NAME:…… **INDEX NO…….**

SCHOOL:…….. **CANDIDATE'S SIGN ……..**

DATE …….

233/3
CHEMISTRY
Paper 3
(PRACTICAL)
Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

1. ***Write your name and Index number in the spaces provided.***
2. ***Answer ALL the questions.***
3. ***Answers must be written in the spaces provided in the question paper.***
4. ***Additional pages must not be inserted.***
5. ***Candidates should check the question paper to ascertain that all the pages are printed.***
6. ***This paper consists of 12 printed pages***

FOR EXAMINER'S USE ONLY

QUESTION		MAXIMUM SCORE	CANDIDATE'S SCORE

This paper consists of 8 printed pages.
Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. You are provided with the following:

i) Solution M which is 0.2 M sodium hydrochloric acid.

ii) Solution N which is a Hydrochloric acid

iii) 1.0g solid X which is a carbonate F_2CO_3.

You are required to:

- Standardize solution N
- Determine the RAM of F in F_2CO_3.

Procedure

- Fill the burrete with dilute Hydrochloric acid (Solution N)
- Pippete 25cm^3 of sodium hydrotide solution M into a conical flask
- To this solution and 2-3 drops of methyl orange indicator
- Titrate this solution with solution with solution N and record your result in table I below. Repeat the procedure two more times to complete the table.

Table	1	2	3
Final burette readings(cm^3)			
Initial burette readings(cm^3)			
Volume of HCl used cm^3(solution N)			

(3 mks)

a) i) Determine the average volume of solution N used. (1 mk)

ii) How many moles of sodium Hydroxide are there in 25cm^3 of solution M used. (1 mk)

iii) Calculate the concentration of HCl (solution N) in moles per dm^3 (1 mk)

Procedure II

- Measure 100cm of Hydrochloric acid(solution N) into a clean beaker. Put all solid X in the beaker containing 100cm^3 of solution N. Leave the acid to react with solid X for 3 minutes.
- Label the resulting solution as L.
- Fill the burette with solution L.
- Titrate this solution with 25.0 cm^3 portions of sodium Hydroxide solution M.
- In the conical flask using methyl orange indicator. Repeat the procedure to complete the table II below.

Table II	1	2	3
Final burette readings(cm^3)			
Initial burette readings(cm^3)			
Volume of solution L used cm^3			

(3 mks)

b) i) Calculate the average volume of solution L used. (1 mk)

ii) Find the number of moles of solution L in the average volume. (1 mk)

iii) Find the number of moles of solution L in $100cm^3$. (1 mk)

iv) Number of moles of Hydrochloric acid in the original solution N. (1 mk)

v) Find the number of moles of HCl which reacted with solid X (F_2CO_3) (1 mk)

vi) Find the number of moles of solid X which reacted with acid. (1 mk)

vii) Find the reactive molecular mass of solid X and hence the relative atomic mass of F. (2 mks)

2. You are provided with the following:

i) Solution D, which is 2 M Hydrochloric acid

ii) Solution B, which is 0.1 M sodium Thiosulphate ($Na_2S_2O_3$)

You are required to find out the effect of change of temperature on the rate of reaction between Sodium thioslphate and hydrochloric acid.

NB: The end result of this reaction is the formation of a yellow/ white precipitate of colloidal sulphur.

Equation:

$Na_2S_2O_{3(aq)} + HCl_{(aq)} \longrightarrow S_{(s)} + SO_{2(g)} + 2NaCl_{(aq)} + H2O_{(l)}$

Procedure:

i) Measure 5 cm^3 of solution D into a clean 100cm3 glass beaker.

ii) Place it together with its contents on a white piece of paper with the word CHEM written on it in bold print.

iii) Measure the temperature of the solution D

iv) Record it as shown below in the Table

v) Measure 100cm3 of solution B

vi) Add this to the contents of the beaker in(i) above set off the stop watch or clock immediately.

vii) Record the time taken for the printed word CHEM to become invisible when viewed above the reaction mixture in the 100cm3 beaker

viii) Thoroughly wash the beaker used in (i) above

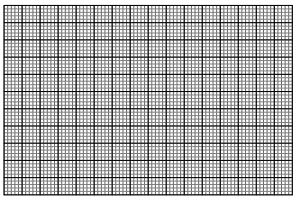
ix) Repeat the experiment using HCl solution D at the temperature indicated in the table.

Test No.	Volume of solution D(HCl) in cm^3	Volume of $Na_2S_2O_3$ solution B cm^3	Temperature ℃	Time in (s)	Reciprical of time 1/t s^{-1}
1	5	10	Room temperature		
2	5	10	30		
3	5	10	35		
4	5	10	40		
5	5	10	45		
6	5	10	50		
7	5	10	55		
8	5	10	60		

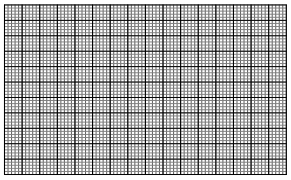
(6 mks)

On the grids provided plot a graph of:

i) Time (sec) on x axis against Temperature ℃ y axis



ii) Recipricoal of time 1/t s^{-1} x axis against Temperature ℃ (y axis) (3 mks)



b) Comment on the effect of change of temperature on the rate of the reaction between sodium thiosulphate and hydrochloric acid.

c) Use the graph of temperature against the recipricoal of time in a) (ii) above to estimate the time that the reaction would take at 58 ℃

d) Use the graph of time against temperature in a(i) bove to calculate the rate of reaction at 43℃

3. a) You are provided with solid L. Use it to carry out the tests below and record your results in the table provided.

TEST	OBSERVATION	INFERENCES
a) Transfer all solid L into a boiling tube. Add 10cm3 of 1M HNO3 and shake Dip a glass rod into calcium Hydroxide solution and place it at the mouth of the boiling tube.	1 mk	½ mk
b) To about 2 cm3 of the solution in a test tube add 3 drops of lead II Nitrate solution and warm	1 mk	½ mk
c) To about 2 cm3 of the solution in another test tube add 2M sodium Hydroxide solution drop wise till in excess	½ mk	½ mk

d) To about 2 cm3 of solution in another test tube dip a clean metallic spatula in the solution and place it on a burner flame.	½ mk	½ mk

b) You are provided with solid Q, you are required to:

i) Carry out the tests described below on solid Q

ii) Record your observations and inference accordingly

iii) Test any gases provided.

Procedure:

i) Place a spatula full of solid Q in a boiling tube

ii) Add about 15 cm3 of distilled water and shake

iii) Divide the resulting solution into four portions

iv) Use a universal indicator paper to test portion one of the solution

Observation	Inference
½ mk	½ mk

v) Add a spatula full of sodium carbonate to the second portion.

Observation	Inference
½ mk	½ mk

vi) Add three drops of acidified Potassium Manganate (vii) solution to the third portion.

Observation	Inference

½ mk	½ mk

vii) Place 4 cm3 of Ethanol in a test tube Add two drops of concentrated Sulphuric (vi) acid and then a spatula full of solid Q shakes well and warm the mixture carefully. Pour the warm mixture into the smell.

Observation	Inference
½ mk	½ mk