

NAME:.....SIGNATURE:.....

P525/3
CHEMISTRY
(Practical)
Paper 3

Oct./Nov. 2023

2 $\frac{1}{4}$ hours.

S.5

END OF YEAR EXAMS

2023

CHEMISTRY PRACTICAL

Paper 3

2 hours 15 minutes

INSTRUCTIONS:

Answer **all** questions. Use **blue** or **black** ink. 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 calculators may be used.

Reference books (i.e textbooks, 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 time 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	Total

1. You are provided with the following:

FA1, which is a 0.4M hydrochloric acid.

FA2, which is a sodium hydroxide solution.

Solid W, which is an impure acid.

You are required to prepare solution FA3, use it to standardise FA2 and determine the percentage purity of W.

PROCEDURE A;

- a) Measure accurately 20 cm³ of **FA1** into a 50cm³ measuring cylinder. Add distilled water carefully to make 50 cm³ of the total solution. Transfer the solution into a clean beaker and label it **FA3**.

Question;

Calculate the;

- (i) number of moles of the acid in 20cm³ of **FA1**. (1 $\frac{1}{2}$ marks)

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- (ii) the molarity of hydrochloric acid in **FA3**. (1 $\frac{1}{2}$ marks)

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PROCEDURE B:

- b) Pipette 25.0 (or 20.0) cm^3 of **FA3** into a clean conical flask. Add 2-3 drops of phenolphthalein indicator and titrate with **FA2** from the burette until end point is reached.
- c) Repeat the titration until you obtain consistent results.
- d) Record your results in **Table 1** below.

Table 1

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

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

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

Titre values used for calculating average volume of **FA2**. ($\frac{1}{2}$ marks)

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..... cm^3

Average volume of **FA2**

used..... cm^3 (2 $\frac{1}{2}$ marks)

Question:

e) Calculate;

- (i) the molar concentration of sodium hydroxide in **FA2**.

(04 marks)

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PROCEDURE B;

- (f) Weigh accurately 1.6 g of solid **W** and place it in a clean plastic beaker. Add about 50cm³ of distilled water and stir to dissolve.
- (g) Transfer the resultant solution into a 250cm³ volumetric flask. Add distilled water to fill up to the 250 cm³ mark and label the resultant solution with **FA4**.
- (h) Pipette 25.0 (or 20.0) cm³ of **FA4** into a clean conical flask. Add 2-3 drops of phenolphthalein indicator and titrate with **FA2** from the burette until end point is reached.
- (i) Repeat the titration until you obtain consistent results.
- (j) Record your results in **Table 2** below.

Table 2

Volume of pipette used;..... cm³ ($\frac{1}{2}$ mark)

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

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

Titre values used for calculating average volume of **FA2**. ($\frac{1}{2}$ marks)

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cm³

Average volume of **FA2**

used..... cm³ (2 $\frac{1}{2}$ marks)

Questions:

(k) Calculate the number of moles of;

(i) sodium hydroxide that reacted. (1 $\frac{1}{2}$ marks)

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(ii) acid **W** that reacted. (1 $\frac{1}{2}$ marks)

(1 mole of W reacts with 2 moles of sodium hydroxide)

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(l) Determine the concentration of **W** in **FA4** in;

(i) moles per litre. (1 $\frac{1}{2}$ marks)

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(ii) grams per litre. (1 $\frac{1}{2}$ marks)

(1 mole of W weighs 90g)

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(m) Calculate the percentage purity of **W**. (01 mark)

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2. You are provided with substance **G** which contains **two** cations and **two** anions. You are required to carry out the tests in Table 3 below to identify the cations and anions in **G**. Identify any gas(es) evolved. Record your observations and deductions in the table. (30 marks)

Table 3

	TEST	OBSERVATIONS	DEDUCTIONS
(a)	Heat two spatula endfuls of G in a test tube gently and then strongly until there is no further change. Keep the residue for part(C)		

(b)	To half a spatula end-ful of G , in a test tube, add dilute nitric acid until no further change.		
(c)	To the residue from (a), add about 8 cm ³ water and shake well. Filter and keep both the filtrate and residue. Divide the filtrate solution into six portions.		
(d)	To the first portion of the acidified solution, add dilute sodium hydroxide dropwise until in excess.		
(ii)	To the second portion of the acidified solution, add aqueous ammonia dropwise until in excess.		
(iii)	To the third portion of the acidified solution, add 2-3 drops of dilute sulphuric acid.		

(iv)	Use the fourth portion to carry out own test to confirm the cation in the filtrate.		
(v)	To the fifth portion, add 2-3 drops of lead(II) nitrate solution , heat and allow to cool		
(vi)	To the sixth portion, add 2-3 drops of silver nitrate solution followed by excess ammonia solution		
(e)	Wash the residue from (c) with distilled water. Add dilute sulphuric acid to dissolve. Divide the resultant solution into three portions.		
(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)	Use the third part to carry out own test to confirm the cation in the residue.		
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(f) Identify the cations and anions in **G**

Cations; and.....

Anions; and.....

END

CONFIDENTIAL

Each student is to be provided with;

40 cm³ of **FA1**

180cm³ of **FA2**

1.8g g of solid **W**

Weighing scale

50 ml measuring cylinder

3 beakers (250ml each)

Volumetric flask (250ml)

Distilled water

Pipettes (**only 25.0cm³**)

2 conical flasks

Burette

Phenolphthalein indicator

FA1 is 0.4M hydrochloric acid.

FA2 is made by dissolving 4g of sodium hydroxide to make one litre of solution.

Solid W is oxalic acid, $H_2C_2O_4 \cdot 2H_2O$.

Source of heat

A spatula

3 g of substance **G**

8 testtubes

Boiling tube

1 filter papers

Litmus papers

G is a mixture of **Copper(II) carbonate** and **Barium chloride** in a ratio 1:2

Reagents;

Silver nitrate solution

Lead(II) nitrate solution

Ammonia solution

Dilute nitric acid

Sodium hydroxide solution

Potassium hexacyanoferrate(II) solution

Dilute sulphuric acid

Potassium chromate(VI) solution

Potassium iodide solution