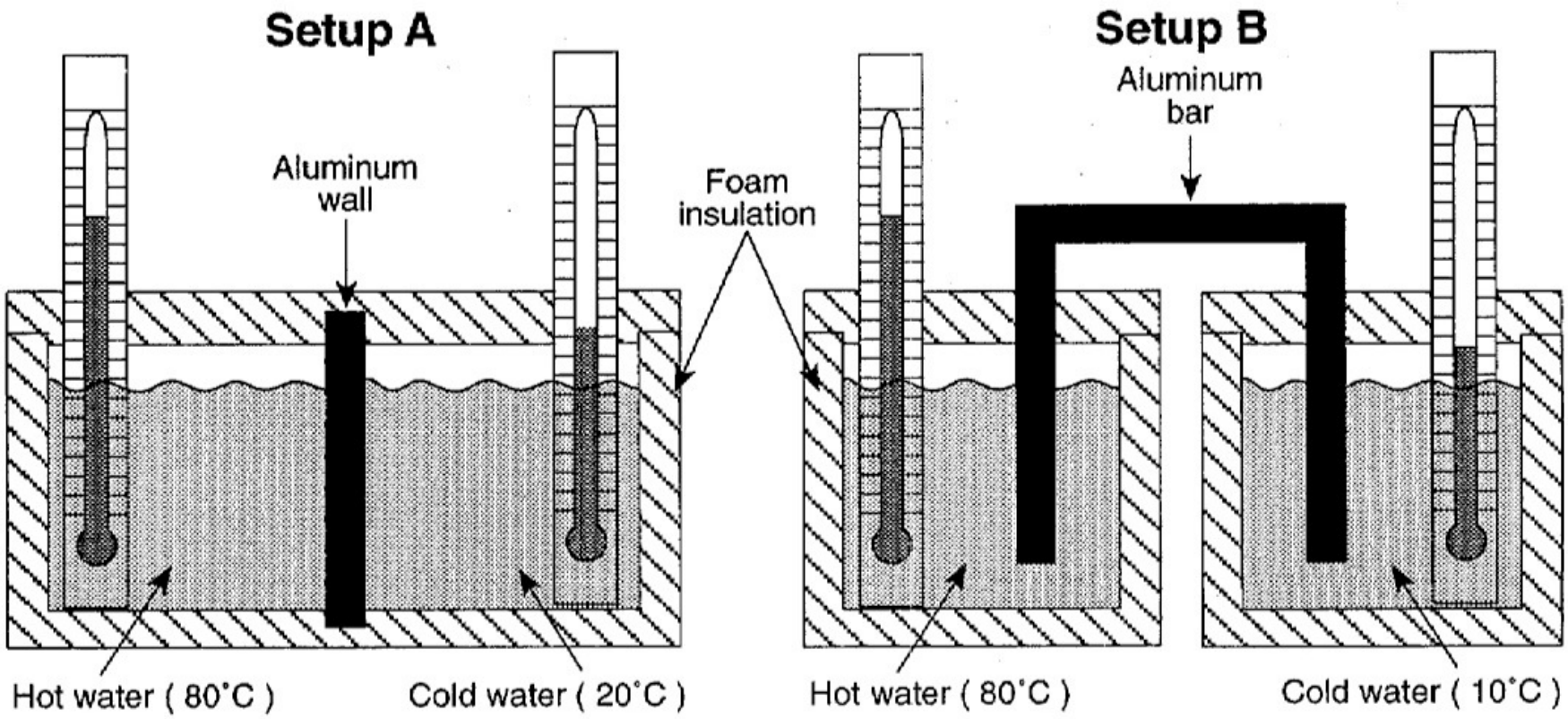


12 In both *A* and *B*, most of the heat energy transferred from the hot water to the cold water is transferred by

1 convection
2 conduction
3 radiation
4 gravity

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

Base your answers to questions 66 through 70 on your knowledge of earth science and the diagrams below. Figure I represents the physical setup of an energy absorption investigation. A black metal container and a shiny metal container are placed equal distances from a lamp heat source. A thermometer is inserted in each container. Inside air-temperature measurements are taken for 12 minutes while the lamp is on. Figure II is a graph of the temperatures recorded for the 12-minute period.

