Thermal Properties & Temperature

Question Paper

Course	CIE IGCSE Physics
Section	2. Thermal Physics
Topic	Thermal Properties & Temperature
Difficulty	Medium

Time Allowed	40
Score	/30
Percentage	/100

Question 1a

Extended

State three factors that determine the rate of evaporation of water.

[3 marks]

Question 1b

Extended

A person climbs out of a swimming pool and stands in the open air.

Explain why evaporation of water from the surface of the person's body causes the person to feel cold.

[2 marks]

Question 2a

The arrows on Fig. 5.1 represent changes of state.
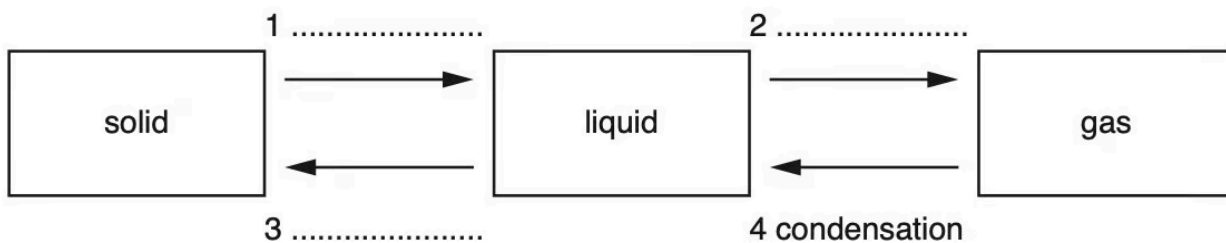

Fig. 5.1

One of the arrows is labelled. Label each of the other arrows with the correct change of state. Write the change of state on the dotted lines next to each arrow.

[3 marks]

Question 2b

Extended

A beaker contains some liquid with a low boiling point. The beaker is placed onto a small amount of water, as shown in Fig. 5.2.
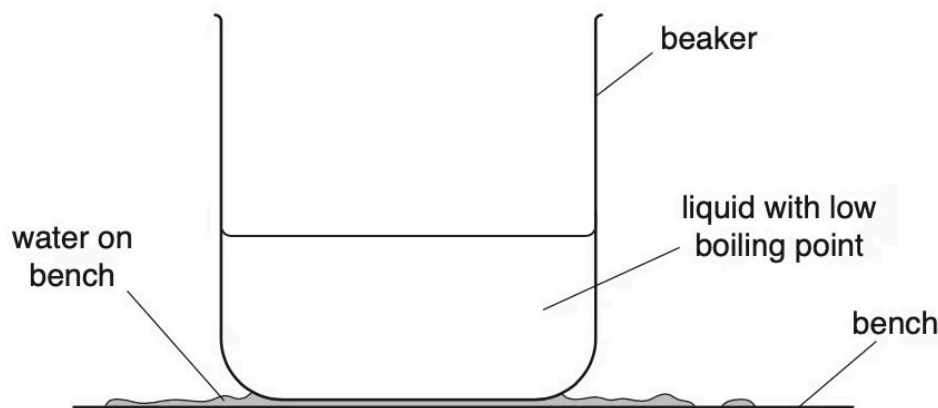

Fig. 5.2

The liquid in the beaker evaporates quickly. The water on the bench cools and turns to ice.

Explain why the water cools.

[3 marks]

Question 3

Extended

In a laboratory at normal room temperature, 200 g of water is poured into a beaker. A thermometer placed in the water has a reading of 22 °C.

Small pieces of ice at 0 °C are added to the water one by one. The mixture is stirred after each addition until the ice has melted. This process is continued until the temperature recorded by the thermometer is 0 °C.

The total mass of ice added to the water is found to be 60 g.

The specific heat capacity of water is 4.2J/(g °C).

Calculate the energy transferred from the water's thermal energy store originally in the beaker.

thermal energy = ...

