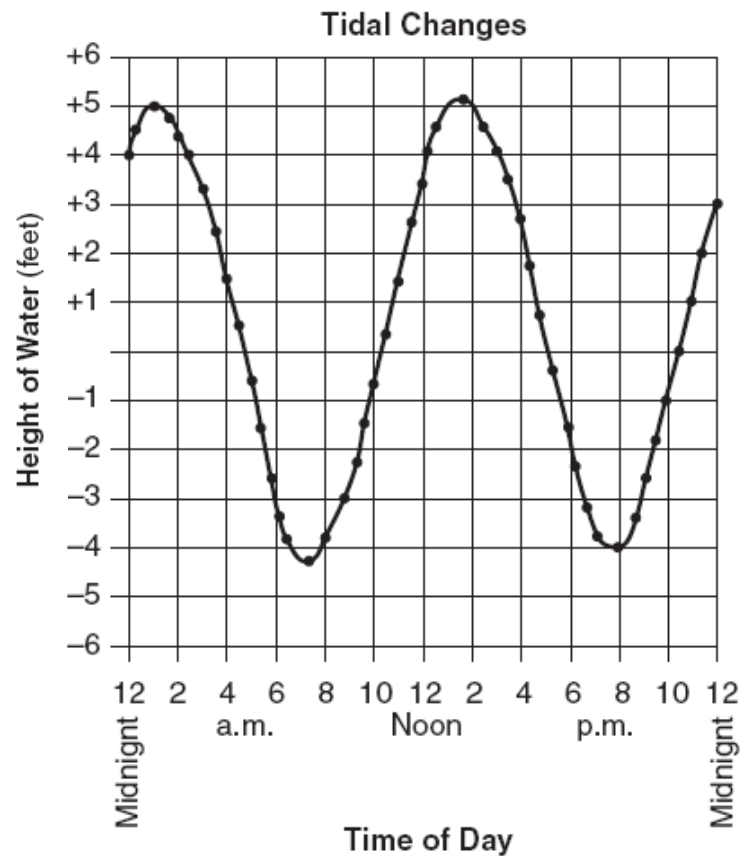
- b. The highest tide was recorded at  
 (1) 1:00am  
 (2) 1:30pm  
 (3) 2:00am  
 (4) 2:30pm

- c. At what time in the evening was the last low tide shown?

\_\_\_\_\_

- d. Keeping in mind that there are usually 12.5 hours between 2 high tides or 2 low tides, predict the time of the next low tide.

\_\_\_\_\_



### Topic 2 - The Model of the Earth

19. Which layer of the atmosphere is closest to the Earth's surface? \_\_\_\_\_

20. What happens to the temperature as altitude increases in the troposphere? \_\_\_\_\_

21. Which layer of the atmosphere contains almost all the water vapor in the air? \_\_\_\_\_

22. What is the altitude of the mesopause ..... in kilometers? \_\_\_\_\_

in miles? \_\_\_\_\_

23. In which layer of the atmosphere is the ozone layer located? \_\_\_\_\_

24. Why is the ozone layer important to human beings? \_\_\_\_\_

\_\_\_\_\_

25. What chemicals released by humans have contributed to the destruction of the ozone layer? \_\_\_\_\_

26. What happens to the temperature as altitude increases in the stratosphere? \_\_\_\_\_

27. State the relationship that exists between altitude and atmospheric pressure.  
\_\_\_\_\_

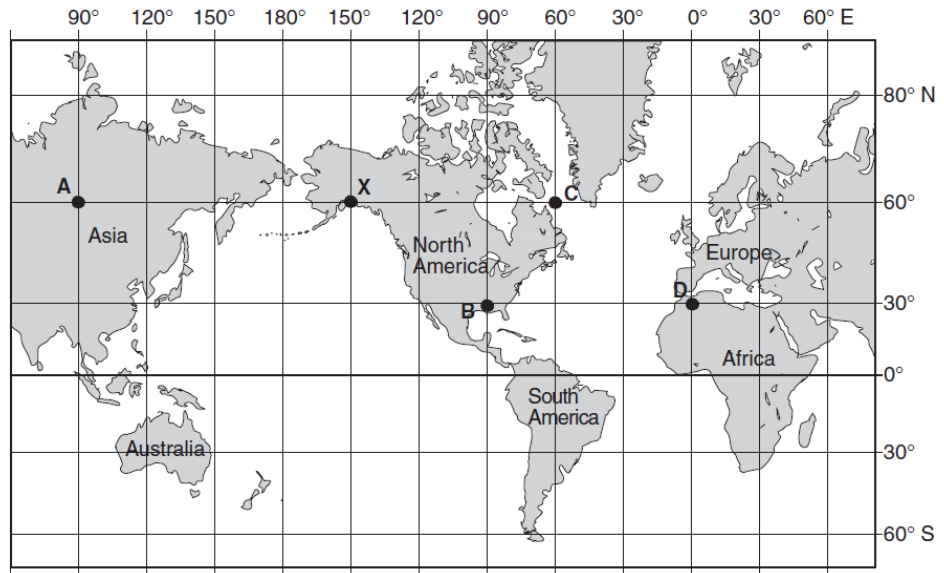
28. What are the latitudes and longitudes of the following points?

