* 0000800000001 * DFD

CAMBRIDGE
International Education

# Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*3785751161*

**CO-ORDINATED SCIENCES** **0654/62**

Paper 6 Alternative to Practical **February/March 2026**

**1 hour 30 minutes**

You must answer on the question paper.

No additional materials are needed.

**INSTRUCTIONS**

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

**INFORMATION**

- The total mark for this paper is 60.
- The number of marks for each question or part question is shown in brackets [ ].
- Notes for use in qualitative analysis are provided in the question paper.

This document has **24** pages. Any blank pages are indicated.

DC (WW/SG) 356563/3
© Cambridge University Press & Assessment 2026
**[Turn over**

**1** A student investigates okra and star fruit.

Figure 1.1 shows a photograph of a slice of okra at its actual size.




**Figure 1.1**

**(a)** In the box, make a large, detailed, pencil drawing of the slice of okra shown in Figure 1.1.

[3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(b) (i)** Draw a line to join points **A** and **B** on Figure 1.1.

Record the length of this line **AB** in millimetres to the nearest millimetre.

length of line **AB** on Figure 1.1 = ..... mm [1]

**(ii)** Draw the line **AB** on your drawing in **1(a)**.

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

length of line **AB** on your drawing = ..... mm [1]

**(iii)** Calculate the magnification $m$ of your drawing.

Use your measurements in **1(b)(i)** and **1(b)(ii)** and the equation shown.

$$m = \frac{\text{length of line } \mathbf{AB} \text{ on your drawing}}{\text{length of line } \mathbf{AB} \text{ on Figure 1.1}}$$

Record your value to **two** significant figures.

magnification $m$ = ..... [2]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**BLANK PAGE**

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(c)** Figure 1.2 is a photograph of a slice of star fruit shown actual size.



**Figure 1.2**

Describe **two** visible differences and **one** visible similarity between the slice of okra in Figure 1.1 and the slice of star fruit in Figure 1.2.

difference 1 .....

.....

difference 2 .....

.....

similarity .....

.....

[3]

[Total: 10]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**2** A student tests the nutrient content of yogurt.

**(a) Procedure**

The student:

**step 1** adds equal amounts of yogurt to two test-tubes

**step 2** adds Benedict's solution to one of the test-tubes of yogurt

**step 3** stirs with a glass rod to mix the contents of the test-tube

**step 4** places the test-tube into a hot water-bath

**step 5** adds biuret solution to the other test-tube of yogurt

**step 6** stirs with a clean glass rod to mix the contents of the test-tube

**step 7** observes the final colour in each test-tube.

**(i)** Draw a results table to record the results.

[2]

**(ii)** The test-tube with Benedict's solution gives a positive result.

The test-tube with the biuret solution gives a positive result.

Record in your Table in **2(a)(i)** the final colours observed by the student in each test-tube. [2]

**(iii)** Use the results to state a conclusion for the nutrient content of yogurt.

.....

..... [2]

DO NOT WRITE IN THIS MARGIN DO NOT WRITE IN THIS MARGIN DO NOT WRITE IN THIS MARGIN DO NOT WRITE IN THIS MARGIN DO NOT WRITE IN THIS MARGIN

**(b)** **(i)** Explain why it is important in **step 3** and **step 6** to stir to mix the contents of the test-tubes.

.....

..... [1]

**(ii)** Explain why it is important in **step 6** to use a clean stirring rod.

.....

..... [1]

**(c)** A student tests a food sample for the presence of fat.

State the reagents needed and the observation for a positive result.

reagents ..... and .....

observation for a positive result .....

[2]

[Total: 10]

DO NOT WRITE IN THIS MARGIN

**3** A student investigates the rate of reaction of calcium carbonate with dilute hydrochloric acid.

Calcium carbonate reacts with dilute hydrochloric acid forming carbon dioxide gas.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

**(a) Procedure**

The student:

