

1. At which temperature would a source radiate the *least* amount of electromagnetic energy?

- 1) 273 K
- 2) 212 K
- 3) 32 K
- 4) 5 K

2. How does the amount of heat energy reflected by a smooth, dark-colored concrete surface compare with the amount of heat energy reflected by a smooth, light-colored concrete surface?

- 1) The dark-colored surface will reflect less heat energy.
- 2) The dark-colored surface will reflect more heat energy.
- 3) The dark-colored surface will reflect the same amount of heat energy.

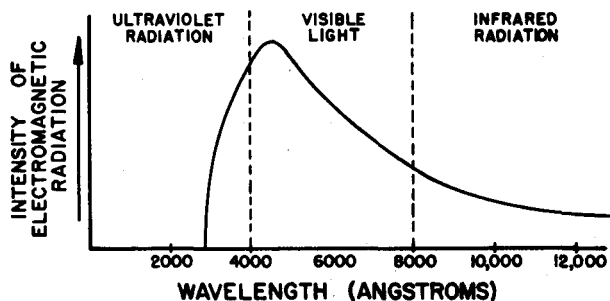
3. An object that is a good absorber of electromagnetic energy is also a good

- 1) reflector of electromagnetic energy
- 2) refractor of electromagnetic energy
- 3) radiator of electromagnetic energy
- 4) convector of electromagnetic energy

4. What happens to most of the sunlight that strikes a dark-colored area of the Earth's surface?

- 1) It is reflected and scattered as potential energy.
- 2) It is reflected and diffused as ultraviolet radiation.
- 3) It is absorbed and reflected as light.
- 4) It is absorbed and reradiated as heat.

5. The graph below represents the relationship between the intensity and wavelength of the Sun's electromagnetic radiation.



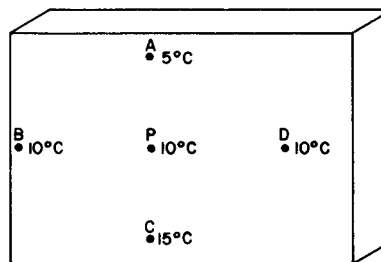
Which statement is best supported by the graph?

- 1) The infrared radiation given off by the Sun occurs at a wavelength of 2,000 angstroms.
- 2) The maximum intensity of radiation given off by the Sun occurs in the visible region.
- 3) The infrared radiation given off by the Sun has a shorter wavelength than ultraviolet radiation.
- 4) The electromagnetic energy given off by the Sun consists of a single wavelength.

6. A temperature of 20°C is equal to a temperature of

- 1) -7°F
- 2) 36°F
- 3) 68°F
- 4) 293°F

7. The diagram below shows temperature values at various points in a solid piece of aluminum. Toward which point will heat flow from point P?

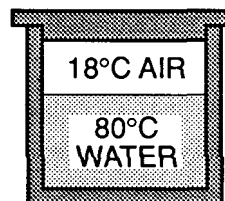


- 1) A
- 2) B
- 3) C
- 4) D

8. An ice cube is placed in a glass of water at room temperature. Which heat exchange occurs between the ice and the water within the first minute?

- 1) The ice cube gains heat and the water loses heat.
- 2) The ice cube loses heat and the water gains heat.
- 3) Both the ice cube and the water gain heat.
- 4) Both the ice cube and the water lose heat.

9. The diagram below shows a sealed container holding 250 milliliters of water at 80°C. The air above the water had an original temperature of 18°C.



Assuming that the container does not transfer heat, which statement most accurately describes the energy exchanges inside the container?

- 1) The air gains more heat energy than the water loses.
- 2) The air gains less heat energy than the water loses.
- 3) The air gains the same amount of heat energy that the water loses.
- 4) No energy is exchanged between the water and the air.

