Name ..... Index No. .....

School ..... Candidates signature .....

233/3 Date .....
CHEMISTRY
Paper 3
(Practical)
July 2018
Time : 2¼ Hours

FORM 4 END OF TERM 2 EXAM

CHEMISTRY
Paper 3
July 2018
Time : 2¼ Hours

INSTRUCTIONS TO CANDIDATES

* Write your name and index number in the spaces provided.
* Sign and write the date of examination in the spaces provided.
* Answer **ALL** questions in the spaces provided in the question paper.
* 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 chemicals and apparatus you may need.
* Mathematical tables and silent electronic calculators may be used.
* All working must be clearly shown where necessary.
* This paper has **8** printed pages.
* Candidates should check the questions paper 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	21	
2	12	
3	07	
Total score	**40**	

1. You are provided with :
- 2M hydrochloric acid, solution W
- 5 pieces of magnesium ribbon, each 2cm long
- 0.5M sodium carbonate, solution R

You are required to determine :
i) the rate of reaction between hydrochloric acid and magnesium
ii) the mass of 2cm of magnesium ribbon

Procedure 1

Using a clean measuring cylinder, measure $60cm^3$ of 2M hydrochloric acid, solution W and place it into a clean conical flask. Take a 2cm piece of magnesium ribbon provided and place hydrochloric acid and immediately start the stopwatch.
Measure and record the time taken for the magnesium ribbon to react completely with hydrochloric acid in table 1 below.
Retain the contents of conical flask 1 for use in procedure II. Label this solution P

Repeat the procedure using $50cm^3$, $40cm^3$, $30cm^3$ and $20cm^3$ portions of 2M hydrochloric acid adding distilled water and complete the table below.

NOTE: Do not retain the contents of the conical flask in experiments 2, 3, 4 and 5.

Table 1

Experiment number	1	2	3	4	5
Volume of 2M hydrochloric acid (cm^3)	60	50	40	30	20
Volume of distilled water (cm^3)	0	10	20	30	40
Time taken for ribbon to disappear (s)					

b) Plot a graph of $^1/_{time}$ against volume of 2M hydrochloric acid. (3 marks)

c) From your graph, determine the time taken for the ribbon to disappear when $36cm^3$ of 2M hydrochloric acid were used. (2 marks)

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d) In terms of rate of reaction, explain the shape of your graph.

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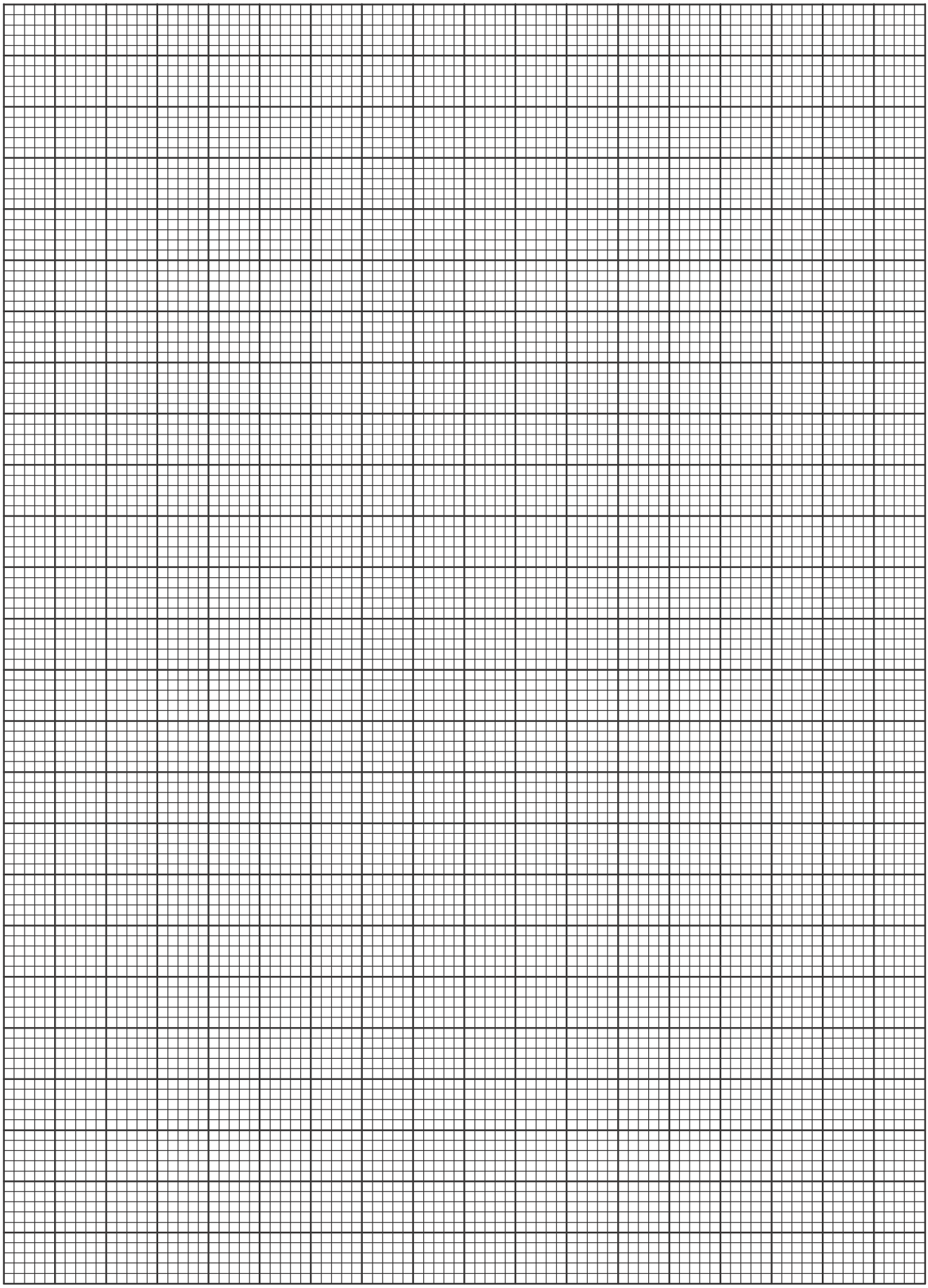

