NAME ……………………………..…………………….. **DATE** …………………………

INDEX NO. ……….……….……………………...….... **SIGNATURE** ……………...…………..

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

MBOONI WEST SUB - COUNTY JOINT EVALUATION TEST

Kenya Certificate of Secondary Education.

233/3
CHEMISTRY
PAPER 3
PRACTICAL
TIME: 2¼ HOURS.

INSTRUCTIONS TO CANDIDATES.

- Write your name and index number in the spaces provided above.
- Sign and write the date of exam in the spaces above.
- Answer **ALL** the questions in the spaces provided in this question paper.
- You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed time for the paper.
- Use the 15 minutes to read through the question paper and note the chemicals and apparatus that you may need.
- Mathematical tables and electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.
- This paper consists of 8 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

FOR EXAMINER'S USE ONLY.

Question	**Maximum score**	**Candidate's score**
1	8	
2	19	
3	13	
Total score	40	

1. You are provided with:-
   (i) Solution A a monobasic acid 0.15M, HA
   (ii) Solution Mc, containing 7.0g of a metal M carbonate (whose formula is $M_2CO_3 . xH_2O$) in 80cm^3 of the solution.

   You are required to:
   (a) Prepare a dilute solution of the metal M carbonate solution Mc
   (b) Determine the value of x in $M_2CO_3 . xH_2O$

   Procedure I
   - Using a pipette and a pipette filler place 50.0cm3 of solution Mc into a 250 ml volumetric flask. Add about 200ml of distilled water. Shake well. Add more distilled water to make upto the mark. Label this as solution Md

   Procedure II
   - Fill a burette with solution A.
   - Using a clean pipette and pipette filler, place 25.0cm^3 of solution Md into a 250ml conical flask.
   - Add two drops of phenolphthalein indicator and titrate with solution A.
   - Record your results in the table 1 below.
   - Repeat the titration two more times and complete the table.

   TABLE 1

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution A (cm^3)			

(3 Marks)

(a) Calculate the:
   (i) Average volume of solution A used. (½ Mark)

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   (ii) Number of moles of the acid used (1 Mark)

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(b) Write equation for the reaction that took place between the acid, HA and the carbonate $M_2CO_3.xH_2O$ (1 Mark)

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(c) Determine the:
   (i) number of moles of the metallic carbonate in 25cm^3 of solution Md. (½ Mark)

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   (ii) number of moles of the metallic carbonate in 50.0cm^3 of solution Mc (½ Mark)

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(iii) molar mass of the metallic carbonate (½ Mark)

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(iv) Value of x in $M_2CO_3 \cdot xH_2O$ (1 Mark)

(H = 1.0, C = 12.0, O = 16.0, M = 23.0)

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2. I. You are provided with:-

- Sodium hydroxide solution prepared by dissolving 9.6g in water to make 200cm^3 of solution and labelled Q
- 0.6M hydrochloric acid labelled solution R

You are required to determine the molar heat of neutralization of sodium hydroxide with hydrochloric acid following the procedure given.

Procedure

Fill the burette with solution R. Pipette 25.0cm^3 of solution Q into a 100ml beaker. Measure the temperature of solution Q in the beaker and record it in table below. Run out exactly 5.0cm^3 of solution R from the burette into a clean test tube. Add the solution in the test tube (solution R) into the beaker containing solution Q and stir with a thermometer. Record the highest temperature of the mixture in the table 2 below. Run out another 5cm^3 of solution R into the test tube and transfer it to the mixture already obtained above. Stir with the thermometer and record the highest temperature attained. Repeat the procedure with four more portions of 5cm^3 solution R. Record your readings in the table 2 below.