10. Heat energy transfer will normally occur between two objects that are close to each other if the objects have different

- 1) specific heats
- 2) temperatures
- 3) masses
- 4) densities

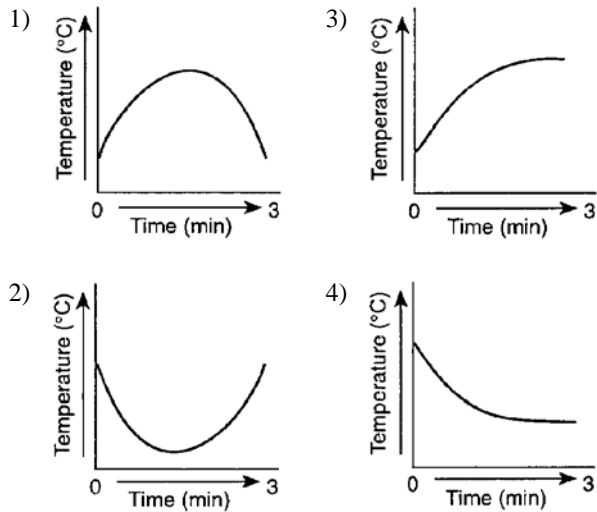
11. Pieces of lead, copper, iron, and granite, each having a mass of 1 kilogram and a temperature of 100°C, were removed from a container of boiling water and allowed to cool under identical conditions. Which piece most likely cooled to room temperature first?

- 1) copper
- 2) lead
- 3) iron
- 4) granite

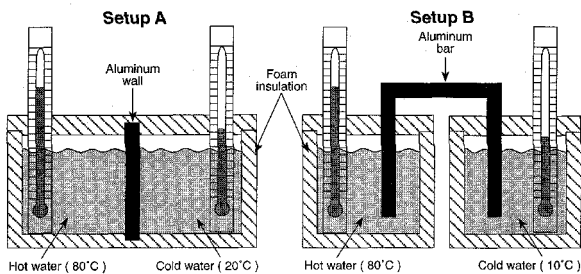
12. Base your answer to the following question on the *Earth Science Reference Tables*, the information below, and your knowledge of Earth science.

A camper takes a 100-gram piece of basalt rock from a campfire and places it in a cup holding 250 milliliters of water. The temperature of the rock is 300°C and the temperature of the water is 20°C. Air temperature also is 20°C.

Which graph best represents the temperature change of the water for the 3 minutes after the basalt was placed in the cup?



Base your answers to questions 13 and 14 on the diagrams below, which show laboratory equipment setups *A* and *B* being used to study energy transfer in a classroom laboratory.



13. Which laboratory setup is more efficient at transferring heat energy from the hot water to the cold water?

- 1) *A*, because less energy is lost to the surrounding environment
 2) *A*, because the hot water has a higher temperature
 3) *B*, because the aluminum bar is bigger than the aluminum wall
 4) *B*, because the cold water has a lower temperature

14. In both *A* and *B*, most of the heat energy transferred from the hot water to the cold water is transferred by

- 1) convection 3) radiation
 2) conduction 4) gravity

15. The greatest amount of energy would be gained by 1,000 grams of water when it changes from

- 1) water vapor to liquid water
 2) liquid water to water vapor
 3) liquid water to ice
 4) ice to liquid water

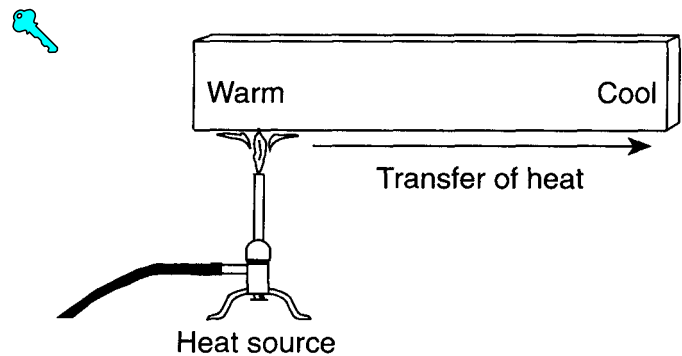
16. Which characteristics of a building material would provide the most energy-absorbing exterior covering for a house?

