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0745481100

CHEMISTRY **0620/52**

Paper 5 Practical Test **February/March 2026**

1 hour 15 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	
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2	
3	
Total	

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1 You are going to investigate the time taken to make 50 cm^3 of carbon dioxide gas when solid sodium hydrogencarbonate reacts with dilute citric acid of different concentrations.

sodium hydrogencarbonate + citric acid → sodium citrate + water + carbon dioxide

Read all of the instructions carefully before starting the experiments.

Instructions

You are going to do five experiments using the apparatus shown in Figure 1.1.

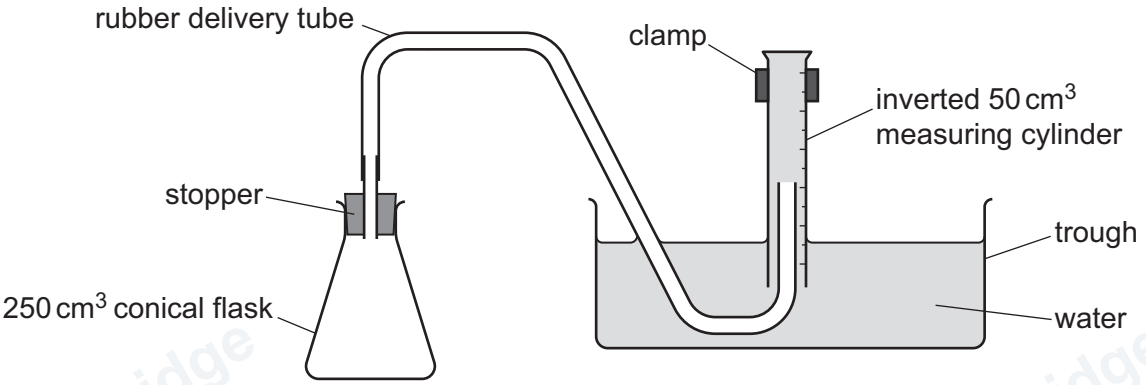

Figure 1.1

Experiment 1

- Use a 50 cm^3 measuring cylinder to pour 50 cm^3 of dilute citric acid into the 250 cm^3 conical flask.
- Use the 100 cm^3 measuring cylinder to pour 55 cm^3 of distilled water into the conical flask.
- Swirl the flask to mix the contents.
- Set up the apparatus as shown in Figure 1.1. Ensure the inverted measuring cylinder is full of water.
- Remove the stopper from the conical flask. Ensure the delivery tube remains in the inverted measuring cylinder.
- Add 1.5 g of solid sodium hydrogencarbonate to the conical flask. Do **not** mix the contents of the flask. Immediately replace the stopper and start the stop-watch.
- Measure the time taken to collect 50 cm^3 of gas in the inverted measuring cylinder. Record the time in seconds, to the nearest whole number, in Table 1.1.
- Rinse the conical flask with distilled water.

Experiment 2

- Repeat Experiment 1, using 50 cm^3 of distilled water instead of 55 cm^3.

Experiment 3

- Repeat Experiment 1, using 45 cm^3 of distilled water instead of 55 cm^3.

Experiment 4

- Repeat Experiment 1, using 40 cm^3 of distilled water instead of 55 cm^3.

Experiment 5

- Repeat Experiment 1, using 30 cm^3 of distilled water instead of 55 cm^3.

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(a) Complete Table 1.1.

Table 1.1

experiment	volume of dilute citric acid / cm^3	volume of distilled water / cm^3	time to collect 50 cm^3 of gas / s
1	50		
2			
3			
4			
5			

[4]

(b) On Figure 1.2, write a suitable scale on the *y*-axis and plot your results from Experiments 1 to 5.
Draw a line of best fit.

