**Name………………………………………………………. Index No……….….………**

**Candidate’s Signature……………………. Date…………………………….**

**233/3**

**CHEMISTRY**

**PAPER 3**

**(PRACTICAL)**

**2 ¼ HOURS**

**2024 EXAMINATIONS**

***Kenya Certificate of Secondary Education (K.C.S.E.)***

**INSTRUCTIONS TO CANDIDATES**

1. *Write your name and Index number in the spaces provided.*
2. *Sign and write the date of examination in the spaces provided.*
3. *Answer* ***all*** *the questions in the spaces provided in the question paper.*
4. *You are not allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read through the question paper and make sure you have all the chemicals and apparatus that you may need.*
5. *This paper consists of* ***8*** *printed pages*
6. *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*
7. *Candidates should answer the questions in* ***English****.*

**FOR EXAMINER’S USE**

|  |  |  |
| --- | --- | --- |
| Question | Maximum score | Candidate’s Score |
| 1 | 13 |  |
| 2 | 11 |  |
| 3 | 16 |  |
| TOTAL SCORE | 40 |  |

**QUESTION 1.**

You are provided with;

* Acid Z labelled as **Solution Z.**
* 2.0 M sodium hydroxide solution labelled as **Solution R.**

You are required to determine;

* Reaction ratio between sodium hydroxide and acid Z.

**PROCEDURE I**

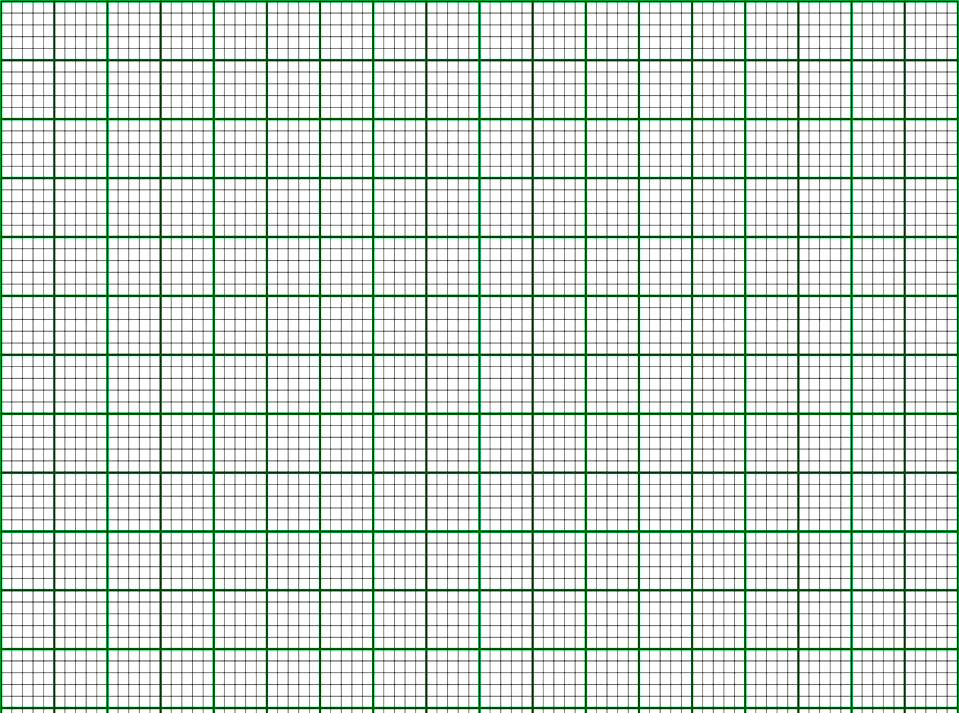
Fill a clean burrete with solution Z. Place 5cm3 of solution Z into a 100ml plastic beaker. Measure the initial temperature of solution Z in the beaker and record in table 1. Using a 50ml measuring cylinder, measure 25cm3 of solution R and add it to solution Z in the beaker and immediately stir the mixture with a thermometer. Record the maximum temperature reached in table 1. Discard the mixture in the plastic beaker.

Repeat the experiment with other sets of volumes of solution Z and R as shown in table 1 and complete table 2 below. (5marks)

**Table 1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Volume of solution Z (cm3) | 5 | 9 | 13 | 17 | 21 | 25 |
| Volume of solution R (cm3 | 25 | 21 | 17 | 13 | 9 | 5 |
| Maximum Temperature (0C) |  |  |  |  |  |  |
| Initial Temperature (0C) |  |  |  |  |  |  |
| Change in temperature (∆T) |  |  |  |  |  |  |

**(a)**On the grid provided, plot a graph of change in temperature (vertical axis) against volume of solution Z (3marks).



**(b)**From the graph determine the volume of solution Z which gave the maximum change in temperature (1mark)

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**(c)**Determine the volume of solution R that reacted with the volume of solution Z.(1mark)

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

**(d)**Calculate;

(i)The ratio between volume of solution Z and R that neutralized one another. (1mark)

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**(ii)**The concentration in moles per litre of the acid in solution Z. (Assume that the volume ratio is the same as the mole ratio) (2marks)

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**QUESTION 2**

You are provided with:

- Acid , solution Z.

- Solid V ( magnesium ribbon).

You are required to determine:-

(i) The rate of reaction between acid, solution Z and magnesium, solid V.

