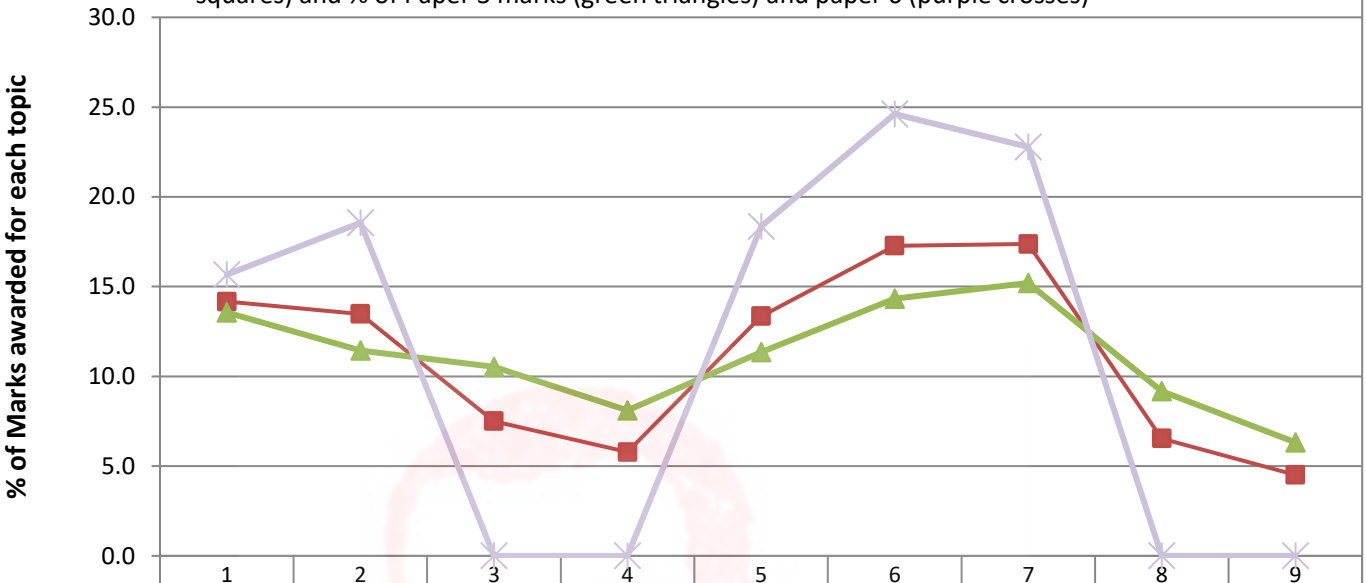
iG Phx 5 EQ 15w to 02s P6 4Students 191marks

For these stats only papers 3 (which after 2016 became paper 4) and paper 6 were used to investigate these topics.

iG Phx CIE 0625 PAPERS 3 and 6

Percentage of all WEIGHTED marks awarded for P3 & 6 each topic from s2002 to w2014 (red squares) and % of Paper 3 marks (green triangles) and paper 6 (purple crosses)

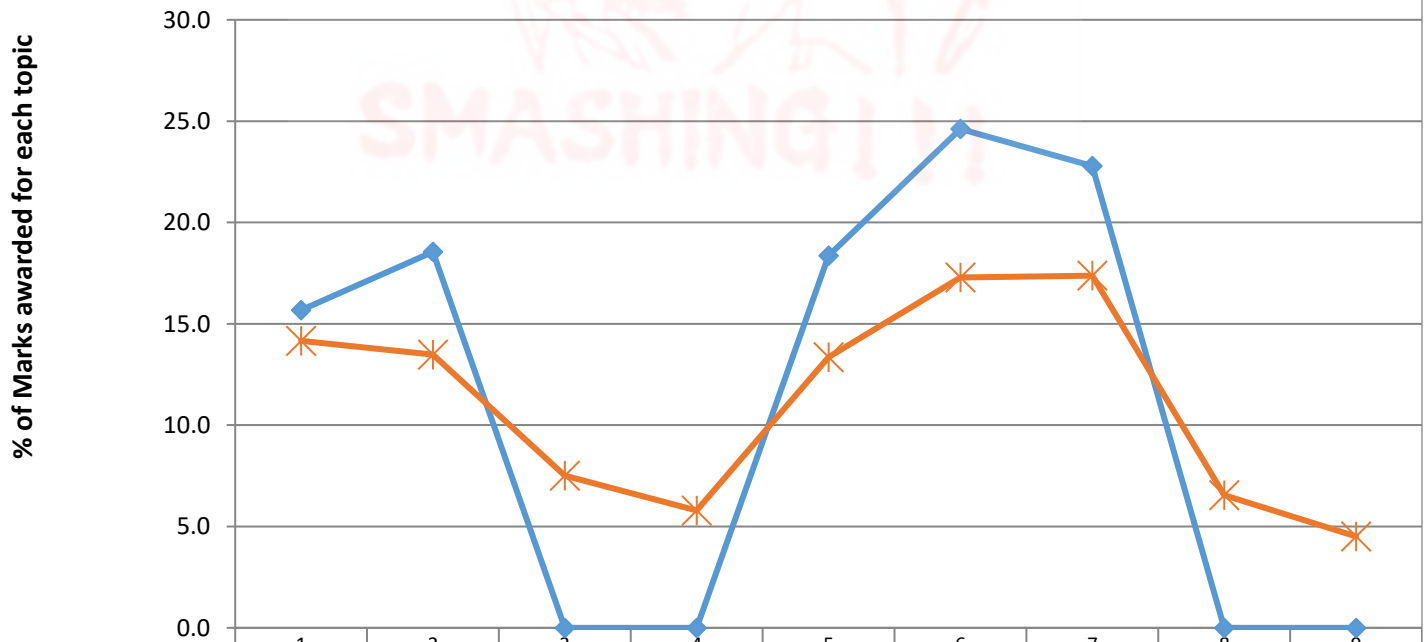


	1	2	3	4	5	6	7	8	9
PhxBoth P3&6	14.2	13.5	7.5	5.8	13.4	17.3	17.4	6.5	4.5
PhxP3	13.6	11.4	10.5	8.1	11.3	14.3	15.2	9.2	6.3
PhxP6	15.7	18.6	0.0	0.0	18.4	24.6	22.8	0.0	0.0

Papers 3 and 6 Topic Number

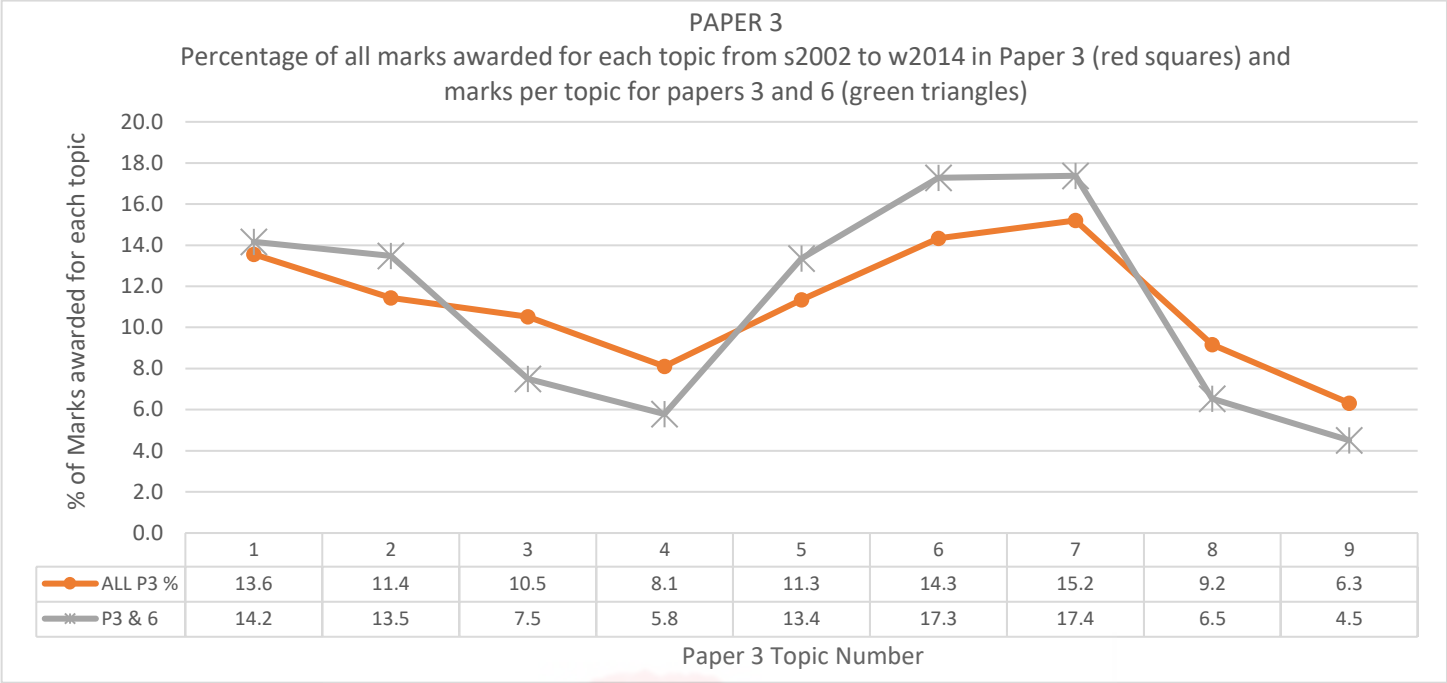
PAPER 6

Percentage of all marks awarded for each topic from s2002 to w2015 in Paper 6 (blue diamonds) and marks per topic for both papers 3/4 and 6 (red squares)



	1	2	3	4	5	6	7	8	9
PhxP6	15.7	18.6	0.0	0.0	18.4	24.6	22.8	0.0	0.0
PhxP3&6 weighted	14.2	13.5	7.5	5.8	13.4	17.3	17.4	6.5	4.5

Paper 6 Topic Number



Papers covered in this sample:

	1st Paper	Last Paper	Marks/ paper	Theor. All Papers	Actual All Marks	Difference	Difference %	Weight per paper	Weight per mark
Paper 3	2002w	2014w	80	2000	2072	72	3.6	50	0.63
Paper 6	2002s	2015w	40	1120	1040	-80	-7.1	20	0.50

There are a few missing: Got all Paper 31s (except 2014w Paper 31), and got 2014w 33. So papers in time zones 2 and 3 are not covered.

All topics ranked by frequency of marks in exams (P3 and 6 only):

Topic	PhxBoth P3&6	PhxP3	PhxP6
7	17.4	15.2	22.8
6	17.3	14.3	24.6
1	14.2	13.6	15.7
2	13.5	11.4	18.6
5	13.4	11.3	18.4
3	7.5	10.5	0.0
8	6.5	9.2	0.0
4	5.8	8.1	0.0
9	4.5	6.3	0.0

Other statistics that might be of interest:

	Topics:	1	2	3	4	5	6	7	8	9
P3/4 marks	2072	281	237	218	168	235	297	315	190	131
P3/4 %		13.6	11.4	10.5	8.1	11.3	14.3	15.2	9.2	6.3
P6	1040	163	193	0	0	191	256	237	0	0
P6 %		15.7	18.6	0.0	0.0	18.4	24.6	22.8	0.0	0.0
Total Marks (WIEGHTED)	1815	257	245	136	105	242	314	315	119	82
% of Marks (Weighted)	1815	14.2	13.5	7.5	5.8	13.4	17.3	17.4	6.5	4.5
# of Questions		63	64	35	16	63	74	70	26	20
Average marks per Q		**4.1**	**3.8**	**3.9**	**6.6**	**3.8**	**4.2**	**4.5**	**4.6**	**4.1**

Final note:

My iG and IB chemistry papers were broken down more carefully than these were, so there may be a mark or two in the wrong topic especially in topics 3 to 5, but if you learnt or taught these topics in sequence than you shouldn't have a problem with seeing material from an earlier topic.

Defining the Topics: Why not use the units given in the syllabus?

Artificial topics have been created for the physics syllabus by me so that each topic is roughly the same size. Topics go in syllabus order. I have decided to use the number of marks allocated in previous exams to each syllabus point to determine how many go into each topic.

1. General physics

Topic 1

1.1 Length and time
1.2 Motion
1.3 Mass and weight
1.4 Density

Topic 2

1.5 Forces
1.6 Momentum (Extended candidates only)

Topic 3

1.7 Energy, work and power
1.8 Pressure

2. Thermal physics

Topic 4

2.1 Simple kinetic molecular model of matter

Topic 5

2.2 Thermal properties and temperature
2.3 Thermal processes

3. Properties of waves, including light and sound

Topic 6

3.1 General wave properties
3.2 Light
3.3 Electromagnetic spectrum
3.4 Sound

4. Electricity and magnetism

Topic 7

4.1 Simple phenomena of magnetism
4.2 Electrical quantities
4.3 Electric circuits
4.4 Digital electronics (Extended candidates only)
4.5 Dangers of electricity

Topic 8

4.6 Electromagnetic effects

5. Atomic physics

Topic 9

5.1 The nuclear atom
5.2 Radioactivity

2 The class is investigating the cooling of water.

Fig. 2.1 shows some of the apparatus used.

(a) A student measures the initial temperature of hot water in a beaker, as indicated by the thermometer in Fig. 2.1.

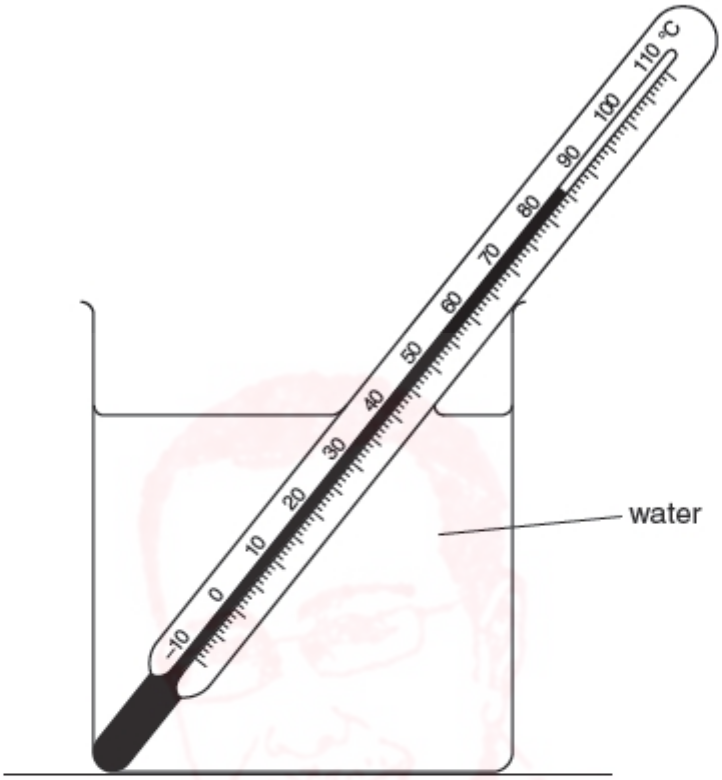


Fig. 2.1

Record this initial temperature in the first row of Table 2.1.

(b) The student allows the water in the beaker to cool and records the temperature at 30 s intervals. The readings are shown in the table.

