MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

MOCK EXAMINATIONS 2022

233/3 **Chemistry Practical** **Paper 3**

September, 2022 **Time: 2¼ Hours**

Name: MARKING GUIDE ..... Adm No: .....

Class: .....Candidate's Signature: ..... Date: 8th September, 2022

Time: 8.00-10.15 AM

Instructions to candidates

(a) *Write your Name, admission number and class in the spaces provided in the question paper.*

(b) *Sign and write the date of examination in the spaces provided above.*

(c) *Answer ALL questions in the spaces provided on the question paper*

(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) *All working **MUST** be clearly shown where necessary.*

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

FOR EXAMINERS USE ONLY.

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	21	21
2	11	11
3	08	08
Total Score	40	40

This paper consists of 9 printed pages.

Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

1. You are provided with:
   - **Solid K** – Magnesium ribbon
   - **Solution L** – 2.0M Hydrochloric acid
   - **Solution C** – 0.4 M Sodium hydroxide solution
   - Stopwatch

You are required to determine:
- the rate of reaction between magnesium and hydrochloric acid at different concentrations
- Mass of magnesium ribbon that reacted

PROCEDURE I

i) Place the five test tube on the test tube rack and label them 1, 2, 3, 4 and 5. Using a 10 cm^3 measuring cylinder, measure out the volumes of 2.0 M hydrochloric acid, Solution L, as shown in **table 1** below and pour them into the corresponding test tube. **RETAIN** the remaining solution L for use in question 2 and 3. Wash the measuring cylinder and use it to measure volumes of water as indicated in the table and pour into the corresponding test tubes.

ii) Cut out FIVE pieces each of **exactly** 1 cm length of magnesium ribbon, Solid K.

iii) Transfer all the solution in test tube 1 into a clean 100 cm^3 beaker. Place one piece of magnesium ribbon into the beaker and start the stopwatch immediately. Swirl the beaker continuously ensuring that the magnesium is always inside the solution. Record in the table the time taken for the magnesium ribbon to disappear. **TRANSFER** carefully the contents of the beaker into the 250ml volumetric flask. Add 10 cm^3 of distilled water into the beaker, swirl and add it to the volumetric flask. **Retain this for Procedure II.**

iv) Repeat procedure (iii) for each of the solutions in test tube 2, 3, 4 and 5 and complete the table 1 below.

Table 1

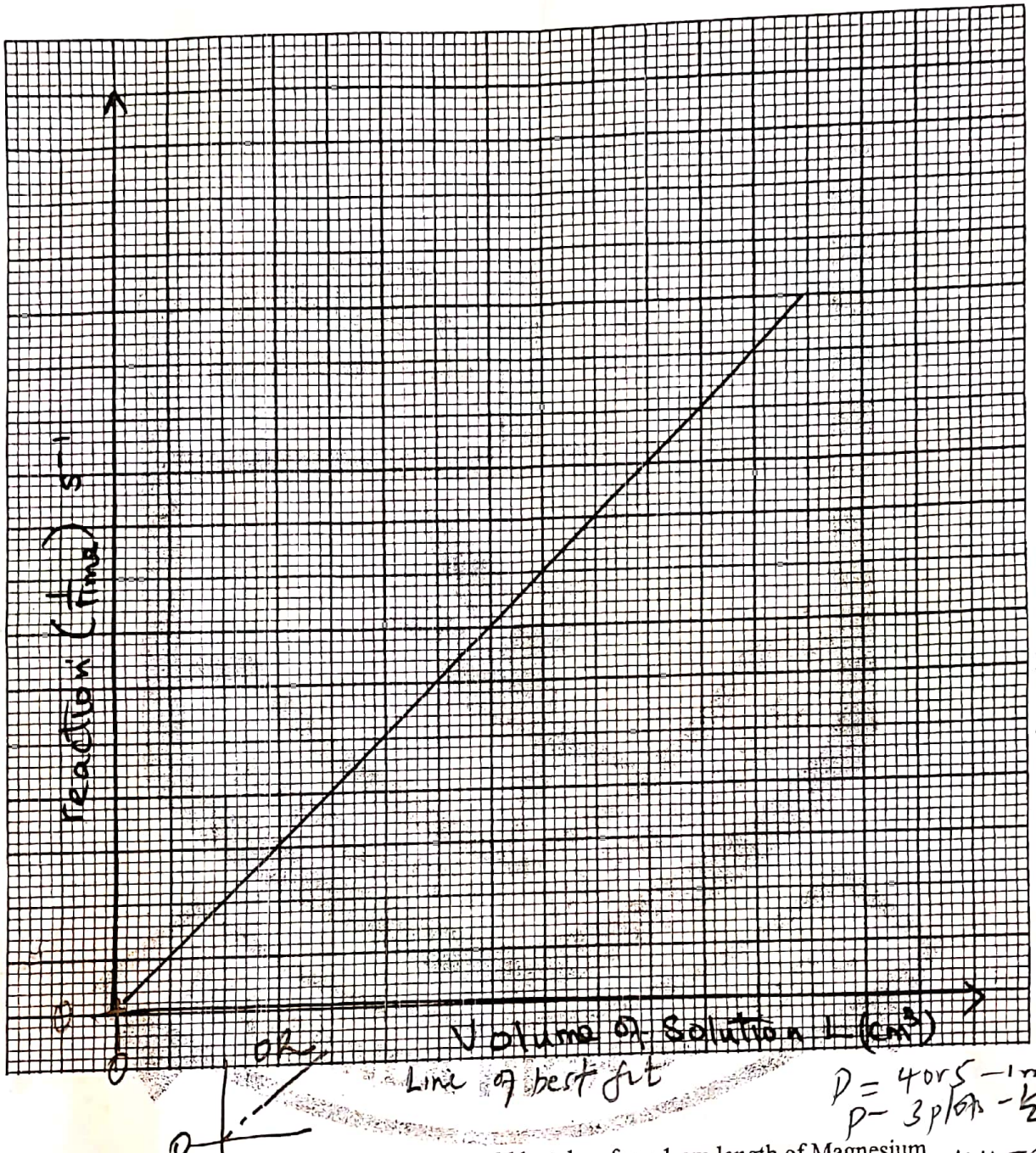
Test tube Number	1	2	3	4	5
Volume of solution L (cm^3)	10	9	8	7	6
Volume of water added (cm^3)	0	1	2	3	4
Time taken for the ribbon to disappear (sec.)	18±2	22	26	34	42
Rate of reaction $\left(\frac{1}{time}\right)$ s^{-1}	0.056	0.046	0.038	0.029	0.024

