Name: …… Index No. ……

School: ……. Candidate's Sign. …….....

Date: …….....

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SERIES 23 EXAMS

233/3
CHEMISTRY
PAPER 3
TIME: 2 ¼ HOURS

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

INSTRUCTIONS TO THE CANDIDATES:-

- ***Write your name and index number in the spaces provided***
- ***Sign*** *and write the* ***date*** *of examination in the spaces provided*
- ***Answer all the questions in the spaces provided.***
- *Mathematical tables and electronic calculators may be used.*
- *All working* ***MUST*** *be clearly shown where necessary.*
- *Use the first 15minutes of the 2 ¼ hours to ascertain you have all the chemicals and apparatus tha you may need.*

For Examiners use Only

QUESTION	MAX. SCORE	SCORE
1		
2		
3		
TOTAL	**40**	

This paper consists of 4 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

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1 **You are provided with;**

- Solution K, hydrochloric acid
- Solution L, containing 2g per lire of sodium hydroxide.
- 0.5 g of an impure calcium carbonate, solid **N.**
- You are required to determine the :

(a)Concentration of solution K in moles per litre.
(b) Percentage purity of calcium carbonate, solid **N**

Procedure I

Fill the burette with hydrochloric acid, solution K. pipette 25cm^3 of sodium hydroxide, solution L into a conical flask. Add 2-3 drops of phenolphthalein indicator and titrate. Record the results in the table. Repeat the procedure two more times.

Table 1

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

(a) What is the average volume of solution **K** used
(1mk)

……..….

(b) Determine the concentration of solution L in moles per litre.
(1mk)
(Na= 23,O = 16, H = 1)

(c) Calculate the concentration of solution K in moles per litre.
(1mk)

Procedure II

Using a measuring cylinder, measure out 100cm^3 of solid K into a 250ml beaker. Add all of solid N into the beaker containing solution K. Swirl the mixture and allow the reaction to proceed until offervescence stops. Label this as solution P. Fill the burette with solution P. pipette 25cm^3 of solution L into a conical flask. Add 2-3 drops of phenolhthalein indicator and titrate. Record your results in table II below repeat the titration two more times and complete the table

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

(a) Determine the average volume of solution **P** used.
(4mks)

(b) Calculate the number of moles of hydrochloric acid in solution P used. (1mk)

c) Determine the number of moles of hydrochloric acid in $100cm^3$ of solution P. (1mk)

d) Calculate the:

(i) Moles of hydrochloric acid in $100cm^3$ of the original hydrochloric acid solution K (1mk)

(ii) Moles of the hydrochloric acid that were used up in the reaction with solid N. (1mk)

(iii) Moles of calcium carbonate that reacted with hydrochloric acid. (1mk)

e) Given that the relative formula mass of calcium carbonate is 100,calculate the:

(i) Mass of the calcium carbonate that reacted. (1mk)

(ii) Percentage purity of the calcium carbonate, solid N. (1mk)

2. **You are provide** :-

- 2m hydrochloric acid labeled solution A
- Solid B
- Distilled water.

You are required to determine the rate of reaction between solid B and solution A

Procedure.

Fill the burette with solution A. Run $10cm^3$ of solution A from the burette into $100cm^3$ beaker. Place one piece of solid B into the beaker and start a stop watch immediately. Swirl the beaker continuously ensuring the solid is always inside the solution. Record the time taken for the solid to disappear. Wash the beaker after the experiment.

Repeat the procedure above using different volumes of solution A and water as shown in the table.