Procedure II

a) Using a clean measuring cylinder measure 40cm^3 of distilled water and add it to the contents of the conical flask retained in procedure I labelled solution P
Fill a burette with 0.5M sodium carbonate solution R. Pipette 25.0cm^3 of solution P and place it into a clean flask.
Add 2-3 drops of phenolphthalein indicator to solution P. Titrate with sodium carbonate solution R and record your results in table II below. Repeat the titration two more times and complete the table.

Table II

	I	II	III
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of solution R used (cm³)			

b) Calculate the :

i) Average volume of solution R used. (1 mark)

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ii) Number of moles of sodium carbonate solution R used. (1 mark)

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iii)Number of moles of hydrochloric acid used. (1 mark)

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iv) Number of moles of hydrochloric acid present in solution R. (1 mark)

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v) Number of moles of hydrochloric acid present in $60cm^3$ of solution W. (1 mark)

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v) Number of moles of hydrochloric acid that reacted with 2cm magnesium ribbon. (1 mark)

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vi) Mass of magnesium present in 2cm ribbon. (Mg = 24.0) (2 marks)

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2. You are provided with solid K. Carry out the following tests below. Write your observations and inferences in the spaces provided.

a) Place about one half of solid K in a dry test tube. Heat gently then strongly. Test any gases produced with blue and red litmus papers.

Observations	Inferences
(1mk)	(1mk)

b) Place the remaining amount of solid K in a boiling tube. Add about $10cm^3$ of distilled water and shake the mixture.

Observations	Inferences
(1mk)	(1mk)

c) Divide solution K above into four portions of $2cm^3$ each in separate test tubes. Use the portions for tests (i) to (iv) below.

i) To the first portion add sodium hydroxide solution dropwise until in excess.

Observations	Inferences
(1mk)	(1mk)

ii) To the second portion add about 1cm^3 of sodium chloride solution.

Observations	Inferences

(1mk) (1mk)

iii) To the third portion add aqueous ammonia dropwise until in excess.

Observations	Inferences

(1mk) (1mk)

iv) To the fourth portion add three drops of aqueous barium nitrate followed by five drops of nitric (v) acid.

Observations	Inferences

(1mk) (1mk)

3. You are provided with an organic substance S. Carry out the following tests and record your observations and inferences in the spaces provided.

a) Place about one third of substance S on a metallic spatula and ignite it with a bunsen burner flame.

Observations	Inferences

(1mk) (1mk)

b) Place the remaining amount of substance S in a boiling tube. Add about $10cm^3$ of distilled water and shake well. Use about $2cm^3$ portions of the mixture obtained for tests (i) to (iii) below.

i) To the first portion add solid sodium hydrogen carbonate.

Observations	Inferences
(½mk)	(½mk)

ii) To the second portion add two drops of acidified manganate (VII) solution.

Observations	Inferences
(1mk)	(1mk)

iii)To the third portion add 3 drops of bromine water.

Observations	Inferences
(1mk)	(1mk)