- uses the apparatus shown in Figure 3.1

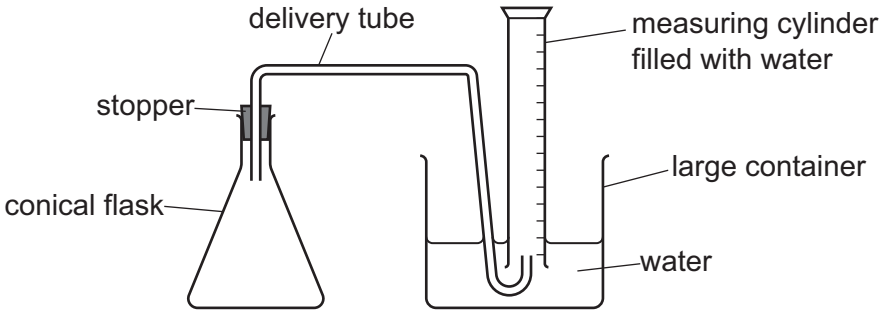



**Figure 3.1**

- removes the conical flask from the apparatus
- adds 25 $cm^3$ of dilute hydrochloric acid into the conical flask
- adds calcium carbonate to the conical flask
- quickly replaces the conical flask into the apparatus and starts a stop-watch
- measures the total volume of carbon dioxide gas in the measuring cylinder every 30 seconds for 5 minutes
- records in Table 3.1 these values to the nearest 0.5 $cm^3$.

**Table 3.1**

| time / s | total volume of carbon dioxide gas / $cm^3$ |
|---|---|
| 0 | 0.0 |
| 30 | |
| 60 | 42.5 |
| 90 | 48.0 |
| 120 | |
| 150 | 52.0 |
| 180 | 53.0 |
| 210 | 54.0 |
| 240 | 55.0 |
| 270 | 55.0 |
| 300 | 55.0 |

© Cambridge University Press & Assessment 2026 

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(i)** Figure 3.2 shows the reading on the measuring cylinder at 30 seconds and 120 seconds.

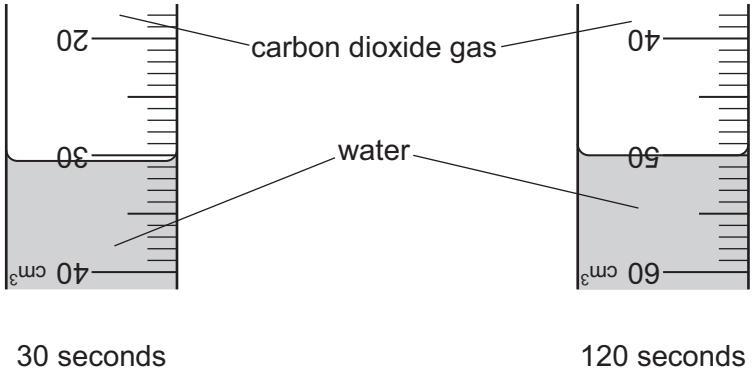
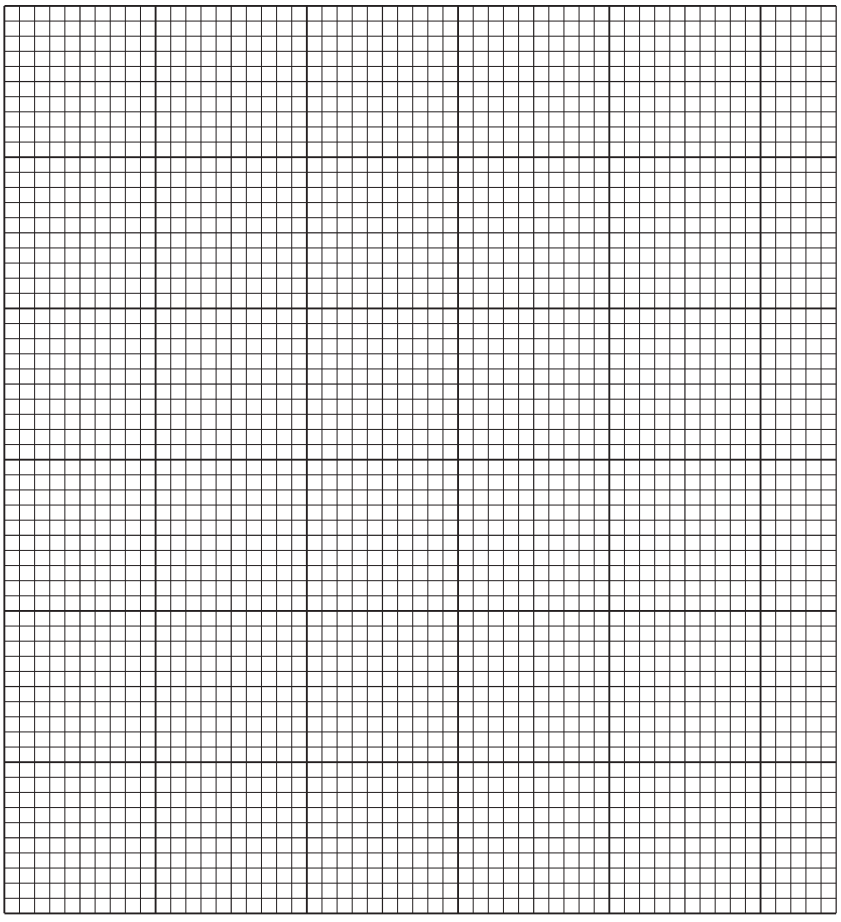



