MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

MOCK 2025 EXAMINATION

233/3 CHEMISTRY PAPER 3

June, 2025 TIME: 2 Hrs 15 Mins

Name: Marking Guide ..... Admission No: .....

Stream: ..... Signature: .....

233/3 - CHEMISTRY
Date.....

Instructions

(a) Write your **name, admission number, date, stream and signature** in the spaces provided above.

(b) This paper consists of 7 printed pages with 3 questions. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

(c) Candidate should answer the questions in **English**

(d) You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the apparatus and chemicals that you may need.

(e) Mathematical tables and silent non-programmed electronic calculators may be used.

For Examiner's Use Only

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	20	
2	10	
3	10	
TOTAL SCORE	40	40 .

Question 1

I. You are provided with:

- Solution **M,** Containing an oxidizing agent **M.**
- Solution **N**,0.05M aqueous sodium thiosulphate.
- Solution **P**, Containing a reducing agent P
- Aqueous potassium iodide.
- Solution **Q**, starch solution.

You are required to determine the:

(i) Concentration of solution **M**

(ii) Rate of reaction between the oxidizing agent **M** and the reducing agent P.

Procedure I

1. Using a pipette and pipette filler, place 25.0cm^3 of **M** into 250 ml conical flask.

2.Measure 10 cm^3 of aqueous potassium iodide and add it to solution **M** in the conical flask shake the mixture. Add 10cm^3 of 2.0 M sulphuric (VI)acid to the mixture and shake.

3.Fill a burette with solution N and use to titrate the mixture in the conical flask until it just changes to orange-yellow. Add 2cm^3 of solution Q to the mixture in a conical flask. Shake thoroughly. Continue titrating until the mixture just changes to colourles. Record your result in the table 1 below.

4.Repeat the procedure and complete table 1. **Retain the remaining solution M and solution Q for use in procedure II**

Table 1

S·V=

	I	II	III
Final burette reading, cm^3			
Initial burette reading, cm^3			
Volume of solution N used, cm^3			

CT-1
Dp-1
A -1
PA -1
FA-1

(4marks) 05

(a) Calculate the:

(i) Average volume of solution N used (1 mark)

.....✓2.....

.....✓2.....

05

(ii) Number of moles of sodium Thiosulphate (1 mark)

$\frac{0.05 \times A.V}{1000}$ ½ = Correct Ans ½ 1

(b) Given that one mole of M reacts with Six moles of sodium thiosulphate, calculate the:

(i) Number of moles of M used (1 mark)

$\frac{1 \times \text{Ans in (ii) above}}{6}$ ½ = Correct Ans ½ 1

(ii) Concentration of solution M in moles per litre (1 mark)

$\frac{\text{Ans in b(i) above} \times 1000}{25}$ ½ = Correct Ans ½

Procedure II

1.Label six test tubes as 1,2,3,4,5 and 6 and place them in a test tube rack.

2.Using a burette, measure the volume of distilled water in table 2 into the labelled test tubes.

3.Using a burette, measure the volumes of solution M shown in table 2 into each of the test tubes.

4.Clean the burette and rinse it with about 5 cm^3 of solution P.

5.Using burette, measure 5cm^3 of solution P and place it into a 100ml beaker.

6, Using a 10 ml measuring cylinder, measure 5cm^3 of solution Q and add it to the beaker containing solution **P**; shake the mixture.

7.Pour the content of test tube number 1 to the mixture in the beaker and immediately start a stop watch. Swirl the content of the beaker. Record the time taken for a blue colour to appear in table 2

8.Repeat steps 5 to 7 using the content of test tube 2,3,4,5 and 6.

9.Complete table 2 by computing Rate=$\frac{1}{time}$ S^{-1}

02

S.V=

CT- Rate column - 2 mks
Temp column - 1 mk.

