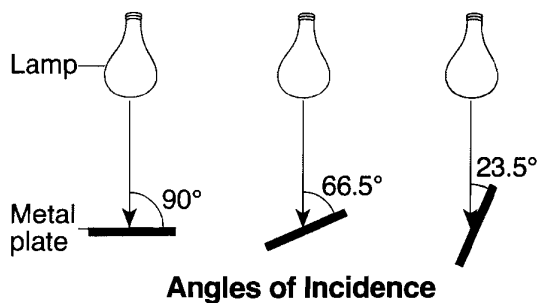


1. Which process is responsible for the greatest loss of energy from Earth's surface into space on a clear night?  
A) condensation            B) conduction  
C) radiation                D) convection
2. Base your answer to the following question on the experiment description and diagram below.

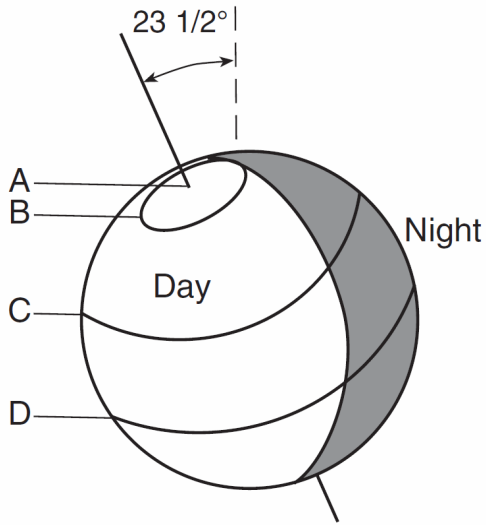
A student was interested in how the angle of insolation affects absorption of radiation. The student took three black metal plates, each containing a built-in thermometer, and placed them at the same distance from three identical lamps. The plates were tilted so that the light from the lamps created three different angles of incidence with the center of the plates, as shown in the diagram. The starting temperatures of the plates were recorded. The lamps were turned on for 10 minutes. Then the final temperatures were recorded.



How would the final temperatures of the three metal plates be different if the experiment was repeated using white metal plates? Explain why the white plates would have these final temperatures.

3. Which color of the visible light has the *shortest* wavelength?  
A) violet                    B) green  
C) yellow                  D) red

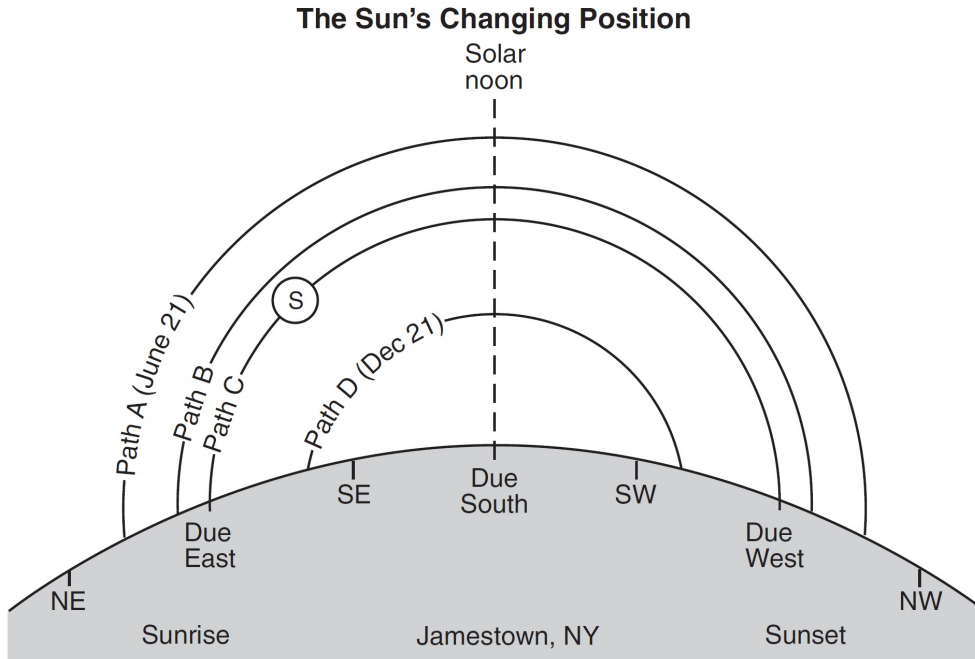
4. The diagram below indicates regions of daylight and darkness on Earth on the first day of summer in the Northern Hemisphere. Four latitudes are labeled *A*, *B*, *C*, and *D*.



