**Name…………………………………… ………………………… Index No:…………………………………………**

**School ………………………………………………………… Candidate’s Signature …………..……………**

**233/3 Date: ………………………………………**

**CHEMISTRY**

**PAPER 3 (PRACTICAL)**

**TIME: 2 ¼ HOURS**

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

**Chemistry**

**Paper 3**

**Practical**

**Time: 2 ¼ Hours**

**INSTRUCTIONS TO CANDIDATES**

* *Write your* ***name****,* ***index******number****,* ***Sign*** *and* ***date****.*
* *Answer* ***all*** *the* ***Q****uestions 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 is to enable you to read the* ***Q****uestion paper and make sure you have all the chemicals and apparatus you need.*
* *All working* ***must*** *be clearly shown where necessary.*
* *Mathematical tables and electronic calculators may be used.*
* ***This paper consists of 4 printed pages.***
* ***Candidates should check to ascertain that all pages are printed as indicated and that no Questions are missing.***

**For Examiner’s Use Only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum Score** | **Candidate’s Score** |
| **1** | **12** |  |
| **2** | **10** |  |
| **3** | **18** |  |
| **Total** | **40** |  |

1. ***You are provided with***:
* 0.6 g of solid **Q**, oxalic acid, H2C2O4.2H2O
* Solution **L**, acidified potassium magnate (VII) the **same solution will be used in question three**

You are required to determine the concentration of solution L potassium manganate (VII) in moles per litre**.**

**Procedure.**

Transfer all solid **Q** into a 250cm3 conical flask. Dissolve the solid in 100cm3 of distilled water and add more water to make up 250cm3 of solution. Label this solution **Q**

Using pipette filler, pipette 25.0cm3 of solution **Q** into a conical flask. Warm this solution to a temperature of 550C. Place solution L in a burette. Titrate solution **L** with solution **Q** while still hot until **a permanent pink colour just appears**. Record your results in table 1 below. Repeat the experiment two more times to obtain concordant results.

 **Table 1**

a)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **1** | **2** | **3** |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of solution L used (cm3) |  |  |  |

 (4mks)

b) Calculate the average volume of solution **L** used (1mk)

c) Calculate the concentration of solution **q** in moles per litre ( rfm of solid **q** =1126) (2mks)

d) Calculate the number of moles of **q** in 250cm3 of solution (2mks)

e) The reaction between potassium manganate (vii) and oxalic acid is given by the ionic equation below.

 2Mn42− (aq) + 5C2O42−(aq) + 16 H+ (aq)  2Mn2+(aq) + 8H2O(l) + 10CO2(g)

 Calculate:

1. The number of moles of solution **L**, potassium manganate (VII) used. (2mks)
2. The concentration of solution **L**, potassium manganate (VII) in moles per litre (1mk)
3. ***You are provide with:***

Solution **P** containing 0.25M of ions of metal **P**, metal **M** and **G**.

You are required to determine the reactivity series of metals **M**, **G** and **P**

**Procedure:**

Using a clean measuring cylinder, measure out 50cm3 of solution **P** into a 100ml beaker. Measure the temperature **t1** of solution **P** and record in table 2

Add all solid **M** provide at once to 50cm3 of solution **P**, stir carefully with the thermometer, allow the reaction to take place for about 5minutes then record the highest temperature, **t2** in table 2 below

|  |  |  |
| --- | --- | --- |
|  **Table 2** | **Solution P + solid M** | **Solution P + solid G** |
| Highest temperature of mixture **t20C** |  |  |
| Initial temperature of solution **P**, **t10C** |  |  |
| Change in temperature **∆T0C** |  |  |

a)

 (3mks)

b) Calculate the number of moles of ions of metal P in 50cm3 of solution **P** (2mks)

c) Calculate the heat change for the reaction per mole of metal **P** ions when solution **P** is reacted. (*Assume the density of solution is 1.0g /cm3 and specific heat capacity is 4.2Jg−1K−1*)

 I. Metal M (2mks)

 II. Metal G (2mks)

d) Arrange the three metals in order of their reactivity starting with the most reactive (1mk)

1. You are provided with solid **R**, carry out the tests below. Write your observations and inferences in the spaces provided.
2. Place all solid R provided into a clean boiling tube, then add about 5cm3 of distilled water, shake the contents thoroughly then filter. Retain both filtrate and residue.

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

1. Divide the filtrate into four equal portions, to the first portion add ammonia solution until in excess

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

1. To the second portion, add about 2cm3 of barium chloride solution.

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

1. To the third portion, add 2 to 3 drops of lead(II)nitrate solution provided followed by about 2cm3 of 2M nitric acid then shake mixture

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

1. To the fourth portion, add 3drops of acidified potassium manganate (VII), solution **L**

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

1. (i) transfer all the residue into a clean boiling tube then add about 2cm3 of 2M nitric acid then add

 about 5cm3 when all the solid has dissolved.

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

(ii) Divide resultant product obtained in (f)(i) above into three equal portions, to the first portion add

 sodium hydroxide solution dropwise until in excess

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

(iii) to the second portion add ammonia solution dropwise until in excess

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |

(iv) to the third portion, add a few drops of potassium iodide solution

|  |  |
| --- | --- |
| **observation** | **Inference** |
|  1mk | 1mk |