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

**School: ……………………………………………….. Candidate’s Sign. ……….………..**

**Date: …………….…………………**

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**CHEMISTRY**

Paper 3

**Time: 2 ¼ Hours**

**MACHAKOS COUNTY KCSE TRIAL AND PRACTICE EXAM 2015**

***Kenya Certificate of Secondary Education (K.C.S.E.)***

**Chemistry 3**

Practical

**Time: 2 ¼ Hours**

**INSTRUCTIONS TO THE CANDIDATES:-**

* ***Write your name*** *and* ***index number in the spaces provided in the question paper.***
* ***Sign*** *and write the* ***date*** *of examination in the spaces provided above.*
* *Answer* ***all*** *the questions in the spaces provided in the question paper****.***
* *You are not allowed to start working with apparatus for the first* ***15 minutes*** *of the* ***2 ¼ hours*** *allowed for this paper. This time is to enable you to read the question paper and make sure you have the chemicals and apparatus that you may need.*
* *Mathematical tables and silent electronic calculators* ***may be*** *used.*
* *All working* ***MUST*** *be clearly shown where necessary.*
* *This paper consists of 8 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing*

**For Examiners use Only**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAX. SCORE** | **CANDIDATE’S SCORE** |
| 1 | 19 |  |
| 2 | 11 |  |
| 3 | 10 |  |
| **TOTAL SCORE** | **40** |  |

***A special Performance Improvement Project***

***By His Excellency Dr. Alfred Mutua***

***Sponsored by the County Government of Machakos***

1. You are provided with:

* 6.0g of an alkanoic acid labeled solid p in a boiling tube
* 2M hydrochloric acid solution W
* 2M sodium hydroxide solution labeled solution Q

You are required to:

1. Determine the solubility of solid P at different temperatures.
2. Determine the number of moles of water of crystallization in solid P.
3. Find the molar mass of the alkanoic acid.

**PROCEDURE I**

1. Using a burette add 10cm3 of distilled water to solid P in the boiling tube. Heat the mixture while stirring with the thermometer to about 700 c. When the entire solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid p first appear. Record this temperature in table I.
2. 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 P first appear.
3. Repeat the procedure (ii) two more times and record the temperatures in table I. Retain the contents of the boiling tube for use in procedure II.

Complete table I by calculating the solubility of solid P at the different temperatures. (The solubility of a substance is the mass of that substance that dissolves in 100cm3 (100g) of water at a particular temperature)

**TABLE I**

|  |  |  |
| --- | --- | --- |
| Volume of water in the boiling tube | Temperature at which crystals of solid P first appear. | Solubility of solid p (g/100g water) |
| 10 |  |  |
| 12 |  |  |
| 14 |  |  |
| 16 |  |  |

(ii) On the grid provided, plot a graph of the solubility of solid p (Vertical axis) against temperature.

(3marks)



(iii) Using your graph, determine the temperature at which 100g of solid P would dissolve in 100cm3 of

Water. (1mark)

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**PROCEDURE (II)**

1. Transfer the contents of the boiling tube in procedure I into a 250ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add to the volumetric flask. Add more distilled water to make up to the mark. Label this solution R.
2. Using a measuring cylinder place 25.0cm3 of solution Q into a 250ml volumetric flask. Add about 200cm3 of distilled water. Shake well. Add more distilled water to make up to the mark. Label this as solution T. Retain the remaining solution Q for use in procedure (iii) and question 2.
3. Fill a burette with solution R. Using a clean pipette and a pipette filler place 25.0cm3 of solution T into a 250ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution R. Record your results in table II. Repeat the titration two more times and complete the table.

|  |  |  |  |
| --- | --- | --- | --- |
| Table II | I | II | III |
| Final burette reading |  |  |  |
| Initial burette reading |  |  |  |
| Volume of solution R (cm3) added |  |  |  |

(4 marks)

Determine the:

1. Average volume of solution R used (1 mark)

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

1. Concentration of solution T in moles per litre (1 mark)

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1. Concentration of the alkanoic acid solution R in moles per litre.( 1 mole of acid reacts with 2 moles of the base) (1 mark)

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1. The relative formula mass of the alkanoic acid, solid P (1 mark)

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1. The formula of P has the form M.XH2O. Determine the value of x in the formula given that the relative formula mass of M is 90.0 and atomic masses of oxygen and hydrogen are 16.0 and 1.0 respectively (1 mark)

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**PROCEDURE III**

Pipette 25.0cm3 of solution W into a 100ml beaker. Measure the temperature T1 of solution W and record it in table III. Pipette 25.0cm3 of solution Q into another 100ml beaker and measure the temperature T2 of solution T and record it in table III. Add all solution W at once to solution T. Stir carefully with the thermometer and measure the highest temperature T3 of the mixture and record it in table III. Repeat the procedure and complete table III.

|  |  |
| --- | --- |
| I | II |
| Initial temperature of solution W, T1 (OC) |  |  |
| Initial temperature of solution T,T2 (OC) |  |  |
| Highest temperature of mixture T3 (OC) |  |  |
| Change in temperature T (OC) |  |  |

Calculate

1. Average ΔT value (1 mark)

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

1. Heat change for the reaction (Assume density of the solution is 1g/cm3 and the specific heat capacity is

4.2Jg-1 K-1) (1 mark)

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

1. You are provided with solid E. Carry out the tests below and record your observation and inferences in the spaces provided.
2. Place about one-half of solid E in a dry test tube. Heat it gently then strongly and test any gas produced with red and blue litmus papers.

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

1. Place the rest of solid E in a boiling tube. Add about 10cm3 of distilled water. Shake well and use 2cm3 portions for each of the tests below.
2. To one portion add solution Q (that remained in question 1) drop wise until in excess

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

1. To the second portion, add ammonia solution drop wise until in excess

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

1. To the third portion, add 1cm3 of Barium chloride solution.

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

1. To the fourth portion add two drops of aqueous lead(II)nitrate and heat the mixture to boiling

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

1. You are provided with solid F. Carry out the following tests and record your observations and inferences in the spaces provided.
2. Describe the appearance of solid F (1mark)

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1. Place about one-third of solid F on a metallic spatula and burn it in a Bunsen burner flame

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

1. Dissolve the remaining amount of solid F in about 10cm3 of distilled water in a boiling tube and shake well. Boil the mixture and divide it into three portions.
2. To the first portion, add five drops of bromine water

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

1. To the second portion add three drops of acidified potassium manganate (VII) solution and warm.

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

1. To the third portion add all the solid sodium hydrogen carbonate provided.

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

1. Describe how you can find the PH of solid F above (1 mark)

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