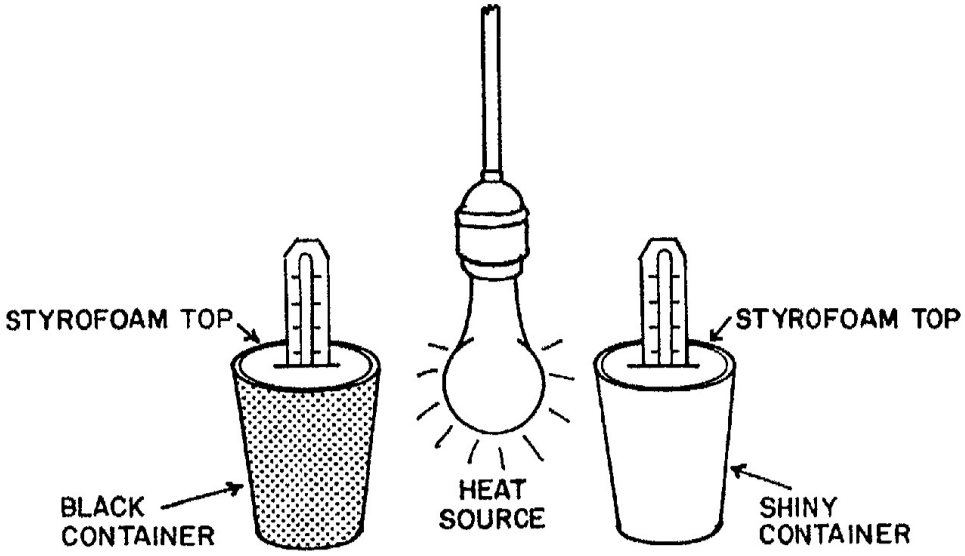


FIGURE I
(NOT TO SCALE)

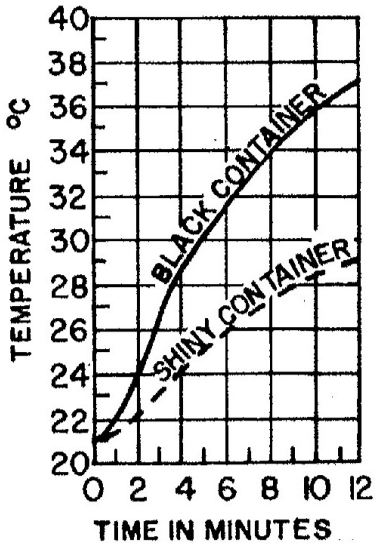


FIGURE II

66 The heat source in figure I is transferring its energy primarily by

1 refraction
2 radiation
3 convection
4 conduction

67 During the 12 minutes of heating, the black container and the shiny container both

1 received the same amount of energy
2 absorbed the same amount of energy
3 radiated the same amount of energy
4 reflected the same amount of energy

68 As electromagnetic energy from the heat source interacts with its surroundings, it is being absorbed and

1 reflected, only
2 refracted, only
3 scattered, only
4 reflected, refracted, and scattered