D \_\_\_\_\_

B \_\_\_\_\_

X \_\_\_\_\_

A \_\_\_\_\_



29. What is the latitude and longitude of the Easter Island Hot Spot?  
(don't forget to indicate proper compass directions) \_\_\_\_\_

30. What is the latitude and longitude of Mt. Marcy  
expressed in degrees and minutes? \_\_\_\_\_

31. What is the latitude and longitude of Jamestown  
expressed in degrees and minutes? \_\_\_\_\_

32. Which reference lines separate time zones (latitude or longitude)? \_\_\_\_\_

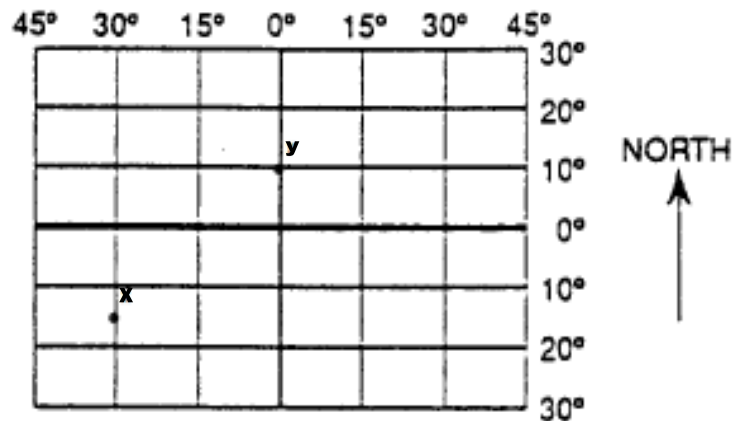
33. How many degrees are there between a standard time zone? \_\_\_\_\_

Use the coordinate grid to answer **questions 34-36**.

34. What are the latitude and longitude of point X?  
\_\_\_\_\_

35. What are the latitude and longitude of point Y?  
\_\_\_\_\_

36. The local time for a person located at position x  
is 11:00am. What time would it be at location y?  
\_\_\_\_\_



37. One city is located at 30°N, 120°W. Another city is located at 60°N, 90°W.  
How many hours difference is there between the two cities? \_\_\_\_\_

Set up a grid to support your answer.

38. The Big Dipper, part of the star constellation Ursa Major, is shown.

a. Circle the two pointer stars used to find Polaris.

b. Put a box around the letter of the point that represents Polaris.

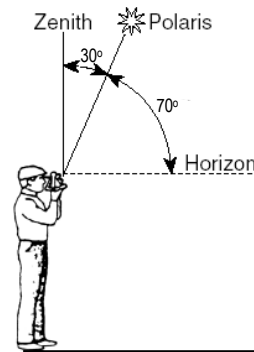


39. What would the altitude of Polaris be as viewed from Slide Mountain? \_\_\_\_\_

40. Where on Earth would one have to go to observe Polaris at his or her zenith? \_\_\_\_\_

41. As an observer travels from Kingston to Massena, she would see the altitude of Polaris  
 (1) increase                      (2) decrease                      (3) remain the same

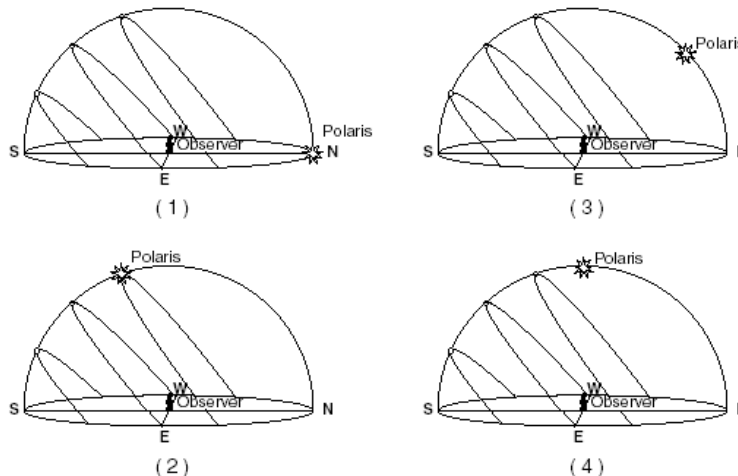
42. The diagram shows an observer on Earth measuring the altitude of *Polaris*.



What is the latitude of this observer?

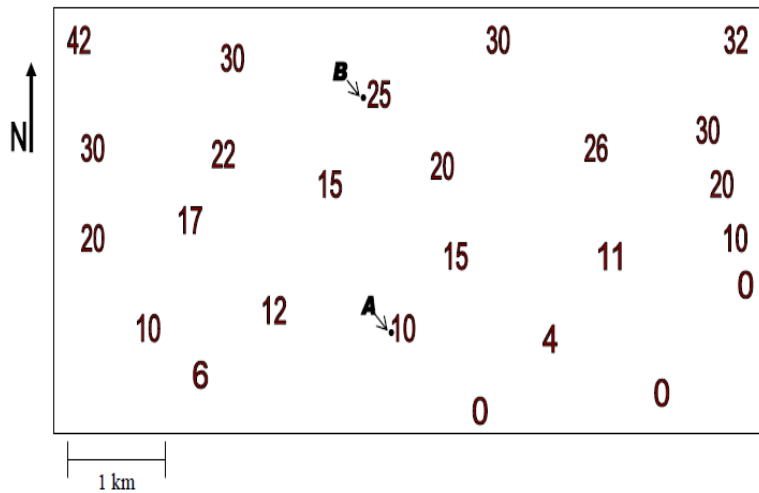
- (1) 90° N
- (2) 70° N
- (3) 30° N
- (4) 40° N

