



Cambridge O Level

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CHEMISTRY

5070/31

Paper 3 Practical Test

May/June 2026

1 hour 30 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

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 40.
- 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.

For Examiner's Use

1	
2	
3	
Total	

This document has **16** pages. Any blank pages are indicated.



- 1 You are going to investigate the effect of concentration on the rate of reaction between calcium carbonate and dilute hydrochloric acid.

A is 2.00 mol/dm^3 hydrochloric acid.

You are also provided with five 1 g samples of powdered calcium carbonate.

Read **all** of the instructions **before** starting the experiments.

Instructions

You are going to do **five** experiments.

(a) (i) Experiment 1

- Use a measuring cylinder to add 50 cm^3 of **A** to a conical flask.
- Place the flask on a black piece of paper or card.
- Add one of the samples of calcium carbonate to the flask.
Immediately start the stop-watch. Do **not** swirl or stir the flask.
- Observe the reaction by looking down into the flask from above.
- Stop the stop-watch when the reaction is complete.
- Record in Table 1.1 the time taken for the reaction to complete to the nearest second.
- Empty and rinse the flask.

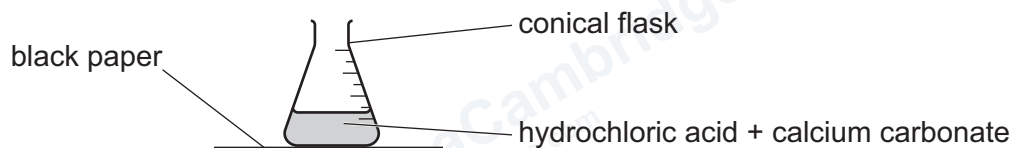


Figure 1.1

Experiment 2

Repeat experiment 1 but instead of using 50 cm^3 of **A**, measure 40 cm^3 of **A** and add 10 cm^3 of distilled water to give a total volume of 50 cm^3 in the measuring cylinder. Add this to the flask.

Experiment 3

Repeat experiment 1 but instead of using 50 cm^3 of **A**, measure 35 cm^3 of **A** and add 15 cm^3 of distilled water to give a total volume of 50 cm^3 in the measuring cylinder. Add this to the flask.

Experiment 4

Repeat experiment 1 but instead of using 50 cm^3 of **A**, measure 30 cm^3 of **A** and add 20 cm^3 of distilled water to give a total volume of 50 cm^3 in the measuring cylinder. Add this to the flask.



Experiment 5

Repeat experiment 1 but instead of using 50 cm^3 of **A**, measure 20 cm^3 of **A** and add 30 cm^3 of distilled water to give a total volume of 50 cm^3 in the measuring cylinder. Add this to the flask.

Table 1.1

experiment	volume of A $/\text{cm}^3$	volume of distilled water $/\text{cm}^3$	time taken $/\text{s}$
1	50	0	
2	40	10	
3	35	15	
4	30	20	
5	20	30	

[3]

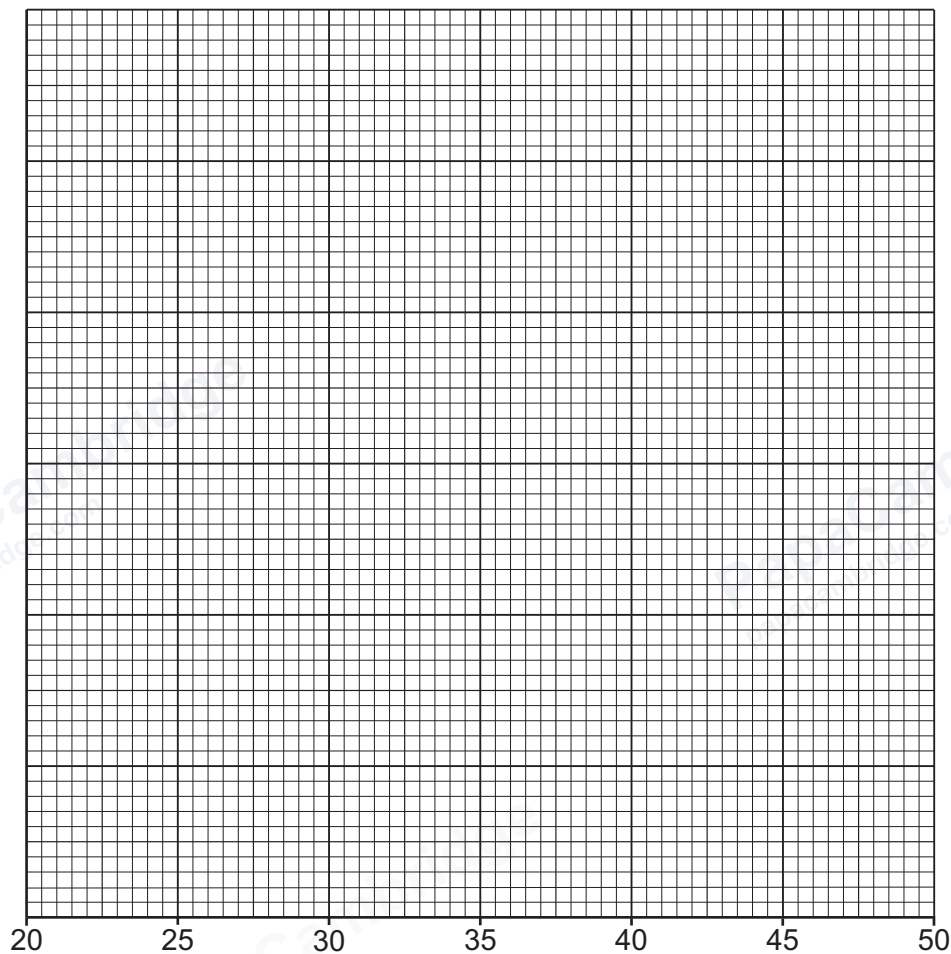
(ii) Describe an observation which shows when the reaction is complete.

