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CHEMISTRY **0620/62**

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

1 hour

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 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.

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

DC (PQ/SG) 355538/3

[Turn over

1 **(a)** A student uses electrolysis to electroplate a zinc rod with silver.

The student uses the apparatus shown in Figure 1.1.

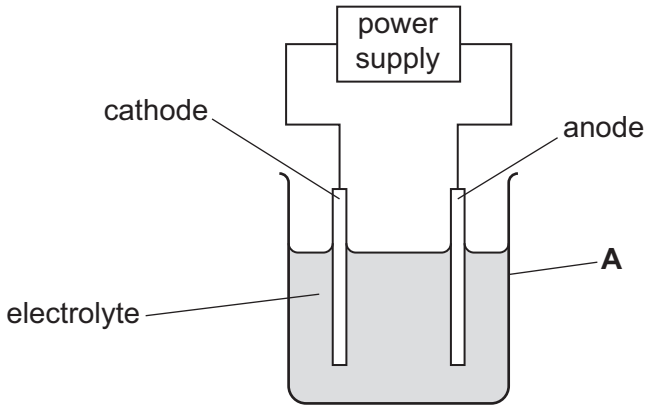

Figure 1.1

(i) Name the item of apparatus labelled **A** in Figure 1.1.

..... [1]

(ii) The zinc rod is used as the cathode in Figure 1.1.

Identify the element that is used as the anode.

..... [1]

(iii) Suggest a suitable electrolyte.

..... [2]

(b) A teacher uses the apparatus in Figure 1.2 to make chlorine gas by electrolysis. Chlorine gas is toxic.

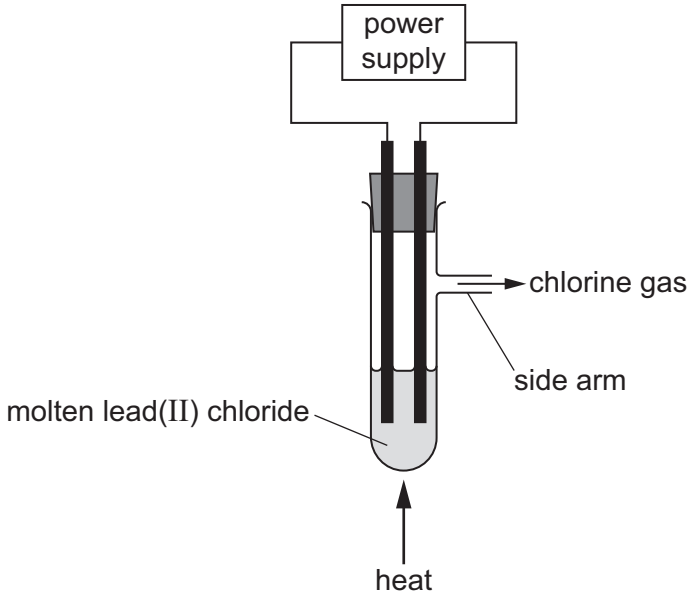

Figure 1.2

(i) Describe how the teacher can confirm that chlorine gas comes out of the side arm during electrolysis.

.....

.....

..... [2]

(ii) State **one** safety precaution that should be taken due to the formation of chlorine gas in this experiment.

..... [1]

[Total: 7]

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2 A student investigates 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

The student does five experiments using the apparatus shown in Figure 2.1.

