**Name …………………………………………………………………………………………….….. Index No. ………………………………..**

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

 **Class: …….**

**STAREHE BOYS’ CENTRE & SCHOOL**

**MOCK EXAMINATION 2015**

**CHEMISTRY PRACTICAL**

**233/3 PAPER 3**

**TIME: 21/4 hours**

**Instructions**

* You are not allowed to start working with the apparatus for the first 15 minutes of the 2 hours allowed for this paper. This time will enable you read through the question paper and make sure have all the chemicals.
* Answer **ALL** questions in the spaces provided.
* Mathematical Tables and Electronic calculators may be used.
* All working **MUST** be clearly shown where necessary.

**For examiners use only**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum Score** | **Candidate’s Score** |
| **1** | **11** |  |
| **2** | **11** |  |
| **3** | **18** |  |
| **TOTAL** | **40** |  |

**Note: This paper consists of 7 printed pages. Candidate’s should check the question paper to ensure that all pages are printed as indicated and no questions are missing.**

***Turn over***

Q1. You are provided with:

 Solution P: Iron (II) ammonium Sulphate crystals

 FeSO4·(NH4)2SO4·xH2O containing 9.8 g in 250 cm3 of solution

 Solution Q: 0.02 M of acidified Potassium manganate (VII)

 You are required to:

* Determine the Relative Formula Mass of FeSO4·(NH4)2SO4·xH2O.
* Determine the value of x in FeSO4·(NH4)2SO4·xH2O

**Procedure I**

 i) Fill a clean burette with solution Q.

 Record the initial burette reading in the Table I below.

 ii) Pipette 25.0 cm3 of solution P into a clean conical flask and titrate it with solution Q from

the burette. Stop titrating when the solution in the conical flask JUST turns pink.

 iii) Record your results in Table I below.

 iv) Repeat the above procedure two more times and record your results in Table I below.

 a) Table I

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | 1 | 2 | 3 |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of solution Q used (cm3) |  |  |  |

 {3 marks}

 Complete the table above by filling volume of solution Q used.

 b) Calculate the average volume of solution Q used. {1 mark}

 (Show clearly your working)

 c) Calculate the number of moles of solution Q that reacted. {1 mark}

 d) Given that the ionic equation for the reaction is:

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

 i) Determine the number of moles of the Iron (II) salt solution P in 25.0 cm3 of the solution

used. {1 mark}

 ii) Determine the molarity of the Iron (II) salt solution P. {1 mark}

 iii) Calculate the concentration of the Iron (II) salt solution P in grams per litre. {1 mark}

 e) Determine the Relative Formula Mass of the salt FeSO4·(NH4)2SO4·xH2O . {1 mark}

 f) Given that, Fe = 56, N = 14, S = 32, O = 16, determine the value of x in the formula

 FeSO4·(NH4)2SO4·xH2O {2 marks}

Q2. You are provided with:

 Solution R: I M solution of an unknown acid.

 Solution T: I M solution of Sodium hydroxide.

 You are required to:

* Determine the basicity of the unknown acid solution R.
* Find the heat of neutralization, ∆H of Sodium hydroxide, solution T.

Procedure II

 i) Using a 50 ml measuring cylinder measure 40 cm3 of solution R into a 100 ml plastic beaker.

 ii) Measure the steady temperature, T1 of solution R and record in Table II below.

 iii) With a clean 100 ml measuring cylinder, measure 5 cm3 of solution T.

 iv) Pour this solution T into the 100 ml beaker containing 40 cm3 of solution R. Stirring gently

with a thermometer, measure the highest temperature, T2 of the mixture and record in Table II below.

 v) **Rinse** the measuring cylinders, thermometer and the 100 ml plastic beaker.

 vi) Repeat the procedure above using the volumes of solution R and solution T as indicated in

Table II below. Remember to **rinse the apparatus after each experiment**.

Table II

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Experiment number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Volume of solution R (cm3) | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 |
| Volume of solution T (cm3) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
| Final temp. T2 (oC) |  |  |  |  |  |  |  |  |
| Initial temp. T1 (oC) |  |  |  |  |  |  |  |  |
| Temp. change ∆T (oC) |  |  |  |  |  |  |  |  |

 a) i) Complete the Table II by filling the temperature change. {4 marks}

 ii) On the provided graph paper, plot a graph of Temperature change, ∆T against the volume

of solution T used. {2 marks}

 iii) What is the maximum rise in temperature? {1 mark}

 iv) Using information from the graph, calculate the number of moles of the unknown acid,

solution R needed to produce the temperature change above. {1 mark}

 v) Using the graph, determine the number of moles of Sodium hydroxide needed for complete

neutralization of the acid. {1 mark}

 vi) Calculate the number of moles of H+ ions per mole of acid. {1 mark}

 (Basicity of the acid)

 vii) Using the experimental results, calculate the molar heat of neutralization of Sodium

hydroxide. {1 mark}

 (Specific heat capacity of water = 4.2 kJ/Kg/K. Assume density of solution = 1 g/cm3)

Q3. You are provided with:

* 0.5 g solid V
* 0.5 solid W

You are required to carry out the tests below to identify solid V and solid W.

Record your observations and inferences in the spaces provided.

 a) i) Put all solid V provided into a clean test-tube. Add about 5 cm3 of dilute 2 M Nitric (V) acid

and warm briefly. Filter the mixture in a test-tube and **retain** the filtrate.

|  |  |
| --- | --- |
| Observations | Inferences |
| {1 mark} |  |

 ii) Divide the filtrate obtained in a(i) above into two portions.

 To the first portion add about 3 – 4 drops of aqueous 2 M Sodium hydroxide solution

 followed by excess.

|  |  |
| --- | --- |
| Observations | Inferences |
| {2 marks} | {1 mark} |

 iii) To the second portion add about 3 – 4 drops of aqueous 2 M Ammonia solution followed by

 excess.

|  |  |
| --- | --- |
| Observations | Inferences |
| {2 marks} | {2 marks} |

 b) i) Put all solid W into a clean test-tube. Add about 5 cm3 of dilute nitric (V) acid. Test for any

gas produced. **Retain** the sample in the test-tube.

|  |  |
| --- | --- |
| Observations | Inferences |
| {2 marks} | {1 mark} |

 ii) Divide the sample obtained in b(i) above into two portions.

 To the first portion, add a few drops of aqueous 2 M Sodium hydroxide solution followed by

excess.

|  |  |
| --- | --- |
| Observations | Inferences |
| {2 marks} | {1 mark} |

 iii) To the second portion, add a few drops of aqueous 2 M Ammonia solution followed by

excess.

|  |  |
| --- | --- |
| Observations | Inferences |
| {1 mark} | {1 mark} |

 c) Give the chemical formula of:

 i) the anion present in solid W. {1 mark}

 ii) the cation present in: I) solid V …………………………………. {½ mark}

 ii) solid W ………………………………… {½ mark}