MARANDA HIGH SCHOOL

The Kenya Certificate of Secondary Education

MOCK FORM 4

233/3 **Chemistry (PRACTICAL) Paper 3**

JUNE, 2024 Time: 2 Hours 15 Minutes

Name: M/G..... Adm No: .....

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

233/3 Chemistry PP3 - Practical
Wed, 28 June, 2024
Morning
Time: 7.00-9.15am

Instructions to Candidates

a) Write your name and Admission number in the spaces provided above.
b) Sign and write the date of examination in the spaces provided above
*c) Answer **ALL** the questions in the spaces provided below each question.*
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 Examiner's Use Only

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	20	
2	08	
3	12	
TOTAL SCORE	40	

1. You are provided with:

- Solid **A**, 0.3g, Magnesium metal
- Solution **B**, Hydrochloric acid
- Solution **C**, 0.15M sodium carbonate
- Methyl orange indicator

You are required to determine the:

- Enthalpy change,ΔH per mole, of the reaction between magnesium metal and excess hydrochloric acid.
- Concentration in moles per litre of hydrochloric acid, solution **B**

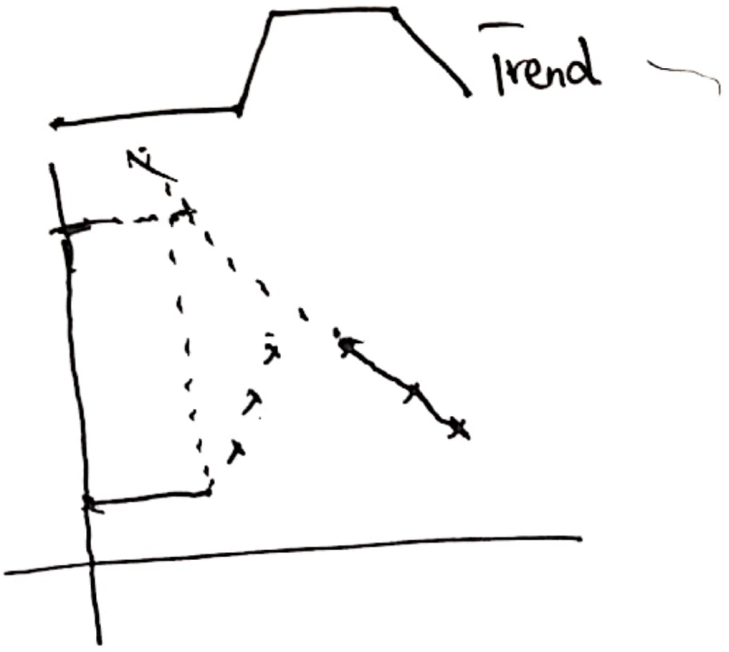
Procedure I

i) Using a burette, measure 50.0cm^3 of solution B and place it in a 100ml plastic beaker.
ii) Measure the temperature of solution **B** in the beaker after every 30 seconds and record it in **table I** below.
iii) At the 90 th second, add all the solid A provided into the beaker, stir with the thermometer and continues measuring and recording the temperature after every 30 seconds and complete **table I. Retain the mixture in the beaker for use in procedure II.**

