

Candidate Marks Report

Series : 6 2026

This candidate's script has been assessed using On-Screen Marking. The marks are therefore not shown on the script itself, but are summarised in the table below.

Centre No :	PK470	Assessment Code :	5070
Candidate No :	58	Component Code :	42
Candidate Name :	HUZAIFA UMER,		

In the table below 'Total Mark' records the mark scored by this candidate.
'Max Mark' records the Maximum Mark available for the question.

Paper:	5070/42	
Paper	32 / 40	
Total:		
Question	Total / Max Mark Mark	
1ai	1 / 1	
1aii	0 / 1	
1b	1 / 1	
1c	2 / 3	
2ai	1 / 1	
2aii	3 / 3	
2aiii	1 / 1	
2aiv	1 / 1	
2b	4 / 4	
2ci	1 / 1	
2cii	1 / 3	
3ai	0 / 2	
3aii	1 / 1	
3aiii	1 / 2	
3aiv	3 / 3	
3bi	1 / 1	
3bii	1 / 1	
3biii	2 / 2	
3biv	1 / 1	
3bv	1 / 1	
4	5 / 6	

**Cambridge O Level**CANDIDATE
NAME

Huzaifa Umer

CENTRE
NUMBER

P K 4 7 0

CANDIDATE
NUMBER

0 0 5 8

CHEMISTRY**5070/42**

Paper 4 Alternative to Practical

May/June 2026**1 hour**

You must answer on the question paper.

No additional materials are needed.

Casio fx-991ES PLUS

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 Figure 1.1 shows the apparatus a student uses to separate a mixture of three different alkanes.

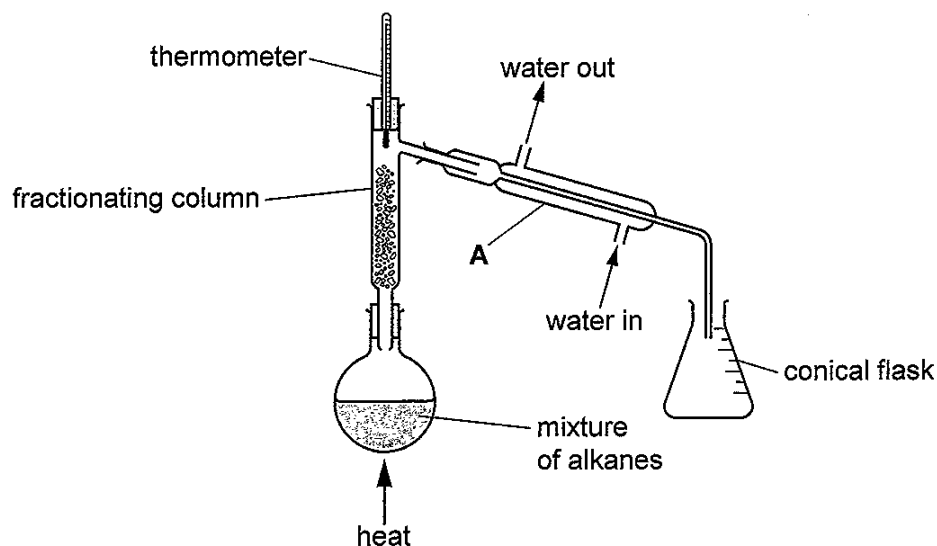


Figure 1.1

- (a) (i) State the name of apparatus A.

Lie big condensor

[1]

- (ii) Explain how apparatus A works.

Apparatus A condenses the gas inside the tube via cold water making it a liquid.

[1]

- (b) State the property that allows the alkanes to be separated by this method.

Different boiling points.

[1]

- (c) Describe how the three different alkanes are obtained from the mixture.

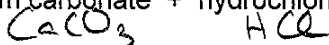
Firstly, heat is supplied to the mixture of alkanes and the alkane with lowest number of carbon atoms will start to boil ^{at specific temperature} and it evaporates. It then passes through the Lie-big condensor and is collected in the flask. Then the second alkane rises up ^{at specific temperature} and in the end the third one and all of them are collected separately by using different conical flasks.

