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

Adm No: ………………………….Date: …………………Candidate’s Signature…………………….

233/3

CHEMISTRY

Paper 3

TIME:2 ¼ HOURS

**ARISE AND SHINE**

**FORM 4 TRIAL 1 EXAMINATION- 2023**

**Kenya Certificate of Secondary Education (KCSE)**

**Instructions:**

* Answer **ALL** questions in the spaces provided.
* 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 will enable you read through the question paper and make sure you have all the chemicals and apparatus required.
* Mathematical tables and electronic calculators may be used
* All working must be clearly shown where necessary.

FOR EXAMINER’S USE ONLY.

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s score** |
| 1 | 20 |  |
| 2 | 12 |  |
| 3 | 8 |  |
| **Total score** | **40** |  |

1. You are provided with:

* Solution A of Potassium manganate (VII).
* 0.05M solution B of oxalic acid.
* Solution C containing 4.9g of ammonium iron (II) Sulphate, (NH4)2 SO4.FeSO4.6H2O, in 250cm3 of water.
* You are required to:

i) Determine the rate of reaction between oxalic acid and Potassium manganate (VII).

ii) Standardize the solution A.

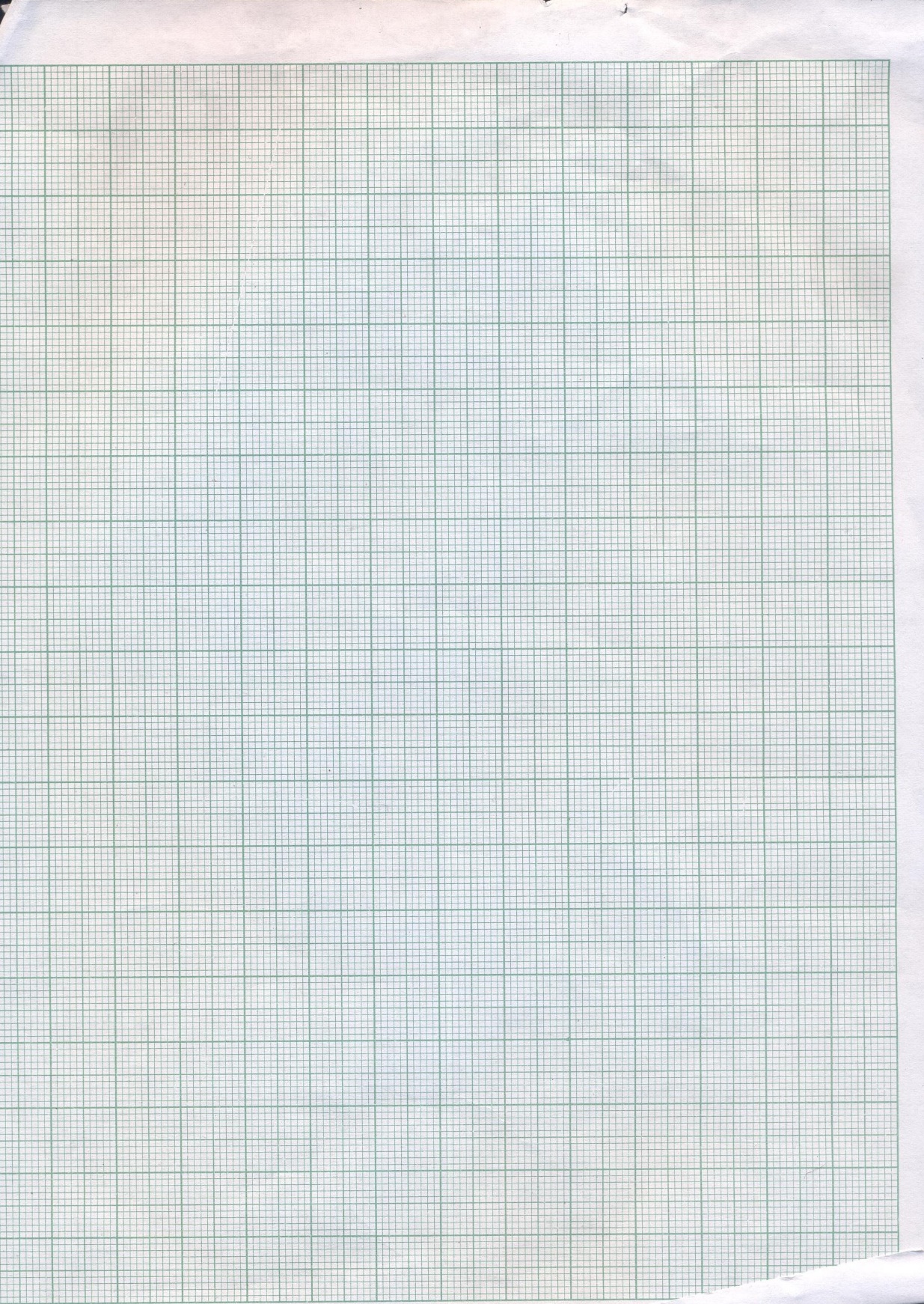
**PROCEDURE I:**

Using a measuring cylinder, place 1 cm3 of solution A into each of the five (5) test-tubes in a rack. Clean the measuring cylinder and use it to place 19cm3 of solution B into a boiling tube. Prepare a water bath by placing about 200cm3 of water into a beaker and start to heat. Place a thermometer into solution B and place it in the warm water until it attains a temperature of 40oC. Remove the boiling tube from the water-bath and place it in the test-tube rack. Add the first portion of solution A immediately and at the same time start a stop watch. Record the time taken of solution A to be decolourised in table I below. Repeat the procedure at temperatures of 50oC,60oC,70oC and 80oC to complete the table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature of solution B (oC) | 40 | 50 | 60 | 70 | 80 |
| Time taken for decolourisation (tsecs) |  |  |  |  |  |
| I/t sec-1 |  |  |  |  |  |

(3 marks)

1. Plot a graph of 1/t against temperature (X-axis) (3 marks)



1. From the graph determine the time taken for the mixture to decolourise at 65oC (2 marks)

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

iii) How does the rate of reaction between oxalic acid and Potassium manganate (VII) vary with

temperature? (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

PROCEDURE II

Fill a burette with solution A. Pipette 25cm3 of solution C into a conical flask and titrate the solution A against solution C until a permanent pink colour just appears. Record your results in table II below and repeat the procedure to fill the table.

