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0653/61

May/June 2017

1 hour

No Additional Materials are required.

DO **NOT** WRITE IN ANY BARCODES.

You may lose marks if you do not show your working or if you do not use appropriate units.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **14** printed pages and **2** blank pages.

1 A student investigates the nutrient content of banana, chickpea and egg white.

- He divides some mashed banana between three test-tubes.
- He carries out Benedict's test on one portion, the biuret test on another and the iodine test on the third portion.
- He repeats the procedure with the chickpea and egg white.

(a) State in which of these tests a source of heat is required.

..... [1]

(b) The banana tests positive for reducing sugar and starch.

The chickpea tests positive for starch.

The egg white tests positive for protein.

All other results are negative.

Complete Table 1.1 to show the colours the student obtains in these tests.

Table 1.1

	Benedict's test for reducing sugar	biuret test for protein	iodine test for starch
banana			
chickpea			
egg white			

[3]

(c) Plan an investigation to **compare** the reducing sugar content of two different brands of clear apple juice.

In your answer you should include how you will determine which brand contains the most reducing sugar and how to make a fair comparison.

.....

.....

.....

.....

.....

..... [3]

(d) Describe how you can test for the presence of fat in egg white.

method

.....

.....

observation for positive result

.....

[3]

- 2 Solution **H** and solution **J** are each one of the following possible solutions.

ammonia solution
sodium hydroxide solution
hydrochloric acid
sulfuric acid
barium nitrate solution
silver nitrate solution

A student carries out some tests to identify solution **H** and solution **J**.

- (a) She tests solutions **H** and **J** separately with both red and blue litmus papers.

She records her observations in Table 2.1.

Table 2.1

	solution H	solution J
red litmus paper	remains red	changes to blue
blue litmus paper	remains blue	remains blue

Using the observations in Table 2.1, choose from the list of possible solutions the **two** possible identities for each of solutions **H** and **J**.

solution **H** could be or

solution **J** could be or

[2]

- (b) (i) The student reacts solid copper(II) oxide with dilute sulfuric acid to prepare a solution containing copper sulfate only.

Describe clearly a method for this preparation.

.....

.....

.....

.....

.....[3]

- (ii) She places solution **H** in a test-tube.

She slowly adds copper sulfate solution until the test-tube is almost full. She filters this mixture to identify the colour of any precipitate (ppt.).

She repeats this process for solution **J**.

Her observations are shown in Table 2.2.

Table 2.2

	solution H	solution J
slowly add copper sulfate solution	white ppt.	dark blue solution at first then blue ppt. appears

Use the observations in Tables 2.1 and 2.2 to identify solutions **H** and **J**.

solution **H** is

solution **J** is

[2]

- (c) Another student suggests that iron(III) sulfate solution may be used in (b)(ii) instead of copper sulfate solution to identify solutions **H** and **J**.

Explain in detail why the student is only partially correct.

.....

.....

.....

.....

.....[3]

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- 3 A student investigates how the resistance of a metal wire depends upon its length.

She sets up the circuit shown in Fig. 3.1.

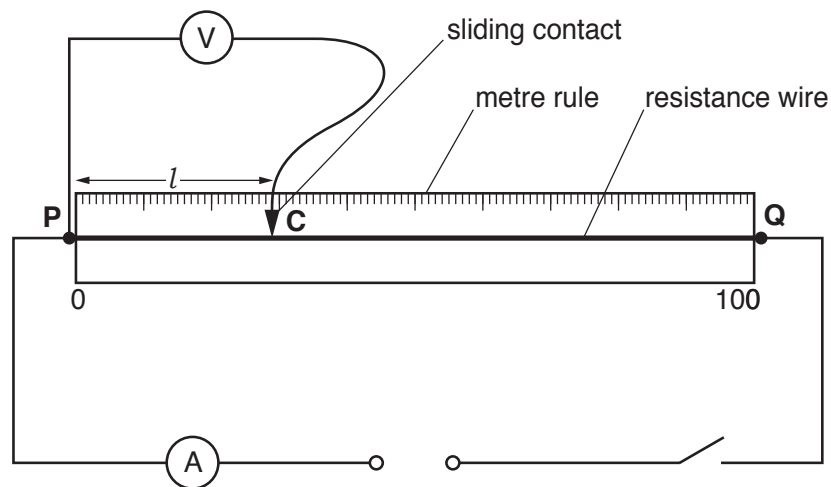


Fig. 3.1

- She connects the sliding contact **C** to the resistance wire at a length $l = 20.0\text{ cm}$ from end **P**.
- She closes the switch.
- She measures the current I flowing through the wire and the potential difference V between **P** and **C**.
- She opens the switch.

(a) Part of the scale of the voltmeter is shown in Fig. 3.2.

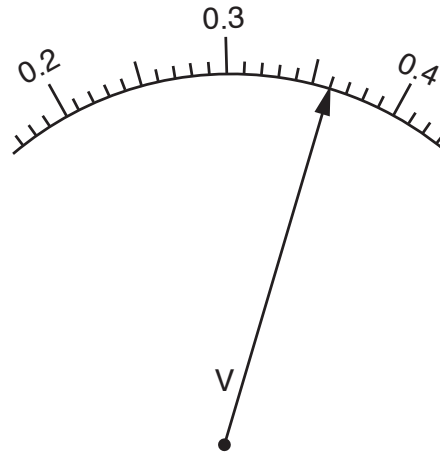


Fig. 3.2

Read the scale and record the value in Table 3.1.

[1]

Table 3.1

length l/cm	current I/A	potential difference V/V	resistance R/Ω
20.0	0.18		
35.0	0.18	0.58	3.22
50.0	0.18	0.79	4.39
65.0	0.18	1.00	5.56
80.0	0.18	1.22	
95.0	0.18	1.43	7.94

(b) She measures the current I in the wire and records its value in Table 3.1.

She repeats this process for values of $l = 35.0\text{ cm}$, 50.0 cm , 65.0 cm , 80.0 cm and 95.0 cm .

She records in Table 3.1 her values for I and V .

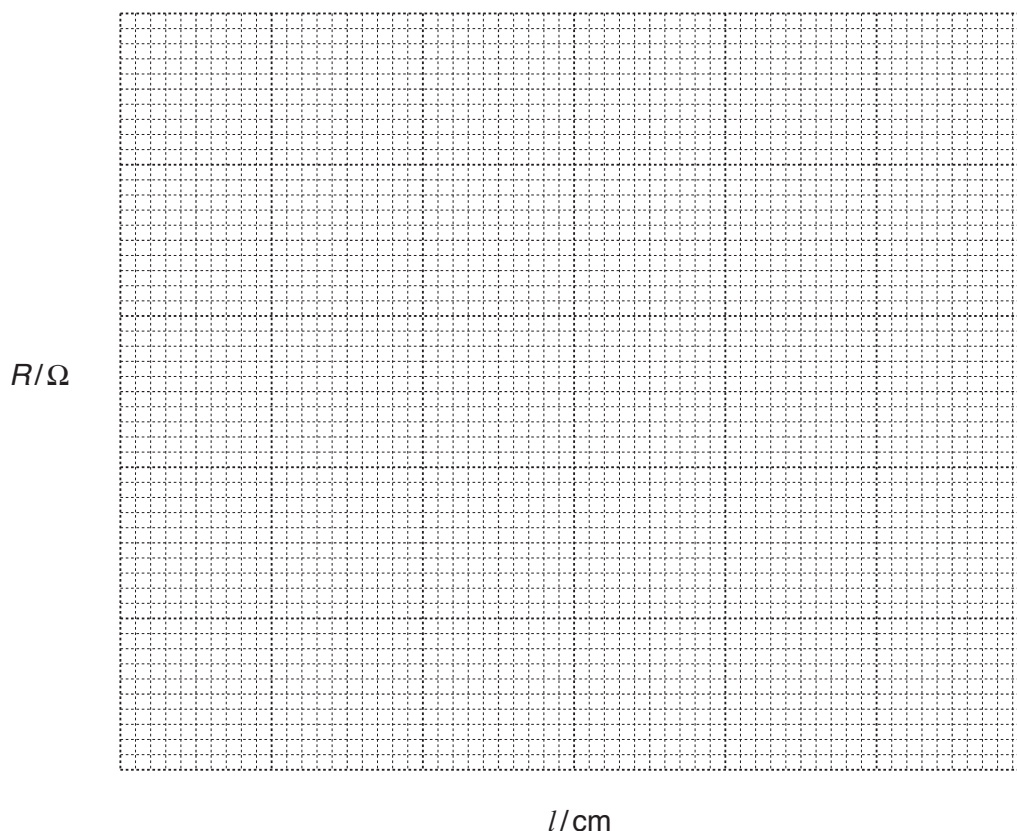
(i) Calculate the resistance R for lengths of wire 20.0 cm and 80.0 cm , using the equation shown.

$$R = \frac{V}{I}$$

Record, in Table 3.1, your values of R .

[2]

- (ii) Use the results in Table 3.1 to plot a graph of R against l . Start your graph at (0, 0). Draw the best-fit straight line.



[3]

- (c) (i) Extend your line to predict the value of resistance R at length $l = 10.0\text{ cm}$.

$R = \dots\dots\dots \Omega$ [1]

- (ii) Suggest the relationship between the length of the wire and its resistance.

.....
[1]

- (d) Give **one** possible source of inaccuracy in this experiment and the precaution you would take to minimise it.

source of inaccuracy

precaution

.....
 [2]

4 A nurse takes a blood sample from a patient.

- (a) Describe a safety precaution the nurse should take when obtaining the blood sample from the patient.

.....
[1]

- (b) Fig. 4.1 shows a photograph of some of this blood as seen under a microscope.

A white blood cell has been labelled.

