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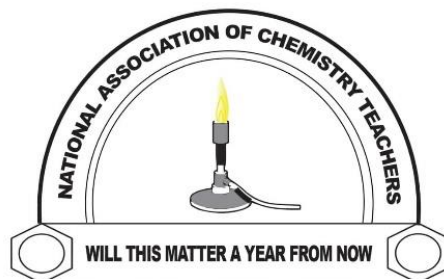
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Chemistry

Paper 3

Sept/Oct 2023

2¼hours



# **NATIONAL ASSOCIATION OF CHEMISTRY TEACHERS**

**Uganda Certificate of Education**

**CHEMISTRY**

**PAPER 3**

**DURATION: 2¼ HOURS**

## **INDTRUCTION TO CANDIDATES**

Answer all questions

Read your answers on this question paper in the spaces provided.

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

All your work must be in blue or black ink. Any work done in pencil will not be marked except drawings.

Reference books (i.e. text books, books 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 to read the question paper and make sure they have all the apparatus and chemicals that may need.

FOR EXAMINER'S USE ONLY			
Q.1			
Q.2			

1. You are provided with the following;

**BA1** which is a solution made by dissolving 8.0g of an impure acid  $H_2A$  in one  $dm^3$ .

**BA2** which is a solution made by dissolving 1.7g of  $OH^-$  ions to make one litre of solution.

You are required to determine the percentage impurity in the acid  $H_2A$ .

**Procedure:**

Pipette **25.0** $cm^3$  or **20.0** $cm^3$  of **BA2** into a clean conical flask followed by 2 or 3 drops of Methyl orange indicator. Titrate with **BA1** from the burette. Repeat the titrations to obtain consistent results. Record your results in the table below.

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 <b>BA1</b> used ( $cm^3$ )			

(4 ½ marks)

Values used to calculate average Titre (1 mark)

.....  
.....

Average volume of **BA1**..... $cm^3$ . (3 marks)

**Questions;**

a) Calculate the;

i) Number of moles of  $\bar{O}H$  ions in one litre of solution. (H=1, O=16).  
(1 ½ marks)

.....  
.....  
.....  
.....

ii) Number of moles of  $\bar{O}H$  ions that reacted. (1 ½ marks)

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 .....  
 .....  
 .....  
 b) Determine the number of moles of acid H<sub>2</sub>A that reacted completely with  $\bar{O}H$  ions.  
 (2 moles of  $\bar{O}H$  ions react completely with 1 mole of H<sub>2</sub>A.) (1 mark)

.....  
 .....  
 .....  
 .....  
 c) **Determine;**  
 i) Concentration of acid H<sub>2</sub>A in moles per dm<sup>3</sup>. (1 ½ marks)

.....  
 .....  
 .....  
 .....  
 ii) Mass of acid H<sub>2</sub>A in One dm<sup>3</sup>. (A=124) (1 ½ marks)

.....  
 .....  
 .....  
 .....  
 d) Determine the percentage impurity in the acid H<sub>2</sub>A. (1 ½ marks)

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 .....  
 .....  
 .....  
 2. You are provided with substance **X** which contains two cations and One anion. Carryout the following tests on **X** to identify the cations and anion in **X**, where gases are evolved, they must be identified. Record your observations and deductions in the table below; (32 marks)

TEST	OBSERVATIONS	DEDUCTIONS
a) Heat a spatula		

endful of <b>X</b> in a dry clean test tube gently and then strongly until there is no further change.		
b) To one spatula endful of <b>X</b> in a test tube, add about 10cm <sup>3</sup> of distilled water and warm to dissolve. Add aqueous sodium hydroxide dropwise until in excess. Filter and keep both the filtrate and the residue.		
c) To the filtrate, add dilute Nitric acid dropwise until the filtrate is just acidic. Divide the acidic filtrate into 5 portions.		
i) To the first portion, add dilute sodium hydroxide dropwise until in excess.		
ii) To the second portion, add 3 drops of Potassium Iodide solution.		
iii) To the third portion, add aqueous ammonia dropwise		

until in excess.		
iv) To the fourth portion, add 3 drops of Lead (II) Nitrate solution and warm		
iv) Use the fifth portion to carry out a test of your own choice to confirm the anion in <b>X</b> .		
d) Wash the residue from <b>b</b> with sodium hydroxide solution and then add dilute nitric acid to dissolve. Divide the resultant solution into portions.		
i) To the first portion, add aqueous sodium hydroxide dropwise until in excess.		
ii) To the second portion, add aqueous ammonia dropwise until in excess.		

iii) To the third portion, add 5 drops dilute sulphuric acid.		

e) Identify the;

i) cations in **X**: .....and .....

ii) anion in **X**.....

**TR. NGOBI ROERS MUTAKA**

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**\*\*\*END\*\*\***