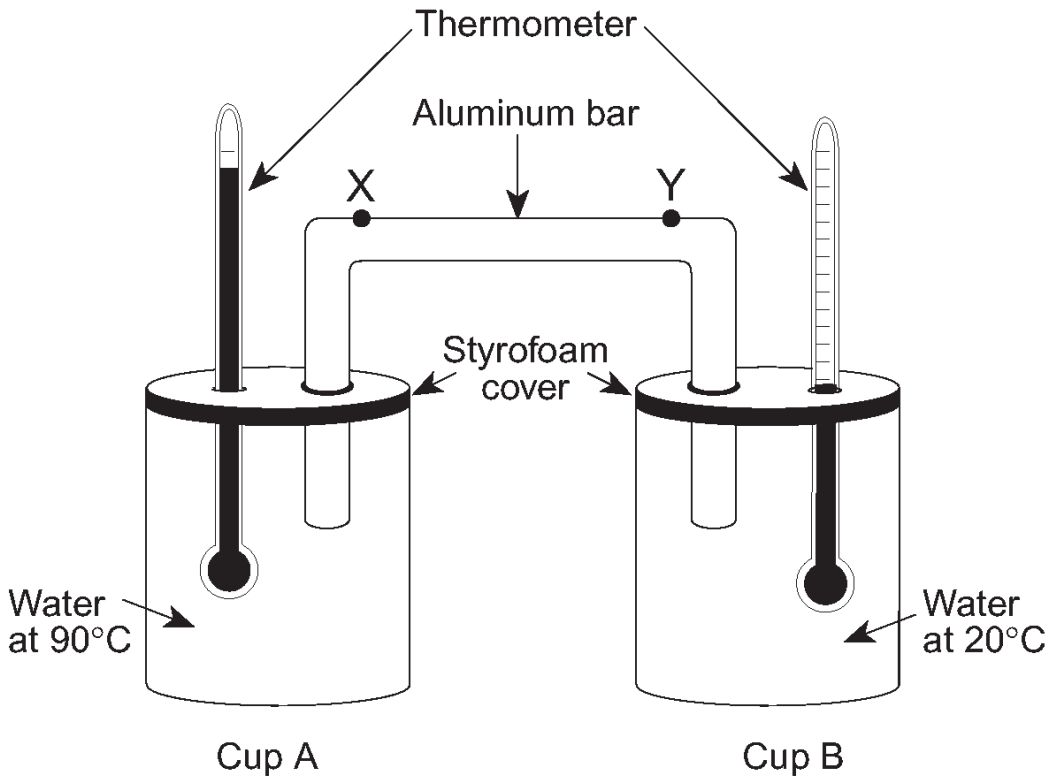
69 According to figure II, the temperature difference between the black container and the shiny container after 5 minutes of heating was

(1) 30°C
(2) 25°C
(3) 5°C
(4) 4°C

70 At what rate did the air temperature inside the black container rise in the first 10 minutes?

(1) 1.5°C/min
(2) 2.6°C/min
(3) 3.6°C/min
(4) 4.5°C/min

Hot water at 90°C is poured into cup *A*. Cool water at 20°C is poured into cup *B*. Styrofoam covers are placed on the cups. An aluminum bar and a thermometer are placed through holes in each cover. Points *X* and *Y* are locations on the aluminum bar. The data table shows temperature readings taken every minute for 20 minutes.

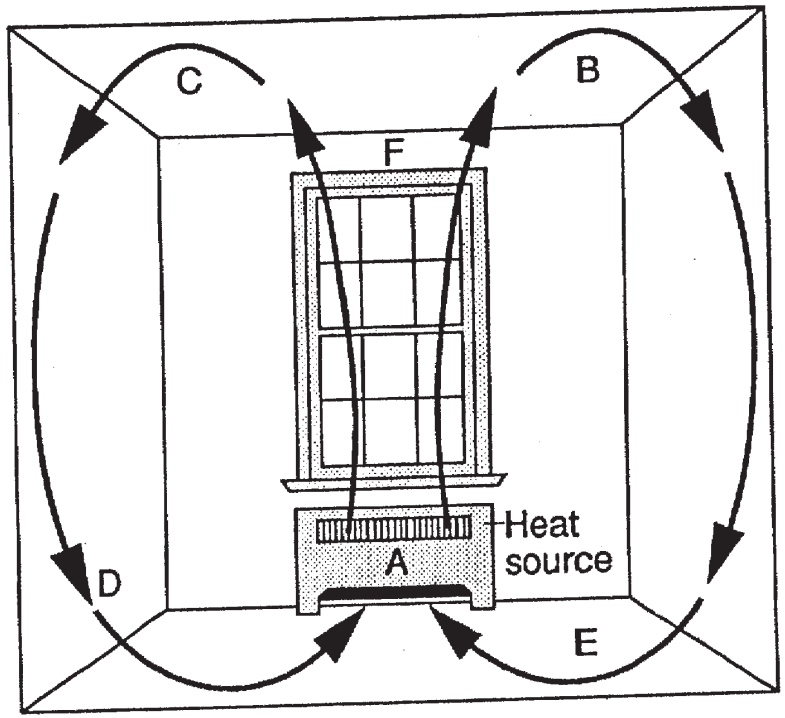


	Temperature of Water (°C)	
Minute	**Cup *A***	**Cup *B***
0	90	20
1	88	20
2	86	20
3	85	21
4	83	21
5	82	22
6	81	22
7	80	22
8	79	22
9	78	23
10	77	23
11	76	23
12	75	23
13	74	23
14	73	23
15	72	24
16	71	24
17	70	24
18	69	24
19	68	25
20	67	25

Which change in the experiment would increase the heating rate of the water in cup *B*?

