



- 1 An IGCSE student is measuring the capacity of a drinks cup by three methods.

The capacity of a cup is the maximum volume of liquid that it will hold in normal use. This maximum level is marked on the cup, as shown in Fig. 1.1.

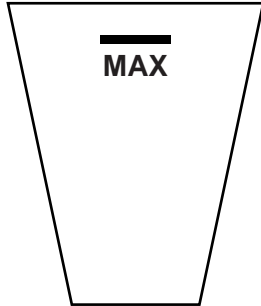


Fig. 1.1

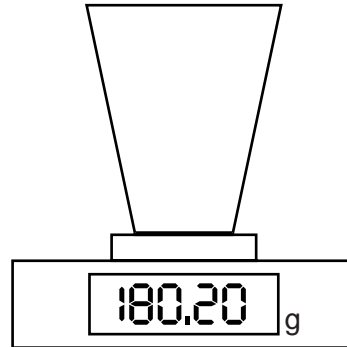


Fig. 1.2

**(a) Method 1**

In Method 1, the capacity  $V_1$  is determined from the mass of water in the cup.

- (i) The cup is filled to the marked level with water. It is then placed on the balance, as shown in Fig. 1.2.

Read and record its mass  $m$ .

$$m = \dots\dots\dots [1]$$

- (ii) Calculate a value for the capacity  $V_1$ , using your reading from **(a)(i)** and the equation  $V_1 = \frac{m}{\rho}$ , where  $\rho = 1.00 \text{ g/cm}^3$ .

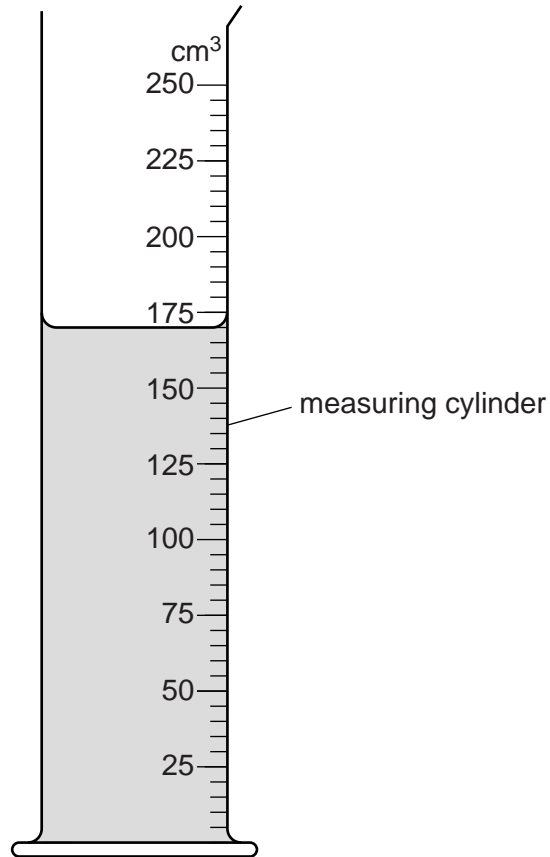
$$V_1 = \dots\dots\dots [2]$$

**(b) Method 2**

In Method 2, the capacity  $V_2$  is measured directly from the volume of water in the cup.

*For  
Examiner's  
Use*

The cup is filled to the marked level and the water is tipped into a measuring cylinder, as shown in Fig. 1.3.



