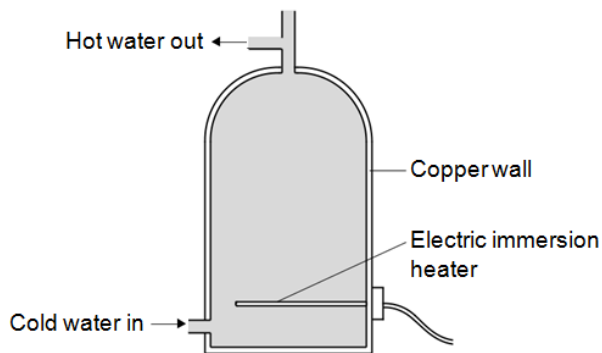


Conduction and Convection 3

Q:1 A homeowner uses an electric immersion heater to heat the water in his hot water tank.

The hot water tank has no insulation.



(a) Draw a ring around the correct answer to complete each sentence.

Energy is transferred through the water by

conduction.
convection.
evaporation.

Energy is transferred through the copper wall of the hot water tank by

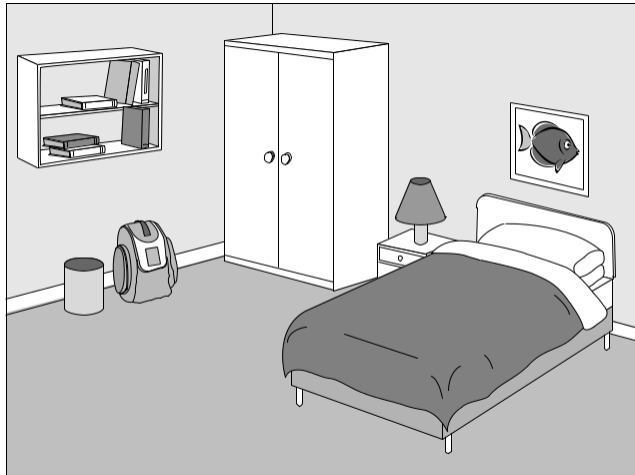
conduction.
convection.
evaporation.

(2 marks)

Q:2 The drawing shows part of a bedroom. The bedroom is heated by an electric fire.

There is a loft space above the bedroom ceiling. Above the bedroom ceiling is a layer of fibreglass.

When the electric fire is switched off, the bedroom cools down.



Match words, A, B, C and D, with the numbers 1– 4 in the sentences.

A conduction

B convection

C insulation

D radiation

The bedroom cools down because heat is transferred through the floor, the ceiling and the walls by ... 1 ...

Heat is transferred from the outside of the walls by ... 2 ...

Heat is transferred through the air in the loft by ... 3 ...

Fibreglass reduces heat transfer through the ceiling because it has good ... 4 ... properties.

(4 marks)

Q:3 Convection currents are formed when liquids are heated.

Match words, A, B, C and D, with the numbers 1– 4 in the sentences.

- A decreases
- B increases
- C is unchanged
- D rises

When liquids are heated, the particles gain kinetic energy.

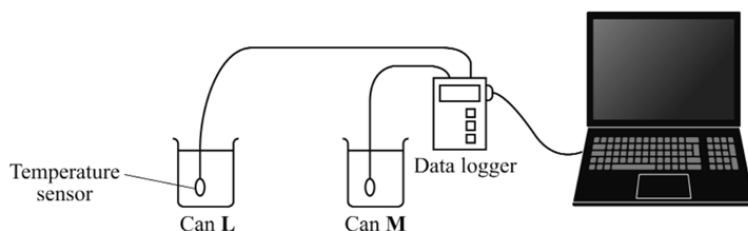
The space between the particles in the liquid . . . 1 . . . so the density of the liquid . . . 2