**Figure 3.2**

Record these volumes in Table 3.1. [2]

**(ii)** On the grid, plot total volume of carbon dioxide gas (vertical axis) against time.



[3]

**(iii)** Draw the best-fit curve. [1]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(iv)** Describe how the rate of the reaction changes during the 300 seconds.

Explain how your graph shows these changes.

.....

.....

.....

..... [2]

**(v)** Use the graph to estimate the volume of carbon dioxide gas evolved at 75 seconds.

volume of carbon dioxide gas = ..... $cm^3$ [1]

**(vi)** Suggest an observation from the investigation which shows that the reaction has finished.

.....

..... [1]

**(b)** Calculate the average rate of reaction.

Use the equation shown.

$$\text{average rate} = \frac{\text{total volume of carbon dioxide gas given off}}{300}$$

average rate = ..... $cm^3/s$ [1]

**(c)** The student repeats the experiment using the same amounts of calcium carbonate and dilute hydrochloric acid but at a **higher** temperature.

The rate of reaction is faster than in the first experiment.

Draw a line on the grid in **3(a)(ii)** to show the results expected for this faster reaction.

Label the line **F**. [2]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(d)** A systematic error in an experiment causes all readings to differ from the true reading by a similar amount or similar proportion. Repeating does **not** correct for a systematic error.

**(i)** One systematic error is the loss of gas when replacing the conical flask into the apparatus.

Explain why this is a systematic error.

.....

..... [1]

**(ii)** Suggest one method of reducing this systematic error.

.....

..... [1]

**(e)** A random error in an experiment is due to changes in the environment or the misreading of a measurement. Repeating and calculating an average may reduce the effect of the random error.

One random error in this experiment is the reading of volume on the measuring cylinder.

Describe how this random error is reduced. Do **not** include repeating the procedure, repeating the readings or changes in the environment.

.....

..... [1]

**(f)** To determine the rate of a reaction at a particular time, a tangent is drawn on the curve at that time.

For example, the rate of reaction at 30 seconds is found by drawing a tangent at 30 seconds as shown on Figure 3.3.

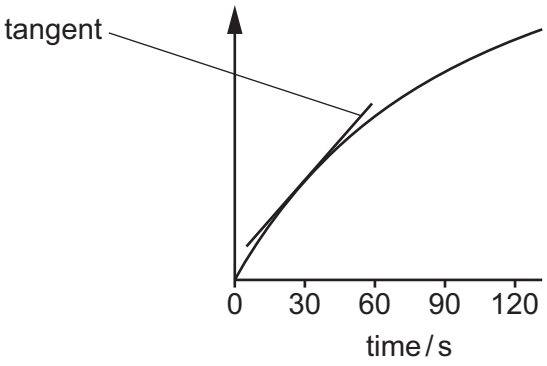



**Figure 3.3**

The rate of the reaction at 30 seconds is the gradient of the tangent in Figure 3.3.

A student does an experiment measuring the mass of gas given off in a reaction.

Figure 3.4 shows the graph of the student's results.

