VIRAJ INTERNATIONAL ACADEMY

NAME…… **INDEX NO……**

SCHOOL…… **SIGN……**

DATE……

233/3

CHEMISTRY

Paper 3

2 HOURS 15 MINUTES

Instructions to candidates

(a) *Write your* ***name, index number*** *and the* ***name*** *of your school in the spaces provided above.*
(b) ***Sign*** *and* ***write*** *the* ***date*** *of examination in the spaces provided above.*
(c) *Answer* ***all*** *questions in this question paper.*
(d) *Answers to* ***all*** *questions* ***must*** *be written in the spaces provided in this booklet.*
(e)*All working* ***MUST*** *be clearly shown.*
(f)*KNEC mathematical tables and non-programmable silent electronic calculators* ***may be*** *used.*
(g) Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	18	
2	10	
3	12	
TOTAL SCORE	40	

This paper consists of 8 printed pages.

1. You are provided with:

- Metal carbonate, MCO_3, solid Q
- 2M hydrochloric acid, solution P
- Sodium hydroxide, solution R containing 40g per litre of solution.

You are required to determine the relative atomic mass of metal M.

Procedure

Measure accurately $100cm^3$ of solution P into a clean $250cm^3$ conical flask and add all the 4.69g of solid Q. MCO_3. Shake well and wait for effervescence to stop. Label the resulting solution as S_1. Pipette $25cm^3$ of solution R into a conical flask and add 2 – 3 drops of phenolphthalein indicator. Fill a burette with solution S_1 and titrate against the solution R until the end point. Record your results in the table below. Repeat the procedure to fill the table.

Table 1

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution S_1, used cm^3			

Calculate **(4 marks)**

(i) average volume of solution S_1 used **(1 mark)**

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(ii) Moles of sodium hydroxide, solution R used. **(2 marks)**

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(iii) Moles of hydrochloric acid, solution S_1 in the average volume used. **(1 mark)**

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(iv) Moles of hydrochloric acid, solution S_1 in $100cm^3$ of solution.` **(2 marks)**

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(v) Moles of hydrochloric acid in the $100cm^3$ of the original solution P. **(2 marks)**

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(vi) Moles of hydrochloric acid, solution P, that reacted with solid Q, MCO_3. **(2 marks)**

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(vii) Moles of MCO_3 that reacted **(2 marks)**

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(viii) The relative formula mass of MCO_3. **(2 marks)**

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2. You are provided with

- Magnesium ribbon labelled solid D
- 2.0 M hydrochloric acid labelled solution F.
- Stop watch

You are required to determine the rate of reaction between magnesium and hydrochloric acid at different concentrations.

Procedure

(i) Place five test tubes in a test tube rack and label them 1,2,3,4 and 5. Using $10cm^3$ measuring cylinder, measure out the volume of 2.0M hydrochloric acid, solution F, as shown in table II below. Pour into the corresponding test tubes.

(ii). Cut out five pieces each exactly 1cm length of magnesium ribbon solid D.

(iii). Transfer all the solution in test tube 1 into a clean $100cm^3$ beaker. Place one piece of magnesium into the beaker and start a stop watch immediately. Swirl the beaker continuously ensuring that the magnesium is always inside the solution. Record in the table the time taken for magnesium to disappear.

