Name ……Index No……..……

P525/3
CHEMISTRY
(Practical)
Paper 3
June/July 2022
3 ¼ HOURS

MWALIMU EXAMINATIONS BUREAU

UACE RESOURCE MOCK EXAMINATIONS – 2022

CHEMISTRY

(PRACTICAL)

Paper 3

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **all** questions. Use **blue** or **black** ink. Any work done in pencil will **not** be marked **except** drawings.

Record your answers on this question paper 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.*

*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**

1. You are provided with the following;
   FA1; which is a 1.0 M hydrochloric acid solution.
   FA2; which is sodium hydroxide solution.
   FA3; which is a 0.1 M sulphuric acid solution.
   Solid T; which is an acid, H_3X.

   You are required to standardise solution **FA2** and use it to determine the value of **X** in the solid **T.**

   PART I
   PROCEDURE:
   Pipette 25.0 (20.0cm^3) of **FA2** into a clean conical flask. Add 2-3 drops of phenolphthalein indicator and shake.
   Titrate the mixture with **FA1** from the burette.
   Repeat the titration until you obtain consistent results.
   Record your results in **Table 1** below.

   RESULTS
   Table 1
   Volume of pipette used = ... cm^3. (0½ marks)

Experiment	**I**	**II**	**III**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **FA1** used (cm^3)			

(4½ marks)

(a) (i) Record the volumes of **FA1** used for calculating average volume.

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(½ marks)

(ii) Calculate the average volume of **FA1** used. (2½ marks)

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(b) Calculate the concentration of **FA1** in $mol\ dm^{-3}$ of sodium hydroxide.
(2½ marks)

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PART II
PROCEDURE:

Weigh accurately 3.4 g of **T** and place in a clean beaker. Add to it exactly 100 cm^3 of **FA2** and carefully stir to dissolve. Transfer the resultant mixture into a 250 cm^3 volumetric flask and make it up to the mark with distilled water. Label **FA4**.

Pipette 25.0 (20.0cm^3) of **FA4** into a clean conical flask. Add 2-3 drops of phenolphthalein indicator and shake.
Titrate the mixture with **FA3** from the burette.
Repeat the titration until you obtain consistent results.
Record your results in **Table 2** below.

RESULTS:

Mass of empty bottle + **T** = ……g (0½ mark)
Mass of empty bottle alone = ……g (0½ mark)
Mass of **T** alone = ……g (0½ mark)
Volume of pipette used = …….. cm^3. (0½ mark)

Table 2

Experiment	**I**	**II**	**III**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **FA3** used (cm^3)			

(4½ marks)

(a) (i) Record the volumes of **FA3** used for calculating average volume.

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(½ mark)

(ii) Calculate the average volume of **FA3** used. (2½ marks)

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(b) Calculate the number of moles of

(i) sulphuric acid in **FA3** that reacted with of sodium hydroxide in **FA4**. (02 marks)

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(ii) excess sodium hydroxide in 250 cm^3 of **FA4**. (04 marks)

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(iii) sodium hydroxide that reacted with **T**. (3½ marks)

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(iv) **T** that reacted with of sodium hydroxide. (2½ marks)

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(c) Determine the value of **X** in $\boldsymbol{H_3X}$. (03 marks)

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2. You are provided with substance **Y** which contains **two** cations and **two** anions. You are required to carry out the following tests on Y to identify the cations and anion in it. Identify any gases evolved. Record your observations and deductions in the table below.

Tests	Observations	Deductions
(a) Heat a spatula end-ful of Y in a dry test tube until there is no further change.		
(b) Shake **two** spatula end-fuls of **Y** with about 5 cm^3 of water. Filter the mixture. Keep both the filtrate and the residue.		
(c) Divide the filtrate into **three** parts. (i) To the **first** part of the filtrate, add 3 drops of dilute nitric acid followed by 3 drops of silver nitrate solution.		
(ii) To the **second** part of the filtrate, add 2-3 drops of hydrogen peroxide and 5 drops of starch solution.		

(iii) To the **third** part of the filtrate, add 2-3 drops of lead(II) nitrate solution.		
(d) Wash the residue thoroughly with water and dissolve it in dilute nitric acid. Then add dilute ammonia solution drop wise until in excess. Shake and filter. Keep both residue and filtrate.		
(e) To the filtrate, add dilute nitric acid dropwise until the solution is just acidic. Divide the filtrate into **three** parts.		
(i) To the **first** part of the acidic filtrate, add dilute sodium hydroxide solution dropwise until in excess.		
(ii) To the **second** part of the acidic filtrate, add dilute ammonia solution dropwise until in excess.		
(iii) To the **third** part of the acidic filtrate, add 3-4 drops of dilute sulphuric acid.		

(iv) To the **fourth** part of the acidic filtrate, to carry out a test of your own choice to confirm one of the cations in **Y**.		
(f) Wash the residue well with water and dissolve it in dilute nitric acid. Divide the acidic solution into **four** parts.		
(i) To the **first** part of the acidic solution, add dilute sodium hydroxide solution drop-wise until in excess		
(ii) To the **second** part of the acidic solution, add an equal volume of water followed by dilute ammonia solution drop-wise until in excess.		
(iii) To the **third** part of the acidic solution, add 3-4 drops of dilute sulphuric acid.		

(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 **Y**.		

(g) (i) The cations in **Y** are ……and ……

(ii)The anions in **Y** are …… and……..

3. You are provided with a compound **N** which is an organic compound. You are required to determine the nature of **N**. Carry out the following tests and identify any gas(es) evolved. Record your observations and deductions in the **Table 4**.

Table 4 **(16 marks)**

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a spatula end-ful of **N** on a spatula end.		
(b) To 3 cm^3 of **N**, add an equal volume of water and shake. Divide the mixture into **six** parts.		
(i) To the **first** part of the mixture, add 2-3 drops of neutral iron(III) chloride solution.		

(ii) To the **second** part of the mixture, add 2-3 drops of potassium dichromate(VI) solution and heat.		
(iii) To the **third** part of the mixture, add 4-5 drops of 2,4-dinitrophenylhydrazine solution.		
(iv) To the **fourth** part of the mixture, add a half spatula of sodium carbonate.		
(v) To the **fifth** part, add 3-4 drops of Tollen's reagent and heat the mixture.		
(vi) Use the **sixth** part of the mixture to carry out a test of your own choice to confirm the functional group in **N**.		

(c) Describe the nature of **N**.

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END