

Name of the Student: \_\_\_\_\_

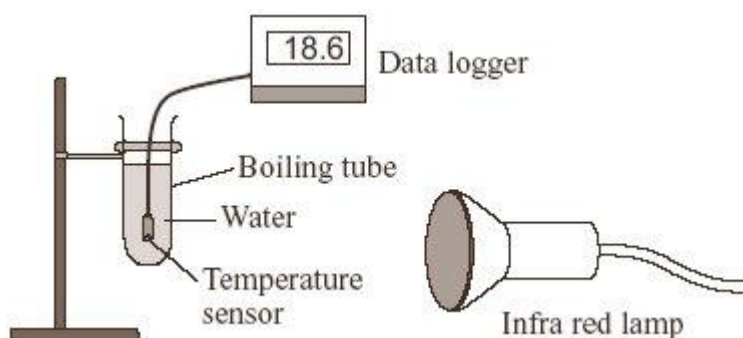
Max. Marks : 20 Marks

Time : 20 Minutes

**Q1.**

A student had read about a glacier that had been covered in insulating material. The idea was to slow down the rate at which the glacier melts in the summer.

She investigated this idea using the apparatus shown in the diagram.



(a) These are the steps taken by the student.

- Measure 30 cm<sup>3</sup> of cold water into a boiling tube.
- Place the boiling tube 25 cm from an infra red lamp.
- Record the temperature of the water.
- Switch on the infra red lamp.
- Record the temperature of the water every minute for 5 minutes.
- Repeat with boiling tubes covered in different insulating materials.

(i) Why did she use an infra red lamp?

\_\_\_\_\_

(1)

(ii) Name **one** control variable in this investigation.

\_\_\_\_\_

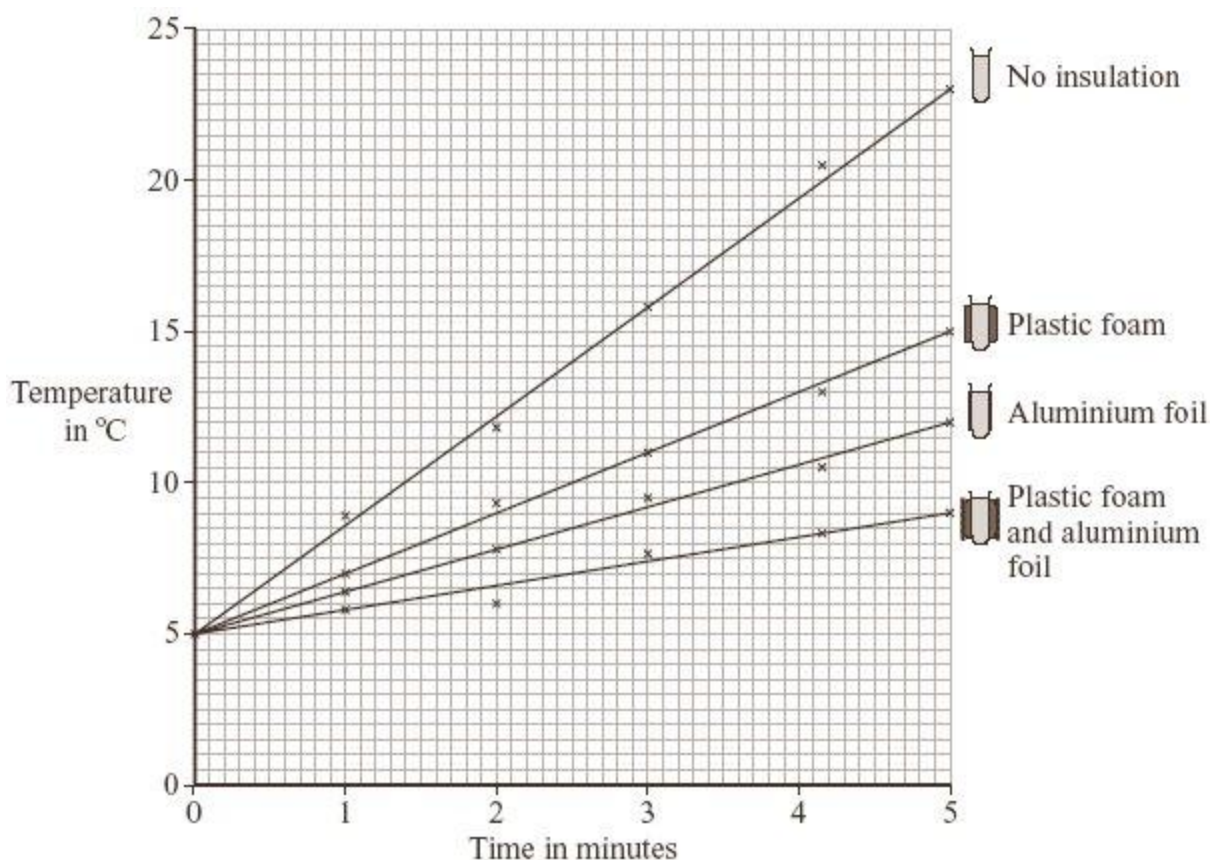
(1)

