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CAMBRIDGE
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CANDIDATE NAME

CENTRE NUMBER

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0474

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CHEMISTRY **0620/62**

Paper 6 Alternative to Practical **May/June 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.

1 Alkanes are flammable hydrocarbons.

Table 1.1 gives the boiling points of three alkanes.

Table 1.1

alkane	boiling point/°C
hexane	69
pentane	36
undecane	196

A student uses the apparatus shown in Figure 1.1 to separate a mixture of the three alkanes in Table 1.1.

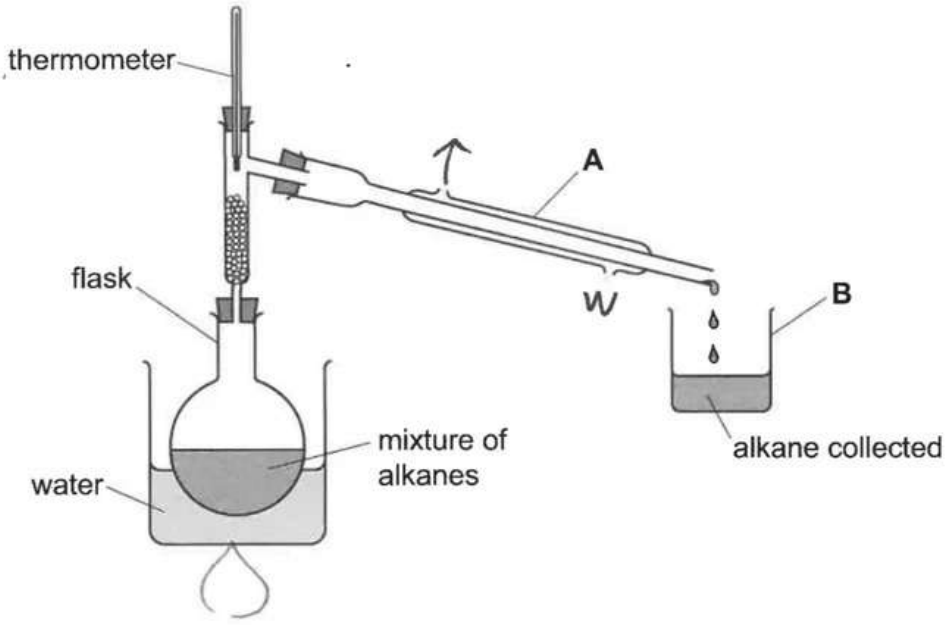


Figure 1.1

(a) Name the items of apparatus in Figure 1.1 labelled **A** and **B**.

A condenser

B beaker

[2]

(b) (i) Draw an arrow on Figure 1.1 to show where the apparatus should be heated. [1]

(ii) Explain why a Bunsen burner should **not** be used to heat the apparatus.

Too hot to maintain the Temperature below 70°C

[1]

(c) Write a **W** on Figure 1.1 to show where water **enters** the apparatus labelled **A**. [1]

(d) State which alkane is collected first.
Give a reason for your answer.

alkane ..... pentane .....

reason ..... has lowest b.p. .....

[1]

(e) State what, if anything, is left in the flask at the end of the experiment.
Explain your answer.

left in flask ..... undecane .....

explanation ..... it has the highest b.p and above the b.p. of water .....

[2]

[Total: 8]

$CH_3COOH + NaHCO_3$

2 A student investigates the volume of gas made in 75 seconds when dilute ethanoic acid reacts with solid sodium hydrogencarbonate.

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

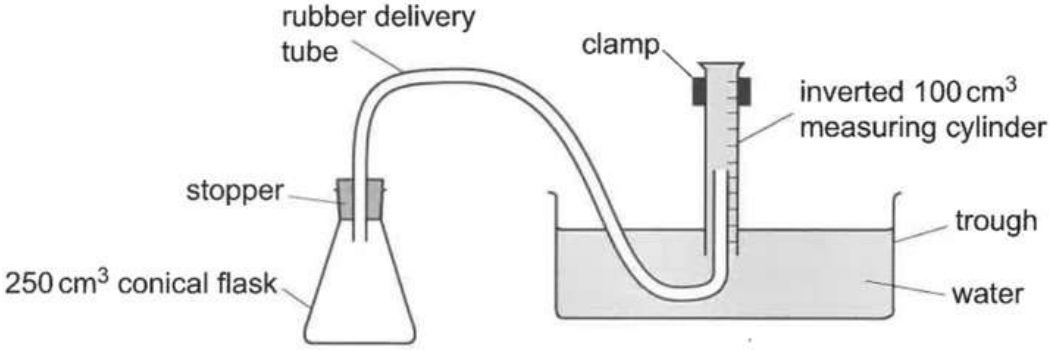


Figure 2.1

Experiment 1

- Use a 10 cm^3 measuring cylinder to pour 10.0 cm^3 of dilute ethanoic acid into a 250 cm^3 conical flask.
- Use a 100 cm^3 measuring cylinder to pour 100 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.
- Add 1 g of solid sodium hydrogencarbonate to the conical flask. Do **not** mix the contents of the flask. Immediately replace the bung and start the stop-watch.
- Measure the volume of gas collected in the inverted measuring cylinder at 75 seconds.
- Rinse the conical flask with distilled water.