[3]

[Total: 6]

- 2 A student investigates the effect of concentration on the rate of reaction between calcium carbonate and dilute hydrochloric acid.

calcium carbonate + hydrochloric acid $\rightarrow$ calcium chloride + water + carbon dioxide



- (a) The student does five experiments using 2.00 mol/dm^3 hydrochloric acid, **B**.

Experiment 1

The student:

- uses a measuring cylinder to add 50 cm^3 of **B** to a conical flask
- puts the conical flask on a piece of black paper
- adds 1 g of calcium carbonate to the flask
- immediately starts the stop-watch
- observes the reaction by looking down into the flask from above
- stops the stop-watch when the reaction is complete
- records in Table 2.1 the time taken for the reaction to complete.

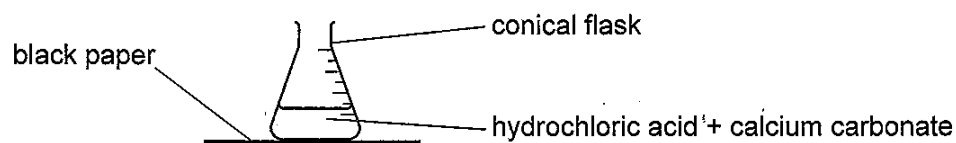


Figure 2.1

**Experiments 2–5**

The student repeats the experiment four times but instead of 50 cm^3 of **B** uses different volumes of **B** and distilled water as shown in Table 2.1.

Table 2.1

experiment	volume of B $/\text{cm}^3$	volume of distilled water $/\text{cm}^3$	time taken $/\text{s}$
1	50	0	7
2	40	10	28
3	35	15	56
4	30	20	130
5	20	30	320

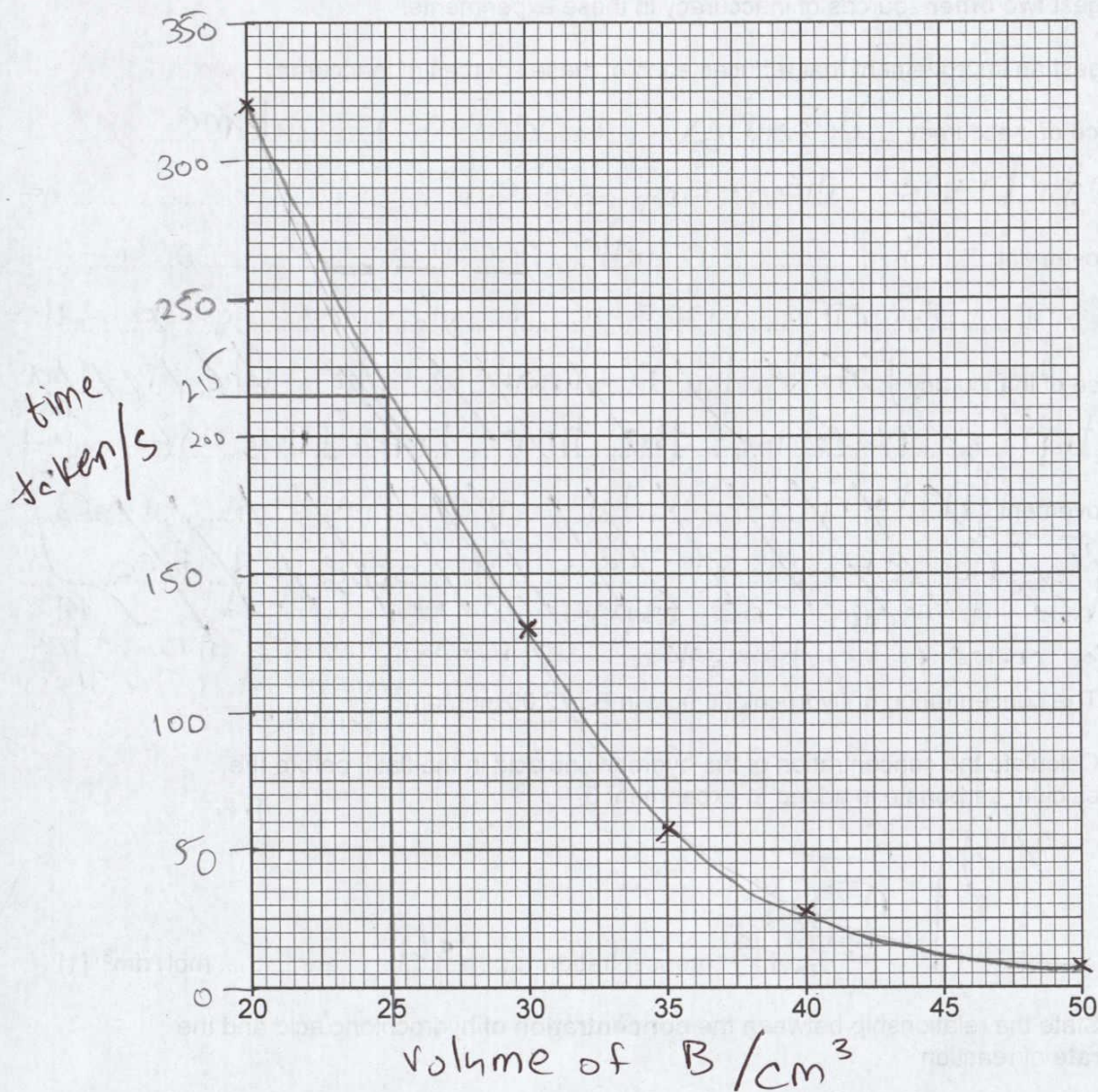
- (i) Suggest an observation that shows when the reaction is complete.

