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

**School ………………………………………………...**

**233/3**

**CHEMISTRY**

**PAPER 3**

(PRACTICAL)

**TIME: 2 ¼ HOURS**

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

**Instructions to Candidates:**

* Write your name and index number in the spaces provided above.
* Answer all the questions in the spaces provided in the question paper.
* 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 the question paper and make sure you have all the chemicals and apparatus that you may need.
* All working MUST be clearly shown where necessary.
* Mathematical tables and electronic calculators may be used.

**For examiner’s use only.**

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| --- | --- | --- |
| **QUESTION** | **MAXIMUM** | **SCORE** |
| **1** | **25** |  |
| **2** | **15** |  |
| **Total score** | **40** |  |

*This paper consists of 8 printed pages.*

#### Candidates should check the question paper to ensure that all pages are printed as indicated

*and no questions are missing*

1. You are provided with:

- Solution Q sulphuric acid

- Magnesium ribbon labelled solid R

- 1.5m sodium hydroxide – solution S

- Phenopthalein indicator

You are required to:

1. determine the rate of reaction between magnesium ribbon – solid R and sulphuric acid solution Q
2. Determine the concentration of sulphuric acid in moles per litre.
3. **Procedure I**
4. Using a measuring cylinder, measure 50cm3 of solution Q and transfer it into a clean 100ml beaker.
5. Use a ruler and scapel / knife to cut out five pieces, each of exactly 1cm length of magnesium ribbon.
6. Place one piece of magnesium into the beaker containing solution Q and start a stop clock/watch immediately . Swirl the beaker gently ensuring that the piece is always inside the solution. Record in the table the time taken for the magnesium ribbon to disappear.
7. Repeat procedure III for each of the remaining 4 pieces to the same solution Q and complete table 1 below.

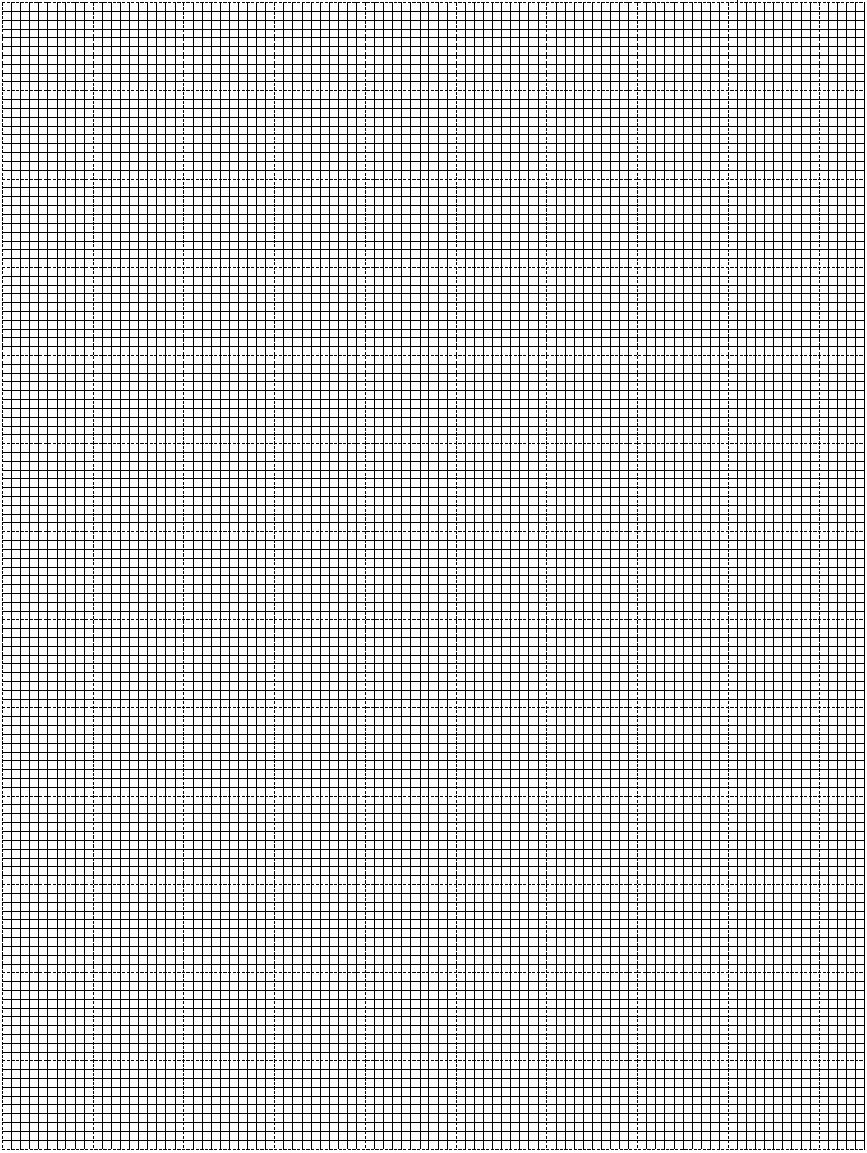
**N/B: Keep solution Q for use in procedure II**