The warm liquid . . . 3

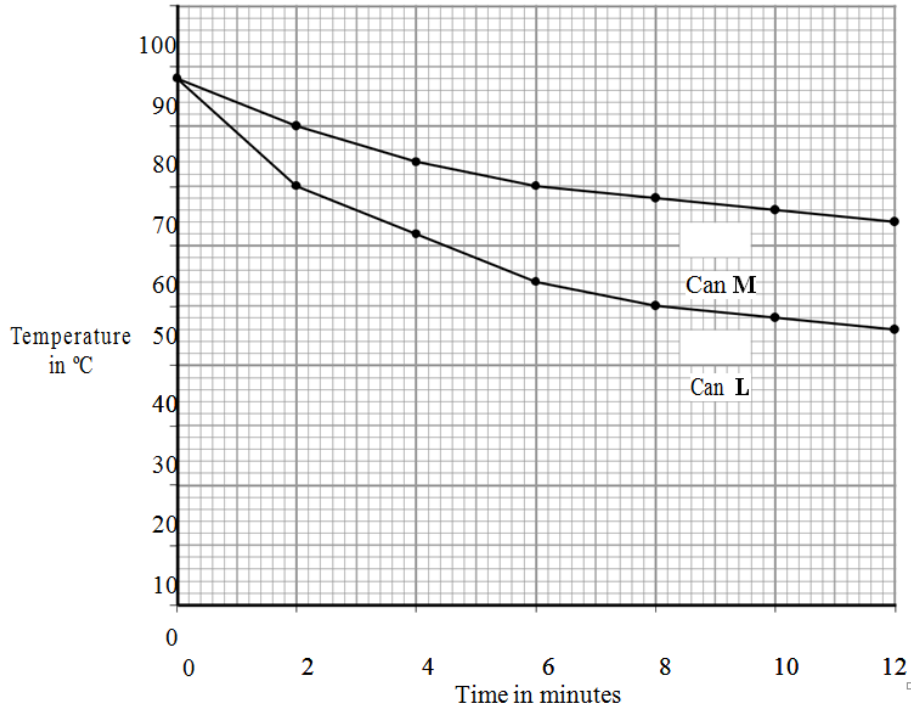
The total mass of the liquid . . . 4

(4 marks)

Q:4 A student was asked to investigate the heat loss from two metal cans, L and M. The cans were identical except for the outside colour.



The student filled the two cans with equal volumes of hot water. He then placed the temperature sensors in the water and started the data logger. The computer used the data to draw the graph below.



(a) Which one of the following is a categoric variable? Put a tick (☑) in the box next to your answer.

the outside colour of the cans

the starting temperature of the hot water

the time

the volume of hot water

(1 mark)

(b) For can L, state the temperature drop of the water:

(i) in the first two-minute interval

(1 mark)

(ii) in the second two-minute interval.

(1 mark)

(c) In both cans the water cooled faster at the start of the investigation than at the end of the investigation. Why?

(1 mark)

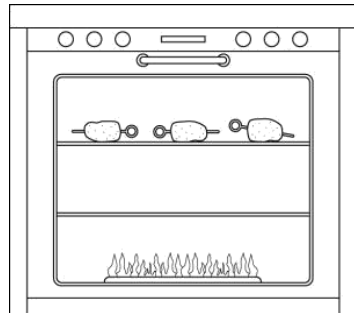
(d) One can was black on the outside and the other can was white on the outside.

What colour was can L? _____

Explain the reason for your answer.

(3 marks)

Q:5 The diagram shows potatoes being baked in a gas oven. Each potato has a metal skewer pushed through it.



(a) Explain how heat is transferred by the process of convection from the gas flame at the bottom of the oven to the potatoes at the top of the oven.

(3 marks)

(b) The metal skewers help the potatoes to cook by transferring heat to the inside of the potatoes.

By what method is heat transferred through a metal skewer?

(1 mark)

(c) When the potatoes are taken from the oven, they start to cool down.

Suggest one factor that will affect how fast a potato cools down.