At which latitude is the Sun above the horizon for the *least* number of hours on the day shown?

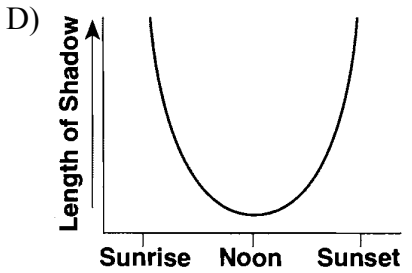
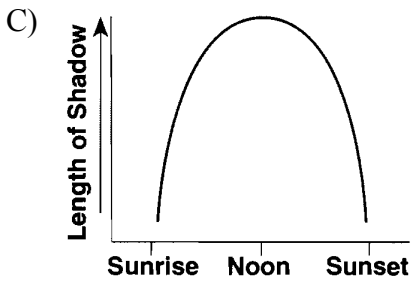
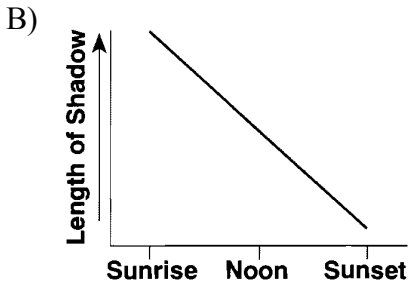
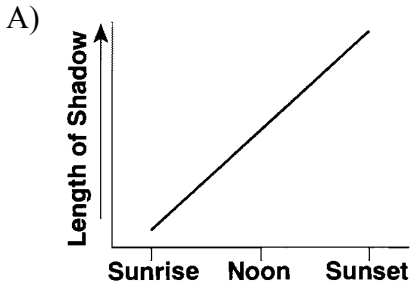
- A) *A*    B) *B*    C) *C*    D) *D*
5. Equal areas of which surface will absorb the most insolation?
- A) partially melted snowfield  
B) blacktop parking lot  
C) white sand beach  
D) lake surface

Base your answers to questions 6 and 7 on the diagram below and on your knowledge of Earth science. The diagram represents four apparent paths of the Sun, labeled *A*, *B*, *C*, and *D*, observed in Jamestown, New York. The June 21 and December 21 sunrise and sunset positions are indicated. Letter *S* identifies the Sun's position on path *C* at a specific time of day. Compass directions are indicated along the horizon.

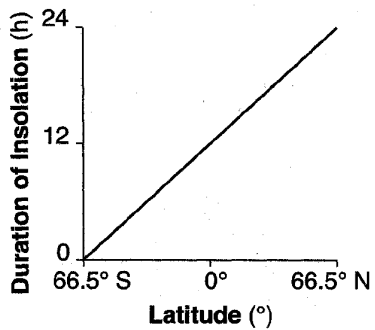


6. When the Sun appears to travel along path *D* at Jamestown, which latitude on Earth receives the most direct rays from the Sun?
- A)  $42^\circ$  N      B)  $23.5^\circ$  N      C)  $0^\circ$       D)  $23.5^\circ$  S
7. At what time of day is the Sun at position *S*?
- A) 6 a.m.      B) 9 a.m.      C) 3 p.m.      D) 6 p.m.
- 
8. Which factor has the greatest influence on the number of daylight hours that a particular Earth surface location receives?
- A) longitude  
B) latitude  
C) diameter of Earth  
D) distance from the Sun

9. Which graph best shows the length of a shadow cast from sunrise to sunset by a flagpole in New York State?



10. The graph below shows the general relationship between latitude and the duration of insolation on a particular day of the year.



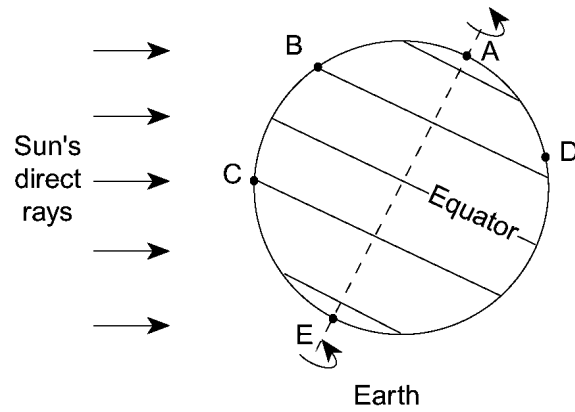
Which date is represented by the graph?

