Name: …… Index No. ……..

Date: ……. Candidate's Sign. …….....

233/3

CHEMISTRY

Paper 3

(Practical)

Time: 2 ¼ Hours

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

233/3

CHEMISTRY

Paper 3

Time: 2 ¼ Hours

INSTRUCTIONS TO THE CANDIDATES:

(a) Answer **ALL** questions in the spaces provided in this question paper.

(b) You are **NOT** allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemical and apparatus that you may need.

(c) All working **MUST** be clearly shown where necessary.

(d) Mathematical tables and electrical calculators may be used.

For Examiners' Use Only

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1a	11	
1b	17	
2	12	
Total	**40**	

This paper consists of 5 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. (a) You are provided with the following:-

(i) 0.5M NaOH, solution **Y**

(ii) Solution of sulphuric (VI) acid **Q**

You are expected to determine the concentration of sulphuric (VI) acid in moles per litre.

Proceed as follows:

Pipette 25cm^3 of solution **Y** and transfer into the conical flask. Put 1-2 drops of phenolphthalein indicator and titrate with solution **Q** from the burette and complete the table.

TABLE 1

Titre	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution Q used (cm^3)			

(4mks)

(i) Determine the average volume of solution **Q** used. Show your working (1mk)

(ii) Calculate the number of moles of sodium hydroxide used. (2mks)

(iii) Calculate the number of moles of sulphuric (VI) acid used (2mks)

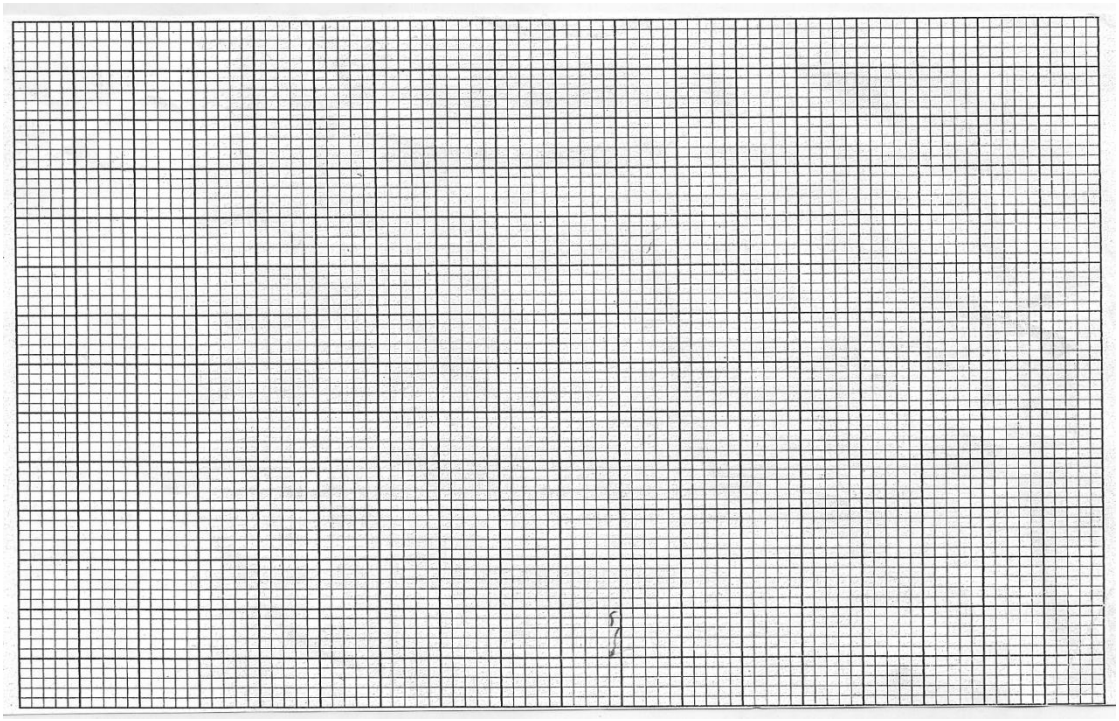
(iv) Hence determine the concentration of sulphuric (VI) acid in moles per litre. (2mks)

(b) In this experiment you are expected to determine the molar heat of neutralization of sulphuric (VI) acid with 2M sodium hydroxide. Measure 20cm^3 of sulphuric (VI) acid, solution **W** and transfer into 100ml beaker provided. Measure its temperature and record in the table below under 1st column. Take 5cm^3 of solution **N** and add to this solution, stir with the thermometer and record the final steady temperature. Continue to add 5cm^3 of **N** to the same solution and record the final steady temperature until 40cm^3 of **N** has been added.

TABLE 2

Volume of H_2SO_4, **W** used (cm^3)	20	20	20	20	20	20	20	20	20
Volume of 2M $NaOH_{(aq)}$ N, added (cm^3)	0	5	10	15	20	25	30	35	40
Highest temperature reached (^oC)									

(i) Plot a graph of highest temperature reached (vertical axis) against volume of 2M $NaOH_{(aq)}$ added (4mks)



(ii) From your graph determine the following:-

(i) Change in temperature (ΔT) (1mk)

(ii) Volume of 2M $NaOH_{(aq)}$ needed to neutralize completely $20cm^3$ of sulphuric (VI) acid. (1mk)

(iii) Determine the number of moles of sulphuric (VI) acid used given that the solution contains 1 mole per litre of the acid. (2mks)

(iv) Calculate the amount of heat evolved in the above reaction. (Take specific heat capacity of the solution to be 4.2J/gK and density of the solution to be $1g/cm^3$) (2mks)

(v) Hence determine the molar heat of neutralization of sulphuric (VI) acid (2mks)

2. You are provided with solution **M**. Carry out the tests below. Write your observations and inferences fully.

(a) Take about $2cm^3$ of solution **M** in a test tube and add 2M $NH_{3\ (aq)}$ dropwise till in excess.

Observation	Inferences
(1mk)	(2mks)

(b) Take about $2cm^3$ of solution **M** in a test tube and add 2-3 drops of barium nitrate solution.

Observation	Inferences
(1mk)	(2mks)

(c) To about $2cm^3$ of **M** add about equal volume of chlorine water.

Observation	Inferences
(1mk)	(1mk)

(d) To about $2cm^3$ of solution **M,** add 6-10 drops of bromine water

Observation	Inferences
(1mk)	(1mk)

(e) To about $2cm^3$ of solution **M**, add 2-3 drops of lead (II) nitrate

Observation	Inferences
(1mk)	(1mk)