

NAME

DATE

INDEX NO. CANDIDATE'S SIGNATURE

233/3

CHEMISTRY

PRACTICAL

PAPER 3

July/August, 2010

TIME: 2¼ HOURS.

MBOONI WEST DISTRICT 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.
- 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 not the chemicals you require
- Mathematical tables and electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY.

Question	Maximum score	Candidate's score
1	21	
2	11	
3	8	
Total score	40	

This paper consists of 8 printed pages.

Candidates should check to ensure that all pages are printed as indicated and no questions are missing

1. You are provided with an acid W (HCl , 110cm^3) whose concentration is unknown. You are required to standardise it using the standard sodium carbonate solution which is 0.5m .

A. Procedure

- i) Using a clean pipette, suck exactly 25cm^3 of the sodium carbonate solution and put it into a clean conical flask.
- ii) Add 2-3 drops of methyl orange indicator
- iii) Fill up the burette with the acid W
- iv) Titrate it against the Sodium Carbonate until the colour of the indicator first changes to pink
- v) Repeat the experiment to obtain two concordant results.
- vi) Tabulate your results in the table below:

Burette Readings	1 st	2 nd	3 rd
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of acid solution W used (cm^3)			

- a. Calculate the average volume of acid W used. Show your working. **1 mark**

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- b. Calculate the moles of Na_2CO_3 in the volume used **1 mark**

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- c. Calculate the moles of acid in the volume used **1 mark**

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d. Calculate the molarity of the acid

1 mark

e. Calculate the concentration of the acid in g/litre (H = 1, Cl = 35.5)

1 mark

B. You are required to use the acid W to establish the purity of an impure calcium carbonate X

Procedure:

1. Using a clean measuring cylinder, measure exactly 25cm^3 of acid W
2. Transfer it into a clean 100cm^3 beaker.
3. Add all the solid P provided into it
4. Stir until all the solid reacts
5. Transfer the resulting solution into a clean 250cm^3 volumetric flask
6. Rinse the beaker with a little amount of water and put into the volumetric flask.
7. Top it up with water upto the 250cm^3 mark with some distilled water and label the solution T
8. Using a clean pipette, transfer 25.0cm^3 of solution T into a conical flask, and add (2-3) drops of methyl orange indicator
9. Fill up the burette with 0.2M NaOH
10. Titrate it against the acid until the colour of the indicator changes from orange to yellow
11. Tabulate your results in the table below.

Burette reading	I	II	III
Final burette reading cm^3			
Initial burette reading cm^3			
Volume of NaOH used			

i) Calculate the average volume of alkali used. (show your working)

1 mark

ii) Calculate the moles of sodium hydroxide in the average volume used

1 mark

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iii) How many moles of hydrochloric acid are in 25cm³ of solution T used?

1 mark

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iv) How many moles of hydrochloric acid were present in the 250cm³ of solution T?

1 mark

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v) How many moles of hydrochloric acid are in the original 25cm³ of hydrochloric acid W?

1 mark

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vi) How many moles hydrochloric acid were used to react with calcium carbonate present in mixture?

1 mark

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vii) Calculate the moles of calcium carbonate that reacted with hydrochloric acid.

1 mark

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viii)

Calculate the mass of calcium carbonate present in 1.0g of mixture X (C=12, O=16)

1 mark

ix) Determine the % purity of CaCO₃ in the mixture.

1 mark

2. You are provided with:

Solution A – which is 2M HCl

Solution B- which is 0.15M sodium thiosulphate

In this experiment you are required to determine the effect of concentration on the rate of reaction between sodium thiosulphate and dilute hydrochloric acid.

Procedure:

Place solution A into a burette. Using a measuring cylinder pour 50cm³ of solution B into a 100cm³ beaker. Mark a large cross (x) into a plain paper. On the plain paper, place the beaker containing the 50cm³ of 0.15M sodium thiosulphate. From the burette, measure 5cm³ of solution A into the 50cm³ of solution B in the beaker. Swirl the mixture and start the stop watch immediately. Look through the solution in the beaker at the cross (X) and note the time taken for the cross to become invisible.

Record this time as shown in the table overleaf.

Repeat the procedure using diluted solution B with the respective volumes adjusted with labelled water as shown in the table below and complete table 1

