Name ..... Centre / Index No ...../.....

School ..... Signature .....

P525/3
CHEMISTRY
(PRACTICAL)
Paper 3
July/August
3 1/4 hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

CHEMISTRY
PRACTICAL

Paper 3

3 hours 15 minutes

Instructions to Candidates:

- *Answer* **all** *questions.*
- *Record your answers on this question paper in the spaces provided.*
- *Mathematical tables and silent non-programmable calculators may be used.*
- *Reference books (i.e, textbooks, books on qualitative analysis etc.) should* **not** *be used.*
- *Candidates are* **not** *allowed to start working with the apparatus for the first 15 minutes. This time is to enable candidates to read the question paper and make sure they have all apparatus and chemicals that they may need.*
- *Where necessary use* (S = 32, O = 16).

For Examiners' Use Only			
Q.1	Q.2	Q.3	Total

1. You are provided with the following;
FA1, which is a solution potassium manganate(VII) of unknown concnetration.

FA2, which is made by dissolving 2.016g of anhydrous sodium sulphite in $0.5dm^3$ of solution.
FA3 which is 0.3M ethanedioic acid solution.

Solid **D**, which is a sample containing manganese (IV) oxide.
1M sulphuric acid.

You are required to standardize FA1 and use it to determine the percentage of manganese(IV) oxide in D.

The equations that take place include

$2MnO_4^-(aq) + 5SO_3^{2-}(aq) + 6H^+(aq) \longrightarrow 2Mn^{2+}(aq) + 5SO_4^{2-}(aq) + 3H_2O(l)$

$2MnO_4^-(aq) + 5C_2O_4^{2-}(aq) + 16H^+(aq) \longrightarrow 2Mn^{2+}(aq) + 10CO_2(g) + 8H_2O(l)$

$MnO_2(s) + H_2C_2O_4(aq) + 2H^+(aq) \longrightarrow Mn^{2+}(aq) + 2CO_2(g) + 2H_2O(l)$

Procedure I.

(a) Pipette **$25cm^3$ (or $20cm^3$)** of **FA2** into a clean conical flask, add an equal volume of 2M sulphuric acid and titrate the mixture with solution **FA1** from the burette. Repeat the titration 2 – 3 times until you obtain consistent readings. Enter your results in the **Table I** below.

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

Titration Number	1	2	3
Final burette reading $(cm)^3$			
Initial burette reading (cm^3)			
Volume of **FA1** used (cm^3)			

(03mark)

Titre values used for calculating average volume of **FA1** (½ mark)

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Average volume of **FA1** used

.....cm^3 (2½ mark)

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Question

(b) Calculate the concentration of potassium manganate (VII) in $moldm^{-3}$ in **FA1**
(05 ½ marks)

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Procedure II

(c) Weigh accurately about **0.2g** of **D** and transfer it into a 250cm^3 conical flask. Add about **100cm^3** of **FA3** and heat the mixture until it just dissolves. Transfer with all the washings of the contents of the conical flask into a **250cm^3** volumetric flask. Add distilled water to top up to the mark. Label the resultant solution **FA4.**

(d) Pipette 25**cm^3** (or 20cm^3) of **FA4** into a clean conical flask. Add an equal volume of 1M sulphuric acid and heat the mixture to about 70^{o}C. Titrate the hot solution with **FA1** from the burette until the end point. Repeat the titration 2 – 3 times until you obtain consistent results. Enter your results in **Table II** below

Results:

Mass of empty bottle + **D** = ...g (½ mark)

Mass of empty bottle alone = ... g (½ mark)

Mass of **D** alone = ...g (½ mark)

Table II

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

Titration Number	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **FA1** used (cm^3)			

(03mark)

Titre values for calculating average volume of **FA1** (½ mark)

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Average volume of **FA1** .....cm^3 (2½ mark)

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Turn Over

Question

(e) Calculate the number of moles of

(i) excess ethanedioic acid in **FA4** that reacted with **FA1.** (3 mark)

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(ii) ethanedioic acid that reacted with manganese(IV) oxide in **D** (2 marks)

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(f) Determine the **Percentage of manganese(IV) oxide in D**
(Mn = 55 , O = 16) (2 marks)

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2. You are provided with substance **Z**, which contains **two** cations and **two** anions. You are required to carry out the following tests on **Z** to identify the cations and anions in it. Identify any gas(es) evolved. Record your observations and deductions in the table below. (28½ marks)

Tests	Observations	Deductions
(a) Heat one spatula endful of **Z** strongly in a dry test tube.		
(b) To ½ spatula endful of Z add 3-4 drops of concentrated sulphuric acid		
(c) To two spatula endfuls of **Z** in a test tube, add dilute nitric acid dropwise until the solid just dissolves. Add sodium hydroxide drop- wise until in excess and filter. Keep both filtrate and residue.		
(d) To the filtrate from (c) add dilute nitric acid drop-wise until the solution is just acidic. Divide the acidified filtrate into **six** portions.		
(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 dilute ammonia solution drop wise until in excess.		
(iv) Use the **fourth** portion of the acidified filtrate to carry out a test of your choice to confirm one of the cations in Z.		

Turn Over

(v). To the **fifth** portion of the acidified filtrate, add lead (II) nitrate solution.		
(vi) Use the **sixth** portion of the acidified filtrated to carry out a test of your own choice to confirm the remaining anion in Z.		
(e) Wash the residue from (c) and then dissolve it in dilute hydrochloric acid. Divide the acidic solution into **four** portions. (i) To the **first** portion of the acidic solution, add dilute sodium hydroxide solution drop wise until in excess.		
(ii) To the **second** portion of the acidic solution, add ammonium oxalate solution followed by concentrated ethanoic acid drop-wise until in excess.		
(iii) To the **third** portion of the acidic solution, add 2-3 drops of sodium sulphate solution.		
(iv) Use the **fourth** portion of the acidic solution to carry out a test of your own choice to confirm the remaining cation in Z.		

(f) (i) Cations in **Z** .....and .....

(ii) Anions in **Z** .....and .....

3. You are provided with organic compound **S**. You are required to determine the nature of **S**. Carry out the following tests on **S** and record your observations and deductions in the table below. (15 marks)

Tests	Observations	Deductions
(a) Burn a small amount of **S** on a spatula end or on a porcelain dish		
(b) To half a spatula endful of **S** in a test tube, add sodium hydroxide solution drop wise until in excess and then shake vigorously.		
(c) To half a spatula endful of **S** in a boiling tube, add about 5 cm^3 of water and shake. Then heat gently to boil. Test the resultant mixture with litmus paper. Divide the resultant mixture into **three** portions.		
(i). To the **first** portion of the hot mixture, add 3-4 drops of neutral iron (III) chloride solution.		
(ii). To the **second** portion of the hot mixture, add half a spatula endful of solid sodium carbonate.		
(iii).To the **third** portion of the hot mixture, add 3-4 drops of Brady's reagent.		
(iv). To half a spatula endful of **S** in a boiling tube, add about 2 cm^3 of methanol. Shake to dissolve and then add 2-3 drops of concentrated sulphuric acid. Heat and allow to cool. Then pour the contents into a small beaker of water.		

(c) Comment on the nature of **S**

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END