Candidate's Name:…………………………………………………………………………

Signature:………………………………………………………………………………..

P525/3

CHEMISTRY

(Practical)

Paper 3

Jul/Aug.2023

3 ¼ hours

WWEK PRACTICALS

Uganda Advanced Certificate of Education

CHEMISTRY-PRE MOCK SET7

(PRACTICAL)

Paper 3

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

*Answer all questions. Use **blue** or **black** ball point pens. Any work done in pencil will **not** be marked except drawings.*

Record your answers on this question paper in the spaces provided.

Mathematical tables and silent non-programmable scientific electronic calculator may be used.

*Reference books (i.e. text books, booklets on qualitative analysis etc.) should **not** be used.*

*Candidates are not allowed to start working with the apparatus for the first **15 minutes**. This is to enable candidates read the question paper and make sure they have all the apparatus and chemicals that they may need.*

For Examiners' Use only

Q.1	Q.2	Q.3	TOTAL

1. You are provided with the following:

FAI, which is a solution containing 39.2 g per litre of ammonium ferrous sulphate $(NH_4)_2SO_4.FeSO_4.6H_2O$.

FA2, which is a solution of potassium manganate (VII) of unknown concentration.

2M sulphuric acid

Solid **W**

You are required to determine the;

(i)   Concentration of **FA2** in moles per litre

(ii)   Stoichiometric ratio of reaction between Fe^{2+} ions in **FA1** and **W**.

Manganate (VII) ions reacts with iron (II) ions in acidic medium according to the following equation.

$$5Fe^{2+}(aq)+ MnO_4^-(aq)+ 8H^+(aq) \longrightarrow 5Fe^{3+}(aq) + Mn^{2+}(aq)+ 4H_2O(I)$$

PROCEDURE:

PART I:

Pipette 25.0 cm^3 (or 20.0 cm^3) of **FAI** into a conical flask, then add 20 cm^3 sulphuric acid. Titrate the mixture with **FA2** from the burette until the end point. Repeat the titration until you obtain consistent results. Record your results in **Table 1**.

Results:

Volume of pipette used………………………………………………..cm^3 (*1/2 mark*)

<div align="center">Table 1</div>

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **FA2** used (cm^3)			

<div align="right">(*41/2 marks*)</div>

Titre values used to calculate average volume of **FA2** used $\qquad$ (*1/2 mark*)

………………………………………………………………………………….cm^3

Average volume of **FA2** used $\qquad$ (*21/2 marks*)

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

Questions:

Calculate the concentration of manganate (VII) ions in **FA2** per litre of solution. (H= 1, N= 14, O= 16, S=32, Fe= 56) $\qquad$ (*3 marks*)

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

PART II:

Weigh accurately about 0.5g of **W** and place it in a beaker. Add to it about 50cm3 of distilled water and stir to dissolve. Transfer the contents of the beaker into a 250cm^3 volumetric flask. Add exactly 150cm^3 of **FA1** and top up with distilled water to the mark, heat the mixture for about 10 minutes. Shake and allow to stand for about 5 minutes. Label the resultant solution **FA3**.

Pipette 25.0cm³ (20.0cm³) of **FA3** into a conical flask followed by 10cm³ of 2M sulphuric acid and then titrate with **FA2** until the end point. Repeat the titration until you obtain consistent results. Record your results in **Table 2**.

Results:

Mass of **W** and the weighing bottle……………………………………….g (*1/2 mark*)

Mass of empty weighing bottle……………………………………………...g (*1/2 mark*)

Mass of **W** used……………………………………………………...….g (*1/2 mark*)

Volume of pipette used……………………………………cm³   (*1/2 mark*)

Table 2

Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of **FA2** used (cm³)			

(*41/2 marks*)

Titre values used to calculate average volume of **FA2** used   (*1/2 mark*)

……………………………………………………………………………….cm³

Average volume of **FA2** used   (*21/2 marks*)

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Questions:

(a) Calculate the number of moles of;

(i)   Excess iron (II) ions that reacted with manganate (VII) ions in **FA2**. (*2 ½ marks*)

....
....
....
....
....
....
....

(ii)   Excess iron (II) ions contained in 250cm^3 in **FA3**.   (*2 marks*)

....
....
....
....
....
....

