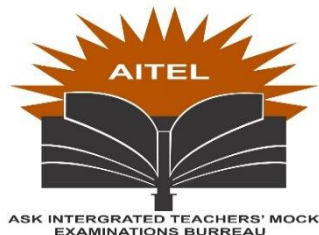


Name: Index No.

Signature:

P525/3
CHEMISTRY
PAPER 3
2023
3 ¼ HOURS



AITEL JOINT MOCK EXAMINATION

Uganda Advanced Certificate of Education

CHEMISTRY

PAPER 3

3 hours 15minutes

Instructions to candidates

- Answer *all* questions
- Record your answers on this question paper in the spaces provided.
- 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 they may need.

FOR EXAMINER'S USE ONLY			
Q.1	Q.2	Q.3	TOTAL

QUESTION 1

1. In this experiment you are required to;

- Standardise hydrochloric acid
- Use the standardized hydrochloric acid to determine the percentage purity of anhydrous sodium carbonate sample which was contaminated with sodium hydrogen carbonate only.
[H=1, Cl=35.5, Na=23, O=16, C=12]

You are provided with the following:

FA₁ which is about 0.5M hydrochloric acid solution

FA₂ which is 0.1M sodium hydroxide solution

Solid Q which is an impure sodium carbonate.

PART A

- Accurately transfer 30cm³ of FA₂ into a clean volumetric flask and add distilled water little at a time as you shake gently up to the mark. Label it FA₃
- Pipette 20cm³ or 25cm³ of FA₃ into a clean conical flask followed by 2 or 3 drops of phenolphthaleine indicator. Titrate the mixture with FA₁ until the end point is reached.
- Repeat step (b) above until consistent results are obtained. Record your results in the table below.

Volume of pipette used=.....cm³

Experiment	1	2	3
Final burette reading/cm ³			
Initial burette reading /cm ³			
Volume FA ₁ used /cm ³			

- i) State the values that may be used to calculate the average titre volume of FA₁

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- ii) Calculate the average titre volume of FA₁ used

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- iii) Calculate the number of moles of sodium hydroxide that reacted with FA₁

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- iv) Determine the moles of hydrochloric acid that reacted with FA_3 . Hence, determine the molarity of FA_2 .

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PART B

- d) Weigh accurately 4.8g of solid Q into a clean volumetric flask. Add little distilled water to dissolve the solid. Continue adding little water at a time followed by gentle shaking up to the mark. Label it FA_4
- e) Pipette 20cm^3 or 25cm^3 of FA_4 into a clean conical flask followed by 2 or 3 drops of phenolphthaleine indicator. Titrate the mixture with FA_3 until the end point is reached.
- f) Repeat the step (e) above until consistent results are obtained. Record your results in the table below:

Mass of weighing dish + solid Q =g

Mass of empty weighing dish =g

Mass of solid Q =g

Volume of pipette used = cm^3

Experiment	1	2	3
Final burette reading /cm ³			
Initial burette reading /cm ³			
Volume of FA ₃ used /cm ³			

i) State the values which may be used to calculate the average volume of FA₃

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ii) Calculate the average volume of FA₃

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iii) Calculate the number of moles of hydrochloric acid that reacted with FA₄

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iv) Determine the concentration in mol dm⁻³ of sodium carbonate in FA₄. Hence, the percentage of sodium carbonate in Q

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2. You are provided with substance W which contains two cations and two anions. You are required to carry out the following tests on Q and to identify the anions and cations in Q. Record your observations and deductions in the table below.

TESTS	OBSERVATIONS	DEDUCTIONS
a)Heat a spatula end-ful of Q in a dry test tube		
b) Shake two spatula end-fuls of Q with about 5cm ³ of water and filter. Keep both the filtrate and the residue. Divide the filtrate into five portions		
i)To the first portion, add sodium hydroxide drop-wise until in excess		
ii)To the second portion, add ammonia solution drop-wise until in excess		

iii)To the third portion, add concentrated ammonia solution drop-wise until in excess followed by few drops of hydrogen peroxide solution		
iv)To the fourth portion, add lead II nitrate solution. Boil the mixture		
v)Use the remaining portion to carry out a test of your own choice to confirm one of the anions in Q		
C) Wash the residue with water, transfer to a test tube and add dilute sulphuric acid drop wise to dissolve the residue. Divide the solution into three parts.		

i)To the first part, add sodium hydroxide solution drop wise until in excess		
ii)To the second part, add ammonia solution drop wise until in excess		
iii)To the third part, add an equal amount of concentrated nitric acid followed by a spatula end- ful of lead IV oxide, Heat and allow to stand		

Identify; i) the cations in W

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iii) The anions in W

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3. You are provided with an organic substance Y. Carry out the following tests to identify Y.

TESTS	OBSERVATION	DEDUCTION
a) Burn a little of Y on a spatula		
b) Dissolve about 3cm ³ of Y into 3cm ³ of water. Test the resultant solution using a universal indicator		
c) To 2cm ³ of Y add 2-3cm ³ of 2,4-dinitrophenyl hydrazine		
d) To 2cm ³ of Y add 2-4cm ³ of sodium carbonate solution		
e) To 3cm ³ of Y add 2cm ³ of acidified potassium dichromate solution and heat. Divide the resultant solution into three portions		

i)To the first portion, add Brady's reagent		
ii)To the second portion, add Tollen's reagent		
f) To 2cm ³ of Y, add 2cm ³ of ethanoic acid followed by 2cm ³ of concentrated sulphuric acid and warm. Pour the mixture into a beaker		
g)To 3cm ³ of Y, add anhydrous zinc chloride followed by concentrated hydrochloric acid		
h)To 3cm ³ of Y, add 2cm ³ of iodine solution followed by 5cm ³ of sodium hydroxide solution. Heat the mixture		

Comment on the nature of Y

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*****END*****