**NAME…………………………………………………………………… CLASS……………..............**

**233/3 ADM. NO………………….**

**CHEMISTRY INDEX NO………………...**

**(PRACTICAL) SCHOOL…………………..**

**SEPTEMBER SIGN……………………….**

**DATE………………………**

**KASSU JET EXAMINATIONS 2021**

***Kenya Certificate of Secondary Education***

**CHEMISTRY PAPER 3**

**Instructions to candidates**

* 1. *Write your name, class, admission number, index number, signature and date in the spaces provided above.*
  2. *Answer ALL the questions in the spaces provided in the question paper.*
  3. *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.*
  4. *All working MUST be clearly shown where necessary.*
  5. *Mathematical tables and silent electronic calculators may be used.*
  6. *This paper contains 8 printed pages.*

**For Examiner’s Use Only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum Score** | **Candidate’s Score** |
| **1** | **23** |  |
| **2** | **10** |  |
| **3** | **07** |  |
| **Total Score** | **40** |  |

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|  |

**Examiner’s Initials**

1. You are provided with:-

* Solution **Q**, 2M Hydrochloric acid.
* Solution **P**, 0.15M Sodium thiosulphate
* Solution **R,** Sodium carbonate

**Procedure 1**

Measure 20cm3 of 0.15M Sodium thiosulphate (solution **P**) into a 250cm3 a conical flask. Place the beaker on a white piece of paper with **ink mark** ‘**X**’ on it. Measure 20cm3 of 2M hydrochloric acid solution **Q** using a 50cm3 measuring cylinder. Put the acid into the conical flask containing Sodium thiosulphate and immediately start off the stop watch. Determine the time taken for the **mark** ‘**X**’ to become invisible /obscured when viewed from above. Repeat the procedure by measuring different volumes of the acid and adding the volumes of the distilled water to complete Table I below.

**Table I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Volume of acid (cm3)** | **Volume of water (cm3)** | **Volume of sodium thiosulphate (cm3)** | **Time taken for mark ‘X’ to be invisible/obscured (seconds)** | **Reciprocal of time (sec-1)**  **1**  **t** |
| **20** | **0** | **20** |  |  |
| **18** | **2** | **20** |  |  |
| **16** | **4** | **20** |  |  |
| **14** | **6** | **20** |  |  |
| **12** | **8** | **20** |  |  |
| **10** | **10** | **20** |  |  |

1. Complete the table above (6 marks)
2. Plot a graph of 1/t (rate) against volume of acid used (3 marks)



1. Explain the shape of your graph (1 mark)

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1. From the graph determine
2. Time taken for the cross to be obscured/invisible when the volume of the acid is:

I) 15cm3  (1 mark)

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II) 8cm3 (1 mark)

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1. The volume of the acid used if the time taken for the cross to be obscured/invisible is:
2. 40 seconds (1 mark)

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1. 43 seconds (1 mark)

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**Procedure 2**

Using a 10 cm3 measuring cylinder, place 10 cm3 of solution Q into a 250 ml volumetric flask. Add about 200 cm3 of distilled water. Shake well. Add more distilled water to top up to the mark. Label this solution T. Fill the burette with solution T. Using a pipette and pipette filler, pipette 25 cm3 of solution R into a conical flask. Add 3 drops of Phenolphthalein indicator and titrate with solution T.

* Record your results in the table.
* Repeat the titration two more times and complete the table.

**Table 2**

|  |  |  |  |
| --- | --- | --- | --- |
|  | I | II | III |
| Final burette reading |  |  |  |
| Initial burette reading |  |  |  |
| Volume of solution T added |  |  |  |

(4 marks)

a) Determine the:-

(I) Average volume of solution T used. (1 mark)

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(II) Moles of the acid in the average volume of solution T used. (2 marks)

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(IV) Concentration of solution R in moles per litre. (2 marks)

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1. (a) Put a spatula end-full of solid A into a boiling tube and add about 10cm3 of distilled water. Shake the mixture well. Divide the resultant solution into 4 equal portions.

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

(b) (i) The solution is suspected to contain **ammonium ions**. Using **calcium** **hydroxide soli**d and **red litmus paper** provided, describe how you would confirm presence of the **ammonium ions**.

|  |  |
| --- | --- |
| **Description** | **Expected observations** |
| (1 mark) | (½ mark) |

(ii) Carry out the actual test as described in (b) (i) above.

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

(c) To the second portion, add 4 drops of hydrogen peroxide solution. Test the gas produced using a glowing splint.

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

(d) (i) The solution is also suspected to contain **sulphite ions**. Using **Barium** **nitrate solution** and **dilute hydrochloric acid** solution, describe how you would confirm presence of the **sulphite ions**.

|  |  |
| --- | --- |
| **Description** | **Expected observations** |
| (1 mark) | (1 mark) |

(ii) Carry out the actual test as described in (d) (i) above.

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

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

**Observation Inference**

(1 mark) (1 mark)

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

**Observation Inference**

(1/2 mark) (1/2 mark)

(I)To about 2cm3of the solution, add 2 drops of acidified potassium manganate (VII).

**Observation Inference**

(1 mark) (1 mark)

(II)To about 1cm3 of the solution, add 3 drops of acidified potassium dichromate (VI) and warm.

**Observation Inference**

(1/2 mark) (1/2 mark)

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

**Observation Inference**

(½ mark) (½ mark)

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