Experiment 2

- Repeat Experiment 1 using 90 cm^3 of distilled water instead of 100 cm^3.

Experiment 3

- Repeat Experiment 1 using 80 cm^3 of distilled water instead of 100 cm^3.

Experiment 4

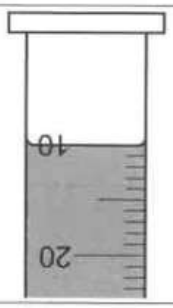
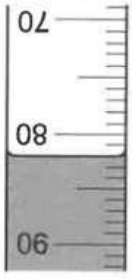
- Repeat Experiment 1 using 70 cm^3 of distilled water instead of 100 cm^3.

Experiment 5

- Repeat Experiment 1 using 60 cm^3 of distilled water instead of 100 cm^3.

(a) Use the information in the descriptions of the experiments and the measuring cylinder diagrams to complete Table 2.1.

Table 2.1

experiment	volume of dilute ethanoic acid /cm^3	volume of distilled water /cm^3	measuring cylinder diagram	volume of gas collected in 75 seconds /cm^3
1	10.0	100.0		10.0
2	10.0	90.0		16.0
3	10.0	80.0		27.0
4	10.0	70.0		46.0
5	10.0	60.0		82.0

[3]

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

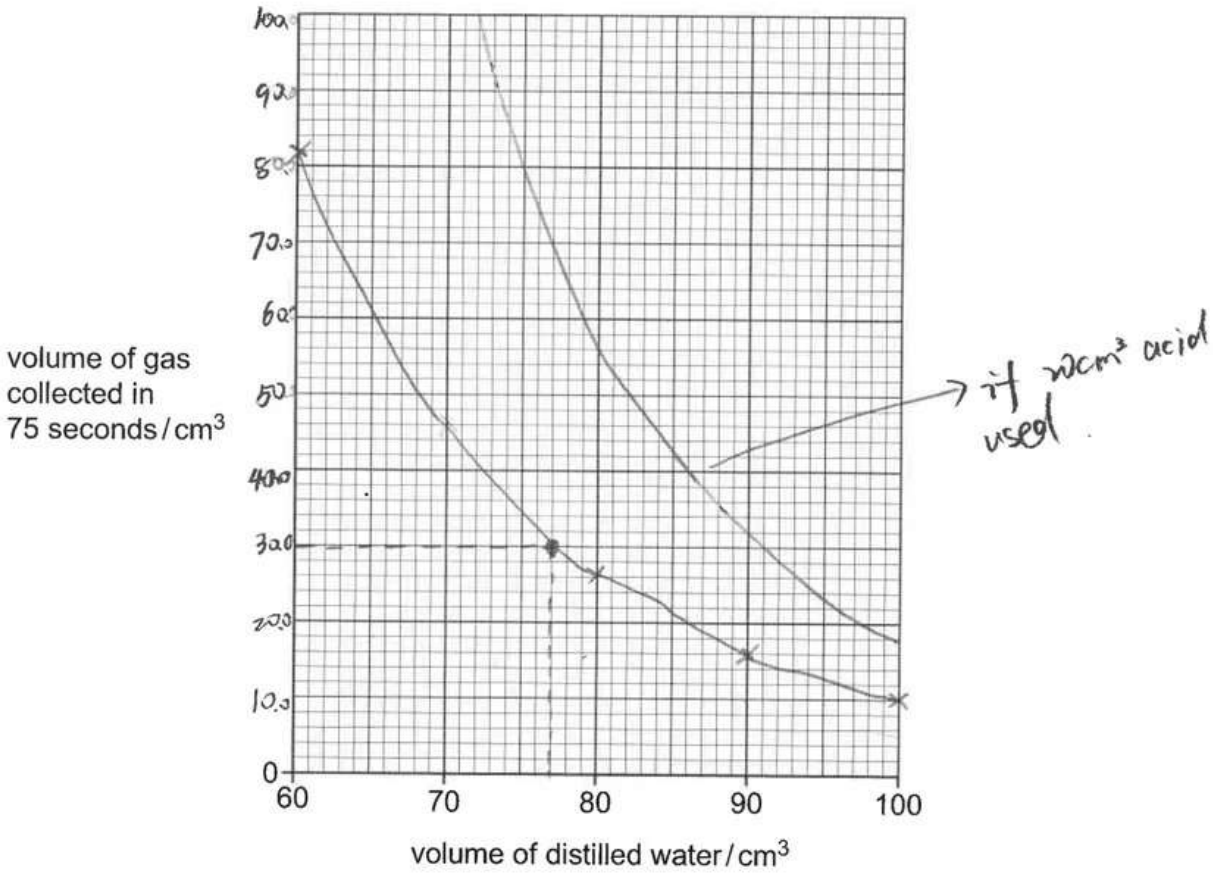


Figure 2.2

[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 you have calculated.

