**NAME: …………………………………………. INDEX NO: ……………………………….**

**SIGNATURE: ………………………………… DATE : …………………………………..**

**233/3**

**CHEMISTRY**

**PAPER 3**

**PRACTICAL**

**TIME: 2 ¼ HOURS**

**INSTRUCTIONS TO CANDIDATES**

* Write your Name and Index Number in the spaces provided above.
* 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 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the apparatus and chemicals that you may need.
* ALL working must be clearly shown.
* Mathematical tables and electronic calculators may be used.

**FOR EXAMINER’S USE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS**  | **MAX SCORE** | **CANDITATE’S SCORE** |
| 1 | 22 |  |
| 2 | 09 |  |
| 3 | 09 |  |
| **TOTAL** | **40** |  |

1. You are provided with:-
* Solid T, hydrated ethanedioic acid H2C2O4.nH2O.
* Solution Q, a 0.2M solution of sodium hydroxide.

You are required to determine:

1. Solubility of solid T.
2. The value of n is the formula H2C2O4.nH2O.

**Procedure I**

1. Fill the burette with distilled water.
2. Place solid T in the boiling tube.
3. Transfer 4cm3 of distilled water from the burette into the boiling tube containing solid T. Heat the mixture while stirring with the thermometer to a temperature of 800.
4. Allow the solution to cool while stirring with the thermometer. Record the temperature at which crystals start to form in the table 1 below.
5. Add a further 2cm3 of distilled water from the burette to the mixture. Repeat the procedure (iii) and (iv) above and record the crystallization temperature. Complete the table I below by adding the volumes of distilled water as indicated.

**(Preserve the contents of the boiling tube for procedure II)**

**TABLE I**

|  |  |  |
| --- | --- | --- |
| **Volume of distilled water in boiling tube** | **Crystallization temperature** | **Stability of solid T in 100g / water** |
| 4  |  |  |
| 6 |  |  |
| 8 |  |  |
| 12 |  |  |

 (6mks)

1. On the grid provided, plot a graph of solubility of solid T (y-axis) against crystallization temperature. (3mks)



From the graph determine:

* 1. Solubility of T at 550C (1mk)

……………………………………………………………………………………………………………………………………………………………………………….

* 1. The temperature at which 80g of T dissolve in 100g of water. (2mks)

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**Procedure II**

* Transfer the contents of the boiling tube in procedure I to a clean 250ml volumetric flask. Add distilled water to the mark. Label the resulting solution T.
* Fill the burette with solution T. Pipette 25cm3 of Q into a clean 250ml conical flask. Add 3 drops of phenolphthalein indicator.
* Titrate T against Q to an accurate end point. Record your results in the table II below.
* Repeat the experiment two more times and complete the table II below.

**Table II**

|  |  |  |  |
| --- | --- | --- | --- |
|  | I | II | III |
| Final burette reading cm3 |  |  |  |
| Initial burette reading cm3 |  |  |  |
| Volume of T used cm3 |  |  |  |

(4mks)

Calculate:

1. Average volume of T used. (1mk)

……………………………………………………………………………………………………………………………………………………………………………….………………………………………………………………………………………………………………………

1. (i) Moles of Q used. (1mk)

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(ii) Moles of T used. (1mk)

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(iii) Concentration of T in molar per dm3. (1mk)

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1. Determine the value of n in the formula H2C2O4.nH2O. (2mks)

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1. You are provided with solution D. You are required to carry out the tests on solution and record your observations and inferences in the space provided.
2. To about 2cm3 of solution D, add 3 drops of potassium iodide solution.

Observations Inference

(1mk) (1mk)

1. To the remaining portion in the boiling tube add 5cm3 of dilute hydrocholic acid and warm. Leave it to cool and filter.

Observation Inference

(1mk) (1mk)

 Divide the filtrate into two portions.

1. To one portion, add sodium hydroxide drop-wise until in excess.

Observation Inference

(1mk) (1mk)

1. To 2nd portion, add aqueous ammonia drop-wise till in excess.

Observation Inferences

(1mk) (1mk)

1. To 3rd portion, add zinc granules and warm.

Observation Inferences

(1mk) (1mk)

1. You are provided with solid R. Carry out the tests below and record your observations and inferences in the spaces provided.
2. Place one third of solid R on a metallic spatula. Burn it in a non-luminous flame of the Bunsen Burner.

Observation Inference

(1mk) (1mk)

1. Place the remaining solid in a test-tube. Add about 6cm3 of distilled water and shake the mixture well.

Observation Inference

(1mk) (1mk)

 Divide the solution into 3 portions.

(I) To about 2cm3 of the solution, add 1g of solid A; sodium hydrogen carbonate.

Observation Inference

(1mk) (1mk)

(II) To about 1cm3, add 3 drops of acidified chromate (vi) and warm.

Observation Inferences

(1mk) (1mk)

 (III) In another 2cm3, add 2 drops of acidified potassium manganate (vii).

Observation Inferences

(½mk) (½mk)