43. Which diagram best shows the location of *Polaris* observed by a person at 45°N latitude?



### Topic 3 - Field Maps and Isolines

44. Create a field map using the data to the right and an interval of 10°F.



45. State the compass direction of the map that would have the greatest temperature gradient? \_\_\_\_\_

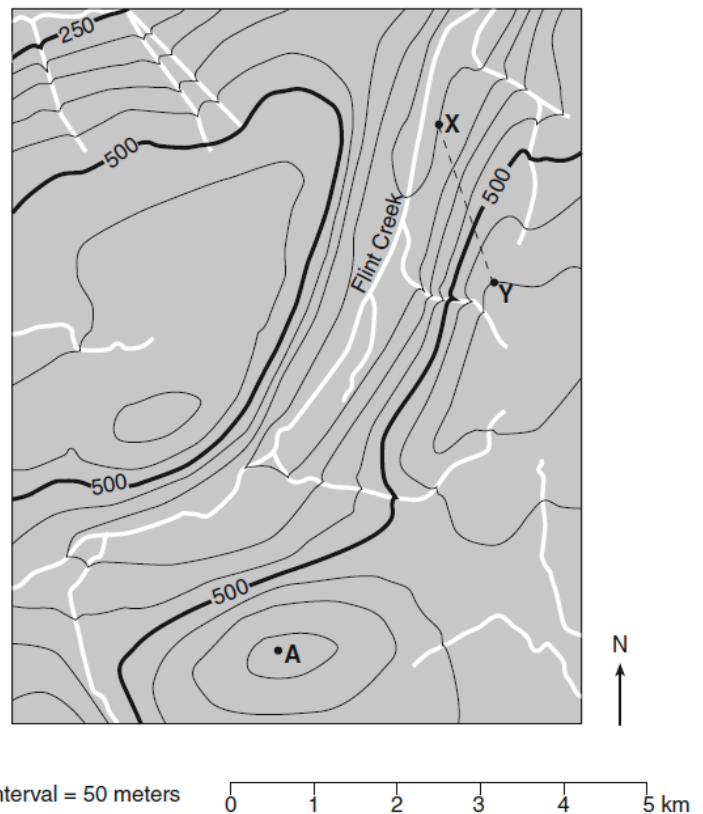
46. Calculate the temperature gradient between points A and B.  
(Write the formula, substitute data, round to the nearest tenths, and use correct units.)

Base your answers to questions 47 through 49 on the topographic map to the right.

47. What is a possible elevation of point A?  
 (1) 575 meters                      (3) 655 meters  
 (2) 600 meters                      (4) 710 meters

48. In which general direction does Flint Creek flow?  
 (1) southwest                      (3) northwest  
 (2) southeast                      (4) northeast

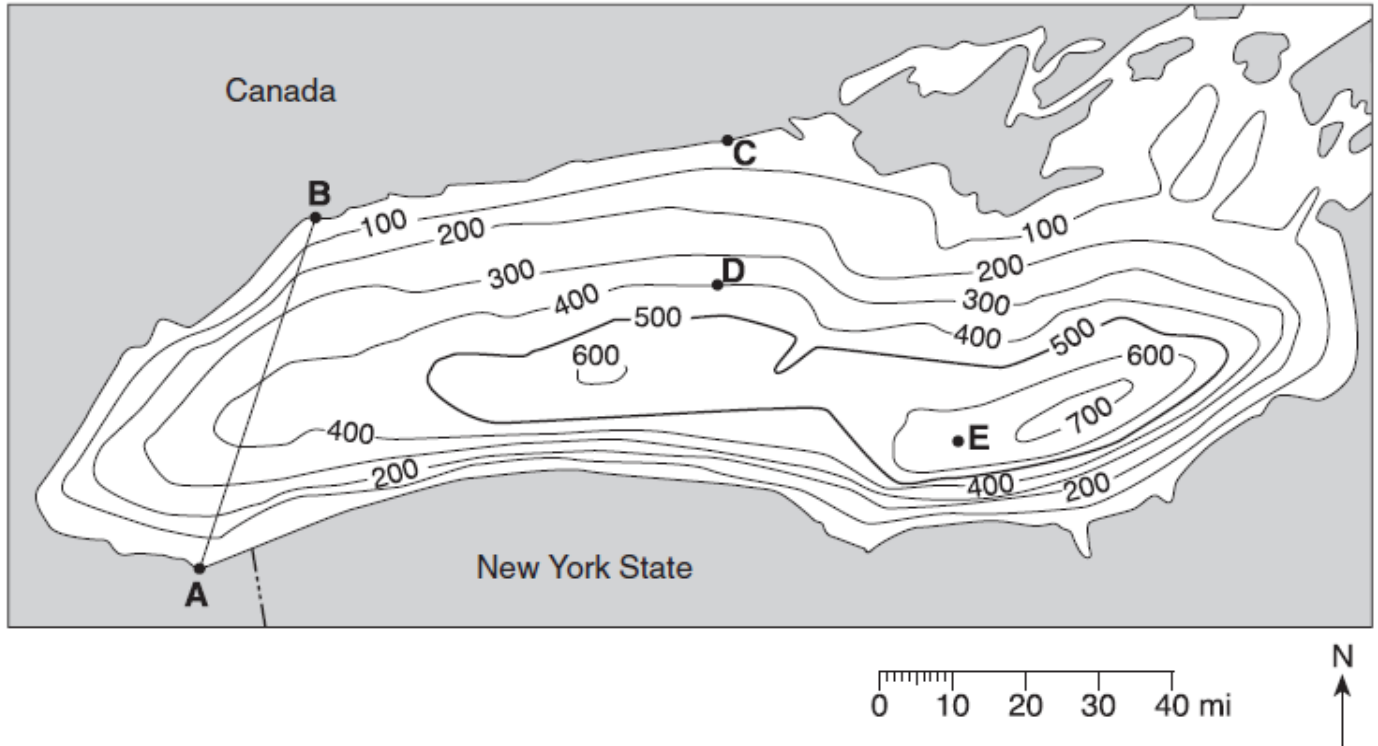
49. What is the approximate gradient along the straight dashed line between points X and Y?  
 (1) 50 m/km                      (3) 150 m/km  
 (2) 100 m/km                      (4) 300 m/km



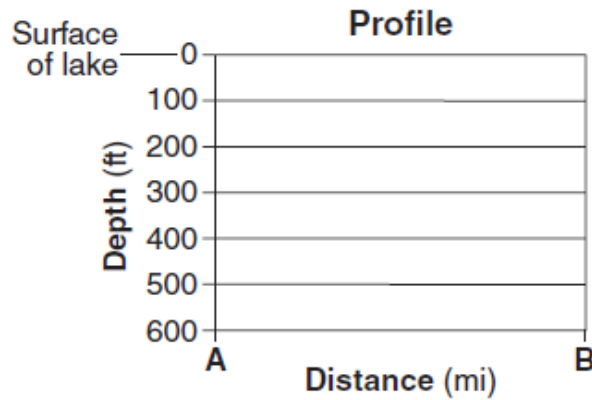


The map shows the depth of Lake Ontario. Isoline values indicate water depth, in feet. Points A, B, and C represent locations on the shoreline of Lake Ontario. Points D and E represent locations on the bottom of the lake.

