



General Certificate of Secondary Education
2024

Centre Number

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Candidate Number

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Single Award Science

Unit 4

Booklet A

MV24

Higher Tier

[GSA43]

Time

2 hours, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **both** questions.

Information for Candidates

The total mark for this paper is **30**.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Follow all health and safety instructions.

You may use a ruler and calculator if required.

The apparatus and materials required to complete the task(s) are provided.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

Task 1 – Biology

Investigating photosynthesis

1 You have been provided with a destarched plant for this investigation.

(a) Complete the sentence below to describe how the plant was destarched.
[2 marks]

Choose from:

light

dark

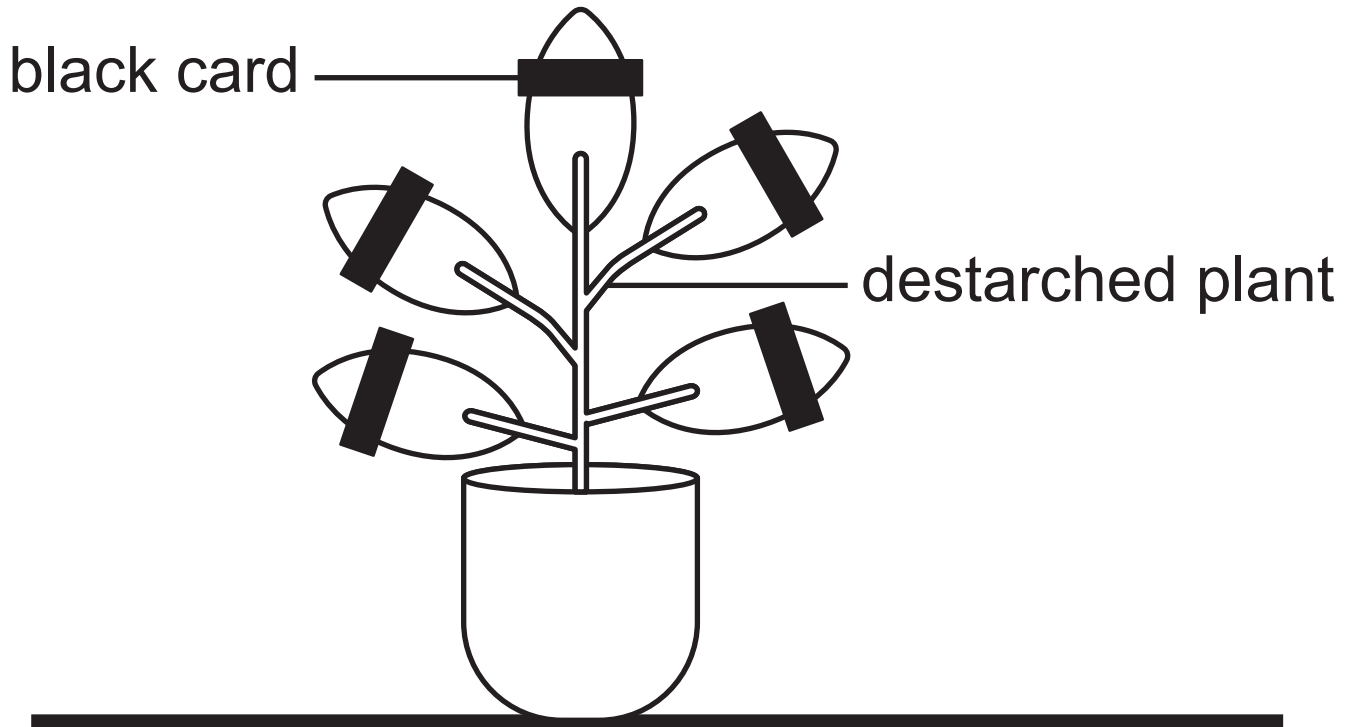
cold

two

forty-eight

The plant was destarched by leaving it in a _____ place for _____ hours.

After the plant was destarched, a strip of black card was placed over part of each leaf as shown in the diagram below.



The plant was then left in bright light for a period of time.

(b) Name the factor needed for photosynthesis which is absent from the part of the leaf under the black card.
[1 mark]

Follow the method below.

1. Remove a leaf with black card from the plant.
2. Remove the black card from the leaf.
3. Use the forceps to place the leaf into the beaker of hot water for one minute.
4. Use the forceps to remove the leaf from the hot water and place it in the boiling tube.
5. Pour just enough ethanol into the boiling tube to cover the leaf.
6. Immediately place the boiling tube with the ethanol and leaf into the beaker of hot water and leave for five minutes.
7. Pour the ethanol and the leaf into the small beaker. Record the colour of the ethanol in **Table 1** on page 6.
8. Use the forceps to remove the leaf from the small beaker. Be careful not to damage the leaf.
9. Dip the leaf back into the hot water for 10 seconds.
10. Use the forceps to remove the leaf from the hot water.
11. Place the leaf on the white tile and carefully spread it out.

