

# Transfer of Thermal Energy

## Question Paper

Course	CIE IGCSE Physics
Section	2. Thermal Physics
Topic	Transfer of Thermal Energy
Difficulty	Medium

**Time Allowed**      40

**Score**                /29

**Percentage**        /100

**Question 1a**

Some materials are poor conductors of thermal energy (heat energy).

State the term that describes materials that are poor conductors of thermal energy.

[1 mark]

**Question 1b**

Some materials are good conductors of thermal energy.

Draw a ring around each material that is a good conductor of thermal energy.

air

aluminium

copper

glass

plastic

water

[1 mark]

**Question 1c**

A student has two rods made of different materials. The rods are the same size.

Describe an experiment to identify which material is the better conductor of thermal energy.

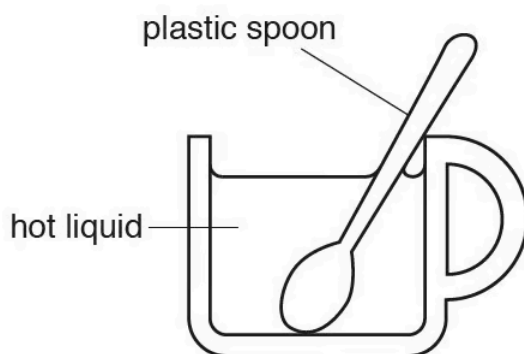
You may draw a diagram in the space below.

[3 marks]

## Question 2a

### Extended

Fig. 4.1 shows a cold plastic spoon that has just been placed in hot liquid in a cup.



**Fig. 4.1**

Describe, in terms of molecules, why the temperature of the whole of the spoon increases.

**[3 marks]**

## Question 2b

### Extended

The plastic spoon is replaced by a metal spoon.

Describe an additional process by which the temperature of the whole of this spoon increases.

**[2 marks]**

**Question 2c****Extended**

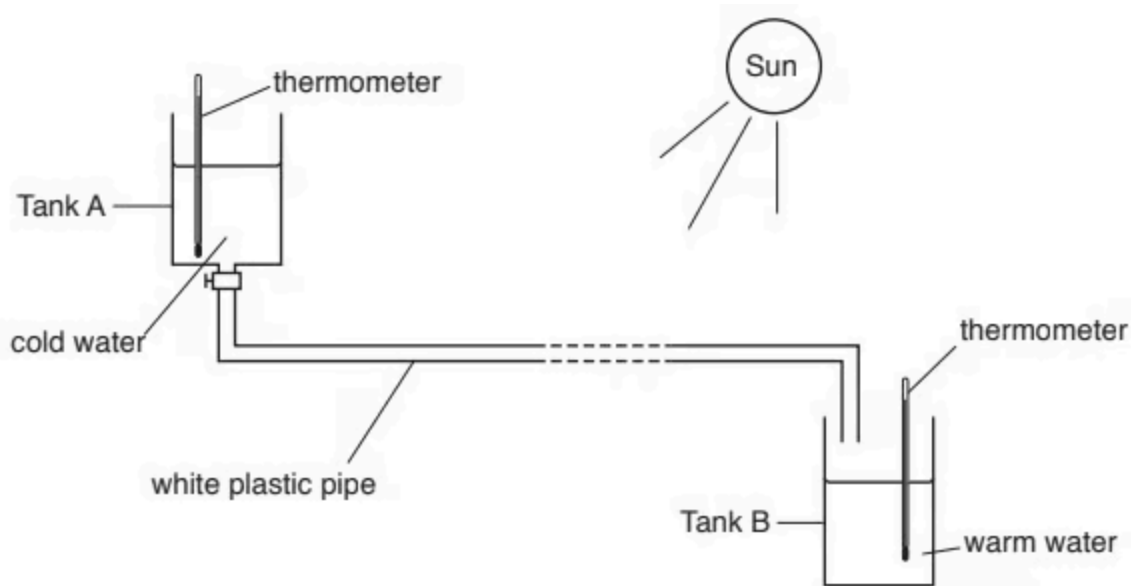
The cup contains 150 g of liquid of specific heat capacity  $4.2 \text{ J / (g}^\circ\text{C)}$ . When the cold spoon is placed into the hot liquid, the temperature of the liquid decreases from  $80^\circ\text{C}$  to  $56^\circ\text{C}$ .

Calculate the loss of thermal energy from the liquid.

energy loss = .....  
[3 marks]

### Question 3a

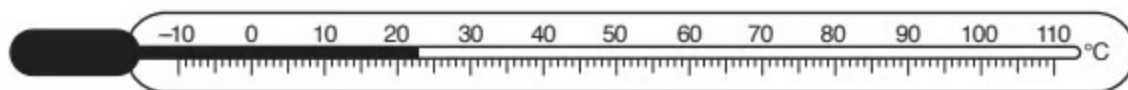
A student constructs a device for absorbing thermal energy from the Sun. Fig. 6.1 shows the device.



