

**MARANDA HIGH SCHOOL**

***Kenya Certificate Of Secondary Education***

 **THE 2024 MOCK EXAMINATION**

**233/3 CHEMISTRY PAPER 3**

 **June, 2024 TIME: 2 Hrs 15 Mins**

**Name**: …………………………………….…….…… Admission No: ……………

**233/3 - CHEMISTRY**

Thursday, 6th June, 2024

Morning

7.00-9.15Am

**Stream**: ……………………….. **Signature**: ……….........

**Instructions**

1. *Write your* ***name****,* ***admission number, date, stream and signature*** *in the spaces provided above.*
2. ***This paper consists of 7 printed pages with 3 questions. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing***
3. *Candidate should answer the questions in* ***English***
4. *You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the apparatus and chemicals that you may need.*
5. *Mathematical tables and silent non-programmed electronic calculators may be used.*

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 **For Examiner’s Use Only**

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| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATES SCORE** |
| **1** | **20** |  |
| **2** | 08 |  |
| **3** | 12 |  |
| **TOTAL SCORE** | **40** |  |

1. You are provided with:
* Solid **A**, 0.3g, Magnesium metal
* Solution **B**, Hydrochloric acid
* Solution **C**, 0.15M sodium carbonate
* Methyl orange indicator

You are required to determine the:

* Enthalpy change,$ΔH$ per mole, of the reaction between magnesium metal and excess hydrochloric acid.
* Concentration in moles per litre of hydrochloric acid, solution **B**

**Procedure I**

i) Using a burette, measure 50.0cm3 of solution B and place it in a 100ml plastic beaker.

ii) Measure the temperature of solution **B** in the beaker after every 30 seconds and record it in **table I** below.

iii) At the 90 th second, add all the solid A provided into the beaker, stir with the thermometer and continues measuring and recording the temperature after every 30 seconds and complete **table I. Retain the mixture in the beaker for use in procedure II.**

**Table I**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time(seconds) | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 |
| Temperature (0C) |  |  |  |  |  |  |  |  |  |  |

 (3marks)

a) Plot a graph of temperature (vertical axis) against time on the grid provided (3marks)



b) Determine the change in temperature,$ΔT$, for the reaction. (1mark)

……………………………………………………………………………………………………….

c)Calculate the heat change, in Joules, for the reaction. (Assume that for the solution, specific heat capacity is 4.2J/g/K and density is 1.0 gcm3 ) (1 mark)

………………………………………………………………………………………………………d)The relative atomic mass of magnesium is 24.0. Calculate the enthalpy change,$ΔH$,of the reaction per mole of magnesium. (1 mark)

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**Procedure II**

(i)Fill the burette with 0.15M sodium carbonate, solution **C**

(ii) Place all the mixture in the beaker from procedure I into 250 ml volumetric flask. Add more distilled water to the mark and shake thoroughly. Label the mixture solution **D**

(iii) Pipette 25cm3 of solution **D** into a 250 ml conical flask and add 2 drops of methyl orange indicator.

(iv) Titrate solution **D** in the conical flask with the sodium carbonate, solution **C** and record the reading in **table II** below

(v) Repeat steps(iii) and(iv) and complete **table II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Table II** | I | II | III |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of solution **C** used (cm3) |  |  |  |

 (4 marks)

(a)Determine the average volume of solution **C**, used. (1 mark)

………………………………………………………………………………………………….........……………………………………………………………………………………………….............(b)Calculate the number of moles of:

(i) Sodium carbonate used, solution **C** (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………….(ii) Hydrochloric acid in the 25.0cm3 of solution D (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………….

(iii) Hydrochloric acid in the 250cm3 of solution D (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………….(iv) Hydrochloric acid that reacted with magnesium metal (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………….(c) Calculate the total number of moles of hydrochloric in the 50.0cm3 of solution B (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………….(d) Determine the concentration of hydrochloric acid in moles per litre, in solution **B** (1 mark)

………………………………………………………………………………………………………2. You are provided with an organic solid **E**. Carry out the following tests and record your observation and inferences in the spaces provided. Divide solid **E** into four portions.

 (i) Place the first portion of solid **E** in a spatula and Ignite it.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

(ii) Place the second portion of solid **E** in test tube. Add about 2cm3 of aqueous sodium hydroxide and shake.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

(iii) Place the third portion of solid **E** in a test tube. Add about 2cm3 of distilled water. Heat the mixture and add three drops of acidified potassium manganate (VII)

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

(iv) Place the fourth portion of solid **E** in a test tube. Add about 2cm3 of distilled water. Heat the mixture and add all the solid sodium hydrogen carbonate provided.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

3.You are provided with solid **F**. Carry out the following tests and write your observations and

inferences in the spaces provided.

(a)Place all the sold **F** in a boiling tube. Add about 10cm3 of distilled water. Shake well and filter. Divide the filtrate into three portions and keep the residue for use in part (b).

(a) (i) To the first portion add aqueous sodium hydroxide drop wise until in excess.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1 mark) |  (1mark) |

(ii) To the second portion add three drops of Barium chloride solution followed by 3cm3 of dilute nitric(V) acid.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

 (iii) To the third portion add ammonia solution dropwise until excess.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

(b) Place the residue in (a) above in a boiling tube and add 8cm3 of dilute nitric (V) acid. Retain

the mixture for the tests below:

(i)To 2cm3 of the solution, add sodium hydroxide solution dropwise until in excess.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1mark) |

(ii)To 2cm3 of the solution, add three drops of sulphuric (VI) acid.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1 mark) |  (1mark) |

(i)To 2cm3 of the solution, add ammonia solution dropwise until in excess.

|  |  |
| --- | --- |
| Observations | Inferences |
|  (1mark) |  (1 mark) |

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