**Water Depth of Lake Ontario**



50. On the grid provided below, draw a profile of the bottom of western Lake Ontario by plotting the depth of the water along line AB. Plot *each* point where an isoline showing depth is crossed by line AB. Connect the plots with a line, starting at A and ending at B, to complete the profile.



51. What is the approximate depth of the lake at point E? (don't forget units) \_\_\_\_\_

52. Which side of the lake has the steepest gradient?  
 (1) north                      (2) northeast                      (3) west                      (4) southeast

### **Topic 4a - Modern Astronomy**

53. What is the inferred age of the Universe? \_\_\_\_\_

54. How far away is Mars from the Sun? \_\_\_\_\_

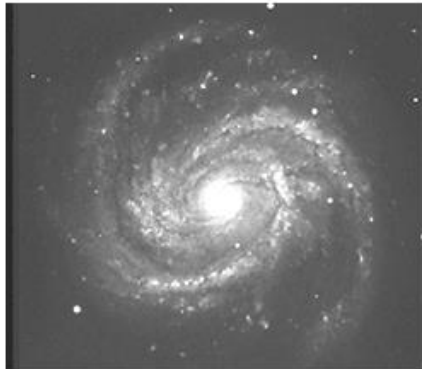
55. Which planet had the longest period of rotation? \_\_\_\_\_

56. What is the definition of a galaxy? \_\_\_\_\_

57. How are galaxies classified? \_\_\_\_\_

58. What is the name of our galaxy? \_\_\_\_\_

59. To the right is a picture of our galaxy. Make an "X" to indicate where our Sun and Solar System would be located in the galaxy.



60. What are the two evidences used to help support the Big Bang Theory?

a. \_\_\_\_\_

b. \_\_\_\_\_

61. a. What is the process by which stars makes their own energy? \_\_\_\_\_

b. What is the chemical formula for this process? \_\_\_\_\_

62. Compare the temperature and luminosity of a red giant star to a white dwarf star.

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63. Fill in the chart related to the properties of stars.

Star Name	Approximate Temperature (K)	Color	Class
Alpha Centauri			
Aldebaran			
Deneb			

64. State three main differences between the terrestrial and Jovian planets.

Terrestrial	Jovian

65. What gas in Venus' atmosphere causes it to have a greenhouse effect? \_\_\_\_\_

66. The diagram below represents the bright-line spectrum for an element.



The spectrum of the same element observed in the light from a distant star is shown below.

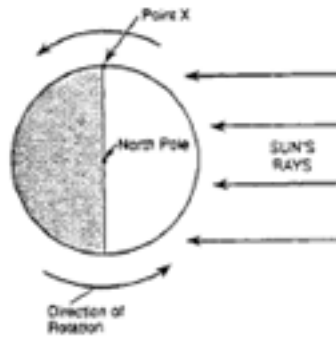


The shift in the spectral lines indicates that the star is moving

- (1) toward Earth
- (2) away from Earth
- (3) in an elliptical orbit around the Sun
- (4) in a circular orbit around the Sun

### Topic 4b - Earth Motions

Use the diagram below to answer questions 67-70.



67. Which motion of the Earth is shown by the curved arrows in the diagram? \_\_\_\_\_

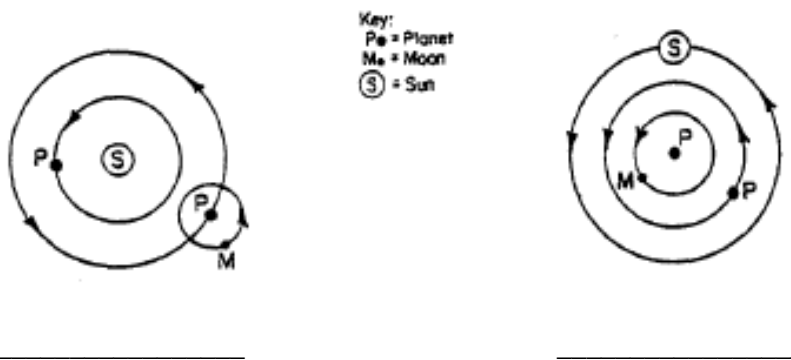
68. What two pieces of evidence did scientists use to prove the Earth motion that is illustrated?

