Thermal Properties & Temperature

Question Paper

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

Time Allowed 30

Score /23

Percentage /100

Question 1a

A student is investigating how partly covering the surface of the water in a beaker affects the rate at which the water cools.

The apparatus used is shown in Fig. 1.1.

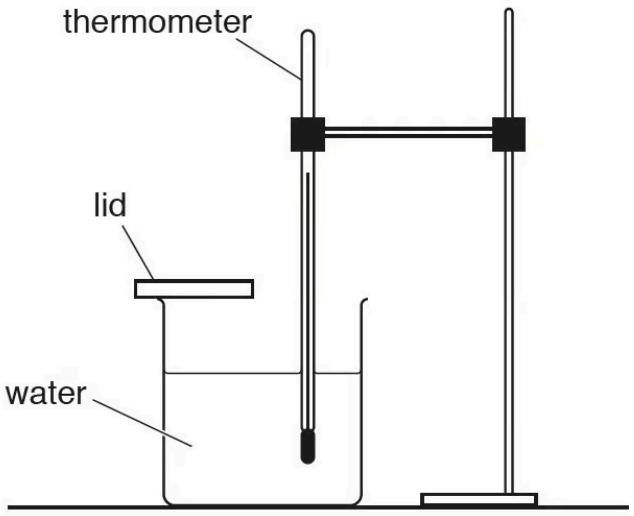


Fig. 1.1

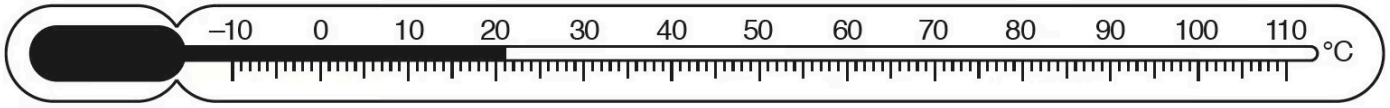


Fig. 1.2

Record the room temperature θ_R, shown on the thermometer in Fig. 1.2.

θ_R = ...

[1 mark]

Question 1b

The student pours 100 cm^3 of hot water into a beaker. She places lid A on the beaker. This leaves half of the water surface uncovered, as shown in Fig. 1.3.

She records the temperature of the water in the beaker and immediately starts a stopclock.

She records the temperature θ of the water every 30 s. Her readings are shown in Table 1.1.

She repeats the procedure using lid B. This leaves a quarter of the water surface uncovered, as shown in Fig. 1.4.

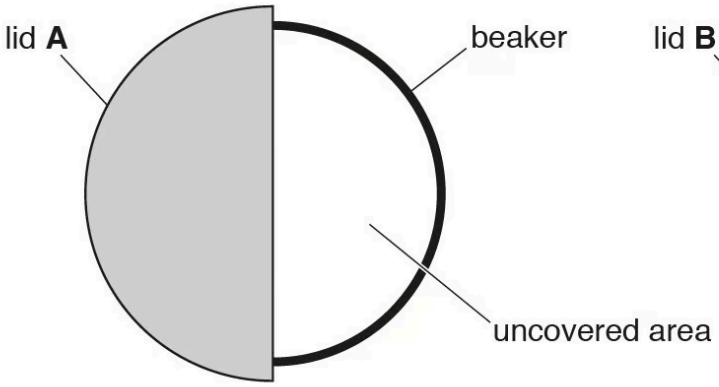


Fig. 1.3

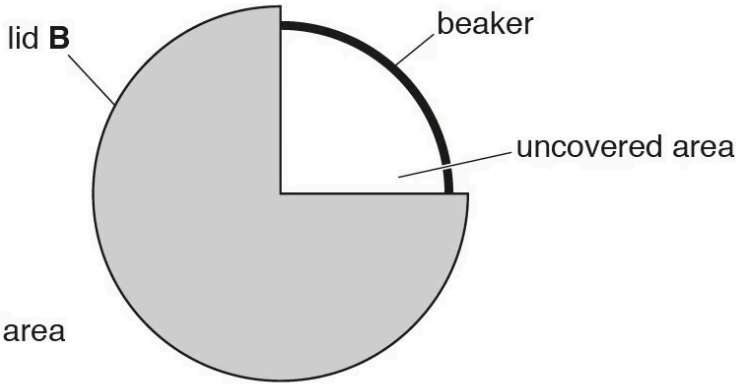


Fig. 1.4

Complete the headings and the time t column in Table 1.1.

