**NAME:……………………………………………………INDEX NO………………….**
**SCHOOL:…………………………… CANDIDATE’S SIGN ………….**

**DATE ………………………………..**

JULY 2019
**Time: 2 ¼Hours***Kenya Certificate of Secondary Education (KCSE)* **.**233/3

**CHEMISTRY Paper 3**

 **(PRACTICAL)**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name and Index number in the spaces provided.

2. Answer ALL the questions.

3. Answers must be written in the spaces provided in the question paper.

4. Additional pages must not be inserted.

5. Candidates should check the question paper to ascertain that all the pages are printed.

**FOR EXAMINER’S USE ONLY**

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| --- | --- | --- | --- |
| **QUESTION** |  | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
|  |  |  |  |

1. You are provided with:

* + 3.0g of dibasic acid H2X, solid **W**
	+ Aqueous Sodium hydroxide solution **K**
	+ Aqueous hydrochloric acid containing 7.3g per litre, solution M

You are required to:

Determine the concentration of sodium hydroxide, solution **K** in moles per litre. Work out the concentration of solution **W**

**Procedure I**

Fill the burette with solution **M**. pipette 25cm3 of solution **K** and pour into a conical flask. Add 2 drops of phenolphthalein indicator and titrate against solution M from burette. Repeat two more times and complete table 1

Table 1

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

 (4mks)

(a)(i) Work out the average volume of solution **M.**  (1mk)

……………………………………………………………………………………………………………………………………………………………………………………………………………...(ii) Calculate the concentration of solution **M** in mole per litre. (2mks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………… (iii) Calculate the number of moles of solution **K** present in one litre of its solution. (2mks)

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**Procedure II**

Using a 100ml measuring cylinder, measure 40cm3 of distilled water and add the whole of solid **W** to the water in a measuring cylinder. Shake to dissolve solid **W** and add more distilled water to make a total volume of 50cm3 of the solution. Transfer the solution into an empty beaker. Measure accurately 25.0cm3 of the solution using a 100ml measuring cylinder and then add distilled water to make 100ml of the solution and label it solution **W.** Pipette 25.0cm3 of solution **K** into a conical flask and add two drops of Methyl orange indicator. Titrate against solution W from burette. Repeat two more times and record your results in table II below

Table II

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

 (4mks)

(a) What is the average volume of solution W used? (1mk)

………………………………………………………………………………………………………………………………………………………………………………………………………………

(b) Calculate the:

 (i) Mole of solution **W** that reacted with solution K( reaction ratio=2:1,2 mole of K

 react with 1 mole of **W**) (2mks)

………………………………………………………………………………………………………………………………………………………………………………………………………………

 (ii) Mole of solution W in 100cm3 of solution (2mks)

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(iii) Moles per litre of the original solution made when solid **W** was dissolved (2mks)

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2. You are provided with solid **D** weighed exactly of 4.0g

 You are required to determine the solubility of solid **D** at difference temperatures

 **Procedure**

 (i) Put all the solid D provided into boiling tube.

 (ii) Using a clean burette, transfer 4cm3 of distilled water to a boiling tube containing all
 the solid **D** provided

 (iii) Heat the mixture while stirring with the thermometer to a temperature of about 80oC

 When the entire solid will have dissolved

(iv) Allow the solution to cool while stirring with thermometer. Note the temperature at

 Which crystals start to appear and record the temperature in the table below.

(v) To the same solution, add 2cm3 of distilled water from the burette, heat the mixture

 While stirring with the thermometer to a temperature of about 80oC when the entire

 Solid will have dissolved.

(vi) Allow the mixture to cool and record the temperature at which crystals first appear in

 the table below

(vii) Repeat procedure (v) and (vi) three more times and record the temperature in the

 table

(viii) Complete the table of solubility of solid **D** at different temperatures. (5mks)

|  |  |  |
| --- | --- | --- |
| Volume of water in boiling tube (cm3) | Temperature at which crystals first appear (oC) | Solubility of solid D in g/100g of water  |
| 4 |  |  |
| 6 |  |  |
| 8 |  |  |
| 10 |  |  |
| 12 |  |  |

(a) On the grid provided plot a graph of solubility of solid **D** against temperature (3mks)

(b) Hence determine the mass of solid deposited when solution is cooled from 55oC to 50oC

 (1mk)

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(c) Use your graph to determine the temperature at which 80g of solid **D** would dissolve in 100g

 of water. (1mk)

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3. (a) You are provided with solid **N**. Carry out the tests below. Write your observations and
 inferences in the spaces provided

(i) Heat about one third of solid **N** in a clean dry test-tube. Test the gases produced with both blue and red litmus papers.

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
|  **(1mk)** |  **(1mk)** |

 (ii) Using a boiling tube, dissolve the rest of solid N in about 10cm**3** of distilled water and

 use the solution for the tests below.

 (I) To about 2cm3 of the solution, add 5cm3 of solution P (Aqueous sodium Hydroxide)

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
|  **(1mk)** |  **(1mk)** |

(II) To 2cm3 of the solution, add about 4cm3 of aqueous ammonia drop wise until in excess

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
|  **(1mk)** |  **(1mk)** |

(III) To 2cm3 of the solution, add about 4cm3 of aqueous barium nitrate

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
|  **(1mk)** |  **(1mk)** |

(IV) To the mixture obtained in III above, add about 2cm3 of dilute hydrochloric acid

|  |  |
| --- | --- |
| **Observations**  | **Inferences**  |
|  **(1mk)** |  **(1mk)** |