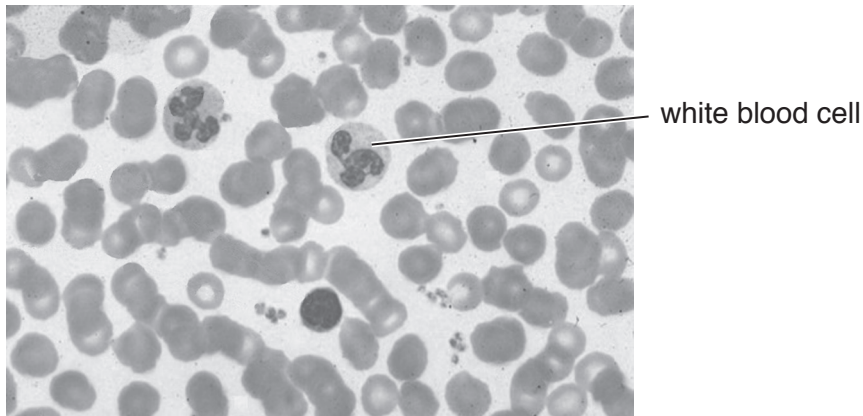
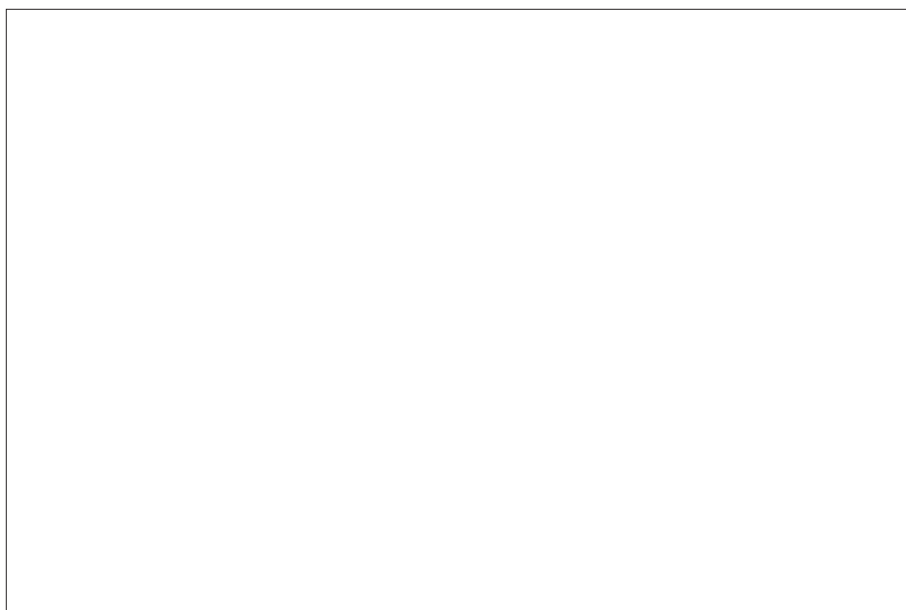


Fig. 4.1

- (i) On Fig. 4.1 draw label lines and label **one** red blood cell and **one** platelet. [2]

- (ii) In the box make a large pencil drawing of the labelled white blood cell.

Label the visible components.



[4]

- (c) (i) Measure to the nearest 0.5 mm the diameter of the labelled white blood cell in Fig. 4.1.

diameter = ... mm [1]

- (ii) Measure to the nearest 0.5 mm the diameter of this cell in your drawing.

diameter = ... mm [1]

- (iii) Use these measurements to calculate the magnification of your drawing to the nearest whole number.

magnification = ... [1]

- 5 A student investigates the effect of changing acid concentration on the rate of the reaction between hydrochloric acid and calcium carbonate.

In each experiment, he uses the same volume of hydrochloric acid and the same mass of powdered calcium carbonate.

Method

- He measures the volume of hydrochloric acid of concentration 0.2 mol/dm^3 and puts it into a conical flask.
- He measures the mass of the calcium carbonate with a balance and adds it to the acid.
- He measures the volume of gas produced after 2 minutes.
- He repeats the experiment for this concentration of acid.
- He repeats this procedure for concentrations of acid of 0.5 , 1.0 , 2.0 and 2.5 mol/dm^3 .
- He records in Table 5.1 the volume of gas produced in each experiment.

- (a) Complete the diagram in Fig. 5.1 to show how he can collect and measure the volume of gas produced. Remember to label the diagram. [2]

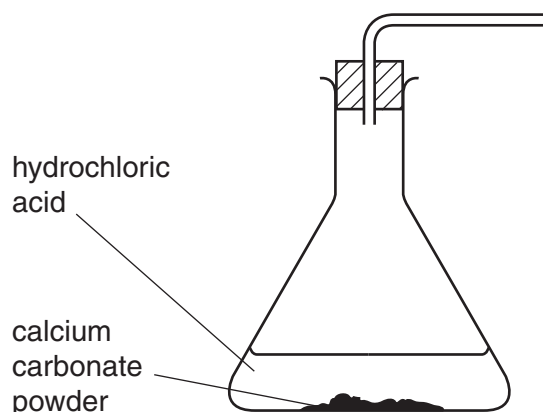


Fig. 5.1

- (b) Calculate the average (mean) volume of gas produced for each concentration of acid and record these values in Table 5.1. [1]

Table 5.1

concentration of hydrochloric acid in mol/dm^3	volume of gas produced in 2 minutes/ cm^3		
	experiment 1	experiment 2	average
0.2	5	7	
0.5	13	14	
1.0	29	27	
2.0	53	56	
2.5	66	64	

- (c) State which concentration of hydrochloric acid produced the fastest rate of reaction.

Use the data in Table 5.1 to justify your answer.

concentration

justification

..... [1]

- (d) (i) There is a piece of equipment not mentioned in the method, but which is needed to carry out a rate of reaction experiment.

State the name of this piece of equipment.

..... [1]

- (ii) The student measures the volume of hydrochloric acid using a measuring cylinder.

State the name of a different piece of apparatus which could be used to measure the volume more accurately.

..... [1]

- (e) (i) Suggest **one** factor not mentioned in the method which must be kept constant throughout the investigation.

..... [1]

- (ii) Explain why the experiment was repeated for each concentration of hydrochloric acid.

..... [1]

- (f) One of the products of the reaction is a gas.

State the name of the gas and describe a test which can be used to confirm its identity. Remember to include the result of the test in your answer.

gas

test

..... [2]

- 6 A student investigates the air temperature at different heights, h , above a lamp as shown in Fig. 6.1.

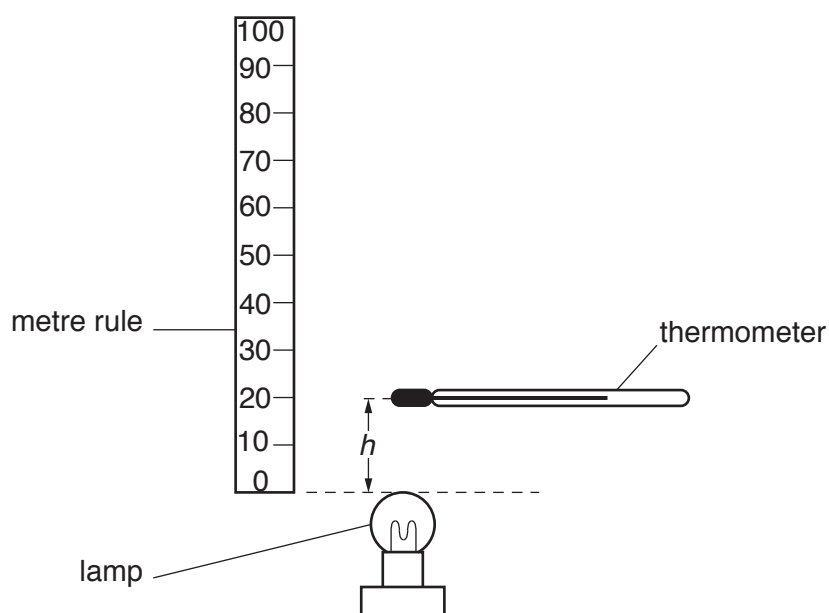


Fig. 6.1

- (a) Name the apparatus that she should use to keep the thermometer at a fixed height above the lamp.

.....[1]

- (b) Suggest **one** safety precaution the student should take while doing this experiment.

.....[1]

- (c) She records in Table 6.1 the temperature at different heights above the lamp.

Table 6.1

h/cm	2	4	6	8	10	12	14	16	18	20
temperature/ $^{\circ}\text{C}$	50	49	47	44	39	38	27	23	22	22

She plots her results on a graph as shown in Fig. 6.2.

