

Candidate's Name

Signature

Random No.					Personal No.		

545/3

CHEMISRY

(PRACTICAL)

PAPER 3

2 Hours

Uganda Certificate of Education

CHEMISTRY PRACTICAL

Paper 3

2 hours

INSTRUCTIONS TO CANDIDATES:

Answer **both** questions. Answers are to be written in the spaces provided in this booklet. Use **blue** or **black** ink ball pen only. Any work done in **pencil** will not be marked except drawings.

You are **not** allowed to use reference books (i.e. text books, booklets on qualitative analysis etc)

All working must be clearly shown.

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

For Examiners' use only			
Q. 1			
Q. 2			
Total			

1. You are provided with the following:

BA1, which is a solution containing 80.3 g of an impure sample of base R per litre of solution

BA2, which is a solution containing 2 moles of acid Q per litre of solution.

You are required to determine the percentage impurity of R

Procedure:

- Using a measuring cylinder, transfer 40.0cm^3 of solution **BA1** into a plastic beaker or cup.
- Measure and record the temperature of the solution **BA1** in the plastic beaker or cup.
- Using a burette, transfer 5.00cm^3 of solution **BA2** into each of the six (06) test tubes.
- To solution BA1 in the plastic beaker or cup, add solution **BA2** from one of the test tubes. Stir the mixture with a thermometer and record the highest temperature of the mixture.
- Immediately add solution **BA2** from another test tube to the mixture obtained in (d), stir and record the highest temperature attained. Continue adding solution **BA2** from each of the remaining test tubes one at time, stirring the mixture and recording the highest temperature attained.
- Record your results in the table below.

Volume of BA2 added (cm^3)	0.00	5.00	10.00	15.00	20.00	25.00	30.00
Highest temperature ($^{\circ}\text{C}$)							

(7 marks)

Questions.

- Plot a graph of highest temperature (vertical axis) against volume of BA2 (horizontal) ($6\frac{1}{2}$ marks)
- From the graph, determine the volume of **BA2** required to completely neutralize 40.0cm^3 of BA1. (2 marks)

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c. Calculate the:

(i) number of moles of **Q** that reacted. (02 *marks*)

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(ii) number of moles of **R** that reacted.

(**Q** reacts with **R** in the ratio 1:2)($1\frac{1}{2}$ *marks*).

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(iii) concentration of **R** in moles per litre of **BA1**. (2*marks*)

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(iv) concentration of **R** in grams per litre of **BA1**. (2*marks*)

(Relative molecular mass of **R**=40)

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d. Determine the percentage impurity of R. (02 marks)

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2. You are provided with solid **X**, which contains one anion and two cations.

Carry out the following tests to identify the anion and cations present in **X**.

Identify any gas(es) that may be evolved.

Record your observations and deductions in the table below. (25marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat a spatula end-ful of X until there is no further change		
(b) To 2 spatula end-fuls of X, add dilute nitric acid a little at a time until there no		

further change.		
(c) To the acidic solution from (b), add dilute sodium hydroxide drop-wise until in excess. Filter and keep both the filtrate and residue.		
(d) To the filtrate, add dilute nitric acid in small portions until the precipitate formed just dissolves. Divide the acidic filtrate into 3 parts and test as follows: (i) To the first of the acidified filtrate, add sodium hydroxide solution drop-wise until in excess.		
(ii) To the second part of the solution, add excess sodium hydrogen carbonate solution and heat.		
(iii) To the third part of the acidified filtrate add dilute ammonia solution drop-wise until in excess.		
(e) Wash the residue with sodium hydroxide solution and water, then transfer the residue into a test tube. Dissolve the residue in a minimum amount of nitric acid. Divide the resultant solution into three parts and test as follows.		

(i) To the first part of the solution, add sodium hydroxide solution drop-wise until in excess.		
(ii) To the second part of the solution, add excess sodium hydrogencarbonate solution and heat.		
(iii) To the third part of the solution add dilute ammonia solution drop-wise until in excess.		

(i) The anion in X is.....

(ii) The cations in X are.....

CONFIDENTIAL

Great care should be taken that the information given below does not reach the candidates either directly or indirectly.

INSTRUCTIONS FOR PREPARING APPARATUS

N.B: the Head teacher must ensure that the teacher responsible for preparing the apparatus hands in his/her trial results properly sealed in a separate envelope and firmly fastened (attached) to the candidates' scripts envelope(s)

- 1. The description of the reagents and chemicals specified below does not necessarily correspond with the description in the question paper.*
- 2. In addition to the fittings, apparatus and substances ordinarily contained in a chemistry laboratory, each candidate will require the following;*

1 burette (50cm³)

1 pipette (25cm³ or 20cm³)

2 conical flasks.

1 measuring cylinder

1 thermometer (-10-110°C)

1 plastic beaker or plastic cup (100ml or 250ml)

6 test tubes

1 filter paper.

distilled water.

60cm³ of BA1

50cm³ of BA2

2.0g of X

***BA1** is a solution made by dissolving 80.0g of sodium hydroxide in one litre of solution.*

***BA2** is a solution made by diluting 115cm³ of concentrated sulphuric acid in one litre of solution.*

Phenolphthalein indicator.

***X** is a mixture of MgCO₃ and ZnCO₃ in the ratio of 1:1 respectively.*