b) Table 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Length of solid R added cm (Magnesium ribbon) | 1 | 2 | 3 | 4 | 5 |
| Time taken in seconds |  |  |  |  |  |
| Rate of reaction = 1/time |  |  |  |  |  |

(6mks)

c) (i) Plot a graph of rate of reaction 1/time ( y-axis) against length of solid R added. (3mks)



(ii) Use the graph to determine the time that would be taken for 3.5cm of solid R to disappear. (2mks)

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(iii) In terms of rate of reaction, explain the shape of your graph. (1mk)

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d) Given that the mass of solid R used was 0.13g and relative atomic mass of magnesium is 24. Calculate the number of moles of solution Q that were used up during the reaction. (2mks)

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e) **Procedure II**

(i) Place all the solution obtained in procedure I in 100ml measuring cylinder. Add distilled water to make 100cm3 of solution in the measuring cylinder. Transfer this solution into a 100ml beaker and stir well. Label this solution T.

(ii) Fill the burette with solution S. Using a pipette and a pipette filler, place 25.ocm3 of solution T into a conical flask. Add 2 – 3 drops of phenolphthalein indicator into solution T and Titrate it with solution S. Record your readings in table 2. Repeat the titration two more times and complete table 2.

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

(4mks)

1. Calculate the :

I. Average volume of solution S used. (1mk)

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II. Number of moles of sodium hydroxide – solution S used. (1mk)

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III. Number of moles of sulphuric acid in 25.0cm3 of solution T. ( 1 ½ mks)

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IV. Number of moles of sulphuric acid in 100cm3 of solution T. (1mk)

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(iv) Using your answer in 1 (d) above, determine the number of moles of sulphuric acid in 50cm3 of solution Q. ( 1 ½ mks)

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(v) Calculate the concentration of the original sulphuric acid-solution Q in moles per litre. (1mk)

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2. You are provided with solid U. Carry out the following tests on it and record your observations and inferences.

a) Using a spatula put about half of solid U provided into a boiling tube. Add 20cm3 of distilled water and shake well.

b) Divide solution formed in (a) into five portions of 2cm3 each in separate test tubes.

(i) To first portion add ammonia solution dropwise till in excess.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1mk) | (1mk) |

(ii) To the second portion add 2cm3 of sodium sulphate solution.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1mk) | (2mks) |

(iii) To the third portion add 2cm3 of lead (II) nitrate solution.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1mk) | (2mk) |

(iv) To the fourth portion add 2cm3 of Barium nitrate solution.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1mk) | (2mk) |

(v) To the fifth portion add blue and red litmus papers.

|  |  |
| --- | --- |
| Observations | Inferences |
| (1mk) | (1mk) |

