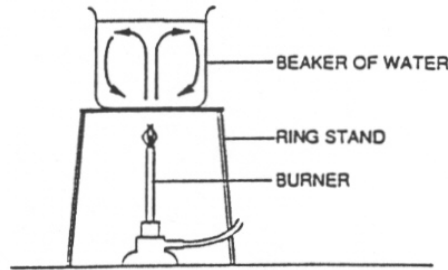


## Energy and Insolation Review 2

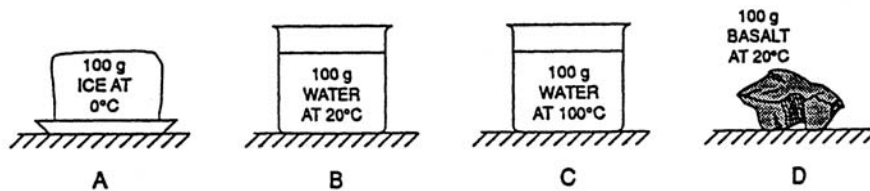
The diagram below shows a container of water that is being heated.

1. The movement of water shown by the arrows is most likely caused by
- (1) density differences
  - (2) insolation
  - (3) the Coriolis Effect
  - (4) the Earth's rotation



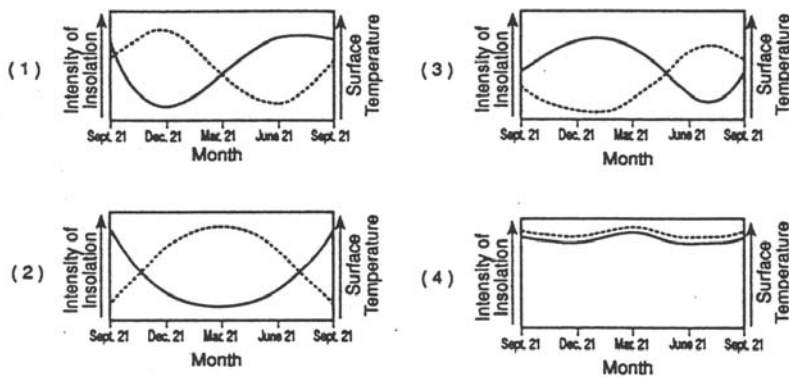
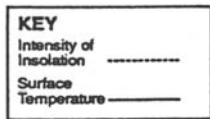
2. Which substance will heat up the quickest?
- (1) 1 gram of liquid water
  - (2) 1 gram of copper
  - (3) 1 gram of basalt
  - (4) 1 gram of granite

Base your answers to the following questions 3 and 4 on the *Earth Science Reference Tables*, and the diagram below. The diagrams represent equal masses of ice, water, and basalt under standard atmospheric conditions and at the temperatures shown.



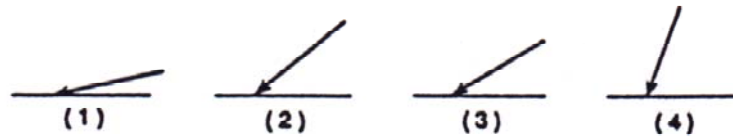
3. The four samples were observed under ordinary classroom conditions with a room temperature of 20°C. Which sample would be a heat sink in this room environment?
- 1 A
  - 2 B
  - 3 C
  - 4 D
4. If the basalt was placed into the beaker of 100°C water, which of the following energy transfers would occur?
- 1 Heat would be transferred from the basalt into the water.
  - 2 Heat would be transferred from the water into the basalt.
  - 3 There would be no heat energy transfer.

5. A temperature of  $10^{\circ}\text{C}$  is equal to a temperature of  
 (1)  $40^{\circ}\text{F}$                       (2)  $46^{\circ}\text{F}$                       (3)  $50^{\circ}\text{F}$                       (4)  $56^{\circ}\text{F}$
6. Which type of electromagnetic energy has the shortest wavelength  
 (1) red light    (3) X-rays  
 (2) blue light    (4) infrared rays
7. Which process is primarily responsible for the transfer of energy by air currents within the Earth's atmosphere?  
 1 convection    3 absorption  
 2 radiation    4 conduction
8. For which phase change does water absorb the most energy?  
 1 freezing    3 condensation  
 2 melting    4 evaporation
9. Which graph best represents the intensity of insolation and surface temperature for a location at the Equator?



10. Which latitude on the Earth would receive the highest average yearly insolation per square meter of surface if the atmosphere were completely transparent at all locations?  
 1  $90^{\circ}\text{N}$     3  $0^{\circ}$   
 2  $23\frac{1}{2}^{\circ}\text{N}$     4  $23\frac{1}{2}^{\circ}\text{S}$

11. Which diagram shows the angle of insolation that would produce the greatest intensity of insolation in New York State?