(iii)   Iron (II) ions that reacted with **W**.   (*2 ½ marks*)

....
....
....
....
....
....
....

(b) Determine the reaction ratio between iron (II) ions and **W**. (Relative formular mass of
    W = 123)   (*2 ½ marks*)

....
....
....
....
....

……

……

……

……

……

……

……

……

……

2.You are provided with substance **X** which contains two cations and two anions. You are required to identify the ions in **X**. Carry out the following tests and identify any gas(es) evolved. Record your observations and deductions in **Table 3**.   (30 marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat **X** in a dry test tube gently then strongly and allow to cool.		
(b) To **one** spatula endful of **X** add concentrated sulphuric acid and warm.		

(c) Shake **two** spatula endfuls of **X** with 5cm^3 of water. Divide the resultant solution into three parts.		
(i) To the **first** part, add 3-4 drops of ethanol followed by 2-3 drops of concentrated sulphuric acid and heat.		
(ii) To the **second** part, add Iron (III) chloride solution and heat.		
(iii) To the **third** part add ammonia solution dropwise until in excess. Filter, keep both the filtrate and residue.		
(d) To the **filtrate** from (c iii), add dilute hydrochloric drop wise until the solution is just acidic. Divide the resultant solution into **five** parts.		
(i) To the **first** part of the acidic solution, add sodium hydroxide solution dropwise until in excess.		
(ii) To the **second** part of the acidic solution, add ammonia solution dropwise until in excess.		

(iii) Use the **third** part of the acidic solution to carryout a test of your choice to confirm the first cation in **X**. **Test:**		
(iv) To the **fourth** part of the acidic solution, add 2-3 drops of lead (II) nitrate solution.		
(v) To the **fifth** part of the acidic solution, add 2-3 drops of barium chloride solution.		
(e) Wash the **residue** from (c iii) with ammonia solution once then dissolve it in dilute sulphuric acid. Divide the resultant solution into **three** parts.		
(i) To the **first** part add sodium hydroxide solution dropwise until in excess.		
(ii) To the **second** part add ammonia solution dropwise until in excess.		

(iii) To the third **part** add litmus solution followed by ammonia solution.		

Cations in **X** are………………………………and……………………………………………

Anions in **X** are……………….…………and………………….…..……………………….

2. You are provided with substance **M** which is an organic compound. You are required to determine the nature of **M**. Carry out the following tests and identify any gas(es) evolved. Record your observations and deductions in **Table 4**.   (20 marks)

Table 4.

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of **M** on a spatula end		
(b) To 2cm3 of **M**, add 3cm3 of water and shake. Divide the mixture into **three** parts.		
(i) To the **first** part of the solution add 2-3 drops of Iron (III) chloride solution.		

(ii)	To the **second** part of the solution add 2-3 drops of sodium carbonate solution.		
(iii)	To the **third** part of the solution add 2-3 drops of acidified potassium manganate (VII) solution and heat.		
(c) To 0.5cm^3 of **M** in a test tube, add 2-3 drops of 2,4- dinitrophenyl hydrazine solution (Brady's reagent)			
(d) To 1cm^3 of **M**, add 2cm3 of ethanol followed 2-3 drops of concentrated sulphuric acid and heat. Pour the products in a beaker of cold water and stir.			
(e) To 1cm^3 of **M**, add 2-3 drops of Tollen's reagent and heat.			

Describe the nature of **M**.

………

………

………

………

END

CONFIDENTIAL

Each student is to be provided with;

120 cm3 of **FA1**

60cm^3 of FA2

1.0 g of solid **W**

60cm^3 2M Sulphuric acid

Weighing scale

100 ml measuring cylinder

3 beakers (250ml each)

Volumetric flask (250ml)

Distilled water Pipettes (25.0cm^3/20.0cm^3)

2 conical flasks

Burette

Droppers

Source of heat

A spatula

3 g of substance **X**

6 test tubes

2 filter papers

Litmus papers

FA1 is made by dissolving 39.2g of Ammonium ferrous sulphate in 1 litre

FA2 is 0.02M Potassium manganate (VII) solution

Solid **W** is Potassium chlorate.

X is a mixture of Zinc acetate and Aluminium sulphate in a ratio 3:2

3g of substance **W**.

M is Methanoic acid/Formic acid.