- 1) dark colored and smooth textured
 2) dark colored and rough textured
 3) light colored and smooth textured
 4) light colored and rough textured

17. By which process is heat energy transferred when molecules within a substance collide?

- 1) conduction 3) radiation
 2) convection 4) sublimation

18. The diagram below shows a solid iron bar that is being heated in a flame.



The primary method of heat transfer in the solid iron bar is

- 1) convection 3) absorption
 2) conduction 4) advection

19. Which natural event is most directly caused by insolation?

- 1) faulting within the Earth's crust
 2) convection in the atmosphere
 3) tides in the oceans
 4) revolution of the Earth around the Sun

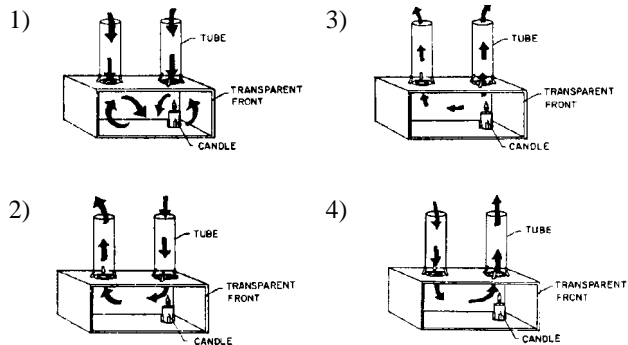
20. What method of energy transfer requires no medium for transfer?

- 1) conduction 3) advection
 2) convection 4) radiation

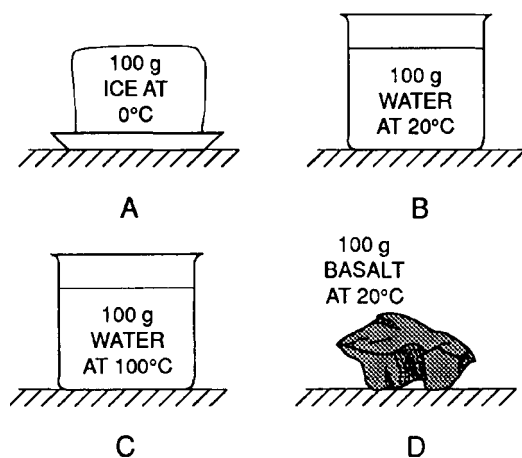
21. Which action would help an air-conditioner use less energy on a hot, sunny summer day?

- 1) opening draperies and blinds
 2) adding insulation in the walls and ceiling
 3) turning on lights and heat-producing appliances
 4) replacing light-colored roofing materials with dark-colored ones

22. The diagrams below represent a laboratory model used to demonstrate convection currents. Each model shows a burning candle in a closed box with two open tubes at the top of the box. Which diagram correctly shows the air flow caused by the burning candle?



23. Base your answer to the following question on the *Earth Science Reference Tables* and the diagrams below. The diagrams represent equal masses of ice, water, and basalt under standard atmospheric pressure conditions and at the temperatures shown.



Each sample was subjected to the same amount of heat for several minutes. Within which two samples would the heat be transferred best by convection?

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

24. Which form of electromagnetic energy is radiated from the Earth's surface with the greatest intensity?



- 1) x-rays
- 2) infrared rays
- 3) ultraviolet rays
- 4) visible light rays

25. Which method of energy transfer is primarily responsible for energy being lost from Earth into space?



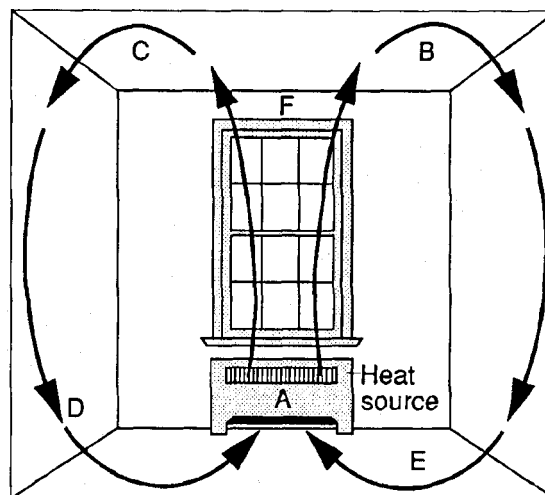
- 1) conduction
- 2) convection
- 3) solidification
- 4) radiation