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

(4 marks)

1. Determine the average volume of A used ……………………………………….cm3

(Show how you arrive at your answer) (1 mark)

ii). Calculate the concentration of solution C in moles per litre (Fe, = 56, S = 32,

O = 16, N =1 4, H = 1) (2 marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Find the number of moles of solution C used. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

iv) Given the ionic equation for the reaction is

5Fe2+(aq) + MnO4-(aq) + 8H+(aq) 5Fe3+(aq) + Mn2+(aq) + 4H2O(l);

Find the number of moles of solution A used. (1 mark)

(v) Determine the concentration of the Potassium manganate (VII), solution A in moles per litre.

(2 marks)

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

……………………………………………………………………………………………

1. You are provided with solid Q. Carry out the tests below and record your observations and inferences in the table below.
2. Place half a Spatula full of solid Q in a clean dry test-tube and heat gently then

Strongly.

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

ii). Place the remaining solid Q in a boiling tube and add about 5cm3 of distilled water and shake well. Divide the resulting mixture into four portions for the tests below.

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

a). To the first portion add Sodium hydroxide solution dropwise until in excess.

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

b). To the second portion add 2-3 drops of dilute Sulphuric (VI) acid

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

c). To the third portion add aqueous ammonia dropwise until in excess

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

d). To the fourth portion add 2-3 drops acidified barium nitrate solution

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

1. You are provided with solid L. carry out the tests below on L and record the observations and inferences in the spaces provided.
2. Place half of solid L in a boiling tube and add about 5cm3 of distilled water

(i)

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

Divide the solution into two portions and carry out the tests below.

(ii). To the first portion add 2-3 drops of acidified potassium manganate (VII).

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

(iii). To the second portion add Sodium carbonate provided (1 mark)

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

(b). Place the remaining solid L in metallic spatula and ignite it.

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