[2 marks]

Question 4a

Extended

Fig. 5.1 shows a plastic cup. The cup contains sand, an electric heater and a thermometer.
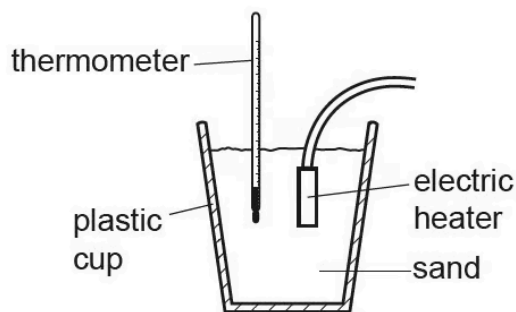

Fig. 5.1

The power of the heater is 50 W. The mass of the sand in the cup is 550 g. The initial temperature of the sand is 20 °C. The heater is switched on for 2.0 minutes.

The temperature is recorded until the temperature stops increasing. The highest temperature recorded by the thermometer is 33 °C.

    (i)   Calculate the energy supplied by the heater.

energy = ... [2]

    (ii)   Calculate a value for the specific heat capacity of the sand, using your answer to (a)(i) and the data in the question.

specific heat capacity = ... [3]

(iii) Explain why the specific heat capacity of sand may be different from the value calculated in **(a)(ii)**.

[2]

[7 marks]

Question 4b

Extended

On a sunny day, the temperature of the sand on a beach is much higher than the temperature of the sea.

Explain why.

[2 marks]

Question 5a

Extended

Fig. 4.1 shows apparatus used by a student to measure the specific heat capacity of iron.
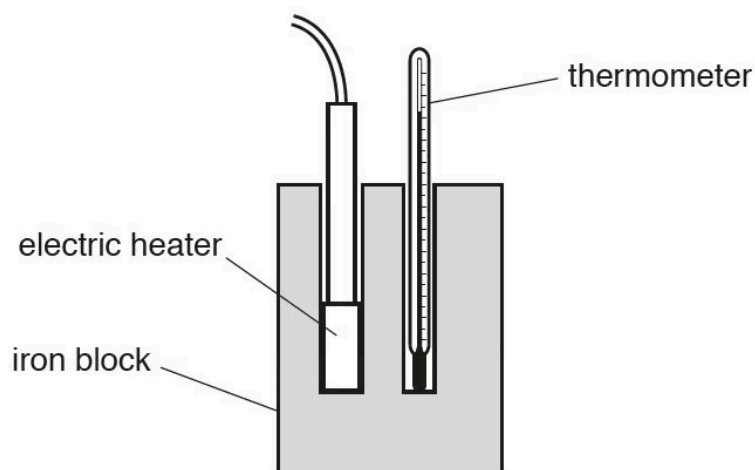

Fig. 4.1

The student improves the accuracy of the experiment by placing material around the block, as shown in Fig. 4.2.
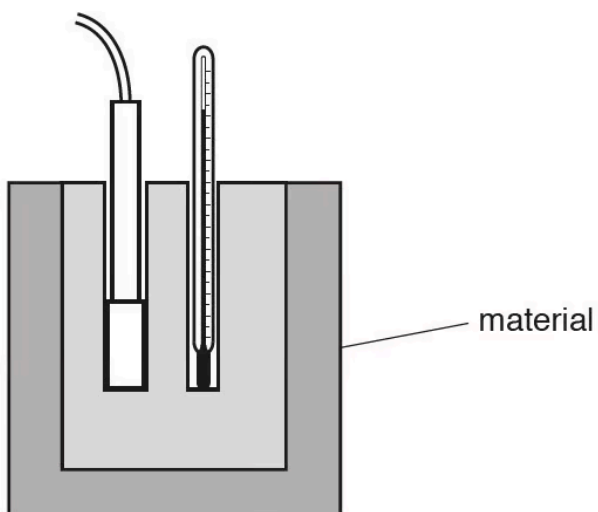
Fig. 4.2

(i)   Suggest the name of a possible material the student could use and explain how it improves the accuracy of the experiment.

[3]

(ii)   State how the student could further improve the accuracy of the experiment by using more of the material used in Fig. 4.2.

[1]

[4 marks]

Question 5b

Extended

The current in the heater is 3.8 A and the potential difference (p.d.) across it is 12 V. The iron block has a mass of 2.0 kg. When the heater is switched on for 10 minutes, the temperature of the block rises from 25 °C to 55 °C.

Calculate the specific heat capacity of iron.

specific heat capacity = ...

[4 marks]