



Rewarding Learning

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

Higher Tier

ML

[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 down the right-hand side of pages 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.

For Examiner's  
use only

Question Number	Marks
1	
2	

Total  
Marks



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**.
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**

Colour of ethanol at step 7	
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[1]

(ii) **Table 2**

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

[2]

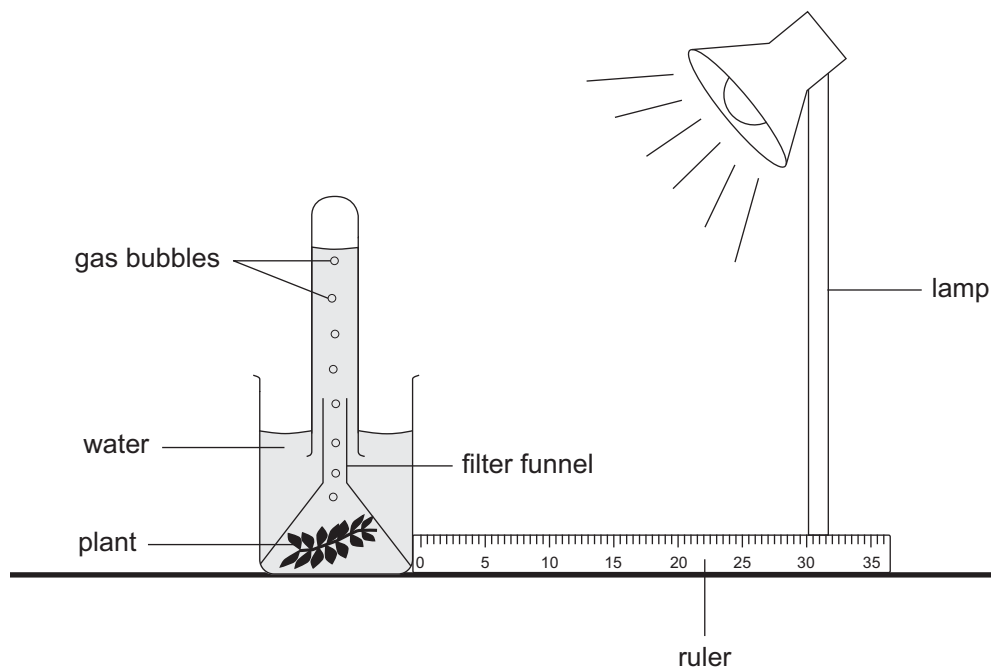
Examiner Only	
Marks	Remark



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(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



## Section B – Chemistry

Examiner Only

Marks Remark

### 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]

- (ii) State **one** safety precaution needed when using the acid.

\_\_\_\_\_  
\_\_\_\_\_ [1]

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

1. Use the measuring cylinder to measure  $20\text{ cm}^3$  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 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  $1\text{ cm}^3$  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  $10\text{ cm}^3$  of acid to the beaker.



### Results table

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

[3]

(ii) Suggest the volume of acid added that made the solution pH 7.

\_\_\_\_\_ cm<sup>3</sup> [1]

Examiner Only

Marks Remark

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

Indicator \ pH	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.

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[2]

Examiner Only	
Marks	Remark

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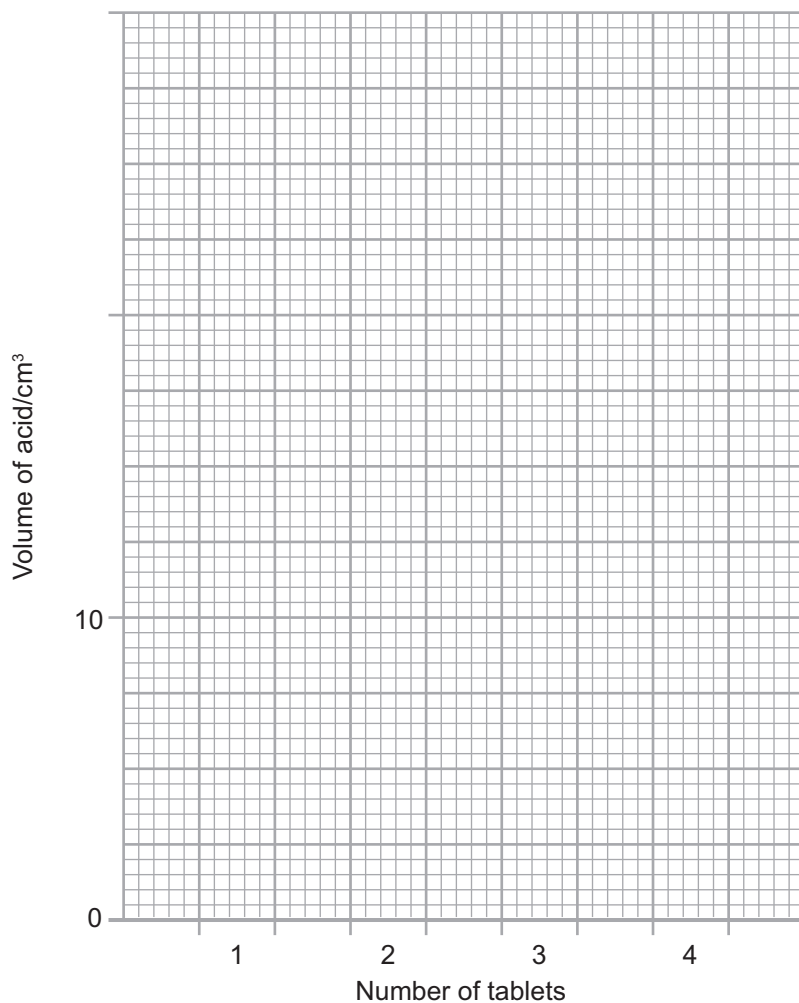
- (d) A student followed a similar method to investigate how **changing the number of tablets** affected the volume of acid needed for neutralisation.

His results are shown below.

Number of tablets	Volume of acid/cm <sup>3</sup>
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/cm<sup>3</sup>).



[3]

Examiner Only	
Marks	Remark

(ii) State the trend shown by these results.

\_\_\_\_\_  
\_\_\_\_\_ [1]

(iii) Use the results opposite to suggest the volume of acid that would be needed to neutralise **five** indigestion tablets.

\_\_\_\_\_ cm<sup>3</sup> [1]

(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]

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**THIS IS THE END OF THE QUESTION PAPER**

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Examiner Only	
Marks	Remark





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