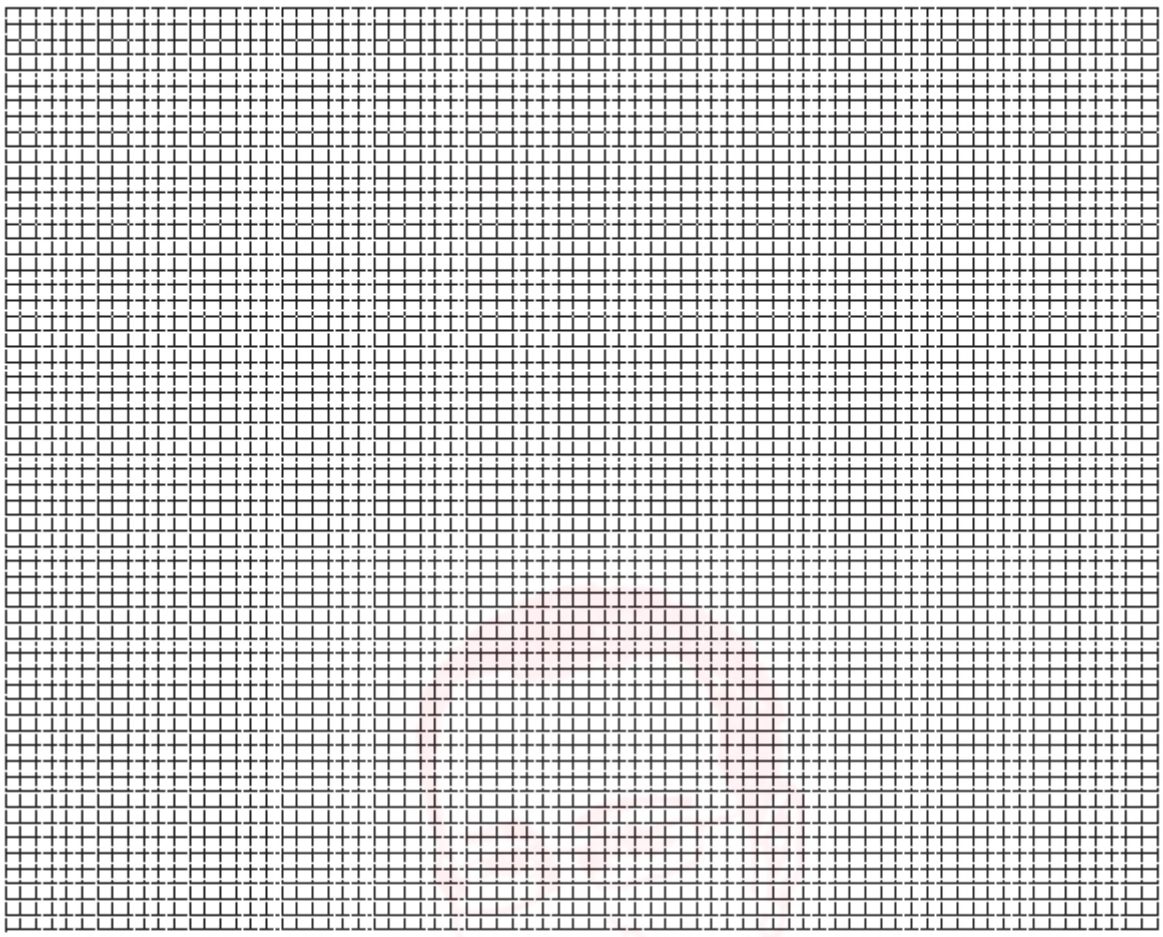
Complete the column headings in the table.

Table 2.1

t/	*θ*/
0	
30	72
60	64
90	60
120	57
150	56

[2]

(c) Plot a graph of θ/°C (y-axis) against t/s (x-axis).



[5]

(d) **(i)** State whether the rate of cooling of the water in the beaker increases, decreases or stays approximately constant during the period of cooling.

The rate of cooling of the water ..... .[1]

(ii) Justify your statement by reference to the graph.

.....

.....

.....[1]

[Total: 9]

2 The IGCSE class is investigating the cooling of hot water under different conditions.

Figs. 2.1 and 2.2 show the apparatus used.

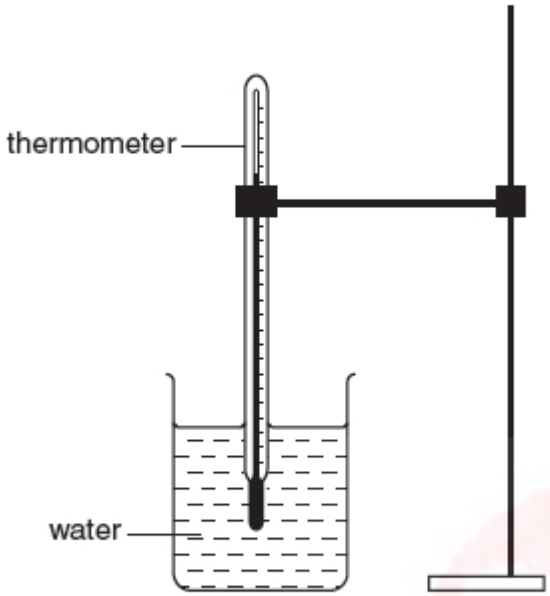


Fig. 2.1

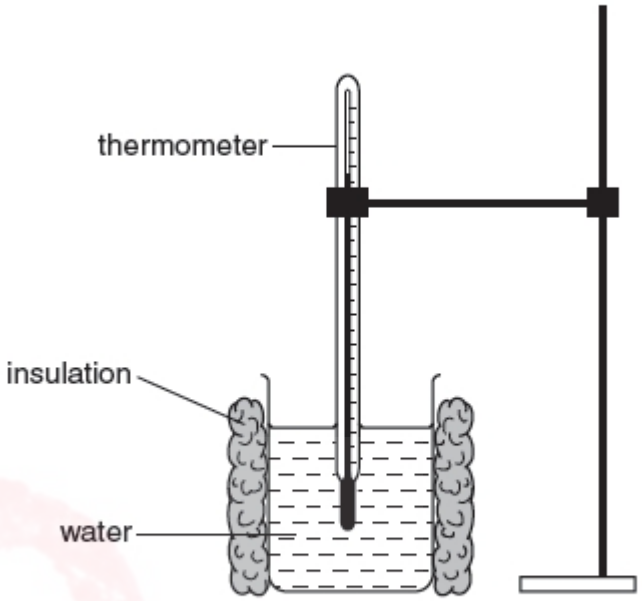


Fig. 2.2

(a) Record room temperature θ_R as shown on the thermometer in Fig. 2.3.

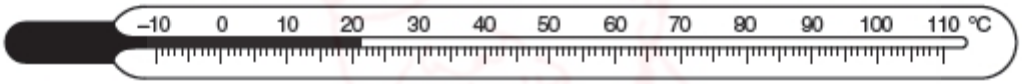


Fig. 2.3

θ_R = ... [1]

(b) A student pours hot water into the uninsulated beaker shown in Fig. 2.1 until it is about two-thirds full. She measures the temperature and immediately starts a stopclock. She records the temperature every 30 s. She repeats the procedure using the insulated beaker as shown in Fig. 2.2. The readings are shown in Table 2.1.

Table 2.1

	without insulation	with insulation
t/	*θ*/	*θ*/
0	80	79
30	77	76
60	74	73
90	72	71
120	70	70
150	69	69

Complete the column headings in the table. [1]

(c) State whether the cotton wool insulation increases, decreases, or has no significant effect on the rate of cooling of the water, compared with the rate of cooling with no insulation. Justify your answer by reference to the results.

statement .....

justification .....

.....

.....

[2]

(d) The student suggests that a significant cause of loss of thermal energy from the beakers is evaporation.

Suggest how you would reduce the evaporation in this experiment.

.....[1]

(e) Suggest one condition that should not be changed when this experiment is repeated.

.....[1]

[Total: 6]

3 The IGCSE class is investigating the cooling of a thermometer bulb under different conditions.

A student places a thermometer in a beaker of hot water, as shown in Fig. 3.1.

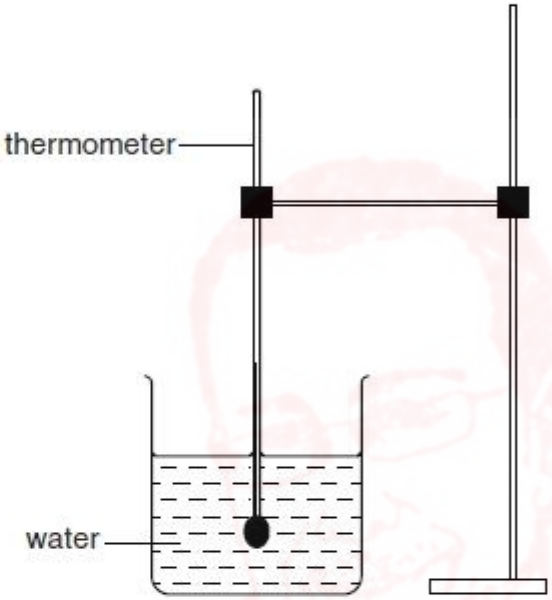


Fig. 3.1

Fig. 3.2

(a) Write down the temperature θ_H of the hot water, as shown on the thermometer in Fig. 3.2.

θ_H ..... [1]

(b) The student removes the thermometer from the beaker of water. He immediately starts a stopclock. He records the temperature θ every 30 s. The readings are shown in Table 3.1.

Table 3.1

	without insulation	with insulation
t/	*θ*/	*θ*/
30	78	84
60	71	79
90	67	76
120	65	74
150	63	73

He replaces the thermometer in the beaker of hot water and records its temperature.

θ_H ..... 90 °C

He removes the thermometer from the beaker of hot water and places it in a beaker containing only dry cotton wool. The thermometer bulb is completely surrounded by cotton wool. He immediately starts a stopclock, and records the temperature θ every 30 s. The readings are shown in Table 3.1.

(i) Complete the column headings in the table. [1]

(ii) State whether the cotton wool insulation increases, decreases, or has no significant effect on the rate of cooling of the thermometer bulb, compared with the rate of cooling with no insulation. Justify your answer by reference to the results.

statement .....

justification .....

.....

[2]

(c) Suggest two conditions that should be kept constant when this experiment is repeated.

1. .....

.....

2. .....

.....

[2]

[Total: 6]

2 A student carries out an experiment to compare how quickly thermal energy is conducted along rods made from different metals. Each rod is heated at one end with a Bunsen burner flame.

Each rod carries a marker held on the rod with a little wax. When the wax melts, the marker falls.

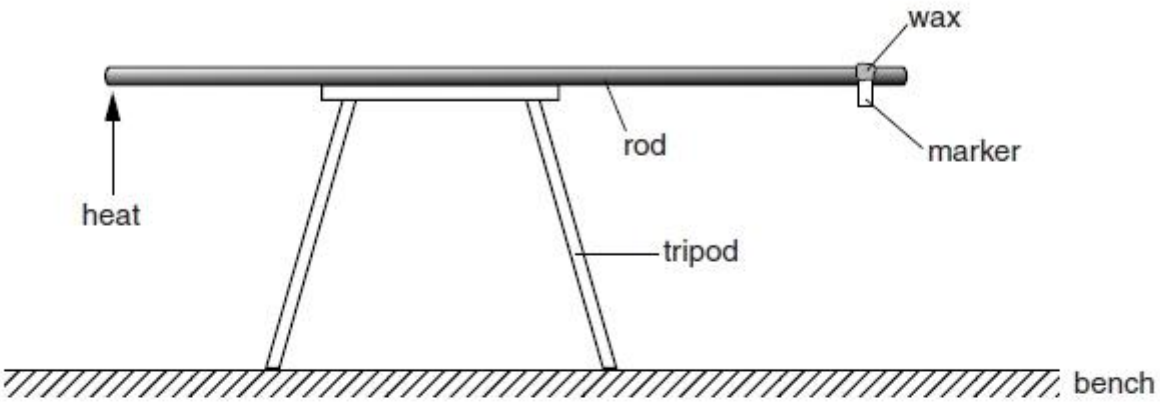


Fig. 2.1

(a) One other piece of equipment is required to compare how quickly thermal energy is conducted. Name this piece of equipment.

.....[1]

(b) Suggest **three** possible variables that the student should keep constant in order to make a fair comparison between the different metals.

1. .....

2. .....

3. .....

[3]

(c) Another student suggests that it would be helpful to measure the temperatures at both ends of the rod. He suggests using a liquid-in-glass thermometer, normally used for measuring the temperature of hot water.

Suggest two reasons why a liquid-in-glass thermometer is **not** suitable.

1. .....

2. .....

[2]

[Total: 6]

2 An IGCSE student is investigating the cooling of a thermometer bulb.

The apparatus used is shown in Figs. 2.1, 2.2 and 2.3.

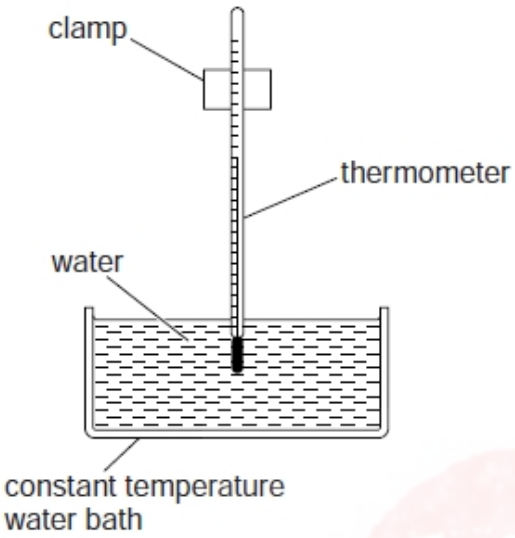


Fig. 2.1

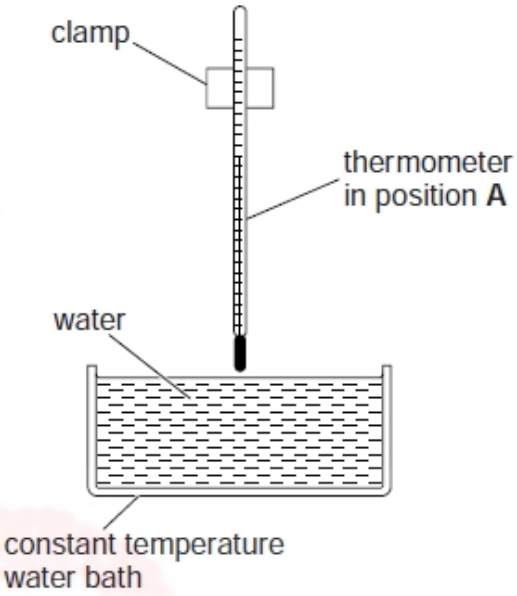


Fig. 2.2

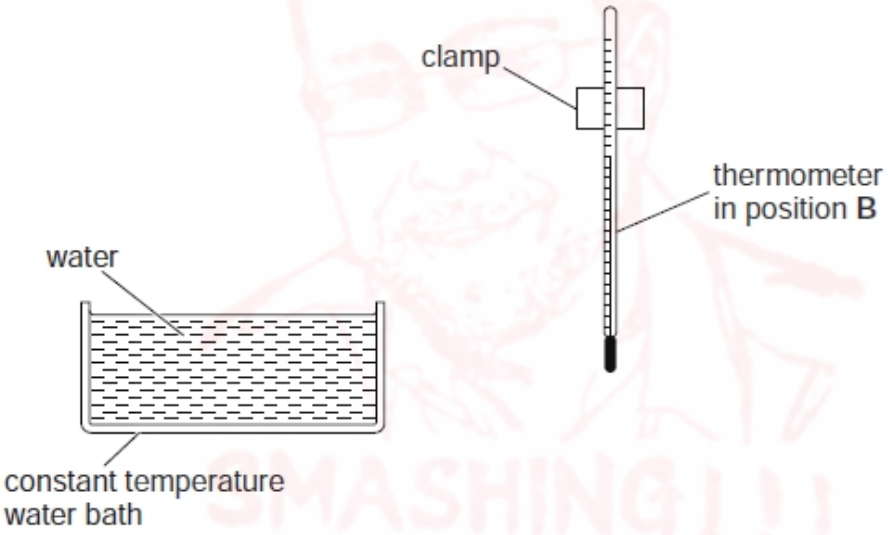


Fig. 2.3

(a) The student places the thermometer in the water bath, as shown in Fig. 2.1.

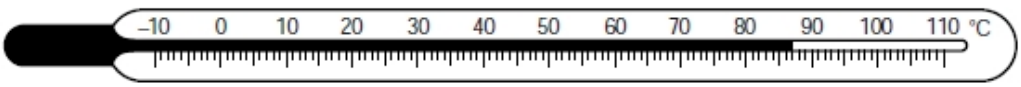


Fig. 2.4

Write down the temperature θ_H of the water bath, shown on the thermometer in Fig. 2.4.

θ_H = ... [1]

(b) The student moves the thermometer until the thermometer bulb is in position **A** above the surface of the water, as shown in Fig. 2.2. She starts a stopclock. She records the time and temperature readings every 30 s.

She replaces the thermometer in the water bath, still at temperature θ_H.

She then moves the thermometer to position **B**, as shown in Fig. 2.3. She records the time and temperature readings every 30 s.

All the readings are shown in Table 2.1.

Table 2.1

	position **A**	position **B**
t/	*θ*/	*θ*/
30	79	66
60	74	42
90	70	29
120	66	27
150	61	26
180	56	26

(i) Complete the column headings in the table. [1]

(ii) State in which position, **A** or **B**, the thermometer has the greater rate of cooling **in the first 30 s**.

position .....

(iii) Explain briefly how you reached this conclusion.

.....

.....

.....[1]

(iv) Calculate the temperature difference from 30 s to 180 s for each set of readings.

temperature difference for position **A** = ...

temperature difference for position **B** = ...

[1]

(v) Estimate room temperature θ_R.

θ_R = ... [1]

(c) Describe briefly a precaution you would take to make the temperature readings reliable.

.....

.....[1]

(d) A scientist is using this experiment as part of research into convection currents above hot water.

Suggest two conditions that should be kept constant when this experiment is repeated.

1. .....

2. .....