(a) Table III

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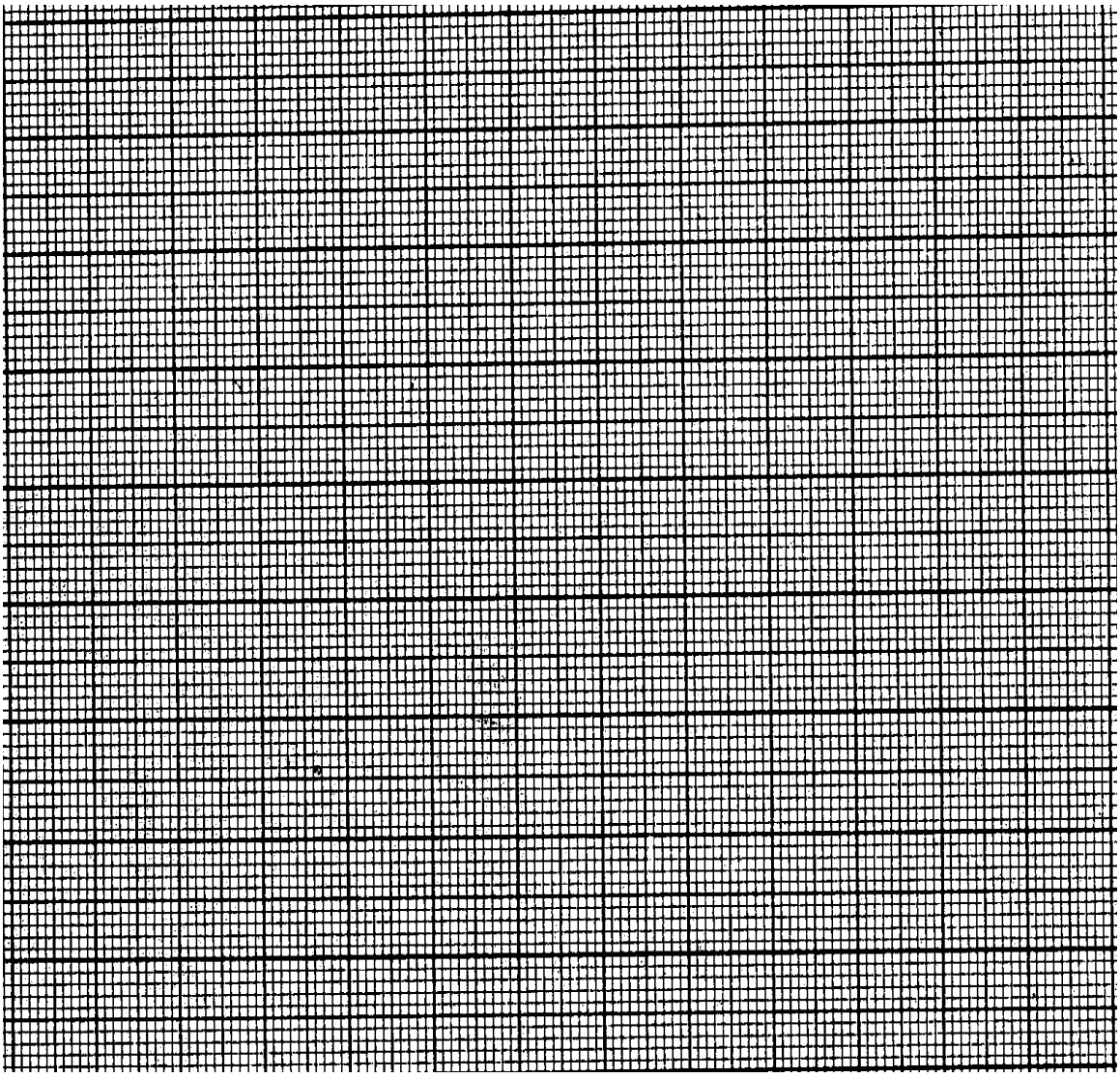
Volume solution A used (cm^3)	10	9	8	7	6
Volume of water (cm^3)	0	1	2	3	4
Time taken(sec)					
Rate of reaction = $\frac{1}{\text{Time}}$					

(6mrks)

(b) (i) Plot a graph of rate of reaction (y-axis) against volume of solution A (3mks)



(ii) Use the graph to determine the time that would take B to disappear if the volume of the acid, solution A was $7.5cm^3$.
(1mk)

(iii) In terms of rate of reaction, explain the shape of your graph.
(1mk)

……..….

3. You are provided with solid Q. Carry out the following tests and record your observations and inference in the spaces provided.

a) Place the whole of solid Q in a dry test tube. Add about 10cm3 of distilled water and shake. Divide the solution into four portions.

Observations	Inferences
1mk	1mk

(b) To the first portion add sodium hydroxide solution drop –wise until in excess.

Observations	Inferences
1mk	1mk

(c) To the second portion add ammonia solution drop-wise until in excess.

Observations	Inferences
1mk	1mk

(d) To the third portion, add lead (II) nitrate solution.

Observations	Inferences
1mk	1mk

(e) To the fourth portion, add Barium chloride solution followed by about $2cm^3$ of dilute hydrochloric acid.

Observations	Inferences
1mk	1mk

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