Candidate's Name.....

Signature ..... Centre Name.....

P525/3

Chemistry

(Practical)

Paper 3

August. 2024

3 ¼ Hours

ASSOCIATION OF SECONDARY SCHOOLS HEADTEACHERS OF UGANDA

(ASSHU)- NTUNGAMO

NTUNGAMO DISTRICT JOINT MOCK EXAMINATIONS 2024

Uganda Advanced Certificate of Education

CHEMISTRY

(PRACTICAL)

PAPER 3

3 HOURS AND 15 MINUTES

INSTRUCTIONS TO CANDIDATES :

- Answer all questions. Use **blue** or **black** ink. Any work done in pencil will **not** be marked except drawing.
- All your answers **must** be written in the spaces provided.
- Mathematical tables and silence non-programmable scientific calculators may be used.
- Reference books (i.e text books, booklets on qualitative analysis e.t.c) should **not** be used
- You are not allowed to start working with the apparatus for the first **15 minutes**. This time is to enable you read the question paper and make sure you have all the apparatus and chemicals that you may need.

For Examiner's use only			
Q1	Q2	Q3	Total

1. You are provided with the following :

FA1, which is a solution containing manganate (VII) of unknown concentration.

FA2, which is a solution containing **6.3gdm^{-3}** of hydrated ethane – 1, 2-dioic acid, $H_2C_2O_4.\mathbf{2}H_2O$

Solid , **X** which is a salt of Iron(II)

2M sulphuric acid solution

You are required to standardize **FA1** and use it to determine the percentage of Iron in the salt **X**

Manganate (VII) ions react with ethane dioate and Iron (II) ions according to the following equations;

$$2MnO_{4\,(aq)}^{-} + 16H_{(aq)}^{+} + 5C_2O_{4\,(aq)}^{2-} \longrightarrow 2Mn_{(aq)}^{2+} + 8H_2O_{(l)} + 10CO_{2\,(g)}$$

$$MnO_{4\,(aq)}^{-} + 8H_{aq}^{+} + 5Fe_{(aq)}^{2+} \longrightarrow Mn_{(aq)}^{2+} + 4H_2O_{(l)} + 5Fe^{3+}{}_{(aq)}$$

PART 1

PROCEDURE:

Pipette 25.0 (or 20.0)cm^3 of **FA2** into a conical flask. Add an equal volume of 2M Sulphuric acid and heat the mixture to about **60^{0}c**

Titrate the hot mixture with **FA1**

Repeat the titration until you obtain consistent results

Record your results in table **1**

Results

Table 1

Volume of pipette used .....cm^3 **(½ mark)**

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

(4 ¼ marks)

(a) (i) Record the volumes of **FA1** used for calculating the average volume **(½ mark)**

.....cm^3

(ii) Calculate the average volume of **FA1** used **(2½ marks)**

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.....cm^3

(b) Calculate the concentration of ;

(i) **FA2** in $moldm^{-3}$ **(02marks)**

(H=**1**, C=**12**, O=**16**)

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(ii) **FA1** in moldm^{-3} **(3 ½ marks)**

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PART II

PROCEDURE

Weigh accurately **5.2g** of **X** into a beaker. Add 50cm^3 of 2M Sulphuric acid and stir to dissolve. Transfer the solution into a 250cm^3 volumetric flask and make it up to the mark with distilled water. Label the solution **FA3**

Pipette 25.0cm^3 or (20.0cm^3) of **FA3** into a conical flask. Add an equal volume of 2M sulphuric acid.

Titrate the mixture with **FA1** from the burette

Repeat the titration until you obtain consistent results.