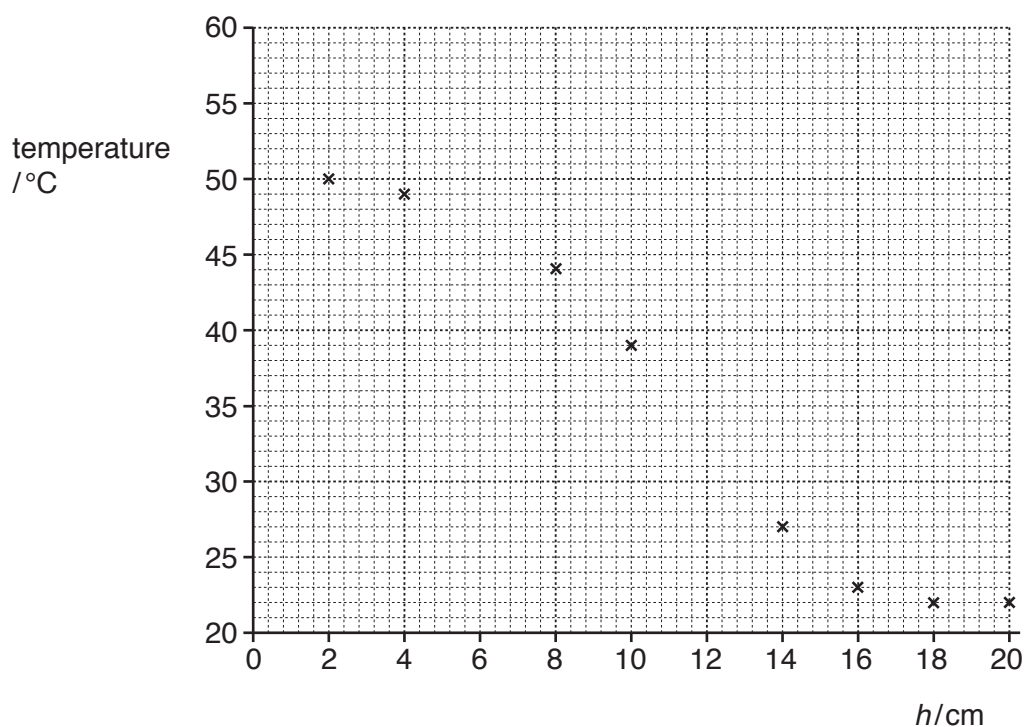


Fig. 6.2

- (i) Plot the **two** missing points on the graph. [1]
- (ii) Draw the curve of best-fit. [2]
- (iii) Use the graph to estimate the temperature 15 cm above the lamp.

Show clearly on the graph how this temperature is determined.

temperature = ... $^{\circ}\text{C}$ [2]

- (iv) Use the graph to describe the relationship between the height, h , of the thermometer above the lamp and the temperature.

.....
 [2]

- (v) Suggest why she stopped taking temperature measurements at 20 cm above the lamp.

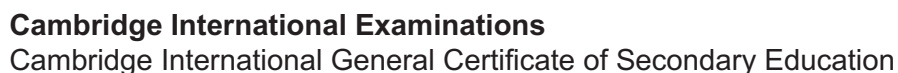
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 [1]

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0653/62

May/June 2017

1 hour

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READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

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The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **18** printed pages and **2** blank pages.

- 1 Fig. 1.1 shows a flower that has been cut in half lengthways. The photograph is life-size.

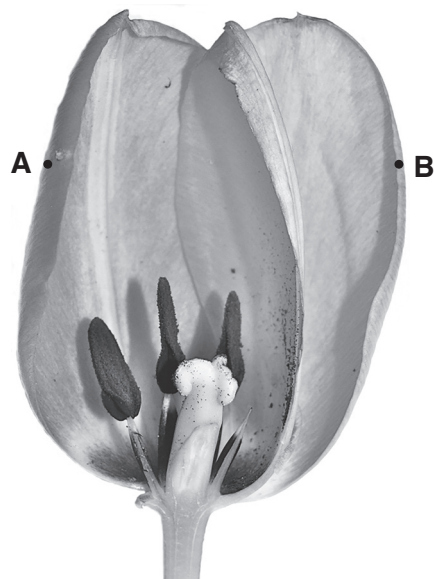
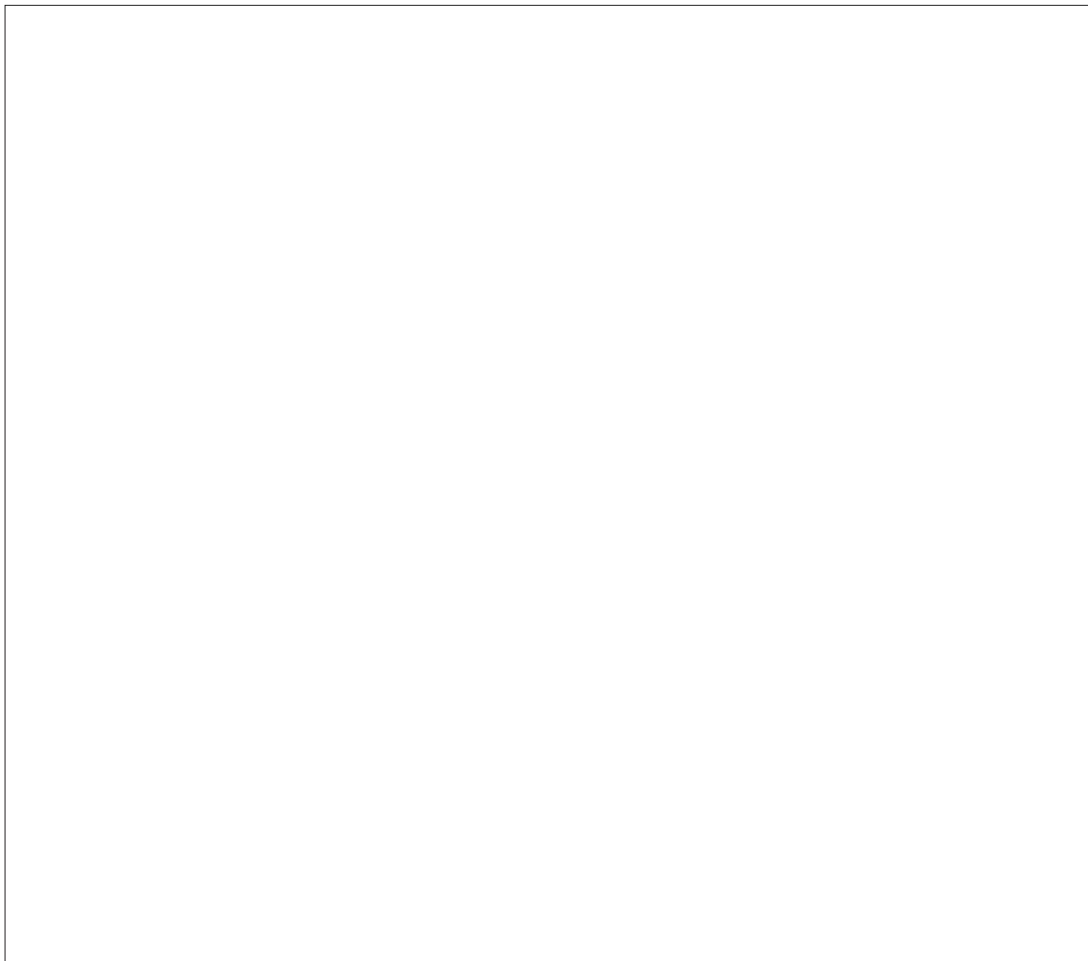


Fig. 1.1

- (a) (i) In the box shown, make a **large** pencil drawing of the flower. This should show all the flower parts including the petals.



[4]

(ii) On your drawing, use label lines to **label only** the following structures.

- an anther
- a stigma

[2]

(b) You are going to calculate the magnification of your drawing.

(i) On Fig. 1.1 draw a straight line between points **A** and **B**.

Measure the length of this line in millimetres to the nearest millimetre.

length = ... mm

Draw a matching line **A–B** on your pencil drawing.

Measure the length of this line in millimetres to the nearest millimetre.

length = ... mm
[2]

(ii) Use your two measurements to calculate the magnification of your drawing.

Show your working in the space below.

magnification = ... [1]

(c) On Fig. 1.1, circle the structure that receives pollen during pollination. [1]

- 2 A student investigates how the temperature of a reactant affects the rate of reaction between calcium carbonate (marble chips) and hydrochloric acid.

He sets up the apparatus as shown in Fig. 2.1.

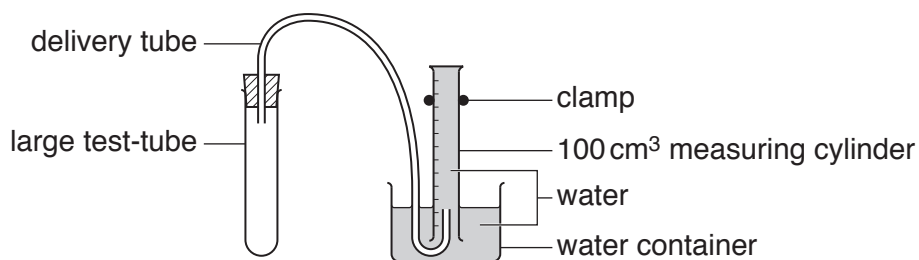


Fig. 2.1

- He places 20cm³ of hydrochloric acid into the large test-tube, measures the temperature of the acid and records the value in Table 2.1.
- He adds five marble chips to the acid and reconnects the delivery tube.
- He starts the stopclock.
- After **one** minute he reads the volume V_1 of gas collected in the measuring cylinder.
- After **two** minutes he reads the new total volume V_2 of gas collected in the measuring cylinder.
- Both values are shown in Table 2.1.
- This is repeated for different temperatures of acid.