\_\_\_\_\_

69. What is the rate of the motion shown in the diagram? \_\_\_\_\_

70. What is the approximate time of day at point X in the diagram? \_\_\_\_\_

71. Label each diagram of the Solar System as either the geocentric or heliocentric model?



\_\_\_\_\_

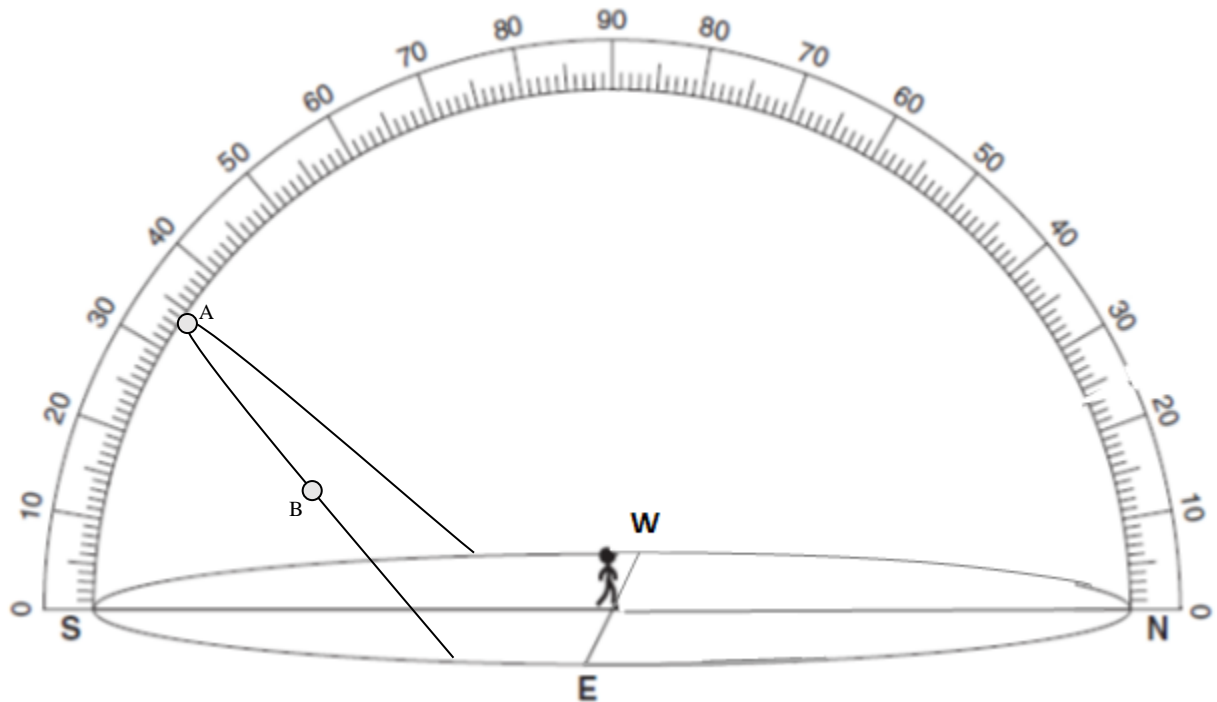
\_\_\_\_\_

72. Which Earth motion causes day and night? \_\_\_\_\_

73. What evidence did scientists use to help prove the Earth is revolving?  
\_\_\_\_\_

Use the model of the celestial sphere below to answer **questions 74-81**.

The arc path illustrates the apparent path of the Sun as seen from a location near NYC during October.

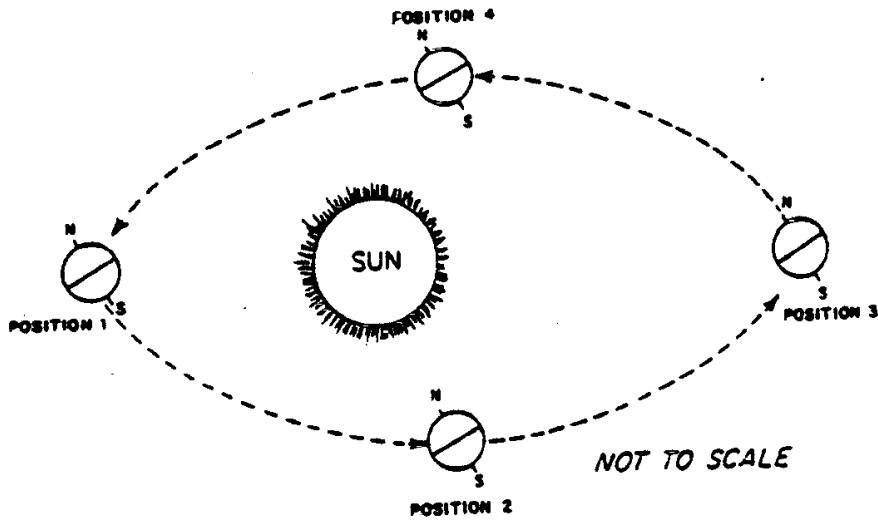


- 74. What is the approximate time of day when the Sun is at position A? \_\_\_\_\_
- 75. What direction would the observer look to see the Sun when it is at position A? \_\_\_\_\_
- 76. What direction would the observer look to see his shadow when the Sun is at position A? \_\_\_\_\_
- 77. What is the approximate time of day when the Sun is at position B? \_\_\_\_\_
- 78. What direction would the observer look to see the Sun when it is at position B? \_\_\_\_\_
- 79. What direction would the observer look to see his shadow when the Sun is at position B? \_\_\_\_\_
- 80. Which position of the Sun (A or B) would cause objects to have the longest shadows? \_\_\_\_\_

Explain why: \_\_\_\_\_

- 81. Keeping in mind that the observer that is viewing this celestial sphere is doing so from a location near NYC, plot the point on the celestial sphere that the observer would see Polaris. Label the point Polaris

Use the diagram below to answer questions 82-84.

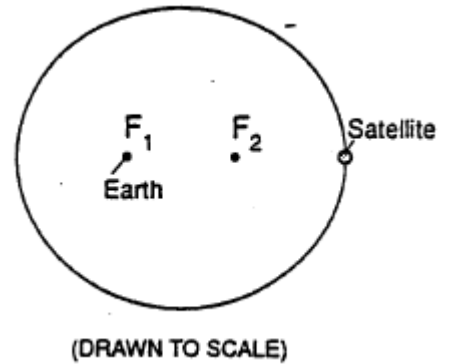


82. What is the term used for the orbital motion of the Earth shown in the diagram? \_\_\_\_\_

83. How long does it take the Earth to complete one trip in its orbit? \_\_\_\_\_

84. What is the rate of orbit motion shown? \_\_\_\_\_

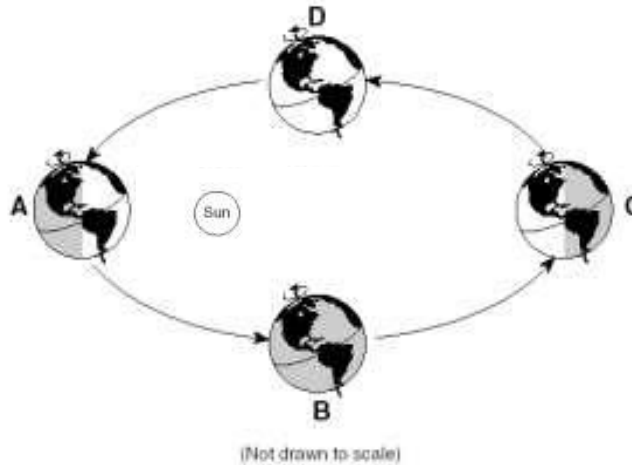
85. Calculate the eccentricity of the ellipse shown.  
Write the formula, substitute data, and round final answer to the nearest thousandths place.  
(use a centimeter ruler to make your measurements)



