

Thermal Process

Question Paper 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Thermal Physics
Sub-Topic	Thermal Process
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 1

Time Allowed: 62 minutes

Score: /51

Percentage: /100

- 1 A solar panel is mounted on the roof of a house. Fig. 4.1 shows a section through part of the solar panel.

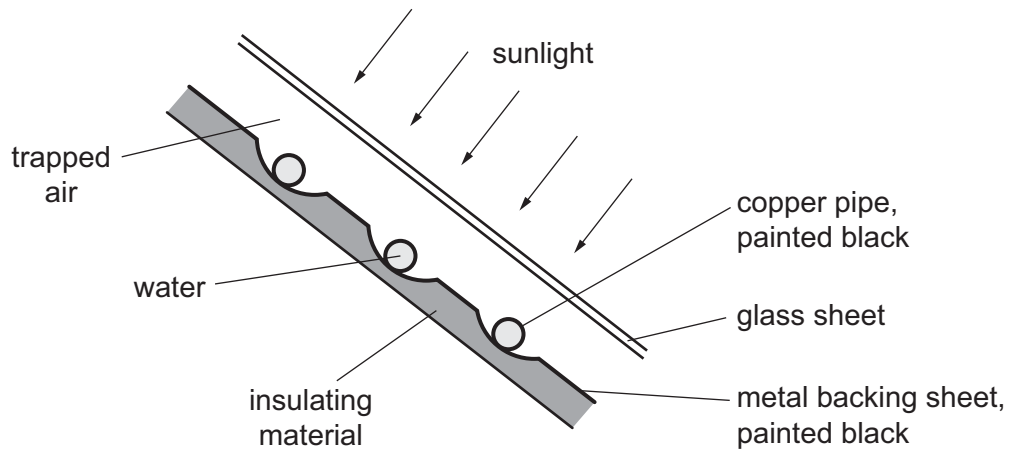


Fig. 4.1

A pump makes water flow through the copper pipes. The water is heated by passing through the solar panel.

- (a) Select and explain **three** features of the solar panel that maximise the final temperature of the water.

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- (b) During one day, 250 kg of water is pumped through the solar panel. The temperature of this water rises from 16 °C to 38 °C.

The water absorbs 25 % of the energy incident on the solar panel. The specific heat capacity of water is 4200 J/(kg °C).

Calculate the energy incident on the solar panel during that day.

energy = [4]

- (c) The solar panel in Fig. 4.1 is designed to heat water.

A person is deciding whether to install solar panels on her house.

List and explain **three** pieces of information she needs to consider in order to make her decision.

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..... [4]

- (d) The Sun releases energy as a result of nuclear fusion.

State the meaning of *nuclear fusion*.

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..... [2]

- 2 Fig. 4.1 shows a cross-section of a double-walled glass vacuum flask, containing a hot liquid. The surfaces of the two glass walls of the flask have shiny silvered coatings.

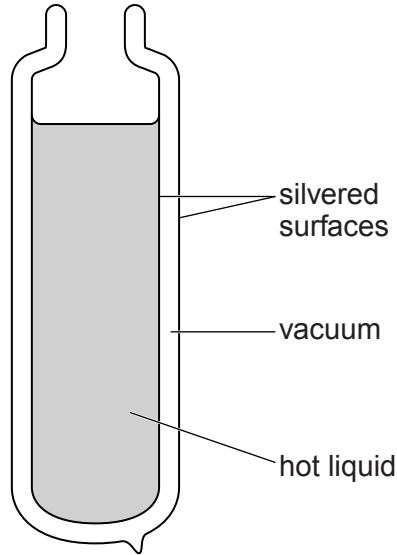


Fig. 4.1

(a) Explain

- (i) why the rate of loss of thermal energy through the walls of the flask **by conduction** is very low,

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- (ii) why the rate of loss of thermal energy through the walls of the flask **by radiation** is very low.

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- (b) Suggest, with reasons, what must be added to the flask shown in Fig. 4.1 in order to keep the liquid hot.

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..... [3]

[Total: 6]

- 3 One side of a copper sheet is highly polished and the other side is painted matt black. The copper sheet is very hot and placed in a vertical position, as shown as in Fig. 5.1.

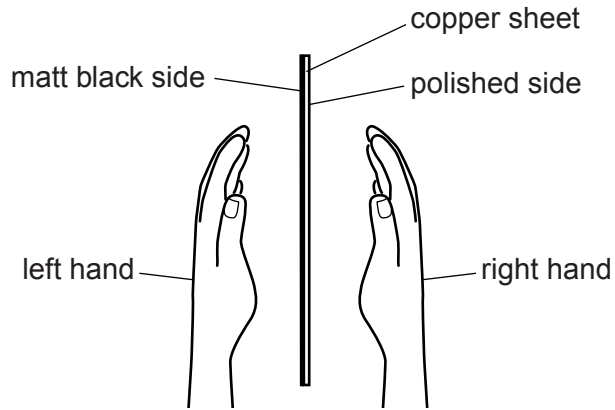


Fig. 5.1

A student places her hands at equal distances from the sheet, as shown in Fig. 5.1.

(a) Explain

(i) why her hands are not heated by **convection**,

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..... [1]

(ii) why her hands are not heated by **conduction**.

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..... [1]

(b) State and explain which hand gets hotter.

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..... [2]

- (c) It is suggested that one side of the copper sheet cools to a lower temperature than the other side.

Explain why this does not happen.

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..... [2]

[Total: 6]

- (ii) Another student is given the same equipment but finds two polystyrene tiles. Fig. 5.2 shows the tiles alongside the cans.