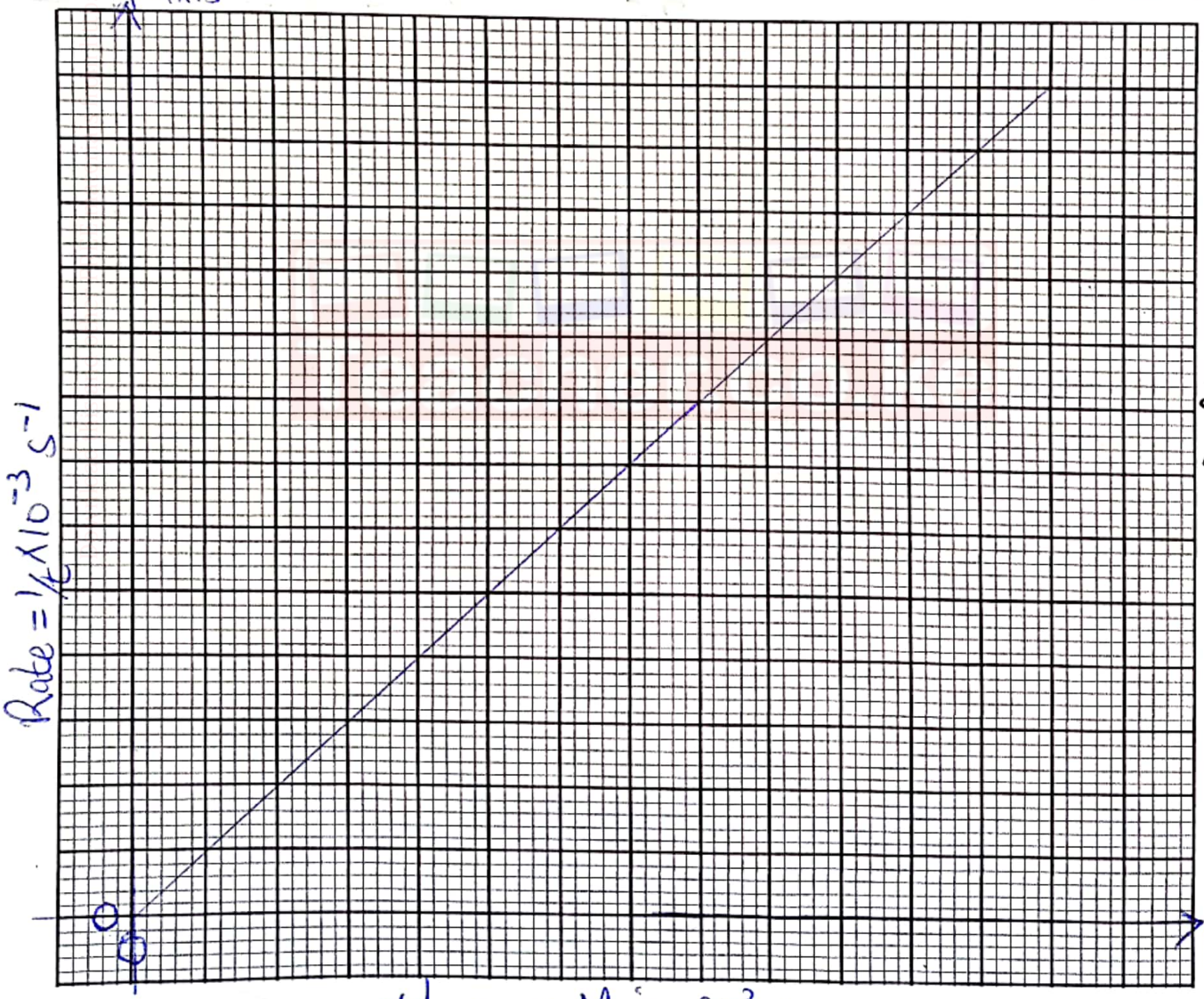
Table 2

Test tube Number	Volume of distilled water (cm^3)	Volume of solution M (cm^3)	Time (seconds)	Rate = $\frac{1}{\text{time}}$
1	0	10		
2	2	8		
3	3	7		
4	5	5		
5	6	4		
6	7	3		