1) making the aluminum bar shorter between points *X* and *Y*
2) making the aluminum bar longer between points *X* and *Y*
3) keeping cup *A* covered, but uncovering cup *B*
4) keeping cup *B* covered, but uncovering cup *A*

Base your answers to questions 66 through 70 on the diagram below and your knowledge of Earth science. The diagram shows the pattern of air movement within a closed room.



66 Which type of energy transfer is indicated by the arrows in the diagram?

1 insolation
2 conduction
3 convection
4 radiation

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

(1) *F*
(2) *B*
(3) *C*
(4) *E*

68 The temperature of the radiator is 65°C. What is the equivalent Fahrenheit temperature?

(1) 126°F
(2) 132°F
(3) 144°F
(4) 149°F

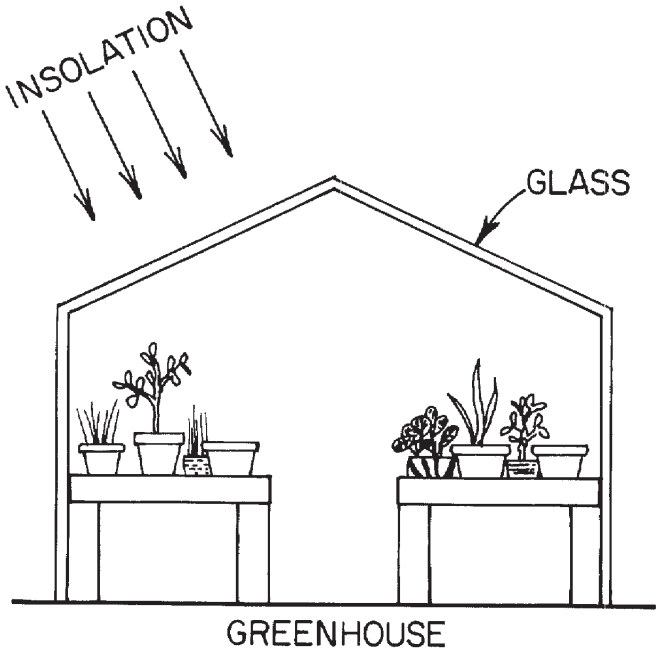
69 What color should the heat source in the room be painted in order to radiate the most heat?

1 red
2 black
3 green
4 silver

70 If the room is considered a model of circulation in the Earth's atmosphere, at which location would air pressure be greatest?

(1) *A*
(2) *B*
(3) *E*
(4) *F*

Base your answers to questions 66 through 70 on your knowledge of earth science, the *Earth Science Reference Tables*, and the diagram and data below. The diagram represents a closed glass greenhouse. The data table shows the air temperatures inside and outside the greenhouse from 6 a.m. to 6 p.m. on a particular day.



AIR TEMPERATURE

Time	Average Outside Temperature	Average Inside Temperature
6 a.m.	10°C	13°C
8 a.m.	11°C	14°C
10 a.m.	12°C	16°C
12 noon	15°C	20°C
2 p.m.	19°C	25°C
4 p.m.	17°C	24°C
6 p.m.	15°C	23°C

66 The highest temperature was recorded at
(1) 12 noon outside the greenhouse
(2) 2 p.m. outside the greenhouse
(3) 12 noon inside the greenhouse
(4) 2 p.m. inside the greenhouse

67 By which process does air circulate inside the greenhouse due to differences in air temperature and air density?
1 absorption
2 radiation
3 convection
4 conduction

68 Several objects made of the same material, but with different surface characteristics, are tested in the greenhouse to determine which object will absorb the most sunlight. The object that absorbs the most sunlight most likely has a surface that is
1 dark-colored and smooth
2 dark-colored and rough
3 light-colored and smooth
4 light-colored and rough

69 Which statement best explains what happens to the insolation reaching the 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 at longer wavelengths.
4 Insolation absorbed inside the greenhouse is reradiated at shorter wavelengths.

