

Candidate's Name: ...TR'S COPY.....
Index no: ...U0503/-/-.....Signature:

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CHEMISTRY
(PRACTICAL)
PAPER 3
JULY/AUG 2023
2 hours

ASSHU ANKOLE JOINT MOCK EXAMINATIONS 2023
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. All your work **must be in blue or black ink**. Any work done in **pencil** except drawings will **not** be marked.
- You are **not** allowed to use Reference Books (i.e. text books, booklets or qualitative analysis etc.)
- Mathematical Tables and silent non-Programmable Scientific 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 made by dissolving 16.5g of an impure acid in one litre of solution.

BA2, which is a solution containing 1.92g of sodium hydroxide dissolved in 500cm³ of solution.

You are required to determine the percentage of the pure acid in **BA1**.

(2 moles of sodium hydroxide react with 1 mole of acid)

Procedure:

Pipette 25.0cm³ (or 20.0cm³) of **BA2** into a conical flask.

Add 2 – 3 drops of phenolphthalein indicator and titrate the solution with

BA1 from the burette. Record your results in Table 1.

Repeat the procedure until you obtain consistent results.

Table 1

Volume of pipette used ~~25.0~~ cm³

(½ mark)

Titration number	1	2	3
Final burette reading (cm ³)	16.10	32.20	48.50
Initial burette reading (cm ³)	0.00	16.10	32.20
Volume of BA1 used (cm ³)	16.10	16.10	16.30

(7½ marks)

a) (i) State the volumes of **BA1** used to calculate the average volume.

(½ mark)

..... 16.10 cm³ ~~X~~ 16.10 cm³

(ii) Calculate the average volume of **BA1** used. (2½ marks)

..... $\frac{(16.10 + 16.10)}{2}$ cm³

..... $\frac{32.20}{2}$ cm³

..... 16.10 cm³

b) Calculate:

i) The concentration of BA2 in moles per litre.

(Na = 23, O = 16, H = 1)

(3 ½ marks)

1 mole of NaOH weigh $\frac{40}{1}$ g of NaOH. ~~are~~ contained in 1 mole.
 $\therefore 1.92$ g of NaOH weigh are contained in $\left(\frac{1.92}{40}\right)$ moles
 $= 0.048$ moles
 500 cm^3 of BA2 solution contain 0.048 moles of NaOH
 1000 cm^3 of BA2 solution contain $\left(\frac{0.048 \times 1000}{500}\right)$ moles of NaOH
 $= 0.096 \text{ M NaOH}$

ii) The number of moles of BA2 that reacted. (2 ½ marks)

~~25 cm³ of BA2 solution~~
 1000 cm^3 of BA2 solution contain 0.096 moles of NaOH
 25 cm^3 of BA2 solution contain $\left(\frac{0.096 \times 25}{1000}\right)$ moles of NaOH
 $= 2.4 \times 10^{-3}$ moles of NaOH
 0.25

c) Determine the;

i) Concentration of BA1 in moles per litre. (04 marks)

2 moles of NaOH react with 1 mole of the acid
 2.4×10^{-3} moles of NaOH reacted with $\left(\frac{2.4 \times 10^{-3}}{2}\right)$ moles of the acid
 $= 1.2 \times 10^{-3}$ moles of the acid
 16.10 cm^3 of BA1 contain 1.2×10^{-3} moles of the acid
 1000 cm^3 of BA1 contain $\left(\frac{1.2 \times 10^{-3} \times 1000}{16.10}\right)$ moles of the acid
 $= 0.0745 \text{ M BA}_1$
 0.4

ii) The concentration in grams per litre of the pure acid in BA1.

(Formula mass of the acid = 98)

(2 ½ marks)

1 mole of the acid weigh 98g
 0.0745 moles of the acid weigh (98×0.0745) g
 = 7.301 g pure acid
 2 ½

iii) The percentage of the pure acid in BA1

(1 ½ marks)

percentage purity = $\frac{7.301}{16.5} \times 100$
 = 44.2%
 1 ½

2. You are provided with substance T which contains two cations and one anion, carry out the following tests in Table 2 to identify the cations and the anions in T.

Identify any gas(es) evolved.

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

TABLE 2

TESTS	OBSERVATIONS	DEDUCTIONS
a) Heat one spatula end full of T strongly in a dry test tube	White powdery substance colourless gas that turns lime dump blue litmus paper red and lime water milky. Colourless Condensate on the walls of the test tube turn anhydrous Copper II sulphate from white to blue Brown residue when hot, Yellow when cold	Ca^{2+} , Mg^{2+} , Al^{3+} , Pb^{2+} , Zn^{2+} CO_2 gas evolved CO_3^{2-} , HCO_3^- suspected water of Crystallisation Hydrated Salt PbO , Pb^{2+} suspected

08/2

<p>b) To two spatula end-fuls of T in a test tube, add dilute nitric acid drop-wise until there is no further change.</p> <p>Add dilute sodium hydroxide solution to the resultant solution until the alkali is in excess.</p> <p>Shake and filter. Keep both the filtrate and the residue.</p>	<p>Effervescence of a colourless gas that turns damp blue litmus paper red and lime water milky.</p> <p>A white precipitate insoluble</p> <p>White residue</p> <p>Colourless filtrate</p>	<p>CO_2 evolved</p> <p>CO_3^{2-} confirmed</p> <p>Ca^{2+}, Mg^{2+}</p> <p>Ca^{2+}, Mg^{2+} suspected 04 1/2</p> <p>Pb^{2+}, Zn^{2+}, Al^{3+} suspected</p>
<p>c) To the filtrate, add dilute nitric acid drop-wise until the solution is just acidic. Divide the acidic solution into four parts and test as follows.</p>	<p>A white precipitate soluble in the acid</p>	<p>Pb^{2+}, Zn^{2+}, Al^{3+} suspected</p>
<p>i) To the first part of the acidified solution add dilute sodium hydroxide solution drop-wise until in excess.</p>	<p>A white precipitate soluble for to form a colourless solution</p>	<p>Pb^{2+}, Al^{3+}, Zn^{2+} suspected</p>
<p>ii) To the second part of the acidified filtrate, add dilute ammonia solution drop-wise until in excess.</p>	<p>A white precipitate insoluble</p>	<p>Pb^{2+}, Al^{3+} suspected</p>
<p>iii) To the third part of acidified filtrate, add 4 – 5 drops of dilute sulphuric acid and warm.</p>	<p>A white precipitate insoluble on warming</p>	<p>Pb^{2+} suspected</p>

iv) Use the fourth part of the acidic filtrate to carry out a test of your own choice to confirm one of the cations in T		
Test: To the test solution was added potassium iodide	A yellow precipitate is formed	Pb^{2+} confirmed
d) Dissolve the residue in a minimum amount of dilute nitric acid. Divide the resultant solution into two parts.	Residue dissolves to form a colourless solution	Ca^{2+} , Mg^{2+} suspected.
i) To the first part, add dilute sodium hydroxide solution drop-wise until in excess	A white precipitate insoluble	Ca^{2+} , Mg^{2+}
ii) To the second part of the solution, add dilute ammonia solution drop-wise until in excess	No observable change	Ca^{2+} confirmed

e) (i) The cations in T are Pb^{2+} and Ca^{2+}

(ii) The anion in T is CO_3^{2-}

25

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