26. During nighttime cooling, most of the energy radiated by Earth's oceans into space is



- 1) ultraviolet rays
- 2) gamma rays
- 3) visible light rays
- 4) infrared rays

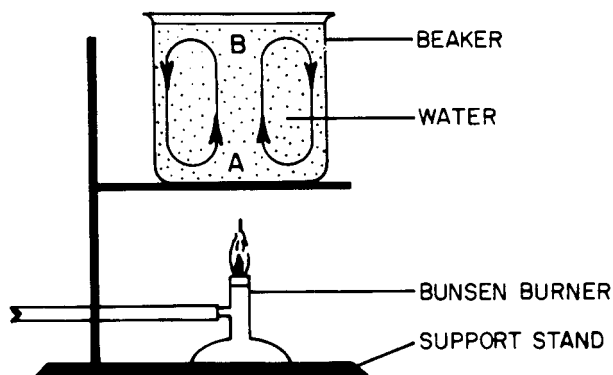
27. Base your answer to the following question on the diagram below. The diagram shows the pattern of air movement within a closed room.



At which location in the room will the density of the air be greatest?

- 1) F
- 2) B
- 3) C
- 4) E

28. The diagram below represents a large beaker of water being heated to demonstrate convection.



The movement of water upward from A toward B results primarily from

- 1) differences in density in the water
- 2) air movement across the surface of the water
- 3) capillary action within the water
- 4) the shape of the beaker

29. In which region of the electromagnetic spectrum is most of the outgoing radiation from the Earth?



- 1) infrared
- 2) visible
- 3) ultraviolet
- 4) X-ray

30. Electromagnetic energy that is being given off by the surface of the Earth is called



- 1) convection
- 2) insolation
- 3) specific heat
- 4) terrestrial radiation

31. The diagram below shows a melting ice cube.

Temperature	
Ice	0°C
Meltwater	0°C
Air	7°C

Which statement best describes the energy transfer?

- 1) The meltwater is a heat source and the surrounding air is a heat sink.
- 2) The meltwater and ice cube are both heat sources
- 3) The ice cube and surrounding air are both heat sources.
- 4) The ice cube is a heat sink and the surrounding air is a heat source.

32. Between the years 1850 and 1900, records indicate that the Earth's mean surface temperature showed little variation.

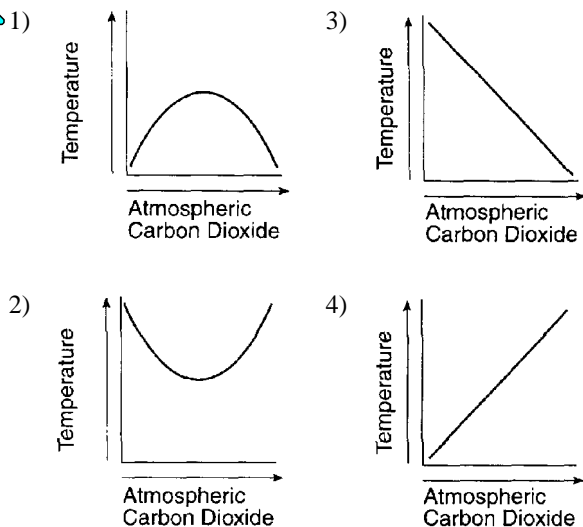
This would support the inference that

- 1) the Earth was in radiative balance
- 2) another ice age was approaching
- 3) more energy was coming in than was going out from the Earth
- 4) the Sun was emitting more energy