12. Add enough drops of iodine solution to cover the leaf. Record your observations in **Table 2**.

(c) (i) Table 1 [1 mark]

Colour of ethanol at step 7	
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(ii) Table 2 [2 marks]

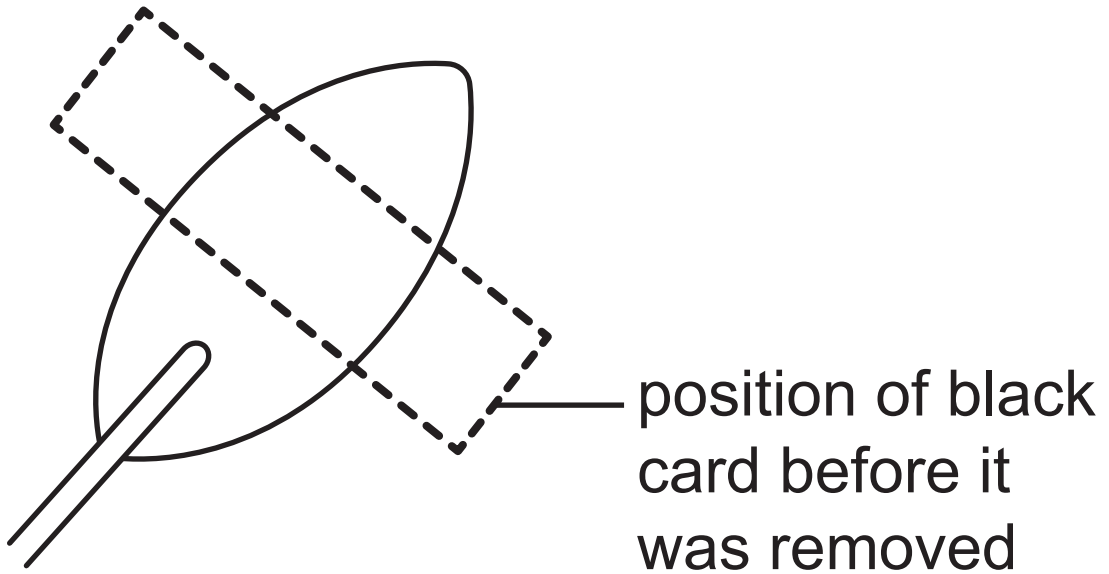
Part of leaf	Colour of iodine solution
covered with black card	
not covered with black card	

(d) Explain why the leaf was placed in the beaker of hot water in **step 3**. [1 mark]

(e) Why was a Bunsen burner **not** used to heat the boiling tube containing ethanol? [1 mark]