- A) March 21                      B) June 21  
C) September 21                  D) December 21

11. On June 21, some Earth locations have 24 hours of daylight. These locations are all between the latitudes of

- A)  $0^\circ$  and  $23\frac{1}{2}^\circ$  N              B)  $23\frac{1}{2}^\circ$  N and  $47^\circ$  N  
C)  $47^\circ$  N and  $66\frac{1}{2}^\circ$  N            D)  $66\frac{1}{2}^\circ$  N and  $90^\circ$  N

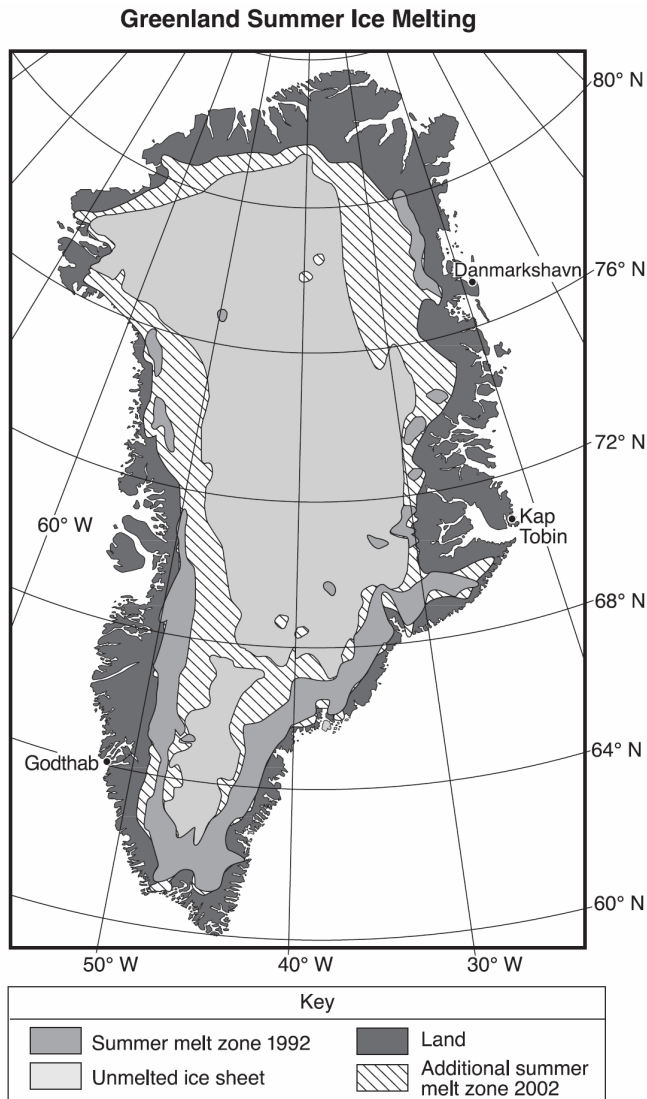
12. Base your answer to the following question on the diagram below, which shows the tilt of Earth on its axis in relation to the Sun on one particular day. Points *A* through *E* are locations on Earth's surface. Point *D* is located in Virginia. The dashed line represents Earth's axis.



On this day, which location has the greatest number of hours of daylight?

- A) *E*                      B) *B*                      C) *C*                      D) *D*

13. Base your answer to the following question on the following map and passage. The map shows the extent of summer ice-melt zones on Greenland in 1992 and 2002. The summer melt zone is an area where summer heat turns snow and ice around the edges of the ice sheet into slush and ponds of meltwater. Three coastal locations are shown on the map.



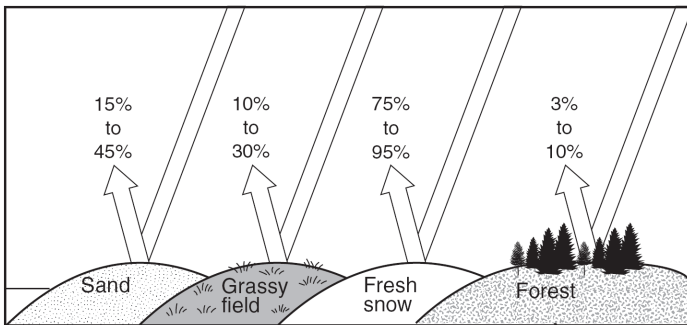
### Arctic Meltdown

Scientists are concerned because average arctic temperatures are rising. The Greenland Ice Sheet, the dominant area of continental ice in the arctic region, broke all previous records for melting in 2002. In 2004, the total amount of ice resting on top of the continental crust in the arctic region was estimated to be about 3,100,000 cubic kilometers. If all this ice were to melt, the ocean levels would rise approximately 8.5 meters. A reduction in ice-covered areas exposes more land surfaces. This increases absorption of insolation and accelerates arctic warming. Scientists continue to collect data to define the role of greenhouse gases in the warming of the arctic region.