Table 2.1

experiment	temperature of acid / °C	volume of gas after one minute V_1 / cm ³	volume of gas after two minutes V_2 / cm ³	volume of gas produced in second minute V / cm ³
1	21.5	6	13	
2	34.5	9	19	10
3	44.0	13	27	
4	55.0	17	38	

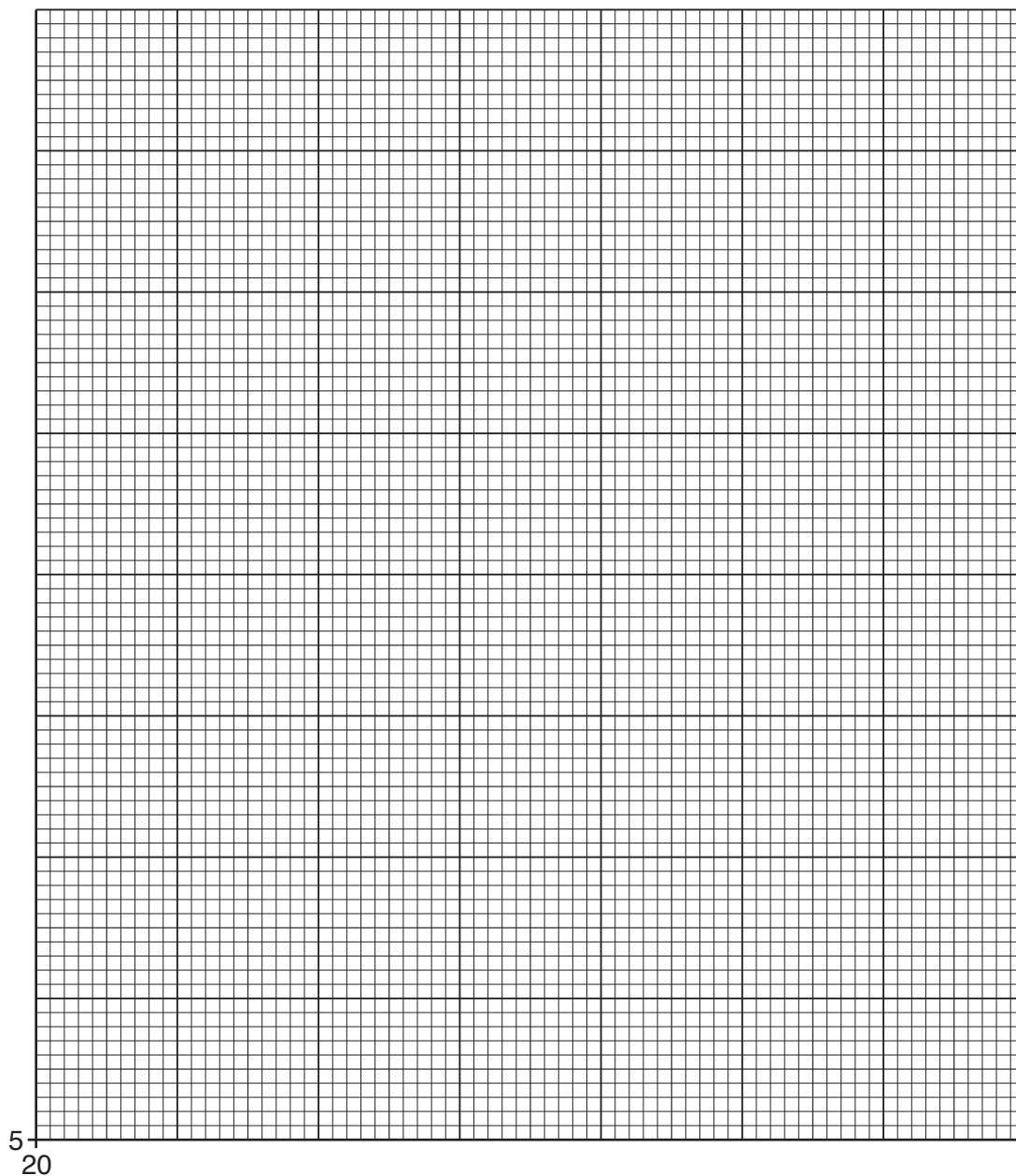
- (a) (i) For each experiment use the equation shown to calculate the volume of gas V produced in the second minute. One has been done for you. Record these values in Table 2.1.

$$V = V_2 - V_1$$

[1]

- (ii) On the grid provided, plot a graph of the volume of gas V produced in the second minute (vertical axis) against the temperature of the hydrochloric acid.

Draw the best-fit straight line or smooth curve as appropriate.



[4]

- (iii) Use your graph to describe the relationship between the temperature of the acid and the rate of the reaction.

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

- (b) (i) Suggest **one** reason why it is more accurate to compare the volumes of gas produced in the second minute rather than in the first minute.

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

- (ii) Another student does **not change** the marble chips for each new temperature of acid.

His results are significantly different from those of the first student.

Suggest why this happens.

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

- (iii) Suggest an alternative method for measuring the rate of reaction between marble chips and acid.

You may draw a labelled diagram but you must state what is being measured.

.....
.....
.....
.....[2]

Please turn over for Question 3.

- 3 A student measures the density of water by two different methods.

(a) **Method 1**

She uses a balance to measure the mass m_1 of an empty measuring cylinder.

The scale of the balance is shown in Fig. 3.1.

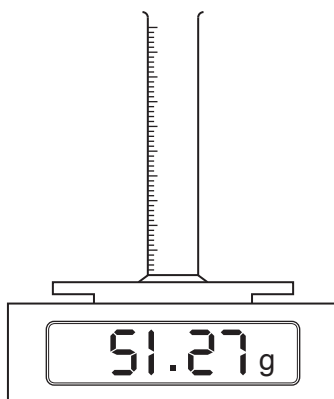


Fig. 3.1

- (i) Read the scale and record the mass of the empty measuring cylinder to the nearest 0.1 g.

$m_1 = \dots\dots\dots$ g [1]

- (ii) She removes the measuring cylinder from the balance and pours water into it. Part of the scale of the measuring cylinder is shown in Fig. 3.2.

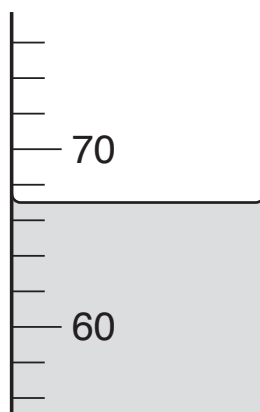


Fig. 3.2

Read the scale and record the volume V_1 of water in the measuring cylinder.

$V_1 = \dots\dots\dots$ cm³ [1]

- (iii) State how the student should ensure that the reading of the volume of water in the measuring cylinder that she records in (a)(ii) is as accurate as possible.

.....
[1]

- (iv) She uses the balance to measure and record the mass m_2 of the measuring cylinder and water.

$$m_2 = 120.4 \text{ g}$$

Calculate the density d_1 of the water using your values from (a)(i) and (a)(ii) and the value of m_2 . Use the equation shown. State the unit of your answer.

$$d_1 = \frac{(m_2 - m_1)}{V_1}$$

$$d_1 = \dots\dots\dots \text{ unit} = \dots\dots\dots [2]$$

(b) Method 2

The student uses the balance provided to measure and record the mass m_3 of a test-tube.

$$m_3 = 18.1 \text{ g}$$

She takes the measuring cylinder and water used in **Method 1** and slowly lowers the test-tube into the measuring cylinder until it floats, approximately vertically, as shown in Fig. 3.3.

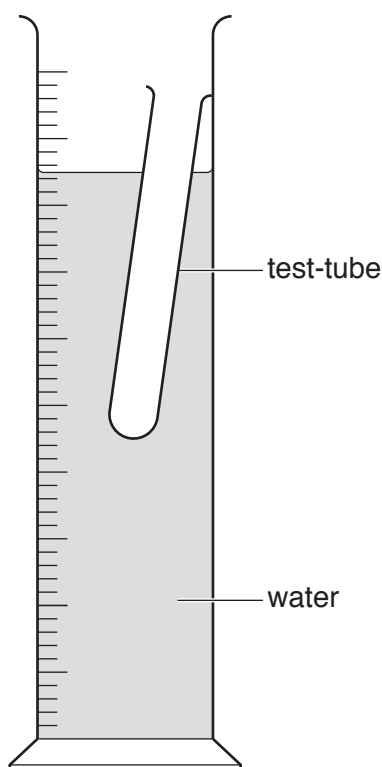


Fig. 3.3

She measures the volume V_2 of water recorded by the measuring cylinder.

$$V_2 = 85 \text{ cm}^3$$

- (i) Use the volume value from **(a)(ii)** and V_2 to calculate the volume of water V_3 displaced by the test-tube.

$$V_3 = \dots\dots\dots \text{cm}^3 \text{ [1]}$$

- (ii) Calculate the density d_2 of the water using your value from **(b)(i)** and the value of m_3 . Use the equation shown.

$$d_2 = \frac{m_3}{V_3}$$

$$d_2 = \dots\dots\dots \text{ [2]}$$

- (c) (i) Apart from the reading of the volumes, suggest **one** other possible source of inaccuracy in **Method 2**.

.....
 [1]

- (ii) Suggest **one** reason why it is good experimental practice for the student to carry out the two measurements of density in the order that she does.

.....
 [1]

Please turn over for Question 4.

- 4 A student investigates the starch and sugar content of plants using four similar shoots. She sets up the shoots as shown in Fig. 4.1.

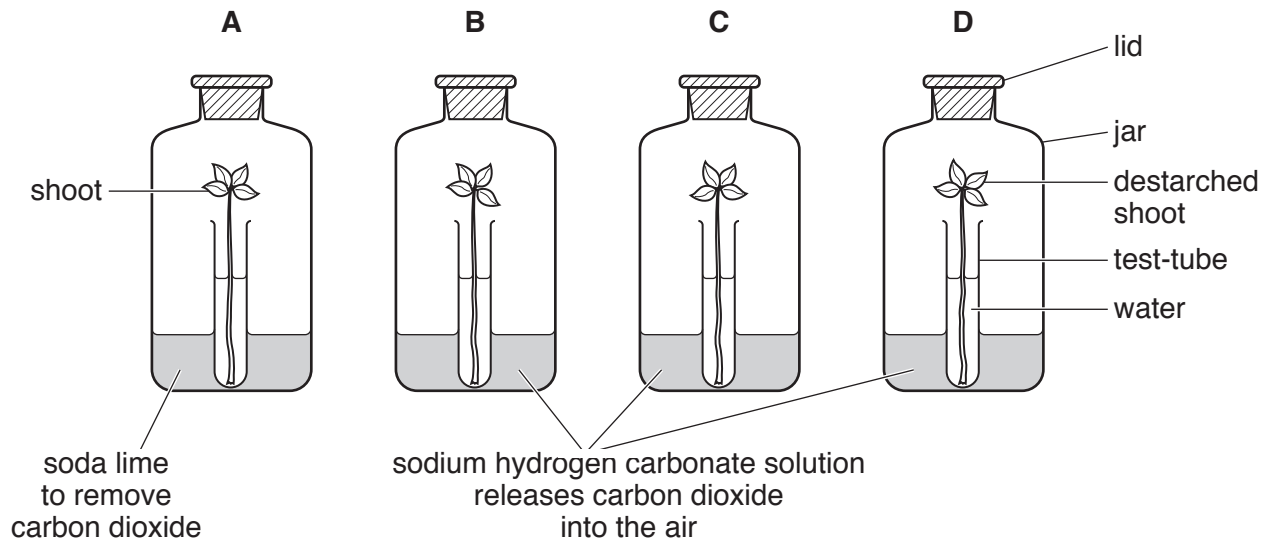


Fig. 4.1

The shoot in jar **D** is destarched. The other three shoots are **not** destarched.

