



CHRIST CHURCH SECONDARY SCHOOL
2025 PRELIMINARY EXAMINATION
FOUR EXPRESS

CANDIDATE
NAME

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CLASS

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CENTRE
NUMBER

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INDEX
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CHEMISTRY

Paper 3 Practical

6092/03

28 July 2025

1 hour 50 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the confidential instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number, name and class in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in the spaces provided on the Question Paper.

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

Qualitative analysis notes are printed on page 12.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

Shift
Laboratory

For Examiner's Use	
1	
2	
3	
Total	40

This document consists of **11** printed pages and **1** blank page.

- 1 An oxyacid of phosphorus has the formula, H_3PO_3 .

You are required to find, by experiment, the number of moles of sodium hydroxide that react with 1 mole of this acid.

P is 0.0984 mol/dm^3 sodium hydroxide.

Q is a solution containing 5.04 g of the oxyacid of phosphorus, H_3PO_3 , in 1 dm^3 of solution.

Read all the instructions carefully before starting the experiments in Question 1.

Instructions

- (a) (i) Fill the burette with solution **Q**.

Pipette 25.0 cm^3 of **P** into a flask and titrate with **Q**, using the indicator provided.

Record your titration results in the space provided below, repeating the titration as many times as you consider necessary to achieve consistent results.

Results

[5]

- (ii) From your titration results, obtain an average volume of **Q** to be used in your calculations. Show clearly how you obtained this volume.

average volume of **Q** [1]

- (b) (i) **P** is 0.0984 mol/dm^3 sodium hydroxide.

Calculate the number of moles of sodium hydroxide in 25.0 cm^3 of **P**.

no. of moles of sodium hydroxide in 25.0 cm^3 of **P** [1]

- (ii) **Q** is an aqueous solution of H_3PO_3 with a concentration of 5.04 g/dm^3 .

Calculate the molar concentration, in mol/dm^3 , of H_3PO_3 in **Q**.

[Ar: H, 1; P, 31; O, 16]

concentration of H_3PO_3 in **Q** [2]

- (iii) Hence, using your answer from (b)(i) and (b)(ii), calculate the number of moles of sodium hydroxide which react with 1 mole of H_3PO_3 .

no. of moles of sodium hydroxide [2]

- (iv) Using your answer to (b)(iii), write an equation for the reaction of the oxyacid of phosphorus, H_3PO_3 , with sodium hydroxide.

..... [1]

- (c) Using your results in (a)(ii), describe briefly how a pure and dry sample of the salt formed from the reaction of the oxyacid of phosphorus, H_3PO_3 , with sodium hydroxide can be obtained.

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[3]

- (d) A student repeated the experiment. When preparing solution **Q**, the student accidentally measured 5.04 g of the oxyacid of sulfur, H_2SO_3 , instead and dissolved it in 1 dm³ of solution.

The number of moles of sodium hydroxide which react with 1 mole of H_2SO_3 is the same as the number of moles of sodium hydroxide which react with 1 mole of H_3PO_3 .

Describe and explain the effect this would have on the titration results recorded in (a)(i).

[A_r: H, 1; S, 32; O, 16]

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[2]

[Total: 17]

2 You are provided with two solids, **R** and **S**.

You will carry out the following tests on the two solids, recording your observations at each stage. You should test and identify any gases evolved.

Read the instructions carefully before starting the experiments.

(a) Tests on Solid R

	test	observations
(i)	Using a spatula, place approximately half of the solid R sample in a boiling tube. With a measuring cylinder, add about 8 cm³ of dilute sulfuric acid to the boiling tube.	[2]
	Filter the reaction mixture from (a)(i) . The filtrate is solution T .	
(ii)	Pour about 1 cm depth of solution T into a test-tube. Add aqueous sodium hydroxide dropwise and then in excess.	[2]
(iii)	Place the remaining solid R in a hard-glass boiling tube. Heat the solid strongly until no further change is seen. Then, stop the heating and leave the solid to cool.	[2]

(iv) Identify the gas given off in (a)(i).

..... [1]

(v) Explain why it is **not** possible to identify the cation contained in solution **T** from your observations in (a)(ii).

.....

..... [1]

(vi) Suggest an additional test that can be done on solution **T** that would allow you to identify the cation contained in solution

.....

..... [1]

(b) Tests on Solid S

Place solid **S** in a boiling tube. With a measuring cylinder, add about 15 cm³ of distilled water to the boiling tube. Stopper the boiling tube and shake to dissolve the solid to form solution **S**.

Divide this volume of solution **S** into three approximately equal portions in three test-tubes.

	test	observations
(i)	Add the first portion of solution S to the aqueous chlorine provided in a test-tube.	[1]
(ii)	To the second portion of solution S , add about 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.	[1]

(iii)	To the third portion of solution S , add aqueous sodium hydroxide dropwise and then in excess.	[2]
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(iv) Use evidence from the observations above to identify solid **S**.

Identity:

Evidence:

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..... [3]

[Total: 16]

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- 3 (a)** You are provided with a rusty iron nail. The mass of the nail is between 0.10 to 0.20 g.

Outline a method you would use to determine the mass of rust in the iron nail.

You can assume all the apparatus and reagents normally found in a school laboratory are available. You may wish to include one or more labelled diagrams as part of your answer.

In your method, you should include the measurements you would take and explain how you would use your results to determine the mass of rust in the iron nail.

[illegible]

- (b) A separate experiment was carried out on a similar rusty nail to determine how the mass of the nail changes as time proceeds.

At 1-minute intervals, the mass of the rusty iron nail is measured.

The results are shown in the table.

time / min	mass of the rusty nail / g
0	0.17
1	0.11
2	0.07
3	0.06
4	0.06

Use these results to plot a suitable graph on the grid in the next page. Draw a line of best fit, using all of the plotted points.



[3]

[Total: 7]

END OF PAPER

NOTES FOR QUALITATIVE ANALYSIS

Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white 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.

Test for aqueous cations

<i>cation</i>	<i>effect of aqueous sodium hydroxide</i>	<i>effect of aqueous ammonia</i>
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.
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	green ppt., insoluble in excess
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

Test for gases

<i>gas</i>	<i>test and test result</i>
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	gives white ppt. with limewater (ppt. dissolves with excess CO_2)
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 aqueous acidified potassium manganate(VII) from purple to colourless