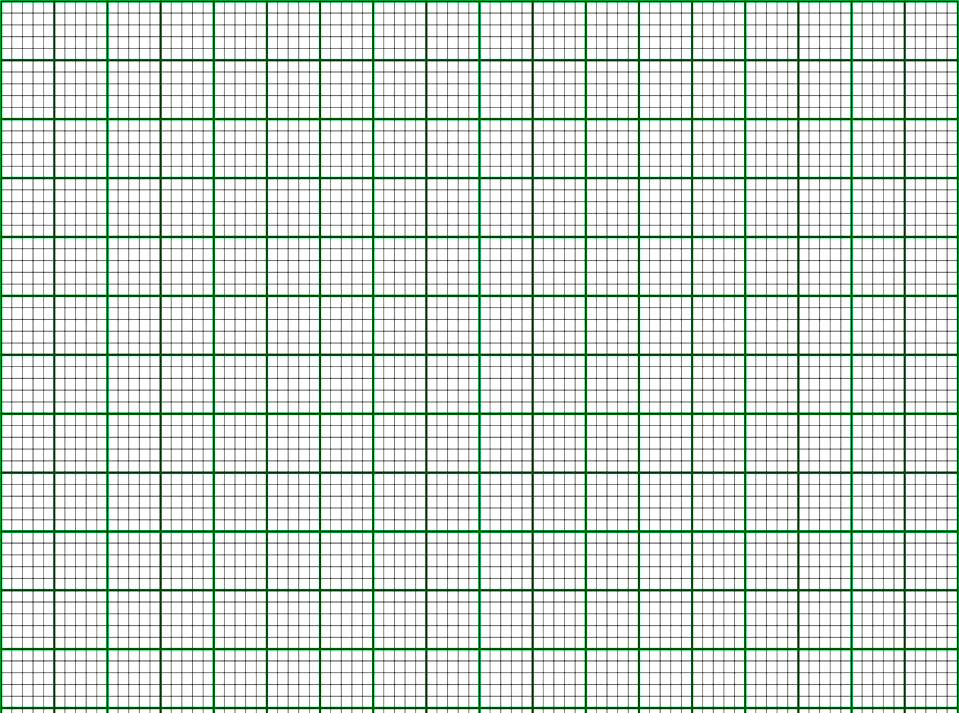
**PROCEDURE II**

Using a burette, measure 12cm³ of acid, solution Z and place it in a clean 100ml beaker. Cut a 1cm piece of magnesium ribbon and place it in the 100ml beaker containing the acid, solution Z and immediately start the stop clock/watch; measure and record the time taken for the magnesium ribbon to react completely with the acid, solution Z in the table 2 below. Rinse the beaker. Measure 10 cm³ of acid, solution Z accurately and put it into the beaker. Add 2cm³ of distilled water to make the total volume 12cm³.Place another piece of 1cm length magnesium ribbon in the beaker then swirl and record the time taken for it to completely react. Repeat this procedure by measuring the volumes of the acid and distilled water as in table 2 below.

**TABLE 2 (5mk)**

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | Volume of acid, solution Z (cm³) | Volume of water (cm³) | Time taken for magnesium ribbon to react completely (sec) |
| 1 | 12 | 0 |  |
| 2 | 10 | 2 |  |
| 3 | 8 | 4 |  |
| 4 | 6 | 6 |  |
| 5 | 4 | 8 |  |

1. Plot a graph of volume of acid, solution Z against time taken (3mks)



**(b)** From the graph determine the time taken for the ribbon to react completely if 3cm³ water was used. **(1mks)**

**……………………………………………………………………………..**

c) Explain the shape of the graph (2mk)

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**QUESTION 3**

You are provided with solids M, N and P. Carry out the following tests and write your observations and interferences in the spaces provided.

a) Place all of solid M in the boiling tube. Add about 10 cm3 of distilled water and shake until all the solid dissolves to obtain Solution M.

i). To about 2 cm3 of Solution M in a test tube, add 2M sodium hydroxide solution drop wise until in excess.

|  |  |
| --- | --- |
| OBSERVATION (1mk) | INFERENCES (2mk) |
|  |  |

ii). To about 2 cm3 of Solution M in a test tube, add 2M ammonium hydroxide solution drop wise until in excess.

|  |  |
| --- | --- |
| OBSERVATIONS(1mk) | INFERENCES(1mk) |
|  |  |

iii) To about 2 cm3 of Solution M in the test tube, add 4 drops of 2M sulphuric (VI) acid.

|  |  |
| --- | --- |
| OBSERVATION (1mk) | INFERENCES(1mk) |
|  |  |

iv) To about 2 cm3 of solution M in a test tube, add 2 drops of potassium iodide solution.

|  |  |
| --- | --- |
| OBSERVATION (1mk) | INFERENCES (1mk) |
|  |  |

b). Place solid P into boiling tube. Add about 10cm3 of distilled water and shake well to obtain solution P .Use this solution for the following tests.

i) Place about 2cm3 of solution P in a test tube and determine its pH.

|  |  |  |
| --- | --- | --- |
| METHOD ( 1 ½ mk) | OBSERVATION ( ½ mk) | INFERENCES (1mk) |
|  |  |  |

ii). To about 2cm3 of solution P made in (ii) above, add 3 drops of acidified potassium manganate (vii) solution.

|  |  |
| --- | --- |
| OBSERVATIONS (1mk) | INFERENCES (1mk) |
|  |  |

iii). To the remaining solution P in the boiling tube, add the other half of solid N.

|  |  |
| --- | --- |
| OBSERVATIONS (1mk) | OBSERVATIONS (1mk) |
|  |  |