86. How does the eccentricity of the orbit above compare to the eccentricity of Earth's orbit?  
\_\_\_\_\_

87. Which two factors influence the gravitational attraction between two celestial objects? \_\_\_\_\_

Use the diagram below to answer questions 88-92.



88. Which position represents the Earth at perihelion? \_\_\_\_\_

89. Which position represents the Earth at aphelion? \_\_\_\_\_

90. In which position would the Earth have the greatest orbital velocity? \_\_\_\_\_

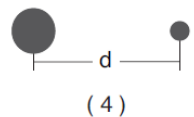
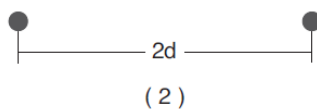
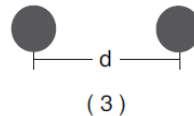
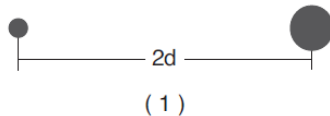
91. In which position would gravitational attraction between the Earth and Sun be the least? \_\_\_\_\_

92. What will happen to the apparent diameter of the Sun as the Earth moves in its orbit from position A to position C? \_\_\_\_\_

93. The symbols below represent star masses and distances.

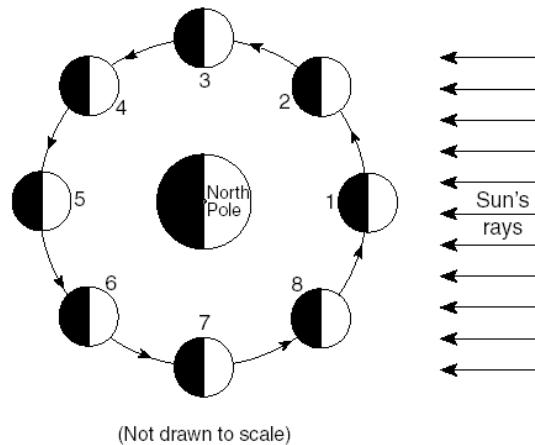
- represents a star with a mass the same as the Sun's mass
- represents a star with a mass greater than the Sun's mass
- $d$  represents a certain distance between star centers
- $2d$  represents twice the distance between star centers

Which diagram shows two stars that have the greatest gravitational force between them?

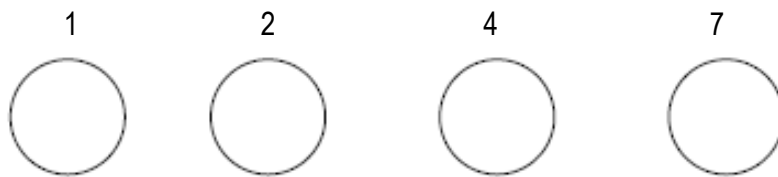


### Topic 4c –The Moon

Use the diagram below to answer questions 94-99.



94. Why would an observer on Earth see a complete cycle of phases of the Moon in approximately 1 month?
- |  |  |
|--|--|
| (1) The Moon rotates on its axis.<br>(2) The Moon revolves around the Earth. | (3) The Earth rotates on its axis.<br>(4) The Earth revolves around the Sun. |
|--|--|
95. How long does it take for the moon to proceed from new Moon to full Moon?
- |                           |                            |
|---------------------------|----------------------------|
| (1) 1 week<br>(2) 2 weeks | (3) 3 weeks<br>(4) 4 weeks |
|---------------------------|----------------------------|
96. Correctly shade in the circles to show the correct Moon phase at each position indicated.



97. a. Which positions would the Moon be in to produce the greatest difference between high and low tides on Earth? \_\_\_\_\_
- b. What is the name given to this type of tide? \_\_\_\_\_
98. Which position would the Moon be in to produce a neap tide? \_\_\_\_\_
99. Which position of the Moon could result in a solar eclipse? \_\_\_\_\_
- .... a lunar eclipse? \_\_\_\_\_

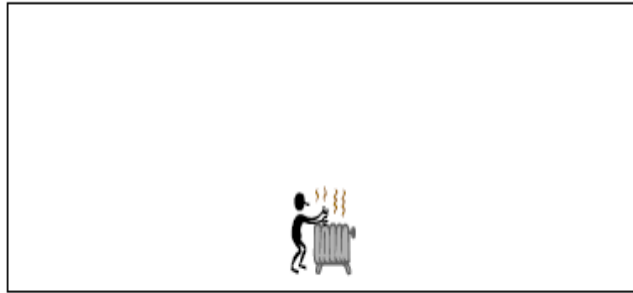


## Topic 5 - Energy in Earth Processes

100. Heat always flows from a source to a sink. What does this mean?

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101. a. Use arrows to draw a convection cell in the room.



b. Explain the direction of the arrows that you drew by discussing the density of the air in the different parts of the convection cell.

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102. Compare the wavelength of visible light to the wavelength of infrared radiation.