12. Which combination of date and latitude will have the least duration of insolation?

- 1 June 21 at  $23\frac{1}{2}^{\circ}\text{N}$
- 2 June 21 at  $0^{\circ}$
- 3 June 21 at  $90^{\circ}\text{S}$
- 4 June 21 at  $23\frac{1}{2}^{\circ}\text{S}$

13. On which date does the maximum intensity of insolation usually occur in New York State?

- |           |             |
|-----------|-------------|
| 1 June 21 | 3 August 21 |
| 2 July 10 | 4 August 31 |

14. Which statement describes how the insolation changes in New York State from May 21 to June 21?

- 1 The intensity and duration of insolation both decrease.
- 2 The intensity and duration of insolation both increase.
- 3 The intensity of insolation decreases and duration of insolation increases.
- 4 The intensity of insolation increases and duration of insolation decreases.

15. Compared to polar areas, why are equatorial areas of equal size heated much more intensely by the Sun?

- 1 The Sun's rays are more nearly perpendicular at the Equator than at the poles.
- 2 The equatorial areas contain more water than the polar areas do.
- 3 More hours of daylight occur at the Equator than at the poles.
- 4 The equatorial areas are nearer to the Sun than the polar areas are.

16. Which type of surface would most likely be the best reflector of electromagnetic energy?

- |                           |                            |
|---------------------------|----------------------------|
| 1 dark-colored and rough  | 3 light-colored and rough  |
| 2 dark-colored and smooth | 4 light-colored and smooth |

17. On a clear day, which type of electromagnetic energy will pass most easily through the Earth's atmosphere and reach the Earth??

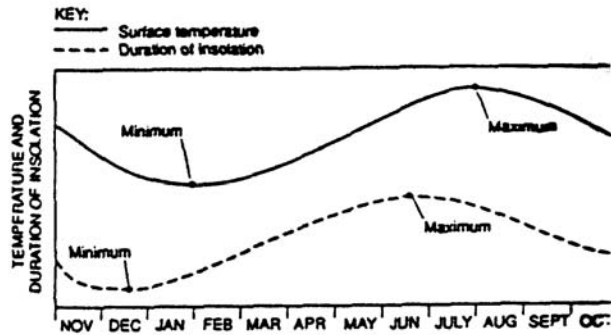
- |                         |                         |
|-------------------------|-------------------------|
| 1 terrestrial radiation | 3 ultraviolet radiation |
| 2 infrared radiation    | 4 visible light         |

18. If the water vapor and carbon dioxide content of the Earth's atmosphere were to increase, the amount of Earth radiation absorbed by the atmosphere would tend to

- |            |            |                   |
|------------|------------|-------------------|
| 1 increase | 2 decrease | 3 remain the same |
|------------|------------|-------------------|

19. Compared to the date of maximum duration of insolation, the date of maximum surface temperature for this location is

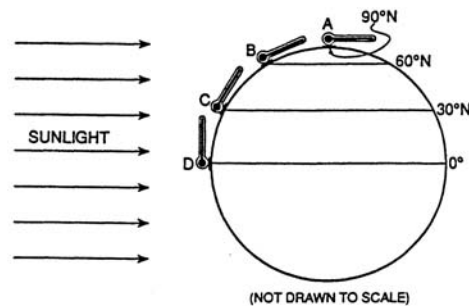
- 1 earlier in the year
- 2 later in the year
- 3 the same day of the year



20. Changing the shingles on the roof of a house to a lighter color will most likely reduce the amount of solar energy that is

- 1 scattered
- 2 absorbed
- 3 reflected
- 4 refracted

21. The activity shown in the diagram below was used to test the effect of the angle of insolation on temperature. A student placed four thermometers (A, B, C, and D) on a large globe. The bulb of each thermometer was placed against a black plastic square directly on a line representing latitude. The thermometers were then exposed to direct sunlight for 10 minutes at the angles shown.



Which thermometer will show the greatest increase in temperature?

- 1 A
- 2 B
- 3 C
- 4 D

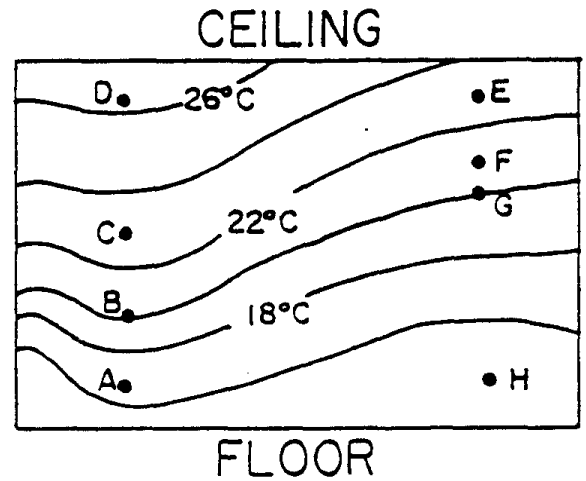
22. As the amount of reflection by the Earth's atmosphere increases, the amount of the insolation reaching the Earth's surface

- 1 decreases
- 2 increases
- 3 remains the same

23. Short waves of electromagnetic energy are absorbed by the Earth's surface during the day. They are later re-radiated into space as

