**MID TERM 1-SERIES-2023**

**CHEMISTRY PAPER 3 (233/3)**

**PRACTICAL**

**FORM FOUR (4)**

**TIME: 2 1/2 HOURS**

**Name …………………………………………….……… Adm. Number…………………………..**

**Candidate’s Signature ………………….…...……….. Date……………………………………**

**INSTRUCTIONS TO CANDIDATES**

(a) Write your name and Index number in the spaces provided in the question paper.

(b) Sign and write the date of examination in the spaces provided above.

(c) Answer ALL questions in the spaces provided on the question paper

(d) 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 apparatus and chemicals that you may need.

(e) All working MUST be clearly shown where necessary

(f) Mathematical tables and silent non-programmed electronic calculators may be used.

**FOR EXAMINERS USE ONLY.**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATES SCORE** |
| **1** | **22** |  |
| **2** | **11** |  |
| **3** | **07** |  |
| **Total Score** | **40** |  |

*This paper consists of 8 printed pages.*

*Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.*

1. You are provided with:

i) Solution A which is 2.0M hydrochloric Acid (HCl)

ii) Solution B, which is 0.1 M sodium thiosulphate (Na2S2O3)

iii) Solution C which is alkali of 0.1 M concentration

You are required to:

i) Find the effect of change of temperature on the rate of reaction between sodium thiosulphate, solution B, and hydrochloric Acid, solution A.

ii) Prepare a dilute solution of hydrochloric acid, solution A

iii) Write an ionic equation for the reaction between hydrochloric acid, solution A, and the alkali solution C.

**Procedure I**

Using a measuring cylinder measure 10 cm3 of solution B into a clean 100cm3 glass beaker. Place it together with its contents on a white piece of paper marked with a **cross (X**) on it with bold blue print. Measure the temperature of the solution and record it as shown in the table below.

Using a clean measuring cylinder, measure 5cm3 of solution A. add it to the contents of the beaker containing solution B and immediately start the stop watch. Record the time it will take for the cross (X) to become invisible when viewed above the reaction mixture in the beaker.

Wash the glass beaker used and repeat the experiment at the temperature indicated in the table below by warming sodium thiosulphate solution B to the stated temperature before adding hydrochloric Acid, solution A.

Table I

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Experiment number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Volume of hydrochloric Acid, solution A  (1 cm3) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Volume of sodium thiosulphate solution B(cm3) | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Temperature (0C) of sodium thiosulphate, solution B | Room temp. | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| Time in seconds |  |  |  |  |  |  |  |  |
| Reciprocal of time per seconds, S-1 |  |  |  |  |  |  |  |  |

**(6 marks)**

1. On the grid provided, plot a graph of reciprocal of time  against temperature **(3 marks)**

b) Comment on the effect of change in temperature on the rate of reaction between sodium

thiosulphate, solution B and hydrochloric acid, solution A. (1mark)

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

c) Use your graph to determine:

i) The time taken by the reaction when the temperature is 580C. (1mark)

ii) The temperature at which the rate of the reaction is 0.045 sec-1. (1mark)

**Procedure II**

Using a clean measuring cylinder, place **12.5 cm3** of solution A in a 250ml volumetric flask. Add 200 cm3 of distilled water and shake. Add distilled water upto the mark. **Label this solution D**. Fill a burette with solution D. Using a pipette and pipette filler, place 25.0 cm3 of solution C into a 250 ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution D until the pink colour disappears.

Record your results in table II. Repeat the titration two more times and complete the table.

**Table II**

|  |  |  |
| --- | --- | --- |
| I | II | III |
| Final Burette Reading(cm3) |  |  |  |
| Initial Burette Reading(cm3) |  |  |  |
| Volume of solution D (cm3) |  |  |  |

(5 marks)

d) Calculate:

1. The average volume of solution D used. (1 mark)
2. Moles of hydrochloric Acid, solution D used. (1 mark)
3. Moles of Alkali solution C used. (1mark)
4. Determine the reacting mole ratio between the hydrochloric acid, solution D, and the alkali, solution C. (1 mark)

1. Write ionic equation for the reaction between hydrochloric acid, solution A and

alkali, solution C. (1mark)

1. Place all **solid R** provided into a clean boiling tube then add about **10cm3** of distilled water. Shake

the contents thoroughly then filter. Retain both the filtrate and residue. Divide the filtrate into four

equal portions.

(a) To the first portion, add sodium hydroxide solution dropwise until in excess.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (½ mark) | (½ mark) |

(b) To the second portion, add about 2cm3 of Barium Chloride Solution.

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

(c) To the third portion, add 3 drops of lead (ii) nitrate solution provided followed by about 2cm3 of

2M nitric (V) acid and shake the mixture.

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

(d) To the fourth portion, add 3 drops of acidified potassium manganate (VII).

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

(e) Transfer all the residue into a clean boiling tube, then add about 2cm3 of 2M nitric acid and

add about 3cm3 of distilled water when all the solid has dissolved. Divide the resulting

product into three equal portions.

(i) To the 1st portion add sodium hydroxide solution drop wise until in excess.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (½mark) | (½mark) |

(ii) To the second portion, add ammonia solution drop wise until in excess.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (½mark) | (½mark) |

(iii) To the third portion, add a few drops of potassium iodide solution.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| ( ½mark) | (½mark) |

1. You are provided with solid V. You are required to carry out the tests indicated below.

Place a spatulaful of solid V in a boiling tube. Add about 6 cm3 of distilled water and shake well. Divide the mixture into four equal portions in test tubes.

1. To the first portion, add two drops of potassium manganate (VII) solution.

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

1. To the second portion, add three drops of bromine water.

|  |  |
| --- | --- |
| **Observations** | **Inferences** |
| (l mark) | (l mark) |

(c) To the third portion, add all the sodium carbonate.

|  |  |
| --- | --- |
| **Observations** | **Inferences** |
| (l mark) | (l mark) |

(d) Test the pH of the solution using universal indicator solution provided.

|  |  |
| --- | --- |
| **Observations** | **Inferences** |
| (½mark) | (½mark) |

**END**