[2]

[Total: 8]

2 The IGCSE class is investigating the scale of a thermometer.

(a) Record room temperature θ_R as shown on the thermometer in Fig. 2.1.

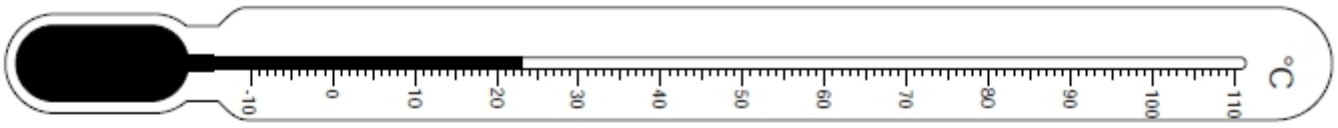


Fig. 2.1

θ_R = ...[1]

A student pours hot water into a beaker. She measures the temperature θ of the water in the beaker every 30 s. The readings are shown in Table 2.1.

Table 2.1

t/	*θ*/	*d*/
0	80	
30	74	
60	69	
90	65	
120	63	
150	61	
180	60	

(b) (i) Using Fig. 2.2, measure, and record in the table, the distance *d* from the end of the thermometer to the position of the liquid in the thermometer at the first temperature reading in the table.

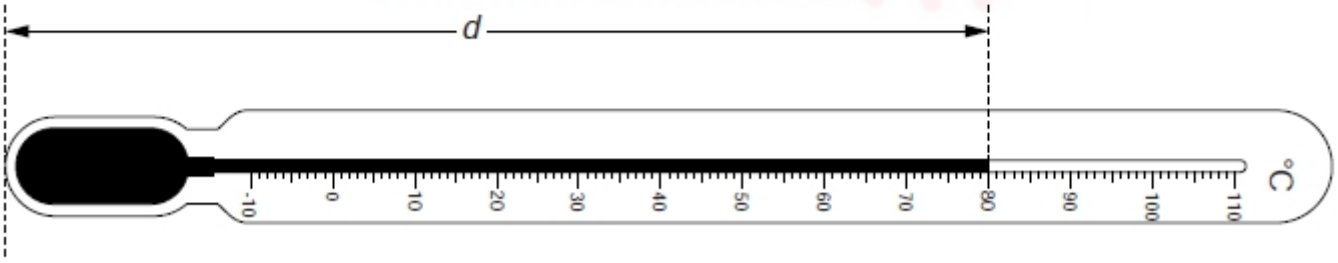


Fig. 2.2

(ii) Repeat the measurement in **(b)(i)** for all the other temperature readings. [2]

(iii) Complete the column headings in the table. [1]

(c) The student plotted a graph of θ against d. A sketch of the graph obtained is shown in Fig. 2.3.

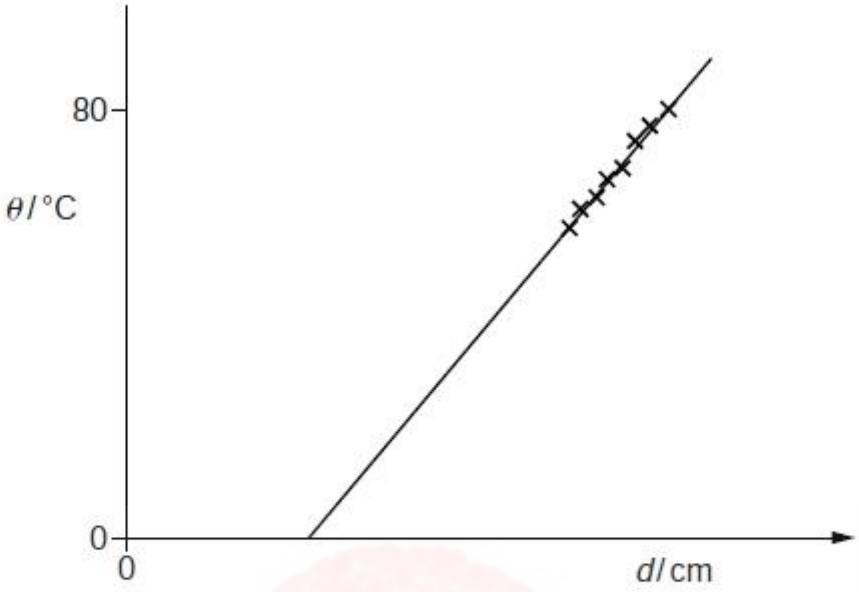


Fig. 2.3

(i) Explain how the graph line shows that θ is not directly proportional to d.

.....

..... [1]

(ii) Suggest why, when $\theta = 0\,°C$, the value of d is not zero.

.....

.....

..... [1]

(d) Determine, as accurately as possible, the distance x between the 1 °C marks on the thermometer shown in Fig. 2.2. Show your working.

x = ... [3]

[Total: 9]

2 The IGCSE class is investigating the rate of cooling of water under different conditions.

The apparatus is shown in Fig. 2.1.

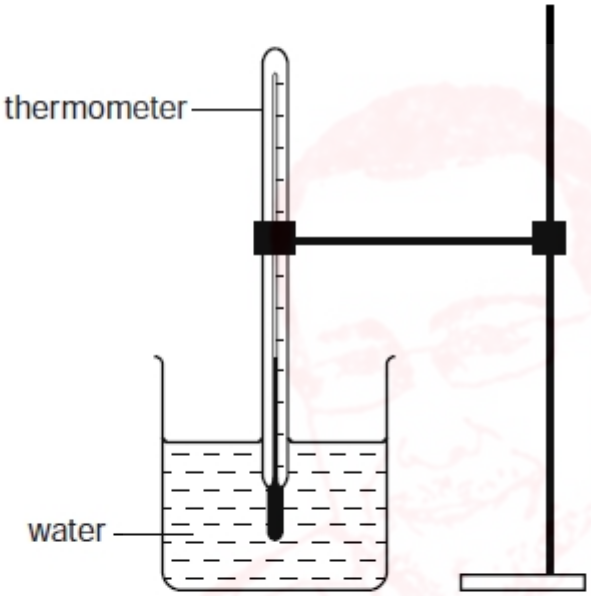


Fig. 2.1

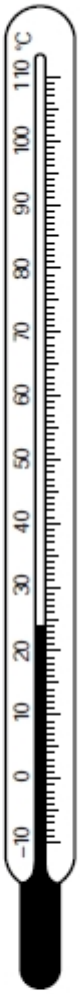


Fig. 2.2

(a) Record the value of room temperature θ_R shown on the thermometer in Fig. 2.2.

θ_R = ...[1]

(b) A student pours 150 cm^3 of hot water into a beaker. She measures the temperature θ of the water at time $t = 0$ and records it in a table.

She starts a stopclock and records the temperature of the water at 30 s intervals until she has a total of six values up to time $t = 150$ s. The readings are shown in Table 2.1.

She repeats the procedure, using 250 cm^3 of hot water.

Table 2.1

	volume of water	
	150 cm^3	250 cm^3
t/	θ/	θ/
0	84	85
30	79	79
60	74	75
90	70	72
120	68	70
150	66	68

(i) Complete the column headings in the table. [1]

(ii) State whether the rate of cooling is significantly faster, slower, or about the same when using the larger volume of hot water. Justify your answer by reference to the readings.

statement .....

justification .....

.....

.....

[2]

(c) If this experiment were to be repeated in order to check the results, it would be important to control the conditions. Suggest two such conditions that should be controlled.

1. .....

2. .....

[2]

[Total: 6]

2 The IGCSE class is investigating the heating of a thermometer bulb.

The apparatus is shown in Figs. 2.1, 2.2 and 2.3.

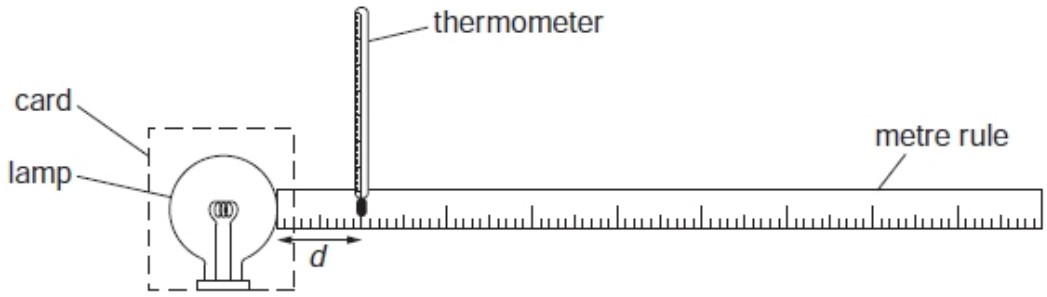


Fig. 2.1

(a) Record the value of room temperature θ_R shown on the thermometer.

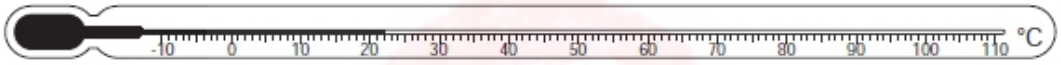


Fig. 2.2

θ_R = ... [1]

(b) A student switches on the lamp and places the thermometer so that its bulb is a horizontal distance d = 100 mm from the surface of the lamp, as shown in Fig. 2.1. She records the distance d between the thermometer bulb and the surface of the lamp. She also records the temperature θ shown on the thermometer. She repeats the procedure using values of d of 80 mm, 60 mm, 40 mm, 20 mm and 10 mm. The temperature readings are shown in Table 2.1.

(i) Record the d values in the table.

(ii) Complete the column headings in the table.

Table 2.1

d/	*θ*/
	52
	56
	61
	67
	75
	86

[2]

(c) The student moves the thermometer away from the lamp and waits for about a minute for the thermometer to cool. She places the thermometer so that its bulb is a vertical distance d_V = 100 mm from the top surface of the lamp, as shown in Fig. 2.3.

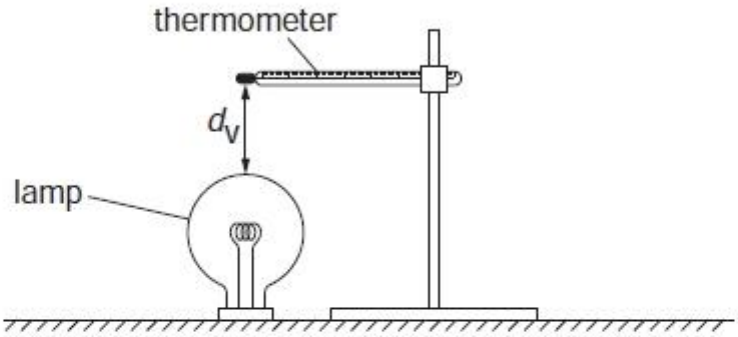


Fig. 2.3

She records the temperature θ_V shown on the thermometer: θ_V = 55 °C.

Calculate the difference between θ_V and the thermometer reading θ_H at a horizontal distance of 100 mm from the lamp. State whether θ_V is higher, lower or the same as θ_H.

temperature difference = ...

θ_V is ..... [1]

(d) A student suggests that θ_V will be higher than the thermometer reading θ_H because thermal energy will travel by infra-red radiation and convection to the thermometer bulb above the lamp but by infra-red radiation only when the bulb is to one side of the lamp.

If the experiment were to be repeated in order to investigate this suggestion it would be important to control the conditions. Suggest two such conditions, relevant to this investigation, that should be controlled.

1. .....

2. .....

[2]

(e) Briefly describe a precaution that you would take in this experiment in order to obtain a reliable result.

.....

.....

..... [1]

[Total: 7]

2 The IGCSE class is investigating temperature changes when cold water and hot water are mixed.

(a) A student records the temperature θ_c of 100 cm^3 of cold water and the temperature θ_h of 100 cm^3 of hot water.

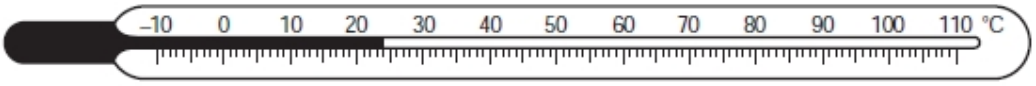


Fig. 2.1

Write down the temperature θ_c shown on the thermometer in Fig. 2.1.

θ_c = ... [2]

(b) The hot water is at a temperature θ_h = 86 °C.

Calculate θ_{av}, the average of θ_c and θ_h.

average θ_{av} = ... [1]

(c) The student adds 100 cm^3 of the hot water to the cold water. She records the temperature θ_m of the mixture of hot and cold water, θ_m = 48 °C.

State two precautions (other than repeating the experiment) that the student could take to ensure the reliability of her value of the temperature θ_m.

1. .....

2. .....

[2]

(d) Suggest a practical reason in this experiment for the temperature of the mixture θ_m being different from the average value θ_{av}, even when the student has taken the precautions you suggested in **(c)**.

.....

.....[1]

(e) Suggest a modification to the experiment which should reduce the difference between θ_m and θ_{av}.

.....

.....[1]

(f) The student decides to repeat the experiment to check the readings. Suggest one possible variable that she should keep constant.

.....[1]

[Total: 8]

2 The IGCSE class is investigating the cooling of water.

Fig. 2.1. shows the apparatus used.

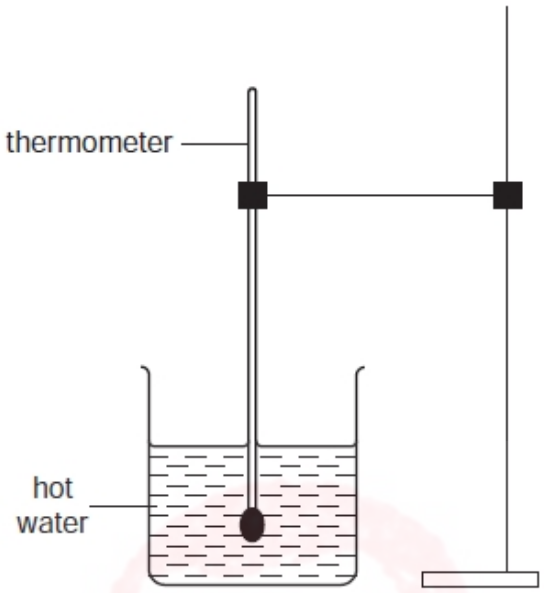


Fig. 2.1

Hot water is poured into the beaker and temperature readings are taken as the water cools.

Table 2.1 shows the readings taken by one student.

Table 2.1

t / s	*θ* / °C
0	85
30	78
60	74
90	71
120	69
150	67
300	63

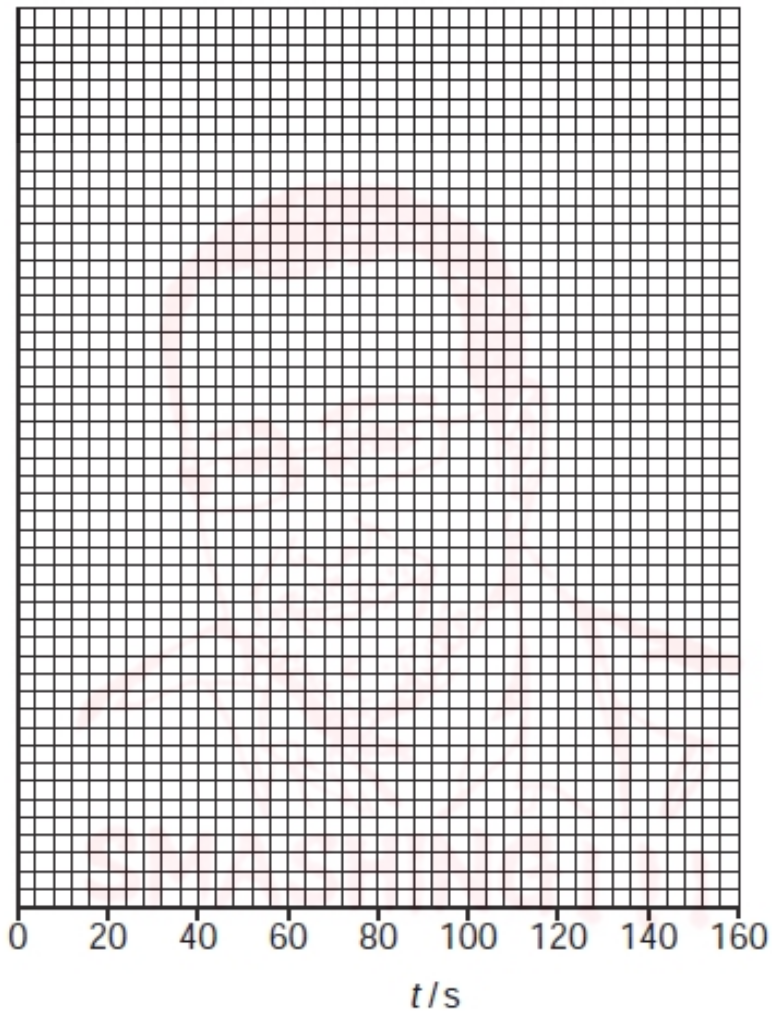
(a) (i) Using the information in the table, calculate the temperature change T_1 of the water in the first 150 s.

