**Candidate's Name: …….. ……**

**Signature: ……**

***(Do not write your School/ Centre Name or Number anywhere on this booklet.)***

**P525/3**
**CHEMISTRY**
**Paper 3**
**July/ Aug: 2022**
3 ¼ hours

**MATIGO MOCK EXAMINATIONS 2022**

**Uganda Advanced Certificate of Education**

CHEMISTRY (PRACTICAL)

**Paper 3**

3 hours 15 minutes

**INSTRUCTIONS TO CANDIDATES:**

*Answer* **all** *questions. Use* ***blue*** *or* ***black*** *ball point pen. Any work done in pencil will not be marked except drawings.*
*Record your answers on this question paper in the spaces provided.*
*Mathematical tables, slide rules and silent-programmable calculators may be used.*
*Reference books (text books, Books on qualitative analysis etc) should* **not** *be used.*
*Candidates are* **no***t 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 Examiners' Use Only | | | |
|---|---|---|---|
| **Q.1** | **Q.2** | **Q.3** | **Total** |
| | | | |
| | | | |

 **Turn Over**

**1.** An experiment to determine the enthalpy of solution

You are given the following;

**$FA_1$**, which is 0.1M hydrochloric acid

Solid **Y** which is a sample of sodium carbonate

Specific heat capacity of water $=4.18Jg^{-1}K^{-1}$

Na=23, C=12, O=16, H=1, Cl=36

You are required to determine the;

i) Molar mass of **Y**
ii) Enthalpy of solution of **Y**

**PROCEDURE**

**Part 1**

a) Weigh accurately 0.60g Y into a clean beaker and add about $50cm^3$ of distilled water to dissolve it. Transfer the contents into a $250cm^3$ volumetric flask and make up to the mark. Label the resultant solution **$FA_2$**.
b) Accurately transfer $50cm^3$ of **$FA_1$** into a clean beaker followed by $30cm^3$ of distilled water and label the resultant solution **$FA_3$**.
c) Pipette $20cm^3$ or $25cm^3$ of **$FA_2$** into a clean conical flask followed by 2 -3 drops of methyl orange indicator and titrate the mixture with **$FA_3$** until the end point. Repeat the titration until you obtain consistent results and record your results in the table of results below.

**Table I**

Mass of weighing dish +**Y** = …….g
Mass of empty dish = …….g
Mass of **Y** = …….g
Volume of pipette used = ……..... $cm^3$

| Experiment number | I | II | III |
|---|---|---|---|
| Final burette reading ($cm^3$) | | | |
| Initial burette reading ($cm^3$) | | | |
| Volume of **$FA_3$** added ($cm^3$) | | | |

i) State the values that can be used to calculate the average volume of **$FA_3$** added. *(½ mark)*

……....

ii) Calculate the average volume of **$FA_3$** added. *(2 ½ marks)*

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d) Determine the number of moles of;

i) Hydrochloric acid added. *(2 ½ marks)*

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ii) Sodium carbonate reacted. *(1 ½ marks)*

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e) Calculate the molar mass of sodium carbonate sample given. *(2 marks)*

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## Part II

f) Using a measuring cylinder, accurately transfer 50cm$^3$ of distilled water into a plastic beaker wrapped with two layers of a tissue and record the temperature reading initially followed by every after a half a minute for 1 ½ minutes. At exactly 2 minutes, add 8.0g of **Y** and continue recording the temperature every after half a minute for the next 5 minutes. Record your results in the table of results below.

**Table II** *(7 ½ marks)*

| Time (minutes ) | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature ($^0$C) | | | | | | | | | | | | | | | |

g) Plot a graph of Temperature against Time. *(5 marks)*

h) i) From your graph determine the maximum temperature change. *(1 mark)*

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ii) Calculate the molar heat of solution of the sample of sodium carbonate given. *(3 marks)*

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**2.** You are given a solid **W** which contains **three** cations and **one** anion. Carry out the following tests to identify the ions in **W**. Identify any gas evolved and record your observations and deductions in the table below. *(29 ½ marks)*

| **TESTS** | **OBSERVATIONS** | **DEDUCTIONS** |
|---|---|---|
| a) Heat a spatula endful of **W** in a hard test tube gently and then strongly until no further change | | |

| | | |
|---|---|---|
| b) To about a spatula endful of **W** in a boiling tube, add about 1cm$^3$ of distilled water and shake vigorously until it dissolves. To the resultant solution, add dilute sodium hydroxide solution drop- wise until in excess, warm and filter the mixture. Keep both the filtrate and residue. | | |
| c) Wash the residue, transfer it into a boiling tube and add dilute hydrochloric acid drop-wise until it just dissolves. Divide the resultant solution into **four** portions.<br><br>i. To the **first** portion about 1cm$^3$ of calcium nitrate solution | | |
| ii. To the **second** portion add about 3-4 drops of concentrated nitric acid and warm the mixture. Allow it cool. To the cold mixture, add dilute sodium hydroxide solution drop-wise until in excess. | | |
| iii. To the **third** portion add dilute ammonia solution drop-wise until in excess. | | |

| | | |
|---|---|---|
| iv. Use the **fourth** portion to carry out a test of your own in order to confirm the cation in **W**. | | |
| d) To the filtrate add dilute hydrochloric acid drop-wise until the solution just becomes acidic.<br>Divide the acidic solution into four portions<br>i) To the **first** portion add about 4-5 drops of acidified potassium manganate (VII) solution and heat but don't boil. | | |
| ii) To the **second** portion, add dilute sodium hydroxide solution drop-wise until in excess. | | |
| iii) To the **third** part add dilute ammonia solution drop-wise until in excess. | | |
| iv) To the **fourth** part add potassium iodate solution drop wise until in excess. | | |

| | | |
|---|---|---|
| v) Use the **fifth** portion to carry out a test of your own in order to confirm the third cation in **W**. | | |

e) Identify the ions in **W**; *(2 marks)*

i) Cations ……

ii) Anion……...

**3.** You are given an organic solid substance **T**. Carry out the following tests to identify the nature of **T**. record your observations and deductions in the table below.

*(16 marks)*

| **TESTS** | **OBSERVATIONS** | **DEDUCTIONS** |
|---|---|---|
| a) Burn a small amount of **T** on a spatula or porcelain dish. | | |
| b) To about half spatula endful of **T** in a test tube add about $0.5cm^3$ of dilute sodium hydroxide solution and shake vigorously. | | |
| c) To about half spatula endful of **T** in a boiling tube add about $1cm^3$ of distilled water and shake vigorously. Test the resultant mixture with a litmus paper and divide it into **five** portions. | | |

| | | |
|---|---|---|
| i) To the **first** portion, add about half spatula endful of soda lime and warm. | | |
| ii) To the **second** portion, add about $1cm^3$ of Brady's reagent | | |
| iii) To the **third** portion, add about $1cm^3$ of Tollen's reagent and warm. | | |
| iv) To the **fourth** portion, add about 4 -5 drops of neutral iron (III) chloride solution. | | |
| v) To the **fifth** portion, add about $1cm^3$ of acidified potassium manganate (VII) solution and warm. | | |

d) Comment on the nature of **T**. *(2 marks)*

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**END**