Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CHEMISTRY **5070/32**

Paper 3 Practical Test **May/June 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough work.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
Qualitative Analysis Notes are printed on page 8.
You should show the essential steps in any calculations and record experimental results in the spaces provided on the Question Paper.

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.

For Examiner's Use	
1	
2	
Total	

This document consists of **6** printed pages and **2** blank pages.

DC (RW) 107228

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 an aqueous solution of the oxyacid of phosphorus, H_3PO_3, containing 5.04 g / dm^3.

(a) Put **Q** into the burette.

Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **P** into a flask and titrate with **Q**, using the indicator provided.

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

Results

Burette readings

titration number	1	2	
final reading / cm^3			
initial reading / cm^3			
volume of **Q** used / cm^3			
best titration results (✓)			

Summary

Tick (✓) the best titration results.

Using these results, the average volume of **Q** required was .... cm^3.

Volume of **P** used was .... cm^3. [12]

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

Calculate the number of moles of sodium hydroxide in the volume of **P** used.

moles of sodium hydroxide in the volume of **P** used ....[1]

(c) **Q** is an aqueous solution of H_3PO_3 containing 5.04 g / dm^3.

Calculate the concentration, in mol / dm^3, of H_3PO_3 in **Q**.
The relative formula mass of H_3PO_3 is 82.

concentration of H_3PO_3 in **Q** ....mol / dm^3 [1]

(d) Calculate the number of moles of H_3PO_3 in the average volume of **Q** used in the titration.

moles of H_3PO_3 ....[1]

(e) Using your answers from **(b)** and **(d)**, calculate the number of moles of sodium hydroxide which react with 1 mole of H_3PO_3.

moles of sodium hydroxide ....[1]

(f) Using your answer to **(e)**, write an equation for the reaction of the oxyacid of phosphorus, H_3PO_3, with sodium hydroxide.

....[2]

[Total: 18]

2 You are provided with solutions **R** and **S**.
Carry out the following tests and record your observations in the table.
You should test and name any gas evolved.

test no.	test	observations
1	Gently warm 2 cm depth of **R** in a test-tube.	
2	To 1 cm depth of aqueous zinc sulfate in a test-tube, add **R** until no further change occurs.	
3	**(a)** To 1 cm depth of aqueous sodium chloride in a test-tube, add a few drops of aqueous silver nitrate. **(b)** To the mixture from **(a)**, add **R** until no further change occurs.	
4	**(a)** To 1 cm depth of aqueous hydrogen peroxide in a test-tube, add an equal volume of **R**. **(b)** To the mixture from **(a)**, add a small amount of copper(I) oxide powder. Leave to stand.	

test no.	test	observations
5	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous barium nitrate. **(b)** To the mixture from **(a)**, add dilute nitric acid.	
6	To 1 cm depth of **S** in a test-tube, add **R** until no further change is seen. Allow the final mixture to stand for a few minutes.	
7	**(a)** To 1 cm depth of **S** in a boiling tube, add an equal volume of dilute sulfuric acid. Add a small amount of manganese(IV) oxide to the boiling tube. Warm the mixture gently for about 20 seconds, then filter the warm mixture and collect the filtrate. **(b)** To 1 cm depth of the filtrate from **(a)** in a test-tube, add **R** until no further change occurs.	

[20]

Conclusions

Identify the compounds in solutions **R** and **S**.

Solution **R** contains ....

Solution **S** contains .... [2]

[Total: 22]

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QUALITATIVE ANALYSIS NOTES

Tests for anions

anion	*test*	*test result*
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 add aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

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.
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

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 aqueous acidified potassium manganate(VII) from purple to colourless