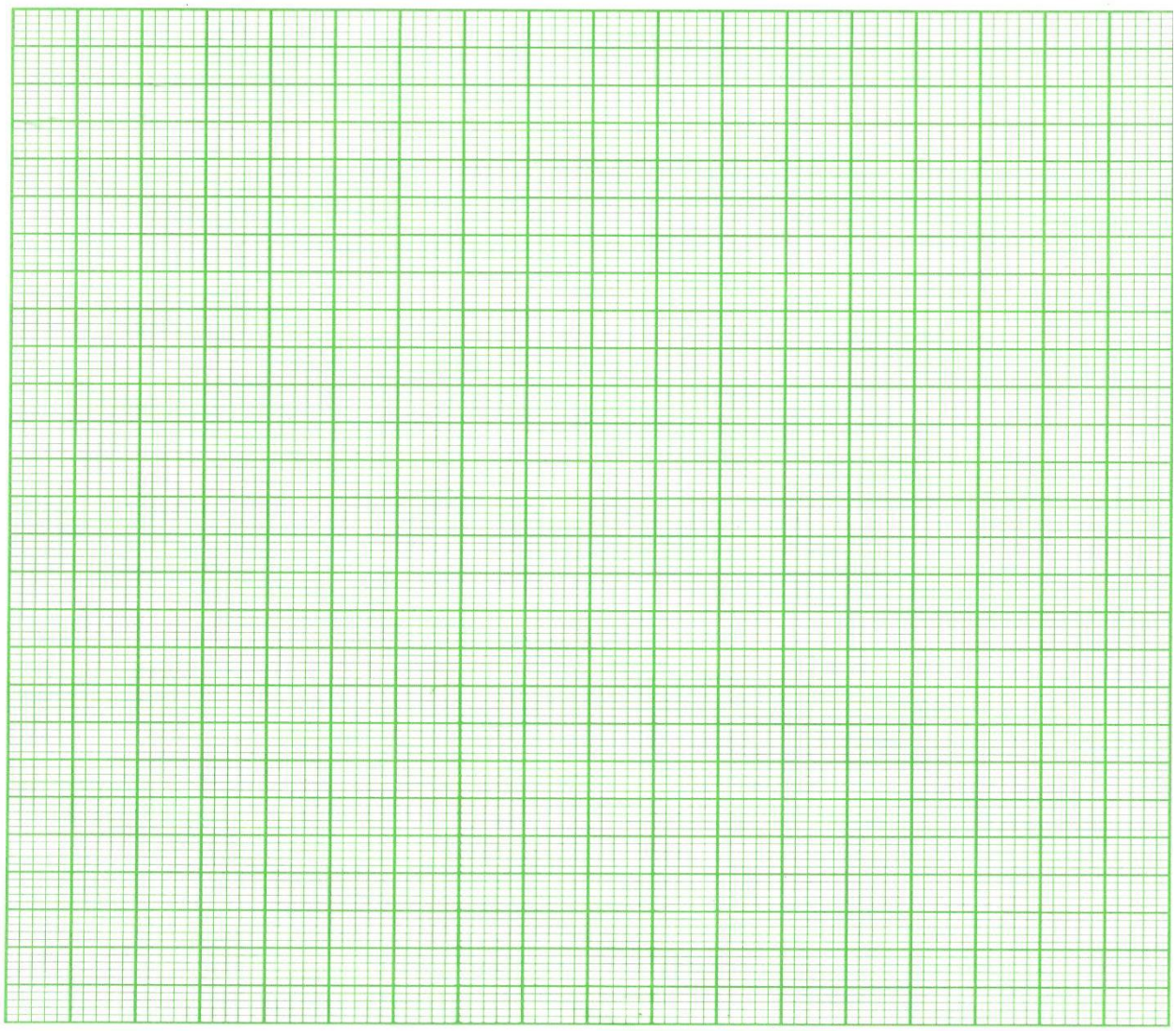
(iv). Repeat procedure (iii) for each of the solution in test tubes 2,3,4 and 5 and complete the table.

Table II

Test tube number	1	2	3	4	5
Volume of solution F cm^3	10	9	8	7	6
Volume of water cm^3	0	1	2	3	4
Time taken (sec)					
Rate of reaction $^1/_{time}$					

(5 marks)

(a) Plot a graph of rate of reaction $^1/_{time}$(y-axis) against volume of solution F. **(3 marks)**



(b) Use the graph to determine the time that would be taken for a 1cm length of magnesium ribbon to disappear if the volume of the acid solution F used was $7.5cm^3$ **(1 mark)**

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(c) In terms of rate, explain the shape of your graph. **(1 mark)**

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3. You are provided with solid L which is a mixture. Carry out the tests below. Record your observations and inferences in the table, in order to determine the ions present in solid L.

Place the solid in about $10cm^3$ of distilled water and shake then filter the mixture. Keep both the filtrate and residue. Divide the filtrate into 3 portions.

(i). To the first portion add aqueous ammonia solution dropwise until in excess.

Observation	**Inferences**
½ mk	**½ mk**

ii) To the second portion add lead (II) nitrate and warm

Observation	**Inferences**
½ mk	**½ mk**

iii) Transfer all the residue into a test tube and add dilute hydrochloric acid to it drop wise, shaking after each addition until a solution is formed. Divide the solution into 3 portions.

Observation	**Inferences**
½ mk	**½ mk**

(iv). To the first portion add sodium hydroxide dropwise until in excess.

Observation	**Inferences**
½ mk	**½ mk**

(v). To the second portion add ammonia solution dropwise until in excess.

Observation	**Inferences**
½ mk	**½ mk**

(vi). To the third portion add Barium nitrate solution.

Observation	**Inferences**
½ mk	**½ mk**

(b). You are provided with solid X. Carry out the tests below and record your observations and inferences in the table below.

(a). Place one spatula endful of solid x in a test tube and add about $10cm^3$ of distilled water. Shake well and use for test (i) below.

(i). Test $2cm^3$ of the solution in test tube with red litmus paper and blue litmus paper.

Observation	**Inferences**
½ mk	**½ mk**

(ii). To 2cm^3 of the solution in a test tube, add one spatula endful of sodium hydrogen carbonate.

Observation	**Inferences**
½ mk	**½ mk**

(iii). To 2cm^3 of the solution, add <u>three</u> drops of acidified potassium manganate VII solution

Observation	**Inferences**
½ mk	**½ mk**

iv) Place about 4cm^3 of ethanol in a test tube and add two drops of concentratedsulphuric acid then add a spatula endful of solid X. Warm the mixture carefully. Shake well and pour the mixture into 20cm^3 of water in a beaker.

Observation	**Inferences**
1 mk	**1 mk**