- (a) Describe how a shoot can be destarched.

..... [2]

- (b) The jars are left for five days. Jars **A** and **B** are placed in light. Jars **C** and **D** are placed in the dark.

Each test-tube is tested for starch and reducing sugar at the start of day **1** and at the end of day **5**. The results of these tests are shown in Table 4.1.

Table 4.1

	A	B	C	D
presence of carbon dioxide	none	present	present	present
light conditions	light	light	dark	dark
starch content on day 1	high	high	high	none
starch content on day 5	none	high	none	none
reducing sugar content on day 1	high	high	high	little
reducing sugar content on day 5	little	high	little	none

- (i) Describe how the student can test a leaf for starch. Include the observation for a positive result.

.....

.....

.....

.....[3]

- (ii) Describe how the student can test for reducing sugar. Include the observation for a positive result.

.....

.....

.....

.....[3]

- (iii) State and explain **one** important safety precaution that the student should take in either of the above tests.

.....[1]

- (c) Use the results in Table 4.1 to state what the student can conclude from her investigation.

.....

.....[1]

- 5 A student prepares some pure blue crystals of copper sulfate.

He heats some dilute sulfuric acid in a beaker and then adds a small amount of black copper oxide, CuO.

He stirs the mixture and keeps adding copper oxide until it is in excess. See Fig. 5.1.

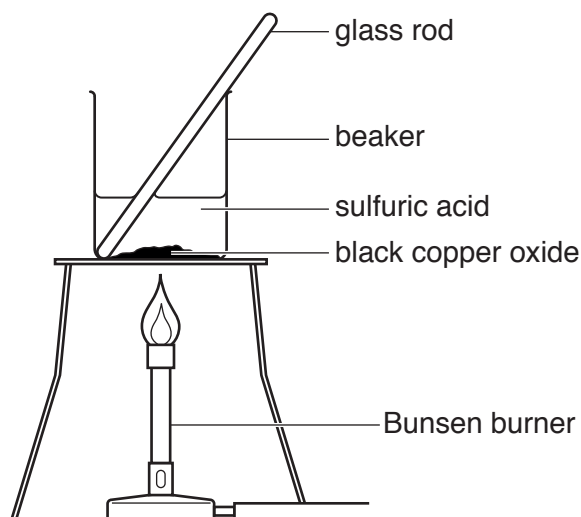


Fig. 5.1

- (a) (i) Explain how he knows when the copper oxide is in excess. Include observations in your answer.

.....
[1]

- (ii) Explain why he adds excess copper oxide.

.....
[1]

- (iii) Describe how the student removes the excess copper oxide.

.....
[1]

- (b) (i) The student wants to make pure dry crystals of blue copper sulfate.

He heats the solution from (a)(iii) strongly with a Bunsen burner, but he does **not** obtain blue crystals of copper sulfate. Instead he sees a white powder which gradually turns black.

Suggest what might have happened to the copper sulfate during this heating to dryness.

.....
[1]

- (ii) Describe a three-step method which the student should have used to obtain pure dry crystals of blue copper sulfate.

step 1

.....

step 2

.....

step 3

.....

[3]

- (c) The student wants to show that the blue crystals contain the sulfate ion.

Describe the test for the sulfate ion. Include the result for a positive test in your answer.

.....

.....[1]

- (d) Another student is asked to make a sample of zinc chloride crystals using the same method as in (a) and (b)(ii).

Name the **two** chemicals he should use.

1

2

[2]

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- 6 Five students, **P**, **Q**, **R**, **S** and **T**, investigate how temperature changes during the process of evaporation. They use the apparatus shown in Fig. 6.1.

They each perform the same experiment.

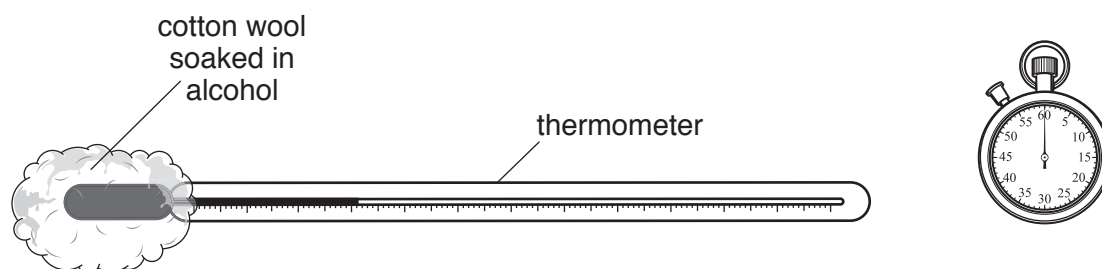


Fig. 6.1

They each put 1 cm^3 of alcohol onto the cotton wool surrounding the thermometer bulb.

They measure the starting temperature and then the temperature every 30 seconds for five minutes.

- (a) (i) Name a suitable piece of equipment for putting 1 cm^3 of alcohol onto the cotton wool surrounding the bulb of the thermometer.

.....[1]

- (ii) Explain why it is important for the students to use the same sized pieces of cotton wool to make it a fair comparison.

.....

.....[1]

- (b) (i) Read the thermometers shown in Fig. 6.2, which show the temperatures measured by student **Q** at 0s and 150s.

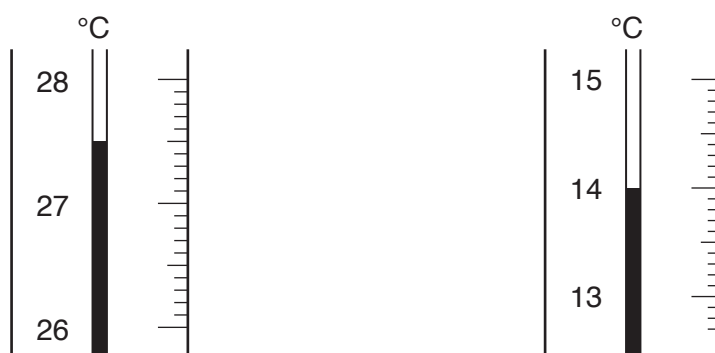


Fig. 6.2

Record the temperatures to the nearest 0.5 °C in Table 6.1.

[2]

Table 6.1

time/s	P	Q	R	S	T	average temperature/°C
0	25.0		26.5	25.0	25.0	25.8
30	22.0	20.5	22.0	19.0	20.5	20.8
60	18.0	17.0	18.0	17.0	19.0	
90	14.0	16.5	17.0	15.5	14.5	15.5
120	12.0	14.5	15.5	13.0	12.0	13.4
150	11.0		11.5	12.0	10.5	11.8
180	14.0	11.0	10.0	11.0	10.0	11.2
210	10.0	10.0	9.0	10.0	9.5	9.7
240	9.0	9.0	8.5	9.5	9.0	
270	8.0	8.0	8.0	9.0	8.0	8.2
300	8.0	7.0	8.0	7.5	8.0	7.7

- (ii) Calculate the average (mean) temperatures at 60 s and 240 s. Record these values in Table 6.1.

[2]

(c) One of student **P**'s results is anomalous.

(i) State the time at which this anomalous result occurred.

time = ... s [1]

(ii) Suggest what could have happened to cause this anomaly.

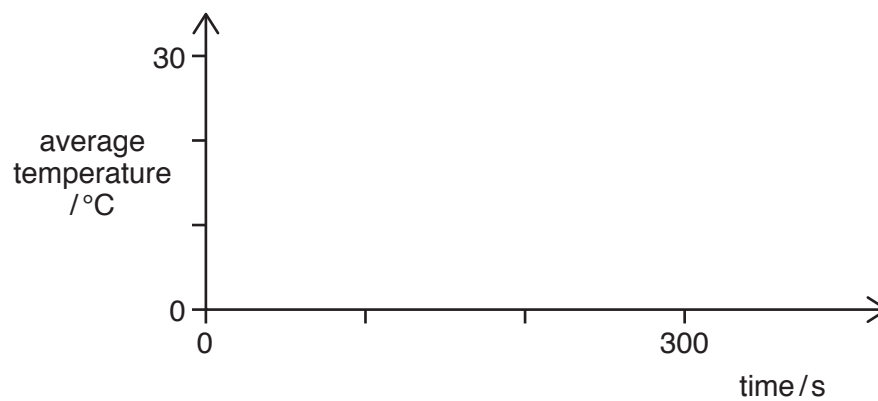
.....
 [1]

(d) Explain why the changes in temperature between 240 s and 300 s are very small.

.....
 [1]

(e) On the axes provided, sketch a line to show how the average temperature changes with time.

You do **not** have to plot the points.



