

Name:.....

**P525/3**  
**Chemistry**  
**Practical**  
**Paper 3**  
**July 2024**  
**3½ hours.**



**ACEITEKA JOINT MOCK EXAMINATIONS 2024**

**Uganda Advanced Certificate of Education**

Chemistry

Practical

Paper 3

**Time: 3 hours 15 minutes**

***INSTRUCTIONS TO CANDIDATES***

- *All questions are compulsory*
- *Answers are to be written in the spaces provided in the booklet.*
- *All your work must be in **blue** or **black** ink.*
- *Any work done in pencil will not be marked.*
- *You are not allowed to work with the apparatus for the first 15 minutes. Use this time to read through the paper and check whether you have all chemicals and apparatus.*
- *You are not allowed to use any reference books.*
- *All working must be clearly shown.*
- *Mathematical tables and silent non-programmable scientific calculators may be used*

For Examiner's Use ONLY		
Q.1		
Q.2		
Q.3		
TOTAL		

1. You are provided with the following

**FA1:** which is an aqueous solution containing thiosulphate ions

**FA2:** which is an aqueous solution containing **1.19g** per litre of manganate (VII) ions

Solid **W:** which is a salt containing Iodate (V) ions.

**5%** potassium iodide solution

**2M** sulphuric acid

Starch indicator

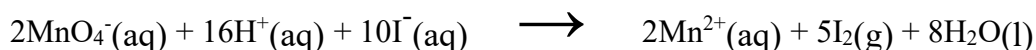
You are required to determine the

(i) concentration of thiosulphate ions in **FA1** in  $\text{mol dm}^{-3}$ .

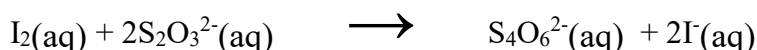
(ii) percentage of mass of iodine in **W**.

### Theory:

In acidic medium, manganate (VII) ions and iodate (V) ions oxidise iodide ions to liberate iodine according to the following equations.



The Iodine liberated in each reacts with thiosulphate ions according to the following equation.



### Procedure A

- (a) Using a measuring cylinder, transfer exactly **100cm<sup>3</sup>** of **FA1** into a **250cm<sup>3</sup>** volumetric flask. Add distilled water to make it up to the mark and label the resultant solution **FA3**.
- (b) Pipette **25.0 (20.0) cm<sup>3</sup>** of **FA2** into a conical flask, add **15cm<sup>3</sup>** of sulphuric acid followed by an equal volume of **5%** potassium iodide solution. Titrate the iodine liberated with **FA3** from the burette using starch indicator until the end point. Repeat the titration until you obtain consistent results. Record your results in the table 1 below

Results

**Table 1**

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

Titration	1	2	3
Final burette reading( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of FA3 used ( $\text{cm}^3$ )			

(ii) Volumes of **FA3** used for calculating average volume ( $\frac{1}{2}$  *mk*)

.....

(iii) Calculate the average volume of **FA3** used ( $2\frac{1}{2}$  *mks*)

.....

.....

#### Questions

(a) Calculate the

(i) moles of thiosulphate ions contained in **250cm<sup>3</sup>** of **FA3**. (*03mks*)

(**Mn = 55, O= 16**)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (ii) concentration of thiosulphate ions in  $\text{mol dm}^{-3}$  of **FA1**

.....

.....

.....

.....

.....

.....

### Procedure B

- (i). Weigh accurately about **1.8g** of **W** into a beaker. Add minimum amount of distilled water and stir to dissolve. Transfer the products into a **250cm<sup>3</sup>** of volumetric flask. Make up to the mark with distilled water and label the resultant solution **FA4**.
- (ii). Pipette **25.0 (20.0) cm<sup>3</sup>** of **FA4** into a conical flask. Add **15.0cm<sup>3</sup>** of **2M** sulphuric acid followed by an equal volume of **5%** potassium iodide solution. Titrate the liberated iodine with **FA1** from the burette using starch indicator until the end point.

Repeat the titration until you obtain consistent results.