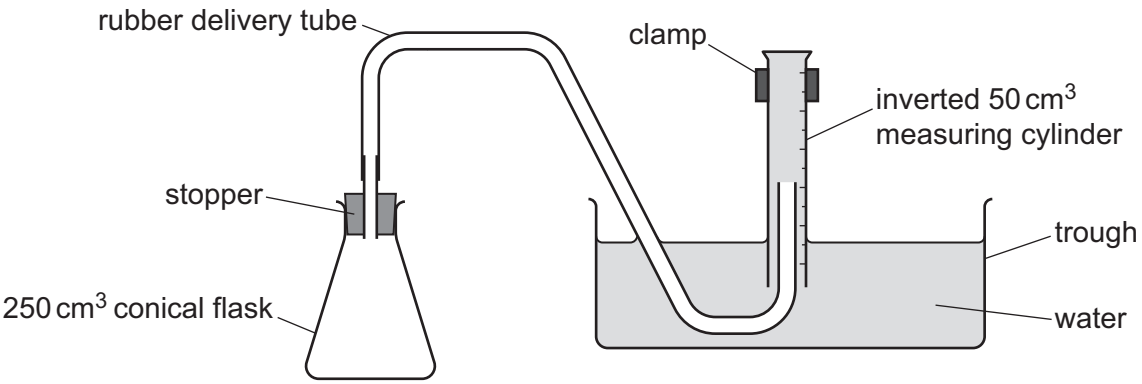


Figure 2.1

Experiment 1

- Use a 50 cm^3 measuring cylinder to pour 50 cm^3 of dilute citric acid into a 250 cm^3 conical flask.
- Use a 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 2.1. 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.
- 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

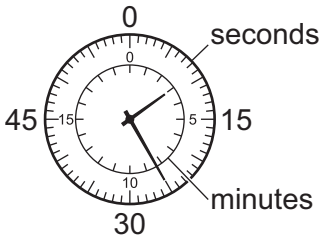
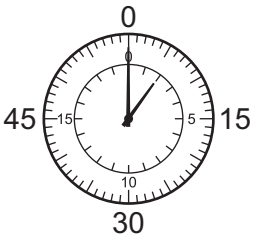
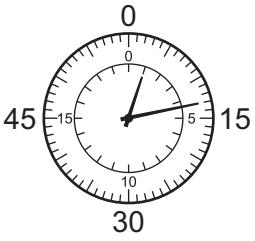
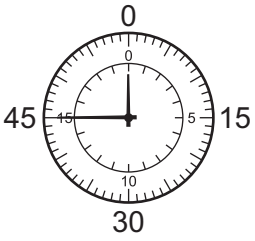
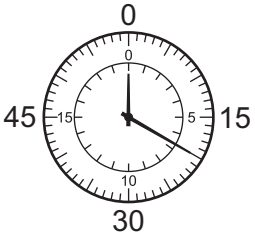
- Repeat Experiment 1, using 40 cm^3 of distilled water instead of 55 cm^3.

Experiment 5

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

(a) Use the information in the descriptions of the experiments and the stop-watch diagrams to complete Table 2.1.

Table 2.1

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

[3]

(b) On Figure 2.2, write a suitable scale on the *y*-axis and plot the results from Experiments 1 to 5. Draw a line of best fit.