.....
 [1]



(iii) Plot on the grid the time taken (y-axis) against volume of **A** (x-axis).

Label the axes.



[3]

(iv) Draw a curve of best fit.

[1]

(v) Use the graph to deduce the time taken when 25 cm^3 of **A** and 25 cm^3 of distilled water are used.

time s [1]

- (b) Measuring the mass of the calcium carbonate and the precision of the stop-watch are sources of inaccuracy in these experiments.

Suggest two **other** sources of inaccuracy in these experiments.

Suggest an improvement that reduces each of these sources of inaccuracy.

source of inaccuracy

.....

improvement

.....

source of inaccuracy

.....

improvement

.....

[4]

- (c) (i) The concentration of hydrochloric acid in **A** is 2.00 mol/dm^3 .

Calculate the concentration of the hydrochloric acid added to the flask in **Experiment 3**.

concentration mol/dm^3 [1]

- (ii) State the relationship between the **concentration** of hydrochloric acid and the **rate** of reaction.

Explain how the data in Table 1.1 shows this relationship.

relationship

.....

explanation

.....

.....

[3]

[Total: 17]



- 2 You are provided with two samples of a solid compound, **B**, that contains two cations and one anion.

Do the following tests and answer the questions.

Record your observations and conclusions for these tests.

- (a) Put one sample of **B** into a boiling tube. Put the boiling tube in a stand and clamp horizontally as shown in Figure 2.1.

Heat **B** gently in the boiling tube while holding a piece of damp red litmus paper and a piece of damp blue litmus paper at the mouth of the boiling tube. Stop heating when no further changes are observed.

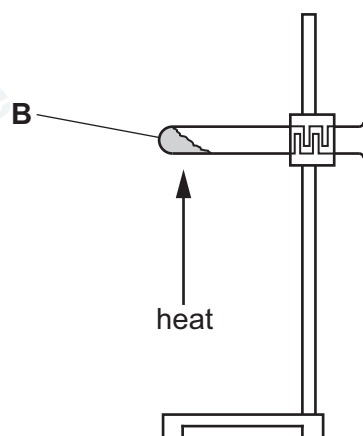


Figure 2.1

- (i) Suggest a possible safety hazard and a precaution to take to minimise the hazard when using the apparatus in Figure 2.1.

hazard

precaution

[2]

- (ii) State the name of the piece of apparatus used to heat the solid.

..... [1]

- (iii) Describe the changes observed when **B** is heated.

.....

.....

.....

..... [3]

- (iv) Describe the effect on the litmus papers.

Suggest a conclusion about solid **B** that is made from these observations.

red litmus

blue litmus

conclusion

[3]

- (b) Put the second sample of **B** into a 100 cm³ beaker and add approximately 50 cm³ of distilled water. Stir until the solid is fully dissolved. This is aqueous **B**.

- (i) Put 1 cm depth of aqueous **B** into a test-tube. Determine the pH of aqueous **B**.

Describe how you determine the pH.

.....

..... [1]

- (ii) State your observation and suggest the pH of the solution.

observation

pH

[2]

- (iii) Put 1 cm depth of aqueous **B** into a test-tube.

Add aqueous sodium hydroxide drop by drop until a change is seen.

Add a further 2 cm depth of aqueous sodium hydroxide. This is an excess.

Record your observations and conclusion.

observations

.....

conclusion

[3]

(iv) Put 1 cm depth of aqueous **B** into a test-tube.

Add 1 cm depth of dilute nitric acid and then 1 cm depth of aqueous barium nitrate.

Leave the mixture to stand.

Record your observations and conclusion.

observations

.....

conclusion

[2]

[Total: 17]



3 You are **not** expected to do **any** experimental work for this question.

Aqueous ammonia is an alkaline solution that is used to clean surfaces.

The higher the concentration of aqueous ammonia, the better it is at cleaning surfaces.

A student investigates three different samples of aqueous ammonia.

Plan an investigation to determine the **concentration** of ammonia in each of the three samples.

Your plan should describe the use of common laboratory apparatus, dilute hydrochloric acid, a suitable indicator and the three samples of aqueous ammonia.

No other chemicals should be used.

Your plan should include:

- the apparatus needed
 - the method to use
 - how to use the results to show which sample is the best at cleaning surfaces.
- You do **not** need to show any calculations.

You may draw a diagram to help answer the question.

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[6]





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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.
sulfite, SO_3^{2-}	add a small volume of acidified aqueous potassium manganate(VII)	the acidified aqueous potassium manganate(VII) changes colour from purple to colourless

Tests for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
aluminium, Al^{3+}	white ppt., soluble in excess, giving a colourless solution	white ppt., insoluble in excess
ammonium, NH_4^+	ammonia produced on warming	—
calcium, Ca^{2+}	white ppt., insoluble in excess	no ppt. or very slight white ppt.
chromium(III), Cr^{3+}	green ppt., soluble in excess	green ppt., insoluble in excess
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
sulfur dioxide, SO_2	turns acidified aqueous potassium manganate(VII) from purple to colourless

Flame tests for metal ions

metal ion	flame colour
lithium, Li^+	red
sodium, Na^+	yellow
potassium, K^+	lilac
calcium, Ca^{2+}	orange-red
barium, Ba^{2+}	light green
copper(II), Cu^{2+}	blue-green

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