T_1 = ...

(ii) Using the information in the table, calculate the temperature change T_2 of the water in the final 150 s.

T_2 = ...
[3]

(b) Plot a graph of θ / °C (y-axis) against t / s (x-axis) for the first 150 s. [5]



(c) During the experiment the rate of temperature change decreases.

(i) Describe briefly how the results that you have calculated in part **(a)** show this trend.

.....

.....

(ii) Describe briefly how the graph line shows this trend.

.....

.....

2 The IGCSE class is investigating the rate of cooling of water.

The apparatus is shown in Fig. 2.1.

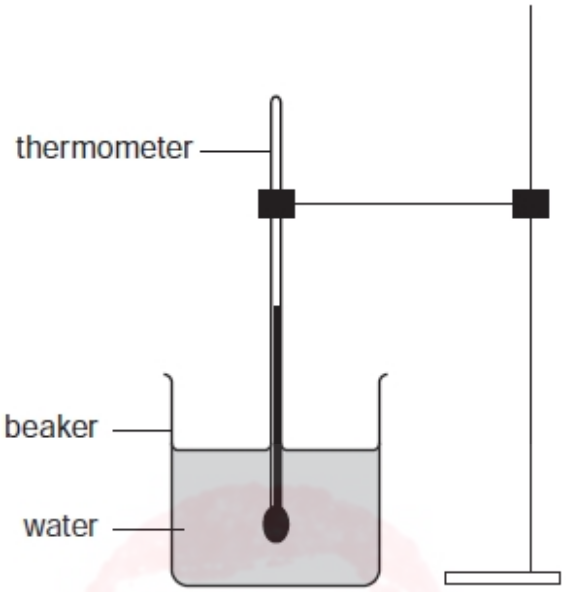


Fig. 2.1

(a) Record room temperature θ_R as shown on the thermometer in Fig. 2.2.

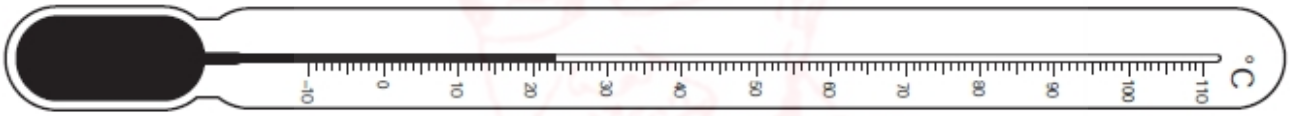


Fig. 2.2

θ_R = ...[1]

(b) The beaker contains 200 cm^3 of hot water. A student takes temperature readings as the water cools, as shown in Table 2.1.

Table 2.1

t /	θ /
0	79
30	65
60	58
90	55
120	53
150	52
180	51

(i) Complete the column headings in Table 2.1.

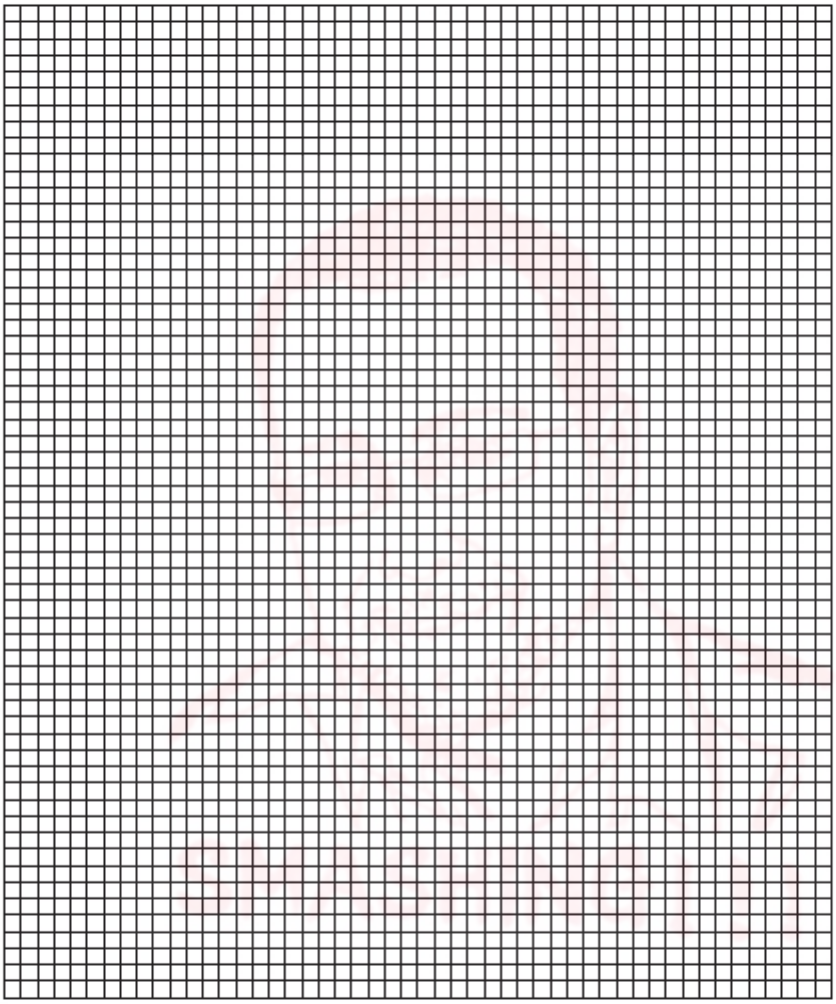
(ii) Calculate the temperature fall T_1 during the first 30 s of cooling.

T_1 = ...

(iii) Calculate the temperature fall T_2 during the final 30 s of cooling.

T_2 = ...[3]

(c) Plot the graph of temperature (*y*-axis) against time (*x*-axis).



[5]

(d) (i) State how the rate of cooling in the first 30 s differs from that in the final 30 s.

.....

.....

(ii) Explain how the graph line shows this difference.

.....

.....[2]

[Total: 11]

2 The IGCSE class is investigating the rate of heating and cooling of a thermometer bulb.

The apparatus used is shown in Fig. 2.1.

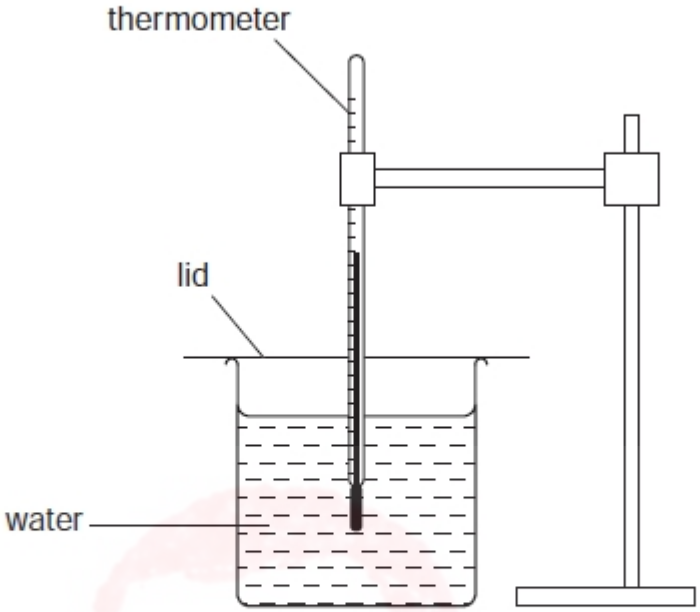
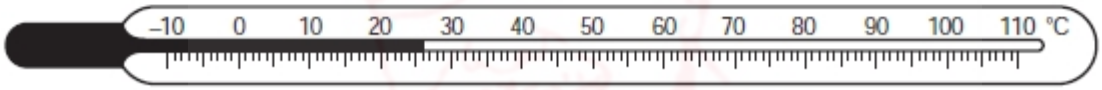


Fig. 2.1

(a) Record the room temperature θ_r shown on the thermometer.



θ_r = ... [1]

(b) For the cooling experiment, a student places the thermometer into hot water as shown in Fig. 2.1. When the temperature shown on the thermometer stops rising, she records the temperature θ at time $t = 0$ s. She removes the thermometer from the water, immediately starts a stopclock, and records the temperature shown on the thermometer at 30 s intervals. The readings are shown in Table 2.1.

For the heating experiment, the student takes another thermometer and records the temperature θ shown on the thermometer at time $t = 0$ s. She places the thermometer in the beaker of hot water, immediately starts the stopclock, and records the temperature shown by the thermometer at 10 s intervals. The readings are shown in Table 2.2.

Table 2.1

t/	θ/
0	74
30	60
60	52
90	45
120	39
150	35
180	33

Table 2.2

t/	θ/
0	25
10	69
20	80
30	81
40	81
50	82
60	82

(i) Complete the column headings in both tables. [1]

(ii) Estimate the time that would be taken in the cooling experiment for the thermometer to cool from the reading at time $t = 0$ s to room temperature θ_r.

estimated time = ... [1]

(c) State in which table the initial rate of temperature change is the greater. Justify your answer by reference to your readings.

The initial rate of temperature change is greater in Table .....

justification .....

..... [1]

(d) If one of these experiments were to be repeated in order to determine an average temperature for each time, it would be important to control the conditions. Suggest two such conditions that should be controlled.

1. .....

2. ..... [2]

[Total: 6]

5 The IGCSE class is investigating the time taken for ice cubes to melt when placed in water.

Each student is able to use
glass beakers,
a thermometer,
a stopclock,
a measuring cylinder,
an electronic balance,
a supply of ice cubes of different sizes,
a supply of cold water,
a stirrer,
a method of heating the water
and any other common laboratory apparatus that may be useful.

A student decides to investigate the effect of the mass of ice cubes on the time they take to melt in water.

(a) Suggest three possible variables that should be kept constant in this investigation.

1. .....

2. .....

3. ..... [3]

(b) In the table below, write the names of three items of apparatus that are necessary in order to take readings in this investigation. In the second column of the table write the quantity that the item measures.

item of apparatus	quantity measured

[3]

[Total: 6]

2 An IGCSE student is investigating the cooling of thermometer bulbs under different conditions.

He places a thermometer in a beaker of hot water and records the temperature θ_h of the hot water.

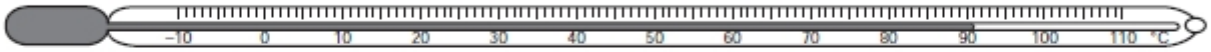


Fig. 2.1

(a) Fig. 2.1 shows the thermometer. Write down the value of θ_h that it shows.

θ_h ..... [1]

He then moves the thermometer until the thermometer bulb is just above the surface of the water (position **A**) and immediately starts a stopclock.

He records the time t and the temperature reading θ every 30 s. The readings are shown in Table 2.1.

Table 2.1

	Position A	Position B
t/	θ/	θ/
30	65	56
60	58	47
90	54	40
120	52	35
150	50	32
180	48	30

(b) Complete the column headings in the table. [1]

The student replaces the thermometer in the hot water and then moves the thermometer 15 cm away from the beaker to position **B** and immediately starts the stopclock. He records the time t and the temperature reading θ every 30 s. The readings are shown in Table 2.1.

(c) State in which position the thermometer bulb cooled more quickly. Justify your answer by reference to the readings.

statement .....

justification .....

..... [1]

(d) To make a fair comparison between the rates of cooling of the thermometer bulbs in the two positions, it is important to control other experimental conditions. Suggest two conditions that should be controlled in this experiment.

1. .....

2. ..... [2]

[Total: 5]

2 The IGCSE class is investigating the cooling of thermometer bulbs under different conditions.

The students are provided with two thermometers **A** and **B**. Thermometer **B** has cotton wool wrapped around the bulb. Fig. 2.1 shows thermometer **A**.

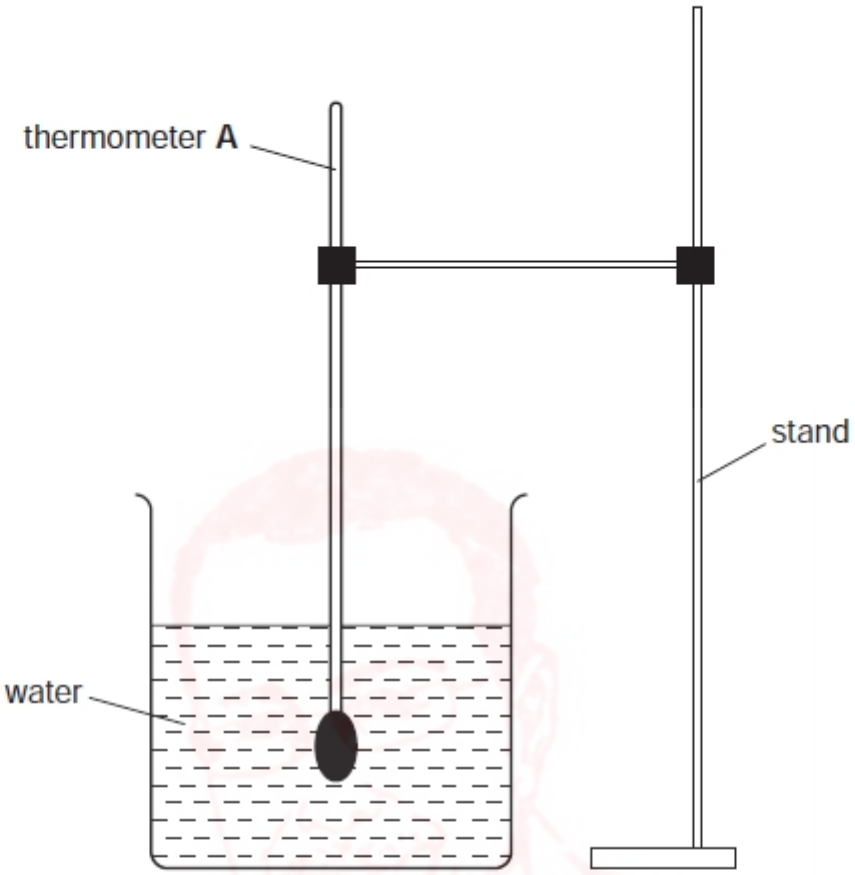


Fig. 2.1

The students measure the temperature θ of the hot water in the beaker. Fig. 2.2 shows the thermometer reading.

thermometer **A**

Fig. 2.2

(a) Record in Table 2.1 at time $t = 0$ s the temperature θ shown in Fig. 2.2.

(b) The students remove the thermometer from the water, starting the stopclock at the same time. Table 2.1 shows the temperature of the thermometer bulb at 30 s intervals. The experiment is repeated using thermometer **B** which has cotton wool wrapped around the thermometer bulb.

Complete Table 2.1 by inserting the appropriate unit in the time and in the temperature column headings.

Table 2.1

	Thermometer **A**	Thermometer **B**
t /	*θ*/	*θ*/
0		81
30	51	72
60	43	58
90	37	49
120	34	43
150	30	38
180	28	34
210	27	31

[2]

(c) Suggest which thermometer cooled more quickly at first. Justify your answer by reference to the readings.

statement .....

justification .....

..... [2]

(d) To make a fair comparison between the rates of cooling of the two thermometer bulbs under different conditions (in this experiment one thermometer bulb is covered with cotton wool), it is important to control other experimental conditions. Suggest two conditions that should be controlled in this experiment.

1. .....

2. ..... [2]

[Total: 6]

3 The IGCSE class is investigating the change in temperature of hot water as cold water is added to the hot water.

A student measures and records the temperature θ of the hot water before adding any of the cold water available.

He then pours 20 cm^3 of the cold water into the beaker containing the hot water. He measures and records the temperature θ of the mixture of hot and cold water.

He repeats this procedure four times until he has added a total of 100 cm^3 of cold water.

The temperature readings are shown in Table 3.1. V is the volume of cold water added.