Record your results in table II below

### Results:

**Table II**

Mass of weighing bottle + W = ..... g ( $\frac{1}{2}$  mk)

Mass of empty weighing bottle = .....g ( $\frac{1}{2}$  mk)

Mass of W used= .....g ( $\frac{1}{2}$  mk)

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

Titration	1	2	3
Final burette reading( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of <b>FA1</b> used ( $\text{cm}^3$ )			

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

- (i). State the volumes of **FA1** used for calculating average volume ( $\frac{1}{2}$  mk)

.....

(ii). Calculate the average volume of **FA1** used

(2½ mks)

.....

.....

**Questions:**

(b) Calculate the concentration of iodate (V) ions in **FA4** in  $\text{mol dm}^{-3}$

(4mks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Determine the percentage by mass of iodine in **W**. (I=127, O=16)

(3½ mks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2. You are provided with substance **T** which contains **three** cations and **one** anion. You are required to carry out the following tests to identify the cations and anion in **T**. Record your observation and deductions in the table below. Identify any gases evolved.

Tests	Observations	Deductions
(a) Heat two spatula endfuls of <b>T</b> strongly until there is no further change.		
(b). To two spatula endfuls of <b>T</b> add about 6cm <sup>3</sup> of water. Shake thoroughly and filter. Keep both the filtrate and residue. Divide the filtrate into three parts.		
(i). To the first part of the filtrate, add sodium hydroxide solution drop wise until in excess and filter. Keep the filtrate for part (c).		

(ii). To the second part of the filtrate, add ammonia solution drop wise until in excess.		
<b>Tests</b>	<b>Observations</b>	<b>Deductions</b>
iii. Use the third part of the filtrate to carry out a test of your own choice to confirm one of the cations in T.  <b>Test:</b>		
(c). Acidify the filtrate using dilute hydrochloric acid. Divide the filtrate into three parts.		
(i). To the first portion of the acidic filtrate add sodium hydroxide dropwise until in excess.		
(ii). To the second part of the acidic filtrate, add ammonia solution dropwise until in excess		

iii. To the third part of the acidic filtrate, carryout a test of your own choice to confirm the second cation in T.  <b>Test:</b>		
<b>Tests</b>	<b>Observations</b>	<b>Deductions</b>
(d). Wash the residue from(b) and transfer it into a test tube, add dilute nitric acid until there is no further change. Divide resultant solution into two parts.		
(i). To the first part of the solution add sodium hydroxide dropwise until in excess.		
(ii). To the second part of the solution, add ammonia solution dropwise until in excess. To the product(s) add 2-3 drops of dimethylglyoxime solution.		

Identify the:

(i) Cations in T .....

(ii) Anion in T .....



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

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of <b>M</b> on a tip of a dry spatula or dry porcelain		
(b). (i) Shake a half spatula endful of <b>M</b> with about <b>2cm<sup>3</sup></b> of dilute sodium hydroxide solution.		
(ii). Shake a half spatula endful of <b>M</b> with about <b>2cm<sup>3</sup></b> water and add <b>2-3</b> drops of litmus solution.		
(c). Shake a spatula endful of <b>M</b> with about <b>5cm<sup>3</sup></b> of water and divide the solution into three parts.		
(i). To the first part of the solution, add <b>2-3</b> drops of sodium hydrogen carbonate solution.		
(ii). To the second part of the solution, add <b>2-3</b> drops of 2, 4-dinitrophenyl hydrazine (Brady's Reagent) solution		

TESTS	OBSERVATIONS	DEDUCTIONS
iii. To the third part of the solution, add <b>2-3</b> drops of iron(iii) chloride solution and warm.		
(d). Dissolve a spatula endful of <b>M</b> , in about <b>5cm<sup>3</sup></b> of water. To the solution add about <b>1-2cm<sup>3</sup></b> of dilute sodium hydroxide solution. Heat the mixture, cool, add <b>2-3</b> drops of silver nitrate solution and filter. Keep both the filtrate and the residue.		
(e). To the residue, add dilute ammonia solution dropwise until in excess		
(f). To the filtrate, add an equal volume of ethanol followed by <b>3-4</b> drops of concentrated sulphuric acid. Heat the mixture and cool.		

(g). Comment on the nature of **M**

.....

.....

**END**