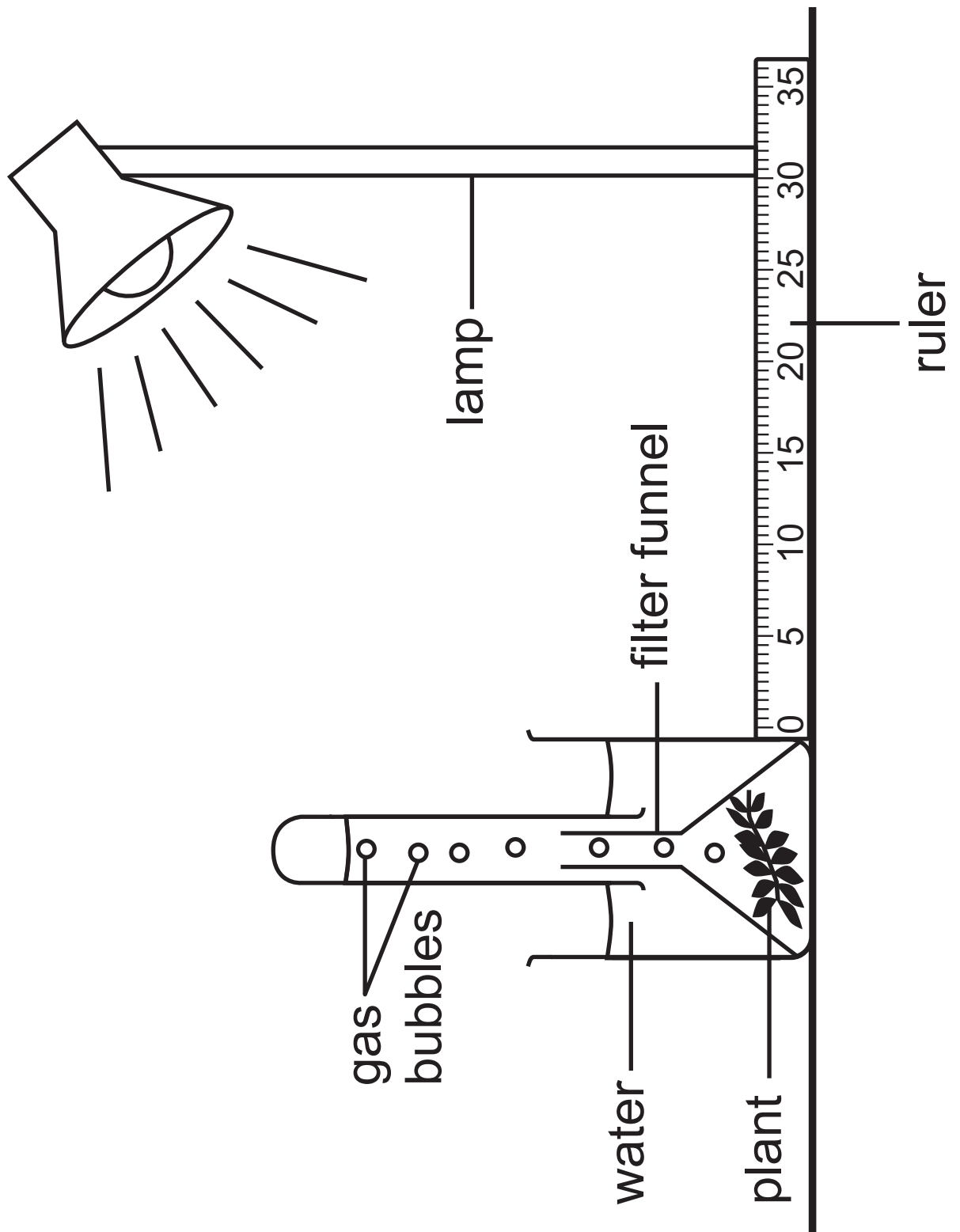
(f) In **step 6**, the ethanol was used to remove the chlorophyll from the leaf. Suggest why it was necessary to remove the chlorophyll. [1 mark]

(g) Shade the area(s) on the leaf below to show where starch was present in the leaf you tested. [1 mark]



(h) Another investigation was carried out to show how light intensity affects the **rate** of photosynthesis.

The diagram below shows how the apparatus was set up.



The lamp was placed 10 cm from the plant at the start of the investigation and the number of bubbles of gas produced in one minute was counted.