Table 3.1

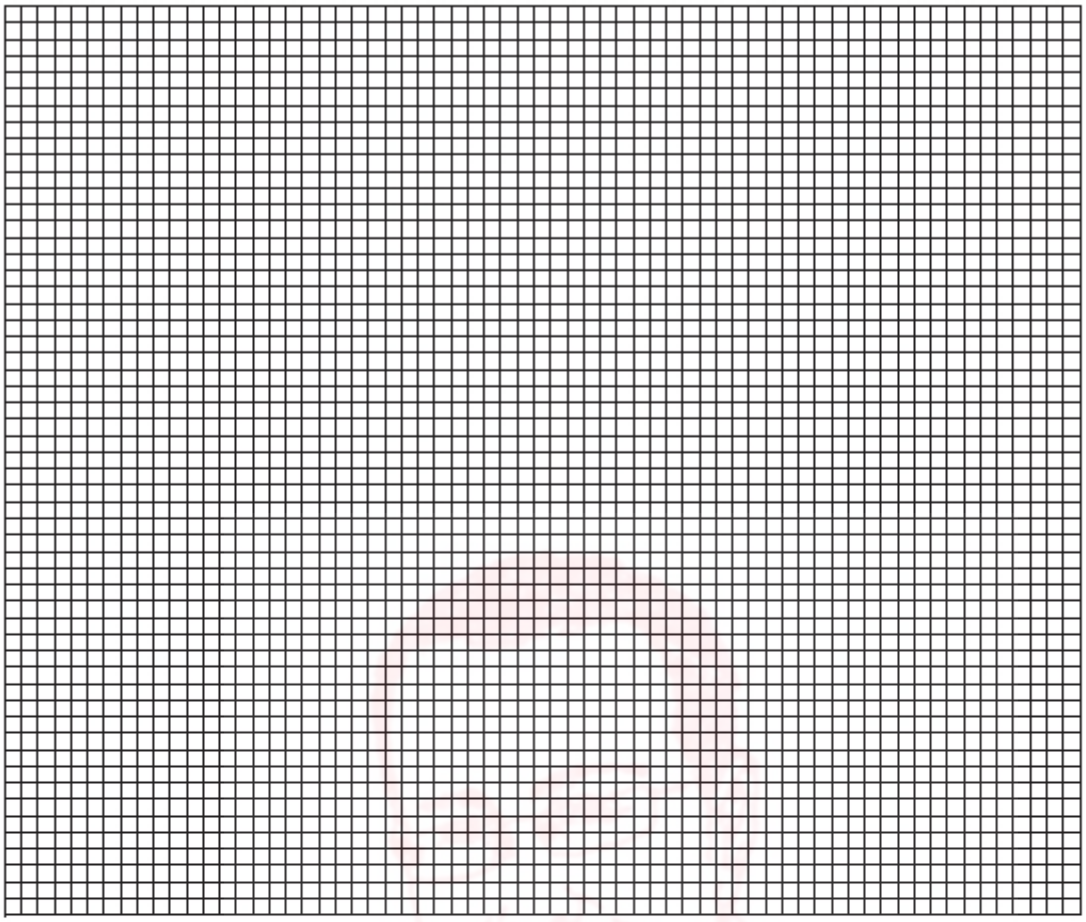
V/	*θ*/
0	82
	68
	58
	50
	45
	42

(a) (i) Complete the column headings in the table.

(ii) Enter the values for the volume of cold water added.

[2]

(b) Use the data in the table to plot a graph of temperature (*y*-axis) against volume (*x*-axis). Draw the best-fit curve.



[4]

(c) During this experiment, some heat is lost from the hot water to the surroundings. Also, each time the cold water is added, it is added in quite large volumes and at random times.

Suggest two improvements you could make to the procedure to give a graph that more accurately shows the pattern of temperature change of the hot water, due to addition of cold water alone.

1. .....

.....

2. .....

.....[2]

[Total: 8]

3 A student is investigating the effect of surface area exposed to the air on the rate of cooling of hot water.

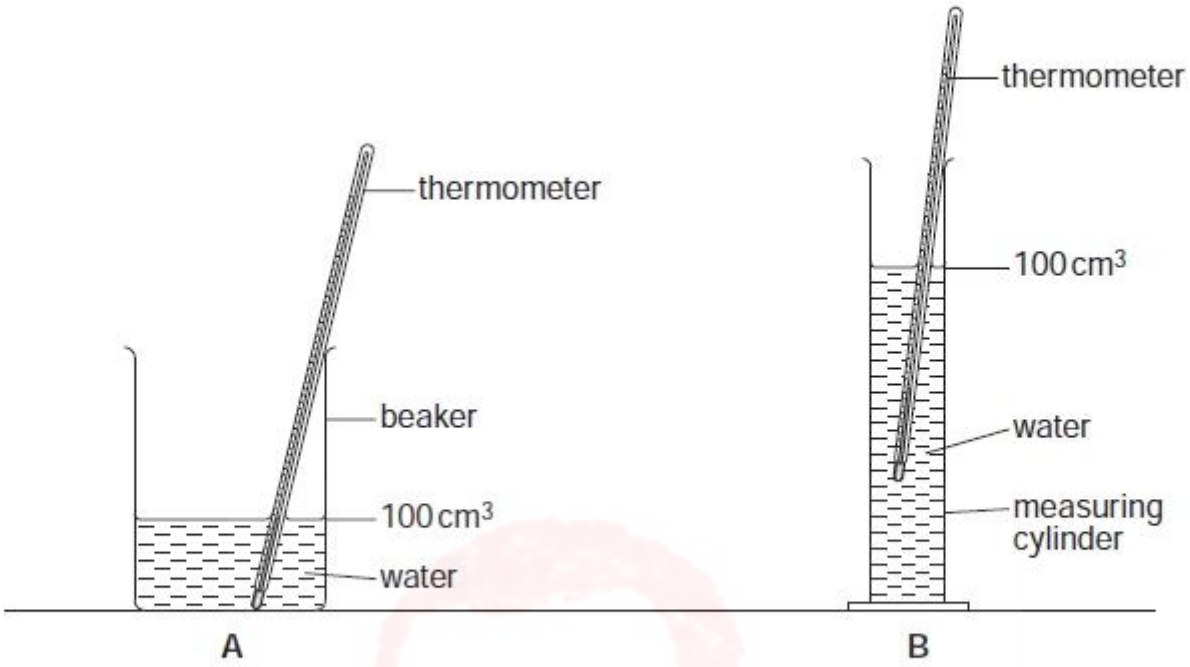


Fig. 3.1

The student is provided with two containers. The beaker is labelled **A** and the measuring cylinder is labelled **B**. Each container contains 100 cm^3 of hot water. He records the temperature of the water at 30 s intervals for a total of four minutes. Table 3.1 shows the readings of time t and temperature θ.

Table 3.1

	container **A** (beaker)	container **B** (measuring cylinder)
t/s	θ/°C	θ/°C
0	85	85
30	76	79
60	68	74
90	63	69
120	59	66
150	56	63
180	54	61
210	52	59
240	51	58

(a) **(i)** Use the data in Table 3.1 to plot a graph of θ/°C (y-axis) against t/s (x-axis) **for the beaker**. Draw the best-fit curve.

(ii) Use the data for the measuring cylinder to plot another curve on the same graph axes that you used for part **(a)(i)**.

[6]

(b) The experiment is designed to investigate the effect of the surface area exposed to the air on the rate of cooling. State briefly the effect of a larger surface area on the rate of cooling. Justify your answer by reference to your graph.

statement.....

justification.....

.....[2]

[Total: 8]

1 The IGCSE class is investigating the rate of cooling of hot water.

(a) A student measures room temperature. Write down the value of room temperature θ_0 shown on the thermometer in Fig. 1.1.

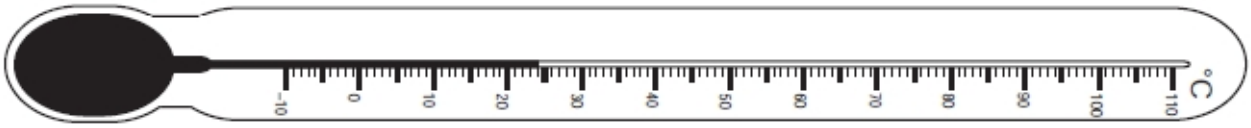


Fig. 1.1

θ_0 = ... [1]

(b) He then pours hot water into a beaker until it is about two-thirds full. He measures and records the temperature θ of the hot water and at the same time starts a stopwatch. As the water cools, he records the temperature every 30 s for a total of five minutes. His readings are shown in the table below.

t/	*θ*/
0	68.0
30	53.0
60	45.0
90	40.0
120	36.5
150	33.5
180	32.0
210	30.0
240	29.0
270	28.5
300	28.0

(i) Complete the column headings in the table.

(ii) Calculate the temperature fall T_1 in the first minute of the experiment.

T_1 = ...

(iii) Calculate the temperature fall T_2 in the final minute of the experiment.

T_2 = ...

[3]

(c) Theory suggests that the rate of cooling of the hot water at any time depends on the difference between the temperature of the water at that time and room temperature.

(i) State and explain whether your answers in **(b)** support this theory.

Statement .....

Explanation .....

..... [1]

(ii) Suggest three variables that you would attempt to keep constant if this theory were to be investigated further.

1. .....

2. .....

3. ..... [3]

(d) Suggest one addition you could make to the apparatus provided in order to reduce the rate of evaporation of the water in the beaker.

..... [1]

[Total: 9]

1 The IGCSE class is investigating the temperature changes that occur when hot and cold water are mixed.

(a) A student pours 50 cm^3 of water into a beaker. He then measures the temperature θ_1 of the water in the beaker. Write down the value of θ_1 shown on the thermometer in Fig. 1.1.

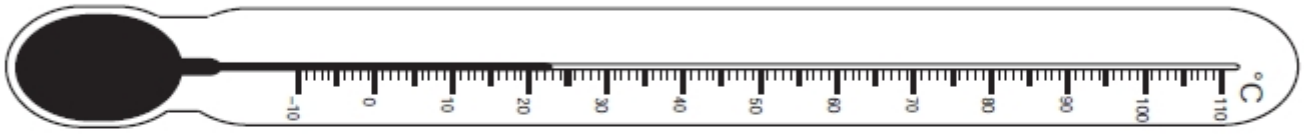


Fig. 1.1

θ_1 = ... [2]

(b) The student then measures the temperature θ_2 of some hot water. He pours 50 cm^3 of this hot water into the beaker of water at room temperature. He then records the temperature θ_3 of the water in the beaker. His readings are

θ_2 = 76 °C,

θ_3 = 42 °C.

Calculate

(i) the temperature rise of the cold water, ...

(ii) the temperature fall of the hot water. .....

[2]

(c) A theoretical calculation based on the equation

thermal energy lost by hot water = thermal energy gained by cold water

predicts a higher value for the temperature θ_3 than the value that is obtained by this experiment. Suggest

(i) a practical explanation for the difference in values,

.....

(ii) two practical improvements that you could make to the procedure for this experiment to obtain a result that is closer to the theoretical result.

1. .....

2. ..... [3]

[Total: 7]

4 The IGCSE class is investigating conditions affecting the rate of cooling of a beaker of hot water.

(a) The students start by measuring room temperature. Record the value of room temperature as shown on the thermometer in Fig. 4.1.

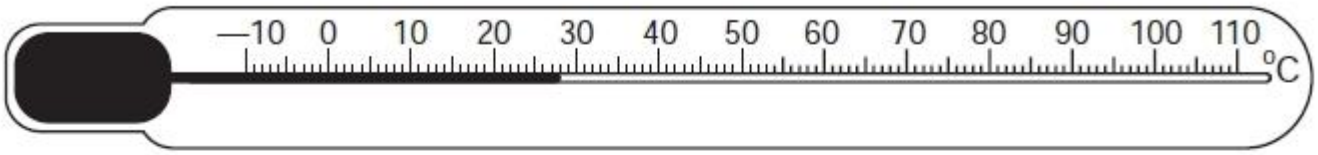


Fig. 4.1

temperature = ... [2]

(b) The students are provided with hot water in beakers as shown in Fig. 4.2. Beaker **A** is insulated and beaker **B** has a lid.

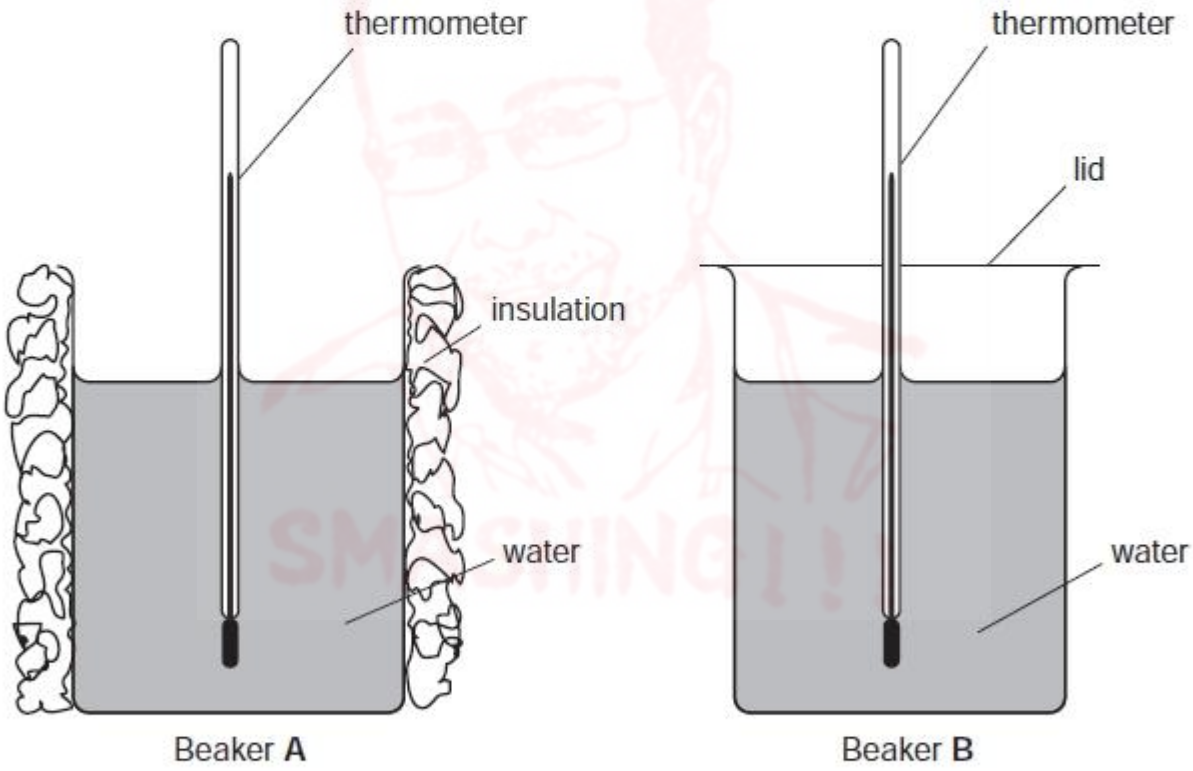


Fig. 4.2

The students measure and record the temperature θ of the water in each beaker every 30 s for a total of five minutes. One student's readings are shown in the tables.

beaker **A**

time / s	θ / °C
0	83.0
30	82.0
60	81.0
90	79.5
120	79.0
150	77.0
180	75.0
210	74.0
240	72.0
270	71.0
300	70.0

beaker **B**

time / s	θ / °C
0	82.0
30	82.0
60	81.0
90	80.0
120	79.0
150	78.0
180	76.0
210	75.0
240	74.0
270	73.0
300	72.0

(i) Look at the temperature readings in the tables. State whether the insulation round beaker A or the lid on beaker B or neither is most effective in keeping the water hot. By reference to readings in the tables, justify your answer.

statement .....

justification .....

..... [2]

(ii) Suggest a suitable material for the insulation around beaker A.

..... [1]

(iii) To obtain reliable results in this experiment, it is important that variables are controlled. State three variables that should be controlled in this experiment.

variable 1 .....

variable 2 .....

variable 3 ..... [3]

4 An IGCSE student is investigating the temperature rise of water in beakers heated by different methods. The apparatus is shown in Fig. 4.1. Beaker A is heated electrically and beaker B is heated with a Bunsen burner.

