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

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**CHEMISTRY**

**PRACTICALS**

Paper 3

**Time: 2 ¼ Hours**

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

## INSTRUCTIONS TO CANDIDATES

* Answer **all** the 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 in this paper. This is to enable you read the question paper and make sure you have all the chemicals and apparatus you may need.
* Mathematical tables and Electronic calculators may be used.
* All working **must** be clearly shown where necessary

*For Examiner’s Use only*

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum Score** | **Candidates Score** |
| **1** | **21** |  |
| **2** | **12** |  |
| **3** | **7** |  |
| **Total** | **40** |  |

*This paper consists of 5 printed pages.*

*Candidates should check the question paper to ensure that all pages are printed as indicated*

*and no questions are missing*

1.You are provided with the following:

i) **2.1g** of solid sodium carbonate, solid **W**

ii) Hydrochloric acid, solution **Y**

iii) **0.2M** sodium hydroxide, solution **V**

You are required to :

 -Determine the molar heat of reaction of sodium carbonate

 -Determine the concentration of hydrochloric acid ,solution Y in moles per litre

This question has two parts:

**PART I**

Measure 60 cm3 of solution Y, hydrochloric acid and transfer into a plastic beaker and measure its
temperature, **T1**=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_°C ( 1 mark)

Take all the 2.1g of sodium carbonate and transfer into the solution in the beaker.
Stir with the thermometer and record final temperature reached, **T2**=\_\_\_\_\_\_\_\_\_\_°C ( 1 mark)
Keep the mixture for part II and label it **X.**

Calculations

a) Determine the rise in temperature ΔT \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

b) Determine the amount of heat absorbed by the solution(density of the solution = lg/cm3, specific
heat capacity of the solution = 4.2 J/g/°C) (2 marks)

c) If the acid was in excess, determine the number of moles of sodium carbonate used (Na =23, O = 16,
H=l)(1 marks)

d) Calculate the number of moles of hydrochloric acid which reacted. (1 marks)

e) Determine the molar heat of reaction of sodium carbonate. (2 marks)

**PART II**

To the mixture in PART I add 20 cm3 of distilled water and mix well. Transfer the solution into the burette. Pipette 25 cm3 of NaOH into the conical flask and titrate with solution X using phenolphthalein indicator. Repeat the experiment and complete the table below.

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

 (4 marks)

i) Determine the average volume of X used (1 mark)

ii) Calculate the number of moles of NaOH in 25cm3. (1 mark)

iii) Determine the number of moles of hydrochloric acid that reacted with moles in 25cm3 of sodium hydroxide. (2 marks)

iv) Determine the number of moles of hydrochloric acid in 80 cm3 of X (1 mark)

v) What is the total number of moles of hydrochloric acid in the original 60 cm3 of HC1? (1 mark)

iv) Hence determine the concentration of hydrochloric acid, solution Y in moles per litre. (2 marks)

2. You are provided with solid N. Carry out the tests below, write your observations and inferences in the spaces provided.

a) Take a spatula end full of N in a test tube and add distilled water until half filled. Shake well and keep the mixture.

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

b) To about 2 cm3 of the mixture add 2M NaOH dropwise until excess

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1mk) | (2mks) |

 c) To about 2 cm3 of the mixture add 2M NH3 dropwise until excess

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

d) To the about 2 cm3 add 3 drops of 2M HC1 solution.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1mk) | (2mks) |

(e) To the about 2 cm3 add 3 drops of 2M HC1 solution followed 2cm3barium chloride

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

3. You are provided with solution K. Carry out the tests below and record your observations and

inferences.

a) To about 2 cm3 of solution K, add 2 drops of acidified potassium manganate (VII)

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1mk) | (2mks) |

b) To about 2 cm3 of solution K, add 2 drops of 2M Pb(NO3)2

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

c) To the remaining solution K, add 2 drops of phenolphthalein indicator.

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