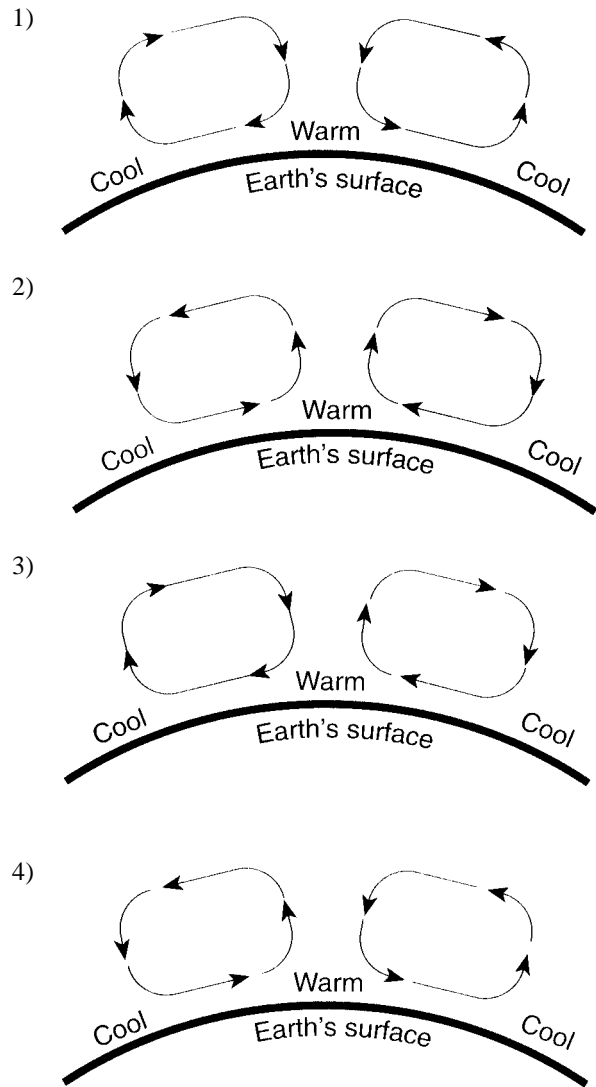
33. Water vapor and carbon dioxide affect the warming of the Earth's atmosphere because they both

- 1) have high specific heats
- 2) scatter insolation
- 3) absorb infrared radiation
- 4) reflect ultraviolet radiation

34. Which graph best shows the relationship between the amount of carbon dioxide contained in Earth's atmosphere and the average atmospheric temperature?



35. The cross sections below show different patterns of air movement in Earth's atmosphere. Air temperatures at Earth's surface are indicated in each cross section. Which cross section shows the most likely pattern of air movement in Earth's atmosphere that would result from the surface air temperatures shown?

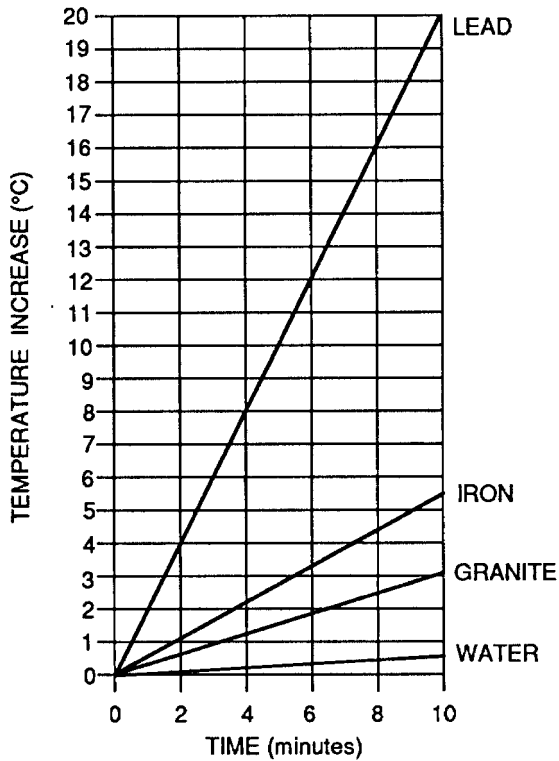


36. Earth's atmosphere is warmed when

- 1) ultraviolet radiation emitted by Earth is absorbed by nitrogen and carbon dioxide in the atmosphere
- 2) x-ray radiation emitted by Earth is absorbed by nitrogen and carbon dioxide in the atmosphere
- 3) infrared radiation emitted by Earth is absorbed by carbon dioxide and water vapor in the atmosphere
- 4) gamma radiation emitted by Earth is absorbed by carbon dioxide and water vapor in the atmosphere