70 At approximately what rate did the temperature rise inside the greenhouse between 8 a.m. and 10 a.m.?
(1) 1.0 °C/hr
(2) 2.0 °C/hr
(3) 0.5 °C/hr
(4) 12.0 °C/hr

Base your answers to questions 66 through 70 on your knowledge of earth science and on the diagrams below. Diagram I represents a light source located at an equal distance from two air-filled metal cans. One can is shiny and the other is black. Diagram II represents two insulated cups, each filled with equal masses of water. One insulated cup contains cold water and the other contains warm water. A metal bar is inserted into the water of each insulated cup.

DIAGRAM I

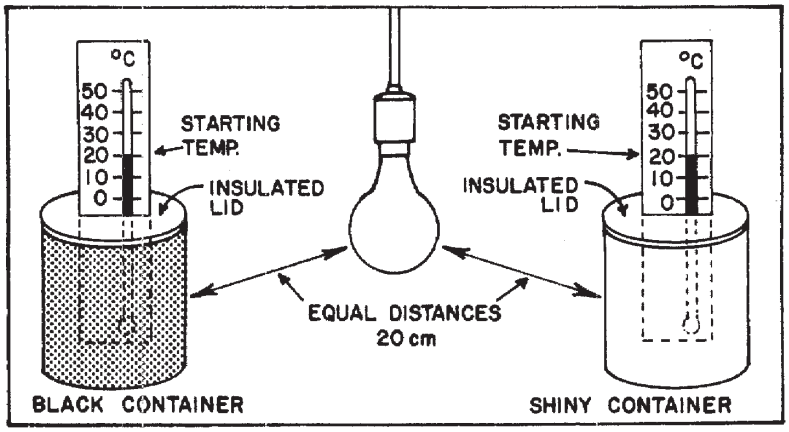
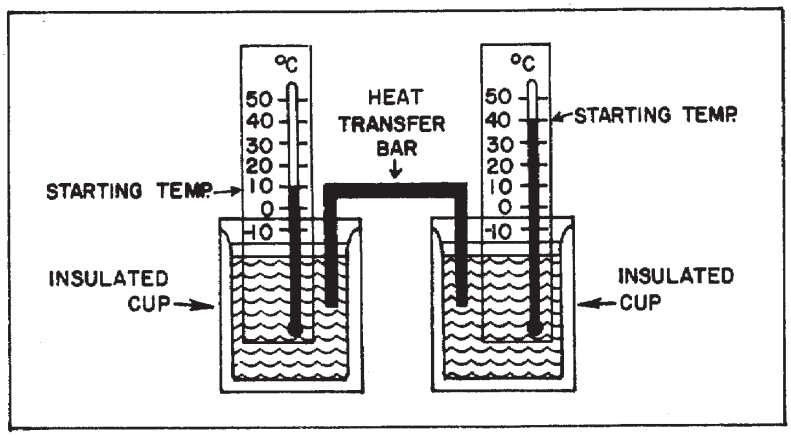


DIAGRAM II

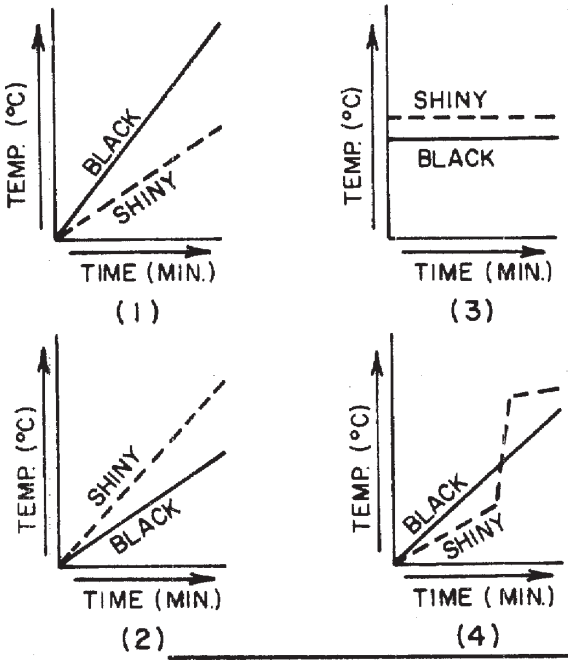


Note that question 66 has only three choices.