**Fig. 1.3**

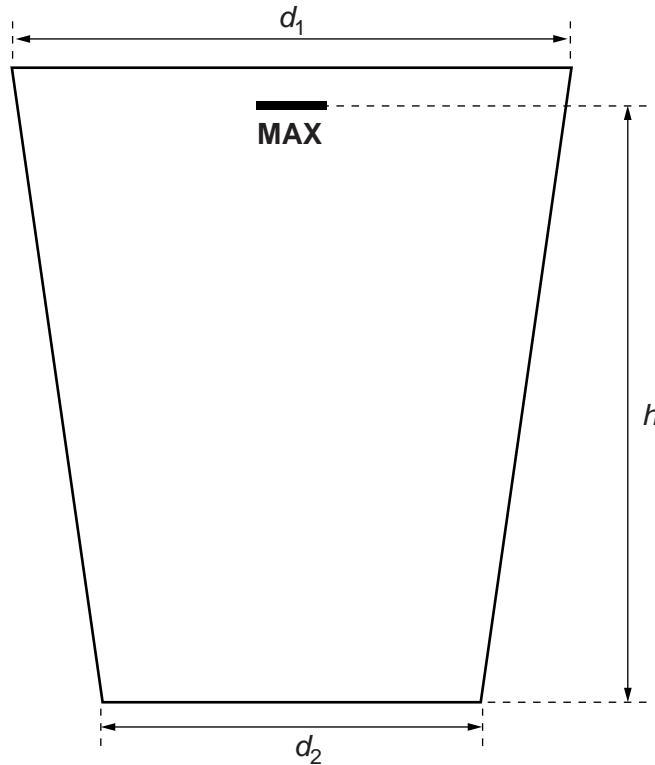
Read and record the volume  $V_2$  of water in the measuring cylinder.

$V_2 = \dots\dots\dots$  [1]

**(c) Method 3**

In Method 3, the capacity  $V_3$  is calculated by considering the cup as a cylinder, using the average diameter of the cup and an approximate equation.

For  
Examiner's  
Use



**Fig. 1.4**

- (i) On Fig. 1.4, measure and record the diameter  $d_1$  of the top of the cup.

$d_1 = \dots\dots\dots$  cm

- (ii) On Fig. 1.4, measure and record the diameter  $d_2$  of the base of the cup.

$d_2 = \dots\dots\dots$  cm

- (iii) On Fig. 1.4, measure and record the height  $h$  from the base to the marked level **MAX**.

$h = \dots\dots\dots$  cm  
[1]

- (iv) Calculate the average diameter  $D$  using your readings from (c)(i) and (c)(ii), and the equation  $D = \frac{(d_1 + d_2)}{2}$ .

$D = \dots\dots\dots$

- (v) Calculate a value for the capacity  $V_3$ , using your results from (c)(iii) and (c)(iv) and the equation  $V_3 = \frac{\pi D^2 h}{4}$ .

$V_3 =$  ..... [2]

- (d) State a possible practical source of inaccuracy in **Method 2** and a possible practical source of inaccuracy in **Method 3**.

Method 2 .....  
.....  
Method 3 .....  
..... [2]

- (e) State an additional measurement which could be taken to give a more accurate result in **Method 1**.