Two of the greenhouse gases that may be responsible for the increased ice melting in Greenland are

- |                        |                               |
|------------------------|-------------------------------|
| A) nitrogen and oxygen | B) oxygen and silicon         |
| C) hydrogen and helium | D) carbon dioxide and methane |

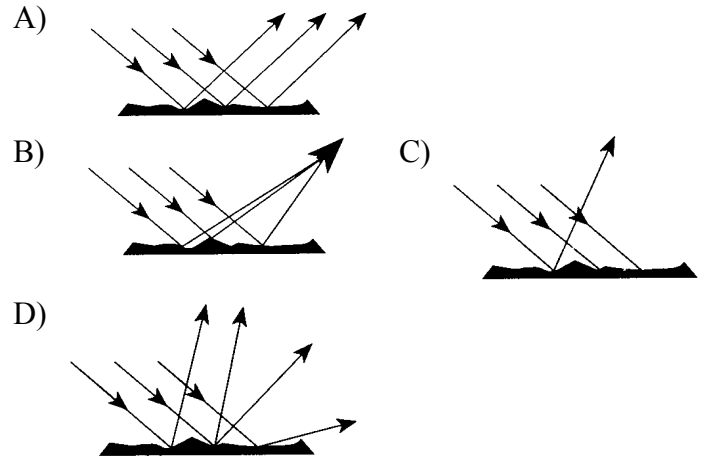
14. Ozone is important to life on Earth because ozone
- cools refrigerators and air-conditioners
  - absorbs energy that is reradiated by Earth
  - absorbs harmful ultraviolet radiation
  - destroys excess atmospheric carbon dioxide
15. Compared to a light-colored rock with a smooth surface, a dark-colored rock with a rough surface will
- both absorb and reflect less insolation
  - both absorb and reflect more insolation
  - absorb less insolation and reflect more insolation
  - absorb more insolation and reflect less insolation
16. Which change would cause a *decrease* in the amount of insolation absorbed at Earth's surface?
- a decrease in cloud cover
  - a decrease in atmospheric transparency
  - an increase in the duration of daylight
  - an increase in nitrogen gas
17. Most insolation striking a smooth, light-colored, solid surface is
- refracted
  - transmitted
  - reflected
  - absorbed
18. The diagram below indicates the amount of solar radiation that is reflected by equal areas of various materials on Earth's surface.



Which material absorbs the most solar radiation?

- grassy field
  - fresh snow
  - sand
  - forest
19. A square meter of surface of which of these natural areas would most likely absorb the most insolation during a clear day?
- a fast-moving river
  - a dark-green forest
  - a beach with white sand
  - a snow-covered field

20. Which diagram best represents visible light rays after striking a dark, rough surface?

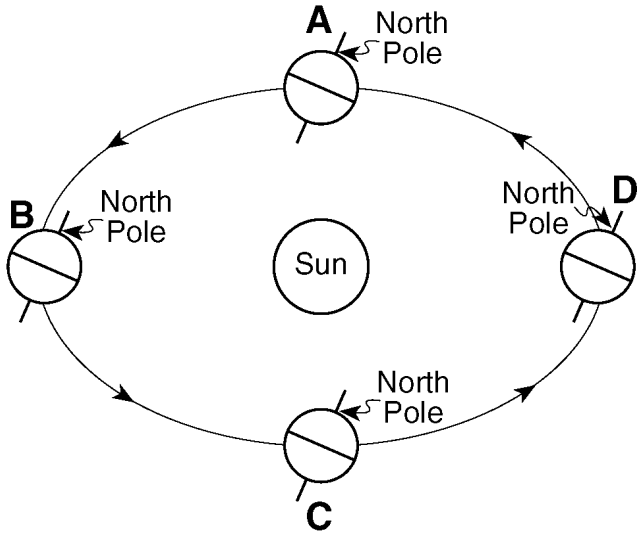


21. Evidence supports the idea that increases in carbon dioxide and methane in Earth's atmosphere are major contributors to global warming. This is based primarily on the fact that carbon dioxide and methane are excellent absorbers of
- gamma rays
  - microwaves
  - visible light
  - infrared radiation
22. An increase in which gas in Earth's atmosphere will most significantly increase global temperatures?
- methane
  - oxygen
  - nitrogen
  - hydrogen
23. Deforestation increases the greenhouse effect on Earth because deforestation causes the atmosphere to contain
- more carbon dioxide, which absorbs infrared radiation
  - less carbon dioxide, which absorbs short-wave radiation
  - more oxygen, which absorbs infrared radiation
  - less oxygen, which absorbs short-wave radiation
24. Which gas in Earth's upper atmosphere is beneficial to humans because it absorbs large amounts of ultraviolet radiation?
- water vapor
  - methane
  - nitrogen
  - ozone
25. If the Earth's rate of rotation decreased, there would be an increase in the
- length of the seasons
  - Sun's angle of insolation at noon
  - number of observable stars at night
  - length of time for one Earth day