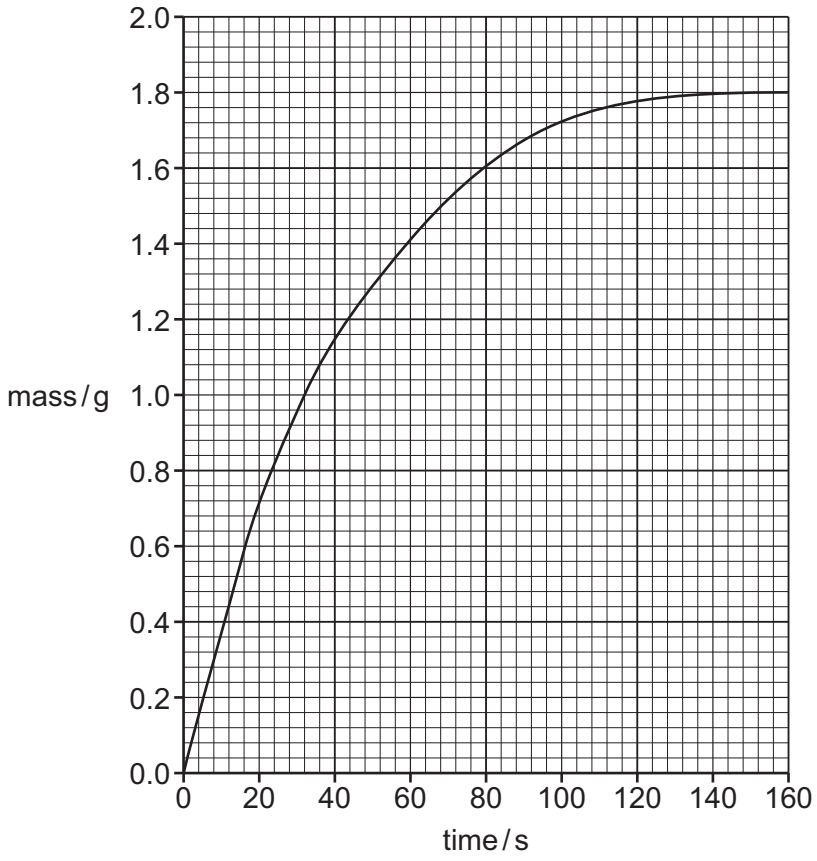



**Figure 3.4**

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(i)** Draw a tangent at 40 seconds on the graph in Figure 3.4. [1]

**(ii)** Calculate the gradient of your tangent.

This is the rate of reaction at 40 seconds.

gradient = ..... [1]

[Total: 18]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**4** A student investigates the identity of aqueous **H**.

**(a) Procedure**

The student:

- adds aqueous **H** into each of three test-tubes
- completes the tests detailed in Table 4.1
- records their observations in Table 4.1.

**Table 4.1**

| test | reagents added | observations |
|---|---|---|
| 1 | universal indicator | red colour |
| 2 | dilute nitric acid followed by aqueous silver nitrate | white ppt |
| 3 | dilute nitric acid followed by aqueous barium nitrate | colourless solution |

Explain why dilute nitric acid is added in tests **2** and **3**.

.....

..... [1]

**(b)** State the identity of solution **H**.

..... [1]

[Total: 2]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**Turn over**

**5** A student determines the power *P* of a burning candle by heating two different liquids.

**(a) Procedure**

The student:

**step 1** places a beaker on a balance and zeroes the balance

**step 2** pours water into the beaker

**step 3** records the mass in Table 5.1

**step 4** stirs the water with a stirring thermometer

**step 5** records in Table 5.1 the initial temperature of the water using the thermometer

**step 6** assembles the apparatus shown in Figure 5.1 and lights the candle

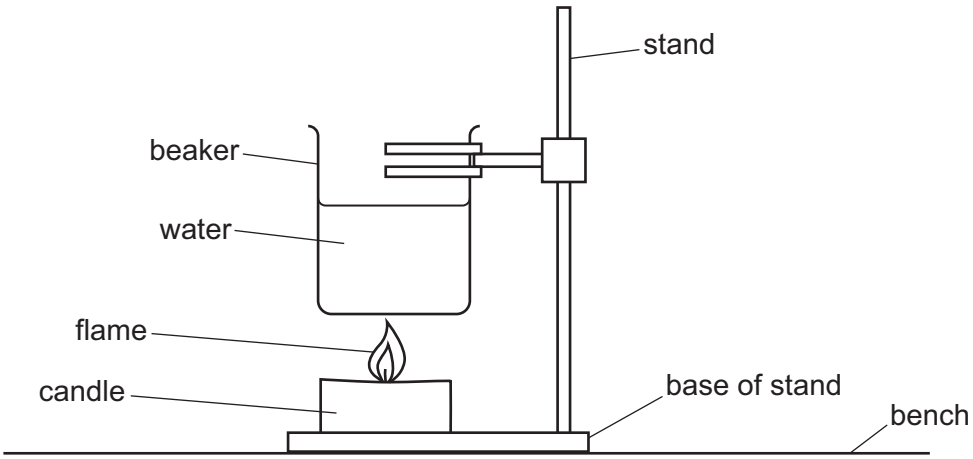



**Figure 5.1**

**step 7** immediately starts a stop-watch and waits for 120 s

**step 8** blows out the candle, stirs the water and records in Table 5.1 the final temperature of the water.

Repeats **step 1** to **step 8** using oil instead of water.

**Table 5.1**

| liquid | mass / g | initial temperature / °C | final temperature / °C | change in temperature / °C |
|---|---|---|---|---|
| water | 50.8 | 16.0 | 24.0 | |
| oil | | | | |

DO NOT WRITE IN THIS MARGIN

**(i)** Figure 5.2 shows the reading on the balance in **step 3** when oil is used.

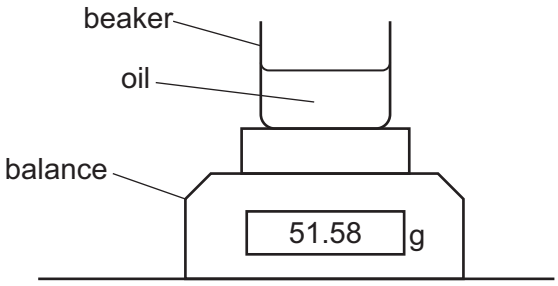



**Figure 5.2**

Record in Table 5.1 the mass in g to the nearest 0.1 g. [1]

**(ii)** Figure 5.3 shows the initial and final temperature readings on the thermometer when oil is used.

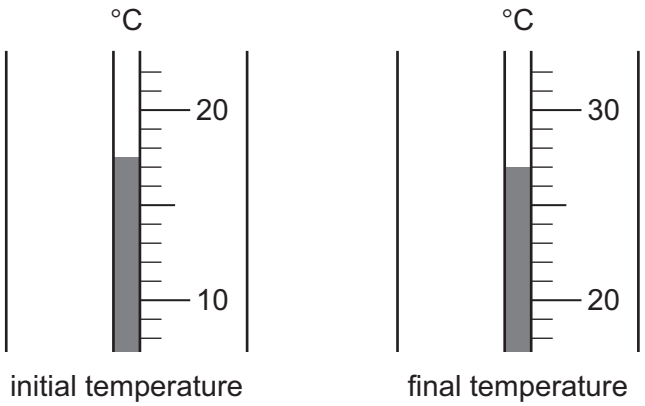



**Figure 5.3**

Record in Table 5.1 the temperatures in °C to the nearest 0.5 °C. [2]

**(iii)** Calculate the changes in temperature for the water and the oil.

Use the equation shown.

change in temperature = final temperature – initial temperature

Record these values in Table 5.1.

[1]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(iv)** Calculate the power $P$ of the burning candle for each liquid.

Use the equations shown.

**water**

$$P = \frac{4.2 \times \text{mass of water} \times \text{change in temperature}}{120}$$

$P =$ ..... W

**oil**

$$P = \frac{3.2 \times \text{mass of oil} \times \text{change in temperature}}{120}$$

$P =$ ..... W
[2]

**(v)** Two values are considered to be equal within the limits of experimental error if the difference between them is less than 10%.

Explain if your values of $P$ from **5(a)(iv)** are considered equal within the limits of experimental error.

Justify your answer with a calculation.

(If you do not have values of $P$ from **5(a)(iv)**, use $P = 15.5\,\text{W}$ for water and $P = 21.6\,\text{W}$ for oil.)

.....

..... [2]

**(vi)** To obtain accurate readings of temperature, it is important to stir the water in **step 4** and **step 8** of the procedure.