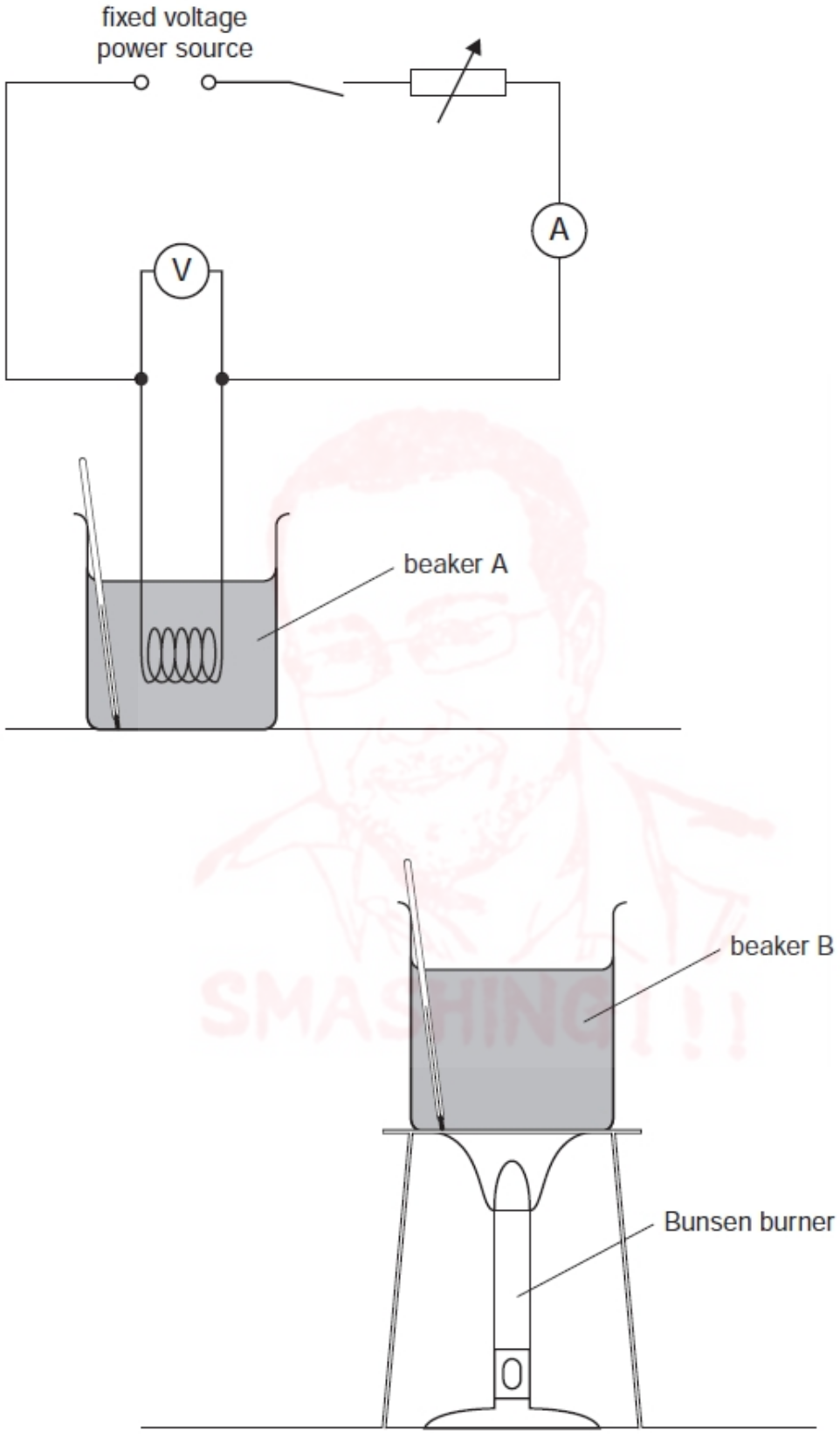


Fig. 4.1

The student first records room temperature.

(a) Fig. 4.2 shows the thermometer at room temperature.

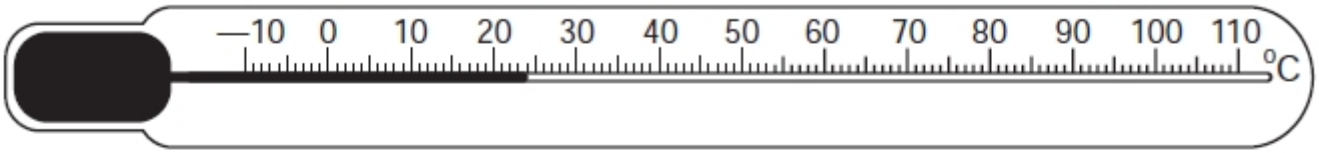


Fig. 4.2

(i) Write down the value of room temperature.

room temperature = ... [1]

(ii) The two beakers are heated from room temperature for the same length of time. The new water temperature for beaker A is 30 °C and for beaker B is 28 °C.

Calculate the temperature rise of the water in each beaker.

temperature rise in beaker A = ...

temperature rise in beaker B = ... [1]

(b) The electrical heater and the Bunsen burner both have the same power and both beakers were heated from room temperature for the same length of time. Suggest why there is a difference in temperature rise between beaker A and beaker B.

.....

.....

..... [2]

(c) In order to keep the heating effect of the electrical heater constant throughout the heating period, the student adjusts the current. Name the component in the circuit that the student uses for this purpose.

..... [1]

3 The IGCSE class carries out an experiment to investigate the effect of insulation on the rate of cooling of hot water.

The apparatus is shown in Fig. 3.1.

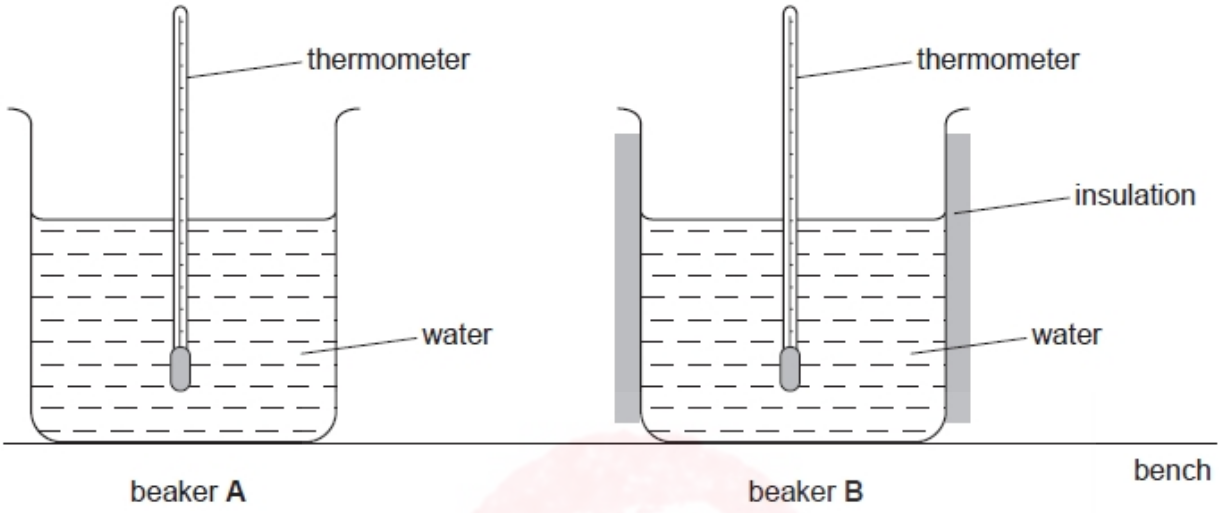


Fig. 3.1

The students each have two glass beakers **A** and **B**. Beaker **B** is insulated. They also have a supply of hot water.

A student pours hot water into beaker **A** until it is approximately two thirds full and then measures the temperature θ of the hot water. He records this temperature in the table at time t = 0 s. He then starts a stopwatch and records the temperature of the water at 30 s intervals for a total of four minutes.

He repeats the experiment using beaker **B**. All the readings are shown in the tables below.

beaker **A**

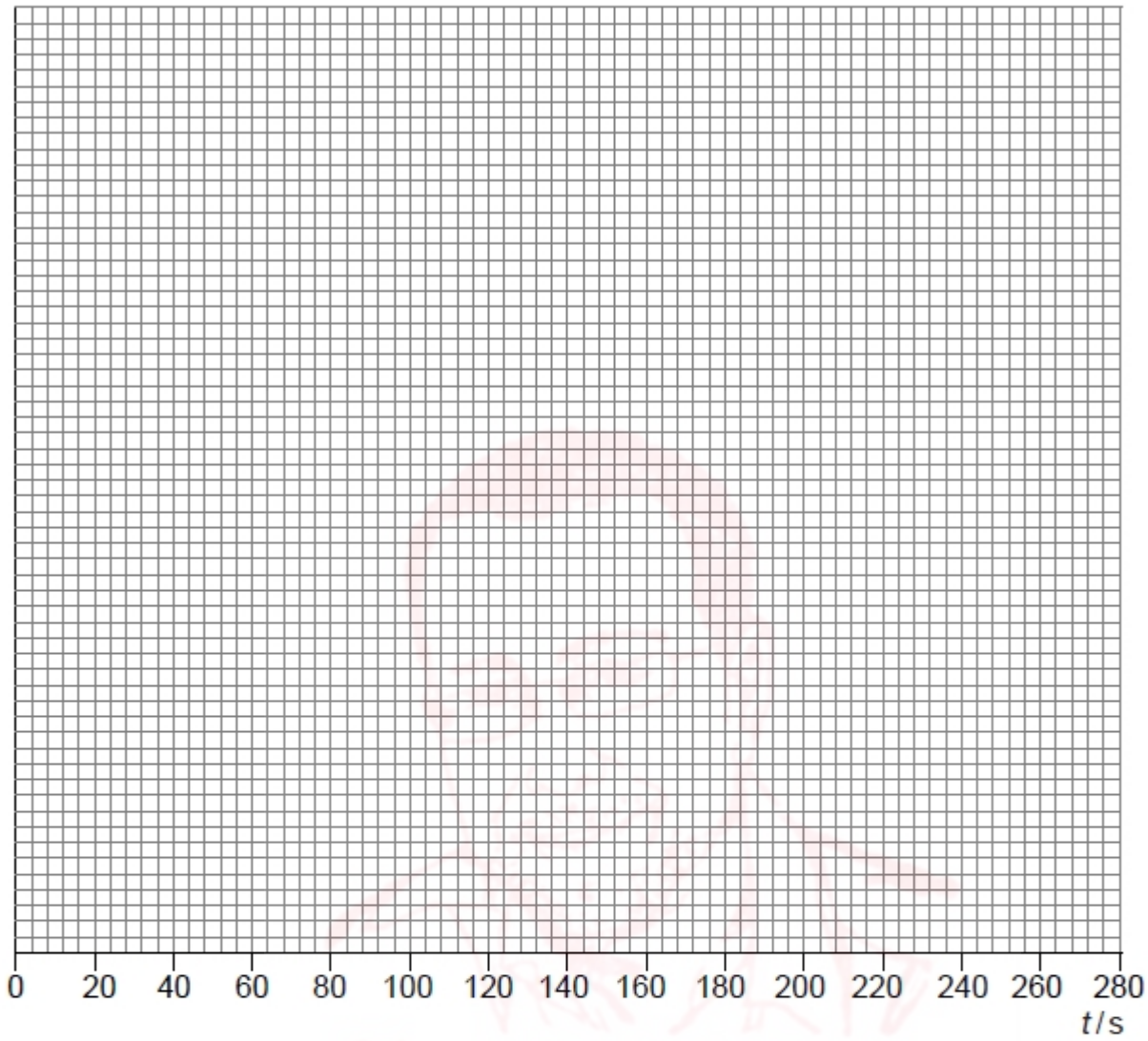
t/	θ/
0	80
30	67
60	59
90	54
120	51
150	48
180	47
210	46
240	45

beaker **B**

t/	θ/
0	80
30	69
60	62
90	57
120	53
150	50
180	48
210	47
240	46

(a) Complete the column headings in the tables. [1]

(b) Use the readings for beaker **A** to plot a graph of temperature θ (y-axis) against time t (x-axis). Start the temperature scale at 40 °C. Draw the best-fit curve. [4]



(c) Use the readings for beaker **B** to plot another curve on the same graph axes that you used in part **(b)**. [2]

(d) The experiment you have just done was designed to investigate the effect of insulation on the rate of cooling. Suggest two improvements that could be made to the design of the experiment.

1. .....

.....

2. .....

..... [2]

1 The IGCSE class is investigating the change in temperature of hot water as cold water is added to it.

The students are provided with 100 cm^3 of hot water and a supply of cold water at room temperature.

(a) The thermometer in Fig. 1.1 shows the temperature of the cold water.

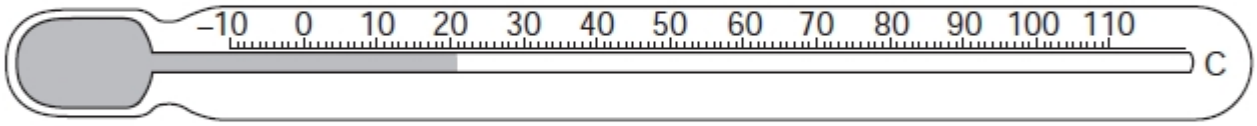


Fig. 1.1

Record the temperature of the cold water, as shown in Fig. 1.1.

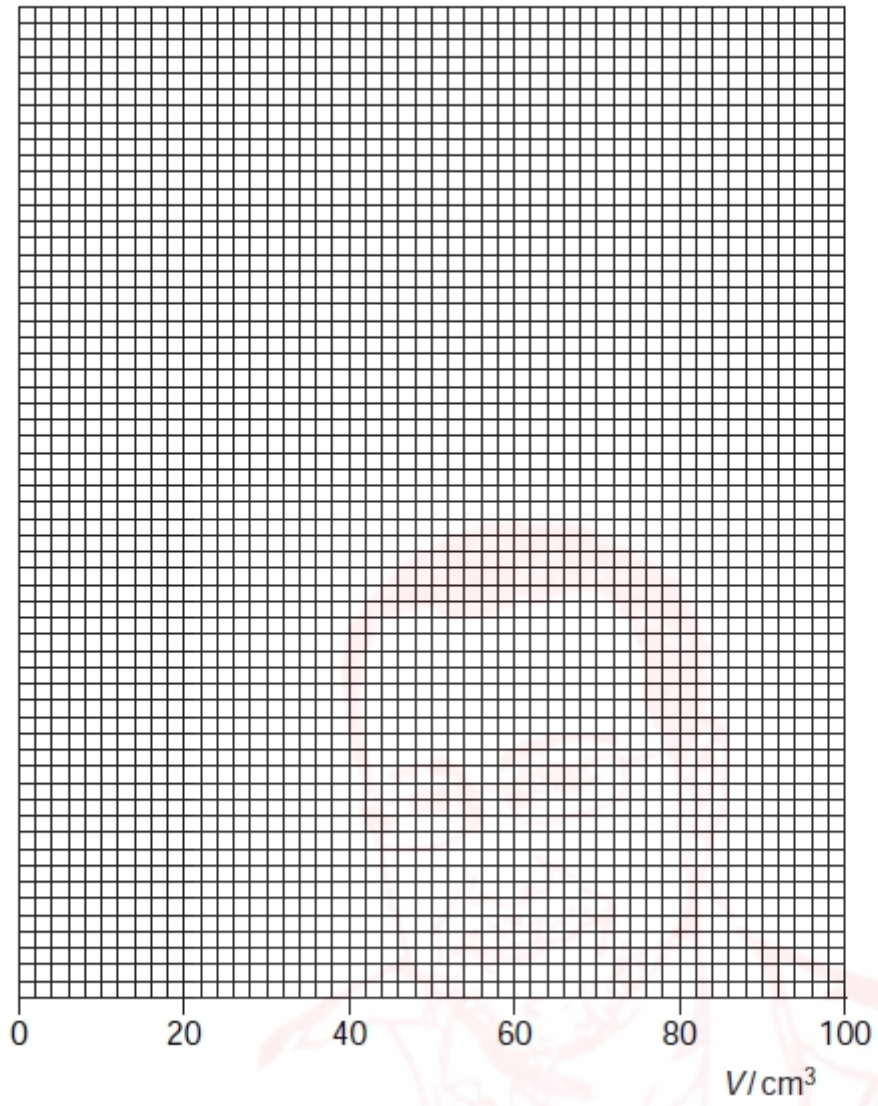
..... [1]

(b) A student records the temperature of the hot water. He then pours 20 cm^3 of the cold water into the beaker containing the hot water. He records the temperature θ of the mixture of hot and cold water and the volume V of cold water added. He then repeats the process four times until he has added a total of 100 cm^3 of cold water. The table shows the readings.

V/	θ/
0	80.0
20	58.0
40	48.0
60	40.5
80	34.0
100	29.0

(i) Complete the column headings in the table. [1]

(ii) Use the data in the table to plot a graph of temperature θ (y-axis) against volume V (x-axis).



[5]

(c) A sketch graph of the readings taken by another student carrying out a similar experiment is shown in Fig. 1.2.

The theoretical line shows the results expected by the student after calculating the values of θ. The student assumed that all the heat lost by the hot water was gained by the cold water when the cold water was poured into the beaker.

The other line shows the experimental results.

