**ELDORET DIOCESE EXAM 2021**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Index No. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Candidate’s Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**233/3**

**CHEMISTRY**

**PAPER 3**

**PRACTICAL**

**2 ¼ HOURS**

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**PAPER 3**

**2 ¼ HOURS**

**OCT 2021**

**INSTRUCTIONS TO CANDIDATES**

* Write your name and admission number in the spaces provided.
* Sign and write the date of examination in the spaces provided above.
* Answer all questions in the spaces provided.
* KNEC Mathematical tables and silent non-programmable electronic calculators may be used.
* All working must be clearly shown where necessary.
* Candidates should answer all the questions in English.

**FOR EXAMINER’SUSE ONLY**

|  |  |  |
| --- | --- | --- |
| Question  | Maximum Score  | Candidate’s Score |
| 1 | 19 |  |
| 2 | 10 |  |
| 3 | 11 |  |
| **TOTAL SCORE** | **40** |  |

***This paper consists of 8 printed pages***

***Turn Over***

1. You are provided with:

 - Solution **A**, a mixture of two bases sodium hydroxide and sodium carbonate solids

 dissolved in a 1 litre solution.

 - Solution **B**, **0.2**M hydrochloric acid.

 - Phenolphthalein and methyl orange indicators.

 - Solution **C**, barium chloride solution.

 You are required to determine the **concentration** of **each** of the reactants in the mixture.

**Procedure 1**

Pipette **25.0**cm3 of solution **A** into a conical flask.

Add two drops of methyl orange indicator.

Titrate solution **A** with **B** until the yellow colour just changes to pink.

Record your results in the table below.

Repeat the procedure to obtain two more readings.

**Table I** (3 marks )

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

(a) Calculate the average volume (**V**1) of solution **B** used. (1 mark )

(b) Calculate the number of moles of hydrochloric acid that reacted. (1 ½ marks )

**Procedure II**

Pipette **25.0**cm3 of solution **A** into a conical flask. Measure **15.0**cm3 of barium chloride

solution (solution **C**) with clean measuring cylinder.

Add it to the solution **A** in the conical flask. Shake it gently and add three drops of phenolphthalein indicator.

Titrate solution **B** into the conical flask until the pink colour just changes to colourless.

**NB**: The white precipitate should remain in the flask.

 Repeat the procedure to obtain two more readings.

**Table II** ( 3 marks )

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

(c ) Calculate the average volume (**V2**) of solution **B** used. (1 mark )

(d) The equation for the formation of white precipitate

 **Na2CO3 (aq) + BaCl2 (aq)  BaCO3 (s) + 2NaCl (aq)**

 During titration **II** the white precipitate formed after adding barium chloride does

not take part in the titration but all the hydroxide ions (**OH-**) in the solution are neutralized.

 (i) Calculate the moles of the acid (solution **B**) reacting in titration **II**. ( 1 ½ marks )

 (ii) Calculate moles of sodium hydroxide (**OH-**) reacting during the titration. ( 1 ½ marks )

(e) Calculate number of moles of acid that reacted with sodium carbonate in the mixture. ( 1 ½ marks )

(f) Calculate the concentration of solution **A** in terms of sodium hydroxide in

moles per litre. ( 1 ½ marks )

(g) Write an ionic equation for the reaction of the acid with sodium carbonate. ( 1 mark)

(h) (i) Calculate the number of moles of sodium carbonate in the mixture. (1 mark )

 (ii) Calculate concentration of solution **A** in terms of sodium carbonate in

 moles per litre. (1 ½ marks )

**2.** You are provided with solid **Z**. Carry out the tests below and write your observations

and inferences.

 (a) Using a clean metallic spatula, heat a half of solid **Z** in a Bunsen burner flame.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1 ½ marks ) | ( 1 marks  |

 (b) Dissolve the remaining portion of solid **Z** into **10**cm3 of distilled water in a boiling tube.

Divide the resulting solution into four portions.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1 mark ) | ( ½ mark ) |

 (c ) To 1st portion, add **3** drops of acidified potassium manganate (VII)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( ½ mark ) | ( 1 ½ marks ) |

(d) To the 2nd portion, add **3** drops of acidified potassium dichromate (VI) and warm.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( ½ mark ) | ( 1 ½ marks ) |

 (e) To the 3rd portion, add all the NaHCO3 provided.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1 mark ) | ( ½ mark ) |

 (f) To the 4th portion, add **3** drops of universal indicator and determine the pH value.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1mark ) | ( ½ mark ) |

3. You are provided with solid **Y**. Carry out the tests below and record your observations and

inferences in the spaces provided.

 (a) Place half of solid **Y** in a boiling tube and heat. Test any gas produced with litmus paper.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1 ½ marks ) | ( 1 mark ) |

 (b) Place the remaining solid **Y** into a boiling tube. Add about **10**cm3 distilled water and

shake. Divide the resulting solution into **5** portions.

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

 (c ) To the 1st portion, add NaOH (aq) dropwise till in excess.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1mark ) | ( ½ mark ) |

 (d) To the 2nd portion, add NH3 (aq) dropwise till in excess.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1 mark ) | ( ½ mark ) |

 (e) To the 3rd portion, add **1**cm3 of acidified hydrogen peroxide followed by

NaOH (aq) dropwise till in excess.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| ( 1 mark ) | ( ½ mark ) |

(f) To the 4th portion, add **3** drops of lead (II) nitrate and then filter.

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

 (g) To the 5th portion, add **3** drops of acidified barium nitrate solution.

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

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