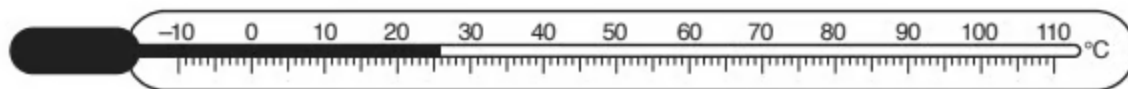
**Fig. 6.1**

The student places the white plastic pipe in sunlight. The cold water flows slowly from Tank A to Tank B. Energy from the Sun heats the water in the pipe.

Fig. 6.2 shows the temperatures in Tank A and Tank B.



Thermometer showing temperature in Tank A.



Thermometer showing temperature in Tank B.

**Fig. 6.2**

Determine the rise in temperature of the water.

temperature rise = ..... °C  
[1 mark]

### Question 3b

The student wants to increase the thermal energy absorbed by the water in the pipe. Suggest three improvements he can make to increase the thermal energy absorbed.

[3 marks]

### Question 3c

Describe how the thermal energy is transferred from the Sun to the water inside the pipe.

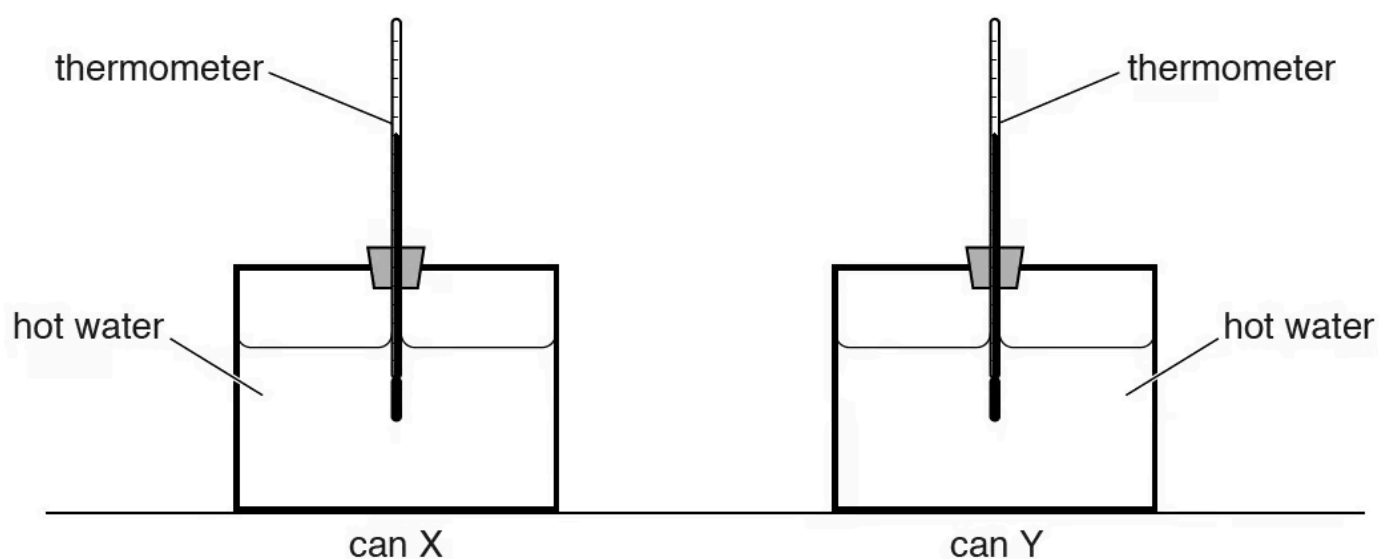
[2 marks]

### Question 4a

A student investigates the thermal energy lost from two metal cans, X and Y. The cans are identical apart from their outside colour.

