**SUNRISE ONE TERM 1 EXAMINATION -2023**

***Kenya certificate of Secondary Education***

***FORM 4***

**233/3**

**CHEMISTRY**

**PAPER 3**

**NAME:………………………………………………………………………….ADM NO:………………………..**

**CLASS: ……………………………………………………………CANDIDATE’S SIGNATURE:…….............**

**DATE: …………………**

**233/3**

**CHEMISTRY**

**PAPER 3**

**(PRACTICAL)**

**APRIL-2023**

**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 2 ¼ hours allowed for this paper.*

*-This time is to enable you to read the question paper and make sure you have all apparatus and chemicals that you may need.*

*-All working must be clearly shown, mathematical and electronic calculators may be used.*

**FOR EXAMINER’S USE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **1** | **21** |  |
| **2** | **11** |  |
| **3** | **08** |  |
| **TOTAL** | **40** |  |

***This paper consists of 7 printed pages Check the Question paper to ensure that all pages are printed as indicated and no question are missing.***

1. **You are provided with:**

-Solid A 2.0g of dibasic acid, H2X.

-Solution B, 0.5M solution of dibasic acid, H2X.

-Solution C, Sodium hydroxide solution

-Solution D, 0.02M acidified Potassium Manganate (VII) solution.

**You are required to determine:**

a) The heat of reaction of solid A, H2X with sodium hydroxide.

b) The number of moles of solution E that reacts with 2 moles of acidified potassium manganate (VII) solution.

**Procedure 1 (a)**

Place 40cm3 of distilled water into 100ml beaker. Measure the initial temperature of water and record in the table 1 below. Add all the solid A provided at once. Stir the mixture carefully with the thermometer until **ALL** the solid dissolves. Measure the final temperature and record in table 1.

**TABLE 1**

|  |  |
| --- | --- |
| Final temperature (o C) |  |
| Initial temperature( 0C) |  |

 (1 mk)

1. Determine the change in temperature T. (1 mk)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the
2. Heat change when H2X dissolves in water. (Assume the heat capacity of solution is 4.2J/g/0C and density of the solution is 1 g/cm3). (1 mk)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

ii) The molar heat of solution, H1 solution of the acid H2X. (Molar mass of acid H2X is 126g) (2 mks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

…………………………………………………………………………………………………

**Procedure 1 (b)**

Place 40cm3 of solution B into 100ml beaker. Measure the initial temperature and record in table II below. Measure 40cm3 of sodium hydroxide solution C. Add all the 40cm3 of solution at once to solution. Stir the mixture carefully with thermometer. Measure the final temperature reached and record in table II. (Keep remaining solution n B to use in procedure II)

**Table II**

|  |  |
| --- | --- |
| Final temperature(oC) |  |
| Initial temperature( 0C) |  |

 (1 mk)

1. Determine the change in temperature, T. (1 mk)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the
2. Heat change for the reaction. (Assuming the heat capacity of the solution is 4.2J/g/0C and density of the solution is 1g/cm3) (1 mk)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Heat for the reaction of one mole of the acid H2X with sodium hydroxide, H2.

 (2 mks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Given that H2X(s) + 2OH-(aq)2H2O(l) + X2- (aq)

Determine H3 using an energy circle diagram.(2 mks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

**Procedure II**

Measure exactly 15cm3 of solution B and put in 250ml volumetric flask. Add water as you shake up to the mark. Label as solution E. Using a pipette, pipette 25cm3 of solution E and place in a conical flask. Warm solution E to boiling. Fill the burette with solution D and titrate with hot solution E. Stop just when a permanent change in color appears. Record your results in table III below. Repeat the procedure to complete table III below.

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

 (4 mks)

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

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the number moles of solution D reacting. (1 mk)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the number of moles of solution E used. (1 mk)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the number of moles of E which react with 2 moles potassium Manganate (VII). (2 mks)

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

2. a) You are provided with solution F in a conical flask. Carry out the following test and record your observations and inferences in the spaces provided.

i) Add 20cm3 of 2M sodium hydroxide solution to solution F in the flask; shake well. filter the mixture in a clean boiling tube. Retain the filtrate and the residue.

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

1. Place about 2cm3 of the filtrate in a test tube. Add 2M nitric (v) acid drop wise until in excess. Retain the mixture.

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

1. Divide the mixture in (ii) above into two portions. To one portion add 2M sodium hydroxide solution drop wise until in excess.

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

1. To portion two, add 2M ammonia solution drop wise until in excess.

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

1. Place about 2cm3 of filtrate in a test tube. Add 3 drops of barium chloride solution.

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

1. To the residue add about 5cm3 of 2M nitric (v) acid a and filter into a test tube. Place about 2cm3 of this filtrate in a test tube. Add 2M ammonia solution drop wise until in excess.

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

b) You are provided with solid G. Carry out the tests below and record your observations and inferences in the spaces provided.

1. Using a metallic spatula heat half spatula end full of solid G in a non-luminous flame. Remove it when it ignites.

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

1. Put the remaining solid G in a boiling tube. Add about 5cm3 of distilled water and shake vigorously. (Keep the content for the next test)

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

1. Divide the resulting solution into two portions. To the first portion add two drops of acidified potassium Manganate (VII) solution and shake vigorously.

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

1. Test pH of the second portion using pH indicator paper.

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