Name: ………………………………………………………… Index No. ……………………………………..

Date: …………………………………………………………. Candidate’s Sign. ………….............................

**233/3**

**CHEMISTRY**

Paper 3

(Practical)

**Time: 2 ¼ Hours**

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

**233/3**

**CHEMISTRY**

Paper 3

**Time: 2 ¼ Hours**

**INSTRUCTIONS TO THE CANDIDATES:**

1. Answer **ALL** questions in the spaces provided in this question paper.
2. 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 chemical and apparatus that you may need.
3. All working **MUST**be clearly shown where necessary.
4. Mathematical tables and electrical calculators may be used.

**For Examiners’ Use Only**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **1a** | 11 |  |
| **1b** | 17 |  |
| **2** | 12 |  |
| **Total** | **40** |  |
|  |  |  |

*This paper consists of 5 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.*

1. (a) You are provided with the following:-

(i) 0.5M NaOH, solution **Y**

(ii) Solution of sulphuric (VI) acid **Q**

You are expected to determine the concentration of sulphuric (VI) acid in moles per litre.

***Proceed as follows:***

Pipette 25cm3 of solution **Y** and transfer into the conical flask. Put 1-2 drops of phenolphthalein indicator and titrate with solution **Q** from the burette and complete the table.

**TABLE 1**

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

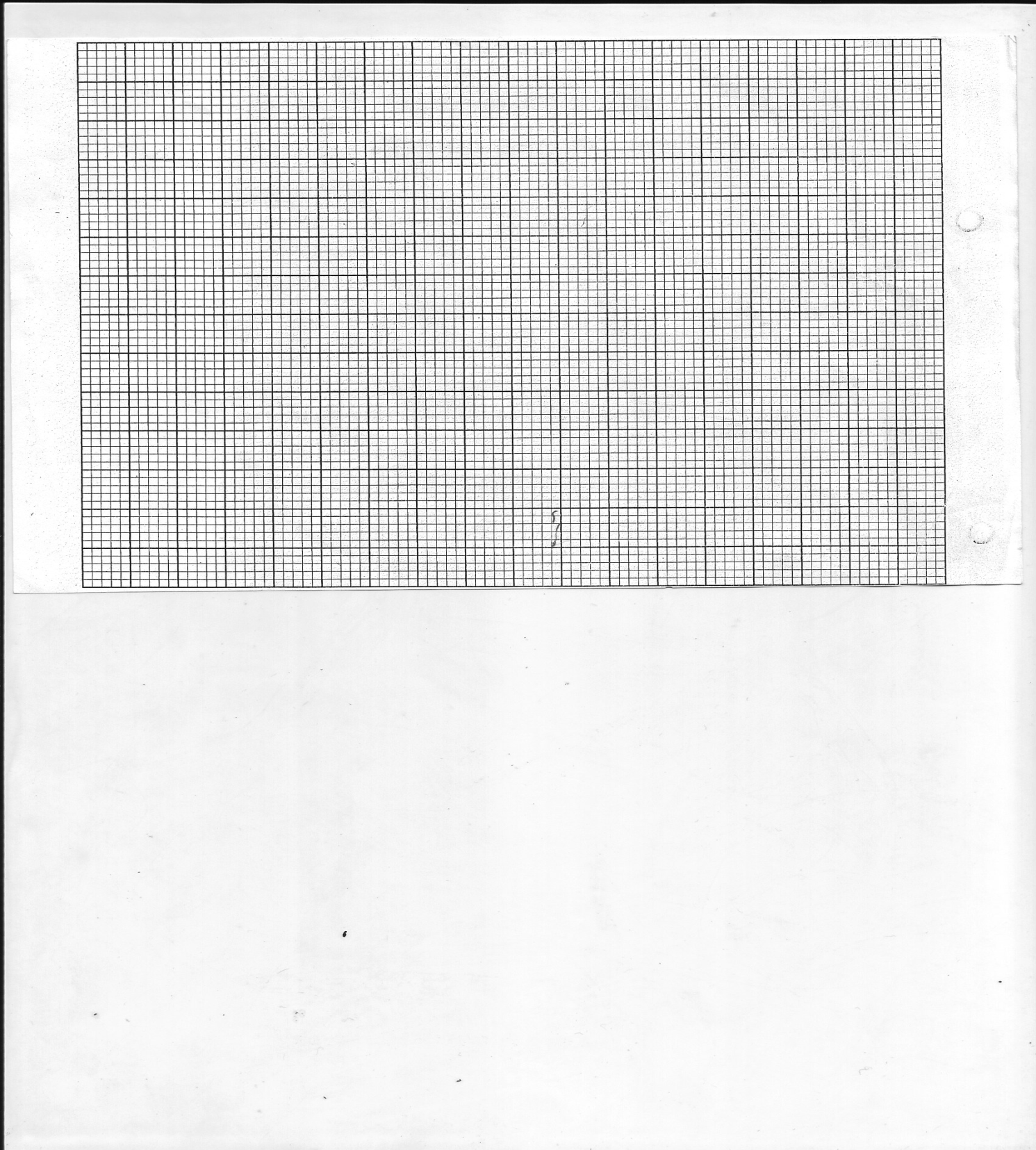
(4mks)