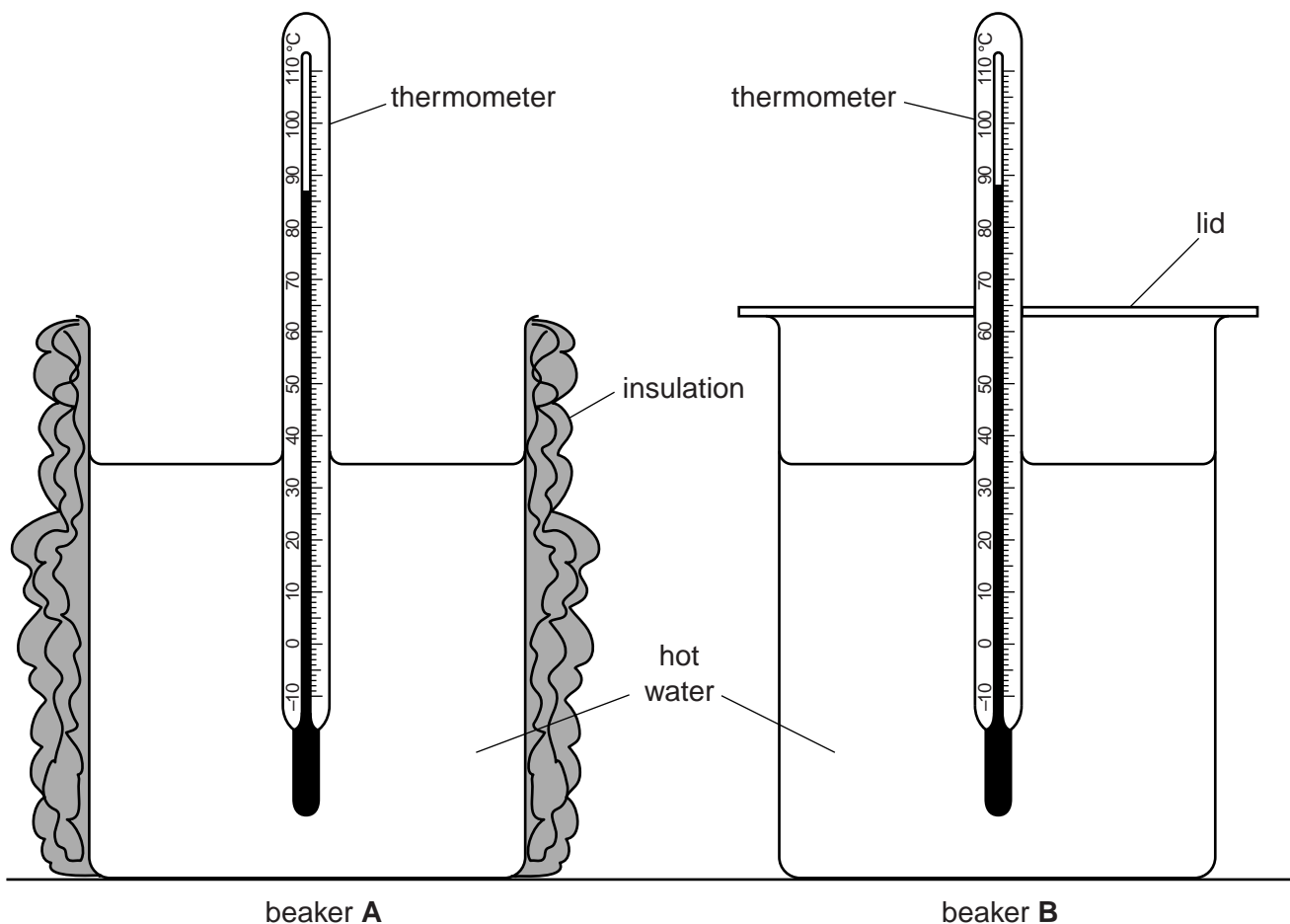
.....  
..... [1]

[Total: 10]

2 An IGCSE student is investigating methods of preventing loss of thermal energy.

The student is using two beakers labelled **A** and **B**, as shown in Fig. 2.1.

For  
Examiner's  
Use



**Fig. 2.1**

Beaker **A** has a layer of insulation and beaker **B** has a lid but no insulation.

The beakers contain hot water at the start of the experiment. The initial temperatures are as shown in Fig. 2.1.

- (a) Read, and record in the first row of Table 2.1, the temperatures of the water in beakers **A** and **B** at time  $t = 0$ . [1]
- (b) The temperatures of the hot water after 30 s, 60 s, 90 s, 120 s, 150 s and 180 s are shown in Table 2.1.

Complete the column headings and enter the values of  $t$  in the table.

[2]

Table 2.1

	beaker A	beaker B
<i>t/</i>	<i>θ/</i>	<i>θ/</i>
	85.0	87.0
	83.5	85.5
	82.0	84.5
	81.0	84.0
	79.5	83.0
	78.5	82.5

- (c) State from which beaker, if either, the rate of loss of thermal energy is the greater. Justify your answer by referring to the results.

beaker .....

justification .....

.....

.....

[2]

- (d) State one condition that should be controlled to ensure that the comparison between beaker A and beaker B is a fair one.

.....

..... [1]

- (e) A student points out that the experiment does not test the effectiveness of insulation in reducing thermal energy loss.

*For  
Examiner's  
Use*

Suggest a change to this experiment which could be made so that the effect of insulation could be investigated. Explain why this change would help.

suggestion .....

.....

explanation .....

.....

.....

[2]

[Total: 8]



**BLANK PAGE**

- 3 IGCSE students are investigating the current and potential difference in an electrical circuit. The circuit is shown in Fig. 3.1.