(1 mark)

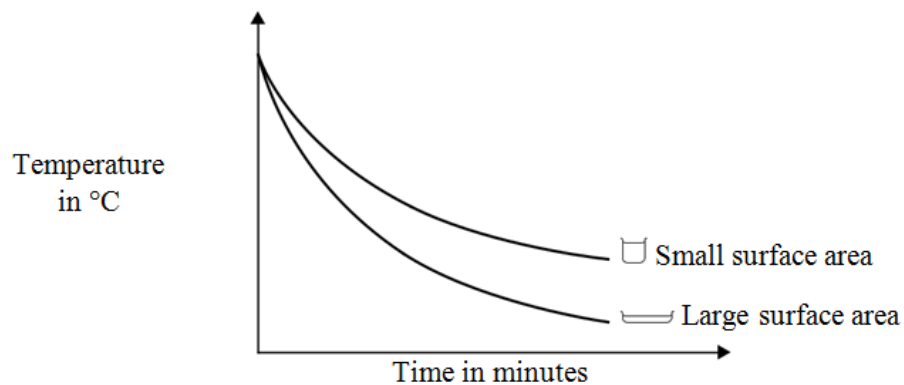
(d) If the potatoes need to be kept hot, they may be wrapped in shiny aluminium foil.

Why does this help to keep the potatoes hot?

(1 mark)

Q:6 (a) The graph compares how quickly hot water cooled down in two glass beakers with different surface areas.

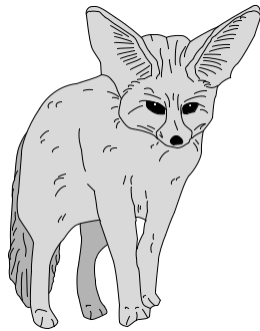
The volume of water in each beaker was the same.



Describe how the surface area of the water affected how fast the water cooled down.

(1 mark)

(b) Some foxes live in a hot desert environment.

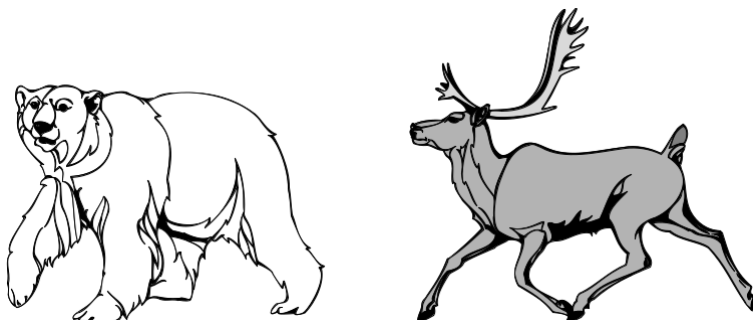


This type of fox has very large ears.

Explain how the size of the fox's ears help it to keep cool in a hot desert.

(2 marks)

(c) Polar bears and reindeer are adapted to live in cold environments.



Use the words in the box to complete the following sentences.

conduction convection radiation

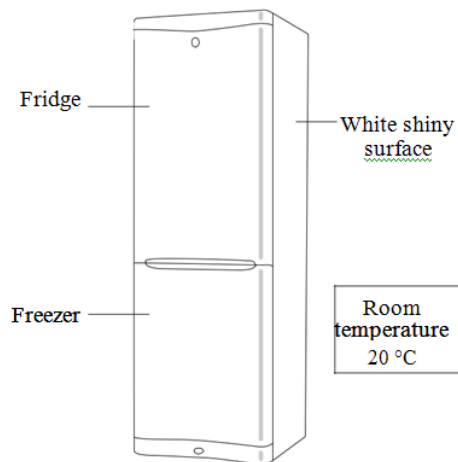
(c)(i) The white colour of a polar bear's fur helps to keep the polar bear warm by reducing the heat lost by _____

(1 mark)

(c)(ii) The hairs of a reindeer are hollow. The air trapped inside the hairs reduces the heat lost by _____

(1 mark)

Q:7 The diagram shows a fridge-freezer.



(a) By which method is heat transferred through the walls of the fridge-freezer?

(1 mark)

(b) The inside of the fridge is at 4 oC. The inside of the freezer is at -18 oC. Into which part of the fridge-freezer will the rate of heat transfer be greater?

Draw a ring around your answer.

the fridge the freezer

Give a reason for your answer.

(1 mark)

(c) The outside surface of the fridge-freezer is white and shiny.