(5 marks)

ADONGO - B, C, G, M, O

OMONDO - P, R, W, V, T

b) i) Plot a graph of rate of reaction $\left(\frac{1}{time}\right)$ (y-axis) against volume of **solution L.** (3 marks)



S ½
A ½
P 1
L 1
03

P = 4 or 5 – 1mk
P – 3 plots – ½

ii) Using the graph, determine the time that would be taken for a 1 cm length of Magnesium ribbon to disappear if the volume of the acid was 7.5 cm^3. (1 mark)

20 ml = 0

Showing on graph ½ to get ½ then convert I

Correct reading and calculation ½

GOA – ALL

PROCEDURE II

To the contents of 250ml volumetric flask from Procedure I, add distilled water to the mark while shaking. Label this as **solution D**. Fill the burette with solution C. Pipette 25 cm^3 of solution D into a 250 cm^3 conical flask. Add three drops of phenolphthalein indicator and titrate with solution C. Record the results in table 2. Repeat the titration and complete table 2.

20·3±0·1 ✓1mk or ~~10·5~~ 20·3±0·2 ½ penalise ½ once

Table 2

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of Solution C used (cm^3)			

CT-1 realistic 07<CT<11
D-1
A-1 any value
PA-1
FA-1
05
(4 marks)

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

= titre 1 + titre 2 + titre 3 ✓½ / 3

= Average titre ✓½ (2dp max)

(b) Calculate the number of moles of:

(i) Sodium hydroxide in solution C used. (1 mark)

= 0·4 × Average titre ✓½ / 1000

= Correct answer ✓½ I

(ii) Hydrochloric acid in 25cm^3 of solution D. (1 mark)

Mole ratio HCl : NaOH is 1:1 ✓½

= Answer in b(i) above ✓½ I

OBONYO - ALL

8/12 = 0·8

(iii) Hydrochloric acid in 250 cm^3 of solution D. (1 mark)

= Answer b(ii) x 250 / 25 ✓½ | = Answer b(ii) x 10 ✓½ I

= Correct Answer ✓½ | = Correct answer

(iv) Hydrochloric acid in 40 cm^3 of solution L (1 mark)

= 40 x 2 / 1000 ✓½ I

= 0.08 ✓½

(v) Hydrochloric acid that reacted with Magnesium. (1 mark)

= Answer (iv) - answer (iii) ✓½ I

= Correct answer ✓½

(c) Determine the mass of Magnesium that reacted. (Mg = 24.0) (2 mark)

$Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$ ✓½ ✓½

= Answer (v) x 24 / 2 ✓½

= Correct Answer ✓½ x 24 Ans g

1) Ans = moles ✓½

2) moles x RAM ✓½ = g ✓½ I

OR

Ratio Mg : HCl is 1 : 2

= Answer (v) x 24 / 2

= Correct answer g.

Mass = (V) x 24 / 2

ANDANGO - B, C, G, M, O ODUNDO - P, R, W, V, Y

2. You are provided with **solid E**. Carry out the following tests and write your observations and inferences in the spaces provided.