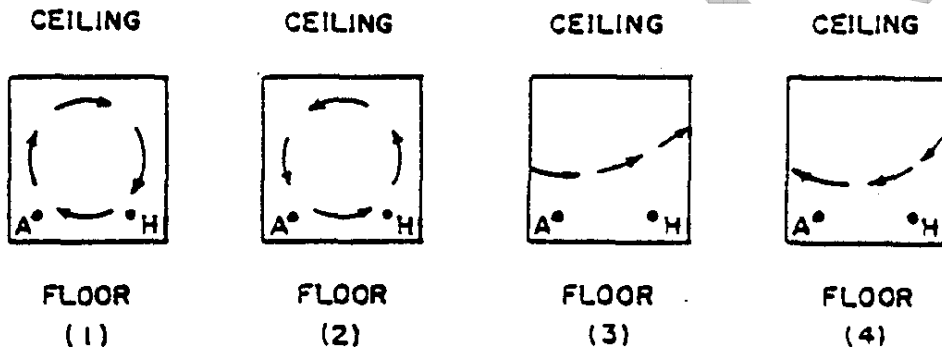
- 1 visible light rays
- 2 X-rays
- 3 infrared rays
- 4 ultraviolet rays

Directions: Base your answers to the **questions 24-25** on the diagram to the right. The diagram represents a temperature field for a vertical cross section of a room from ceiling to floor with points A -H at different locations within the room.



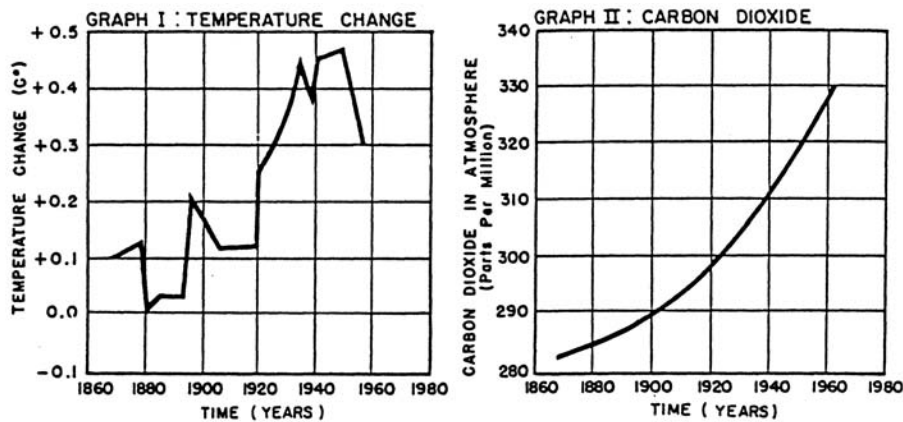
24. At which point would the air have the least density?
- (1) A
  - (2) E
  - (3) H
  - (4) D

25. If a heat source is located at point A, which diagram best represents the probable direction of air movement in this room?



26. Under which conditions will the greatest amount of cooling by terrestrial reradiation occur?
- 1 a clear night with a small amount of moisture in the air
  - 2 a clear night with a large amount of moisture in the air
  - 3 a cloudy night with a small amount of moisture in the air
  - 4 a cloudy night with a large amount of moisture in the air
27. Which statement best explains what happens to the insolation reaching a greenhouse?
- 1 Most of the insolation is absorbed by the glass.
  - 2 All of the insolation is reflected by the glass.
  - 3 Insolation absorbed inside the greenhouse is reradiated as longer wavelengths.
  - 4 Insolation absorbed inside the greenhouse is reradiated as shorter wavelengths.

Base your answers to **questions 28-29** on the graphs below. Graph I shows the average temperature change on the Earth between the years 1870 and 1955. Graph II shows the amount of carbon dioxide in the atmosphere between the years 1870 and 1962.



28. Which is the best interpretation that can be made from the graphs for the period between 1870 and 1955?
- 1 The amount of carbon dioxide in the atmosphere has increased steadily, and the temperature change on the Earth has shown an overall increase.
  - 2 The amount of carbon dioxide in the atmosphere and the temperature change on the Earth have increased at a steady rate.
  - 3 The amount of carbon dioxide in the atmosphere has decreased steadily, and the temperature change on the Earth has shown an overall decrease.
  - 4 The amount of carbon dioxide in the atmosphere has decreased at a steady rate, causing a varying change in temperature on the Earth.
29. Which statement best accounts for the relationship between the carbon dioxide and temperature change data shown by the graphs?
- 1 Carbon dioxide is a good absorber of infrared radiation.
  - 2 Carbon dioxide is a poor absorber of infrared radiation.
  - 3 Temperature decreases usually occur when the carbon dioxide content of the atmosphere increases.
  - 4 Temperature changes do not usually occur when the amount of carbon dioxide in the air increases.
30. Which of the following is true of insolation and terrestrial radiation?
- 1 short-wave visible light is absorbed by the Earth and long-wave infrared energy is re-radiated.
  - 2 short-wave infrared energy is absorbed by the Earth and long-wave visible light is re-radiated.
  - 3 long-wave visible light is absorbed by the Earth and short-wave infrared energy is re-radiated.
  - 4 long-wave infrared energy is absorbed by the Earth and short-wave visible light is re-radiated.