Name: …………………………………………………………………………………………………

Index no. ………………………………………

Candidates signature: …………………………

Date: ……………………………….………

233/3

Chemistry

(Practical)

July/August 2017

2 ¼ Hours

SUKEMO JOINT MOCK KCSE EXAMINATION

KENYA CERTIFICATE OF SECONDARY EDUCATION

Chemistry Paper 3 (Practical)

July/August 2017 - Time 2¼Hours

Instruction to Candidates:

1. *Write your name and index number in the spaces provided on this page above*
2. *Sign and write the date of examination in the spaces on this page above.*
3. *Answer ALL the questions in the spaces provided after EACH question in the question-paper.*
4. *You are NOT allowed to start working with the apparatus for the first 15minutes of the 2¼ hours allowed for this paper. This time is to enable you read the question-paper and make sure you have ALL the chemicals and apparatus that you may need.*
5. *Mathematical tables and silent electronic calculator may be used.*
6. *ALL working MUST be clearly shown where necessary.*
7. *This paper consists of 12 printed pages.*
8. *Candidates should check the question-paper to ascertain that ALL the pages are printed as indicated and that no questions are missing.*

|  |  |  |
| --- | --- | --- |
| Questions | Maximum Score | Candidate’s Score |
| 1 | 22 |  |
| 2 | 12 |  |
| 3 | 6 |  |
| Total Score | 40 |  |

1. You are provided with:
2. 0.3g of metal **FA1**.
3. 100cm3 of a **1.0M** hydrochloric acid solution labelled as solution **FA2**.
4. 120cm3 of a **0.0984M** sodium hydroxide solution, labelled as solution **FA3**.
5. Screened methyl orange indicator solution.

You are required to determine the Relative Atomic Mass of metal **FA1**.

Procedure:

1. Using a burette, measure 50.00cm3 of solution **FA2** into a clean 250ml beaker.
2. Add the WHOLE AMOUNT of BA1 provided into the beaker containing 50.00cm3 of solution **FA2** and stir well with a glass rod until ALL the solid metal reacts completely.
3. Transfer the mixture left in the beaker after the reaction into a 250ml volumetric flask. Rinse the beaker as well as the glass rod with distilled water and transfer ALL the rinsings into the volumetric flask. Make up the volume of the solution in the volumetric flask up to the calibration mark with distilled water, cover the flask with a stopper, shake well and label as solution **FA4**.
4. Fill a clean burette with solution **FA4**.
5. Pipette 25.0cm3 of solution **FA3** into a 250ml conical flask, add 3 drops of screened methyl orange indicator solution and titrate against solution **FA4** from the burette. A change in colour of the mixture from **green** to **pink** marks the end point of the titration. Record your results in Table 1.
6. Repeat the titration TWO more times in order to complete Table 1.

Table 1 (5marks)

|  |  |  |  |
| --- | --- | --- | --- |
| Titration  | 1 | 2 | 3 |
| Final burette reading, cm3 |  |  |  |
| Initial burette reading, cm3 |  |  |  |
| Volume of solution **FA4** used, cm3 |  |  |  |

Average volume of solution **FA4** used = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm3.

1. Calculations:
2. Calculate the number of moles of HCl in 50.0cm3 of solution **FA2.**  (1mark)
3. Determine the number of moles of NaOH in 25.0cm3 of solution **FA3**. (1mark)
4. Determine the number of moles of HCl in the average volume of solution **FA4** used in the titration. (1mark)
5. Calculate the moles of HCl left unreacted after the reaction between metal **FA1** and solution **FA2**. (1mark)
6. Determine the moles of HCl that reacted with metal **FA1**. (1mark)
7. Given that metal **FA1** forms a divalent cation, determine the moles of metal **FA1** that reacted with hydrochloric acid. (1mark)
8. Determine the Relative Atomic Mass of metal **FA1**. (1mark)

1(b) You are provided with:

* 1. 2.00g of solid **FA5**.
	2. a thermometer.
	3. distilled water.
	4. a boiling tube.
	5. a hot water-bath.

You are required to determine the temperatures at which solutions of known concentrations of compound **FA5** became saturated and then plot a solubility curve.

**Procedure:**

1. Transfer the whole amount of solid **FA5** supplied to you into a clean dry boiling tube.
2. Using a burette, add 5.00cm3 of distilled water into the boiling tube with solid **FA5**.
3. Put the boiling tube into a beaker of hot water bath and warm the boiling tube, whilst continuously stirring the content with a thermometer, until the crystals of **FA5** just dissolve/disappear. (DO NOT BREAK THE THERMOMETER)

Arrangement:

*Solution of* ***FA5***

*HEAT*

*Tripod stand*

*Water*

*Beaker*

*Boiling tube*

*Thermometer*

1. Remove the boiling tube from the hot water bath and allow the content to cool slowly while stirring with the thermometer. Note the temperature at which the crystals FIRST form/reappear and record this temperature in Table 2.
2. Add a further 2.00cm3 of distilled water from the burette into the boiling tube containing the mixture and repeat steps (c) and (d) above. Continue this way until the volume of water added to the boiling tube is 5.00cm
3. Complete Table 2 by calculating the solubility of compound **FA5** in water at the different temperatures.

