Name: ..................................................................................................................

Signature: .......................................... Index No.................................

P525/3

**CHEMISTRY**

**(Practical)**

**Paper 3**

July/August 2022

3¼ hours



WESTERN JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

**CHEMISTY 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 and silent non-programmable calculators may be used.*
* *Reference books (i.e textbooks, 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 read the question paper and make sure they have all the apparatus and chemicals that they may need.*

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| --- | --- | --- | --- |
| **For Examiners’ Use Only** | | | |
| **Q.1** | **Q.2** | **Q.3** | **Total** |
|  |  |  |  |
|  |  |  |  |

1. You are provided with the following;

* **FA1** which is approximately a 0.1 M sodium thiosulphate solution
* **FA2** which is a 1.0 M solution of sulphuric acid
* **FA3** which is a solution of 10% potassium iodide
* Solid **M** which is sodium dichromate
* Liquid **Z** which is a liquid bleaching agent containing chlorate(I)
* Starch solution

You are required to standardize **FA1** and use it to determine the mass of chlorine required to produce 1.0 dm3 of the bleaching agent.

In acidic medium, dichromate (VI) ions and chlorate (I) react with potassium iodide to liberate iodine according to the following equations.

The iodine liberated in both cases reacts with thiosulphate ions according to the following equation.

**Procedure A**

Weigh accurately 1.2 g of solid **M**, dissolve it in minimum quantity of distilled water and make it up to mark of 250 cm3 in the volumetric flask with distilled water, label the solution **FA4**.

Pipette 20 or 25 cm3 of **FA4**, add an equal volume of **FA2** using a measuring cylinder, followed by 10.0 cm3 of **FA3**.

Titrate the iodine liberated with **FA1** using starch as an indicator.

Repeat the titration until you obtain consistent results.

Record your results in the table below.

**Results**

Mass of weighing bottle + **M** = ......................................g (*½ mark*)

Mass of weighing bottle = ......................................g (*½ mark*)

Mass of **M** = .................................................................g (*½ mark*)

Volume of pipette used = .........................................cm3 (*½ mark*)

|  |  |  |  |
| --- | --- | --- | --- |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of **FA1** used (cm3) |  |  |  |

(*4½ marks*)

Titre values used to calculate the average volume of **FA1** used =............... cm3 (*½ mark*)

Average volume of **FA1** used =................................................. cm3 (*2½ marks*)

Questions

1. Calculate the number of moles of iodine liberated by **FA4**.

(Na = 23, Cr = 52, O = 16) (*2½ marks*)

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**Procedure B**

Measure 10 cm3 of **Z** into a 250 cm3 volumetric flask. Add distilled water up to the mark. Label the solution **FA5**.

Pipette 25 cm3 or 20 cm3 of **FA3** into a clean conical flask, add 10.0 cm3 of **FA3**, followed by 10.0 cm3 of **FA2**.

Titrate the iodine liberated with **FA1** using starch as an indicator.

Record your results in the table below.

**Results**

Volume of pipette used = .........................................cm3 (*½ mark*)

|  |  |  |  |
| --- | --- | --- | --- |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of **FA1** used (cm3) |  |  |  |

(*4½ marks*)

Titre values used to calculate the average volume =..................... cm3 (*½ mark*)

Average volume of **FA1** used =.................................................. cm3 (*2½ marks*)

1. Calculate the
2. number of moles of iodine liberated by **FA5**. *02 marks*)

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1. number of moles of chloride ions that would be liberated from 10.0

cm3 of **Z**. (*02 marks*)

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1. number of moles of chlorine required to produce 1.0 cm3 of **Z**. (*02 marks*)

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1. Determine the mass of chlorine required to produce 1.0 cm3 of **Z**. (C = 35.5) (*02 marks*)

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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 **W** to identify the anions and cations in **W**. Record your observations and deductions in the table below. Identify any gases evolved. (*33 marks*)

|  |  |  |
| --- | --- | --- |
| **Tests** | **Observations** | **Deductions** |
| 1. Heat **two** spatula endfuls of **W** strongly in a hard glass tube. |  |  |
| 1. To **two** spatula endfuls of **W** in a dry test tube, add 5 drops of concentrated sulphuric acid and warm. |  |  |
| **Tests** | **Observations** | **Deductions** |
| 1. Dissolve **three** spatula endfuls of **W** in about 5.0 cm3 of water to make a solution. |  |  |
| 1. Use 1.0 cm3 of the solution of **W** to carry out a test of your choice to confirm one of the anions in **W**. |  |  |
| 1. To the remaining solution of **W**, add dilute sodium hydroxide solution drop-wise until there is no further change. Filter. Keep both the filtrate and residue. |  |  |
| 1. Add dilute hydrochloric acid drop-wise to the filtrate until the solution is just acidic. Divide the solution into **four** portions. |  |  |
| 1. To the **first** portion of the acidified filtrate, add dilute sodium hydroxide solution drop-wise until in excess. |  |  |
| 1. To the **second** portion of the acidified filtrate, add potassium iodide solution. |  |  |
| 1. To the **third** portion of the acidified filtrate, perform a test of your choice to confirm one of the cations in **W**. |  |  |
| 1. To the **fourth** portion of the acidified filtrate, add 5 drops of barium nitrate solution. |  |  |
| 1. Wash the residue with distilled water and dissolve it in dilute hydrochloric acid. Divide the acidic solution into **four** portions. |  |  |
| Tests | Observations | Deductions |
| 1. To the **first** portion of the acidic solution, add sodium hydroxide solution drop-wise until in excess. |  |  |
| 1. To the **second** portion of the acidic solution, add ammonia solution drop-wise until in excess. |  |  |
| 1. To the **third** portion of the acidic solution, add dilute sulphuric acid. |  |  |
| 1. To the **fourth** portion of the acidic solution, carry out a test of your own choice to confirm one of the anions in **W**. |  |  |

1. Identify the
2. cations in **W**...........................................and.......................................
3. anions in **W**............................................and.......................................
4. You are provided with organic substance **T**. You are required to determine the nature of **T**. Carry out the following test on **T** and record your observations and deductions in the table below. (*17 marks*)

|  |  |  |
| --- | --- | --- |
| Tests | Observations | Deductions |
| 1. Burn a small amount of **T** on a spatula end or in a porcelain dish. |  |  |

|  |  |  |
| --- | --- | --- |
| 1. Add 2.0 cm3 of **T** to about 2.0 cm3 of water, shake and test the mixture with litmus. Divide the mixture into **five** parts. |  |  |
| 1. To the **first** part, add a half spatula endful of sodium carbonate. |  |  |
| 1. To the **second** part, add neutral iron(III) chloride solution. |  |  |
| 1. To the **third** part, add 3 – 4 drops of acidified potassium manganate(VII) solution. |  |  |
| 1. To the **fourth** part, add 2 – 3 drops of dinitrophenyl hydrazine solution. |  |  |
| 1. To the **fifth** part, add Fehling’s solution and heat. |  |  |
| 1. To about 3.0 cm3 of silver nitrate solution, add 2 drops of sodium hydroxide solution followed by ammonia solution until the precipitate just dissolves.   Add about 1.0 cm3 of **T**, shake and heat in a water bath for about 5 minutes. |  |  |
| 1. To about 1.0 cm3 of **T**, add bromine water. |  |  |

Comment on the nature of **T**.

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END