**NAME……………………………………………………….…… STREAM.:………………………...**

**ADM NO: .…..…………………………………………………… DATE: ……………………………....**

**233/3**

**CHEMISTRY**

**PAPER 3**

**NOV-DEC-2021**

**TIME: 2 ¼ HOURS**

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**CEKENAS END OF TERM TWO EXAM-2021**

**FORM FOUR EXAM**

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

233/3

Chemistry

Paper 3

2 ¼ hours

**INSTRUCTIONS TO CANDIDATES**

* *Write your* ***name*** *and* ***index number*** *in the spaces provided.*
* ***Sign*** *and write the* ***date*** *of examination in the spaces provided.*
* *Answer* ***all*** *the questions in the spaces provided in the question paper.*
* *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 you need.*
* *All working* ***must*** *be clearly shown where necessary.*
* *Mathematical tables and electronic calculators may be used.*

**For examiner’s use only**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum Score** | **Candidate’s Score** |
| **1** | **22** |  |
| **2** | **10** |  |
| **3** | **8** |  |
| **Total Score** | **40** |  |

***This paper consists of 8 printed pages.***

***Candidates should check the question paper to ascertain that all pages are printed as indicated.***

 ***And that no questions are missing.***

1. You are provided with following

* 5 pieces of magnesium ribbon each 1cm long
* 2M HCl
* A stop watch

 You are required to determine the time taken for magnesium ribbon to disappear completely.

 Procedure

1. Take 100ml beaker and place in it 10cm3 of 2M HCL solution using a burette.
2. Put a piece of magnesium ribbon into the beaker and note the time taken for the magnesium to disappear completely. Record your results in the table below.
3. Rinse the beaker & dry it, repeat the experiment using 9cm3 of the acid and 1cm3 of distilled water.
4. Carry out the experiments 3,4 and 5 using quantities shown on the table.

 Table of results (4 mks)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Experiment No. | 1 | 2 | 3 | 4 | 5 |
| Volume of 2M HCl | 10 | 9 | 8 | 7 | 6 |
| Valume of water  | 0 | 1 | 2 | 3 | 4 |
| Time in seconds |  |  |  |  |  |

 (b) Plot a graph of volume of hydrochloric acid against time in seconds. (3 mks)



 (c) From the graph determine ;

 (i) Time taken for magnesium to disappear completely in 7.5cm3 of acid. (1 mk)

 (ii) Volume of the acid in which magnesium takes 60 seconds to disappear. (1mk)

 (d) The total volume of solution remains constant for all experiments. Calculate the concentration of the equal acid in;

 (i) Experiment 2 (1 mk)

 (ii) Experiment 5 (1 mk)

 (e) From your answer (d) above, what is the effect of addition of water to the 2M acid, and how does that affect the rate of the reaction in this experiment. (2mks)

1. (b) You are provided with

* Solution R, A solution KMnO4 containing 0.05moles in 250cm3 of solution.
* Solution S made by dissolving 19.6g of FeSO4 (NH4)2)SO4.6H2Oin 1000cm3 of distilled water.
* 2M H2SO4

 You are required to;

 -Determine the ratio of moles of R to the moles of S.

 -Write a balanced ionic equation that occur.

 Procedure.

1. Pipette 25cm3 of solution S into a clean 250ml conical flask. Using a measuring cylinder, add 5cm3 of 2M H2SO4 to solution S in the conical flask.
2. Titrate with solution R from the burette until a permanent colour appears. Repeat the procedure two more times and record your results in table below.

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

 (4mks)

 (a) Calculate the average volume of a solution R used. (1mk)

 (b) Determine the number of moles of solution S used. RFM of S=392 (2mks)

 (c) Determine the number of moles of R used. (1 mk)

 (d) Determine the ratio of R to S. (½ mk)

 (c) Balance the ionic equation below for the reaction between KMnO4 and FeSO4 (NH4)2SO4.6H2O. (½mk)

 Fe2+(aq) + MnO4-(aq) +H+(aq) 🡺 Mn2+(aq) +Fe3+(aq) +H2O(l) (½ mk)

2. You are provided with Solid M. Carry out the teats below. Record your observations and inferences in the spaces provided.

 (a) Put solid M in a boiling tube, add 6cm3 of distilled water and shake.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
|  ( 1mk) | (1mk)  |

 (b) Dive the solution into 5 portions.

 (i) To the first portion add sodium hydroxide drop wise until in excess.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
|  ( ½mk) | (½mk)  |

 (ii) To the second portion of solution M add 5cm3 of sodium sulphate solution provided.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
|  ( 1mk) | (1mk)  |

 (iii) Clean one end of a glass rod thoroughly. Dip the ocean end in to the third portion of solution M and place it on the non-luminous flame part. Note the colour of the frame.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
|  ( ½mk) | (½mk)  |

 (iv) To the forth portion of Solution M, add 3 drop of Barium Chloride solution, followed by 1cm3 of hydrochloric acid.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
|  ( 1mk) | (1mk)  |

 (v) To the 5th portion of solution M, add three drops of acidified potassium dichromate (VI) solution.

