

Candidate's name.....

Index No.....Sign.....

P525/3
CHEMISTRY
Paper 3
August 2019
3 ¼hours.



WESTERN JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate Of Education

CHEMISTRY

Paper 3

3¼ Hours.

INSTRUCTIONS TO CANDIDATES:

- Answer **ALL** QUESTIONS.
- Record your results 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 that they have all the apparatus and chemicals that they may need.
- Where necessary use (H = 1, C = 12, O = 16, Na = 23, S = 32)

For Examiner's use Only		
Q1	Q2	Q3

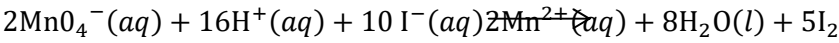
1. You are provided with the following;
FA1, which is a solution containing 24.8 gdm^{-3} of sodium thiosulphate -5- water, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

FA2, which is aqueous potassium manganate (vii) solution of unknown concentration.

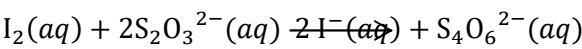
Solid T, which is ethanedioate (oxalate) with the formula; $\text{Y}_2\text{C}_2\text{O}_4$.

You are required to standardize potassium manganate (vii) using FA1 and then use it to determine the relative atomic mass of **Y**.

In acidic medium, manganate (vii) ions oxidise iodide ions to iodine according to the following equation.



The iodine liberated reacts with sodium thiosulphate according to the equation.



PROCEDURE A:

Pipette 25.0cm^3 (or 20.0cm^3) of FA2 into a conical flask. Add 10cm^3 of 2M sulphuric acid followed by 10cm^3 10% of potassium iodide solution. Titrate the mixture with FA1 until the solution is pale-yellow. Add 4-5 drops of starch indicator and continue the titration until the solution turns colourless. Repeat the titration until you obtain consistent results. Record your results in Table 1 below.

Results

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

Table 1

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

(03 marks)

Titre values used for calculating average volume of FA1 _____ cm^3
 (½mark)

Average volume of FA1 used. (2½marks)

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PROCEDURE B:

Weigh accurately about 1.0g of T and dissolve in about 100cm^3 of water in a 250cm^3 volumetric flask. Make the solution to the mark by adding distilled water. Label this solution FA3

Results:

Mass of weighing container + T _____(½mark)
 Mass of weighing container _____(½mark)

Mass of T used _____

(1/2mark)

PROCEDURE C:

Pipette 25.0cm^3 (or 20.0cm^3) of FA3 into a conical flask and add an equal volume of 2M sulphuric acid. Warm the mixture to about 60°C and titrate the warm solution with FA2. Repeat the titration until you obtain consistent results. Record your results in Table 2.

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

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

(03 marks)

Titre values used for calculating average volume of FA2_____cm³ (½mark)

Average volume of FA2 used _____ cm^3 (2½marks)

Questions.

(a) Calculate the concentration of manganate (vii) in FA2 in moles per dm^3 . (04 marks)

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(b) Calculate the:

(i) Concentration of the ethanedioate (oxalate) in FA3 in moles per dm^3 . (3½ marks)

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(ii) Molar mass of T

(1½ marks)

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(iii) Relative atomic mass of Y(1½ marks)

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2. You are provided with substance X, which contains two cations and two anions. You are required to carry out the following tests on X and identify the cations and anions in it. Record your observations and deductions in the table below. Identify any gas(es) evolved. (27 marks)

	TESTS	OBSERVATIONS	DEDUCTIONS
(a)	Heat one spatula endful of X strongly in a dry test tube until there is no further change		
(b)	To a spatula endful of X, add 2-3 drops of concentrated sulphuric acid and warm.		

(c)	To three spatula endfuls of X add dilute nitric acid until there's no further change. Add dilute sodium hydroxide solution drop wise until in excess. Filter and keep both the filtrate and residue.		
(d)	To the filtrate, add dilute nitric acid until the solution is just acidic. Divide the acidic solution into five parts.		
(i)	To the first part of the acidic solution, add sodium hydroxide solution drop wise until in excess.		
(ii)	To the second part of the acidic solution, add ammonia solution drop wise until in excess.		
	Use the third part of the acidic solution to carryout a test of your own choice to confirm one of the cations in X.		

(iii)	To the fourth part of the acidic solution, add 4-5 drops of lead (ii) ethanoate solution.		
(iv)	Use the fifth part of the acidic solution to carryout a test of your own choice to confirm one of the anions in X.		
(v)	Wash the residue with water and dissolve it in dilute hydrochloric acid. Divide the resultant solution into four parts.		
(e)	To the first part of the acid solution, add dilute sodium hydroxide solution dropwise until in excess.		
(i)			
	To the second part of the acidic solution, add dilute ammonia dropwise until in excess.		
(ii)	To the third part, of the acidic solution add 3-4 drops of dilute sulphuric acid		

(iii)	To the fourth part of the acidic solution, add 2-3 drops of potassium chromate (vi) solution followed by 2-3 drops of ethanoic acid.	

- (f) (i) Cations in X are _____
- (iv) (ii) Anions in X are _____

3. You are provided with an organic substance, K. you are required to determine the nature of K. Carry out the following tests on K and record your observations and deductions in the table below. (15 marks)

	TESTS	OBSERVATIONS	DEDUCTIONS
(a)	Burn a small amount of K on a spatula end or on a porcelain dish.		
(b)	Shake 1cm ³ of K with about 2cm ³ of water and test with litmus paper. Divide the mixture into two parts.		
(i)	To the first part of the mixture, add 2-3 drops of iron (iii) chloride solution.		
	To the second part of the mixture, add 2-3 drops of 2,4- dinitrophenyl hydrazine (Brady's reagent)		
	To about 1cm ³ of K, add about 1cm ³ of concentrated sulphuric acid. Heat the mixture and pass the gas produced through potassium manganate (vii) solution.		
	To about 2 cm ³ of K, add 2-3 drops		

(d)	(ii)	of potassium dichromate (vi) solution and heat. Divide the resultant solution into two parts.		
	(c)	To the first part of the resultant solution add about 2cm ³ of Brady's reagent		
		To the second part of the resultant solution, add Tollen's reagent and warm		
	(i)	To about 0.5cm ³ of K, add about 4cm ³ of iodine solution followed by sodium hydroxide solution drop wise until the solution is pale-yellow. Heat and allow to stand		
	(ii)	To about 1cm ³ of K, add about 5 drops of Lucas reagent.		

- (e)

Comment on the nature of K

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- (f)

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END