Name: .... Index no ....

Candidate's sign ....

Date: ....

233/3
CHEMISTRY
Paper 3
PRACTICAL
Time: 2 ¼ hours

MOKASA JOINT EXAMINATION - 2016
Kenya Certificate of Secondary Education
CHEMISTRY
Paper 3

Instructions to candidates

(a) Write your name, index number, signature and date in the spaces provided above.
(b) Answer ALL the questions in the spaces provided in the question paper.
(c) You are not allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
(d) All working MUST be clearly shown where necessary.
(e) Mathematical tables and silent electronic calculators may be used.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	15	
2	10	
3	15	
Total Score	**40**	

1. You are provided with;

- Solid Q, 2.0g of impure sodium carbonate (contaminated with sodium chloride).
- Solution R, hydrochloric acid solution, containing 2.07g of the acid in 500 cm^3 of solution.

You are required to determine the percentage impurity in solid Q.

Procedure:

(i) Place all solid Q in a beaker and add 100cm^3 of distilled water. Stir well a glass rod.
(ii) Transfer the solution into a 250 cm^3 volumetric flask and top it up to the mark with distilled water. Shake well and label as solution Q.
(iii) Fill a burette with solution R.
(iv) Pipette 25.0 cm^3 of solution Q into a conical flask. Add three drops of methyl orange indicator.
(v) Titrate solution Q against solution R from the burette. Record the results in the table below.
(vi) Repeat the titration two more times and complete the table.

<u>Table I</u>

(a)	**I**	**II**	**II**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution I used (cm^3)			

(4marks)

(a) Determine the average volume of solution R used. **(1 mark)**

(b) Calculate the concentration of solution R in moles per litre. **(2 marks)**
(H = 1.0, Cl = 35.5)

(c) Calculate the number of moles of the acid in solution R that reacted. **(1 mark)**

(d) Write an equation for the reaction that occurs. **(1 mark)**

(e) Calculate the number of moles of sodium carbonate in 25 cm^3 of solution Q that reacted. **(1 mark)**

(f) Calculate the mass of sodium carbonate in 250 cm^3 of solution Q. **(2 marks)**
(C = 12.0, O = 16, Na = 23)

(g) Find the percentage of mass of the impurity, sodium chloride, in solid Q. **(2 marks)**

2. Your are required to investigate the effect of change in concentration on the reaction rate between sodium thiosulphate solution C and dilute hydrochloric acid solution D. When hydrochloric acid is added to sodium thiosulphate sulphur is deposited.

$$Na_2S_2O_{3(aq)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + SO_{2(g)} + S_{(g)} + H_2O_{(l)}$$

The time taken for sulphur to reach a certain amount can be used to indicate the rate of the reaction. Solution C contains 0.08 moles of sodium thiosulphate in one litre of solution.

Procedure:

(i) Measure 40 cm^3 of solution C and pour it into a 100 cm^3 glass beaker.
(ii) Mark a cross (X) on a white paper. Place the beaker containing solution C over the cross on the paper.
(iii) Measure 10 cm^3 of solution D add it to the solution C in the beaker. Start the stopwatch immediately. Observe the cross on the white paper from the top of the beaker and record the time taken for it to be obscured (to disappear from view).
(iv) Repeat the experiment using different volumes of solution C as indicated in the following table and in each case water is added to make a total of volume of 40 cm^3. The same volume of hydrochloric acid is added in each case.

Complete the table below. **(5 marks)**

Volume of HCl used (cm^3)	Volume of $Na_2S_2O_3$ used cm^3 solution	Volume of water added	Time taken (s)	$\frac{1}{time(s^{-1})}$
10	40	0		
10	30	10		
10	25	15		
10	20	20		
10	10	30		

I.
On the grid provided plot a graph of the reciprocal of time $\frac{1}{time(s^{-1})}$ y-axis against volume of solution C used. **(3 marks)**

II. From the graph determine the time taken for the cross to disappear if 35 cm^3 of solution C was used. **(1 mark)**

III. Explain the shape of the graph in terms of rates of reaction. **(1 mark)**

3. **I.**

(a) You are provided with solid K. Carry out the tests below. Write your observations and inferences in the spaces provided.

Place all of solid K in a boiling tube, add about 10cm^3 of distilled water and shake until all the solid dissolves. Divide the solution into 4 portions.

(i) To the first portion in a test-tube, add a few drops of sodium hydroxide until in excess. Retain the mixture for procedure (b).

Observations	**Inferences**
(1 mark)	(1 mark)

(i) Warm the mixture in (a) above and test any gases produced using red and blue litmus papers.

Observations	**Inferences**
(1 mark)	(1 mark)

(iii) To the third portion, add about equal volume of freshly lead (II) nitrate solution followed by a few drops of dilute nitric (V) acid.

Observations	Inferences
(1 mark)	(1 mark)

(iv) To the fourth portion add Barium nitrate solution.

Observations	Inferences
(1 mark)	(1 mark)

II. You are provided with substance Z. Carry out the tests below. Write your observations and inferences in the spaces provided.

(a) Scoop a little of solid Z using a clean spatula and burn it in a Bunsen burner flame.

Observations	Inferences
(1 mark)	(1 mark)

Divide the remaining amount into two portions.

(b) To the first portion, add water and shake.

Observations	Inferences
(1 mark)	(1 mark)

(c) To the second portion, add potassium manganate (VII) and warm.

Observations	**Inferences**
(1 mark)	(1 mark)

(d) To a little amount of Z, add sodium carbonate.

Observations	**Inferences**
(1 mark)	(1 mark)