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

**Class: ……………………… Adm no:………………………… Date…………………………………**

**233/3** **CHEMISTRY PRACTICAL**

**PAPER 3**

**November, 2020**

**TIME: 2 ¼ HOURS**

**MOKASA I JOINT EXAMINATIONS 2020**

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

**Chemistry 233/3**

**2 ¼ Hours**

**INSTRUCTIONS TO CANDIDATES**

* Write your **name** and **index** **number** in the spaces provided.
* **Sign** and write the **date** of examination in the spaces provided.
* Answer ***all*** the questions in the spaces provided in the question paper in **English**.
* 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 you need.
* All working **must** be clearly shown where necessary.
* Mathematical tables and silent electronic calculators may be used

**For examiners use only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum Score** | **Candidate’s Score** |
|  **1** | **22** |  |
|  **2** | **10** |  |
|  **3** | **08** |  |
| **TOTAL**  | **40** |  |

**Question 1**

You are provided with the following reagents:

* **Solution K**- Copper (II) sulphate solution
* **Solid L**- Iron powder
* **Solution M**- Acidified Potassium Manganate (VII) solution, containing **0.8g** of Potassium Manganate (VII) in 250cm3 of the solution.

You are required to determine the ***molar heat of displacement*** of copper in a solution of its ions by iron metal.

**Procedure I**

* Place 50cm3 of **Solution K** in a 100cm3 plastic beaker using a burette.
* Measurethe constant temperature of the solution and record it in the **Table 1** below.
* Add all of the **Solid L** provided at once and start a stop watch immediately.
* Using a thermometer, Stir the mixture **thoroughly and continuously** and record the temperature of the mixture after every **one minute** in the table 1.
* **Retain** the resultant mixture for use in the next **Procedure II**.

 **Table 1**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (Min) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Temperature(0C) |  |  |  |  |  |  |  |  |  |  |  |

 **(3 marks)**

1. Plot a graph of temperature (vertical axis) against time on the grid provided below. **(3 marks)**



(ii) From the graph you have drawn, determine the;

1. highest change in temperature, ∆T **(1 mark)**
2. time taken for the reaction to completely occur **(1 mark)**

(iii) Calculate the heat change for the reaction. (Take density of the solution to be 1g/cm3 and specific heat capacity of the solution to be 4200kJ/Kg/K) **(2 marks)**

**Procedure II**

* Swirl the mixture obtained in procedure I above and filter into a 250mL volumetric flask.
* Thoroughly rinse the beaker with 20cm3 of distilled water and ensure all the mixture has been transferred onto the filter paper.
* Add 50cm3 of 2M Sulphuric (VI) acid to the filtrate mixture in the volumetric flask.
* Add more distilled water to the solution in the volumetric flask to the mark. Mix the contents thoroughly and label this solution as **Solution N**.
* Fill the burette with **Solution M.**
* Place 25 cm3 of **Solution N** into a 250 cm3 conical flask using a pipette and a pipette filler.
* Titrate **Solution N** against **Solution M** until the **first permanent pink** colour is seen.
* Record your results in **Table 2** below.
* Repeat the titration **twice** and complete **Table 2**.

**Table 2**

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

 **(3 marks)**

1. What is the average volume of **Solution M** used? **(1 mark)**
2. Calculate the molarity of **Solution M,** KMnO4 **(1 mark)**

**(K=39, Mn=55, O=16)**

1. Calculate the number of moles of:
2. Potassium manganate (VII) used, **solution M**  **(1 mark)**
3. Iron (II) ions in 25cm3 of **solution N**  **(1 mark)**

The equation for the reaction is:

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

1. Iron (II) ions in the 250cm3 of **solution N** **(1 mark)**
2. Determine the molar heat of displacement of copper from a solution of its ions by iron metal **(2 marks)**
3. Draw an energy level diagram for the reaction **(2 marks)**

**Question 2**

1. You have been provided with solutions X, Y and Z. Carry out the flame tests for each and indicate the colour of the flames and inferences below.

|  |  |  |
| --- | --- | --- |
| Ions | Flame colour | Inference |
| X |  |  |
| Y |  |  |
| Z |  |  |

**(3 marks)**

1. You are provided with **Solid Q**. Carry out the tests below and Write your observations and inferences in the spaces provided.

 i) Place all **Solid Q** in a clean test tube. Add about 8cm3 of distilled water and shake.Divide the solution into 3 portions

|  |  |
| --- | --- |
| Observation | Inference |
| **(1/2 mark)**  | **(1/2 mark)** |

 ii) To the first portion add a few drops of Lead (II) nitrate solution and warm

|  |  |
| --- | --- |
|  Observation | Inference |
|  **(1 mark)** | 1. **mark)**
 |

(iii) To the first portion add a few drops of Barium nitrate solution followed by few drops of dilute hydrochloric acid

|  |  |
| --- | --- |
| Observation | Inference |
| **(1 mark)** | **(1 mark)** |

iv) To the third portion add a few drops of acidified potassium dichromate (VI) then warm gently

|  |  |
| --- | --- |
| Observation | Inference |
| **(1 mark)** | **(1 mark)** |

3. You have been provided with **Liquid E**.

i) Place about 2cm3 of the **Liquid E** in a clean test tube. Add an equal amount of distilled water and shake the mixture. Allow to settle.

|  |  |
| --- | --- |
| Observation | Inference |
| **(1 mark)** | **(1 mark)** |

ii) Place about 2cm3 of the **Liquid E** in a clean test tube. Add a half spatulaful of sodium hydrogen carbonate.

|  |  |
| --- | --- |
| Observation | Inference |
| **(1 mark)** | **(1 mark)** |

iii) To about 2cm3 the **Liquid E** add 3 drops of acidified potassium dichromate (VI) solution and warm gently

|  |  |
| --- | --- |
| Observation | Inference |
| **(1 mark)** | **(1 mark)** |

iv) Take a few drops of **Liquid E** on a **clean and dry** metallic spatula and ignite over a non-luminous Bunsen flame

|  |  |
| --- | --- |
| Observation | Inference |
| **(1 mark)** | **(1 mark)** |