Table I

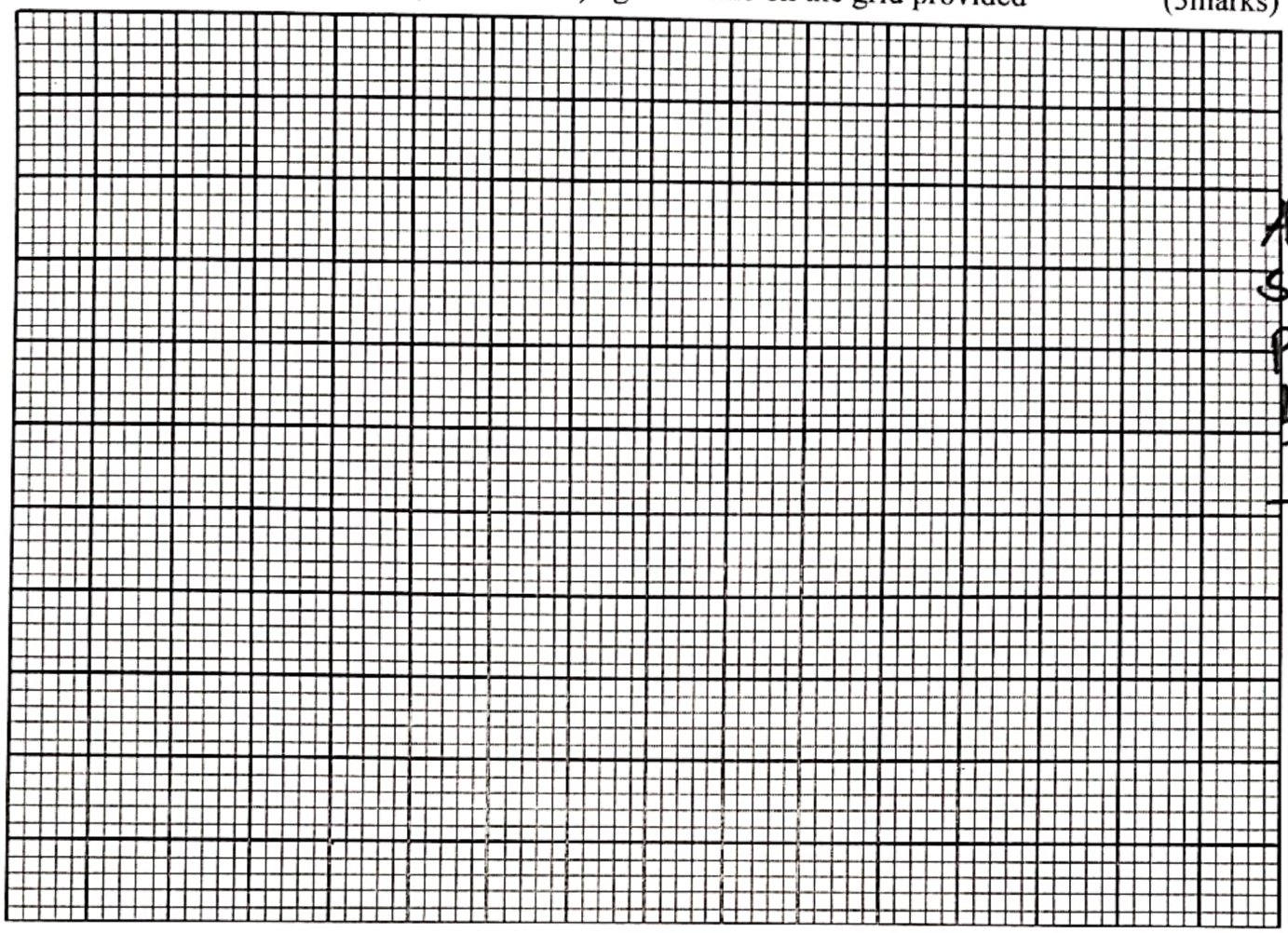
Time(seconds)	0	30	60	90	120	150	180	210	240	270
Temperature (^{0}C)										

(3marks)



CT-1
DP-½
A-½
T-½
03

a) Plot a graph of temperature (vertical axis) against time on the grid provided (3marks)



A-½
S-½
P-1
L-1
03

b) Determine the change in temperature, ΔT, for the reaction. (1mark)

.....Correct Reading ✓1.....

c)Calculate the heat change, in Joules, for the reaction. (Assume that for the solution, specific heat capacity is 4.2J/g/K and density is 1.0 gcm^3) (1 mark)

.....ΔH= 50 X 4·2 X Ans in (b) ✓½.....

.....= Correct Ans. ✓½ Joules.....

d)The relative atomic mass of magnesium is 24.0. Calculate the enthalpy change, ΔH, of the reaction per mole of magnesium. (1 mark)

Moles = $\frac{0.3}{24}$ = 0·0125 moles ✓½

$\Delta H = -\frac{\text{Ans in (c) in kJ}}{0.0125}$

Correct Ans ✓½ (-ve sign and units kJ/mol)

Procedure II

(i)Fill the burette with 0.15M sodium carbonate, solution **C**

(ii) Place all the mixture in the beaker from procedure I into 250 ml volumetric flask. Add more distilled water to the mark and shake thoroughly. Label the mixture solution **D**

(iii) Pipette 25cm^3 of solution **D** into a 250 ml conical flask and add 2 drops of methyl orange indicator.

(iv) Titrate solution **D** in the conical flask with the sodium carbonate, solution **C** and record the reading in **table II** below
(v) Repeat steps(iii) and(iv) and complete **table II**

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

CT-1
DP-1
A-1
PA-1
FA-1

(4 marks) 05

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

.....√½.....

.....√½.....