When ^{no}effervescence is observed, it means
the reaction has stopped. [1]



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

Label the axes.



(iii) Draw a curve of best fit.

[3]

(iv) Use the graph to deduce the time taken when 25 cm³ of **B** and 25 cm³ of distilled water are used.

time 215 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 Measuring in-accurate volume of B via measuring cylinder.

improvement Use a burette to measure 50 cm³ or volumetric pipette as it gives more accurate readings.

source of inaccuracy [Student is unaware when the reaction stops, increasing the time taken] Using different sized CaCO_3

improvement [Attach a volume measuring gas syringe] when no change in gas is observed for a while it means the experiment has finished. [4]

- (c) (i) The concentration of hydrochloric acid in B is 2.00 mol/dm³ experiment rather than lumps.

Calculate the concentration of the hydrochloric acid in the flask before the calcium carbonate is added in experiment 3.

$$n = \frac{1}{100} \quad n = 0.01 \quad \begin{array}{r} 50 \\ 35 \end{array} \quad \begin{array}{r} 2 \\ x \end{array} \quad x = 1.4$$

$$\frac{1}{100} \quad \frac{0.01}{100} \quad \frac{1}{100} \quad \frac{0.01}{100}$$

concentration 1.4 mol/dm³ [1]

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

Explain how the data in Table 2.1 shows this relationship.

relationship Inverse relationship as concentration of HCl decreases, time taken increases.

explanation Because at first when highest concentration of acid is used in experiment 1. Then only 7 seconds took to complete the reaction but when gradually acid concentration was decreased [3] time taken increased. Such as when 20 cm³ of acid was used 320 seconds took to complete reaction. [Total: 14]

- 3 A student investigates a pink solid, C, which contains two cations and one anion.

(a) The student:

- puts some **C** into a boiling tube
- clamps the boiling tube as shown in Figure 3.1
- heats **C**
- observes any changes that take place.

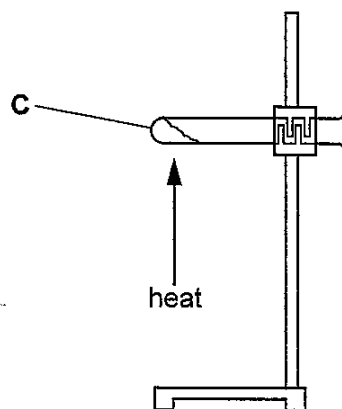


Figure 3.1

- (i) Suggest a possible safety hazard and a precaution to take to minimise the hazard when using the apparatus in Figure 3.1.

hazard Test tube might burst.

precaution Wear safety gloves to prevent any damage to hand or skin.

