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CANDIDATE NAME

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1380659655

CHEMISTRY **0620/52**

Paper 5 Practical Test **October/November 2025**

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 or correction fluid.
- 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	

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1 You are going to investigate the reaction between acidic solution **B** and two different solutions of aqueous sodium hydroxide, solution **C** and solution **D**, using two different indicators.

Read all of the instructions carefully before starting the experiments.

Instructions
You are going to do two experiments.

Experiment 1

- Rinse the burette with distilled water and then with solution **C**.
- Fill the burette with solution **C**. Run some of solution **C** out of the burette so that the level of the solution is between the 0.0 cm^3 and 1.0 cm^3 mark.
- Record the initial burette reading in Table 1.1.
- Use the measuring cylinder to pour 25 cm^3 of solution **B** into the conical flask.
- Add five drops of methyl orange indicator **and** five drops of thymolphthalein indicator to the conical flask.
- Stand the conical flask on a white tile.
- Slowly add solution **C** from the burette to the conical flask, while swirling the flask, until the solution changes colour from red to orange. This is the first end-point.
- Record the burette reading at the first end-point in Table 1.1.
- Continue to add solution **C** from the burette to the conical flask while swirling the flask. The solution changes colour from orange to yellow.
- Continue to add solution **C**, while swirling the flask, until the solution changes colour from yellow to green. This is the second end-point.
- Record the burette reading at the second end-point in Table 1.1.

Experiment 2

- Empty the conical flask and rinse it with distilled water.
- Repeat Experiment 1 using solution **D** instead of solution **C**.

(a) Complete Table 1.1.

Table 1.1

	Experiment 1 using solution **C**	Experiment 2 using solution **D**
burette reading at first end-point / cm^3		
burette reading at second end-point / cm^3		
initial burette reading / cm^3		
volume added from burette to reach first end-point / cm^3		
total volume added from burette to reach second end-point / cm^3		

[6]

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(b) **(i)** Explain why the conical flask is rinsed with distilled water at the start of Experiment 2.

.....

..... [1]

(ii) At the start of Experiment 1, the burette is rinsed with distilled water and then with solution **C**.

Explain how the volume added from the burette to reach the first end-point would be different if the burette was **not** rinsed with solution **C**.

.....

.....

.....

..... [2]

(iii) Explain why the conical flask is placed on a white tile during the titration.

.....

..... [1]

(c) Compare the concentration of solution **C** used in Experiment 1 with the concentration of solution **D** used in Experiment 2.

Explain your answer.

.....

.....

.....

..... [3]

(d) **(i)** Deduce the volume of solution **C** required to reach the **first** end-point if Experiment 1 is repeated using 50 cm^3 of solution **B** instead of 25 cm^3.

volume of solution **C** = ... [2]

(ii) State why using 50 cm^3 of solution **B** would cause a problem when finding the volume of solution **C** needed to reach the **second** end-point in Experiment 1.

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..... [1]

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(e) A student repeats Experiment 2.

The student warms solution **B** in the conical flask before carrying out the titration.

State the effect, if any, on the volume of solution **D** required to reach the **second** end-point in Experiment 2.

Explain your answer.

effect on volume of solution **D** .....

explanation .....

.....

[2]

(f) State **one** change to the **apparatus** that will improve the accuracy of the results.

..... [1]

[Total: 19]

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2 You are provided with two solids: solid **E** and solid **F**.

Do the following tests on solid **E** and solid **F**. Record all of your observations at each stage.

Tests on solid E

Add about 3 cm depth of distilled water to the boiling tube containing solid **E**. Replace the stopper in the boiling tube and shake the boiling tube to dissolve solid **E** and form solution **E**.
Divide solution **E** into three approximately equal portions in one boiling tube and two test-tubes.

(a) (i) To the first portion of solution **E** in a boiling tube, add about 2 cm depth of aqueous sodium hydroxide.

Keep the product for use in (a)(ii).

Record your observations.

.....

..... [1]

(ii) Gently warm the product from **(a)(i)**. Test any gas produced.

Record your observations.

.....

..... [1]

(b) To the second portion of solution **E** in a test-tube, add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous barium nitrate.

Record your observations.

.....

..... [1]

(c) To the third portion of solution **E** in a test-tube, add a few drops of acidified aqueous potassium manganate(VII).

Record your observations.

.....

..... [1]

(d) Identify solid **E**.

.....

..... [2]

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Tests on solid F

(e) Carry out a flame test on solid **F**.

Record your observations.

..... [1]

(f) Add about 3 cm depth of distilled water to the remaining solid **F** in the boiling tube. Replace the stopper in the boiling tube and shake the boiling tube to dissolve solid **F** and form solution **F**.
Divide solution **F** into three approximately equal portions in two boiling tubes and one test-tube.

(i) To the first portion of solution **F** in a test-tube, add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.

Record your observations.

.....

..... [1]

(ii) To the second portion of solution **F** in a boiling tube, add aqueous sodium hydroxide dropwise and then in excess.

Record your observations.

dropwise .....

in excess .....
[2]

(iii) To the third portion of solution **F** in a boiling tube, add aqueous ammonia dropwise and then in excess.

Record your observations.

dropwise .....

in excess .....
[2]

(g) Identify the **three** ions in solid **F**.

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3 Liquid alcohols can be burned as fuels in spirit burners. The energy given out can be used to heat water in a boiling tube as shown in Fig. 3.1.

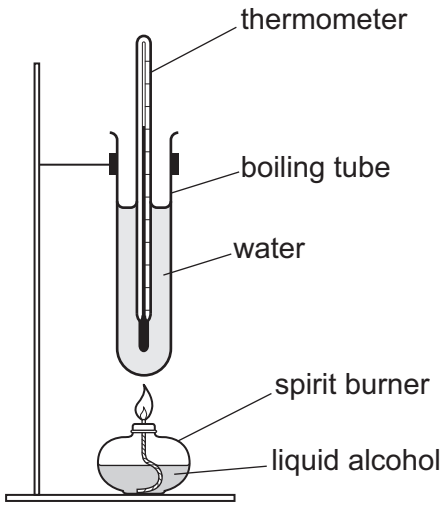


Fig. 3.1

Describe how to investigate which of three liquid alcohols, ethanol, propanol and butanol, heats the water in the boiling tube the fastest.

You are provided with three spirit burners, samples of the three alcohols, water 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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