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

**SCHOOL: ……………………………..………………… SIGNATURE……………………… ADM NO………………….…**

**233/3**

**CHEMISTRY**

**FORM THREE**

**PAPER 3 / PRACTICAL**

**2¼ HOURS**

**TOP SCHOOLS MULTILATERAL END OF YEAR JOINT EXAMS 2023.**

**INSTRUCTIONS TO CANDIDATES**

* *Answer all questions in the spaces provided on the question paper*
* *You are not allowed to start working with the apparatus for the 1stfifteen minutes of the time allowed for this paper.This time is to enable you read through the question paper and make sure you have all the chemicals and the apparatus that you may need.*
* *All working must be clearly shown where necessary.*
* *Mathematical tables and electronic calculators may be used*

**For Examiners Use Only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s Score** |
| 1 | 20 |  |
| 2 | 11 |  |
| 3 | 09 |  |
| **Total** | 40 |  |

**QUESTION 1** (**20 MARKS)**

You are provided with:

* Solution H which is potassium manganate (VII) solution.
* Solution X which is dilute solution of hydrogen peroxide.
* Solution N which is 0.02M ammonium iron (II) sulphate solution.

You are required to:

1. Standardize solution H using solution N.
2. Use the standardized solution H to determine the concentration of solution X.

**Procedure 1**

1. Fill the burette with solution H.
2. Pipette 25cm3 of solution N and transfer it into a conical flask.
3. Titrate solution N against solution H until a permanent pink colour just appears.
4. Record the results in table 1 below.
5. Repeat the titration two more times to complete the table.
6. **Table 1**

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

 (3mks)

1. Determine the average volume of solution H used. (1mk)
2. Calculate;
3. The number of moles of solution N in 25cm3. (2mks)
4. The number of moles of solution H that reacted given the equation for the reaction is (2mks)

MnO4-(aq) + 5Fe2+(aq)+ 8H+(aq) Mn2+(aq) + 5 Fe3+(aq) + 4H2O(l)

1. The concentration of H in moles per litre. (2mks)

**Procedure II**

1. Fill the burette with solution H.
2. Using a clean pipette, place 25cm3 of solution X into a conical flask.
3. Add 10cm3 of 1Msulphuric acid and shake well.
4. Titrate using solution H until a permanent pink colour just appears.
5. Record the reading in table II below.
6. Repeat the titration two more times to complete the table.
7. **Table II**

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

(3mks)

1. Determine the average volume of solution H used. (1mk)
2. Calculate;
3. The number of moles of solution H used. (2mks)
4. The number of moles of solution X in 25cm3 if the equation for the reaction is; (2mks)

2MnO42-(aq) + 6H+(aq) + 5H2O2(l)  2Mn2+(aq) + 8H2O(l) + 5O2(g)

1. The concentration of solution X in moles per litre. (2mks)

**QUESTION 2**  (**11 MARKS)**

You are provided with the following;

* Solid Y
* Sodium chloride solution
* Potassium chloride solution
* Calcium chloride solution

You are required to identify the cations present in solid Y.

**The following notes will assist in making the correct observations and inferences.**

 Cations are positively charged ions, majority of which are metal ions. Cations can be tested using one or a combination of the following methods;

1. Flame tests
* Some cations burn with flames that have distinct colours.
1. Carrying out precipitation reactions using the following;
2. Sodium hydroxide
3. Aqueous ammonia
4. Anions such as CO32-, SO42-, Cl- and SO32-

Precipitates are formed as a result of formation of insoluble salts or metal hydroxides. The colour of the precipitate should be noted down when writing the observations. Incase a white precipitate is expected and not observed, then one should record that there is no white precipitate but NOT no observation.

It is important to note that hydroxide of zinc, lead and aluminium are amphoteric thus can react with sodium hydroxide which is alkaline. Another thing to note is that zinc hydroxide and copper (II) hydroxide dissolve in excess aqueous ammonia due to formation of complex ions.

**Procedure**

 Carry out the tests below and record your observations and inferences in the spaces provided.

1. Place all of the solid Y provided in a boiling tube. Add about 10cm3 of distilled water and shake well. Use about 2cm3 of the resulting solution to carry out tests (i)to (iii) below. Reserve the remaining portion for test (b).

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

1. To

i)To the first portion, add aqueous sodium hydroxide dropwise until in excess.

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

1. To the second portion, add aqueous ammonia dropwise until in excess.

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

1. To the third portion, add about 1cm3 sodium chloride solution.

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

1. **Procedure**

Clean a glass rod and rinse it with distilled water. Dry the glass rod on a Bunsen burner flame. Allow it to cool. Dip it in a little sodium chloride solution and burn it strongly with a non-luminous Bunsen burner flame. Note the colour of the flame and record it in table III below. Clean the spatula thoroughly and repeat the procedure using each of the other solutions and complete table III.

1. **Table III**

|  |  |
| --- | --- |
| **Solution**  | **Colour of flame** |
| Sodium chloride |  |
| Potassium chloride |  |
| Calcium chloride  |  |
| Solution Y |  |

(2mks)

1. From table III, suggest the cation that could be present in solid Y\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1mk)

**QUESTION 3**  (**9 MARKS)**

 You are provided with solid F.

**Procedure**

Carry out the tests below using solid F. write the observations and inferences in the spaces provided.

1. Place all solid F in a dry boiling tube. Add about 15cm3 of distilled water and shake thoroughly. Use 2cm3 portions of the solution for tests (b) to (e) below.

|  |  |
| --- | --- |
| **Observations** | **Inferences**  |
| (1/2mk) | (1/2mk) |

1. To the first portion add two drops of universal indicator and record the color and PH.

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

1. To the second portion add a spatula and full of sodium carbonate.

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

1. To the third portion add two drops of bromine water.

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

1. To the fourth add three drops of acidified potassium manganate (VII)

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