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

**School ………………………………………………...Date…………………………sign…………...**

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**CHEMISTRY**

Paper 3

PRACTICAL

NOVEMBER – 2021

Time: 2 ¼ Hours

**JOINT EVALUATION EXAMINATIONS – 2021**

***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** | **20** |  |
| **2** | **12** |  |
| **3** | **8** |  |
| **Total** | **40** |  |

***This paper consists of 7 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:

* 4.5g of dibasic acid (**H2X. 2H2O)**, **Solid N**
* 0.4M sodium hydroxide,  **Solution P**

You are required to:

1. You are required to determine the solubility of Solid N in water at different temperatures.
2. Determine RAM of dibasic N in H2X.2H2O.

**Procedure I**

1. Place all solid N into a clean boiling tube.
2. Using a burette, add 4cm3 of distilled water to solid A in the boiling tube. Heat the mixture while stirring with a thermometer to about 80oC. When all the solid has dissolved allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid **A** first appear. Record this temperature in table I

(c) Using the burette, add 2cm3 of distilled water to the contents of the boiling tube, warm the mixture while stirring with the thermometer until **ALL** the solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid **N** first appear.

(d) Repeat procedure (b) two more times and record the temperatures in table I.

***Retain the contents of the boiling tube for use in procedure (II)***

(d) Complete table I by calculating the solubility of solid **N** at different temperatures.

**NOTE:**

You may hasten cooling for the first two temperatures readings by pouring cold water from the tap on the sides of the boiling tube.

1. **TABLE I (6marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Volume of water added (cm3) | 4 | 6 | 8 | 10 |
| Crystallization temperature, (°C) |  |  |  |  |
| Solubility of solid C in g/l00g water |  |  |  |  |

(b) Plota graph of solubility of solid N against crystallizing temperature (3marks)

(c) Use your graph to determine

1. the solubility of solid N in water at 55°C. (1 mark)
2. determine the temperature at which 100g of solid N would dissolve in 100 cm3 of water. (1 mark)

**Procedure II**

Transfer the content of the boiling tube into 100ml Measuring cylinder. Rinse both the boiling tube and thermometer with distilled water and add to the measuring cylinder and shake thoroughly. Add more water **carefully** to make up to 100 ml mark. Label this solution **N**. Fill the burette with solution **N** (H2X. 2H2O). Pipette 25cm3 of solution **P** into a conical flask. Add 2-3 of Phenolphthalein indicator and titrate with solution **N**. Record your readings in table **II** below. Repeat the procedure and complete table **II**.

**Table II**  (4marks)

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

1. Calculate the average volume of solution N used. (1 mark)
2. Calculate the ;
3. Number of moles of sodium hydroxide in 25 cm3 solution P. (1mark)
4. number of moles dibasic acid solution N used, given the equation for the reaction as;

2NaOH +H2X Na2X + 2H2O (1mark)

1. number of moles of dibasic acid in 100cm3 of solution N (1mark)
2. Determine the ;
3. Relative formula mass of dibasic acid, H2X.2H2O. (1mark)
4. RAM of X in dibasic acid, H2X.2H2O. (H=1,O=16) (1mark)

2. You are provided with **solid M** containing two cations and one anion. Carry out the tests given and record your observations and deductions in the space provided.

 (a) Place half of solid **M** in a clean dry test-tube and heat gently then strongly. Test any gases produced with both blue and red litmus papers.

|  |  |
| --- | --- |
| Observation | Inference |
| ( 2 marks) |  (1mark) |

(b) Place the remaining solid M into a boiling tube. Add about10cm3 of distilled water and shake thoroughly. Divide the resultant mixture into 4 portions.

(i) To the first portion add a few drops of sodium hydroxide solution till in excess.

|  |  |
| --- | --- |
| Observation | Inference |
| ( 1 mark) | ( 1 mark) |

(ii) To the second portion, add a few drops of ammonium hydroxide solution till in excess.

|  |  |
| --- | --- |
| Observation | Inference |
| ( 1 mark) |  ( 1 mark) |

(iii) To the third portion, add 2-3 drops of dilute hydrochloric acid.

|  |  |
| --- | --- |
| Observation | Inference |
|  ( 1mark) |  (1mark) |

(iv) To the third portion, add 2-3 drops of Lead (II) nitrate solution.

|  |  |
| --- | --- |
| Observation | Inference |
| ( 1mark) | (1mark) |

 (v) To the third portion, add a few drops of Barium chloride solution.

|  |  |
| --- | --- |
| Observation | Inference |
| ( ½ mark) | ( ½ mark) |

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

i). Place about half of solid **Q** on a metallic spatula and burnt it using a non-luminous flame

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

ii) Place the remaining solid **Q** in a clean boiling tube and add about 5cm3 of water and shake thoroughly.

I) To about 2cm3 of the solution **Q**, put the universal indicator paper provided to determine its PH.

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

II) To about 2cm3 of solution **Q**, add three drops of acidified potassium manganate (VII) solution and warm.

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

III) To about 2cm3 of solution **Q**, add solid sodium hydrogen carbonate.

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