NAME ----------------------------------------------------------------- INDEX NO ------------------------

CANDIDATE’S SIGNATURE ------------------------------ ADM NO. -------------------------------

233/3

Chemistry

Paper3

Practical

Time: 2 ¼ hours

**Kenya certificate of secondary education.**

**Chemistry**

**Paper 3**

**2 ¼ hours**

**INSTRUCTIONS TO THE CANDIDATES**

1. Write your name and index number in the spaces provide above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer all questions in the spaces provided in the question paper.
4. You are not allowed to start working with the apparatus for the first 15 minutes of the 21/4 hours allowed for this paper. This time enable you to read the questions paper and make sure you have all the chemical and apparatus that you may need.
5. Mathematical tables and silent electronic calculators may be used.
6. All working must be clearly shown here necessary
7. This paper consists of 6 printed pages
8. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For examiners use only

|  |  |  |
| --- | --- | --- |
| Question | Maximum score | Candidates score |
| 1 | 11 |  |
| 2 | 15 |  |
| 3 | 14 |  |
| 4 | 12 |  |
| Total score | 40 |  |

1. You are provided with:

* Solution X containing 0.2 moles of hydrochloric acid in a litre of solution.
* Solution Y containing 4.8 g of a basic compound Na2B4O7. NH2O in 250ml of solution

You are required to determine the value of n in the formula of the compound.

**Procedure I.**

1. Place solution X in a burette and pipette 25cm3 of solution Y into a 250 ml conical flask and then titrate using methly orange indicator.

Record your results in the table below and repeat the nitrate the titration to achieve consistent results. (4 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| TITRES | 1ST | 2ND | 3RD |
| Final burette readings (cm3) |  |  |  |
| Initial burettes readings (cm3) |  |  |  |
| Volume of solution X used (cm3) |  |  |  |

Work out the average volume of solution x used. (1 mark)

1. Given that the ionic equation for the reaction is

B4O72-(aq) + 2H+(aq) + 5H2O(l) 4H3BO3(aq)

1. Calculate the concentration of Y in moles per dm3. (3 marks)
2. Calculate the relative formular mass of the basic compound. (2 marks)
3. Determine the value of N in the formular NA2 B4 O7. N H2O. (1 marks)

(B = 10.8, H = 1.0, Na= 23.0,) = 16.0

1. With the help of measuring cylinder measure 30cm3 of the 2M NaOH (solution B) and place it into a 100ml beaker.
2. Measure the temperature of the solution with the help of the thermometer provided and record in the table below.
3. Add sulphur (Vi) acid (solution A) into the beaker from a burette at intervals of 5 cm3 while stirring and each time recording the temperature o f the solution and complete the table below.
4. Table of results

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Total volume of acid added (cm3) | 0 | 5 | 10 | 15 | 20 | 25 | 20 | 235 | 40 |
| Temp. of solution ° C. |  |  |  |  |  |  |  |  |  |

1. Plot a graph of the temperature against volume of acid solution (3 marks)
2. Determine the maximum temperature of the solution (2 marks)
3. Determine from the graph the volume of acid needed for complete neutralization in this reaction (2 marks)
4. Determine the total volume of solution mixture when the neutralization just occurs and hence determine the heat evolved by the reaction. (density of solution = 1 g/cm3. Specific heat capacity of solution = 4.2Jg -1 K – 1) (3 marks)
5. Determine the molar heat of neutralization using the values obtained in the experiment. (2 marks)

1. Using the value obtained in (a) (iii) and any other relevant information provide, determine the molar concentration of the acid. (1 mark)
2. I) A) You are provided with solid Q to carry out the tests below. Place solid Q in a boiling tube and about 10cm3 of distilled water while shaking. Filter the mixture and divide the filtrate into four portions. Keep the residue for part (b) below.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1 marks) | (1/2 mark) |

1. To the first portions, add sodium hydroxide drop by drop till in excess.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1/2 marks) | (1/2 mark) |

1. To the second portion, add a few drops of lead (II) nitrate solution.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1/2 marks) | (1 mark) |

1. To the third portion, add a few drops of nitric (v) acid.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1/2 marks) | (1/2 mark) |

b) Place the residue obtained in (a) above in a boiling tube and ad dilute nitric (V) acid little by little while shaking until the solid JUST dissolves.

Divide the solution into three portions.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1/2 marks) | (1/2 mark) |

1. To the first portion add sodium hydroxide drop wise till in excess.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1/2 marks) | (1/2 mark) |

1. To the second portion add a few drops of dilute sulphuric (VI) acid

|  |  |
| --- | --- |
| Observations | Deduction |
| (1/2 marks) | (1/2 mark) |

1. II) You are provided with solid P.

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

1. Using a metallic spatula, take one- third of solid F and ignite it using a Bunsen burner flame.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1 marks) | (1 mark) |

1. Place the remaining solid F in a boiling tube. Add about 10cm3 of distilled water. Shake the mixture until all the dissolved. Divide the solution into two for (i) & (ii) below.
2. T about 4 cm3 of the solution, add 2 to 3 drops of acidified potassium manganese (VII), solution B.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1 marks) | (1 mark) |

1. Place half the solution in (b) above in a test –tube and add some NaHCO3 provided.

|  |  |
| --- | --- |
| Observations | Deductions |
| (1 marks) | (1 mark) |