**NAME: ………………………………………………………………… INDEX NO: ………………………**

**SCHOOL ………………………………………………………………… DATE: ……………………….……**

**CANDIDATE’S SIGN……….…………………………………………**

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[**SERIES 27 EXAMS**](https://teacher.co.ke/notes/)

**233/3**

**CHEMISTRY**

**PAPER 3**

**PRACTICAL**

**TIME: 2 ¼ HOURS**

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

**Chemistry**

**Paper 3**

**Practical**

**INSTRUCTIONS TO THE CANDIDATES**

* *Write**your* ***name school*** *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****.***
* *You are not allowed to start working with apparatus for the first 15minutes of the 2 ¼ hrs allowed for this paper. This time is enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need*
* *Mathematical tables and electronic calculators may be used.*
* *All working* ***MUST*** *be clearly shown where necessary.*
* *Mathematical tables and electronic calculator may be used.*

**FOR EXAMINERS USE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAX. SCORE** | **CANDIDATE’S SCORE** |
| 1 | 26 |  |
| 2 | 14 |  |
| **TOTAL SCORE** | **40** |  |

*This paper consists of 5 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.*

(1) ***You are provided with***

- 2.0g of sodium carbonate solid **H**

- 2M HCl solution **C**

- 0.1M sodium hydroxide solution **D**

***You are required to determine:***

(i) Number of moles of sodium carbonate solid **H**.

(ii) The molar heat of reaction between sodium carbonate and hydrochloric acid.

**Procedure I**

Using burette place 30cm3 of 2M HCl solution **C** into a 100cm3 beaker. Stir gently with a thermometer and take the temperature of the acid after every half a minute for 1 ½ minutes. Record your readings in table I. At exactly 2 minutes add all of solid **H** to the acid, stir gently and continue taking the temperature every ½ minute up to the 4th minute. Record your readings in table I.

**NB: PRESERVE THE SOLUTION FOR THE NEXT PROCEDURE**

1. **table I**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time in Min | 0 | ½ | 1 | 1 ½ | 2 | 2 ½ | 3 | 3 ½ | 4 |
| Temperature (0C) |  |  |  |  |  |  |  |  |  |

(3mks)

(ii) On the grid provided plot a graph of temperature (y – axis) against time (3mks)

(iii) From the graph, determine the change in temperature (DT) and show it on the graph. (2mks)

**Procedure II**

Transfer **all** the solution obtained in procedure I into 250ml volumetric flask. Rinse both the beaker and thermometer with distilled water and add to volumetric flask. Add more distilled water to make up to the mark. Label this as solution **A**. Empty the burette and rinse with distilled water and fill it with solution **A**.

Pipette 25cm3 of solution **D** into 250ml conical flask. Add 2-3 drops of phenolphthalein indicator and titrate with solution **A**. Record the results in table II. Repeat the titration two more times and complete the table II below.

b (i) **table II**

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

(4mks)

ii) Calculate the average volume of solution **A** used (1mk)

(iii) Calculate the number of moles of solution **D** (sodium hydroxide) in 25cm3 of solution (2mks)

(iv) Calculate the number of moles of solution **A** used. (2mks)

(c) Calculate the number of moles of HCl in

(i) 250cm3 of solution **A**  (2mks)

(ii) 30cm3 of solution **C** (2mks)

(d) Calculate:

(i) The number of moles of HCl used in the reaction with NaOH, solution **B**  (2mks)

(ii) Moles of Na2CO3 in solid **H**  (2mks)

(e) Calculate the molar heat of reaction between Na2CO3 and HCl in kJ / mole. (3mks)

(*Assume the specific* heat *capacity of solution = 4.2J g -1 k -1 and density of solution is 1.0g/cm3*)

2. You are provided with a solid **Q.** Carry out the tests below. Record your observations and inferences in the spaces provided.

(i) Place the whole of solid **Q** in a boiling tube.

Add about 10cm3 of distilled water. Divide the resulting solution in to six portions.

(ii) To the 1st portion add few drops of sodium hydroxide until in excess.

|  |  |
| --- | --- |
| **OBSERVATIONS** | **INFERENCE** |
| (1mk) | (1mk) |

(iii) To the second portion, add three drops of potassium iodide solution.

|  |  |
| --- | --- |
| **OBSERVATIONS** | **INFERENCE** |
| ( 1mk) | ( 1mk) |

(iv) To the 3rd portion, add few drops of ammonia solution until in excess.

|  |  |
| --- | --- |
| **OBSERVATIONS** | **INFERENCE** |
| ( 1mk) | (1mk) |

(v) To the fourth portion, add few drops of universal indicator and determine the pH of solution.

|  |  |
| --- | --- |
| **OBSERVATIONS** | **INFERENCE** |
| (1mk) | (1mk) |

(vi) To the 5th portion, add three drops of Barium chloride solution.

|  |  |
| --- | --- |
| **OBSERVATIONS** | **INFERENCE** |
| (1mk) | (1mk) |

(vii) To the 6th portion, add two drops of Lead (II) Nitrate solution.

|  |  |
| --- | --- |
| **OBSERVATIONS** | **INFERENCE** |
| (1mk) | (1mk) |