(a) Place all of solid E in a boiling tube. Add about 10 cm^3 of distilled water and shake thoroughly. Filter the mixture into another boiling tube. **Retain** the filtrate for use in test 2(b) below. Dry the residue using pieces of filter papers.

i) Place the residue in a dry test-tube. Add 4 cm^3 of 2M hydrochloric acid, **solution L**. Retain the mixture for test (iii) below.

Observations	Inferences
Effervescence/bubbles ½ of a colourless gas Rej: - Hissing - Fizzling (½ mark)	CO_3^{2-} ½ SO_3^{2-} ½ Penalise fully for any contradictory ion (1mark)

1½

ii) To 2 cm^3 of the solution obtained in (i) above, add aqueous ammonia dropwise until in exess.

Observations	Inferences
White precipitate ½ Soluble in excess ½ (or dissolves in excess to form a colourless sln) (1 mark)	Zn^{2+} 1 (1mark)

rej. - soluble white ppt

2

(b) Use about 2 cm^3 of the filtrate obtained in (a) above for tests (i) to (iii) below.

i) Add aqueous ammonia dropwise until in excess.

Observations	Inferences
White precipitate ½ insoluble in excess ½ (1 mark)	Al^{3+}, Pb^{2+}, Mg^{2+} present 1 Conditions - 3 correct ions – 1mk - 2 correct ions – ½mk - Only 1 correct ion – 0mk (1mark) NB: Penalise ½mk for each contradictory ion to a max of 1mk

2

rej. insoluble white ppt.

HOS - B, C, G, M, O JESSE - P, R, W, V, Y

ii) Add about 2 cm^3 of 2M hydrochloric acid, **solution L.**

Observations	Inferences
-No effervescence ½ -No white precipitate ½ (1 mark)	CO_3^{2-}, SO_3^{2-} absent ½ - Award ½mk for both ions tied to no effervescence Al^{3+}, Mg^{2+} present ½ - Must be correctly inferred in b(i) above otherwise Penalise Fully. Pb^{2+} absent ½ (1mark)

2

iii) Add aqueous sodium hydroxide dropwise until in excess.

Observations	Inferences
- White precipitate ½ Insoluble in excess (½ mark)	Mg^{2+} present 1 (1mark)

1½

v) Add three drops of barium nitrate solution.

Observation	Inference
White precipitate 1 Penalise FULLY for white ppt soluble. (1mark)	SO_4^{2-} present 1 - Penalise fully for any contradictory ion mentioned (1mark)

2

ROSE-V, G, C MANALA-P, R, B, O IMBUGA-W, Y, M

3. You are provided with **solid F**. Carry out the following tests. Write your observations and inferences in the spaces provided.

a) Place all of solid F in a boiling tube. Add about 20 cm^3 of distilled water and shake until all the solid dissolves. Label the solution as solution F.

Add about half of the solid sodium hydrogen carbonate provided to 2 cm^3 of solution F.

Observations	Inferences
No effervescence / No bubbles (½ mark)	H^+, H_3O^+, R-COOH absent (½ mark)

I

b) (i) Add about 10 cm^3 of dilute hydrochloric acid, **solution L**, to the rest of solution F in the boiling tube. Filter the mixture. Wash the residue with about 2 cm^3 of distilled water. Dry the residue between filter papers. Place about one third of the dry residue on a metallic spatula and burn it in a Bunsen burner flame.

Observations	Inferences
- Burns with a sooty yellow flame. (1 mark)	C=C / -C≡C- (Aromatic cpds, long-chain alkanes) (1 mark)

2

(ii) Place all the remaining residue into a boiling tube. Add about 10 cm^3 of distilled water and shake thoroughly. Retain the mixture for tests in (c).

Observations	Inferences
- White suspension / white solid remains undissolved. Rej. White ppt/undissolved residue alone (1 mark)	- Compound slightly soluble/ partially soluble. Rej. Solid F is INSOLUBLE coz we are using its proteins to conduct test (1 mark)

2

OMENDA - P, R, B, O, C ELIJAH - V, W, Y, G, M

c) Divide the mixture into two portions:

(i) To the first portion, add the rest of the solid sodium hydrogen carbonate.

Observations	Inferences
Effervescence/bubbles of a colourless gas ½ (½ mark)	H^+, H_3O^+, R-COOH ½ Reg. Mention of F being an acid, but accept for ½ mk F is acidic (½ mark)

I

ii) To the second portion, add two drops of bromine water.

Observations	Inferences
Bromine water is not decolourised/ Yellow bromine water remains yellow/ Yellow colour of bromine water persist. (1 mark)	C=C / −C≡C− absent. (1 mark)

2

OKUMU - P, R, B, O, C

ALAGO - V, W, Y, G, M

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