CT-3
Dp-1
A-1
TR-1
06

(6 marks)

(a) Plot a graph of rate (y-axis) against volume of M (3 marks)



S-½
A-½
P-1
L-1
03

09

(b) What time would be taken for the blue colour to appear if the experiment was repeated using 1 cm^3 of distilled water and 9 cm^3 of solution M (2 marks)

Correct reading of rate ✓1
Correct time conversion ✓1
2

(c) Explain how the rate of reaction is affected by the volume of solution M (1 mark)

Increase in concentration increases the number of reacting particles which increase number of successful collisions thus increasing the rate of reaction. // Decrease in concentration decreases the number of reacting particles which decrease number of effective collision thus decreases rate of reaction. ✓1

Question 2

You are provided with **solid R**. Carry out the following tests and record your observations and inferences in the spaces provided.

Place all solid R in a boiling tube. Add about 20cm^3 of distilled water and shake until the solid dissolves. Label the solution as solution R. Use about 2cm^3 of solution R in a test tube for each of the following test.

(a) Add aqueous sodium hydroxide dropwise until excess.

Observations	Inferences
White precipitate ½ insoluble ½ in excess (1 mark)	Ca^{2+}, Mg^{2+}, Ba^{2+} present. All 3 – 1mk, 2 – ½ mk, 1 – 0 mk (1 mark)

2

(b) Add three drops of aqueous sodium sulphate.

Observations	Inferences
White precipitate ✓1 (1 mark)	Ca^{2+} ½, Ba^{2+} ½ present. (1mark)

2

Penalise for ½ mk for any contradictory ion to a max of 1 mk.

07

(c) To another 2 cm^3 portion, dip a clean glass rod and heat in the non-luminous flame.

Observations	Inferences
Burns with a red flame ✓1	Ca^{2+} present ✓1
(1 mark)	(1 mark)

2

(d) Add three drops of aqueous barium chloride.

Observations	Inferences
No white precipitate ✓1	SO_4^{2-}, CO_3^{2-}, SO_3^{2-} absent ✓1
(1 mark)	(1 mark)

2

(e) Add three drops of aqueous lead(II) nitrate

Observations	Inferences
White precipitate ✓1	Cl^- / Br^- present.
(1 mark)	(1 mark)

Penalise for 1 mk for any contradictory ion to a max of 1 mk

2

Question 3

You are provided with **solid S**. Carry out the following tests and record the observations and inferences in the spaces provided.

(a) Describe the appearance of solid S (1 mark)

White crystalline solid ✓1 ..... rej. white solid

1

(b) Place one-third of solid S in a spatula and burn it with a Bunsen burner flame.

Observations	Inferences
Burns with a yellow sooty flame.	$C=C$, $-C\equiv C-$ present.
(1 mark)	(1 mark)

2

(c)Place the remaining solid S in a boiling tube and add about $10cm^3$ of distilled water shake the mixture thoroughly. Divide the mixture into three equal portions for test (i) to (iii).

Observations	Inferences
Dissolves to form a colourless solution. (1mark)	Polar organic compound/substance rej- Cu^{2+}, Fe^{2+}, Fe^{3+} absent. (1 mark)

(i) To the first portion, add 3 drops of bromine water, warm the mixture.

Observations	Inferences
Yellow bromine water changes to colourless/decolorise rej Orange (1 mark)	$\overset{1}{C}=\overset{1}{C}-C\equiv C$ present. (1 mark)

(ii) To the second portion add all the solid sodium carbonate provided.

Observations	Inferences
Bubbles of a colourless gas (½ mark)	R-COOH present rej H^+/H_3O^+ (½ mark)

(iii) To the third portion in a test-tube add **3** drops of acidified potassium dichromate (VI).

Observations	Inferences
Orange acidified potassium dichromate (VI), does not change to green/ remains orange. (1 mark)	R-OH absent (1mark)

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