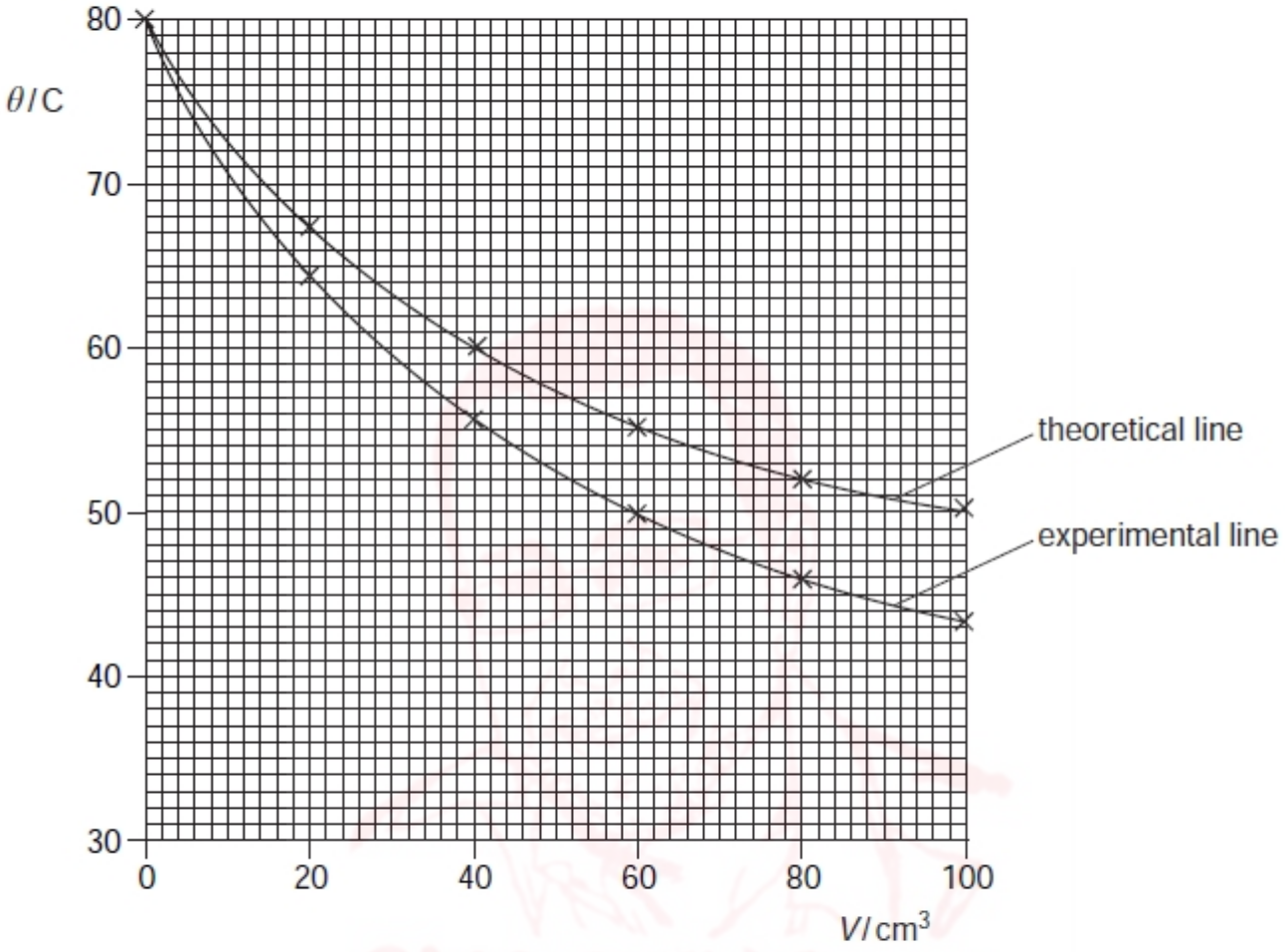


Fig. 1.2

The student carried out the experiment with care. Suggest a practical reason why the experimental line differs from the theoretical line.

.....

..... [1]

5 In a heating experiment, a student takes the temperature of a beaker B containing water at room temperature. Fig. 5.1 shows the thermometer used.

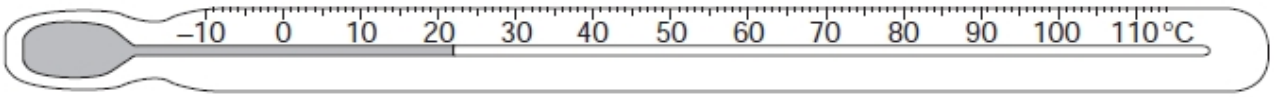


Fig. 5.1

(a) State the temperature reading shown on the thermometer.

temperature reading = ... [1]

(b) The student then transfers a small metal cylinder from beaker A of boiling water to the beaker B of water at room temperature, as shown in Fig. 5.2.

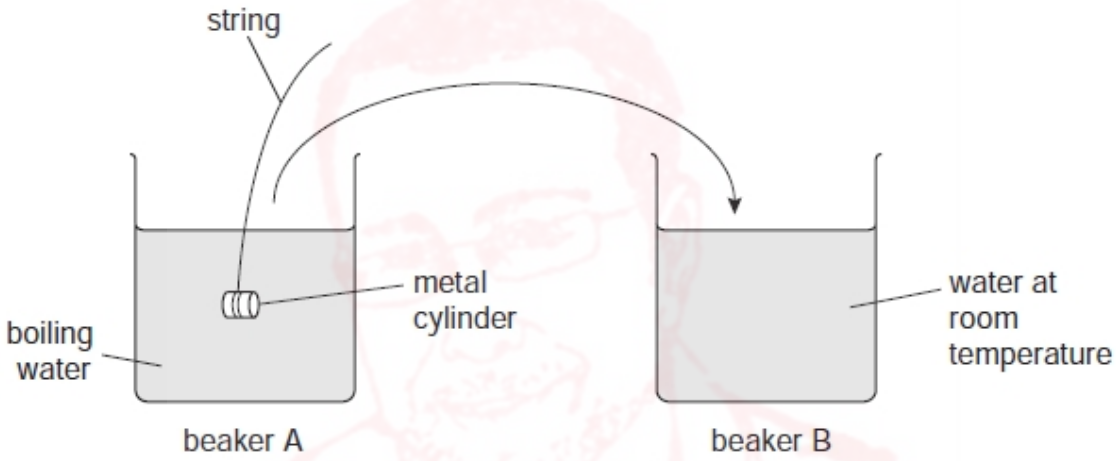


Fig. 5.2

The student assumes that the metal is at a temperature of 100 °C when it enters the water in beaker B.

The temperature of the water in beaker B rises to 36 °C.

(i) Calculate the temperature rise of the water in beaker B.

temperature rise = ...

(ii) Calculate the temperature fall of the metal cylinder.

temperature fall = ...
[3]

(c) The student uses these readings and some other information to calculate the specific heat capacity of the metal.

Why is it important to transfer the metal between the beakers as quickly as possible?

.....

..... [1]

Q# 25/ iG Phx/2003/w/Paper 61/ www.SmashingScience.org :o)

5 A student wants to find out which of the three materials is the best thermal insulator.

The student's apparatus at the beginning of each test is as shown in Fig. 5.1.

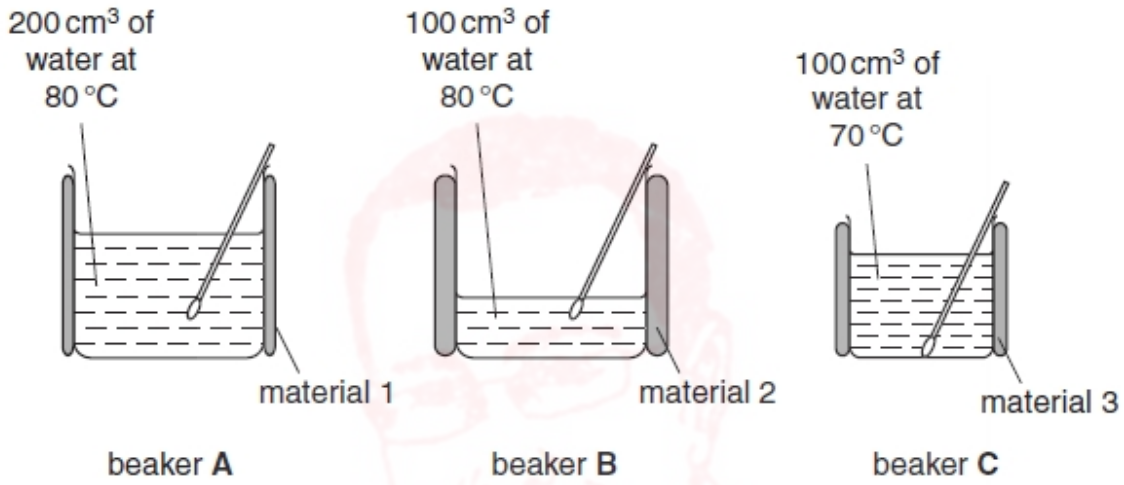


Fig. 5.1

Each beaker is surrounded by a different insulating material. The water is allowed to cool and the temperatures are recorded at different times. The student is unable to write a correct conclusion because the variables have not been controlled.

(a) Study Fig. 5.1 and then state **two** ways in which you would improve the control of variables.

1. .....

.....

2. .....

..... [2]

(b) State the reading shown on the thermometer shown in Fig. 5.2.

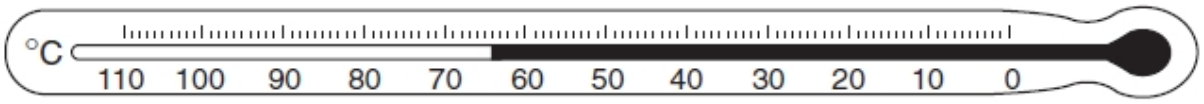


Fig. 5.2

temperature reading ..... [1]

(c) The graph of Fig. 5.3 shows the results obtained by the student.

The graph lines **A**, **B** and **C** correspond to the beakers **A**, **B** and **C**.

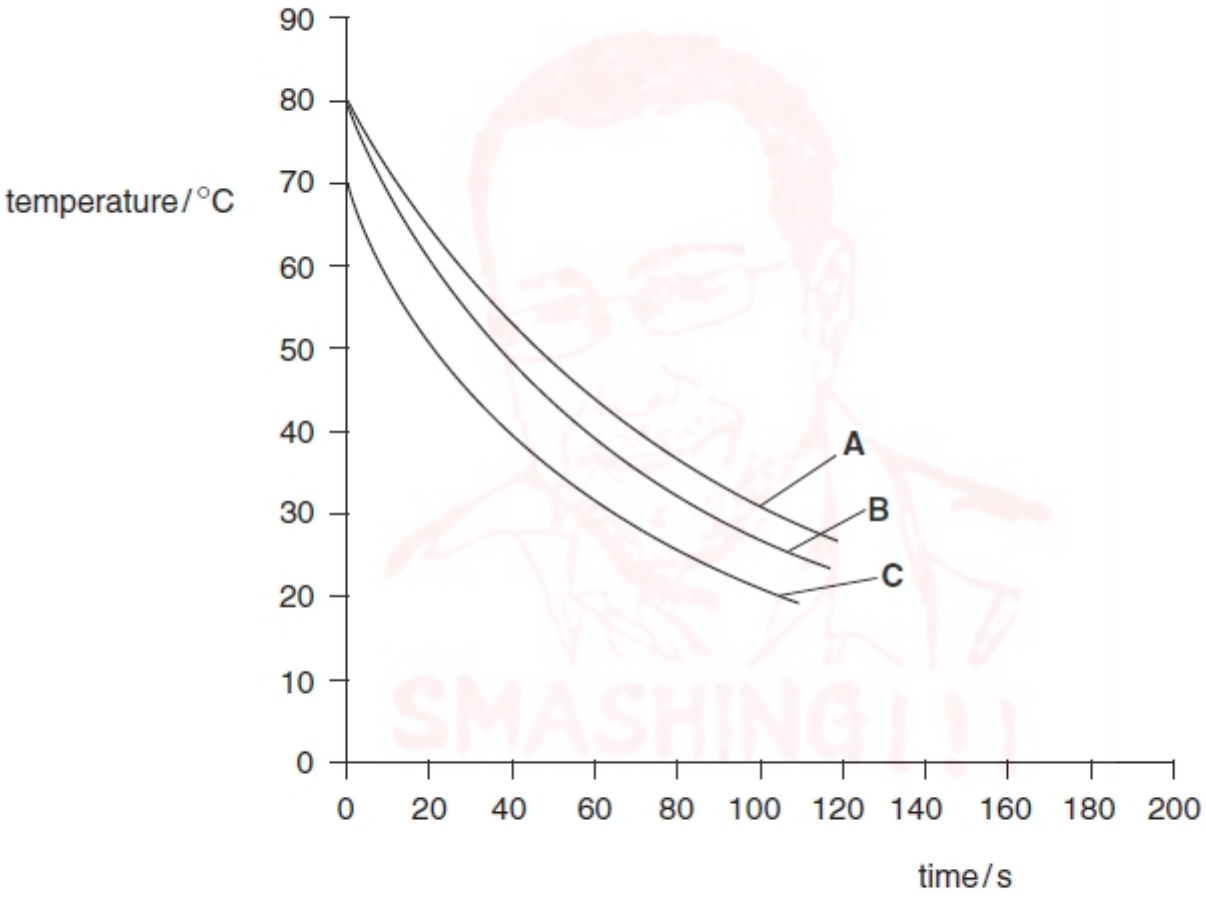


Fig. 5.3

Which beaker cools the most quickly in the first 60 s?

..... [1]

5 A student was asked to carry out an experiment to compare the insulating properties of cotton wool, cardboard and polystyrene. The apparatus provided was hot water, a thermometer, a stopclock and a copper can with a lid, as shown in Fig. 5.1.

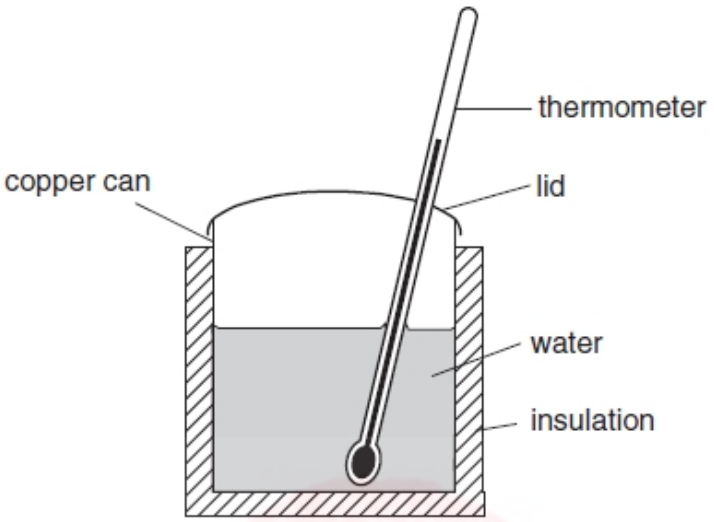


Fig. 5.1

The student wrapped one of the insulators around the can, poured hot water into the can, and then took temperature and time readings as the water cooled. This was then repeated for each insulator. The graph in Fig. 5.2 shows how the student displayed his readings.

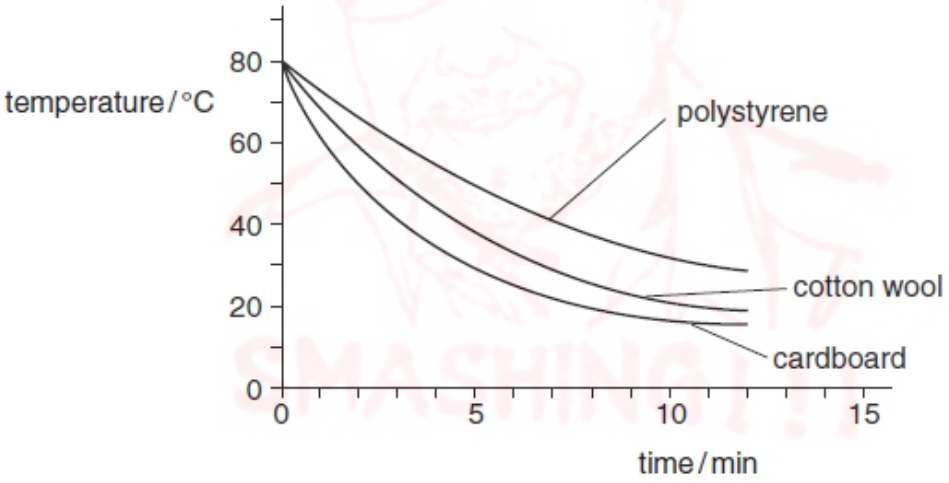


Fig. 5.2

(a) (i) Using the information on the graph, which material appears to be the best insulator?

.....

(ii) Justify your answer by referring to the information on the graph.

.....

.....

[2]

(b) In this experiment, it is important to control the variables. Suggest three variables that the student should keep constant for this experiment.

1. .....

2. .....

3. .....

[3]

Q# 27/ iG Phx/2002/w/Paper 61/ www.SmashingScience.org :o)

4 The IGCSE class was performing a heating experiment. The apparatus is shown in Fig. 4.1. The aim was to determine the rate at which the temperature of 200 cm^3 of water increased when heated with an electric immersion heater.