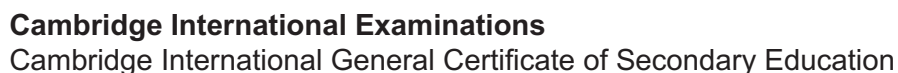
[1]

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0653/63

May/June 2017

1 hour

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

You may lose marks if you do not show your working or if you do not use appropriate units.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **18** printed pages and **2** blank pages.

1 A student investigates the production of gas by yeast cells.

- He adds some yeast suspension to a large test-tube and places the test-tube in a water-bath at 35 °C.
- He adds 5 g of sucrose to the test-tube and stirs well.
- He attaches a delivery tube to the large test-tube and collects the gas produced in an inverted measuring cylinder as shown in Fig. 1.1.

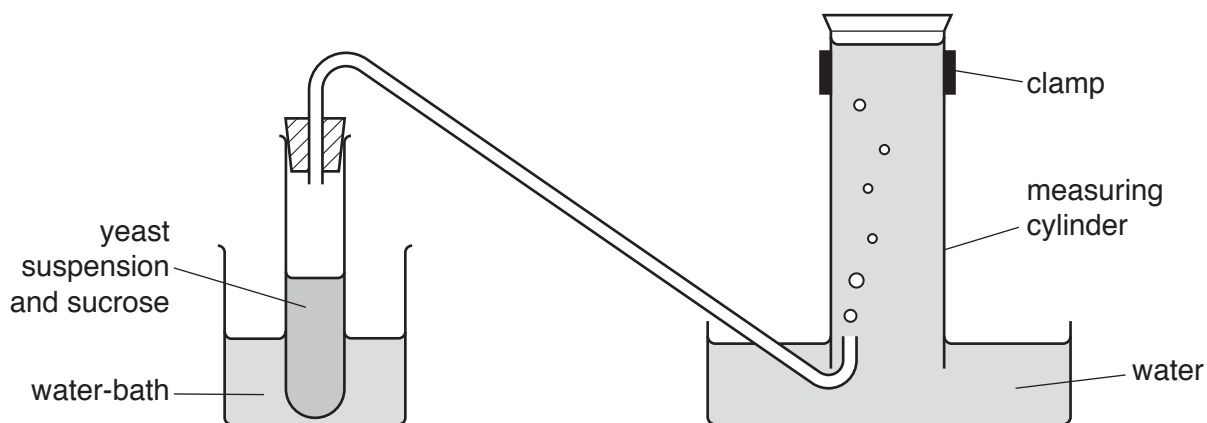


Fig. 1.1

- He starts the stopclock and measures the volume of gas collected to the nearest 0.1 cm³ every 2 minutes for 10 minutes.

His measurements are shown in Table 1.1.

Table 1.1

time / minutes	volume of gas collected / cm ³
0	0.0
2	0.5
4	1.5
6	6.2
8	
10	

(a) Read the volumes of gas in the measuring cylinder in Fig. 1.2.

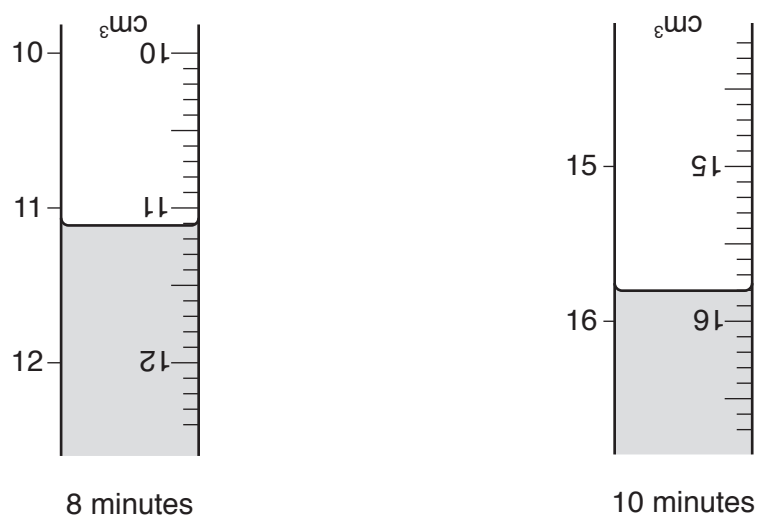


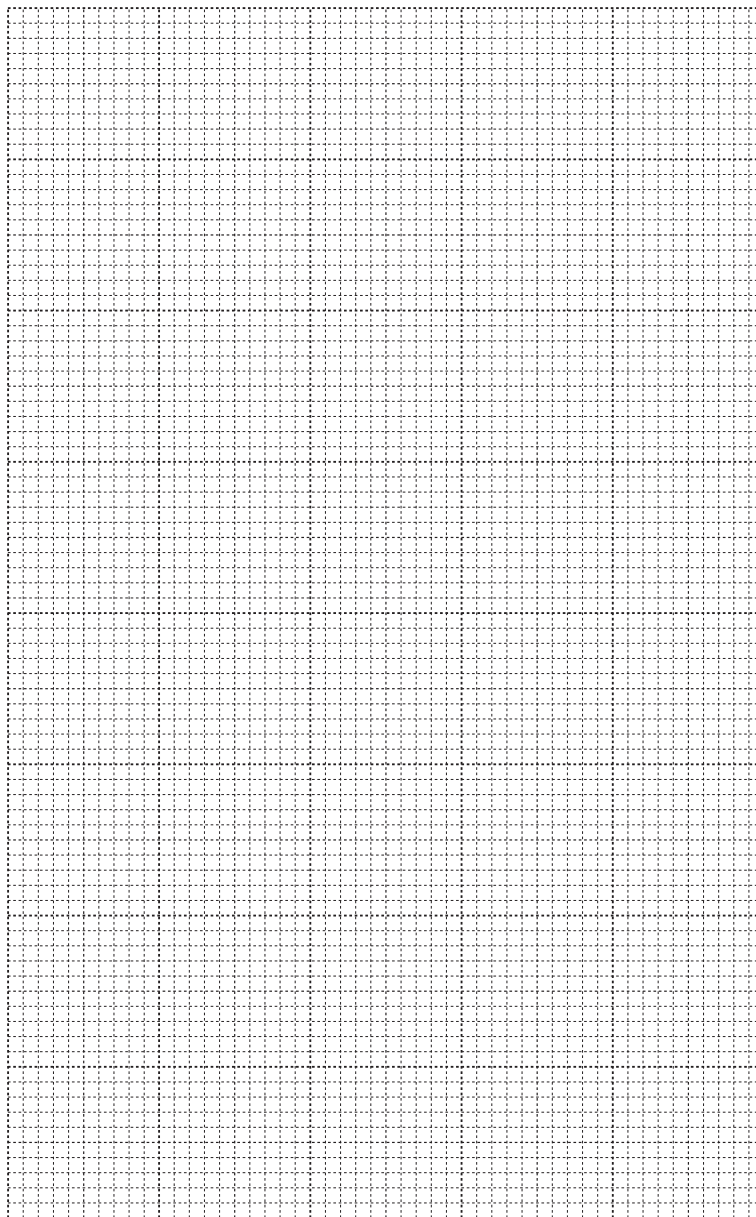
Fig. 1.2

Record these values in Table 1.1.

[2]

- (b) On the grid provided, plot a graph of the volume of gas produced (vertical axis) against time.

Draw the best-fit line.



[4]

- (c) The student empties the measuring cylinder. He adds limewater to the measuring cylinder and shakes it for a few seconds. The limewater turns milky.

- (i) Name the gas identified by this test.

.....[1]

- (ii) Name the process in yeast cells that produces this gas.

.....[1]

(d) Another student wants to investigate the effect of the amount of sucrose on the production of gas by yeast. She carries out the same experiment but uses **only half** the amount of sucrose.

(i) Predict, by adding a new line to your graph in (b), how this would change the volume of gas collected. Label this new line **S**. [1]

(ii) State **one** variable that the student needs to keep constant.

.....[1]

Please turn over for Question 2.

- 2 A student has to identify compounds **H** and **J**. Compound **J** is a solution of a sulfate and has the same cation as solid **H**.

- (a) • She strongly heats a test-tube containing **H**.
- The gas produced is bubbled through a delivery tube into limewater.
 - She removes the delivery tube from the limewater before she stops heating.
- (i) Complete Fig. 2.1 to show the apparatus when it is connected together.
- Label the apparatus and the chemicals.

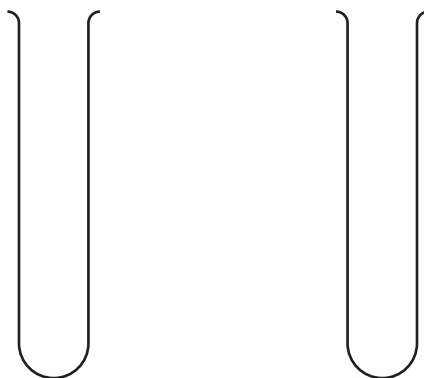


Fig. 2.1.

[2]

- (ii) Explain why it is important that the student removes the delivery tube from the limewater before she stops heating.

.....

.....[1]

- (iii) Her observations are shown below.

appearance of solid:

green solid changes to a black solid

appearance of limewater:

colourless solution becomes milky

State what these observations tell you about the identity of **H**.

.....

.....[1]

- (b) • She places solution **J** (which is blue in colour) in a large test-tube and adds an **excess** of sodium hydroxide solution.
- She stirs well and then filters the mixture.

Her description of the filtrate **F**, and the residue **R**, is shown below.

F colourless

R blue

Use the information in (a)(iii) and (b) to identify **H** and **J**.

H is

J is [2]

- (c) She heats **R**, the residue from (b), in a test-tube. She observes that steam and a black solid are produced.

During this reaction **R** changes into compound **K**.

K contains the same cation as **H**.

K also forms when **H** is heated in (a).