For  
Examiner's  
Use

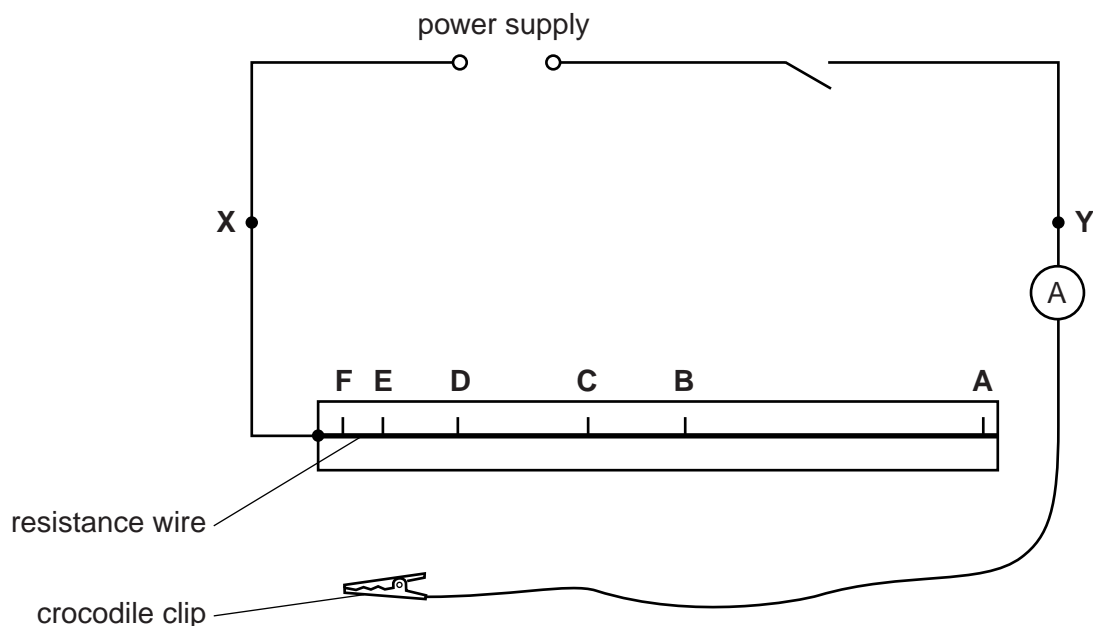


Fig. 3.1

- (a) The potential difference across part of the resistance wire, and the current in the circuit are to be measured.

On Fig. 3.1, use an appropriate circuit symbol to draw a voltmeter connected to measure the potential difference between X and Y.

[1]

- (b) The crocodile clip is connected in turn to the resistance wire at points A, B, C, D, E and F.

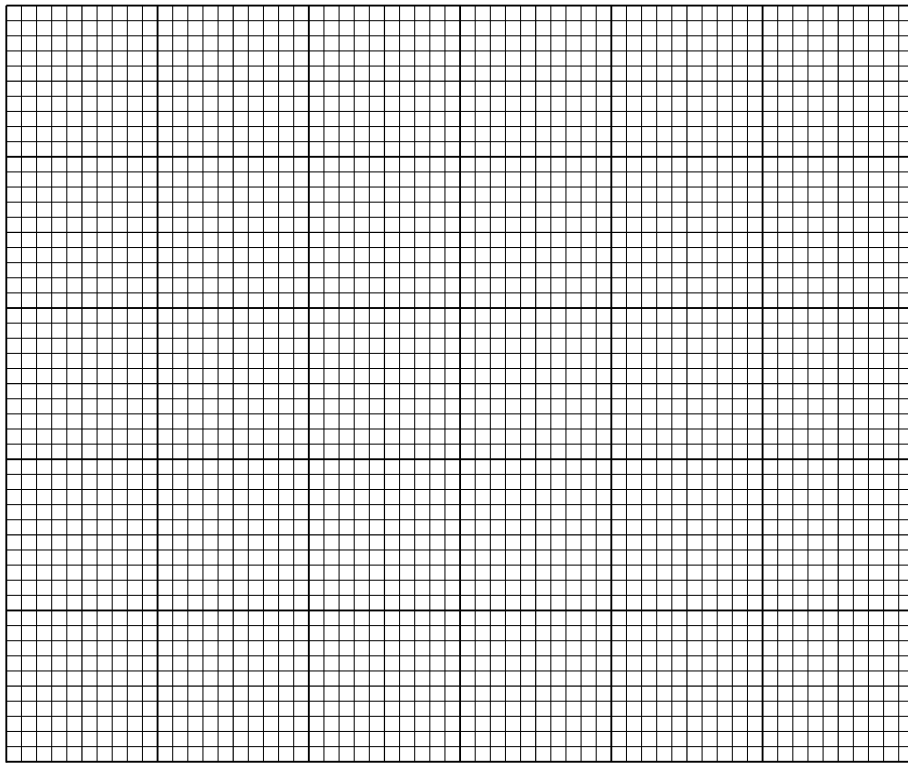
The potential difference  $V$  and current  $I$  are measured for each position and recorded in Table 3.1.