1. Determine the average volume of solution **Q** used. Show your working (1mk)
2. Calculate the number of moles of sodium hydroxide used. (2mks)
3. Calculate the number of moles of sulphuric (VI) acid used (2mks)
4. Hence determine the concentration of sulphuric (VI) acid in moles per litre. (2mks)

(b) In this experiment you are expected to determine the molar heat of neutralization of sulphuric (VI) acid with 2M sodium hydroxide. Measure 20cm3 of sulphuric (VI) acid, solution **W** and transfer into 100ml beaker provided. Measure its temperature and record in the table below under 1st column. Take 5cm3 of solution **N** and add to this solution, stir with the thermometer and record the final steady temperature. Continue to add 5cm3 of **N** to the same solution and record the final steady temperature until 40cm3 of **N** has been added.

**TABLE 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Volume of H2SO4, **W** used (cm3) | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Volume of 2M NaOH(aq) N, added (cm3) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
| Highest temperature reached (oC) |  |  |  |  |  |  |  |  |  |

(i) Plot a graph of highest temperature reached (vertical axis) against volume of 2M NaOH(aq) added (4mks)

(ii) From your graph determine the following:-

1. Change in temperature (∆T) (1mk)
2. Volume of 2M NaOH (aq) needed to neutralize completely 20cm3 of sulphuric (VI) acid. (1mk)
3. Determine the number of moles of sulphuric (VI) acid used given that the solution contains 1 mole per litre of the acid. (2mks)
4. Calculate the amount of heat evolved in the above reaction. (Take specific heat capacity of the solution to be 4.2J/gK and density of the solution to be 1g/cm3) (2mks)
5. Hence determine the molar heat of neutralization of sulphuric (VI) acid (2mks)

2. You are provided with solution **M**. Carry out the tests below. Write your observations and inferences fully.

(a) Take about 2cm3 of solution **M** in a test tube and add 2M NH3 (aq) dropwise till in excess.

Observation Inferences

(1mk) (2mks)

(b) Take about 2cm3 of solution **M** in a test tube and add 2-3 drops of barium nitrate solution.

Observation Inferences

(1mk) (2mks)

(c) To about 2cm3 of **M** add about equal volume of chlorine water.

Observation Inferences

(1mk) (1mk)

(d) To about 2cm3 of solution **M,** add 6-10 drops of bromine water

Observation Inferences

(1mk) (1mk)

(e) To about 2cm3 of solution **M**, add 2-3 drops of lead (II) nitrate

Observation Inferences

(1mk) (1mk)