

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
24 July 2018
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 a solution of sodium thiosulphate in water.

FA₂ which is a solution containing 2.87 gdm⁻³ of iodate(v) ions.

Solid **W** which is a hydrated copper(ii) salt.

Starch indicator

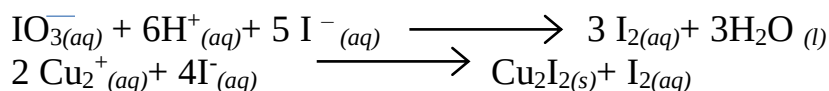
You are required to

(i) Standardize **FA₁**

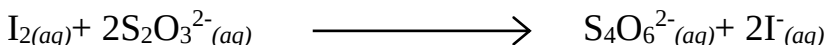
(ii) Determine the percentage of copper in **W**

Theory

Under acidic medium iodide ions react with iodate(v) ions and copper(ii) ions according to the following equations:



Iodine produced reacts with thiosulphate ions according to the equation:



Procedure A

Pipette 25.0 (or 20.0) cm³ of **FA₂** into a conical flask. Add an equal volume of 1 M sulphuric acid followed by 10 cm³ of potassium iodide solution. Titrate the mixture with **FA₁** until the solution is pale yellow add 5 drops of starch indicator and continue the titration until end point. Repeat the titration to obtain consistent results. Record your observations in Table I below.

Results:

Volume of pipette used cm³ (1 ½ marks)

Table I

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA₁ used (cm ³)			

(4 ½ marks)

Values of **FA₁** used to calculate the volumes of **FA₁**. (½ mark)

Average volume of **FA₁** used (2 ½ marks)

Questions:

- (a) Calculate the concentration of the thiosulphate ions in mol dm^{-3} of **FA1**.
($K = 39$, $I = 127$, $O = 16$) (3 ½ marks)

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Procedure B

Weigh accurately 6.0 g of **W** and dissolve it in about 100 cm^3 of distilled water. Transfer the solution into about 25.0 cm^3 of a volumetric flask. Add sodium carbonate solution until there is a slight precipitate formed. Then add dilute ethanoic acid drop wise until the precipitate dissolves. Make up to the mark with distilled water. Label the solution **FA3**.

Pipette 25.0 (or 20.0) cm^3 of **FA3** into a conical flask and add 10 cm^3 of potassium iodide solution. Titrate the mixture with FA1 until the solution just turns to a white precipitate. Repeat the titration to obtain consistent results. Record your results in table II below.

Results:

Mass of weighing container + W = ...	g (½ mark)
Mass of weighing container = ...	g (½ mark)
Mass of W alone = ...	g (½ mark)
Volume of pipette used = ...	cm^3

Table II

Final burette reading (cm^3)				
Initial burette reading (cm^3)				
Volume of FA1 used (cm^3)				

(4 ½ marks)

Values of **FA₁** used to calculate the volumes of **FA₁**. (½ mark)

Average volume of **FA₁** used (2 ½ marks)

Questions:

(b) Calculate the

(i) Number of moles of copper(ii) ions in 25 cm^3 or 20.0 cm^3 of **FA3**.

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(ii) Concentration of copper(ii) ions in mol dm^{-3} of **FA3**. (1 ½ marks)

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(iii) Percentage of copper in salt **W**. (Cu = 64) (02 marks)

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2. You are provided with substance **P** which contains *two* cations and *two* anions. You are required to carry out the following tests on **P** to identify the cations and anions in it; to identify any gas(es) evolved and record your observations and deductions in the table below. (35 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat one spatula endful of P strongly in a dry hard test tube.		
(b) To one spatula endful of P in a test tube, add 4 drops of concentrated sulphuric acid and heat.		
(c) To two spatula endfuls of P , add 4cm ³ of water. Shake vigorously; then to the mixture, add sodium hydroxide solution drop wise until in excess. Filter and keep both filtrate and residue.		
(d) Acidify the filtrate using dilute nitric acid. Divide the acidified filtrate into seven parts.		

TESTS	OBSERVATIONS	DEDUCTIONS
(i) To the first portion of the acidified filtrate, add dilute sodium hydroxide solution drop wise until in excess.		
(ii) To the second portion of the acidified filtrate, add potassium iodide solution.		
(iii) To the third portion of the acidified filtrate, add ammonia solution drop wise until in excess.		
(iv) Use the fourth portion of the acidified filtrate to carry out a test of your own choice to confirm one of the cations in P .		
(v) To the fifth portion of the acidified filtrate; add copper turnings followed by 3 drops of concentrated sulphuric acid and heat the mixture.		
(vi) To the sixth part of the acidified filtrate, add 2 -3 drops of Lead (II) ethanoate.		
(vii) Use the seventh part of the acidified filtrate to carry out a test of your own choice to confirm one of the anions in P .		
(e) Wash the residue and dissolve it in 3 cm ³ of dilute nitric acid. Divide the resultant solution into four parts. To the first part of the acidic solution, add dilute sodium hydroxide solution drop wise until in excess.		
(ii) To the second part of the acidic solution; add ammonia solution drop wise until in excess.		

Table continues on next page

TESTS	OBSERVATIONS	DEDUCTIONS
(iii) To the third part of the acidic solution, add 3 drops of dilute sulphuric acid.		
(iv) Use the fourth part of the acidic solution to carry out a test of your own to confirm one of the cations in P .		

(f) Identify the:

(i) Cations in **P** and

(ii) Anions in **P** and

3. You are provided with an organic compound **E**. You are required to determine the nature of **E**. Carry out the following tests and record your observations and deductions in the table below. (17 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of E on a spatula end or on a porcelain dish.		
(b) To about 3cm ³ of E in a test tube, add about 3cm ³ of water; shake and allow to stand. Test the mixture with litmus paper. Divide the resultant mixture into two parts.		
(i) To the first part of the mixture, add 3 drops of neutral Iron (III) chloride solution.		
(ii) To the second part of the mixture, add a spatula endful of sodium carbonate.		

TESTS	OBSERVATIONS	DEDUCTIONS
(c) To about 0.5cm ³ of <i>E</i> , add 3 – 4 drops of acidified potassium dichromate (VI) and heat.		
(d) To about 0.5cm ³ of <i>E</i> , add 3 – 4 drops of Brandy's reagent.		
(e) To about 1cm ³ of silver nitrate solution in a boiling tube, add an equal volume of sodium hydroxide solution followed by dilute ammonia solution drop wise until the precipitate formed just dissolves. Then add about 1cm ³ of <i>E</i> and warm.		
(f) To about 0.5cm ³ of <i>E</i> , add an equal volume of iodine solution and then sodium hydroxide solution drop wise until the brown colour of iodine is just discharged. Warm and allow cooling.		

(e) Comment on the nature of *E*.

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