Candidate's Name ……

Signature …….....

Random No.					*Personal No.*		

525/3

CHEMISRY

(***PRACTICAL***)

***PAPER* 3**

$3\frac{1}{4}$ ***Hours***

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 the 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 Examiner's use only			
Q.1	**Q.2**	**Q.3**	**Total**

1. You are provided with the following;

SA1; which is potassium manganate(VII) solution of unknown concentration.

SA2; which is a 0.10M Diammonium iron(II) sulphate-6-water.

Solid Q; which is an impure metal peroxodisulphate with a formula VS_2O_8.

IM sulphuric acid.

Phenolphthalein indicator.

You are required to;

(i) Standardize **SA1**.

(ii) Determine the percentage purity of VS_2O_8 in **Q**.

Procedure 1

Pipette 20.0 or 25.0cm^3 of **SA2** into a clean conical flask. Add equal volume of 1M sulphuric acid and titrate the mixture with **SA1** from the burette until end point.

Repeat the titration until you obtain consistent results. Record your results in the table 1 below.

Volume of pipette used=…….cm^3 ($\frac{1}{2}mark$)

Table 1

$Experiment\ number$	1	2	3
$Final\ burette\ reading(cm^3)$			
$Initial\ burette\ reading(cm^3)$			
$Volume\ of\ \boldsymbol{SA1}\ used\ (cm^3)$			

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

Titre values used to calculate the average volume of **SA1** used. ($\frac{1}{2}mark$)

……

……

Average volume of **SA1** used ($02\frac{1}{2}marks$)

……

……

Procedure II

Weigh accurately about 0.5g of solid **Q** into a clean beaker. Add about 50cm^3 of distilled water and stir to dissolve. Transfer the solution into a 250cm^3 volumetric flask, add exactly 150cm^3 of **SA2** to the solution in the volumetric

flask and make it up to the mark by adding distilled water. Shake and allow it to stand for 4-5 minutes. Label the resultant solution **SA3**.

Pipette 25.0cm^3 or 20.0cm^3 of **SA3** into a conical flask and add an equal volume of 1M sulphuric acid.

Titrate the mixture with **SA1** from the burette. Repeat the titration until you obtain consistent results.

Record your results in the table 2

Results;

Mass of container + Q =……g ($\frac{1}{2}mark$)

Mass of empty container =……g ($\frac{1}{2}mark$)

Mass of Q used =……g ($\frac{1}{2}mark$)

Volume of pipette used =……cm^3 ($\frac{1}{2}mark$)

Table2

$Experiment\ number$	1	2	3
$Final\ burette\ reading(cm^3)$			
$Initial\ burette\ reading(cm^3)$			
$Volume\ of\ \boldsymbol{SA1}\ used\ (cm^3)$			

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

Titre values used to calculate the average volume of SA1 used. ($\frac{1}{2}mark$)

……

……

Average volume of **SA1** used ($02\frac{1}{2}marks$)

……

……

Questions

(a) Write the overall ionic equation for the reaction between manganate(VII) ions and iron(II) ions in **SA2**. ($01\frac{1}{2}marks$)

……

……..

(b) Determine the molar concentration of **SA1** solution with respect to potassium manganate(VII) $(02marks)$

……
……
……
……
……
……
……
……
……..

(c) Calculate the;

(i) Number of moles of excess iron(II) ions that reacted with manganate(VII) ions in **SA1** $(01\frac{1}{2}marks)$

……
……
……
……
……
……
……
……
……
……
……

(ii) Number of moles of excess iron(II) ions contained in 250cm^3 of **SA3** $(01mark)$

……
……
……
……
……
……
……
……..

(iii) Number of moles of peroxodisulphate ions that reacted with iron(II) ions. $(03\frac{1}{2}marks)$

……
……
……
……
……
……
……
……
……
……
……

(d) Determine the;

(i) The mass of VS_2O_8 that reacted with iron(II) ions.($V = 78$) $(01\frac{1}{2}marks)$

……
……
……
……
……
……
……
……
……
……
……..