66 When the light source is on (diagram I), the amount of radiant energy striking the black container, as compared to the amount striking the shiny container, is

1 less
2 more
3 the same

67 With reference to diagram I, which graph best represents the change in temperature during the first 10 minutes after the light source is turned on?



68 In the equipment shown in diagram II, heat energy will be transferred through the bar from the hot water to the cold water primarily by

1 density differences
2 flowing currents
3 electromagnetic rays
4 molecular collisions

69 In diagram II, if all the energy lost by the warm water is gained by the cold water, what will be the temperature of the water in both insulated cups following the energy transfer?

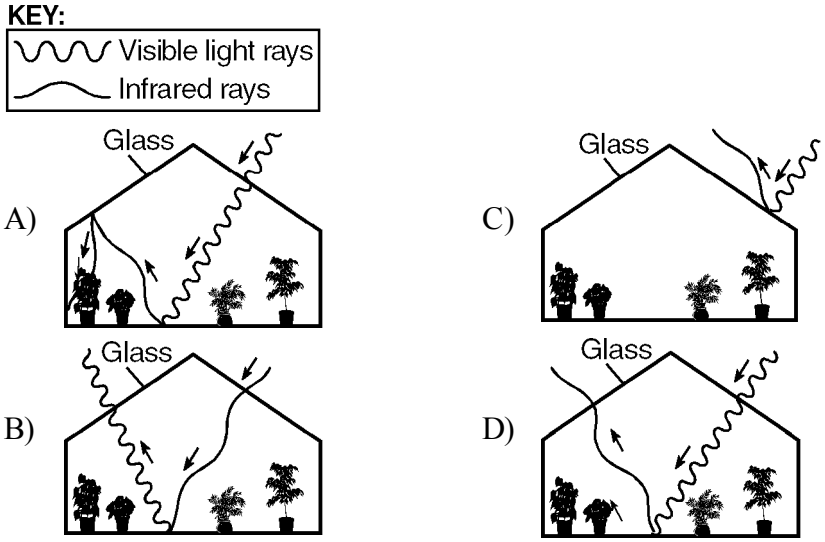
(1) 10.°C
(2) 25°C
(3) 40.°C
(4) 50.°C

70 According to the heat energy formula in the *Earth Science Reference Tables*, how many calories of heat energy must be added to 20 grams of the cold water to raise its temperature 5°C?

(1) 120 calories
(2) 100 calories
(3) 20 calories
(4) 4 calories

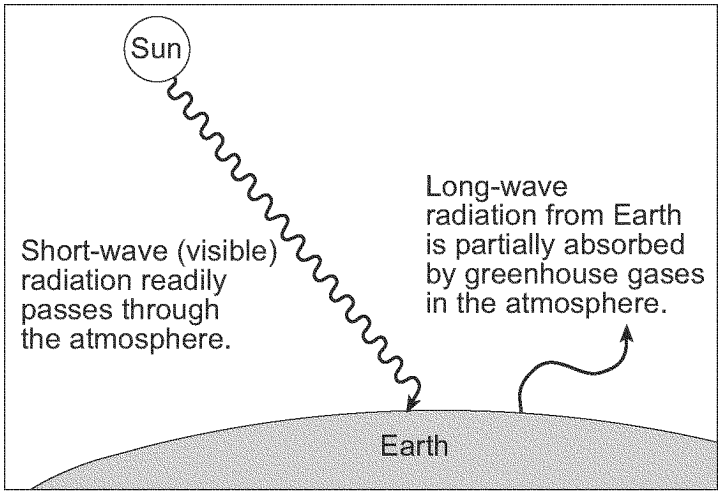
Name: _____

1) Which diagram *best* shows how air inside a greenhouse warms as a result of insolation from the Sun?



Questions 2 and 3 refer to the following:

The diagram below represents the greenhouse effect in which heat energy is trapped in Earth's atmosphere.



