

Name Centre / Index No/.....

School Signature

P525/3
CHEMISTRY
(PRACTICAL)
Paper 3
July/August 2023
3¹/₄ 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 (Na = 32, N = 14, H = 1, O = 16)

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

1. You are provided with the following;
- GA₁**, which is a solution made by dissolving 0.4 g sodium nitrite in 250 cm³ of distilled water.
 - GA₂**, which is a solution of potassium permanganate of unknown concentration.
 - GA₃**, which is 2.0 M sulphuric acid.
 - Solid **Z** which is an acid of a formula, **T.nH₂O**.

You are required to determine the;

- i) the concentration of potassium permanganate in **GA₂** in moles per litre.
- ii) find the value of **n** in **T.nH₂O**.

Theory

Potassium permanganate reacts with sodium nitrite according to the equation



The ratio of reaction between MnO_4^- : **T.nH₂O** is 2:5.

Procedure 1

Pipette **20 or 25 cm³** of **GA₁** into a clean conical flask. Add equal volume of **GA₃**.
 Titrate the resultant solution with **GA₂** from the burette until the end point is reached.
 Repeat the titration until you obtain consistent results.
 Record your results in the table below.

Volume of pipette usedcm³. ($\frac{1}{2}$ mark)

Table I

Experiment Number	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of GA₂ used (cm ³)			

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

Titre values used for calculating average volume.

(01 mark)

Calculate the average volume of **GA₂** used.

($2\frac{1}{2}$ marks)

Questions

(a) Calculate the number of moles of

- (i) Sodium nitrite in **GA₁** that reacted.

($2\frac{1}{2}$ marks)

- (ii) Potassium permanganate in GA_2 that reacted. (01 mark)

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- (b) Determine the concentration of potassium permanganate in GA_2 in moles per litre. (01 mark)

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Procedure 2

Weigh accurately **0.6 g** of **Z** into a clean beaker. Using a measuring cylinder add **100 cm³** of distilled water and stir to dissolve. Transfer the content into a **250 cm³** volumetric flask and make up to the mark with distilled water. Label this solution GA_4 .

Mass of container + **Z** =g (½ mark)

Mass of container alone =g (½ mark)

Mass of solid **Z** =g (½ mark)

Pipette **20** or **25 cm³** of GA_4 into a conical flask. Add equal volume of GA_3 and Heat the mixture up to **70°C**. Titrate the hot solution with GA_2 from the burette until the end point is reached. Repeat the titrations until you obtain consistent results. Record your results in the table below.

Volume of pipette used =cm³. (½ mark)

Table II

Experiment Number	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of GA_2 used (cm ³)			

(4½ marks)

Titre values for calculating average volume. (01 mark)

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Calculate the average volume of GA_2 used.

(2½ marks)

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Questions

(a) Calculate the number of moles of

(i) potassium permanganate in GA_2 that reacted with GA_4 .

(01 mark)

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(ii) acidic compound of a formula $\text{T. nH}_2\text{O}$ in GA_4 that reacted.

(01 mark)

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(b) Determine the;

(i) concentration of acidic compound of a formula $\text{T. nH}_2\text{O}$ in GA_4 in moles per litre.

(01 mark)

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(ii) the value of n in $T \cdot nH_2O$.

($T = 90$, $H = 1$, $O = 16$)

(03 marks)

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2. You are provided with substance **T** which contains **two** cations and **two** anions. Carry out the following tests on **T** to identify the cations and anions present. Identify any gases evolved.

(33 marks)

Tests	Observations	Deductions
(a) Heat one spatula endful of T strongly in a test tube.		
(b) To one spatula end full of T , add 3 drops of concentrated sulphuric acid and warm.		
(c) Dissolve one spatula endfull of T in 6 cm ³ of distilled water. Divide the resultant solution into three portions.		

(i) To the first portion add few drops of Lead(II) nitrate followed by dilute nitric acid and heat.		
(ii) To the second portion add Barium nitrate solution, followed by dilute nitric acid.		
(iii). To the third portion add an equal volume of ethanol followed by 3-4 drops of concentrated sulphuric acid and heat, pour the hot content in a beaker of cold water.		
d) Dissolve two spatula endful of T in 6 cm ³ of distilled water. To the resultant solution add aqueous ammonia solution dropwise until in excess. Filter and keep both the residue and the filtrate.		
e) To the filtrate obtained in (d) add dilute nitric acid until it is just acidic. Divide the resultant solution into three portions.		
(i) To the first portion add sodium hydroxide solution dropwise until in excess.		
(ii) To the second portion add ammonia solution dropwise until in excess.		
(iii) Use the third portion to carry out a test of your choice to confirm the cation in T Test:		

f) Wash the residue with distilled water and dissolve it in dilute nitric acid. Divide the resultant solution into three portions.		
(i) To the first portion, add sodium hydroxide solution dropwise until in excess.		
(ii) To the second portion add 1 cm ³ of sodium sulphate solution.		
iii) Use the third portion to carry out a test of your own choice to confirm the cation in the residue.		

g) Identify the

(i) Cations in T and

(ii) Anions in T..... and

3. You are provided with substance Q which is an organic compound. Carry out the following tests on Q to identify its nature and functional group.

(18marks)

Tests	Observations	Deductions
(a) Burn a small amount of Q on a spatula end or crucible.		
(b) To about 2 g of Q, add 5 cm ³ of water and shake. Divide the resultant solution into eight portions.		
(i) Test the first portion with litmus paper.		
(ii) To the second portion add four drops of iron (III) chloride solution.		

Turn Over

(iii) To the third portion add little solid sodium carbonate.		
(iv) To the fourth portion add 3 drops of acidified potassium permanganate and heat.		
(v) To the fifth portion add 1 cm ³ of 2, 4-dinitrophenylhydrazine solution.		
(vi) To the sixth portion of solution add 1 cm ³ of Fehling's solution and heat.		
(vii) To the seventh portion of solution add acidified solution of potassium dichromate(VI) and heat, cool and then add Brady's reagent.		
(viii) To the eighth portion add Lucas' reagent.		

(c) Comment on the nature of Q

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END

1. The description of the reagents and chemicals specified below does not necessarily correspond with the description in the question paper. Candidates must not be informed of the difference.
2. Candidates are **not** allowed to use reference books (i.e. textbooks, booklets on qualitative analysis etc.) during the examination.
3. On addition to the common reagents and apparatus used in chemistry laboratory, each student should have the following.

- 1 burette of 50 cm³ capacity
- 1 pipette (25 cm³ or 20 cm³)
- 1 filter paper
- 1 thermometer
- 2 conical flasks
- 1 funnel
- 1 volumetric flask of 250cm³
- 8 test tubes
- 100 cm³ of GA₁
- 200 cm³ of GA₂
- 200 cm³ of GA₃
- 1.0g of solid Z
- 2.5g of T
- 3.0g of solid Q

Easy access to:

- Weighing scale which can weigh to atleast 1dp.
- Heat source
- Reagents used to identify organic functional groups, cations, anions and gases.

GA₁ is made by dissolving 1.6g of sodium nitrite (NaNO₂) in distilled water to make one litre of solution.

GA₂ is made by dissolving 3.2g of potassium permanganate in distilled water to make one litre of solution.

GA₃ is 2M sulphuric acid

Solid Z is oxalic acid

Substance T is a solid mixture of aluminum sulphate and zinc acetate (zinc ethanoate) in ratio of 1:1

Solid Q is citric acid

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