

Candidate's Name.

Signature.....

Random No.

Personal no.

525/3

CHEMISTRY

(Practical)

Paper 3

Oct/Nov 2024

2 $\frac{3}{4}$ hours

Random No.						Personal no.		

UGANDA ADVANCED CERTIFICATE OF EDUCATION
CHEMISTRY
(Practical)
PAPER 3
2 Hours 45 minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of **two** questions. Answer **all** the questions. Use **blue** or **black** ink. Any work done in pencil will not be marked **except** drawings
 All your answers must be in the spaces provided.

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

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

You are **not** allowed to start working within the first **15 minutes**. You are advised to use this time to **read** through the paper and ensure that you have all the apparatus, chemicals and specimens you require

For examiners use only		
QN 1	QN 2	Total

1. You are provided with the following;

- **GA1** which is approximately 1M solution of hydrochloric acid
- **GA2** which contains 5.3g of anhydrous sodium carbonate in 250cm³ of water.
- **GA3** which is 0.1M sodium hydroxide solution
- Solid M which is made up of dry egg shells.
- Methyl orange indicator

You are required to;

- i) Standardize **GA1** using sodium carbonate solution
- ii) Determine the percentage of calcium carbonate in egg shells

PART I

Pipette 25cm³ (or 20cm³) of **GA2** into a clean conical flask. Add 2-3 drops of methyl orange indicator and titrate the resultant solution with **GA1** in the burette until the end point.

Repeat the procedure to obtain consistent values and record your observations in the table I below.

Results. Table I

Volume of pipette used.cm³ (½ marks)

Titre	1	2	3
Final burette reading (cm ³)			
Initial burette reading. (cm ³)			
Volume of GA1 used. (cm ³)			

(4 ½ marks)

Values used to calculate the average

.....and (1 mark)

Average volume of **GA1** that reacted. (2 marks)

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Questions.

Calculate the concentration of **GA1** in moldm⁻³ (06 ½ marks).

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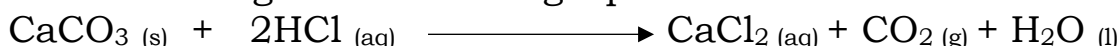
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PART II

Theory

Egg shells contain calcium carbonate which reacts with excess hydrochloric acid according to the following equation



The remaining HCl is neutralized by sodium hydroxide solution.

Procedure.

Weigh accurately 1.2g of solid **M** into a clean beaker.

Add 30cm³ of **GA1** using a measuring cylinder and stir vigorously. Using a spatula, carefully scoop off the foam and unreacted debris on the top.

Transfer the remaining solution into a 250cm³ volumetric flask and make up to the mark with distilled water. Label the solution **GA4**

Pipette 25 (or 20) cm³ of **GA4** into a clean conical flask. Add 2-3 drops of methyl orange indicator and titrate the resultant solution with **GA3** from the burette.

Repeat the titration to obtain consistent values and record your results in table 2.

Results

Mass of weighing bottle + **M**.....g

Mass of weighing bottle alone.....g

Mass of **M** used.....g

Volume of pipette used.....cm³ (2 marks)

Titre	1	2	3
Final burette reading (cm ³)			
Initial burette reading. (cm ³)			
Volume of GA3 used. (cm ³)			

(04S ½ marks)

Values used to calculate the average (½ marks).

Average volume of GA3 that reacted (2 ½ marks).

Questions.

- a) Calculate the number of moles of HCl in GA4 that reacted with sodium hydroxide (3 marks).

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- b) Calculate the total moles of HCl in GA1 (02 marks).

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- c) Calculate the number of moles of calcium carbonate in 1.2g of **M** (03 marks).

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- d) Calculate the percentage of **calcium carbonate** in egg shells. (03 marks).

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- 2.** You are provided with substance **P** which contains 2 cations and 2 anions. Carry out the following tests to identify the cations and anion present. Identify any gas(es) evolved. Record your observations and deductions in the table below.

Tests	Observations	Conclusions
Heat a spatula endful of P in a dry hard test tube		
Shake 2 spatula endful of P in 10cm ³ of water. Filter. Keep both the filtrate and residue. Divide the filtrate into 7 parts.		
To the 1 st part, add sodium hydroxide solution dropwise until in excess. Warm the resultant solution.		
To the 2 nd part, add potassium iodide solution		
To the 3 rd part, add ammonia solution dropwise until in excess		
To the 4 th part, add potassium hexacyanoferrate (ii) solution		

Use the 5 th part to carry out a test of your own to confirm the cation in P		
To the 6 th add lead(ii) nitrate solution and warm.		
To the 7 th part add silver nitrate solution followed by dilute nitric acid		
Wash the residue and dissolve it in dilute sulphuric acid. Divide the resultant solution into 4 parts.		
To the first part add sodium hydroxide solution dropwise until in excess.		
To the 2 nd part add ammonia solution dropwise until in excess.		
To the 3 rd part add sodium carbonate solution		
Use the 4 th part to carry out a test of your own to confirm the second cation in P		

Cations in P..... Anions in P.....

*If I was able to see far in life, it was by standing on shoulders of giants.
Blessed new year 2025*

Advance information.

Each candidate should be provided with the following.

3g of Solid M made by crushing dry egg shells into small particles

100cm³ of **GA1** which is 1M hydrochloric acid solution

100cm³ of **GA2** which is a 0.2M solution of sodium carbonate

100cm³ of **GA3** which is 0.1M sodium hydroxide solutions

5g of **solid P** made by mixing zinc sulphate and lead(ii)carbonate in the ratio of 2:1

In addition to apparatus and materials found in a chemistry lab, each candidate should have access to the following;

A 50cm³ burette

A 25cm³ (or 20) pipette

Retort stand

2 conical flasks

250cm³ volumetric flask

Weighing scale

8 test tubes

Methyl orange indicator

Phenolphthalein indicator

Heat source