Table 1.1

	beaker with lid **A**	beaker with lid **B**
t /	θ /	θ /
0	80.0	81.0
	77.0	79.0
	74.5	77.5
	72.5	76.0
	70.5	75.0
	69.0	74.0
	68.0	73.5

[2 marks]

Question 1c

Describe a precaution that should be taken to ensure that the temperature readings are as accurate as possible in the experiment.

[1 mark]

Question 1d

(i) Write a conclusion to this experiment, stating for which lid the rate of cooling is greater.

Explain your answer by reference to the results.

[2]

(ii) Suggest a change to the **apparatus** that could produce a greater difference between the rates of cooling for lid **A** and lid **B**.

Explain why the change might produce a greater difference.

[2]

[4 marks]

Question 1e

A student suggests that the rate of cooling is directly proportional to the percentage of the uncovered surface area. He wants to draw a graph of cooling rate against the percentage of uncovered area to investigate this.

Describe how his graph line will show whether the rate of cooling and the percentage of uncovered surface area are directly proportional.

[2 marks]

Question 1f

Students in other countries carry out the same experiment.

Suggest **one** factor that they should keep the same if they are to obtain similar readings.

[1 mark]

Question 2a

A student is investigating the cooling of water.

Fig. 2.1 shows the apparatus used.

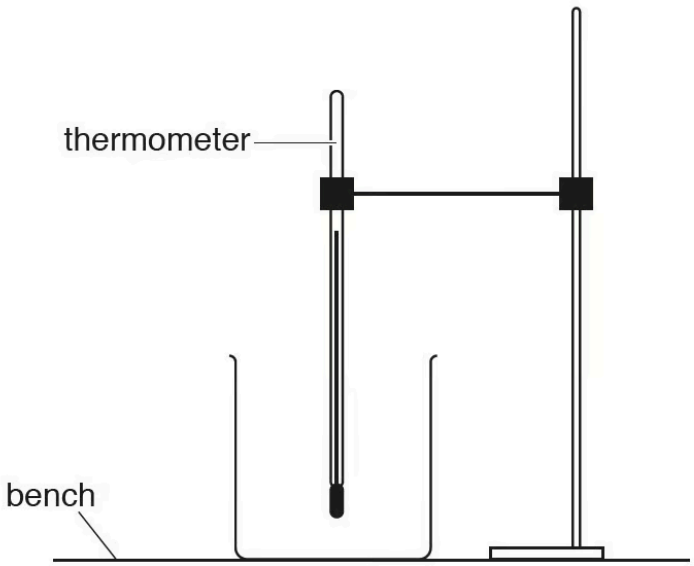


Fig. 2.1

The thermometer in Fig. 2.2 shows room temperature θ_R at the beginning of the experiment.

Record θ_R.

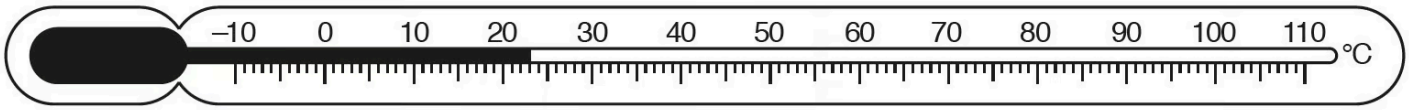


Fig. 2.2

θ_R = ...

[1 mark]

Question 2b

The student pours 200 cm^3 of hot water into the beaker.

He records the temperature θ_H of the hot water at time $t = 0$ and immediately starts a stopclock.

He continues recording the temperature readings every 30 s. The readings are shown in Table 2.1.

(i) Explain why the student should wait a few seconds after placing the thermometer in the hot water before taking the first temperature reading.

[1]

(ii) Complete the column headings in Table 2.1.