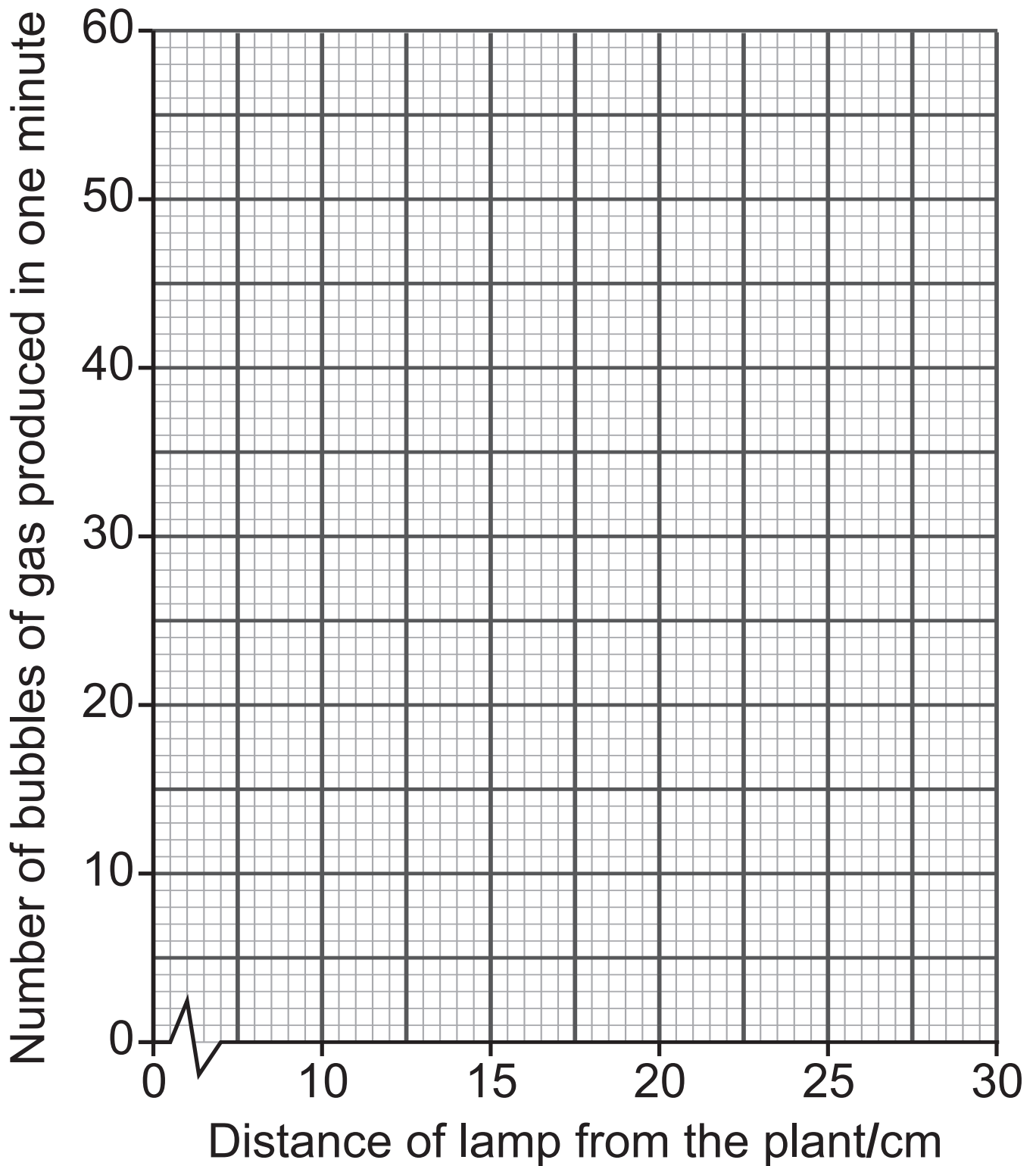
The lamp was then moved different distances from the plant.

The number of bubbles of gas produced in one minute at each distance was counted.

The table below shows the results.

Distance of lamp from the plant/cm	Number of bubbles of gas produced in one minute
10	56
15	44
20	31
25	19
30	7

(i) Plot and draw a line graph on the grid below for these results. [3 marks]



(ii) Describe the trend shown on the graph on page 11. [1 mark]

Measuring the volume of oxygen is a more accurate way of recording the gas produced in this investigation.

(iii) Name a piece of apparatus that could be used to **accurately** measure the volume of oxygen produced.
[1 mark]

Section B – Chemistry

Investigating neutralisation

- 2 Indigestion tablets contain an alkali and work by neutralising excess acid in the stomach.

You are provided with a beaker of acid and one crushed indigestion tablet.

- (a) (i) Name the hazard symbol shown on the acid. [1 mark]

- (ii) State **one** safety precaution needed when using the acid. [1 mark]

(b) (i) Follow the method below to investigate the change in pH when the acid is added to the crushed indigestion tablet. [3 marks]

1. Use the measuring cylinder to measure 20 cm^3 of water and pour this into a small beaker.
2. Add the crushed indigestion tablet to the beaker and stir until dissolved.
3. Add 2–3 drops of universal indicator solution to the beaker.
4. Record the colour of the solution before any acid is added (when the volume of acid added is zero) in the table opposite.
5. Use the pH chart to find the pH of the solution and record this in the table.
6. Use the dropping pipette to add 1 cm^3 of hydrochloric acid to the solution in the beaker.
7. Stir the solution and record its colour and pH in the table.

8. Repeat steps 6 and 7 until you have added a total of 10 cm³ of acid to the beaker.

Results table

Volume of acid added/cm ³	Colour of universal indicator	pH
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

(ii) Suggest the volume of acid added that made the solution pH 7.
[1 mark]

_____ cm³

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(Questions continue overleaf)

A student wanted to carry out this investigation using a different indicator. He used the following information to select a suitable indicator.

pH \ Indicator	1	2	3	4	5	6	7	8	9	10	11	12
Red Cabbage	P	P	P	V	V	B	B	B	G	G	Y	Y
Grape Juice	R	R	R	R	R	R	G	G	G	G	G	G
Litmus Solution	R	R	R	R	R	R	V	B	B	B	B	B

Key

P	Pink
R	Red
Y	Yellow
G	Green
B	Blue
V	Violet

(c) Which indicator, from the table, would be most suitable to use to identify when neutralisation occurred? Explain your answer. [2 marks]