---

103. Water has a high specific heat. How does this affect the rate of heating and cooling of liquid water?

---

104. How much energy must be released by 1 gram of water while it freezes? \_\_\_\_\_

105. Which phase change of water requires the addition of the most amount of heat energy? \_\_\_\_\_

106. a. Name a substance that will heat up and cool down quickly? \_\_\_\_\_

b. Explain your answer to part a. \_\_\_\_\_

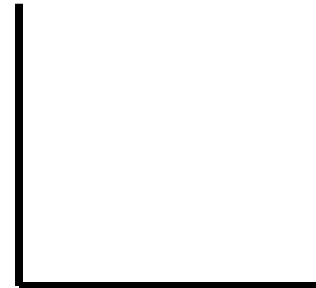
107. Give three qualities of a surface that makes a good absorber of light.

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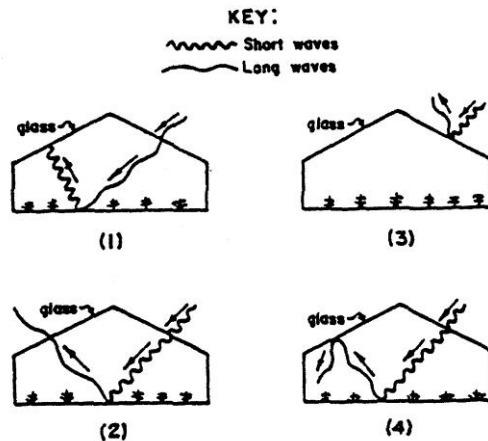
108. The paragraph below explains how the greenhouse effect works. Fill in the blanks.  
 (the words to use are: *re-radiated*, *methane*, *visible*, *absorbed*, *infrared* )

Shorter wave \_\_\_\_\_ light enters the Earth's atmosphere and reaches the Earth. That energy is \_\_\_\_\_ by the Earth's surface and then \_\_\_\_\_ as longer wave \_\_\_\_\_ energy. This energy gets absorbed by the greenhouse gases: carbon dioxide, water vapor, and \_\_\_\_\_.

109. Draw a graph that illustrates the following:  
 (make sure to label each axis)  
 As the amount of water vapor and CO<sub>2</sub> increases,  
 the amount of heat absorbed by the atmosphere increases.



110. Which model best represents how a greenhouse remains warm as a result of insolation from the Sun?



111. A gradual increase in atmospheric carbon dioxide would warm Earth's atmosphere because carbon dioxide is a

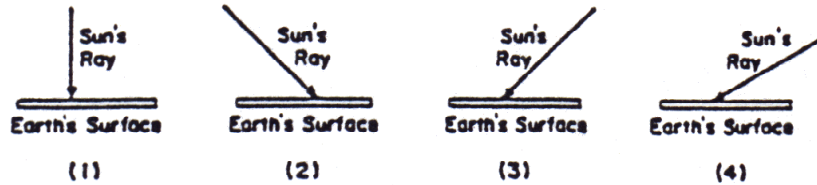
- (1) poor reflector of ultraviolet radiation
- (2) good reflector of ultraviolet radiation
- (3) poor absorber of infrared radiation
- (4) good absorber of infrared radiation

112. An increase in the amount of which atmospheric gas is thought to cause global climate warming?

- (1) oxygen
- (2) hydrogen
- (3) nitrogen
- (4) methane

## Topic 6 – Insolation and the Seasons

113. Which diagram shows the most direct Sun's rays?



114. What are the two main causes of seasons experienced on Earth?

\_\_\_\_\_

115. Why is the Equator hotter than the Poles?

\_\_\_\_\_

116. In New York State, ski trails that are constructed on a north facing slope usually retain their snow later in the spring than those on a south facing slope. This is chiefly because

- (1) the northern slope is protected from the prevailing south winds
- (2) the southern slope has darker soil
- (3) snowfall is greater on the northern slope
- (4) the rays of the Sun are more direct on the southern slopes

117. Which of the following is true of the intensity of insolation received by locations in New York?

- (1) maximum intensity is received on July 21<sup>st</sup> and minimum intensity is received on December 21<sup>st</sup>
- (2) maximum intensity is received on June 21<sup>st</sup> and minimum intensity is received on December 21<sup>st</sup>
- (3) maximum intensity is received on July 21<sup>st</sup> and minimum intensity is received on January 21<sup>st</sup>
- (4) maximum intensity is received on June 21<sup>st</sup> and minimum intensity is received on February 21<sup>st</sup>

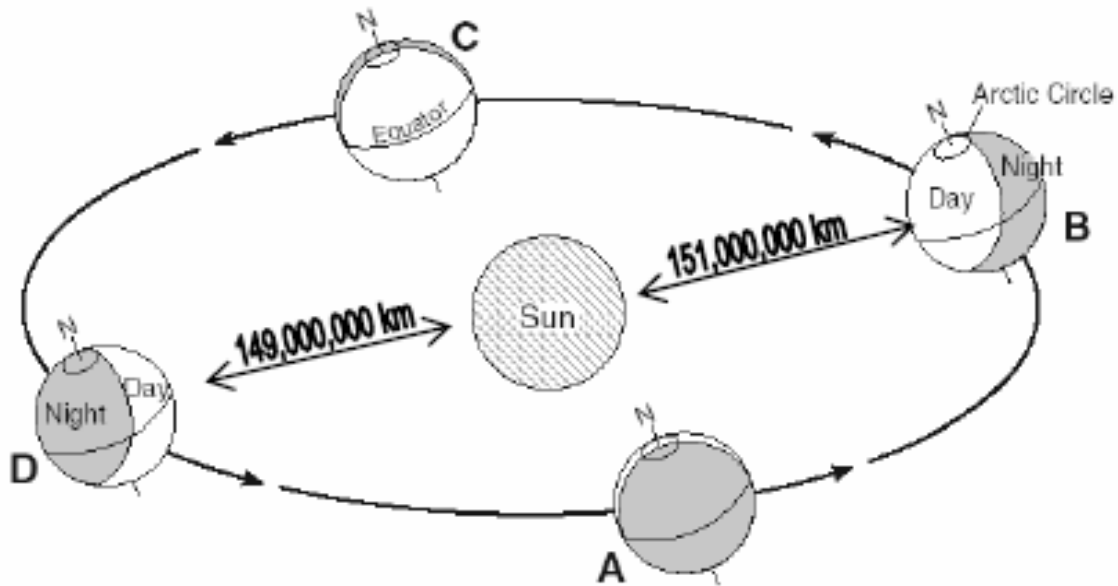
118. Between the months March and May, an observer in New York would observe

- (1) an increase in the angle of insolation
- (2) a decrease in the angle of insolation
- (3) a decrease in the duration of insolation
- (4) greater spring tides

119. During which time period would a person in New York experience a continual decrease in the duration of insolation?

- (1) February to May
- (2) April to July
- (3) January to March
- (4) September to November

Use the diagram below to answer questions 120-122.



