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Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME			
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CHEMISTRY **5070/32**

Paper 3 Practical Test **May/June 2025**

1 hour 30 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 Solid **W** is an impure organic acid, H_3A.

You are going to determine the mass of H_3A in a sample of **W** by titration with 0.100 mol/dm^3 sodium hydroxide, NaOH.

You are provided with a sample of **W**.

Read all the instructions carefully before starting the experiments.

Instructions

(a) Preparation of mixture **X**

- Place the sample of **W** in a 250 cm^3 beaker.
- Use a measuring cylinder to add 100 cm^3 of distilled water to the beaker.
- Stir the mixture until the solid is fully dissolved.
- Label this mixture **X**.

(i) Explain why it is important to use distilled water and **not** tap water for the experiment.

....

.... [1]

(ii) Describe the appearance of **X** after stirring.

.... [1]

(b) Titration of 0.100 mol/dm^3 NaOH with **X**.

- Rinse a burette with distilled water and then with **X**.
- Fill the burette with **X**.
- Record in Table 1.1 the initial burette reading.
- Use a volumetric pipette to add 25.0 cm^3 of the 0.100 mol/dm^3 NaOH to a conical flask.
- Add five drops of thymolphthalein indicator to the conical flask.
- Add **X** from the burette while swirling the flask, adding drop by drop near the end-point, until the solution just changes colour.
- Record in Table 1.1 the final burette reading.
- Repeat this titration two more times.

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(i) Record in Table 1.1 the burette readings from your titrations and complete the table with the volume used in each titration.

Tick (✓) the best titration results.

Table 1.1

	titration 1	titration 2	titration 3
final burette reading / cm^3			
initial burette reading / cm^3			
volume used / cm^3			
best titration results (✓)			

[5]

(ii) Use the best titration results (✓) to calculate the average volume of **X** used.

average volume .... cm^3 [1]

(c) Calculate the number of moles of NaOH in 25 cm^3 of 0.100 mol / dm^3 NaOH.

number of moles .... [1]

(d) The equation for the reaction between H_3A and NaOH is shown.

$$H_3A + 3NaOH \rightarrow Na_3A + 3H_2O$$

Calculate the number of moles of H_3A that react with 25 cm^3 of 0.100 mol / dm^3 NaOH.

number of moles .... [1]

(e) Calculate the number of moles of H_3A in the sample of **W**.

number of moles .... [1]

(f) The relative molecular mass of H_3A is 210.

Calculate the mass of H_3A in the sample of **W**.

mass .... g [1]

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(g) In **(a)** a measuring cylinder is used to add 100 cm^3 of distilled water to the beaker.

Explain why using the measuring cylinder makes the volume of distilled water used inaccurate. Suggest an improvement.

explanation ....

....

improvement .... [2]

(h) In **(b)** the burette is rinsed with distilled water and then with **X**.

(i) Explain why the burette is rinsed with distilled water.

.... [1]

(ii) Suggest and explain the effect on the titration results if the burette is **not** rinsed with **X** after rinsing with distilled water.

effect ....

explanation ....

.... [2]

[Total: 17]

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

Do the following tests on **A** and **B**.

Record your observations and conclusions for these tests.

Test and name any gases evolved.

(a) Do a flame test on **one** sample of **A**. Describe the method you use.

method ....

....

....

observations ....

....

conclusion ....

.... [4]

(b) **(i)** Place the other sample of **A** in a test-tube and add 3 cm depth of dilute hydrochloric acid.

When the reaction has finished, keep the contents of the test-tube for use in **(c)**.

observations ....

....

....

....

conclusion ....

.... [5]

(ii) Explain how you know when the reaction has finished.

....

.... [1]

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(c) Decant 1 cm depth of the solution from **(b)(i)** into each of two test-tubes.

(i) To one of these test-tubes, add aqueous ammonia until no further change is observed.

observations ....

.... [2]

(ii) To the second test-tube, add aqueous sodium hydroxide until no further change is observed.

observations ....

.... [1]

(d) Identify solid **A**.

....

.... [1]

(e) Place 1 cm depth of aqueous silver nitrate into each of four test-tubes.

Add 1 cm depth of dilute nitric acid to each of these test-tubes.

Keep the contents of all four test-tubes until you have completed all of part **(e)**.

To the first test-tube add 1 cm depth of aqueous sodium chloride.

To the second test-tube add 1 cm depth of aqueous potassium bromide.

To the third test-tube add 1 cm depth of aqueous potassium iodide.

To the fourth test-tube add 1 cm depth of **B**.

Leave the test-tubes for at least 1 minute before recording your observations in Table 2.1.

Table 2.1

solution	observation
sodium chloride	
potassium bromide	
potassium iodide	
B	

State the conclusion about **B** you can make from these observations.

conclusion ....

.... [3]

[Total: 17]

3 **You are not expected to do any experimental work for this question.**

Q is a mixture of solid copper(II) carbonate and solid lead sulfate.

Lead sulfate is insoluble in water and does **not** react with dilute sulfuric acid.

Copper(II) carbonate is insoluble in water. It reacts with dilute sulfuric acid to form copper(II) sulfate solution.

Plan an investigation to obtain pure copper(II) sulfate crystals and pure lead sulfate solid from **Q**.

Your plan should describe the use of common laboratory apparatus, dilute sulfuric acid and **Q**. No other chemicals should be used.

Your plan should include:

- the apparatus needed
- the preparation of copper(II) sulfate solution
- the method to obtain pure copper(II) sulfate crystals
- the method to obtain pure lead sulfate solid
- how to test that the lead sulfate is pure.

You may draw a diagram to help answer the question.

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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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