Table 3.1

position	$V/V$	$I/A$
A	1.3	0.20
B	1.2	0.35
C	1.1	0.46
D	0.9	0.74
E	0.8	0.87
F	0.6	1.13

- (i) Plot a graph of  $V/V$  ( $y$ -axis) against  $I/A$  ( $x$ -axis).

For  
Examiner's  
Use



[4]

- (ii) Determine the gradient  $M$  of the graph. Show clearly on the graph how you obtained the necessary information.

$M = \dots\dots\dots$  [2]

- (iii) The gradient  $M$  is numerically equal to the resistance  $R$  of the power supply.

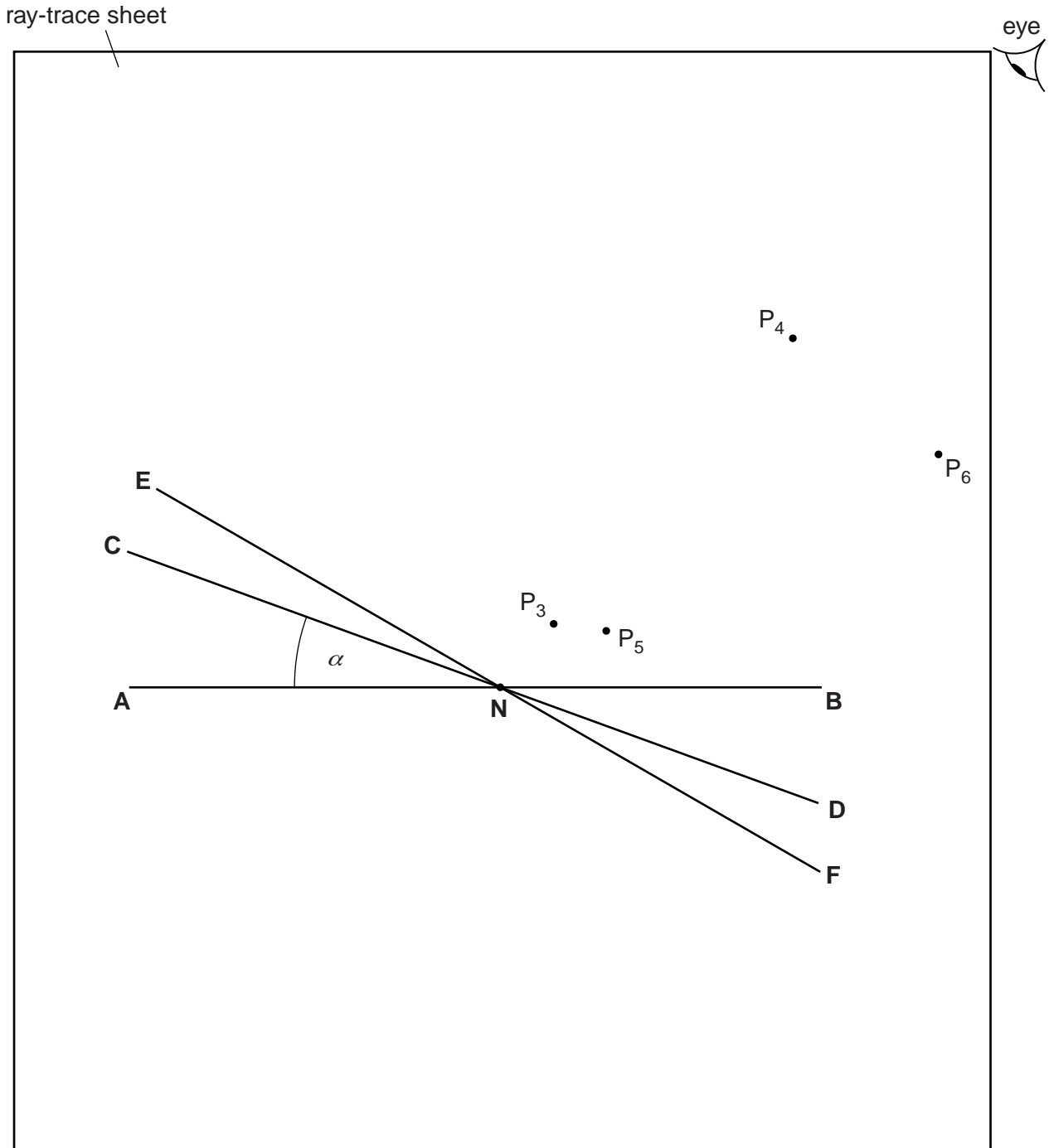
Write down the resistance  $R$  to a number of significant figures suitable for this experiment.