(ii) Percentage purity of VS_2O_8 in **Q** $(01\frac{1}{2}marks)$

……
……
……
……
……
……
……
……

2. You are provided with substance **X** which contains two cations and two anions. Carry out the following tests on **X** to identify the cations and anions. Identify any gas (es) evolved. Record your observations and deductions in the table below. (33 *marks*)

	TESTS	***OBSERVATIONS***	***DEDUCTIONS***
(a)	Heat one spatula end-ful of **X** strongly in a dry test tube until there is no further change.		
(b)	To one spatula end-ful of **X** in a test tube add 4 drops of concentrated sulphuric acid and warm.		
(c)	To two spatula end-fuls of **X**, add about $5cm^3$ of water shake and filter. Keep both the filtrate and residue.		
(d) (i)	Divide the filtrate into 4 parts. To the first part add 4 drops of concentrated nitric acid followed by sodium thiosulphate solution.		

(ii)	To the second part, add silver nitrate solution followed by excess ammonia solution.		
(iii)	To the third part, add copper(II) sulphate solution followed by 4 drops of starch indicator.		
(iv)	Use the fourth part to confirm one of the anion present.		
(d)	Wash the residue with distilled water and transfer it in a boiling tube. Dissolve the residue in minimum dilute nitric acid. (**Do not divide the resultant solution**)		
(i)	To $1cm^3$ of the resultant solution in (d), add sodium hydroxide solution drop wise until in excess.		
(ii)	To another $1cm^3$ of the resultant solution in (d), add dilute sulphuric acid.		
(iii)	To another $1cm^3$ of the resultant solution in (d), add potassium iodide solution.		
(e)	To the remaining solution in (d), add ammonia solution drop wise until in excess. Filter and keep the filtrate.		

(f)	To the filtrate in (e), add dilute nitric acid drop wise until the solution is just acidic. Divide the resultant solution into two parts.		
(i)	To the first part, add dilute sodium hydroxide solution drop wise until in excess.		
(ii)	To the second part, add solid ammonium chloride followed by disodium hydrogen phosphate and ammonia solution drop wise until in excess.		

(g). Identify the;

(i) Cations in **X**……and……...

(ii) Anions in **X**……and……

3. You are provided with an organic substance **P**. You are required to determine the nature of **P**. Carry out the following tests on **P**, record your observations and deductions in the table below. (**20** ***marks***)

	TESTS	***OBSERVATIONS***	***DEDUCTIONS***
(a)	Burn a small amount of **P** on a spatula end or a porcelain dish		
(b)	Shake 1cm^3 of **P** with about 2cm^3 of water and test with litmus. Divide the mixture into two parts.		
(i)	To the first part of the mixture, add 2-3 drops of neutral iron(III) chloride solution.		

(ii)	To the second part of the mixture, add 2-3 drops of 2,4-dinitrophenylhydrazine. (Brady's reagent)		
(c)	To about $1cm^3$ of **P**, add $1cm^3$ of concentrated sulphuric acid. Heat the mixture and pass the gas through potassium manganate(VII) solution.		
(d)	To $2cm^3$ of P add 2-3 drops of acidified potassium dichromate(VI) solution and heat. Divide the resultant solution into two parts.		
(i)	To the first part of the resultant solution, add about $2cm^3$ of Brady's reagent		
(ii)	To the second part of the resultant solution, add Fehling's solution and warm.		
(e)	To about $1.0cm^3$ of **P**, add about $4cm^3$ of iodine solution followed by sodium hydroxide solution drop wise until the solution is pale yellow. Heat and allow to cool.		
(f)	To about $1cm^3$ of P, add about 5 drops of Lucas reagent.		

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

……

END

Confidential

1 burette

1 pipette

One thermometer

One retort stand

Three plastic beakers

One volumetric flask of 250cc

Labels

One measuring cylinder (100cm^3)

200cm^3 of **SA1**

200cm^3 of **SA2**

0.8g of solid **Q**

200cm^3 of 1M sulphuric acid

Q potassium per sulphate

SA1 is 0.02M potassium manganate(VII) solution.

SA2 is 0.1M ammonium ferrous sulphate solution.

8 test tubes

2 filter papers.

Starch indicator

Filter funnel

3g of X

4cc of P (Liquid **P** is propan-2-ol)

Solid **X** is a mixture of $KI + ZnCO_3 + PbCO_3$ *in the ratio of* $1:2:3$