37. Base your answer to the following question on the *Earth Science Reference Tables* and the graph below. The graph shows the temperature increase of samples of water, granite, iron, and lead. Each sample has a mass of 100 grams. Each sample was placed an equal distance from a light bulb and heated for a 10-minute period. This investigation was performed at room temperature under ordinary classroom conditions.

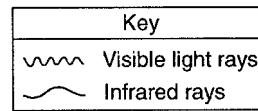
Note that this question only has three choices.



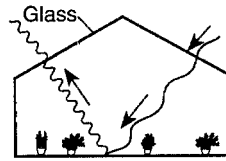
Which statement best describes the amount of energy received by the samples?

- 1) The water received the most energy.
- 2) The lead received the most energy.
- 3) The granite received the most energy.
- 4) All samples received the same amount of energy.

38. Which diagram best shows how air inside a greenhouse warms as a result of energy from the Sun?



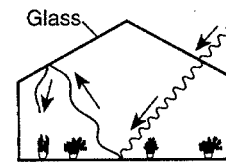
1)



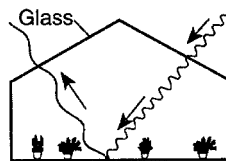
2)



3)



4)



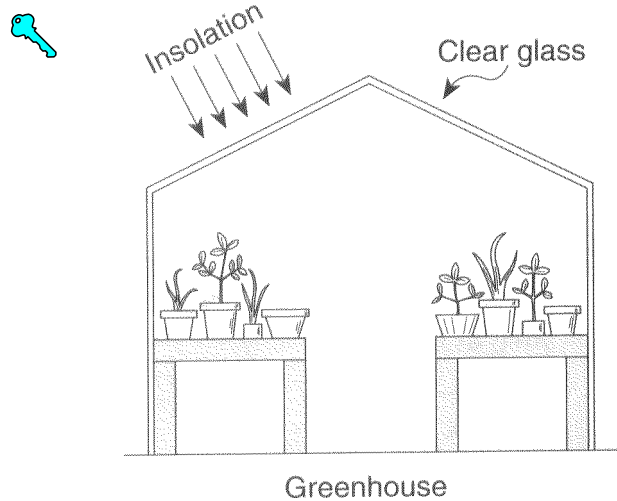
39. Two identical glass containers were placed in direct sunlight. The first container was filled with air and the second container was filled with a mixture of air and additional carbon dioxide. Each container was sealed with a thermometer inside. Temperatures were recorded at 2-minute intervals, as shown in the data table below.

Time (minutes)	Temperature (°C)	
	Container 1 (Air)	Container 2 (Air + CO ₂)
0	24°	24°
2	25°	26°
4	26°	29°
6	27°	32°
8	28°	33°
10	29°	35°

Which statement best explains the results of this activity?

- 1) Carbon dioxide is a good absorber of infrared radiation.
- 2) Carbon dioxide causes a random reflection of energy.
- 3) Carbon dioxide has no effect on the atmosphere's energy balance.
- 4) Carbon dioxide converts some energy into potential energy.

40. The diagram below shows a greenhouse.



What is the primary function of the clear glass of the greenhouse?

- 1) The glass reduces the amount of insolation entering the greenhouse.
- 2) The glass allows all wavelengths of radiation to enter and all wavelengths of radiation to escape.
- 3) The glass allows short wavelengths of radiation to enter, but reduces the amount of longwavelength radiation that escapes.
- 4) The glass allows long wavelengths of radiation to enter, but reduces the amount of shortwavelength radiation that escapes.