(b)Calculate the number of moles of:

(i) Sodium carbonate used, solution **C** (1 mark)

$\frac{0.15 \times A.V}{1000}$ √½ = Correct Ans √½ 1

(ii) Hydrochloric acid in the 25.0cm^3 of solution D (1 mark)

= Ans in Procedure II b(i) above X 2 √½

Correct Ans √½ 1

07

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

250 X Ans in b(ii) or 10 X Ans in b(ii) ✓½
25 = Correct Ans ✓½ 1

(iv) Hydrochloric acid that reacted with magnesium metal (1 mark)

Moles of Mg = 0.3/24 = 0.0125
Moles of HCl = 0.0125 X 2 ✓½ 1
= Correct Ans ✓½

(c) Calculate the total number of moles of hydrochloric in the 50.0cm^3 of solution B (1 mark)

= Correct Ans in b(iii) + Correct Ans in b(iv) ✓½
= Correct Ans ✓½ 1

(d) Determine the concentration of hydrochloric acid in moles per litre, in solution **B** (1 mark)

= Correct Ans in (c) above X 1000 ✓½ / 50 = Correct Ans ✓½ 1

2. You are provided with an organic solid **E**. Carry out the following tests and record your observation and inferences in the spaces provided. Divide solid **E** into four portions.

(i) Place the first portion of solid **E** in a spatula and Ignite it.

Observations	Inferences
Burns with a yellow sooty flame ✓1 (1 mark)	$\overset{1}{C}=\overset{1}{C}$, $\overset{1}{C}\equiv\overset{1}{C}$ present ✓1 (1 mark)

(ii) Place the second portion of solid **E** in test tube. Add about 2cm^3 of aqueous sodium hydroxide and shake.

Observations	Inferences
Dissolves ✓½ to form a colourless ✓½ solution (1 mark)	Acidic Compound / R-COOH present. ✓1 (1 mark)

(iii) Place the third portion of solid **E** in a test tube. Add about $2cm^3$ of distilled water. Heat the mixture and add three drops of acidified potassium manganate (VII)

Observations	Inferences
Purple acidified Potassium manganate (VII) remains purple/ does not change to colourless. (1 mark)	$\overset{1}{C}=\overset{1}{C}$, $-C\equiv C-$, R-OH absent. (1 mark)

(iv) Place the fourth portion of solid **E** in a test tube. Add about $2cm^3$ of distilled water. Heat the mixture and add all the solid sodium hydrogen carbonate provided.

Observations	Inferences
Bubbles of a colourless gas (1 mark)	R-COOH present (1 mark)

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

(a) Place all the sold **F** in a boiling tube. Add about $10cm^3$ of distilled water. Shake well and filter. Divide the filtrate into three portions and keep the residue for use in part (b).

(a) (i) To the first portion add aqueous sodium hydroxide drop wise until in excess.

Observations	Inferences
White precipitate insoluble in excess (1 mark)	Ca^{2+}, Mg^{2+}, Ba^{2+} present (1 mark)

3 ions for 1mk
2 ions for ½ mk
1 ion – 0
Penalize for ½ mk for any contradicting ion to a max of ½ mk

(ii) To the second portion add three drops of ~~lead (II) nitrate~~ Barium chloride solution followed by $3cm^3$ of dilute nitric(V) acid.

Observations	Inferences
White precipitate, insoluble on addition of the acid (1mark)	SO_4^{2-} present (1 mark)

08

(iii) To the third portion add ammonia solution dropwise until excess.

Observations	Inferences
White precipitate insoluble in excess. (1 mark)	Mg^{2+} present ✓1 Penalize ½mk for any contradictory ion to a max of 1mk (1 mark) 2

(b) Place the residue in (a) above in a boiling tube and add ~~1cm³~~ 8cm³ of dilute nitric (V) acid. Retain the mixture for the tests below:

(i)To 2cm³ of the solution, add sodium hydroxide solution dropwise until in excess.

Observations	Inferences
White precipitate soluble in excess. (1 mark)	Zn^{2+}, Al^{3+}, Pb^{2+} present ½ 3 ions for 1mk 2 ions for ½mk 1 ion – 0mk (1 mark) 2

(ii)To 2cm³ of the solution, add three drops of sulphuric (VI) acid. Penalize ½mk for any contradictory ion to a max of 1mk

Observations	Inferences
No white precipitate ✓ No bubbles of a gas ✓ (1 mark)	Zn^{2+}, Al^{3+} ✓ present CO_3^{2-}, SO_3^{2-} absent ✓ rej Pb^{2+} absent. (1mark) 2

(i)To 2cm³ of the solution, add ammonia solution dropwise until in excess.

Observations	Inferences
White precipitate ½ soluble ✓ in excess (1 mark)	Zn^{2+} present ✓1 (1 mark) 2

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08