Name…… School ……

Admission number---------- Class----------

Stream…… Signature----------

233/3

CHEMISTRY

Paper 3

PRACTICAL

2 hours 15 minutes

SUKELLEMO

CHEMISTRY PAPER 3

Instructions to candidates

- 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 time allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and the apparatus that you may need.
- Mathematical tables and silent calculators may be used.
- All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Question	Maximum Score	Candidate's score
1	23	
2	09	
3	08	
Total		

Question One

You are provided with

- Aqueous sulphuric VI acid labelled **solution A**
- **Solution B** containing 8.0 g per litre of sodium carbonate
- An aqueous solution of substance C, labelled **solution C**

You are required to determine the:

- Concentration of solution A
- Enthalpy of reaction between sulphuric VI acid and substance C

PROCEDURE

A. Using a pipette and a pipette filler, place 25.0 cm^3 of **solution A** into a 250ml volumetric flask. Add distilled water to make 250cm^3 of solution. Label this **solution D**. Fill the burette with solution D. Clean the pipette and use it to place 25cm^3 of **solution B** into a conical flask, then add 2 drops of methyl orange indicator provided and then titrate with solution D. Record your results in **table 1.** Repeat the titration 2 more times and complete the table.

Table 1

	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution D used (cm^3)			

(3 marks)

Calculate the:

a). Average volume of solution D used. (1 mark)

b). Concentration of sodium carbonate in solution B. (Na = 23, O =16, C=12).

(1mark)

c). Concentration of sulphuric VI acid in solution D. (2 marks)

d). concentration of sulphuric VI acid in solution A (2 marks)

B. Label six test tubes as 1,2,3,4,5 and 6. Empty the burette, clean and fill it with **solution A.** From the burette, place 2cm^3 of solution A into test tube number 1, from the same burette place 4cm^3 of solution A into test tube number 2. Repeat the process for test tube numbers 3,4,5 and 6 as shown in table 2. Clean the burette and fill it with **solution C.** From the burette, place 14 cm^3 of solution C into a boiling tube. Measure the initial temperature of solution C and record it in **table 2.** Add contents of test tube number 1 to the boiling tube containing solution C. Stir the mixture with the thermometer. Note and record the highest temperature reached in table 2. Repeat the process with the other volumes of solution C given in **table 2** and complete the table

Table 2

Test tube number	1	2	3	4	5	6
Volume of solution **A** (cm^3)	**2**	**4**	**6**	**8**	**10**	**12**
Volume of solution **C** (cm^3)	**14**	**12**	**10**	**8**	**6**	**4**
Initial temperature of solution **C** (^{0} C).						
Highest temperature of mixture (^{0} C).						
Change in temperature ΔT (^{0} C)						

(6 marks)

i. On the grid provided, draw a graph of ΔT (vertical axis) against volume of solution A used.

(3marks)

ii. From the graph, determine:

a). The maximum change in temperature (1 mark)

b). The volume of solution A required to give the maximum change in temperature.

(1 mark)

iii. Calculate the :

a). Number of moles of sulphuric VI acid required to give the maximum change in temperature. (1 mark)

b). Molar enthalpy of reaction between sulphuric VI acid and substance C , in kiloJoules per mole of sulphuric VI acid used.

(Assume the specific heat capacity of the solution is 4.2 J/g/K and density of the solution is 1g/cm^3) (2 marks)

Question Two.

You are provided with **solid Y.** Carry out the following tests and write observations and inferences in the spaces provided.

a). Place about one half of solid Y in a dry test tube and heat it strongly. Test any gas produced using blue and red litmus papers.

Observations	**Inference.**
1 mark	1 mark

b). Place the rest of solid Y in a boiling tube. Add about 10cm^3 of distilled water. Shake well and use 2cm^3 portions for each of the tests below.

To one portion add aqueous ammonia dropwise until excess.

Observations	**Inferences**
1 mark	1 mark

ii). To the second portion add 1cm^3 of hydrochloric acid

Observations	**Inference**
1 mark	2 marks

iii). To the third portion, add two drops of lead (II) nitrate and heat the mixture to boiling.

Observations	**Inference**
1 mark	1 mark

Question Three

You are provided with an organic compound solid Z. Carry out the following tests. Record the observations and inferences in the spaces provided,

a. Place all solid Z in a boiling tube. Add about $10cm^3$ of distilled water and shake. Retain the solution for use in procedure (b) (i), (ii) and (iii)

Observations	Inferences
1 mark	1 mark

b. Use about $2cm^3$ portions of the mixture in a test tube for tests (i), (ii) and (iii)

i. To the first portion, add all the sodium carbonate provided.

Observations	Inferences
1 mark	1 mark

ii. To the second portion, add two drops of acidified potassium manganate (VII) and warm the mixture

Observations	Inferences
1 mark	1 mark

iii. To the third portion, add about $2cm^3$ of acidified Potassium dichromate (VI) , heat the mixture to boiling and allow to stand for 2 minutes.

Observations	Inferences
1 mark	1 mark