**Name………………………………………..ADMN……….CLASS……**

**233/3**

**CHEMISTRY PAPER 3**

**PRACTICAL TIME: 2 ¼ HOURS**

**NOV/DEC 2021**

**Kenya Certificate of Secondary Education**

**Chemistry**

**Paper 3 233/3**

**FORM 4**

**INSTRUCTIONS:**

 Answer ALL questions in the spaces provided in the question paper

 You are NOT allowed to start working with the apparatus for the first 15minutes This time will enable you read through the question paper and make sure you have all the chemicals and apparatus required

 KNEC Mathematical tables and electronic calculators may be used.

 All working must be clearly shown where necessary

 Candidates should answer the questions in English

**FOR EXAMINERS USE ONLY**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s score** |
| 1 | 19 |  |
| 2 | 11 |  |
| 3 | 10 |  |
| **TOTAL SCORE** | **40** |  |

This paper consists of 8 printed pages. Candidates should check the questions paper to ascertain that all the

pages are printed as indicated and no questions are missing.

**1*.* You are provided with;**

 Aqueous hydrochloric acid, solution **W**9 .

 Solution sodium **W**11 containing 6.3g of a dibasic acid H2C2O4**.**2H2O per litre

 Aqueous sodium hydroxide, solution **W**12.  Phenolphthalein indicator

 Solid M

**You are required to;**

 Standardize the sodium hydroxide solution **W**12

 Use the standardized solution **W**12 to determine the concentration of **W9**

 React the hydrochloric acid solution **W**9 with metal **M** and determine the mass per unit length of metal **M**.

**Procedure**

**I.** Fill a burette with solution **W**11, pipette 25.0cm3 of solution **W**12 into a conical flask. Titrate using phenolphthalein indicator. Record your results in Table A below;

**Table A.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Final Burette Reading |  |  |  |
| Initial Burette Reading |  |  |  |
| Volume of solution **W**11 (cm3) |  |  |  |

(3 marks)

i) Average volume of solution **W**11 used (1 mark)

ii) Calculate the concentration of the dibasic solution W11 in mol-1

(*C*=12, *H*=1, *O*=16) (1 mark)

iii) Calculate the concentration of the sodium hydroxide solution **W**12 in mol*l-1*

(1marks)

**II.**Using a 100cm3 measuring cylinder measure 90cm3 of distilled water and place it into a 250cm3 beaker then add 10cm3 of solution **W**9 (**W**9 is supplied in a burette). Mix the solution well and label it **W**10.

Fill a burette with solution W10, pipette 25.0cm3 of solution W12 into a conical flask. Titrate using phenolphthalein indicator. Record your results in Table B below.

**Table B.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Final Burette Reading |  |  |  |
| Initial Burette Reading |  |  |  |
| Volume of solution **W**10 used (cm3) |  |  |  |

(3 marks)

i).Average volume of solution W10 used. (1 mark)

ii).Calculate the concentration of the diluted hydrochloric acid solution W10 in mol *l-1.* (1 marks)

iii).Determine the concentration of the original hydrochloric acid solution W9 in mol *l-1* (1 mark)

**III**. Cut three pieces each of length 2cm from the metal **M** provided. From the burette containing **W**9 measure 10cm3 of **W**9 into a boiling tube. Wrap the boiling tube with tissue paper. Measure the temperature of this solution and record it in **Table C** below. Place one of the 2cm pieces of metal **M** into the hydrochloric solution **W9** in the boiling tube and measure the temperature. Record the highest temperature in table C below. Repeat this procedure using the other two, 2cm, pieces of M.

**Table C.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Piece of metal M | 1 | 2 | 3 |
| Highest temperature |  |  |  |
| Initial temperature |  |  |  |
| Change in temperature, ∆T |  |  |  |

(3 marks)

i).Average change in temperature ∆T0C (1 mark)

ii).Calculate the heat of the reaction between metal **M** and hydrochloric acid using the expression below;

heat of reaction 1 mark)

iii).Given that the heat of the reaction is 440Kj per mole of **M**. Calculate the number of moles of **M** used in this reaction. (1 marks)

iv).Calculate the mass per unit length of metal M (M=24). (1 marks)

2. . You are provide with solid E which is suspected to be calcium nitrate . Using the reagents below, describe how you can confirm its presence

 Aqueous NaOH

 Dilute sulphuric (V) acid

 Aluminium foil

Bunsen burner



Red and blue litmus papers  distilled water

|  |  |
| --- | --- |
| Test 1 | Expected observations |
| (1mk) | (1mk) |
| Test 2 | Expected observations |
| (1mk) | (1mk) |
| Test 3 | Expected observations |
| (1mk) | (1mk) |

Carry out the tests above

|  |  |
| --- | --- |
| Test 1 |  |
| Observations | Inference |
| 1MK | (1mk) |

|  |  |
| --- | --- |
| Test 2 |  |
| Observations | Inference |
| (1mk) | (1mk) |
| Observations | Inference |
| (½mk) | (½mk) |

**3.** You are provided with solid F. carry out the following tests. Write your inferences and observations in the spaces provided.

a) Place all of solid F in a boiling tube. Add about 20cm of distilled water and shake until all the solid dissolves.

*Label the solution F. Add about half of the solid hydrogen carbonate provided to 2 cm3 of solution*

|  |  |
| --- | --- |
| **Observations** | **Inference** |
| (½mk) | (½ mk) |

b) i). Add about 10 cm3 of dilute hydrochloric acid to the rest of solution F in the boiling tube. Filter the mixture.

Wash the residue with about 2 cm of distilled water. Dry the residue

Between filter paper. Place about one third of the dry residue n metallic spatula and burn t on a Bunsen burner flame.

|  |  |
| --- | --- |
| **Observations** | **Inference** |
| (½mk) | (½mk) |

ii). Place all the remaining residue in to a boiling tube. Add about 10 cm3 of distilled water and shake thoroughly. **Retain the mixture for the test in C**

|  |  |
| --- | --- |
| **Observations** | **Inference** |
| (1mk) | (1mk) |

c) Divide the mixture in to two portions:

i. To the first portion add the rest of the solid sodium hydrogen carbonate.

ii. Describe a test show that the mixture above is unsaturated

|  |  |
| --- | --- |
| **Observations** | **Inference** |
| (1mk) | (1mk) |

Carry out the test above

|  |  |
| --- | --- |
| **test** | **Expected observations** |
| (1mk) | (1mk) |

|  |  |
| --- | --- |
| Test 1 |  |
| Observations | Inference |
| (1mk) | (1mk) |