**Name: …………….…………………………………….………….. Adm No:…………………...**

**Candidate’s signature: …….………**

**Date: ………..……………………….**

**JOINT EVALUATION EXAMINATION**

**233/3**

**Chemistry**

**Paper 3**

**Time: 2Hours**

**Instructions**

1. Write your name, admission number and sign in the spaces provided above
2. Answer all questions in the spaces provided
3. Non-programmable silent electronic calculators and KNEC mathematics tables may be used.
4. All questions should be answered in English

**For Examiners only**

|  |  |  |
| --- | --- | --- |
| **QUESTION 1** | 14 |  |
| **QUESTION 2** | 6 |  |
| **TOTAL** | 20 |  |

1**. You are provided with:**

* 5 g of impure anhydrous sodium carbonate labelled as solid X
* 2M hydrochloric acid labelled as solution Y
* 0.4M sodium hydroxide solution as solution Z

You are required to determine the percentage purity of solid X.

**Procedure**

1. Using a measuring cylinder place 80cm3 of solution Y in a beaker.
2. Add all solid X and stir the solution using a stirring rod until effervescence stops.
3. Transfer this solution into a 250 cm3 volumetric flask and add distilled water to the mark. Label this as solution T.
4. Place solution T in a clean burette.
5. Using a pipette filler, put 25 cm3 of solution Z in a conical flask.
6. Add 2 drops of methyl-orange and titrate using solution T.
7. Repeat the titration two more times and complete the table below.

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

( 4mks)

a) Calculate the:

1. Average volume of solution T used (1 mark)
2. The number of moles of solution Z used in titration (2 mark)
3. Concentration of solution T in moles per liter. (2 marks)
4. Calculate the mass of sodium carbonate that reacted with solution Y. (Na= 23, C= 12, O= 16) (3marks)
5. Work out the percentage purity of solid X. (1 mark)

b) Write the ionic equation between solid X and solution Y. (1 mark)

2. **You are provided with solid L. Carry out the test below and record your observations and inferences in the spaces provided.**

a) Describe solid. (2 marks)

b) Place half spatula of L in a non-luminous flame of a Bunsen burner.

|  |  |
| --- | --- |
| Observations | Inference |
| (1/2 mark) | (1/2 mark) |

c) Dissolve the remaining solid L in the distilled water and divide the solution into four portions.

1. To the fourth portion, add few drops of acidified potassium chromate (vii) and warm.

|  |  |
| --- | --- |
| Observations | Inference |
| (1/2 mark) | (1/2 mark) |

1. To the second portion, add few drops of bromine water and warm.

|  |  |
| --- | --- |
| Observations | Inference |
| (1/2 mark) | (1/2 mark) |

1. To the third portion add few drops of acidified potassium manganite (vii) and warm.

|  |  |
| --- | --- |
| Observations | Inference |
| (1/2 mark) | (1/2 mark) |

1. To the fourth portion add a quarter spatula end-full of sodium hydrogen carbonate.

|  |  |
| --- | --- |
| Observations | Inference |
| (1/2 mark) | (1/2 mark) |