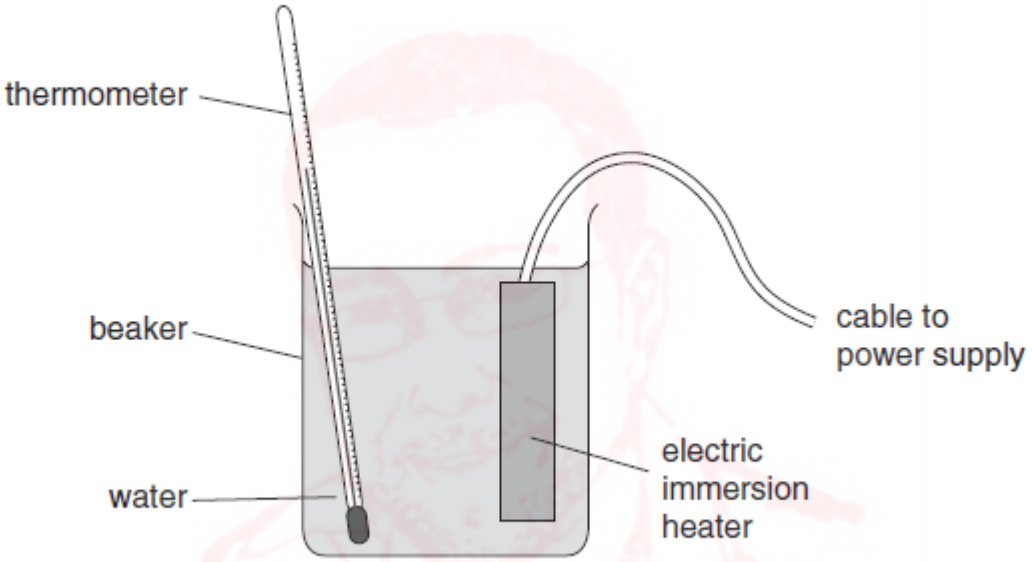


Fig. 4.1

The water was heated from room temperature up to 60 °C. The teacher measured the power of the immersion heater and calculated (correctly) the time required to raise the temperature of 200 cm^3 of water from 21 °C to 60 °C.
The students found that the water must be heated for longer than the calculated time.

(a) (i) What is the most likely cause of the longer time recorded?

Tick the appropriate box.

- ☐ an inaccurate thermometer
- ☐ errors in reading the stopwatch
- ☐ heat loss during the experiment

(ii) Suggest **two** precautions that could be taken to obtain more accurate results.

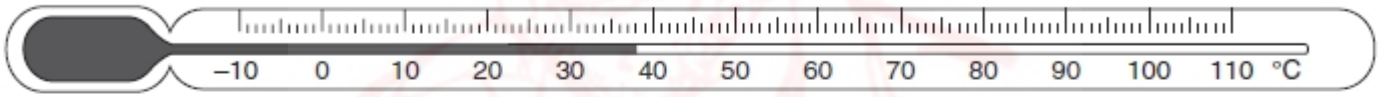
.....

.....

.....

.....[3]

(b) What is the reading on the thermometer shown in Fig. 4.2?



reading = ... [1]

Fig. 4.2

(c) The power P of the immersion heater is calculated using the equation $P = VI$

Calculate the power of an immersion heater in which the current is 5.5 A when the p.d. across it is 12.0 V.

.....

.....[2]

Q# 1/ iG Phx/2015/s/Paper 61/ www.SmashingScience.org :o)

2 **(a)** 85 (recorded in table) [1]

(b) s, °C [1]

(c) Graph:
- axes correctly labelled, right way round and with units [1]
- suitable scales, plots occupying at least half grid in both directions [1]
- all plots correct to within ½ small square [1]
- good best-fit line judgement [1]
- single, thin, continuous line [1]

(d) **(i)** decreases owtte, no ecf [1]

(ii) statement justified by reference to the graph [1]

[Total: 9]

Q# 2/ iG Phx/2014/w/Paper 61/ www.SmashingScience.org :o)

2 **(a)** 21 (°C) [1]

(b) table: s, °C, °C [1]

(c) no significant effect, justified by some reference to results [1]

wording that communicates the idea that the temperatures are the same within the limits of experimental accuracy OR almost the same rate [1]

(d) lid/cover/smaller cross-sectional area [1]

(e) any one from:
room temperature (or equivalent environmental condition)
initial water temperature
volume of water
same/dry insulation [1]

[Total: 6]

Q# 3/ iG Phx/2014/s/Paper 61/ www.SmashingScience.org :o)

3 (a) $\theta_H = 92$ (°C) [1]

(b) (i) table: s, °C, °C [1]

(ii) decreases [1]

justified by reference to results, giving numbers referring to temperature drops [1]

(c) any two from:
- room temperature / air conditioning / draughts / environmental conditions
- starting temperature (of thermometer) / temperature of (hot) water
- density of packing / amount of cotton wool / dryness of cotton wool [max 2]

[Total: 6]

Q# 4/ iG Phx/2014/s/Paper 61/ www.SmashingScience.org :o)

2 (a) stopwatch / stopclock [1]

(b) any three from:
- length of rod
- diameter / thickness / area (of cross-section) of rod
- amount of wax / type of wax
- weight / size/mass of marker
- position for the markers
- (Bunsen) flame / (rate of) heating
- position of Bunsen / flame
- position of rod on tripod [max 3]

(c) temperature too high
or thermometer only measures up to about 100 °C
or small range [1]

thermometer / bulb can't make proper contact [1]

[Total: 6]

Q# 5/ iG Phx/2013/w/Paper 61/ www.SmashingScience.org :o)

2 **(a)** 87 (°C) [1]

(b) **(i)** s, °C, °C [1]

(ii)(iii) **B** and greater temperature difference
OR numbers quoted, *must see* 21 and 8 or 24 and 5 [1]

(iv) **A** 23(°C) and **B** 40(°C) [1]

(v) 20 – 26 (°C) [1]

(c) EITHER viewing thermometer at right angles
OR reference to being ready on time [1]

(d) any two from:
room temperature
water / starting temperature
distance of thermometer bulb from water surface
relevant reference to draughts / fans / air conditioning [2]

[Total: 8]

Q# 6/ iG Phx/2013/s/Paper 61/ www.SmashingScience.org :o)

2 **(a)** $\theta_R = 23(°C)$ [1]

(b) table:
d values 11.9, 11.3, 10.8, 10.4, 10.2, 10.0, 9.9 [1]
all *d* values to nearest mm [1]
s, °C, cm or mm [1]

(c) **(i)** does not go through the origin [1]

(ii) *d* not measured from 0 °C mark (o.w.t.t.e.) [1]

(d) any *l* divided by any number of divisions [1]
l value between 89 and 119 [1]
x = 0.98 mm to 1.00 mm (with unit) [1]

[Total: 9]

Q# 7/ iG Phx/2012/w/Paper 61/ www.SmashingScience.org :o)

2 (a) $\theta_R = 24(°C)$ [1]

(b) (i) Table:
s, °C, °C [1]

(ii) About the same [1]
Justified with reference to numbers in table [1]

(c) Any two from:
Volumes of water
Room temperature/draughts
Same beaker
Initial water temperature [2]

[Total: 6]

Q# 8/ iG Phx/2012/s/Paper 61/ www.SmashingScience.org :o)

2 (a) $\theta_R = 22(°C)$ [1]

(b) Table:
mm, °C [1]
Correct *d* values 100, 80, 60, 40, 20, 10 [1]

(c) Temperature difference = 3(°C), higher [1]

(d) Draughts [1]
Room temperature/humidity [1]

(e) One from:
Relevant avoidance of parallax explained, in using rule or thermometer
Waiting time between readings
Wait for steady thermometer reading
Allow lamp to cool/warm up
Repeats and average [1]

[Total: 7]

Q# 9/ iG Phx/2011/w/Paper 61/ www.SmashingScience.org :o)

2 **(a)** $\theta_c = 24$ °C [1] [1]

(b) $\theta_{av} = 55$ (°C) ecf from **(a)** [1]

(c) any two from:
stirring
waiting for temperature (to stabilise)
view thermometer at right angles o.w.t.t.e. [2]

(d) heat loss (to surroundings) o.w.t.t.e. [1]

(e) one from:
lagging beakers o.w.t.t.e.
use of lid
swifter transfer of water [1]

(f) one from:
amount of stirring o.w.t.t.e.
hot water temperature
cold water temperature
room temperature o.w.t.t.e.
transfer time [1]

[Total: 8]

Q# 10/ iG Phx/2011/s/Paper 61/ www.SmashingScience.org :o)

2 **(a)** **(i)** T_1 correct 18 [1]

(ii) T_2 correct 4 [1]
unit °C (either position and not contradicted) [1]

(b) graph:
y-axis labelled [1]
plots occupying at least half of grid on suitable scale [1]
all plots correct to ½ square [1]
well judged single, smooth curve line, not 'point-to-point' [1]
thin line [1]

(c) **(i)** $T_2 < T_1$ (wtte) [1]

(ii) decreasing gradient (wtte) [1]

[Total: 10]

Q# 11/ iG Phx/2011/s/Paper 61/ www.SmashingScience.org :o)

2. (a) 23 (°C) [1]

(b) *t* in s, *θ* in °C [1]

T_1= 14 [1]
T_2 = 1 [1]

(c) Graph:
Axes the right way round, both labelled with quantity, ignore unit [1]
Use of the scale temperature 50 – 80 and time 0 – 200 or 0 – 250, using the whole grid [1]
All seven plots correct to ½ small square [1]
Good line judgement [1]
Thin line [1]

(d) Greater rate of cooling in first 30 s (owtte) ecf possible [1]
Decreasing slope of graph (owtte) ecf possible [1]

[Total: 11]

Q# 12/ iG Phx/2010/w/Paper 61/ www.SmashingScience.org :o)

2 (a) θ_r 26 [1]

(b) (i) s and °C in both tables [1]

(ii) at least 300s and given to nearest 10s or in mins [1]

(c) Table 2.2 (heating) justified by two temperature differences compared, must see 14 and 44/56 OR 74 to 60 and 25 to 69/81 [1]

(d) any two from:
same starting temperature
constant room temperature/avoid draughts/same place
same time intervals
same thermometer (wtte)
same mass/amount/volume of water
same beaker
lid always used [2]

[Total: 6]

Q# 13/ iG Phx/2010/w/Paper 61/ www.SmashingScience.org :o)

5 **(a)** any three from:
mass/volume/amount of water
room temperature
temperature of water
amount of stirring
size/shape of beaker
temperature of ice cube
number/mass/size of cubes [3]

(b) any three from:

stopclock:	time
balance:	mass
thermometer:	temperature
measuring cylinder:	volume (of water)

[3]

[Total 6]

Q# 14/ iG Phx/2009/w/Paper 61/ www.SmashingScience.org :o)

2 **(a)** 91 (°C) [1]

(b) *t* in s, both *θ* in °C [1]

(c) statement B and justified by reference to readings [1]

(d) any two from:
same starting temperature/temperature of hot water
constant room temperature/keep away from draughts/out of direct sunlight
same time intervals [2]

[Total: 5]

Q# 15/ iG Phx/2009/s/Paper 61/ www.SmashingScience.org :o)

2 **(a)** 87 (°C) [1]

(b) s, °C, °C [1]

(c) **A** ecf allowed [1]
justified by reference to readings (up to 90s) with comparison of drops in temperatures (with numbers) given (ecf allowed) [1]

(d) Any two from:
starting temperature
room temperature
carry out at same time
same thermometer (words to that effect)
same position of thermometers
same time intervals [2]

[Total: 6]

Q# 16/ iG Phx/2008/w/Paper 61/ www.SmashingScience.org :o)

3 Table
θ in °C, V in cm^3 [1]
correct V 0, 20, 40, 60, 80, 100 [1]

Graph: axes labelled with symbol and unit [1]
axes suitable (e.g. not '3' scale) and plots occupy more than ½ grid [1]
all plots correct (better than ½ sq) [1]
well judged, thin best fit line [1]

(c) 1. sensible comment about heat loss to the surroundings, e.g. use of insulation/lid [1]
2. sensible comment about adding water in a regulated, timed flow (including smaller volumes/set time intervals/shorter intervals [1]

[Total: 8]

Q# 17/ iG Phx/2008/s/Paper 61/ www.SmashingScience.org :o)

3 Graph:
Temperature axis labelled θ/°C [1]
Suitable scales (plots occupy at least ½ grid) [1]
Plots correct to nearest ½ square (–1 each error) [2]
Lines well judged curves [1]
Lines thin [1]

(b) Statement:
larger surface area increases rate of cooling [1]
Justification:
Correct reference to gradients of lines or readings [1]

[Total: 8]

Q# 18/ iG Phx/2007/w/Paper 61/ www.SmashingScience.org :o)

1 (a) 24 [1]

(b) s, °C [1]
23, 1 (-1 each error) [2]

(c) (i) reason consistent with results [1]

(ii) Three from:
room temp/draughts etc
volume
beaker
liquid
amount of stirring
surface area [3]

(d) lid [1]

[Total: 9]

Q# 19/ iG Phx/2007/s/Paper 61/ www.SmashingScience.org :o)

1 **(a)** $\theta_1 = 23$ [1]
unit °C correctly written [1]

(b) 19 (°C) ecf [1]
34 (°C) ecf [1]

(c) **(i)** heat loss (to surroundings) [1]

(ii) any two from:
insulation / mat / foil
lid
speedier transfer
repeats
wait to record max temperature
stirring
include beaker in calculation [2]

[Total: 7]

Q# 20/ iG Phx/2006/w/Paper 61/ www.SmashingScience.org :o)

4 **(a)** 28°C value [1]
unit [1]

(b) B [1]
smaller temp drop [1]
(OR neither, insignificant difference)

(c) any suitable insulator [1]

(d) Any 3 from
initial temp
volume of water
size/shape of beaker
room temp/draughts/simultaneous timings
material of beaker
beakers on same surface [3]

[Total: 8]

Q# 21/ iG Phx/2006/s/Paper 61/ www.SmashingScience.org :o)

4 **(a)** **(i)** 24(°C) **[1]**

(ii) 6(°C); 4(°C) (ecf) **[1]**

(b) Heat lost to surroundings **[1]**
round flame/to gauze/tripod **[1]**

(c) Variable resistor **[1]**

TOTAL 5

Q# 22/ iG Phx/2005/w/Paper 61/ www.SmashingScience.org :o)

3	**(a)**	θ in °C, t in s	1
	(b) & **(c)**	θ axis labelled	1
		scale starts at 40 °C and 2 cm to 10 °C	1
		plots correct to ½ sq (–1 each error)	2
		well judged best fit curves	1
		lines not too thick	1
	(d)	Two from: e.g. use a lid insulate the bottom of the beaker use a container that is a good conductor (metal)	2
			TOTAL 9

Q# 23/ iG Phx/2005/s/Paper 61/ www.SmashingScience.org :o)

1	**(a)**	21°C (ignore unit) (20.9 acceptable)	[1]
	(b) **(i)**	t in °C and V in cm^3	[1]
	(ii)	θ axis labelled, with unit	[1]
		scale 10°C to 1 cm or 0 - 100 in 25 sq steps or 20 - 80 in 10 sq steps	[1]
		correct plots to ½ sq (-1 each error)	[2]
		well judged best fit line	[1]
	(c)	heat lost to surroundings or by evaporation	[1]
			[total: 8]

Q# 24/ iG Phx/2004/s/Paper 61/ www.SmashingScience.org :o)

5	**(a)**	22	1
	(b) **(i)**	14 (ecf)	1
	(ii)	64	1
		units all correct	1
	(c)	So that heat is not lost (wtte)	1
			TOTAL 5

Q# 25/ iG Phx/2003/w/Paper 61/ www.SmashingScience.org :o)

5	(a)	Two from: same volume of water same starting temperature of water same size/shape/type beakers same thickness/mass/volume of insulator same room temp	2
	(b)	64°C (with unit)	1
	(c)	B	1
			TOTAL 4

Q# 26/ iG Phx/2003/s/Paper 61/ www.SmashingScience.org :o)

5	(a)	(i)	polystyrene	1
		(ii)	Least steep curve (or numbers suitably quoted)	1
	(b)		Three from: Thickness of insulator Room temp. Starting temp. Mass/vol./amount of water Using same can	3
			TOTAL	**5**

Q# 27/ iG Phx/2002/w/Paper 61/ www.SmashingScience.org :o)

4. (a) (i) heat loss during the experiment (third box)	1
(ii) insulation, repeats, stirring, use dig thermometer, lid (any 2)	1 1
(b) 38°C	1
(c) value 66	1
W	1
	TOTAL 6