120. Which position represents winter in the Northern Hemisphere? \_\_\_\_\_

121. Which position represents the autumnal equinox? \_\_\_\_\_

122. How many daylight hours would be experienced within the Arctic Circle when the Earth is at position D? \_\_\_\_\_

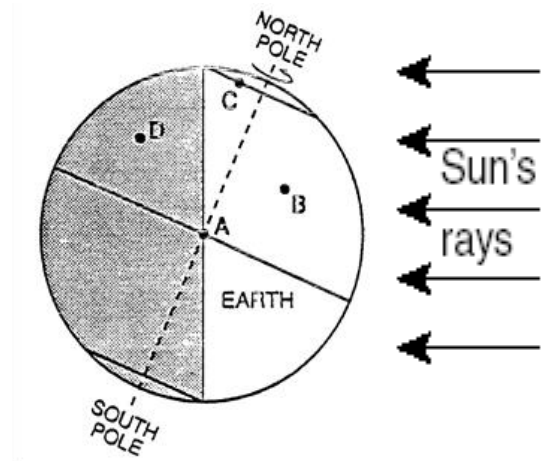
Use the diagram to the right to answer questions 123-125.

123. What date is represented by the diagram?

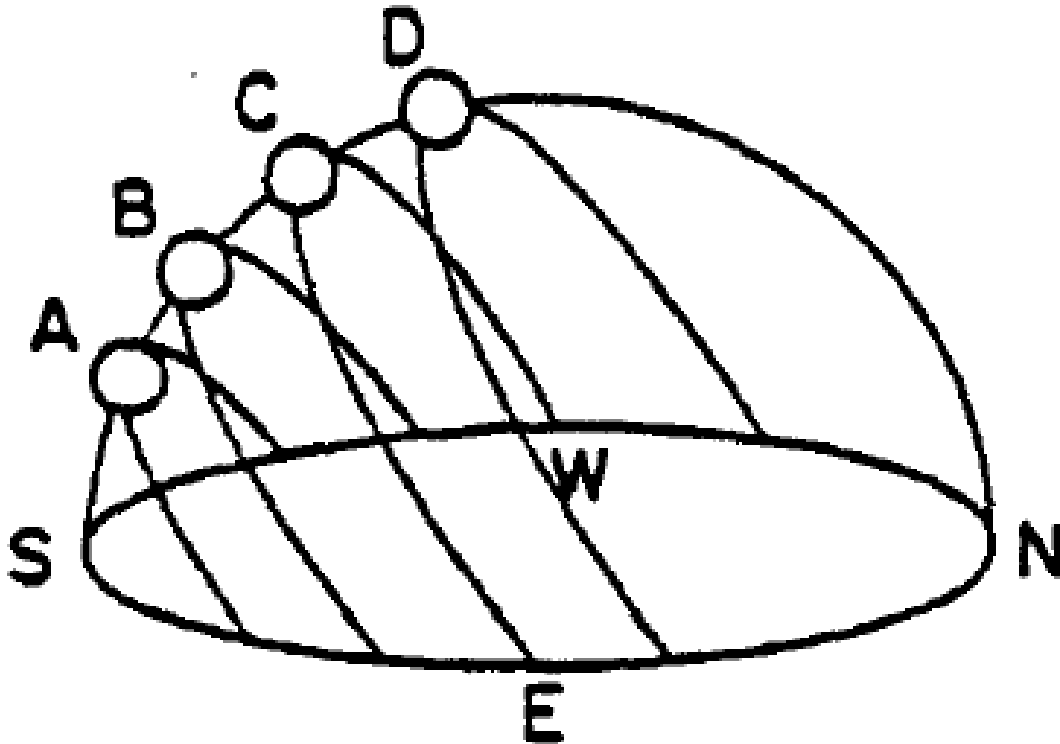
\_\_\_\_\_

124. Which lettered position on Earth would have the greatest duration of insolation? \_\_\_\_\_

125. Which latitude would receive the Sun's direct rays?  
 (1) the Equator (3) the Tropic of Cancer  
 (2) the North Pole (4) the Tropic of Capricorn



Use the diagram below to answer **questions 126-135**. The diagram shows the apparent path of the Sun as viewed from a location near New York City on four different days during the year.



126. Path A is the day with the lowest angle of insolation. What date does path A represent? \_\_\_\_\_

127. Path D is the day with the highest angle of insolation. What date does path D represent? \_\_\_\_\_

128. What date(s) does path C represent? \_\_\_\_\_

129. Put an X in the diagram to represent the position of the Sun at 3pm on June 21st.

130. Name one month during the year that could be the path B could represent? \_\_\_\_\_

131. Sketch the path that the Sun would appear to have during the month of April.

132. Which path represents the date with the greatest intensity of insolation? \_\_\_\_\_

133. What direction does the Sun rise on December 21st? \_\_\_\_\_

134. Which lettered path would create the shortest noontime shadows for the year? \_\_\_\_\_

135. What is the duration of insolation experienced in New York when the Sun follows path D?

- (1) 9 hours      (2) 12 hours      (3) 15 hours      (4) 18 hours