[1]

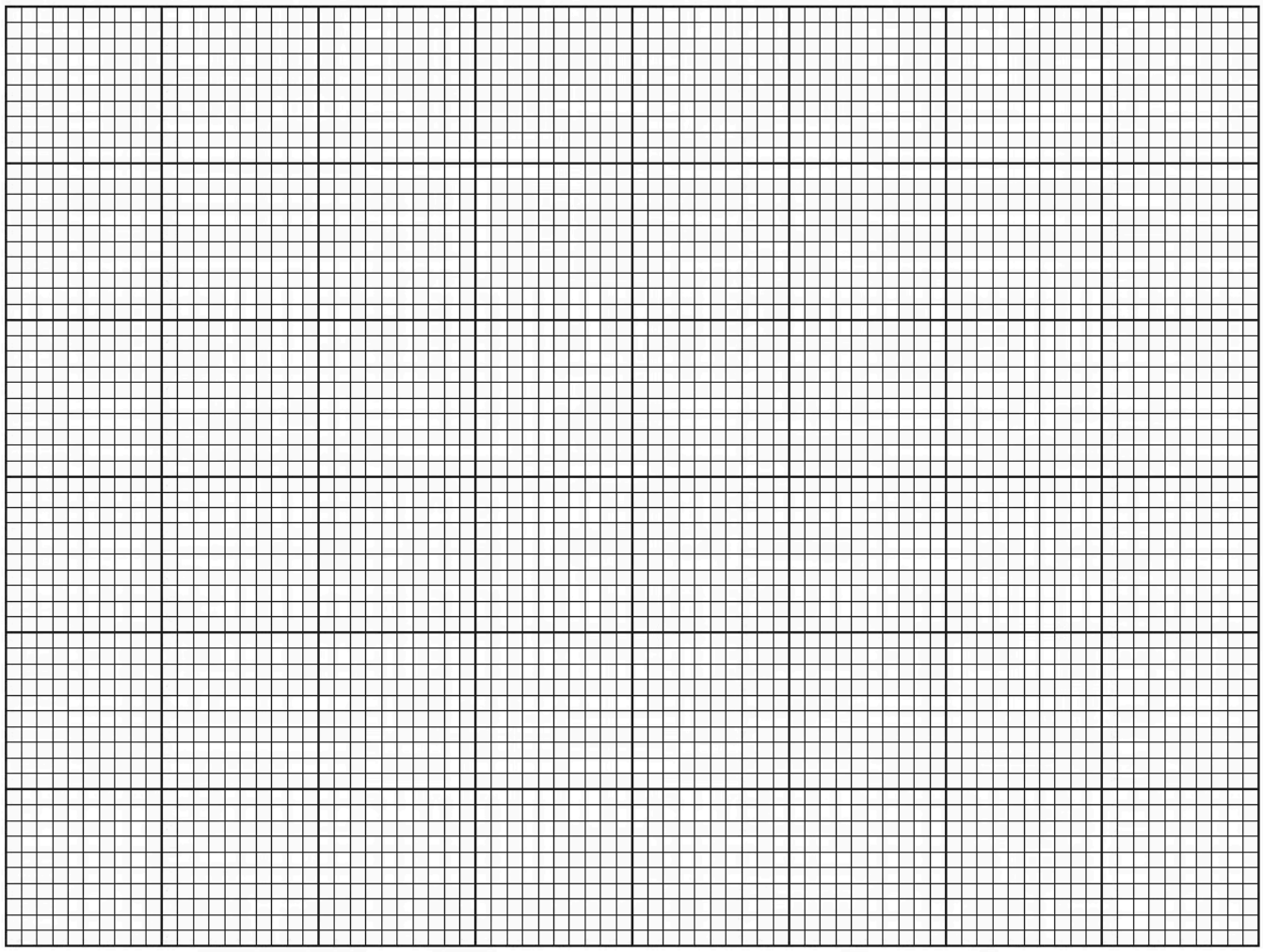
(iii) Complete the time column in Table 2.1.

[1]

Table 2.1

t/	θ/
0	70
	60
	52
	49
	46
	43

(iv) Plot a graph of θ/ °C (y-axis) against t/s (x-axis). You do not need to start the y-axis at the origin (0,0) but the value of room temperature θ^R must be marked on the y-axis.



[4]

[7 marks]

Question 2c

Draw a horizontal line across the graph grid to indicate the value of room temperature θ_R, as shown by the thermometer in Fig. 2.2.

[1 mark]

Question 2d

State **two** precautions that you would take in order to obtain accurate readings in this experiment.

[2 marks]

Question 2e

A student plans to repeat the experiment using the same thermometer and the same volume of water.

Suggest **two** changes to the apparatus or the procedure that would **increase** the rate of cooling of the water.

[1 mark]