Identify **K**.

Compound **K** is [1]

- (d) Filtrate **F** in (b) should be a mixture of sodium sulfate and sodium hydroxide. Suggest how the presence of the sulfate ion can be confirmed.

.....

..... [1]

- (e) A student carries out the test in (b) using zinc sulfate solution instead of solution **J**.

- (i) State what the student observes during the test.

.....

..... [1]

- (ii) Explain why no residue is seen when the mixture is filtered.

.....

..... [1]

- 3 A student measures the focal length, f , of a convex lens using the experimental set-up shown in Fig. 3.1.

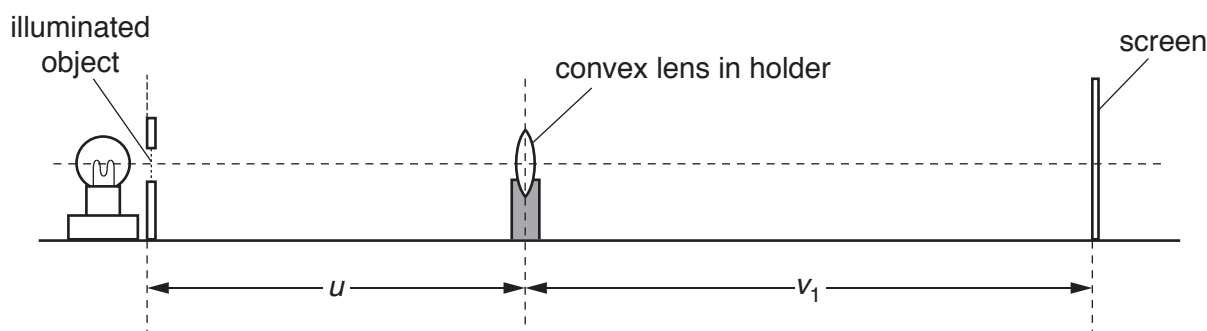


Fig. 3.1

He places the lens a distance $u = 25.0$ cm from the illuminated object. He adjusts the position of the screen by moving it backwards and forwards along the bench, until a sharp image of the illuminated object is formed on the screen.

- (a) (i) On Fig. 3.1, measure, to the nearest 0.1 cm, the image distance v_1 from the lens to the screen.

$v_1 = \dots\dots\dots$ cm [1]

- (ii) Fig. 3.1 is drawn one-fifth full size. Calculate the actual image distance v from the lens to the screen.

Write your answer in Table 3.1.

[1]

- (iii) The student repeats the procedure described above for values of u of 35.0 cm, 45.0 cm, 55.0 cm and 65.0 cm.

His results are shown in Table 3.1.

Table 3.1

object distance u / cm	image distance v / cm	$y = \frac{1000}{u} / \frac{1}{\text{cm}}$	$x = \frac{1000}{v} / \frac{1}{\text{cm}}$
25.0			
35.0	26.2	28.6	38.2
45.0	22.6	22.2	44.2
55.0	20.5	18.2	48.8
65.0	19.4	15.4	51.5

Complete Table 3.1 by filling in the remaining values of y (where $y = \frac{1000}{u}$) and x (where $x = \frac{1000}{v}$).

Write your values of y and x to one decimal place.

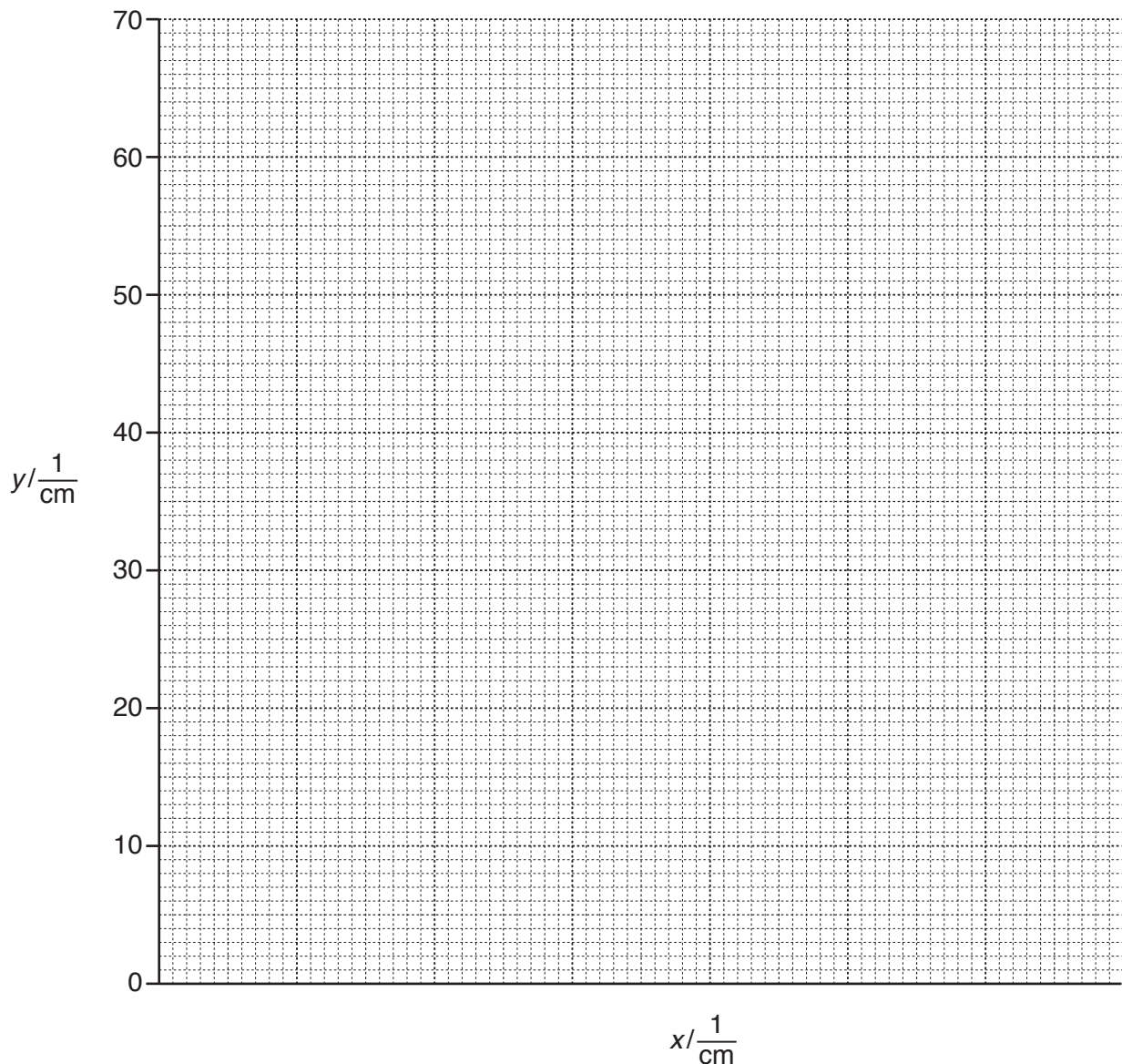
[1]

- (b) State **one** precaution that the student should take while carrying out the experiment to ensure that the readings he obtains are as accurate as possible.

.....
[1]

- (c) (i) On the grid provided, plot a graph of y (vertical axis) against x . **Start the x-axis from zero.**

Draw the best-fit straight line.



[3]

- (ii) Use your graph to determine the intercept your line makes with the y -axis.

You may need to extend your graph line until it cuts the y -axis.

intercept = ... [1]

- (iii) The focal length, f , of the lens is given by the equation shown.

$$f = \frac{1000}{\text{intercept}}$$

Calculate the focal length of the lens.

$f =$ cm [2]

4 A student investigates the effect of temperature on the growth of germinated seeds.

- She takes several seeds that have been allowed to germinate.
- She places some of the germinated seeds onto some cotton wool in dish **A**.
- She repeats for dishes **B** and **C**.
- She places dish **A** in a room at 5 °C,
dish **B** in a room at 15 °C,
and dish **C** in a room at 25 °C.
- After two days she measures the height of the shoots.

(a) State **two** conditions or substances that the seeds need in order to germinate.

1

2 [2]

(b) State how the student can make sure the shoots of the germinated seeds grow **vertically** upwards.

..... [1]

(c) Predict the appearance of the germinated seeds after the two days by drawing **one** shoot in each dish.

Draw these shoots in Fig. 4.1.

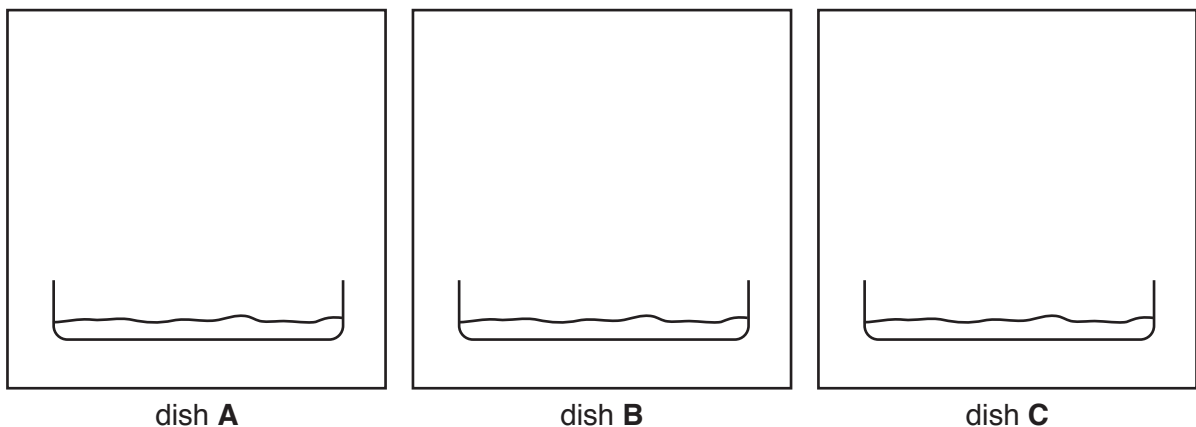


Fig. 4.1

[3]

- (d) Describe how she could test for the presence of reducing sugar. Include the observation for a positive result.

method

.....