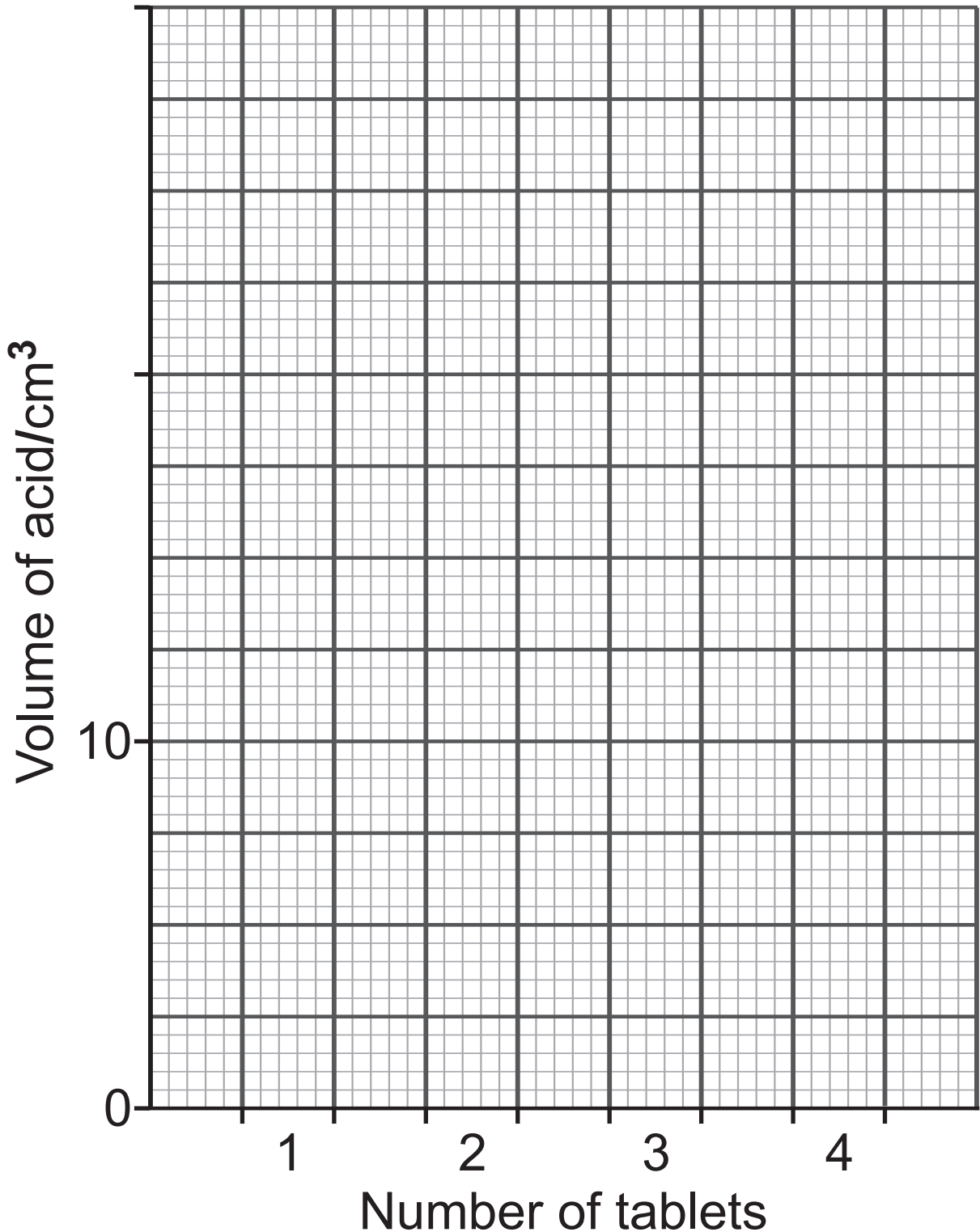
(d) A student followed a similar method to investigate how **changing the number of tablets** affected the volume of acid needed for neutralisation.

His results are shown below.

Number of tablets	Volume of acid/cm³
1	7
2	15
3	20
4	28

(i) Draw a **bar chart** of these results on the grid below.

Complete the scale on the **y-axis** (volume of acid/cm³). [3 marks]



(ii) State the trend shown by these results. [1 mark]

(iii) Use the results on page 20 to suggest the volume of acid that will be needed to neutralise **five** indigestion tablets. [1 mark]

_____ cm³

(e) The teacher suggested that the student should make sure his results are reliable.

Explain fully how the student could make his results more reliable. [2 marks]

This is the end of the question paper

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Question Number	Marks
1	
2	
Total Marks	

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