**Name:………………………………………………………………Index no ……………..**

**Candidate’s sign ……………………….Date: …………………**

**233/3**

**CHEMISTRY**

**Paper 3**

**PRACTICAL**

**Time: 2 ¼ hours**

**MOKASA II JOINT EXAMINATION - 2024**

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**Instructions to candidates**

***(a)******Write your name, index number, signature and date in the spaces provided above.***

***(b) Answer ALL the questions in the spaces provided in the question paper.***

***(c) You are not allowed to start working with the 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 all the chemicals and apparatus that you may need.***

***(d) All working MUST be clearly shown where necessary.***

***(e) Mathematical tables and silent electronic calculators may be used.***

**For Examiner’s Use Only**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Marks** | **Candidate’s Score** |
| 1 | 18 |  |
| 2 | 12 |  |
| 3 | 10 |  |
| **TOTAL** | **40** |  |

1. You are provided with: Solid

a) 3.15g of Dibasic Acid solid C (H2C2O4.nH2O)

b) Solution B; 0.2M sodium hydroxide

You are required to determine:

1. Molar enthalpy of solution of solid C
2. Determine the value of n, water of crystallization in solid C (H2C2O4.nH2O)

**Procedure I**

1. Using a measuring cylinder, place 50cm3 of distilled water in 100ml plastic beaker.
2. Measure the initial temperature of water and record in table I below.
3. Add all the solid C at once into the beaker containing water, stir the mixture with a thermometer and measure the temperature of the solution after every 30 seconds and record the results in table I below.

**NOTE: Retain the solution formed for use in procedure II**

1. Table I (3 marks)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (seconds) | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 |
| Temperature (°C) |  |  |  |  |  |  |  |  |

1. On the grid provided, plot a graph of Temperature (°C) against time (seconds)

 (3 marks)

1. From the graph, show and determine the temperature change (1 mark)
2. Calculate the enthalpy change of solution for the above reaction (1 mark)

(C = 4.2J/g/k, Density = 1g/cm3)

**Procedure II**

1. Transfer the contents of the beaker obtained in procedure I into a 250ml volumetric flask. Rinse both the beaker and thermometer with distilled water and add to the volumetric flask. Add more water upto the mark. Label this as solution C.
2. Fill the burette with solution C upto 0.0 mark.
3. Place 25cm3 of solution B using a pipette into a conical flask, add 3 drops of phenolphthalein indicator and titrate with solution C until the pink colour turns colourless, record readings in table 2 below.
4. Repeat procedure (iii) two more times and complete table II below.

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

(4 marks)

1. Calculate the average volume of solution C used (1 mark)
2. Calculate the number of moles of solution B used (1 mark)
3. 1 mole of Dibasic acid reacts with 2 moles of sodium hydroxide according to equation below.

2NaOH(aq) + H2C2O4(aq) Na2C2O4 + 2H2O(l)

Determine:

1. The number of moles of the Dibasic acid, solution C used in the titration

(1 mark)

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1. Number of moles of the Dibasic acid in 250cm3 of solution C (1 mark)

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1. The relative formula mass of the Dibasic acid (1 mark)

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1. The value of n, water of crystallization in the dibasic acid, H2C2O4.nH2O

(C = 12, O = 16, H = 1) (1 mark)

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1. Calculate the molar heat of solution of the dibasic acid (1 mark)

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2. You are provided with:

a) Solid M

b) Aqueous sodium hydroxide

c) Aqueous acidified Barium Nitrate

d) Water

Solid M is suspected to be magnesium sulphate

1. From the reagents provided, select and describe three tests that could be carried out consecutively to confirm solid M is magnesium sulphate. Write the results and expected observations in the spaces provided.

|  |  |
| --- | --- |
| Test 1 (1 mk) | Expected observation (1 mk) |
|  |  |

|  |  |
| --- | --- |
| Test 2 (1 mk) | Expected observation (1 mk) |
|  |  |

|  |  |
| --- | --- |
| Test 3 (1 mk) | Expected observation (1 mk) |
|  |  |

1. Carry out the tests described in (a) above using solid M and record the observations and inferences in the spaces provided.
2. Test 1

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

1. Test 2

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

1. Test 3

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

3. You are provided with an organic liquid N, carry out the tests below and record your observations and inferences in the spaces provided.

a) Place about 2cm3 of the liquid in a watch glass and ignite it.

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

b) Place about 2cm3 of liquid into 4 test tubes.

(i) To the 1st portion and 2cm3 water and allow the mixture to stand for a minute.

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

(ii) To the 2nd portion, add 2-3 drops of acidified potassium manganite VII.

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

(iii) To the 3rd portion, add 3 drops of acidified potassium dichromate VI and warm.

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

1. To the 4th portion, add 3cm3 of the organic acid provided followed by 3 drops of sulphuric (VI) acid and warm the mixture.

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