Record your results in **table 2**

Results :

Mass of weighing container + **X** = ...g **(½ mark)**

Mass of weighing container alone = ...g **(½ mark)**

Mass of **X** used = ...g **(½ mark)**

Volume of pipette used .....cm^3 **(½ mark)**

Table 2

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

(4 ½ marks)

(a) (i) Record the volumes of **FA1** used for calculating the average volume **(½ mark)**

..... cm^3

(ii) Calculate the average volume of **FA1** used **(2 ½ marks)**

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..... cm^3

(b) Calculate the;

(i) Number of moles of Manganate (VII) in **FA1** that reacted **(1 ½ marks)**

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(ii) Concentration of **FA3** in moldm^{-3} **(02marks)**

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(c) Determine the percentage of iron in salt **X** **(3 ½ marks)**

(Fe = **56**)

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2. You are provided with Substance, **J** which contains **two** cations and **two** anions. Carry out the following tests to identify the cations and anions present in **J**.

Identify any gas(es) evolved

Record your observations and deductions in **table 3** **(32 marks)**

Table 3

TESTS	OBSERVATION	DEDUCTIONS
(a) Heat **two** spatula end-fuls of **J** in a dry test tube strongly until there is no further change		
(b) To **two** spatula end – fuls of **J** in a boiling tube, add dilute nitric acid drop – wise until there is no further change. To the resultant solution, add dilute sodium hydroxide solution drop – wise until in excess. Shake and filter. Keep both the filtrate and residue.		

(c) To the filtrate, add dilute nitric acid little at a time until the solution is just acidic. Divide the acidified filtrate into **seven** portions.		
(i) To the **first** part of the acidified filtrate, add dilute sodium hydroxide solution drop – wise until in excess.		
(ii) To the **second** part of the acidified filtrate, add **2 – 3** drops of potassium iodide solution		
(iii) To the **third** part of the acidified filtrate, add dilute ammonia solution drop – wise until in excess		

(iv) Use the **fourth** part of the acidified filtrate, to carry out a test of your own choice to confirm the first cation in **J** **TEST**		
(v) To the **fifth** part of the acidified filtrate, add **2 -3** drops of silver nitrate solution followed by dilute ammonia solution drop – wise until in excess.		
(vi) To the **sixth** part of the acidified filtrate, add **4 -5** drops of concentrated sulphuric acid followed by **3** drops of **starch** solution.		

(vii) To the **seventh** part of the filtrate, add **3 -4** drops of lead (II) nitrate solution		
(d) Wash the residue with dilute sodium hydroxide solution, transfer it into a test tube, add dilute hydrochloric acid and shake to dissolve. Divide the resultant solution into **three** parts.		
(i) To the **first** part of the solution, add dilute sodium hydroxide solution drop – wise until in excess.		
(ii) To the **second** part of the solution, add dilute ammonia solution drop – wise until in excess		

(iii)Use the **third** part of the solution to carry out a test of your own choice to confirm the second cation in **J** **TEST**		

(d) The cations in **J** are .....and .....

The anions in **J** are ..... and .....

3. You are provided with substance ,**K** which is an organic compound.
You are required to carry out the tests in table 4 and determine the nature of **K**
Record your observations and deductions in **table 4** **(18marks)**

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of **K** on a spatula end or in a porcelain dish		

(b)To 1cm^{3}of **K**, add 4cm^3 of water, shake and test with litmus paper. Divide the mixture into **three** parts.		
(i) To the **first** part of the mixture, add a spatula end – ful of solid sodium hydrogen carbonate		
(ii) To the **second** part of the mixture, add **2 -3** drops of neutral Iron(III) chloride solution		
(iii) To the **third** part of the mixture, add **2 -3** drops of **bromine water.**		
(c) To 1cm^3 of **K**, add 3 - 4 drops of 2,4 – dinitrophenylhydrazine solution (**Brady's reagent**)		

(d) To about $1cm^3$ of **K**, add **2 -3** drops of acidified potassium dichromate (VI) solution, heat and allow to cool. Then add **3 – 4** drops of 2,4-dinitrophenylhydrazine solution **(Brady's reagent)**		
(e) To $1cm^3$ of **K**, add $1cm^3$ of ethanoic acid, followed by **2 – 3** drops of concentrated sulphuric acid. Heat the mixture and pour it into a small beaker of cold water		
(f) To $0.5cm^3$ of **K**, add a solution of an hydrous zinc chloride in concentrated hydrochloric acid **(Luca's reagent)** shake and allow to stand.		

(g) Describe the nature of **K**

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END