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
|  ( 1mk) | (1mk)  |

3. You are provided with Solid P which is suspected to be maleic acid. Using the description below.

(a) (i)Describe a chemical test to show that maleic is a weakly acid.

|  |  |
| --- | --- |
| **Test** | **Expected observation** |
|  ( 1½mk) | (½mk)  |

 (ii) Carry out the test in a(ii) above

|  |  |
| --- | --- |
| **Test** | **inference** |
| ( 1mk) | (1mk)  |

(b) (i) Describe a test to show that maleic acid is unsaturated.

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

 (ii) Carry out the test in b(i) above

|  |  |
| --- | --- |
| **Test** | **Inferences** |
|  ( 1mk) | (1mk)  |

**CEKENAS**

**FORM FOUR EXAMINATION**

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

**233/1**

**CHEMISTRY**

**PAPER 1**

**(PRACTICAL)**

**Nov-Dec-2021**

**MARKING SCHEME**

Table of results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Experiment No. | 1 | 2 | 3 | 4 | 5 |
| Volume of 2M HCl | 10 | 9 | 8 | 7 | 6 |
| Valume of water  | 0 | 1 | 2 | 3 | 4 |
| Time in seconds | 40 | 50 | 75 | 100 | 120 |

 Complete table - 1mark

 Decimal - 1mark

 Accuracy 2 sec- 1 mark

 Trend (continuous increase in time in seconds) 1 mark

 4 mks

 (b) Graph (3 mks)

 -Labelling a-axis ½mark

 -Scale ½mark

 -Plotting -5-6 points 1 mark

 - 4-5 points ½mark

 0-3 points 0 mark

 -Curve 1 mark

 3 mks

 (c) 84 sec 2 sec ½ (students reading)

 Showing on the graph ½

 (ii) 8.85cm ½ (students reading)

 Showing on the graph½

 (d) (i)  (1mk)

 (ii)  (1 mk)

 (e) Addition of water dilutes the acid  reducing its concentration hence fewer molecules reacting hence the rate of reaction reduces with increase in dilution of the acid.  (2mks)

1. (b)

 Table of titration

|  |  |  |
| --- | --- | --- |
| I | II | III |
| Final burette reading (cm3) | 5.0 | 5.0 | 5.0 |
| Initial burette reading (cm3) | 0.0 | 0.0 | 0.0 |
| Volume of solution R used(cm3) | 5.0 | 5.0 | 5.0 |

 Complete table 1mark

 Decimal 1 mark

 Accuracy 1mark

 Principal of averaging 1mark

 final accuracy 1mark

 5marks

 (a) Average = 

 (b) Number of moles of solution S (R.F.M S = 392)

 ½½ 0.05 🡺 25½

 1000 = 0.00125moles½

 (c) Number of moles of k used

 0.05🡺 250½

 Average titre Correct answer ½

 (d) Ratio of R:S

 Correct ans in c above ½ = correct ratio

 0.00125 moles 1:5 (½ mk)

 (e) 5Fe2+(aq) + MnO4-(aq) +8H+(aq) 🡺 Mn2+(aq) +5Fe3+(aq) +4H2O(l) (½ mk)

2. (a)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| Dissolves to form ½ colourless solution ½ ( ½mk) | soluble salt 1(1mk)  |

 (b) (i)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| No white precipitate  ( ½mk) | Zn2+, Ca2+, Mg2+, Pb2+ Al3+ absent (½mk)  |

 (ii)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| No white precipitate  ( 1mk) | Ca2+ , Pb2+ , Ba2+ absent (1mk)  |

 (iii)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| Yellow flame ½ ( ½mk) | Na+Present (½mk)  |

 (iv)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| White ppt ½ dissolves in acid with effervescence ½ ( 1mk) | CO2-3 , SO32- present (1mk)  |

 (v)

|  |  |
| --- | --- |
| **Observation** | **Inferences** |
| Orange K2Cr2O7 turns green  ( 1mk) | SO32- present (1mk)  |

 Total 10 mks

3. (a) (i)

|  |  |
| --- | --- |
| **Test**  | **Expected observation** |
| Dissolve½ the solid in distilled water and dip universal indicator paper ½ into a portion of the solution, match the colour of the indicator with the pH chart ½ | pH 4/5 ½  |

 (ii)

|  |  |
| --- | --- |
| **Test**  | **inference** |
| pH 1/2/31 | Strongly acidic 1  |

(b) (i)

|  |  |
| --- | --- |
| **Test**  | **Expected observation** |
| To a portion of the solution obtained in (a) add H+/ KMnO4 and warm | Purple H+ / KMnO4 changes to colourless 1 |

 (ii)

|  |  |
| --- | --- |
| **Test**  | **Expected observation** |
| Purple H+ / KMnO4 changes to colourless ü1 | R-OH present  |

 Total 8 marks