(iii) Give **one** advantage of using a temperature sensor and data logger instead of a glass thermometer to measure temperature.

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(b) The results of the investigation are shown in the graph.



(i) Why did the student use a boiling tube with no insulation?

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(1)

(ii) From her results, what should she recommend is used to insulate the glacier?

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(1)

(iii) Explain why the insulation recommended by the student will reduce the heat transfer from the Sun to the glacier.

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(2)

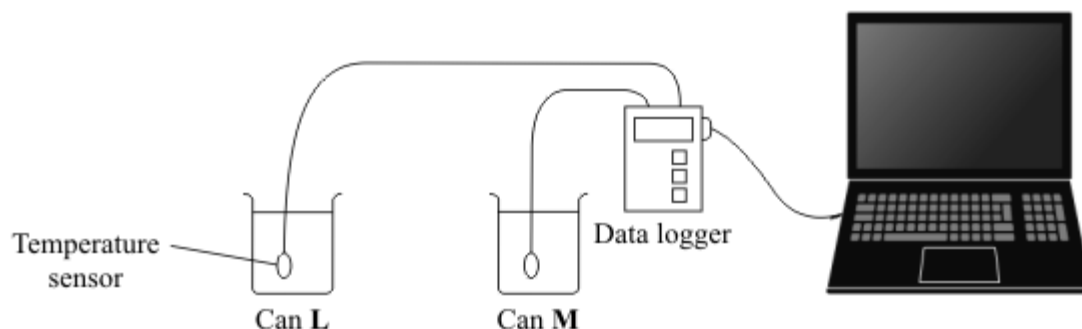
(c) Explain, in terms of particles, how heat is transferred through the glass wall of a boiling tube.