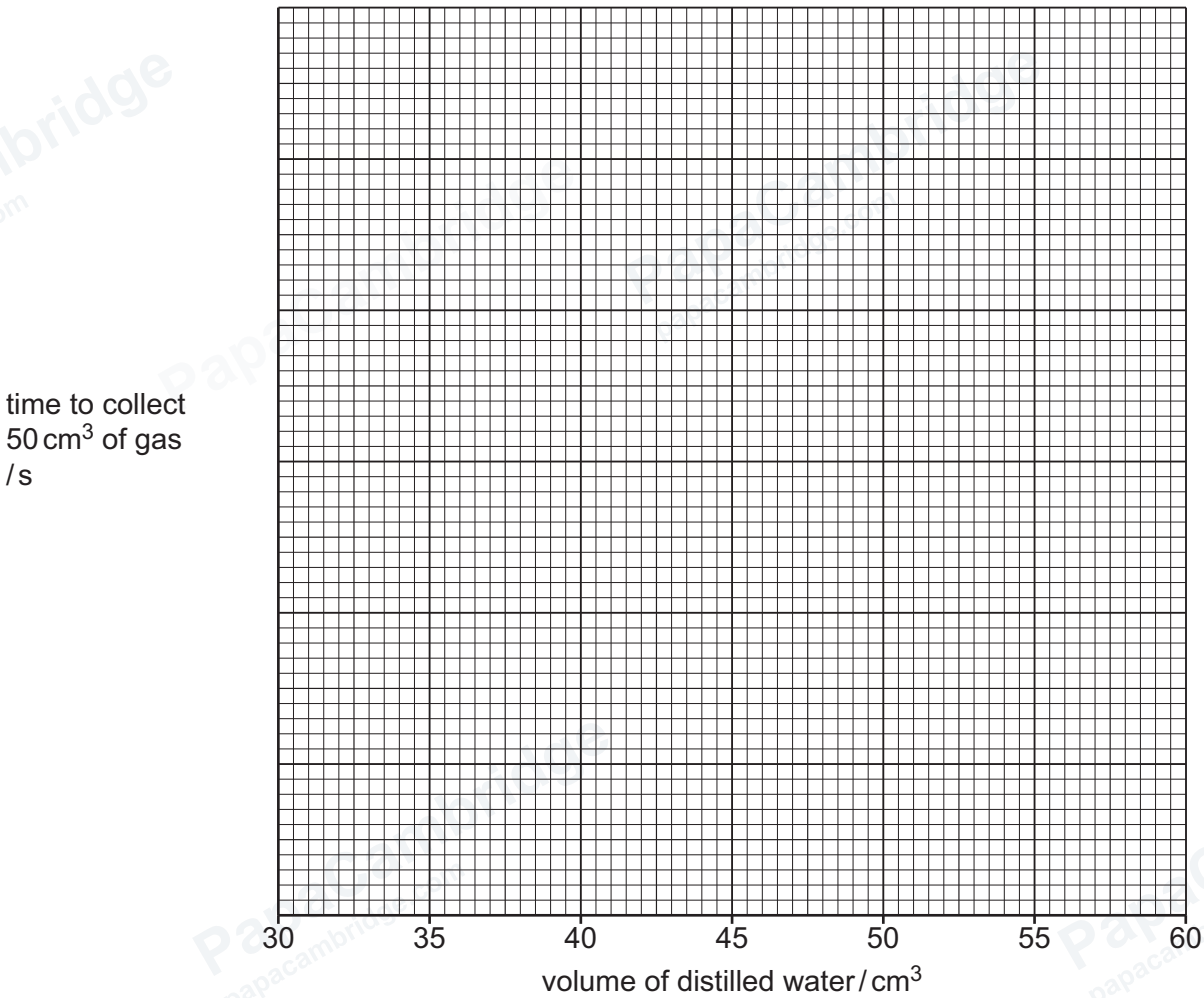

Figure 1.2

[4]

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(c) The mean rate of reaction is calculated using the equation shown.

$$\text{mean rate of reaction} = \frac{\text{volume of gas collected}}{\text{time taken to collect the gas}}$$

(i) Calculate the mean rate of reaction in Experiment 3.
Give units for the mean rate you have calculated.

mean rate of reaction = ...

units .....
[2]

(ii) Use your graph in Figure 1.2 to deduce the time taken to collect 50 cm^3 of gas if 35 cm^3 of water is used.

Show clearly **on Figure 1.2** how you worked out your answer.

time to collect 50 cm^3 of gas = ... s [2]

(d) The gas collected in the inverted measuring cylinder contains air from the conical flask.

State what effect, if any, this air will have on the accuracy of the results of the investigation.
Explain your answer.

effect on accuracy .....

explanation .....

.....
[2]

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(e) Some gas escapes in the short time between adding the solid sodium hydrogencarbonate to the conical flask and replacing the stopper in the conical flask.

(i) Explain how the apparatus can be changed so that no gas escapes. You may draw a diagram to help explain your answer.

.....

.....

.....

.....

[2]

(ii) State the effect, if any, the gas escaping has on the time taken to collect 50 cm^3 of gas compared to if the apparatus was changed so that no gas escapes.

..... [1]

(f) **On Figure 1.2**, sketch the graph you would expect when the investigation is repeated using dilute citric acid of different concentrations at 50 °C instead of at room temperature.

Label this line **F**.

[1]

[Total: 18]

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2 You are provided with two substances: solid **A** and solution **B**.

Do the following tests on solid **A** and solution **B**. Record all of your observations at each stage.

Tests on solid A

(a) Transfer about half of solid **A** to a boiling tube. Heat solid **A** strongly in the boiling tube.

Record your observations.

.....

.....

..... [2]

(b) Transfer the remaining solid **A** to a boiling tube. Add about 5 cm depth of dilute hydrochloric acid to solid **A**. Test any gas given off.

Keep the solution formed for use in 2(c).

Record your observations.

.....

.....

..... [2]

(c) The solution formed in **2(b)** is solution **C**. Carefully pour solution **C** into a boiling tube while leaving the remaining solid behind.

Divide solution **C** into three approximately equal portions in three test-tubes.

(i) To the first portion of solution **C**, add aqueous sodium hydroxide dropwise and then in excess.

Record your observations.

.....

.....

..... [2]

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(ii) To the second portion of solution **C**, add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous barium nitrate.

Record your observations.

.....

..... [1]

(iii) Pour about 2 cm depth of aqueous ammonia into a boiling tube. Add the third portion of solution **C** to the aqueous ammonia in the boiling tube dropwise until it has all been added.

Record your observations.

dropwise .....

.....

all of solution **C** added .....

.....

[2]

(d) Identify solid **A**.

.....

..... [2]

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Tests on solution B

(e) Carry out a flame test on solution **B**.

Record your observations.

..... [1]

(f) Divide the remaining solution **B** into two approximately equal portions in two test-tubes.

(i) To the first portion of solution **B**, add a few drops of dilute sulfuric acid.

Record your observations.

.....

..... [1]

(ii) To the second portion of solution **B**, add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.

Record your observations.

.....

..... [1]

(g) Identify solution **B**.

.....

..... [2]

[Total: 16]

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3 Hydrated chromium(III) nitrate is a salt which is soluble in water. Hydrated chromium(III) nitrate is made by reacting the insoluble base chromium(III) oxide with dilute nitric acid. Chromium(III) oxide reacts very slowly with dilute nitric acid at room temperature.

Describe how to make pure, dry crystals of hydrated chromium(III) nitrate.

You are provided with chromium(III) oxide, dilute nitric acid and common laboratory apparatus.

.....

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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

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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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