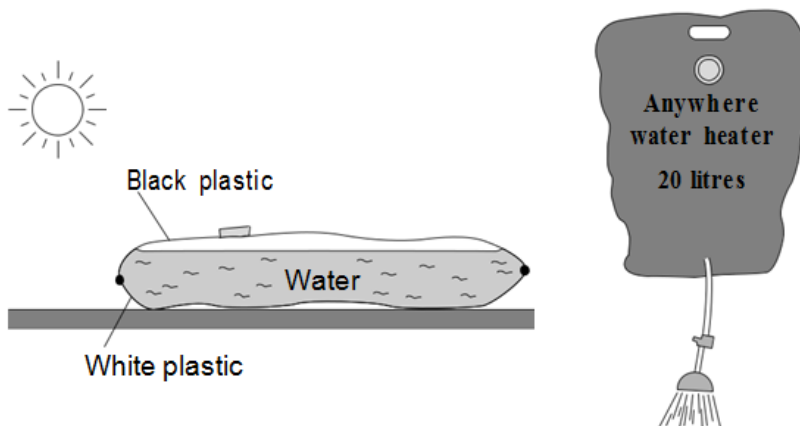
Give two reasons why this type of surface is suitable for a fridge-freezer.

1 _____

2 _____

(2 marks)

Q:8 The diagram shows a simple type of portable shower. The water container is a strong plastic bag that is black on one side and white on the other. To warm the water, the bag is placed on the ground in direct sunlight, with the black side facing the Sun.



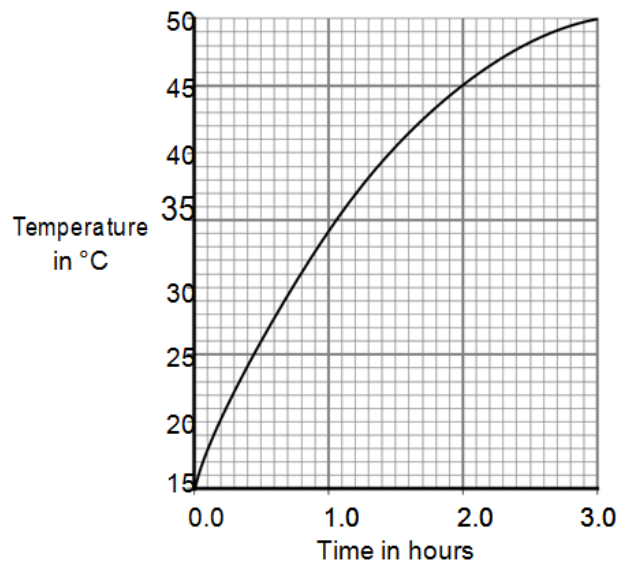
(a) (i) Name the process by which heat is transferred from the Sun to the outside of the bag.

(1 mark)

(a) (ii) Explain why the black side of the bag and not the white side should face the Sun.

(2 marks)

(b) The graph shows how the temperature of the water inside a full bag increases after the bag is placed outside on a sunny day.



(b) (i) How long does it take for the water to reach 37 °C?

(1 mark)

(b) (ii) Describe how the temperature of the water changes during the three hours.

(1 mark)

(c) A different manufacturer makes the same type of portable shower but uses a bag with a larger surface area. The bag is made from the same coloured plastics and holds the same amount of water.

(c) (i) To compare the efficiency of the two bags at heating water, several variables need to be controlled.

Name two variables that need to be controlled.

1 _____

2 _____

(2 marks)

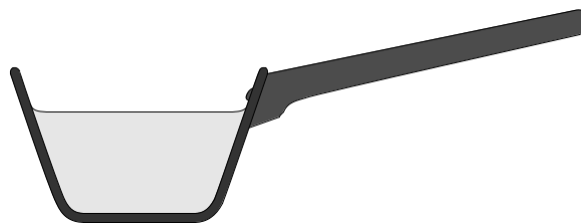
(c) (ii) The second bag has a larger surface area.

Draw a line on the graph to show how the temperature of the water inside the second bag would change over the first hour.

Assume that the two bags are tested in exactly the same way.

(1 mark)

Q:9 The diagram shows a metal pan being used to heat water.



Gas flame

Energy from the gas flame is transferred through the metal pan by conduction.

Explain the process of conduction through metals.

(4 marks)

TOTAL MARKS=44