(not drawn to scale)

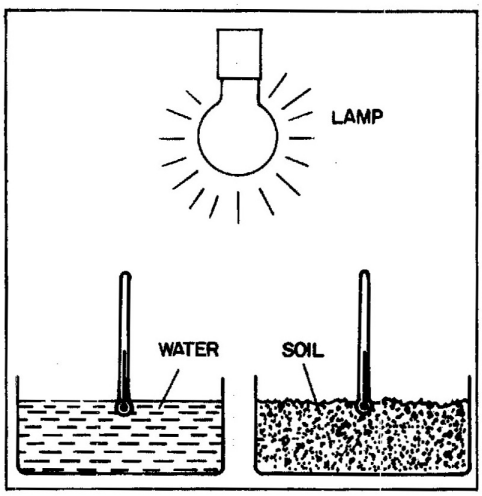
2) Which type of radiation from Earth is the long-wave radiation absorbed by greenhouse gases?

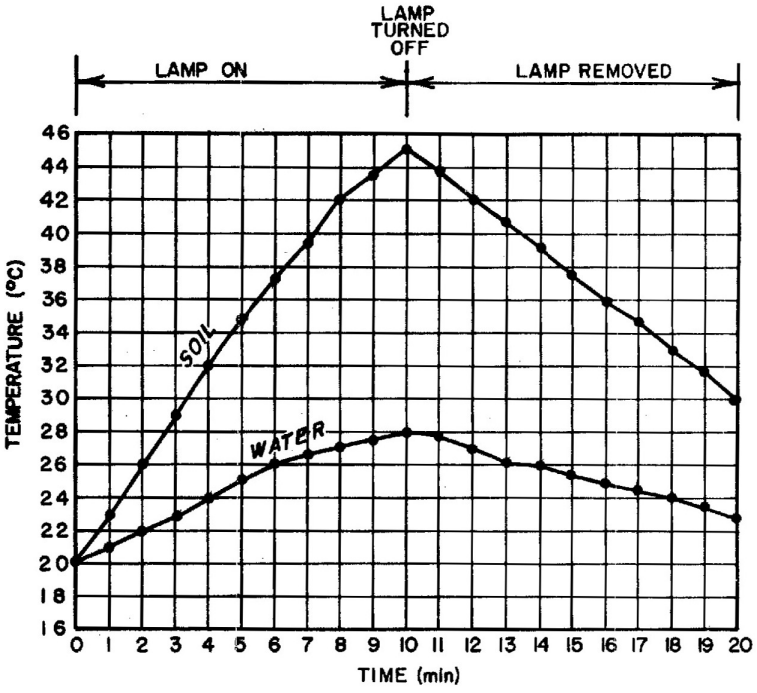
A) visible light
B) ultraviolet
C) radio waves
D) infrared

3) The Earth surface that *best* absorbs short-wave solar radiation has which characteristics?

A) white and rough
B) black and smooth
C) black and rough
D) white and smooth

Base your answers to questions 66 through 70 on your knowledge of earth science, the *Earth Science Reference Tables*, and the diagram and graph below. In the diagram, equal masses of water and soil are located at identical distances from the lamp. Both were heated for ten minutes and then the lamp was removed. The water and soil were then allowed to cool for ten minutes. The graph shows the temperature data obtained during the investigation.





66 What were the temperature readings of the water and soil at the time the lamp was turned off?

1 The water was 20°C and the soil was 20°C.
2 The water was 23°C and the soil was 30°C.
3 The water was 28°C and the soil was 45°C.
4 The water was 45°C and the soil was 28°C.

67 By which process was most of the energy transferred between the lamp and the water during the first 10 minutes of the investigation?

1 conduction
2 convection
3 reflection
4 radiation

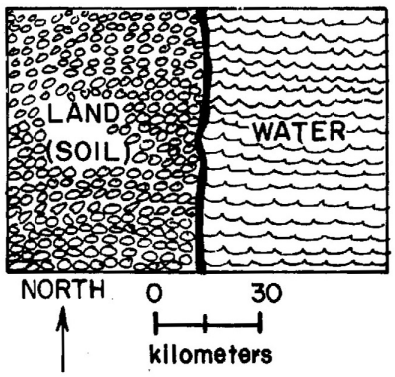
68 What was the rate at which the soil temperature changed during the first ten minutes of the investigation?