26. The apparent daily path of the Sun changes with the seasons because

- A) Earth's axis is tilted
- B) Earth's distance from the Sun changes
- C) the Sun revolves
- D) the Sun rotates

27. Base your answer to the following question on the diagram below, which represents an exaggerated view of Earth revolving around the Sun. Letters *A*, *B*, *C*, and *D* represent Earth's location in its orbit on the first day of each of the four seasons.

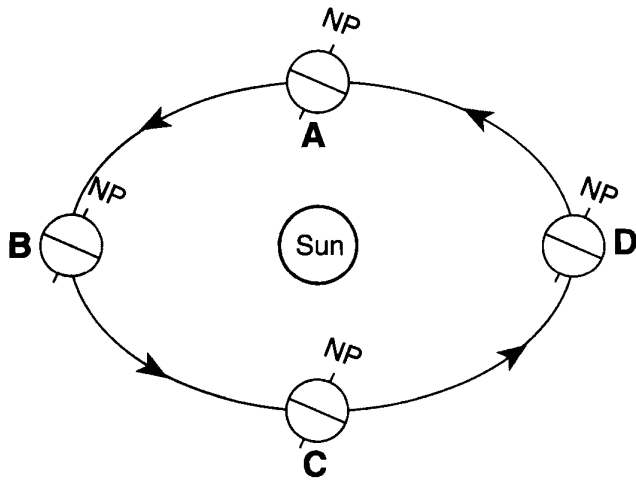


Which location in Earth's orbit represents the first day of fall (autumn) for an observer in Pennsylvania?

- A) *A*
- B) *B*
- C) *C*
- D) *D*

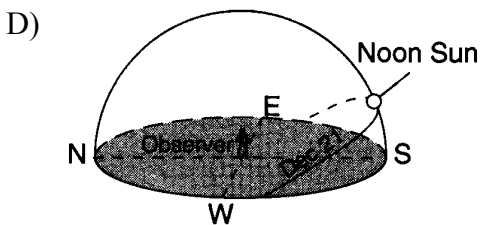
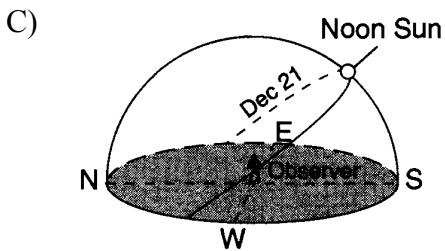
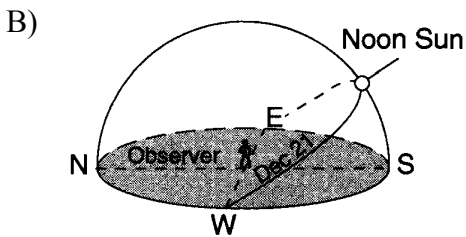
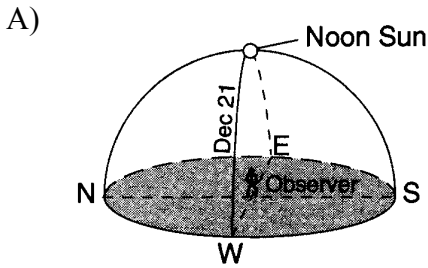


Base your answers to questions 28 through 30 on the diagram below, which represents Earth revolving around the Sun. Letters *A*, *B*, *C*, and *D* represent Earth's location in its orbit on the first day of the four seasons. NP represents the North Pole.



(Not drawn to scale)

28. Which diagram best represents the Sun's apparent path as seen by an observer at  $43.5^\circ$  N latitude on December 21?



29. Which location in Earth's orbit represents the first day of summer in New York State?

- A) *A*    B) *B*    C) *C*    D) *D*

30. If the tilt of Earth's axis were decreased from  $23.5^\circ$  to  $15^\circ$ , New York State's winters would become

- A) warmer, and summers would become cooler  
 B) warmer, and summers would become warmer  
 C) cooler, and summers would become cooler  
 D) cooler, and summers would become warmer