.....

observation

.....

[3]

- (e) Suggest why the student used more than one germinating seed in each dish.

.....[1]

- 5 A student investigates the effect of surface area of a solid on the rate of reaction.

He uses the apparatus shown in Fig. 5.1.

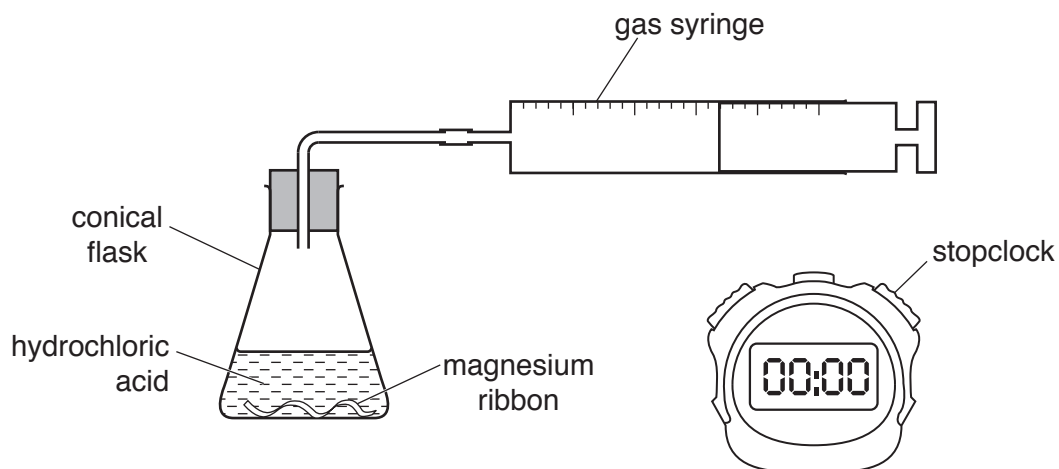


Fig. 5.1

- (a) 1. He places one 3 cm piece of magnesium ribbon into the conical flask.
2. He adds 25 cm³ of hydrochloric acid.
3. He connects the flask to the gas syringe and starts the stopclock.

List the measurements he should record in this experiment.

.....

.....

.....

.....[2]

(b) He repeats the steps in (a) but uses **two** 3 cm pieces of magnesium ribbon instead of one piece.

(i) State how the observations and measurements he makes are different from those in (a).

observations

.....

measurements

.....

[2]

(ii) Suggest how the student should continue the experiment to obtain a more reliable conclusion about the effect of surface area of a solid on the rate of reaction.

.....

.....

.....[2]

(iii) State **two** factors, other than the volume of hydrochloric acid, which must be kept constant throughout the investigation.

1

2

[2]

(c) Name the gas produced in this reaction and describe the test to confirm its identity.

name of gas

test to confirm identity

.....

[2]

6 A student investigates energy transfer.

He attaches a mass onto a piece of string which is attached to a clamp.

He lays a rough cloth on the bench and places a ball bearing, with a diameter of 6 mm, onto the cloth next to the hanging mass as shown in Fig. 6.1.

He places a metre rule on the cloth alongside the ball bearing so that the ball bearing is at the 0 cm mark.

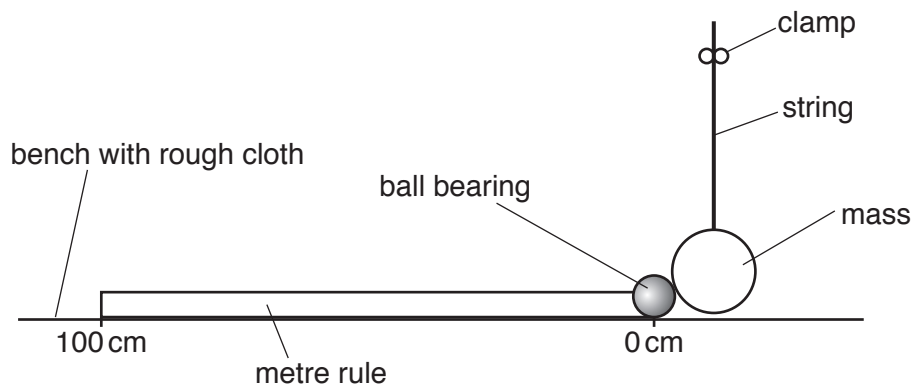


Fig. 6.1

He pulls the mass to the side to make an angle $\theta = 10^\circ$ as shown in Fig. 6.2.

He lets go of the mass and as it swings down it hits the ball bearing which moves to the left as shown in Fig. 6.3.

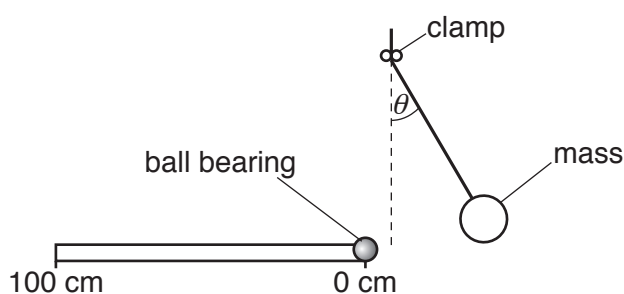


Fig. 6.2

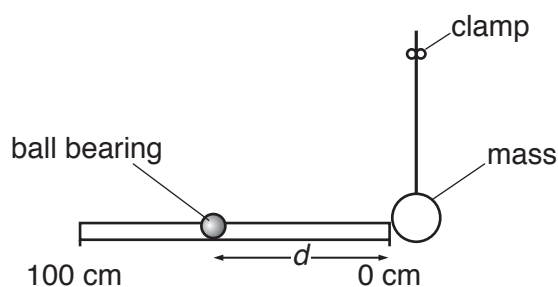


Fig. 6.3

He measures the distance d travelled by the ball bearing.

He repeats the experiment for angles $\theta = 20^\circ, 30^\circ, 40^\circ, 50^\circ, 60^\circ$ and 70° .

(a) Fig. 6.4 shows the distance travelled by the ball bearing at $\theta = 20^\circ$.

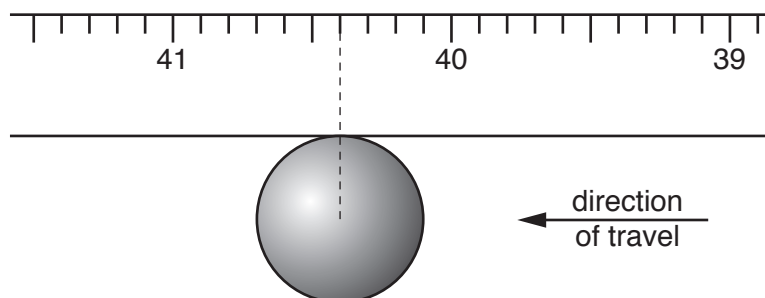


Fig. 6.4

Read the distance on the metre rule and record it in Table 6.1.

Table 6.1

angle $\theta / ^\circ$	distance / cm
10	20.3
20	
30	59.2
40	56.2
50	88.0
60	91.9
70	95.4

[1]

(b) The student plotted his results onto a graph as shown in Fig. 6.5.

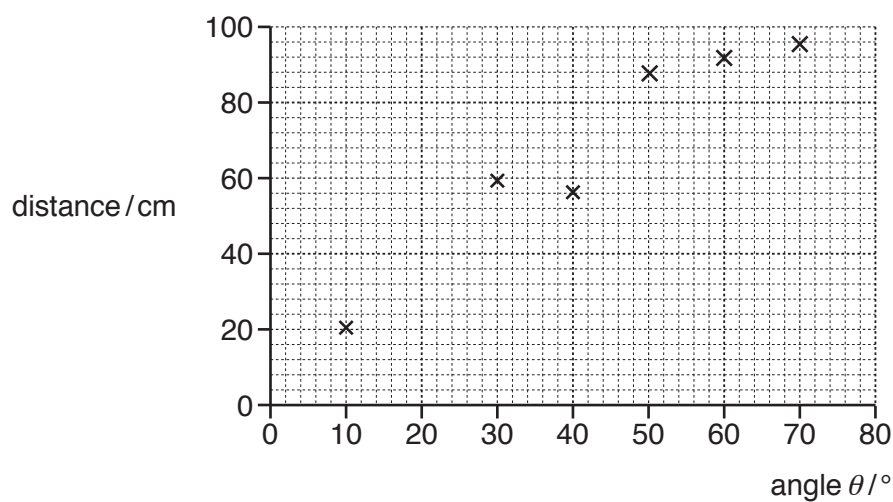


Fig. 6.5

- (i) Plot the point at $\theta = 20^\circ$.

Draw a line of best-fit.

[2]

- (ii) Use your graph to describe in detail the relationship between the angle θ and the distance moved by the ball bearing.

.....

[2]

- (c) Another student carries out a similar experiment to investigate how the distance moved by the ball bearing changes as the diameter of the ball bearing changes.

State the changes that he should make to this experiment. Include the diameters of the ball bearings to be used.

.....

[3]

- (d) In these experiments, some of the energy of the mass transfers to the ball bearing.

- (i) Complete the sentence by adding the names of the energies involved in the transformation.

The energy of the mass transfers to
 energy of the ball bearing.
 [1]

- (ii) Suggest why this experiment is carried out on a rough cloth instead of the surface of the bench.

.....
[1]

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