**MURANG’A EXTRA COUNTY SCHOOLS**

**CHEMISTRY FORM 4 END OF TERM 2 – 2022 EXAMINATION**

**NAME: ………………………………………….…CLASS……………… ADMNO .…………..**

**233/3**

**CHEMISTRY**

**PAPER 3**

**TIME: 2¼ HOURS**

***Kenya Certificate of Secondary Education***

**INSTRUCTIONS TO CANDIDATES**

1. Write your name and admission number in the spaces provided above.
2. Answer all the questions in the spaces provided.
3. Mathematical tables and silent non-programmable electronic calculator many be used.
4. All working must be clearly shown where necessary.

**FOR EXAMINER’SUSE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| 1 | 21 |  |
| 2 | 11 |  |
| 3 | 8 |  |
| **TOTAL SCORE** | **40** |  |

***This paper consists of 6 printed page*** *Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.*

You are provided with:

* Solid F
* 2.0 M hydrochloric acid solution G
* 0.1 M sodium hydroxide

You are required to determine the;

1. Enthalpy change ΔH, for the reaction between solid F and one mole of hydrochloric acid

**Procedure:**

1. Using a burette place 20.0cm3 of 2.0M hydrochloric acid, solution G in a 100ml beaker. Measure the initial temperature of the solution after every ½ minute and record the values in table 1 below. At exactly 2 minutes, add all of solid F to the acid. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every half-minute and complete the table. **(Retain the mixture for use in procedure II)**

**Table 1** (5 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) | 0 | ½ | 1 | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 |
| Temperature (oC) |  |  |  |  |  |  |  |  |  |  |  |

1. Plot a graph of temperature (y-axis) against time. (3 marks)
2. From the graph determine the change in temperature ΔT (1mark)
3. Calculate the heat change for the reaction (Assume the specific heat capacity of the mixture is 4.2 J g-1 K-1 and the density of the mixture is 1g/cm3) (1mark)

**Procedure II**

Rinse the burette thoroughly and fill it with sodium hydroxide. Transfer all the contents of the 100ml beaker from procedure I above into a 250ml volumetric flask, add distilled water to make up to the mark. Label this solution H. using a pipette and a pipette filler, place 25cm3 of solution H into a 250ml conical flask. Add two to three drops of phenolphthalein indicator and titrate against sodium hydroxide. Record your results in table 2. Repeat the titration two more times and complete the table.

Table 2 (4 marks)

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

Calculate the;

I. Average volume of sodium hydroxide used (1mark)

II. Number of moles of:

i) Sodium hydroxide used (1 mark)

ii) Hydrochloric acid in 25cm3 of solution H (1 mark)

iii) Hydrochloric acid in 250cm3 of solution H (1 mark)

iv) Hydrochloric acid in 20cm3 of solution G (1 mark)

v) Hydrochloric acid reacted with solid F (1 mark)

c. Calculate the enthalpy of reaction between solid F and one mole of hydrochloric acid.

(Show the sign of ΔH) (1 mark)

**2.** You are provided withsolid A. Carry out the tests described below and write your observations and inferences accordingly.

* + 1. Dissolve solid A in about 10cm3 of distilled water in a boiling tube divide the resulting solution into five portions.

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

* + 1. To the first portion and 5 drops of 2M sodium hydroxide solution

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

* + 1. To the second portion dip a glass rod to one of the remaining portions and heat it in a non-luminous flame.

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

* + 1. To the third portion add 2 or 3 drops of lead (II) nitrate solution

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

* + 1. To the forth portion add 2 or 3 drops of barium (II) chloride followed by 2cm3 of 2M hydrochloric acid. Shake the mixture well.

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

* + 1. To the fifth portion add 3 drops of acidified potassium manganate (VII) solution

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

3. You are provided with substance B.

Carry out the tests described below and record your observations and inferences accordingly.

Procedure

1. Place a little amount of substance B in a metallic spatula and ignite it in a blue bunsen burner flame.

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

1. Place a spatulaful of substance B in a boiling tube. Add about 20cm3 of distilled water and shake well. Divide the solution into three portions. Test the pH of one portion of the solution above using a full range pH chart.

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

1. Add the sodium carbonate provided to the second portion.

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

1. Add a few drops of potassium manganate (VII) solution to the third portion and warm mixture.

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

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