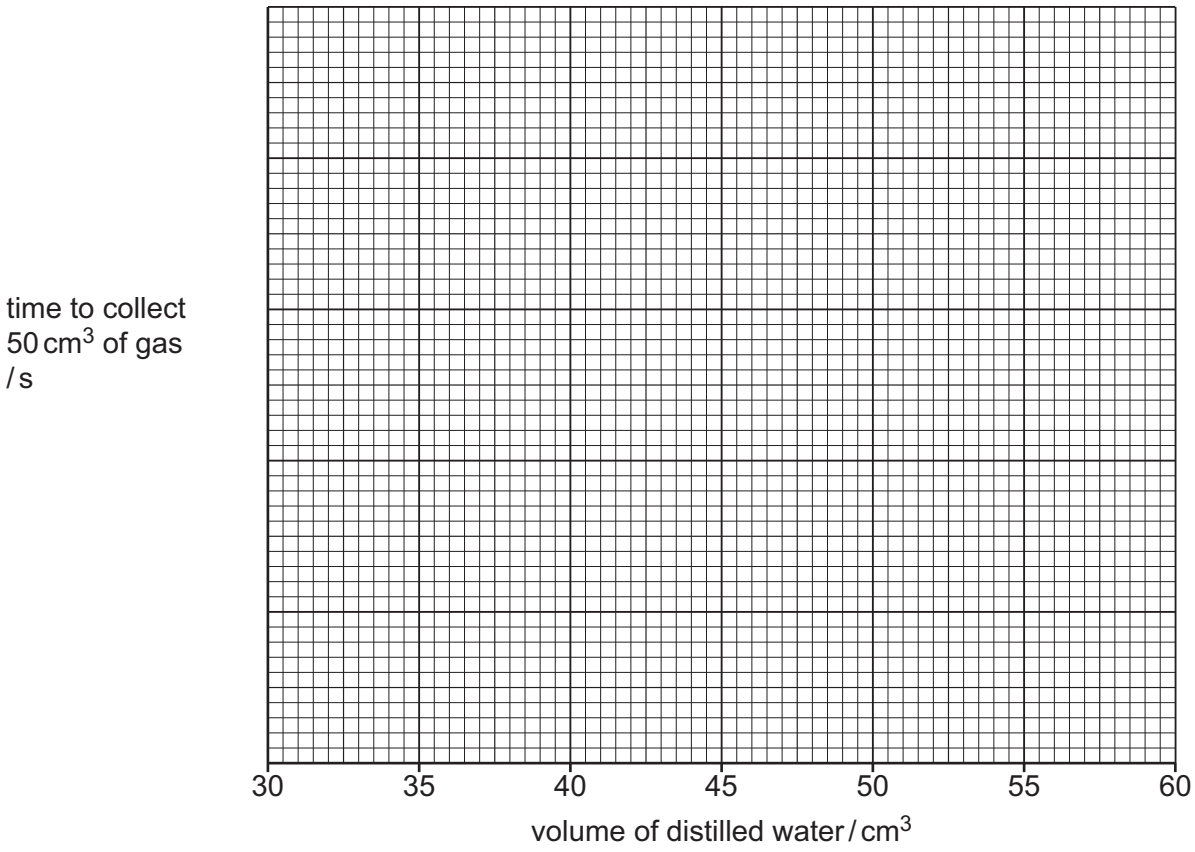


Figure 2.2

[4]

(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 of reaction you have calculated.

mean rate of reaction = ...

units .....

[2]

(ii) Use your graph in Figure 2.2 to deduce the time taken to collect 50 cm^3 of gas if 35 cm^3 of water is used.

Show clearly **on Figure 2.2** 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]

(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 2.2**, 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: 17]

Turn over

3 A student tests two substances: solid **A** and solution **B**.

Tests on solid A

Table 3.1 shows the tests and the student's observations for solid **A**.

Table 3.1

tests	observations
test 1 Place about half of solid **A** in a boiling tube. Heat solid **A** strongly in the boiling tube.	solid **A** turns black
test 2 Place the remaining solid **A** in a boiling tube. Add 10 cm^3 of dilute hydrochloric acid to the boiling tube. Test any gas given off. The solution that forms is solution **C**.	effervescence is seen some of solid **A** dissolves to form a blue solution limewater turns milky
test 3 Solution **C** is divided into three approximately equal portions. To the first portion of solution **C**, add aqueous sodium hydroxide dropwise and then in excess.	blue precipitate forms which remains in excess
test 4 To the second portion of solution **C**, add 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate.	no visible change

(a) Identify the gas given off in **test 2**.

..... [1]

(b) State the conclusion about solid **A** that can be made from the observation in **test 4**.

..... [1]

(c) Identify solid **A**.

.....

..... [2]

(d) To the third portion of solution **C**, the student adds excess aqueous ammonia.

observations .....

..... [2]

Tests on solution B

Solution **B** is aqueous barium chloride.

The student divides solution **B** into three equal portions.

Record the expected observations.

(e) The student carries out a flame test on the first portion of solution **B**.

(i) State the type of Bunsen burner flame the student should use when carrying out a flame test.

..... [1]

(ii) State the result of the flame test on solution **B**.

..... [1]

(f) To the second portion of solution **B**, the student adds about 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate.

observations .....

..... [1]

(g) To the third portion of solution **B**, the student adds about 1 cm^3 of dilute sulfuric acid.

observations .....

..... [1]

[Total: 10]

4 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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..... [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

