

Names: Index No:

School Exam Number: Signature:

Candidates should **NOT** write their
Centre Name or Centre Number
anywhere on this booklet

P525/3
CHEMISTRY
PRACTICAL
Paper 3
1 August 2023
3 ¼ hours



ENTEBBE JOINT EXAMINATION BUREAU

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 3

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt **all** questions.

Answers to all questions are to be written in the spaces
provided in this question paper.

Mathematical tables, slide rules and silent non - programmable
calculators may be used.

You are not allowed to use any reference books such as
textbooks, booklets on qualitative analysis, etc.

FOR EXAMINERS' USE ONLY			
Question 1	Question 2	Question 3	TOTAL

1. You are provided with the following:

FA1; which is an aqueous solution of a strong acid H_2Y .

FA2; which is an aqueous solution containing 4.25 g per litre of hydroxide ions, $\bar{O}H$

FA3: which is a 0.04M solution of hydroxide ions.

Solid W

You are required to determine the:

(i) Concentration of **FA1** in moles per litre;

(ii) Stoichiometric ratio of reaction between H_2Y in **FA1** and W.

PART I

Procedure:

- (a) Using a measuring cylinder, transfer 40.0cm^3 of **FA1** into a 250cm^3 volumetric flask and make up to the mark with distilled water. Label the solution **FA4**.
- (b) Pipette 25.0cm^3 (or 20.0cm^3) of **FA2** into a conical flask and titrate with **FA4** from the burette using phenolphthalein indicator. Repeat the titration to obtain consistent results.

Record your results in Table I below.

(i) Volume of pipette used cm^3 .
($\frac{1}{2}$ mark)

Table I

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of FA4 used (cm^3)			

(4 $\frac{1}{2}$ marks)

- (i) State the volumes of **FA4** used to calculate the average volume.
($\frac{1}{2}$ mark)

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(a) Calculate the number of moles of H_2Y in 250cm^3 of **FA4**.
($H = 1, O = 16$) (4½ marks)

[illegible][illegible]

PART II

Procedure:

- (c) Weigh accurately 2.5 g of **W**. Place it in a beaker. Add to it 20.0 cm³ of **FA1** and stir to dissolve. Transfer the products into a 250cm³ volumetric flask and top up with distilled water to the mark. Label the resultant solution **FA5**.
- (d) Pipette 25.0 cm³ (or 20.0 cm³) of **FA5** into a conical flask. Titrate the solution with **FA3** from the burette using phenolphthalein indicator. Repeat the titration until you obtain consistent results.

Record your results in Table II below.

Results:

Mass of weighing bottle + **W** g. (½ mark)

Mass of empty weighing bottle g (½ mark)

Mass of **W** used. g (½ mark)

Volume of pipette used cm³ (½ mark)

Table II

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA4 used (cm ³)			

(4½ marks)

- (i) State volumes of **FA3** used to calculate the average volume. (½ mark)
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- (ii) Calculate the average volume of **FA3**. (2½ marks)
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Questions

(b) Calculate the number of moles of:

(i) excess acid that reacted with hydrogen ions in **FA3**. (1½ marks)

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(ii) excess acid contained in 250cm³ of **FA5**. (01 mark)

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(iii) acid that reacted with **W**. (02 marks)

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(c) Determine the reaction ratio between H₂Y and **W**.
(Relative formula mass of W = 84)

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2. You are provided with substance **F** which contains **two** cations and **two** anions. You are required to carry out tests in Table 3 below identify the cations and anion in **F**. Identify any gas(es) evolved. Record your observations and deductions in the table below.

(32 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat two spatula endfuls of F in a dry test tube first gently, then strongly until there is no further change. Allow to cool.		
(b) To two spatula endfuls of F in a test tube, add about 5cm ³ of distilled water. Shake well and filter. Keep both the residue and filtrate.		
(c) Divide the filtrate into three parts. (i) To the first part of the filtrate, add 2-3 drops of dilute nitric acid then 2-3 drops of silver nitrate solution followed by dilute ammonia solution drop wise until in excess.		
(ii) To the second part of the filtrate, add 3 drops of concentrated nitric acid, followed by 4-5 drops of carbon		

tetrachloride. Shake well and allow the mixture to stand for one minute.		
(iii) To the third part of the filtrate, add aqueous copper(II) sulphate solution and allow to stand for 2 minutes.		
(d) Wash the residue twice in distilled water. Transfer it into a test tube, add dilute nitric acid and warm. Then add dilute sodium hydroxide solution drop wise until in excess. Filter and keep both the filtrate and the residue.		
(e) Acidify the filtrate using dilute nitric acid. Divide the acidic filtrate into three parts.		
(i) To the first part of the acidic filtrate, add potassium iodide solution.		
(ii) To the second part of the acidic filtrate, add aqueous ammonia solution drop wise until in excess.		

<p>(iii) Use the third part of the acidified filtrate to describe a test of your own choice to confirm one of the cations in F.</p> <p>Test</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>		
<p>(f) Dissolve the residue in (e) above in a minimum amount of dilute nitric acid. Divide the resultant solution in four portions.</p>		
<p>(i) To the first portion of the solution, add sodium hydroxide dropwise until in excess.</p>		
<p>(ii) To the second portion of the solution, add dilute aqueous ammonia solution drop wise until in excess.</p>		
<p>(iii) To the third portion of the solution, add dilute oxalate solution followed by ethanoic acid and warm.</p>		

(iv) Use the fourth portion of the solution to describe a test of your own choice to confirm the second cation in F .		
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(g) Identify the:

(i) cations in **F**.

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(ii) anions in **F**.

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3. You are provided with an organic compound **R**. You are required to determine the nature of **R**. Record your observations and deductions in the table below.

(18 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of R on the tip of a dry spatula or dry porcelain.		
(b) To about 3 cm ³ of distilled water, add 1 cm ³ of R and shake. Divide the mixture into three parts.		
(i) To the first part, add neutral iron(III) chloride solution.		
(ii) To the second part, add sodium hydrogen carbonate solution.		

(iii) To the third part, add acidified potassium(VI) solution and heat the mixture.		
(c) To 1 cm ³ of R , add 1cm ³ of ethanoic acid followed by 3 drops of concentrated sulphuric acid. Heat the mixture and pour the products in a beaker of cold water.		
(d) To 1 cm ³ of R , add about 2-3cm ³ of distilled water followed by 2,4-dinitrophenyl hydrazine solution.		
(e) To 2 cm ³ of R , add aqueous iodine solution, followed by dilute sodium hydroxide solution drop wise until the colour of iodine is discharged.		

(f) Describe the nature of **R**.

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