

Name: Index Number:

School: Signature:

P525/3
CHEMISTRY
PAPER 3
(Practical)
JULY/AUG. 2024
3¼ Hours



ASSHU – KYENJOJO JOINT MOCK EXAMINATIONS 2024

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 3

(Practical)

3 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

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

All your answers **must** be written in the spaces provided.

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

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

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

FOR EXAMINER'S USE ONLY			
Q1	Q2	Q3	Total

1. You are provided with the following;

FA1, which is potassium manganate(VII) solution.

FA2, which was prepared by dissolving 7.2g of impure sodium sulphite in one litre of solution.

FA3, which is 2M sulphuric acid.

Solid **Q**, which are crystals of iron(II) sulphate, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.

You are required to determine the percentage purity of the sodium sulphite in FA2.

PART 1

Procedure

Weigh accurately 3.4g of **Q** into a clean beaker, add 100cm^3 of **FA3** and stir well to dissolve. Transfer the resultant solution into a 250cm^3 volumetric flask and make up to the mark with distilled water. Label the solution **FA4**.

Results

Mass of weighing container + **Q** = _____g (½ mark)

Mass of weighing container alone = _____g (½ mark)

Mass of **Q** weighed = _____g (½ mark)

PART II

Procedure

Pipette 25.0cm^3 (or 20.0cm^3) **FA4** into a clean conical flask and titrate with **FA1** from the burette until the endpoint is reached. Repeat the titration until you obtain consistent results. Record your results in **table 1**.

Results

Table 1

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)			

(4½ marks)

a) i) Record the volumes of **FA1** used for calculating the average volume. (½ mark)

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ii) Calculate the average volume of **FA1** used. (2½ marks)

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b) Write equation for the reaction between iron(II) ions and manganate(VII) ions. (1½ marks)

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c) Calculate the number of moles of iron(II) ions in **FA4** that reacted with manganate(V(II) ions in **FA1**. (Fe = 56, S = 32, O = 16, H = 1) (2½ marks)

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d) Determine the concentration off manganate(VII) ions in **FA1** in moldm⁻³. (2 marks)

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PART III

Procedure

Using a measuring cylinder, measure accurately 25cm^3 of **FA2** into a clean conical flask. Add 10cm^3 of **FA3** and titrate the mixture with **FA1** from the burette until the endpoint is reached. Repeat the titration until you obtain consistent results. Record your results in **table 2**.

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

(4½ marks)

e) (i) Record the volumes of **FA1** used for calculating the average volume.

(½ mark)

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ii) Calculate the average volume of **FA1** used.

(2½ marks)

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f) Calculate the moles of sulphite ions in **FA2** that reacted with manganate(VII) ions in **FA1**.

(4½ marks)

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g) Determine the:

i) concentration of sulphite ions in **FA2** in mol dm^{-3} .

(1½ marks)

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ii) percentage purity of the sodium sulphite sample used in the preparation of **FA2**.

(Na = 23, S = 32, O = 16)

(3 marks)

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

Table 3

TESTS	OBSERVATIONS	DEDUCTIONS
a) Heat two spatula endfuls of R in a dry test tube strongly until there is no further change		
b) To two spatula endfuls of R in a boiling tube, add 5cm ³ of dilute nitric acid and shake well to dissolve. To the resultant solution, add dilute sodium hydroxide solution drop wise until in excess and then filter. Keep both filtrate and residue.		
c) To the filtrate in (b) above, add dilute nitric acid and dropwise until the solution is just acidic. Divide the acidic solution into six portions.		
i) To the first portion of the acidified solution, add dilute sodium hydroxide solution dropwise until in excess.		
ii) To the second portion of the acidified solution, add dilute ammonia solution dropwise until in excess.		
iii) To the third portion of the acidified solution, add 1-2 drops of sodium chloride solution and warm, then cool in a beaker of water.		

TESTS	OBSERVATIONS	DEDUCTIONS
iv) Use the fourth portion of the acidified solution to carry out a test of your choice to confirm one of the cations in R . Test:		
v) To the fifth portion of the acidified solution, add lead(II) nitrate solution.		
vi) To the sixth portion of the acidified solution, add a little bleaching powder (or add 1cm^3 of a solution of a bleaching agent), followed by 1cm^3 of dilute nitric acid and then 1cm^3 of chloroform and shake gently.		
d) Wash the residue from part (b) with dilute sodium hydroxide solution, transfer it into a test tube, add dilute nitric acid and shake to dissolve. Divide the resulting solution into five portions.		
i) To the first portion, add dilute sodium hydroxide solution dropwise until in excess.		
ii) To the second portion, add dilute ammonia solution dropwise until in excess.		
iii) To the third portion, add sodium carbonate solution dropwise until in excess.		
iv) To the fourth portion, add dilute sulphuric acid solution.		

v) Use the fifth portion to carry out a test of your own choice to confirm the second cation in R . Test:		
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e) i) The cations in **R** are and

ii) The anions in **R** are and

3. You are provided with substance **K**, which is an organic compound. You are required to carry out the tests in **table 4** and determine the nature of **K**. Record your observations and deductions in the **table 4**. (18 marks)

Table 4

TESTS	OBSERVATIONS	DEDUCTIONS
a) Burn a small amount of K on a small spatula end or in a porcelain dish.		
b) To 1cm ³ K in a test tube, add 2cm ³ of distilled water and shake. Test the mixture with litmus paper.		
c) To 0.5cm ³ of K , add one spatula endful of solid sodium carbonate.		

TESTS	OBSERVATIONS	DEDUCTIONS
d) To 0.5cm ³ of K , add 2-3 drops of neutral iron(III) chloride solution.		
e) To 1cm ³ of K , add 2 – 3 drops of acidified potassium dichromate(VI) solution and warm.		
f) To about 0.5cm ³ of K , add 2-3 drops of Brady's reagent.		
g) To about 0.5cm ³ of K , add 1cm ³ of Fehling's solution and heat.		
h) To about 1cm ³ of K , add 2cm ³ of iodine solution and shake to mix, then add dilute sodium hydroxide and warm. Allow to stand.		

Describe the nature of substance **K**.

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END