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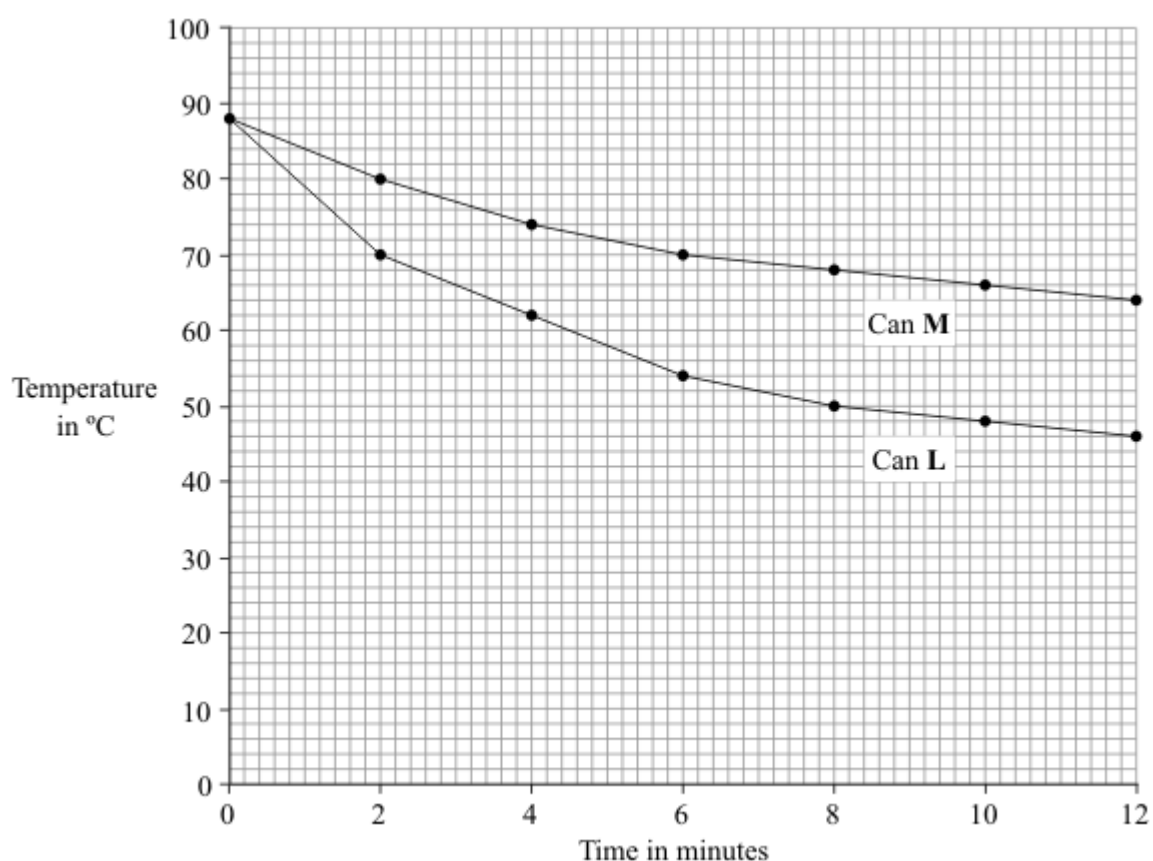
(2)  
(Total 9 marks)

**Q2.**

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)

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

(i) in the **first** two-minute interval

\_\_\_\_\_

(1)

(ii) in the **second** two-minute interval.

\_\_\_\_\_

(1)

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

\_\_\_\_\_  
\_\_\_\_\_

(1)

(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.

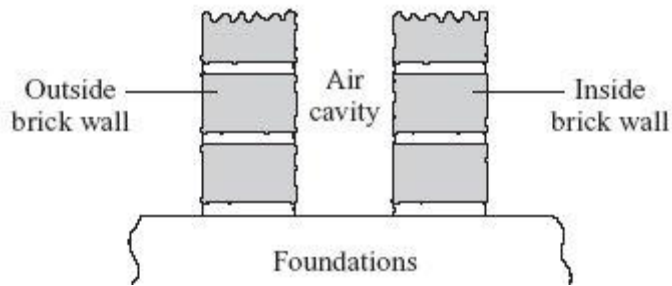
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(3)

(Total 7 marks)

**Q3.**

(a) The diagram shows a section through the walls of a house built in 1930.



Explain how the air cavity between the two walls reduces the heat transfer from the house.

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(2)

- (b) The table shows the installation costs and yearly savings on energy bills for different methods of insulating a house.

Method of insulation	Installation cost in £	Yearly saving on energy bills in £
Double glazing	4000	65
Loft insulation	240	60
Cavity wall insulation	600	80

- (i) Give **one** reason why loft insulation is often fitted to an old house before double glazing or cavity wall insulation.

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(1)

- (ii) The time it takes for the saving on energy bills to equal the cost of installing the insulation is called the pay-back time.

Calculate the pay-back time for loft insulation.

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Pay-back time = \_\_\_\_\_ years

(1)

(Total 4 marks)