NAME:……………………………………………………….INDEX ………………..…..DATE……..…

SCHOOL:…………………………………………………SIGNATURE………………………………

233/3
CHEMISTRY
PAPER 3 / PRACTICAL
JULY / AUGUST, 2014
2¼ HOURS

MMS JOINT EXAMINATION - 2014

Kenya Certificate of Secondary Education

233/3
CHEMISTRY
PAPER 3 / PRACTICAL
JULY / AUGUST 2014

INSTRUCTIONS TO CANDIDATES

- *Answer all questions in the spaces provided on the question paper*
- *You are not allowed to start working with the apparatus for the 1st ¼hour of the 2¼hours allowed for this paper. this time is to enable you read through the question paper and make sure you have all the chemicals and the apparatus that you may need.*
- *Candidates are advised to record their observations as they are made*
- *Mathematical tables and electronic calculators may be used*

For Examiners Use Only

Question	Maximum score	Candidate's Score
1	19	
2	10	
3	11	
Total	40	

1. You are provided with

- Sulphuric acid, solution A
- 0.5M Sodium hydroxide, solution B
- Zinc powder, Solid C

You are required to determine the concentration of Sulphuric acid in moles per litre

Procedure I:

Measure 50cm^3 of solution A using a measuring cylinder and place it in a 100cm^3 plastic beaker. Stir the solution gently with a thermometer and take it's temperature after every thirty seconds. After 60 seconds add all of solid C at once and stir gently using the thermometer.

Record the temperature of the mixture after every 30 seconds. Retain the solution for use in procedure II.

(a)

Time (sec)	0	30	60	90	120	150	180	210	240	270	300	330
Temperature ^{0}C			X									

(3 mks)

(b) Plot a graph of temperature against time on the plane provided (5 mks)

(c) Using the graph, determine the highest change in temperature ΔT (1 mk)

(d) Calculate the heat change for the reaction given that the specific heat capacity for water is 4.2 J/g/K and that the density of resulting solution is 1g/cm^3. (1 mk)

(e) Given that the molar heat of reaction of Sulphuric acid with solid C is 323KJmol^{-1}, calculate the number of moles of Sulphuric acid that were used during the reaction (1 mk)

(f) **Procedure II**

Place all the solution obtained in procedure I in a clean 100cm^3 measuring cylinder. Add distilled water to make 100cm^3 solution. Transfer the solution into a beaker and shake well. Label the resulting solution as D. Fill the burette with solution B. Pipette 25.0cm^3 of solution D into a conical flask and add 2-3 drops of phenolphthalein indicator. Titrate solution B and record the results in the table below

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of B used (cm^3)			

(4 mks)

(g) Determine the average volume of solution B used (1 mk)

(h) Calculate the number of moles of sodium hydroxide solution B used (1 mk)

(i) Determine

(i) The number of moles of Sulphuric acid in 25.0cm^3 of solution C (1 mk)

(ii) Number of moles of Sulphuric acid in $100cm^3$ of solution D (2 mks)

(iii) Using the results from (e) and (i) (ii) above calculate the total number of moles of Sulphuric acid in the $50cm^3$ of solution A (1 mk)

(iv) Calculate the concentration of the original Sulphuric acid, solution A in moles per litre (1 mk)

2. You are provided with
   - A clean piece of Magnesium ribbon about 6cm long.
   - 4M Hydrochloric acid
   - 10ml measuring cylinder
   - 100ml beaker (glass beaker)
   - Ruler

Procedure

Measure $2cm^3$ of 4M HCl into the 100ml glass beaker. Add $8cm^3$ of distilled water and shake to mix. Use the ruler to measure and cut off a 1cm long piece of Magnesium from the ribbon. Add the piece of Magnesium into the Hydrochloric acid in the beaker and start a stop watch immediately. Shake the mixture and record the time taken for the ribbon to disappear.

Repeat using the volumes of acid and water as shown in the table below.

Table of results

Experiment number	1	2	3	4	5
Volume of 4M HCl (cm^3)	2	4	6	8	10
Volume of distilled H_2O cm^3	8	6	4	2	0
Time taken, t(seconds)					
Rate $\frac{1}{t}$ (sec^{-1})					

(5mks)

(b) Plot a graph of volume of 4M HCl against the rate of reaction, $\frac{i}{t}$ on the graph paper provided. (3 mks)

(b) Using a dotted line, sketch a graph that would be obtained if 2M HCl had been used instead. (½ mk)

(c) Use your graph to determine the rate when $7cm^3$ of HCl is used (½mk)

(d) Calculate the concentration of the acid in experiment 3 in g/cm^3 (H=1, Cl=35.5) (1 mk)

(e) If the mass of Magnesium ribbon used in the 1st experiment was 2.0g determine the volume of gas produced. Molar gas volume = $24dm^3$ at room temperature Mg = 24 (1 mk)

3. You are provided with solid H which is a mixture of two salts. Carry out the tests below and record your observations and inferences in the tables below.

(a) Place a spatula end full of solid H into a boiling tube and add $10cm^3$ of distilled water. Shake the mixture well. Filter, retain the residue and divide the filtrate into four portions.

(i) To the 1st portion of the filtrate add aqueous Sodium hydroxide drop wise till in excess

Observations	Inferences
(1mk)	(1mk)

(ii) To the 2nd portion add aqueous Ammonia drop wise till in excess

Observations	Inferences
(1mk)	(1mk)

(iii) To the third portion add a few drops of Lead (II) nitrate solution

Observations	Inferences
(½mk)	(1mk)

(iv) To the 4th portion add 2 – 3 drops of dilute Nitric acid followed by Barium nitrate solution

Observations	Inferences
(½mk)	(½mk)

(b) Transfer all the residue into a boiling tube and heat strongly and test for the gas produced by dipping the tip of a glass rod in a solution of Calcium hydroxide and place it at the mouth of the boiling tube.

Observations	Inferences
(½mk)	(½mk)

(c) Add $5cm^3$ of dilute Nitric acid to the solid remaining in the boiling tube to dissolve. Divide the resulting solution into three portions.

(j) To the 1st portion add aqueous Ammonia drop wise until in excess

Observations	Inferences
(1 mk)	(½mk)

(ii) To the 2nd portion add 2 – 3 drops of Sodium sulphate solution

Observations	Inferences
(½mk)	(½mk)

(iii) To the 3rd portion add 2 – 3 drops of Potassium iodide solution

Observations	Inferences
(½mk)	(½mk)