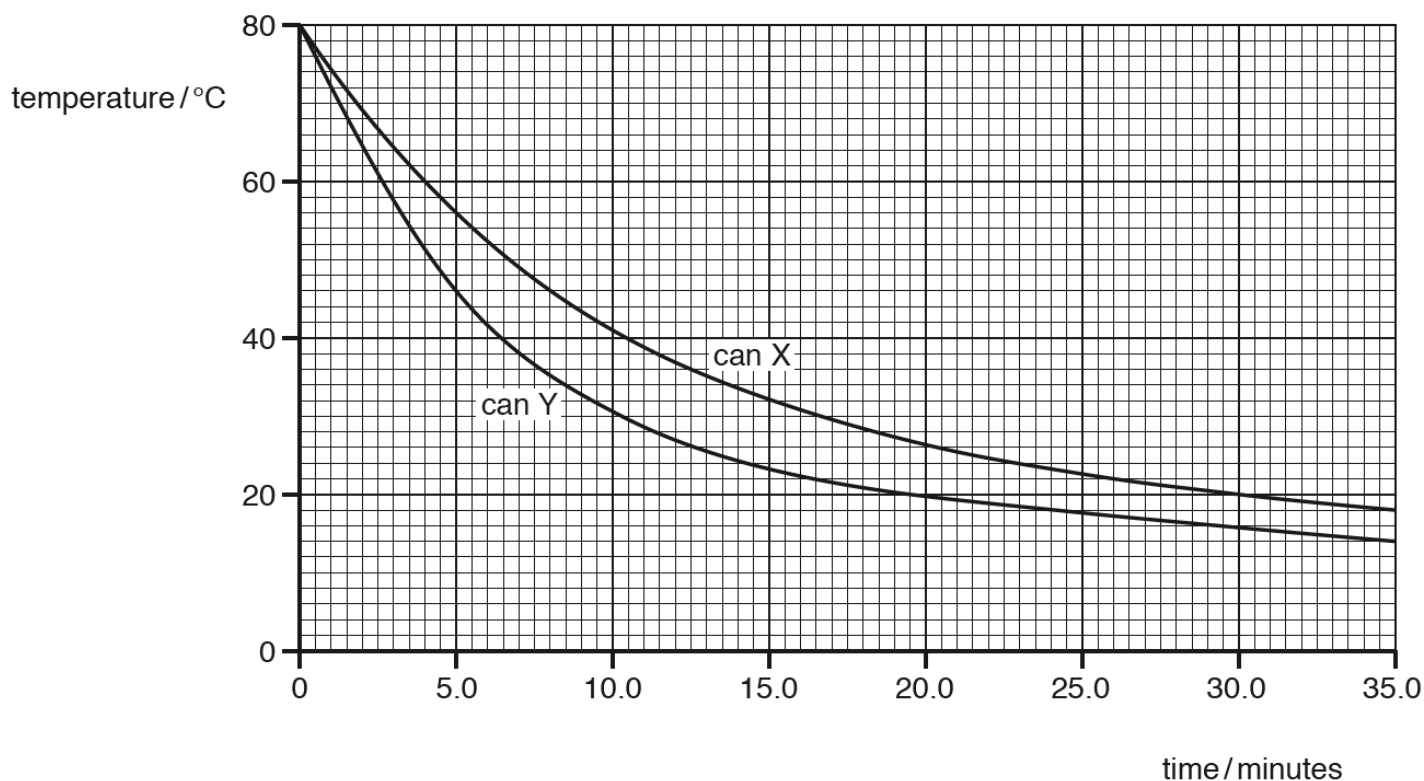
The student pours the same volume of hot water into each can and seals each can. The student records the temperature of the water in each can at regular time intervals for a period of 35 minutes.

The equipment is shown in Fig. 6.1.



**Fig. 6.1**

Fig. 6.2 is a graph of the results from the investigation.



**Fig. 6.2**

For can X, use Fig. 6.2 to determine the drop in temperature of the water

(i) in the **first** five minutes

[1]

(ii) in the **last** five minutes

[1]

[2 marks]



**Question 4b**

Explain why the water cools at a greater rate during the first five minutes of the experiment, compared with the last five minutes.

**[2 marks]****Question 4c**

The outside of one can is dull black and the outside of the other is shiny white.

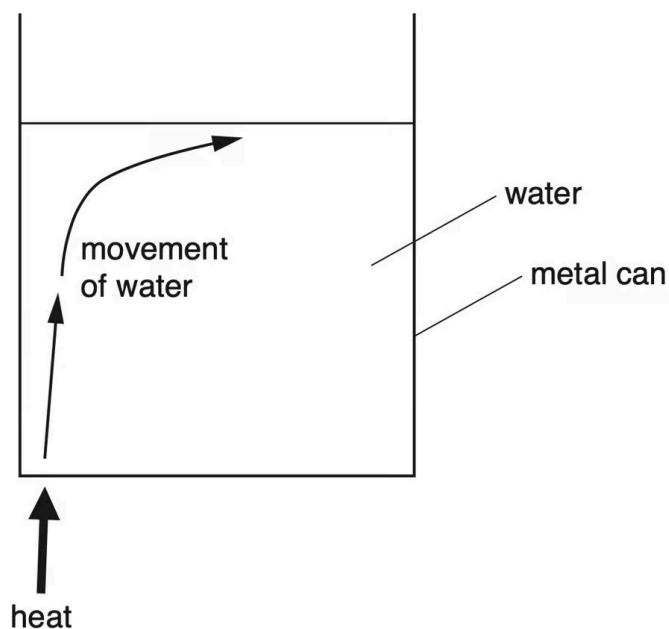
State the colour of can Y.

Explain your answer.

**[2 marks]**

### Question 5a

A student heats some water in a metal can, as shown in Fig. 6.2.



**Fig. 6.2**

Complete the sentence. Choose a word from the box.

conduction      convection      radiation

Thermal (heat) energy moves through the metal can by .....

[1 mark]

### Question 5b

Describe how thermal energy is transferred throughout the water. Include your ideas about density changes.

[3 marks]



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