(1) 0.8 C°/min
(2) 2.5 C°/min
(3) 8 C°/min
(4) 25 C°/min

69 Compared to the water, the soil became warmer during the heating period because the soil

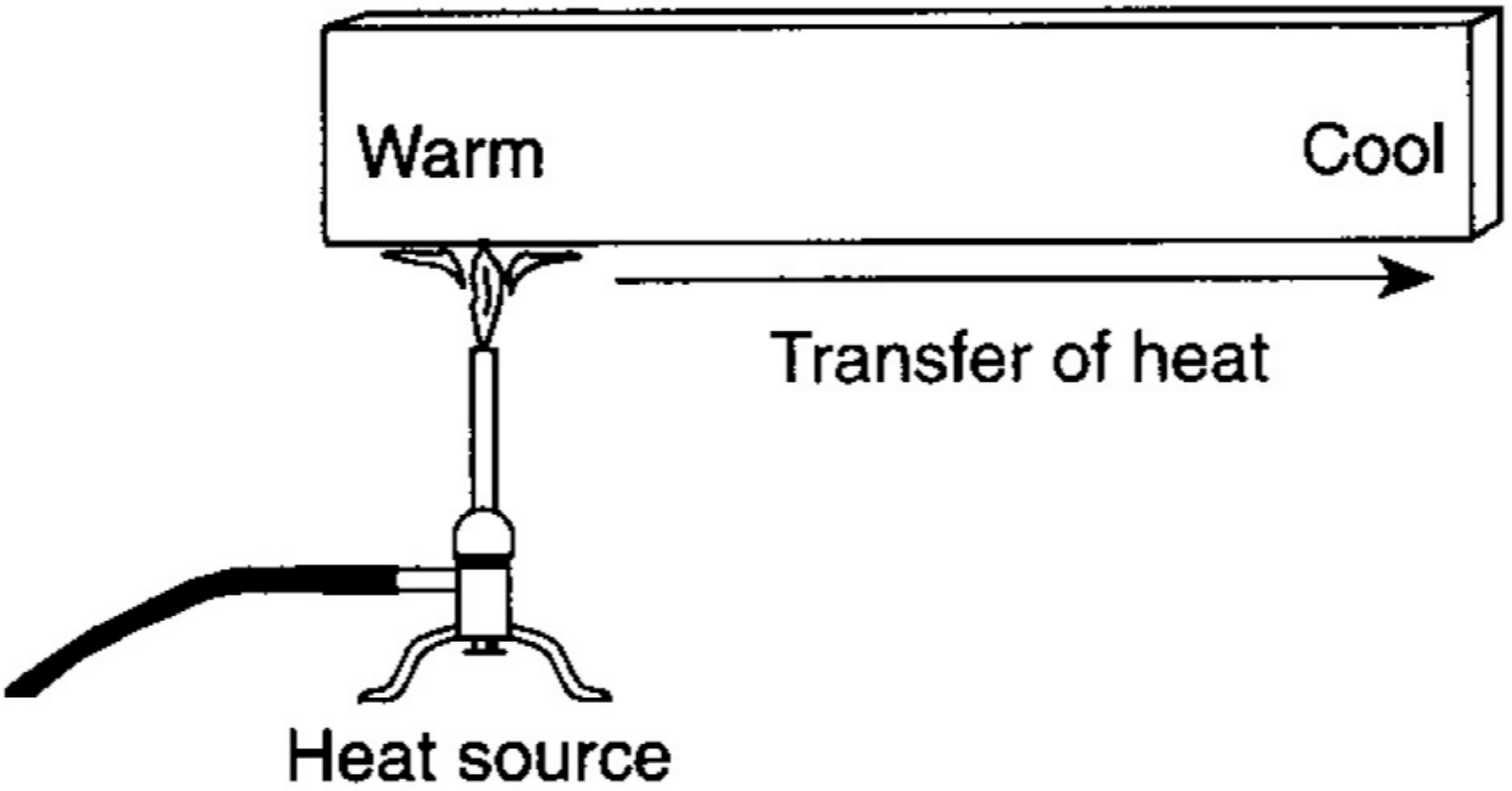
1 has a lower specific heat
2 was closer to the lamp
3 reradiated less heat
4 has a lower density

70 Assume that the soil and water in this investigation heat and cool in the same manner as the land and water on the map below. At the time of highest temperature readings, in which direction would the wind most likely be blowing?



1 south to north
2 north to south
3 east to west
4 west to east

13 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
2 conduction
3 absorption
4 advection