Equation for the reaction

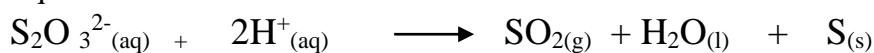


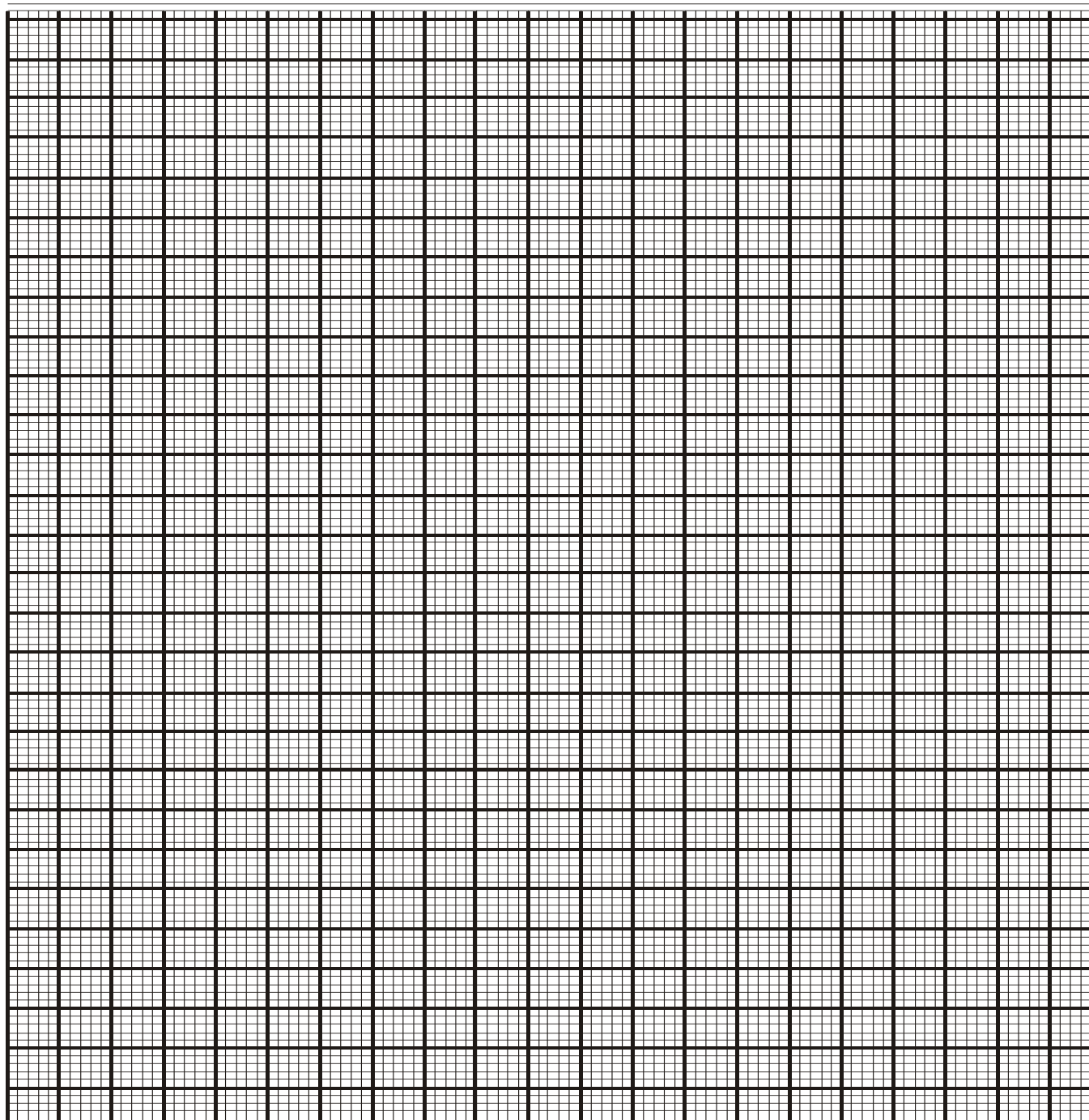
TABLE 1

Volume of thiosulphate of B cm ³	Volume of water (cm ³)	Volume of hydrochloric acid A (cm ³)	Time t (s)	Reciprocal of time $1/t$ (s ⁻¹)
50	0	5		
40	10	5		
30	20	5		
20	30	5		
10	40	5		

4 marks

- b. (i) Plot a graph of thiosulphate ions S₂O₃²⁻ (y-axis) against $1/t$ (x-axis)

3 marks



(ii) From your graph determine the rate of reaction at volume $V=30\text{cm}^3$

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(iii) Explain how the concentration of the thiosulphate ions (B) affects its rate of reaction with dilute hydrochloric acid

2 marks

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3. You are provided with solid V. Carry out the tests below. Write your observations and inferences in the spaces provided.

a) Place a half-spatula handful of solid V in a clean dry test tube. Heat the solid gently and then strongly. Test gas produced with litmus papers.

Observations	Inferences
1 mark	1 mark

b) Dissolve the remaining portion of Solid V in 10cm^3 of distilled water in a boiling tube. Divide the solution into five portions.

i) To the first portion add a few drops of sodium hydroxide solution then excess.

Observations	Inferences
1 mark	1 mark

ii) To the second portion add a few drops of ammonia solution then excess.

Observations	Inferences
1 mark	1 mark

iii) To the third portion add about 2cm³ of chlorine water

Observations	Inferences
1 mark	1 mark

iv) To the fourth portion add five drops of lead (ii) nitrate solution then shake

Observations	Inferences
½ mark	½ mark

v) To the fifth portion dip a clean glass rod into the solution and put the tip of the rod in a Bunsen burner flame

Observations	Inferences
½ mark	½ mark