Explain how stirring improves accuracy.

.....

..... [1]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

**(b) (i)** Another student repeats the procedure three times using 50.0 g of sand and then repeats it three times using 50.0 g of solid wax.

The student's changes in temperature are shown in Table 5.2.

**Table 5.2**

| solid | change in temperature / °C | | |
|---|---|---|---|
| | trial 1 | trial 2 | trial 3 |
| sand | 61.1 | 59.6 | 60.8 |
| wax | 22.2 | 13.9 | 14.6 |

The student concludes the average change in temperature for sand is 60.5 °C and for wax is 16.9 °C.

Explain why the student's conclusion is **not** correct.

.....

.....

..... [2]

**(ii)** The student moves the beaker upwards so that it is further away from the flame.

Suggest what effect this has on the calculated values of *P*.

Explain your answer.

effect .....

explanation .....

.....

[1]

**(iii)** Suggest why the student heats the liquid for 120 seconds instead of 30 seconds in **step 7**.

.....

..... [1]

[Total: 13]

**6** A student investigates how the current in a series circuit changes with the number of lamps connected in the circuit.

Plan an investigation to determine the relationship between the current in a series circuit and the number of lamps connected in the circuit.

You are provided with:

- a number of identical lamps
- connecting wires.

You may use any common laboratory apparatus in your plan.

In your plan, include:

- the apparatus you will use
- a brief description of the method
- the variables you will control and how you will ensure your results are valid
- a results table for your measurements (you are **not** required to enter any readings into the table)
- how you will process your results to form a conclusion.

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [7]





**BLANK PAGE**

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

© Cambridge University Press & Assessment 2026 



## NOTES FOR USE IN QUALITATIVE ANALYSIS

### Tests for anions

| anion | test | test result |
|---|---|---|
| carbonate, $CO_3^{2-}$ | add dilute acid, then test for carbon dioxide gas | effervescence, carbon dioxide produced |
| chloride, $Cl^-$ [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | white ppt. |
| bromide, $Br^-$ [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | cream ppt. |
| iodide, $I^-$ [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | yellow ppt. |
| nitrate, $NO_3^-$ [in solution] | add aqueous sodium hydroxide, then aluminium foil; warm carefully | ammonia produced |
| sulfate, $SO_4^{2-}$ [in solution] | acidify with dilute nitric acid, then add aqueous barium nitrate | white ppt. |

### Tests for aqueous cations

| cation | effect of aqueous sodium hydroxide | effect of aqueous ammonia |
|---|---|---|
| ammonium, $NH_4^+$ | ammonia produced on warming | – |
| calcium, $Ca^{2+}$ | white ppt., insoluble in excess | no ppt. or very slight white ppt. |
| copper(II), $Cu^{2+}$ | light blue ppt., insoluble in excess | light blue ppt., soluble in excess, giving a dark blue solution |
| iron(II), $Fe^{2+}$ | green ppt., insoluble in excess, ppt. turns brown near surface on standing | green ppt., insoluble in excess, ppt. turns brown near surface on standing |
| iron(III), $Fe^{3+}$ | red-brown ppt., insoluble in excess | red-brown ppt., insoluble in excess |
| zinc, $Zn^{2+}$ | white ppt., soluble in excess, giving a colourless solution | white ppt., soluble in excess, giving a colourless solution |

### Tests for gases

| gas | test and test result |
|---|---|
| ammonia, $NH_3$ | turns damp red litmus paper blue |
| carbon dioxide, $CO_2$ | turns limewater milky |
| chlorine, $Cl_2$ | bleaches damp litmus paper |
| hydrogen, $H_2$ | ‘pops’ with a lighted splint |
| oxygen, $O_2$ | relights a glowing splint |

### Flame tests for metal ions

| metal ion | flame colour |
|---|---|
| lithium, $Li^+$ | red |
| sodium, $Na^+$ | yellow |
| potassium, $K^+$ | lilac |
| copper(II), $Cu^{2+}$ | blue-green |

DO NOT WRITE IN THIS MARGIN





**BLANK PAGE**

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

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

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in our Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge International Education is the name of our awarding body and a part of Cambridge University Press & Assessment, which is a department of the University of Cambridge.

© Cambridge University Press & Assessment 2026 