 **Table 2:**

|  |  |  |
| --- | --- | --- |
| **Total volume of water added (cm3)** | **Temperature at which crystals first appear(oC)** | **Solubility of compound FA5 in water (g/100g of water)** |
| 5.00 |  |  |
| 7.00 |  |  |
| 9.00 |  |  |
| 11.00 |  |  |
| 13.00 |  |  |
| 15.00 |  |  |

1. On the grid provided plot a graph of solubility of compound FA5 (vertical axis) against temperature (3marks)
2. What is the relationship between the solubility of solid **FA5** and temperature? Explain. (1mark)
3. From your graph determine the solubility of solid **FA5** in water at 25.00C. (1mark)
4. 40.0g of solid **FA5** was dissolved in 100g of water at 900C. The resulting solution was then cooled to 25.00C. Determine the mass of crystals of **FA5** that would be formed. (1mark)
5. You are provided with 10cm3 of solution **CB35** containing **TWO** cations and **ONE** anion. Carry out the tests below and record your observations and inferences in the spaces provided.
6. Add 20cm3 of 2M aqueous Sodium hydroxide to all of solution CB35 provided. Shake well. Filter the mixture into a conical flask. **retain both the filtrate and the residue**

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

1. To about 2cm3 of the filtrate, add (i.e. about 1cm3 of the acid) of 2M Nitric acid **drop wise** until in excess. Retain the mixture

|  |  |
| --- | --- |
| Observations |  |
| (½mark) |  |

Divide the mixture in **(b)** above into TWO portions.

* 1. To the FIRST portion, add aqueous Sodium hydroxide solution dropwise until in excess.

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

* 1. To the SECOND portion, add 2M aqueous Ammonia solution DROPWISE until in excess.

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

1. To about 2cm3 of the filtrate, add 3 drops of 2M Hydrochloric acid.

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

1. To about 2cm3 of the filtrate, add about 1cm3 of acidified Barium chloride solution.

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

1. To the RESIDUE add about 5cm3 of dilute Nitric acid and allow it to filter into a test tube. To about 2cm3 of this filtrate add 2M aqueous Ammonia solution dropwise until in excess and then filter into a clean test tube.

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

3.You are provided with solid G. Carry out the tests below and record your observations and inferences in the spaces provided.

1. Place 1/3 spatula full of solid G into a clean dry test tube and then place 10cm3 of ethanol.

|  |  |
| --- | --- |
| Observations |  |
| (½mark) |  |

1. Using a metallic spatula, scoop a small portion of solid G and ignite in a non-luminous flame.

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

1. Place the remaining solid G into a clean dry boiling tube. Add about 10cm3 of distilled water and shake until the solid dissolves. Divide the mixture obtained into 5 portions.
2. To the 1st portion, add solid Sodium hydrogen carbonate provide

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

1. To the 2nd portion, add 3 drops of universal indicator.

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

1. To the third portion, add 4 drops of acidified KMNO4

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

**STOP**

**This is the last printed page**

SUKEMO MOCK KCSE EXAMINATION – JULY/AUGUST, 2017

KCSE CHEMISTRY PRACTICAL – PAPER 233/3

**CONFIDENTIAL INSTRUCTIONS**

## **Instructions to Schools:**

*The information contained in this paper is to enable the head of the school and the teacher in charge of Chemistry to make adequate preparation for the Chemistry Practical Examination.*

*NO ONE ELSE should have access to this paper or acquire knowledge of its content. Great care MUST be taken to ensure that the information herein does NOT reach the candidates either directly or indirectly. The teacher in charge of Chemistry should NOT perform any of the experiments in the SAME room as the candidates nor make the results of the experiment available to the candidates of give any information related to the experiments to the candidates. Doing so will constitute an examination irregularity which is punishable.*

**In addition to the fittings and apparatus found in a Chemistry laboratory, EACH candidate will require:**

1. One Burette, 0-50ml.
2. One 25ml Pipette.
3. Three 250ml Conical Flask
4. One Volumetric Flask.
5. One complete Retort Stand
6. One White Tile
7. One Pipette Filler
8. One Test-tube Rack
9. Six Test-tubes
10. Two Boiling tubes
11. Filter paper \*2
12. Filter funnel \*1
13. Measuring cylinder 100ml.\*1
14. Measuring cylinder 10ml. \*1
15. Test tube rack\*1 with Test tubes \*6
16. Wash bottle filled with distilled water
17. About 0.5g of Solid G supplied in a stoppered container.
18. One metallic spatula.
19. About 1g of solid sodium hydrogen carbonate.

**ACCESS TO**

1. Source of heat.
2. Acidified Potassium Manganite (VII) supplied into a dropper.
3. Universal indicator
4. PH chart
5. Pure ethanol supplied with a dropper
6. 2M Hydrochloric acid
7. 2M Acidified Barium chloride
8. 2M Sodium hydroxide solution
9. 2M Ammonia solution
10. 2M Nitric acid solution *enough for use in question 2.*

**NOTES**

1. Acidified Potassium Manganate (VII) is prepared by dissolving 3.16g of solid Potassium Manganate (VII) in about 600cm3 of 2M Sulphuric (VI) acid and adding distilled water to make a litre of solution.
2. Solid G is pure oxalic acid.
3. a) Metal FA1 is 0.3g magnesium granules.
4. Solution FA2 is a 1.0M Hydrochloric acid solution.
5. Solution FA3 is a 0.0984M sodium hydroxide solution.
6. Solid FA5 is 2.0g Potassium chlorate, KClO3 crystals.
7. On the day of the Practical Examination, the teacher in charge of Chemistry should perform the experiment as per the procedures given in the question-paper and complete Table 1 and Table 2 for EACH practical session.
* **Solution CB35** which contains two cations and one anion i.e. **Al2(SO)4 + CuSO4** each being 0.1M in molecular weight, mixed and top up to a litre of distilled water *in a stoppered boiling tube.*
* About 25cm3 2M Sodium hydroxide solution