$\frac{27.0\ cm^3}{75\ s} = 0.36\ cm^3/s$

mean rate of reaction = 0.36

units $cm^3 \cdot s^{-1}$

[2]

(ii) State which Experiment, 1, 2, 3, 4 or 5, has the highest mean rate of reaction.

5

[1]

(d) Use your graph in Figure 2.2 to predict the volume of gas collected in 75 seconds if the volume of distilled water is 77 cm^3.

Show your working on Figure 2.2.

1分 给 捕 时 线

volume = 30 cm^3 [3]

1分 1分

(e) The volume of the dilute ethanoic acid is measured using a 10 cm^3 measuring cylinder.

(i) State why a 10 cm^3 measuring cylinder is used rather than a 50 cm^3 measuring cylinder to measure the volume of the dilute ethanoic acid.

10 cm^3 measuring cylinder gives a more accurate result when measure 10 cm^3 [1]

(ii) The volume of the dilute ethanoic acid can be measured using a 10 cm^3 volumetric pipette.

State **one** advantage of using a 10 cm^3 volumetric pipette rather than a 10 cm^3 measuring cylinder to measure the volume of the dilute ethanoic acid.

More accurate result

..... [1]

(f) Some of the gas made in the reaction escapes from the conical flask before the stopper is replaced in the flask.

(i) State the effect, if any, the gas escaping has on the volume of gas collected in 75 seconds.

less gas volume collected [1]

(ii) Deduce in which experiment the most gas would escape.
Explain your answer.

experiment 5

explanation fast rate to produce CO_2 gas

[2]

(g) Sketch a line on Figure 2.2 to show the results that would be obtained if the experiment is repeated with 20.0 cm^3 of dilute ethanoic acid instead of 10.0 cm^3. [1]

[Total: 19]

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

Tests on solid C

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

Table 3.1

tests	observations
test 1 Carry out a flame test on solid **C**. K^+	lilac flame
test 2 Place about half of the remaining solid **C** in a boiling tube. Gently heat solid **C** in the boiling tube.	condensation forms on the sides of the boiling tube
test 3 Place the remaining solid **C** in a boiling tube. Add a 10 cm depth of distilled water. Shake the boiling tube to dissolve solid **C** and form solution **C**. Divide solution **C** into two approximately equal portions. To the first portion of solution **C**, add aqueous sodium hydroxide dropwise until it is in excess.	green precipitate forms which dissolves in excess to form a dark green solution
test 4 To the second portion of solution **C**, add about 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate.	white precipitate forms

(a) State the conclusion that can be made from the observation made in **test 2**.

water molecules in the hydrated salt

..... [1]

(b) Identify the **three** ions in solid **C**.

K^+

Cr^{3+}

SO_4^{2-} [3]

Tests on solution D

Solution **D** is aqueous ammonium bromide. NH_4Br

The student divides solution **D** into two approximately equal portions.

Record the expected observations.

(c) To the first portion of solution **D**, the student adds aqueous sodium hydroxide in excess.

observations ..... No change .....

..... [1]

(d) The student gently warms the product from **3(c)**. Any gas given off is tested.

observations ..... turns red damp litmus paper blue .....

..... [1]

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

observations ..... cream ppt .....

..... [1]

[Total: 7]

4 Tin is a metal that is between copper and iron in the reactivity series. The ore cassiterite contains the compound tin(IV) oxide, SnO_2.

Tin(IV) oxide is insoluble in water and reacts with dilute acids to form an aqueous solution of a salt. The ore cassiterite contains no other compounds that are insoluble in water and no other compounds that react with acids to form aqueous solutions.

Describe how you could obtain a sample of tin metal starting with a large lump of the ore cassiterite.

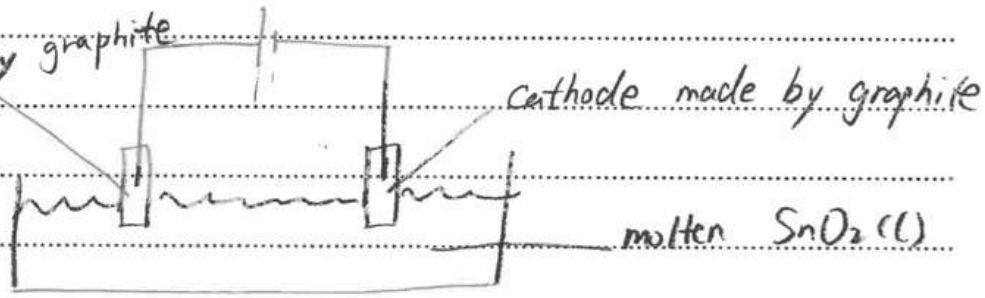
You are provided with common laboratory apparatus and chemicals.

Step 1 crush the large lump of the ore cassiterite into small pieces

Step 2 wasth the small pieces of ore cassiterite to get insoluble SnO_2.

Step 3 heat SnO_2 to molten.

Step 4 electrolysis



Step 5 Collect pure metal tin at cathode.

[6]