**TRIAL EXAMINATIONS 2021**

**Kenya Certificate of Secondary Education (KCSE)**

**233/3 - CHEMISTRY - Paper 3**

**(Practical)**

**Nov/Dec. 2021 – 2⅟4 Hours**

**Name: ………………………………….. Index No: ……….………...Stream ……**

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

**INSTRUCTIONS TO CANDIDATES:-**

1. *Write your name, index number in the spaces provided above.*
2. *Sign and write the date of the examination in the spaces provided*
3. *Answer* ***ALL*** *the questions in the spaces provided.*
4. *All working* ***MUST*** *be clearly shown.*
5. *KNEC mathematical tables and silent non-programmable electronic calculators may be used.*
6. *This paper consists of* ***8 printed pages***
7. *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing*

**FOR EXAMINER’S USE ONLY.**

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| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s score** |
| **1** | **22** |  |
| **2** | **14** |  |
| **3** | **06** |  |
| **TOTAL SCORE** | **40** |  |

1. You are provided with

* 4.5g of **Solid T** in a boiling tube
* **Solution N**, 0.6M acidified potassium manganate (VII)

You are required to determine:

* Solubility of **Solid T** at different temperatures
* The rate of reaction of **Solution T** at different temperatures

**PROCEDURE A**

1. Using a burette, add 4cm3 of distilled water to **Solid T** in the boiling tube. Heat the mixture while stirring with a thermometer to about 85oC for the solid to dissolve; allow the solution to cool while stirring. Note the temperature at which crystals of **Solid T** first appear. Record the temperature in *Table 1*.
2. Using a burette, add 2cm3 of distilled water to the content 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 T** first appears.
3. Repeat **step** **b)** two more times and record the temperature in *Table 1*. Retain the contents of the boiling tube for use in **Procedure B**.
4. Complete *Table 1* by calculating the solubility of **T** at different temperatures

*Table 1*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Total volume of water in the boiling tube (cm3)** | 4 | 6 | 8 | 10 |
| **Temperature at which crystals of T appear (oC)** |  |  |  |  |
| **Solubility of Solid T (g/100g of water)** |  |  |  |  |

(5 marks)

1. On the grid provided, draw a graph of Solubility T (*y-axis*) versus temperature in oC. (3 marks)

Table

Description automatically generated

1. Use your graph to find the temperature at which the first crystal will appear if 100g of **Solid T** is dissolved in 100cm3 of distilled water at 85oC then the solution is allowed to cool. (2 marks)

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**PROCEDURE B**

1. Transfer all the content of the boiling tube into a 100ml beaker. Accurately measure 10cm3 of distilled water and add to **mixture T** in the beaker.
2. Accurately measure 4cm3 of the mixture in the beaker and transfer into a clean boiling tube. Heat the mixture to 80oC and add 4cm3 of **Solution N** (acidified potassium manganate (VII)) and immediately start the stopwatch.
3. Note the time taken for the mixture to change to colourless. Discard the content of the boiling tube and accurately measure another 4cm3 of the mixture in the beaker (**Solution T**) and transfer into the boiling tube.
4. Heat the mixture to 70oC and add 4cm3 of **Solution N** and immediately start the stopwatch. Note the time taken for the mixture to turn to pink.
5. Repeat the procedure two more times and complete *Table 2* using temperature in the table.

*Table 2*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Temperature (oC) | 80 | 70 | 60 | 50 |
| Time, *t* (sec) |  |  |  |  |
| ⅟time (sec-1) |  |  |  |  |

(5 marks)

1. On the grid below, draw a graph of ⅟time (sec-1) (*y-axis*) versus temperature. (3 marks)

Table

Description automatically generated

1. State and explain the shape of your graph (2 marks)

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1. What does the reciprocal of time represent on your graph? (1 mark)

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1. From your graph, determine the time the mixture will decolorize if the experiment is carried out at 65oC (1 mark)

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1. You are provided with **Solid D**. Carry out the tests below. Record your observation and inferences in the spaces provided.
2. Put a spatula end full of **Solid D** in a boiling tube. Add about 1.0cm3 of distilled water. Shake well.

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| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. Divide the above mixture into four portions each, of 2cm3.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. To the 1st portion, add 2M NaOH solution dropwise until in excess.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. To the 2nd portion, add 3 drops of barium chloride solution

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. To the 4th portion, add 3 drops of lead (II) nitrate solution

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. Dip a clean glass rod in the remaining solution and place on a non-luminous flame of a Bunsen burner

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| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. To the 3rd portion, add 2cm3 of bromine water

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. You are provided with **Solid J**. Carry out the tests below and record your observations and inferences in the spaces provided.
2. Burn half of **Solid J** on a non-luminous flame of a Bunsen burner.

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| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. Put the remaining amount of **Solid J** in a boiling tube. Add about 10cm3 of distilled water and shake thoroughly. Divide the mixture into 2 portions. To the 1st portion, add 3 drops of NaHCO3 solution.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |

1. To the 2nd portion, add 3 drops of acidified potassium manganate (VII) solution.

|  |  |
| --- | --- |
| **Observation** | **Inference** |
| (1 Mark) | (1 Mark) |