**Name…………………………………… …………………………. .IndexNo:…………………………………………**

**School ………………………………………………………… Candidate’s Signature …………..……………….**

**233/3 Date: ………………………………………….**

**CHEMISTRY**

**PAPER 3 (PRACTICAL)**

**TIME: 2 ¼ HOURS**

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

**Chemistry**

**Paper 3(PRACTICAL)**

**Time: 2 ¼ Hours**

**INSTRUCTIONS TO CANDIDATES**

* *Write your* ***name****,* ***index******number****,* ***Sign*** *and* ***date****.*
* *Answer* ***all*** *the* ***Q****uestions 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* ***Q****uestion 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.*
* ***This paper consists of 7 printed pages.***
* ***Candidates should check to ascertain that all pages are printed as indicated and that no Questions are missing.***

**For Examiner’s Use Only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum Score** | **Candidate’s Score** |
| **1** | **21** |  |
| **2** | **12** |  |
| **3** | **07** |  |
| **Total** | **40** |  |

1. You are provided with:

* Solution P: 0.1Mhydrochloric acid
* Solution Q: Aqueous sodium carbonate
* Phenolphthalein: indicator
* Methyl orange indicator.

You are required to standardize sodium carbonate solution Q. Fill the burette with solution P, Pipette 25cm3 of solution Q into a conical flask. Add 2-3 0f phenolphthalein indicator and titrate with solution P. Do not pour out the contents of the conical flask. Record your readings in table1 below. Add 2-3 drops of methyl orange indicator to the content in the conical flask and continue titrating with solution P. Record your readings in table **II** below. Repeat the procedure and complete table **I** and **II**.

Table **I** (using phenolphthalein indicator)

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

(4mks)

Determine the average volume of solution P used (V1). Show your workings (1mark)

Table **II** (using methyl orange indicator)

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

(4marks)

Determine the average volume of solution **P** used (V2) . Show your workings (1mark)

1. Find the total volume of solution P used. V1+V2= (1mark)
2. Write down chemical equation for the reaction (1mark)
3. Calculate the:

(i)Number of moles of hydrochloric acid in the total volume of solution P used. (1mark)

(ii) the number of moles of sodium carbonate in 25cm3 of solution Q (2marks)

(iii)Concentration of sodium carbonate in mole per litre (2marks)

(iv) Concentration of sodium carbonate in grams per litre (Na=23.0, C=120, O=16) (2marks)

1. **You are provided with:**

* **3g of ammonium nitrate labeled solid F**
* **Distilled water**
* **Plastic beaker (1000ml)**
* **Thermometer**
* **50cm3 measuring cylinder**

***You are required to determine enthalpy of solution of ammonium nitrate.***

**PROCEDURE**

Using 50cm3 measuring cylinder, measure 50cm3 of distilled water into 100ml plastic beaker, stir the water gently with a thermometer and note its initial temperature and record it in the table below. Add 3g of ammonium nitrate into water in the plastic beaker. Stir gently using the thermometer and note the lowest attained in the reaction and record it in the table below.

|  |  |
| --- | --- |
| Final temperature of solution T2 (0c) |  |
| Initial temperature of water , T1 (0c) |  |
| Change in temperature T (0c) |  |

(3marks)

(a) Calculate the number of moles of ammonium nitrate, solution F. (N=14, H=1.0, O=16 ) (2marks)

(b) Calculate the heat absorbed in this reaction (specific heat capacity=4.2 Jg-1k-1) (2marks)

(c) Calculate the molar enthalpy of solution of ammonium nitrate. (2marks)

(d) Draw the energy level diagram for the reaction. (2marks)

3. You are provided with solid E. carry out the test below and record your observations and inferences in the spaces provided.

Divide solid **E** into **two** halves

1. Place one half of solid E in a clean dry test tube. Heat it gently then strongly. (2marks)

Observations Inferences

(2marks) (1mark)

1. Place the other half of solid E in a boiling tube, add 10cm3 of distilled water and shake well until all the solid dissolves.

(i) Place about 1cm3 of solution, add 2**M** sodium hydroxide drop wise until in excess. (2marks)

Observations Inferences

(1mark) (1mark)

(ii) Place 1cm3 of the solution in a test-tube and add 2-3 drops of 2M sulphuric acid. (2marks)

Observations Inferences

(1mark) (1mark)

(iii) Place about 1cm3 of the solution, add 4-5 drops of 2M lead (II) nitrate solution and heat to boiling (2marks)

Observations Inferences

(2mark) (1mark)