[2]

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

Bunsen burner

[1]

- (iii) **C** turns into a yellow solution that becomes a yellow solid on further heating.

State **two** conclusions made from these observations.

1 ~~both cations are present in C~~

Its freezing point is above room temperature.

2 It might contain transition elements.

[2]



- (iv) Ammonia gas is given off when **C** is heated with aqueous sodium hydroxide.

Describe the effect of ammonia gas on damp red and damp blue litmus papers.

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

damp red litmus turns it into blue

damp blue litmus no effect

conclusion Ammonium ions are present in solution C.

[3]

- (b) The student dissolves **C** in water. A pale yellow aqueous solution of **C** is formed.

The student determines the pH of aqueous **C** but does not use a pH meter.

- (i) Describe how the student determines the pH of aqueous **C**.

Adds universal indicator in it, observe the colour change and match it with pH chart. [1]

- (ii) Aqueous **C** has a pH of 2.

Describe the observation the student makes when determining this pH.

The colour of solution becomes red. [1]
↳ turns yellow to orange to red.

- (iii) A few drops of aqueous sodium hydroxide are added to aqueous **C**.

Excess aqueous sodium hydroxide is then added.

The student concludes that iron(III) ions are present in **C**.

Describe the observations that the student makes.

Add first a red-brown ppt will be formed, but when ex. NaOH is added in excess then the ppt becomes insoluble and can be seen easily. [2]





- (iv) Dilute nitric acid and aqueous barium nitrate are added to aqueous C.

The student thinks that a yellow precipitate is formed. The mixture is left for five minutes to allow the precipitate to settle. The student then sees that the precipitate is white, **not** yellow.

Explain why the precipitate appears yellow at first but is seen to be white after it settles.

As the colour of solution is yellow initially.
Hence ppt at first looks yellow. [1]

- (v) State a conclusion that is made from the observations in 3(b)(iv).

Aqueous C contains sulphate ions. [1]

[Total: 14]



- 4 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.

Apparatus needed:

- | | |
|------------------|------------------|
| 1- Conical flask | 3- Methyl orange |
| 2- Burette | 4- Pipet |

Procedure:

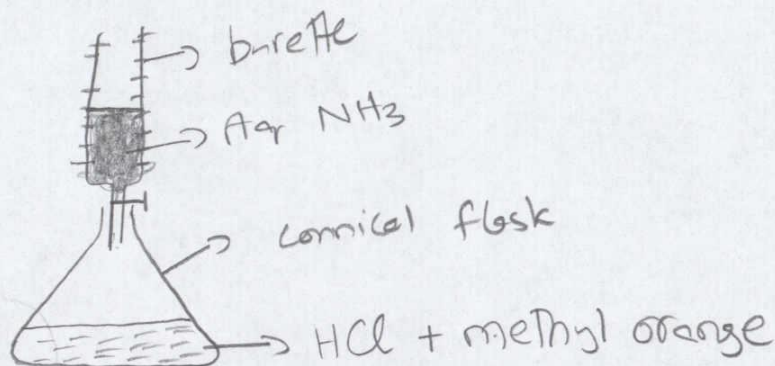
1. Pipet out 25 cm^3 of HCl in a conical flask and add methyl orange in it which will make its colour red.
2. Add 50 cm^3 of aq ammonia in a burette.
3. Assemble the equipment as shown in the diagram.
4. Add aq ammonia dropwise in the acid until a clear colour change is observed.
5. Repeat the note the volume of aq ammonia used to change the colour.
6. Apply formula for $c = \frac{\text{moles}}{\text{volume}} \times 100$

7. And you will get the concentration of one sample of ammonia.

8. Repeat the experiment with other two samples too.

9. After calculating concentration of all 3 solutions, sample containing most concentration of ammonia can be declared the best cleaner.

Diagram:



[6]

HCl





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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. SEEN
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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