$R = \dots\dots\dots$  [2]

[Total: 9]

4 An IGCSE class is investigating the reflection of light by a plane mirror.

One student's ray-trace sheet is shown in Fig. 4.1.



(a) In the first part of the experiment, a plane mirror is to be placed on line **CD**.

- (i) Draw a normal to **AB** at point **N**, towards the top of the page. Label the other end of this normal **L**.
- (ii) Two pins  $P_1$  and  $P_2$  are placed on line **LN**. Label suitable positions for  $P_1$  and  $P_2$ .

[1]

- (b) The mirror is placed on line **CD** and the images of  $P_1$  and  $P_2$  are viewed from the direction indicated by the eye in Fig. 4.1.

Two pins  $P_3$  and  $P_4$  are placed so that the images of  $P_1$  and  $P_2$ , and the pin  $P_3$  all appear exactly in line with  $P_4$ .

- (i) Draw a line passing through  $P_3$  and  $P_4$  and reaching **AB**.
- (ii) Measure the angle  $\theta$  between this line and the normal **NL**. Record this value in Table 4.1. [1]

- (c) The mirror is then moved to line **EF** and pins  $P_5$  and  $P_6$  are placed in line with the new images.

Repeat steps (b)(i) and (b)(ii) using the new mirror line and pin positions. [1]

**Table 4.1**

	$\alpha/^\circ$	$\theta/^\circ$
mirror on <b>CD</b>	20	
mirror on <b>EF</b>	30	

[1]

- (d) A student suggests that  $\theta$  should always be equal to  $2\alpha$ .

State whether the experimental results support this idea. Justify your answer with reference to the results.

statement .....

.....

justification .....

.....

.....

[2]

- (e) Suggest two precautions that could be taken to ensure accurate results from this experiment.

1. ....

.....

2. ....

.....

[2]

[Total: 8]

- 5 Two IGCSE students are investigating the melting of ice cubes in water.

They are dropping ice cubes into hot water at different temperatures and measuring the time taken for the cubes to melt.

This is a page from one student's notebook.

temperature 20°C – time 216 seconds

temperature 40 – time 95 sec

temperature 60°C – time 72 seconds

temperature 30 – time 180

temperature 50 – time 108 seconds

- (a) In the space below, draw a suitable table. Enter the readings in such a way that it is easier to see a pattern from them.

[2]

(b) It appears that one of the readings does not fit the general pattern.

(i) At which temperature does this occur?

temperature ..... [1]

(ii) Suggest what the student might do next with the data to show more clearly that this reading does not fit the general pattern.

Explain how this would help to make it more clear.

suggestion .....

.....

explanation .....

.....

[2]

[Total: 5]

**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.