(a) Table 2

Volume of R added (cm^3)	0	5	10	15	20	25	30
Volume of Q used (cm^3)	25	25	25	25	25	25	25
Temperature (0^C)							

(3 ½ marks)

(b) On the grid provided, plot a graph of temperature (Y- axis) against volume of R used. (3 Marks)

(c) From the graph determine:-

(i) the volume of R used to react with $25cm^3$ of solution Q. (½ Mark)

(ii) the highest temperature change (½ Mark)

(d) Assuming that specific heat capacity is $4.2\ kjkg^{-1}k^{-1}$ and taking density of solution as $1gcm^{-3}$, determine enthalpy change for the reaction. (1½ Marks)

(e) Determine the moles of sodium hydroxide, solution Q, used hence calculate the molar heat of neutralization of the solution. (1 Mark)

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2. II. You are provided with

- 2M hydrochloric acid, solution S
- 5 pieces of 1cm long polished magnesium ribbon

You are required to determine the time taken for complete reaction between magnesium ribbon and the acid.

Procedure

Measure exactly 14cm^3 of solution S into a clean dry 100ml beaker. Drop a piece of magnesium into the acid and immediately start a stop watch. Whirl the mixture and record the time taken for the magnesium ribbon to completely disappear. Discard the mixture. Clean the beaker with water and dry it using tissue paper. Repeat the procedure using 12cm^3 of solution S and 2cm^3 of distilled water. Repeat the procedure with the specified volumes of solution S and distilled water as shown in table 3 below.

(a) Table 3

Volume of S (cm^3)	14	12	10	8	6
Volume of distilled water (cm^3)	0	2	4	6	8
Time in seconds (s)					
$\frac{1}{t}$					

(5 Marks)

(b) Plot a graph of $\frac{1}{t}$ against volume of solution S. (3 Marks)

(c) From the graph, determine time taken for 1cm length of magnesium ribbon to react completely with $5cm^3$ of solution S. (1 Mark)

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3. (a) You are provided with solid P. Carry out the tests below and record your observations and inferences in the tables provided.

(i) Transfer a half spatula end full of solid P into a clean-dry test tube.
Heat the solid strongly and test any gas produced using litmus papers.

Observations	Inferences
(1 Mark)	(1 Mark)

(ii) Place the remaining solid P into a boiling tube. Add about $8cm^3$ of distilled water and shake thoroughly. Filter the mixture into another boiling tube. Retain the filtrate for use in (iii) below.

Place the entire residue into a boiling tube. Add all Nitric (V) acid provided in a test tube labeled Z. Divide the resulting mixture into two portion.

(I) To the first portion in test tube add ammonia solution dropwise to excess.

Observations	Inferences
(½ Mark)	(1 Mark)

(II) To the second portion in a test tube add two drops of potassium iodide.

Observation(s)	Inferences
(½ Mark)	(½ Mark)

(iii) (I) To 2cm^3 of the filtrate, add three drops of dilute Nitric (V) acid.

Observations	Inferences
(½ Mark)	(½ Mark)

(II) To 2cm^3 of the filtrate add 3 drops of Lead (II) Nitrate solution.

Observations	Inferences
(½ Mark)	(½ Mark)

(b) You are provided with solid T. Carry out the tests in (a) and (b) and write your observations and inferences in the spaces provided.
Describe the method used in part (c)
(i) Place about a third of solid T on a metallic spatula and burn it in a Bunsen burner flame

Observations	Inferences
(1 Mark)	(1 Mark)

(ii) Place the rest of solid T in a boiling tube. Add about 8cm3 of distilled water. Shake the mixture well. Retain the mixture to use in the tests in (ii) I to IV.

Observations	Inferences
(½ Mark)	

(I) To 2cm^3 of the mixture in a test tube add the remaining magnesium metal.

Observations	Inferences
(½ Mark)	(½ Mark)

II. To 2cm^3 of the mixture in a test tube add about 1cm^3 of acidified potassium dichromate (VI) solution and warm.

Observations	Inferences
(½ Mark)	(½ Mark)

III. To 2cm^3 of the mixture in a test tube add 2 drops of bromine water.

Observations	Inferences
(½ Mark)	(½ Mark)

IV. Determine the pH of the mixture obtained in (b)

Method used	Inferences
(½ Mark)	(½ Mark)