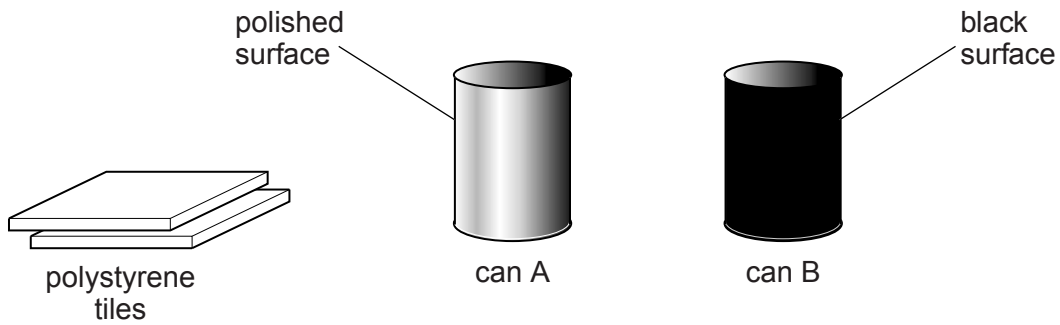


Fig. 5.2

State how she could use the tiles to improve the experiment, and explain why this is effective.

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..... [2]

- (c) The two cans are now filled with cold water and placed equal distances from a strong source of infra-red radiation.

State and explain which can of water heats up more quickly.

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..... [2]

[Total: 10]

5 An archaeologist digging at an ancient site discovers a spoon. The spoon is made from an unidentified material.

(a) The archaeologist suspects that the spoon is made of metal. She places it above a flame, as shown in Fig. 1.1.

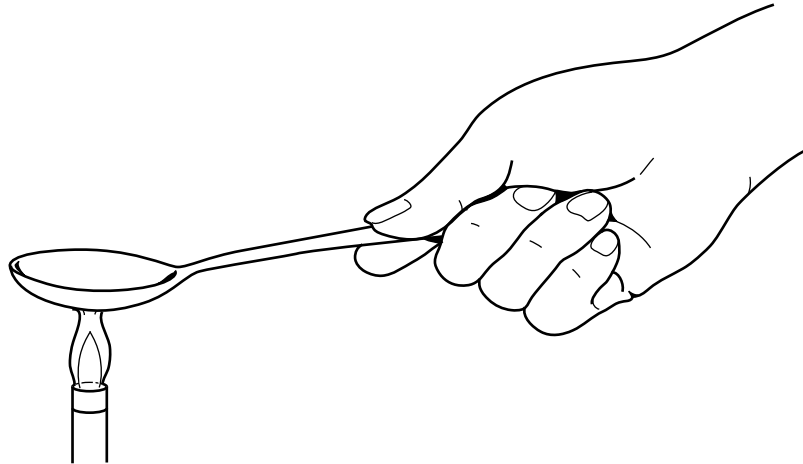


Fig. 1.1

(i) She notices that the handle of the spoon quickly becomes very hot.

State why this observation supports the suggestion that the spoon is made of metal.

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..... [1]

(ii) Describe, in terms of its atoms, how thermal energy is transferred through a metal.

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..... [3]

- (b)** The archaeologist hopes that, by determining its density, she will be able to identify the metal.

Describe a method for determining the density of the metal from which the spoon is made.

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..... [4]

[Total: 8]

- 6 (a) State the electrical quantity that has the same value for each of two resistors connected to a battery
- (i) when they are in series,
- (ii) when they are in parallel. [1]

(b) Fig. 10.1 shows a circuit with a $1.2\text{ k}\Omega$ resistor and a thermistor in series. There is no current in the voltmeter.

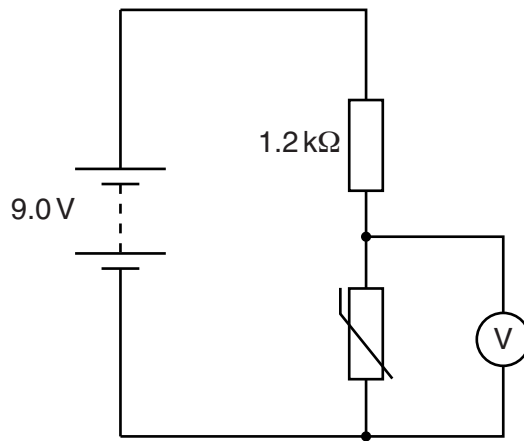


Fig. 10.1

Calculate the voltmeter reading when the resistance of the thermistor is $3.6\text{ k}\Omega$.

voltmeter reading = [3]

- (c) Fig. 10.2 shows a fire-alarm circuit. The circuit is designed to close switch S and ring bell B if there is a fire.

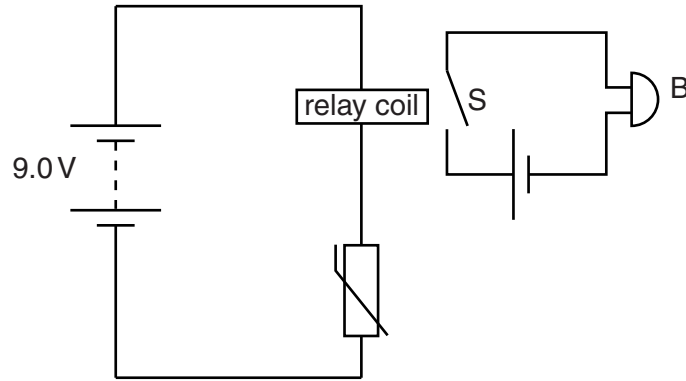


Fig. 10.2

Explain the operation of the circuit.

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..... [3]

[Total: 7]