

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

18 JANUARY 2017 (p.m.)



J1701212032

FILL IN ALL THE INFORMATION REQUESTED CLEARLY IN CAPITAL LETTERS.

TEST CODE

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SUBJECT CHEMISTRY – Paper 032

PROFICIENCY GENERAL

REGISTRATION NUMBER

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SCHOOL/CENTRE NUMBER

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NAME OF SCHOOL/CENTRE

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CANDIDATE'S FULL NAME (FIRST, MIDDLE, LAST)

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DATE OF BIRTH

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SIGNATURE _____



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JANUARY 2017

CARIBBEAN EXAMINATIONS COUNCIL

**CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

CHEMISTRY

Paper 032 – General Proficiency

Alternative to SBA

2 hours and 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of THREE questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, ALL WORKING MUST BE SHOWN in this booklet.
5. You may use a silent, non-programmable calculator to answer questions.
6. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
7. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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NOTHING HAS BEEN OMITTED

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Answer ALL questions.

Write your responses in the spaces provided in this booklet.

1. (a) You are required to determine the concentration of Solution X.

You are provided with the following reagents:

- Solution X – an unknown concentration of sulfuric acid, H_2SO_4
- Solution Y – 0.10 mol dm^{-3} sodium hydroxide, NaOH
- Screened methyl orange indicator

Procedure:

1. Rinse the burette with a small amount of Solution X.
2. Fill the burette with Solution X and record the burette reading in Table 1 (**page 6**).
3. Rinse the pipette with a small amount of Solution Y.
4. Pipette 25.0 cm^3 (20.0 cm^3) of Solution Y into a conical flask.
5. Add ONE drop of the screened methyl orange indicator.
6. Titrate the solution in the conical flask to an almost colourless endpoint and record the burette reading in Table 1 (**page 6**).
7. Repeat the experiment until consistent results are obtained, but do NO MORE than THREE titrations.

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Results:

- (i) Record your volume readings to 2 decimal places in Table 1.

TABLE 1: TITRATION OF SOLUTION Y WITH SOLUTION X

Burette Readings (cm ³)	Titration 1	Titration 2	Titration 3
Final volume			
Initial volume			
Volume of Solution X used			

Pipette volume used: _____ cm³ **(10 marks)**

- (ii) In Table 1, indicate using asterisks (*) the titration volumes that will be used to calculate the average volume of Solution X. **(1 mark)**
- (iii) Calculate the average volume of Solution X used in the titration.

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(1 mark)

- (iv) Write a balanced equation for the reaction taking place in the titration.
-
.....
(2 marks)

- (v) Calculate the number of moles of sodium hydroxide used in the titration.
-
.....
(1 mark)

- (vi) Assuming that 1 mole of H₂SO₄ reacts with 2 moles of NaOH, calculate the number of moles of sulfuric acid in the volume of Solution X used from the burette.
-
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(1 mark)

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(vii) Calculate the concentration (in mol dm⁻³) of sulfuric acid in Solution X.

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(1 mark)

(viii) Solution X was prepared by taking 25 cm³ of a stock solution and diluting it to 250 cm³ in a volumetric flask. Calculate the concentration of sulfuric acid in the original stock solution.

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(2 marks)

(b) Conduct the following qualitative tests on Solution M, as outlined in Table 2. Divide the sample of Solution M into two equal portions. Complete Table 2 by filling in the resulting observations and inferences.

TABLE 2: RESULTS OF QUALITATIVE ANALYSIS ON SOLUTION M

	Test	Observation	Inference
(i)	To the first portion of Solution M: • Add two drops of aqueous sodium hydroxide solution. • Add aqueous sodium hydroxide dropwise with intermittent shaking until in excess and no further change is observed.	• • (2 marks)	• • (2 marks)
(ii)	To the second portion of Solution M: • Add two drops of aqueous potassium iodide solution.	• (1 mark)	• [Ionic equation required] (2 marks)

Total 26 marks

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2. The effect of the concentration of an acid, A, on the rate of production of hydrogen gas by a metal, N, was investigated. The data are presented in Table 3.

TABLE 3: THE EFFECT OF CONCENTRATION ON THE RATE OF GAS PRODUCTION

Concentration of Acid A (mol dm ⁻³)	0.04	0.05	0.06	0.07	0.08	0.09
Rate of Production of Hydrogen Gas for Metal N (cm ³ min ⁻¹)	2.0	3.1	4.1	6.0	7.9	9.1

- (a) Using the axes provided in Figure 1 on page 9, plot a graph of rate versus concentration. Circle the plotted points on the graph, ⊗, and draw the line of best fit. **(7 marks)**

- (b) State TWO variables that should be kept constant when the experiment is being carried out.

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(2 marks)

- (c) State ONE precaution that should be taken during the experiment.

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(1 mark)

Total 10 marks

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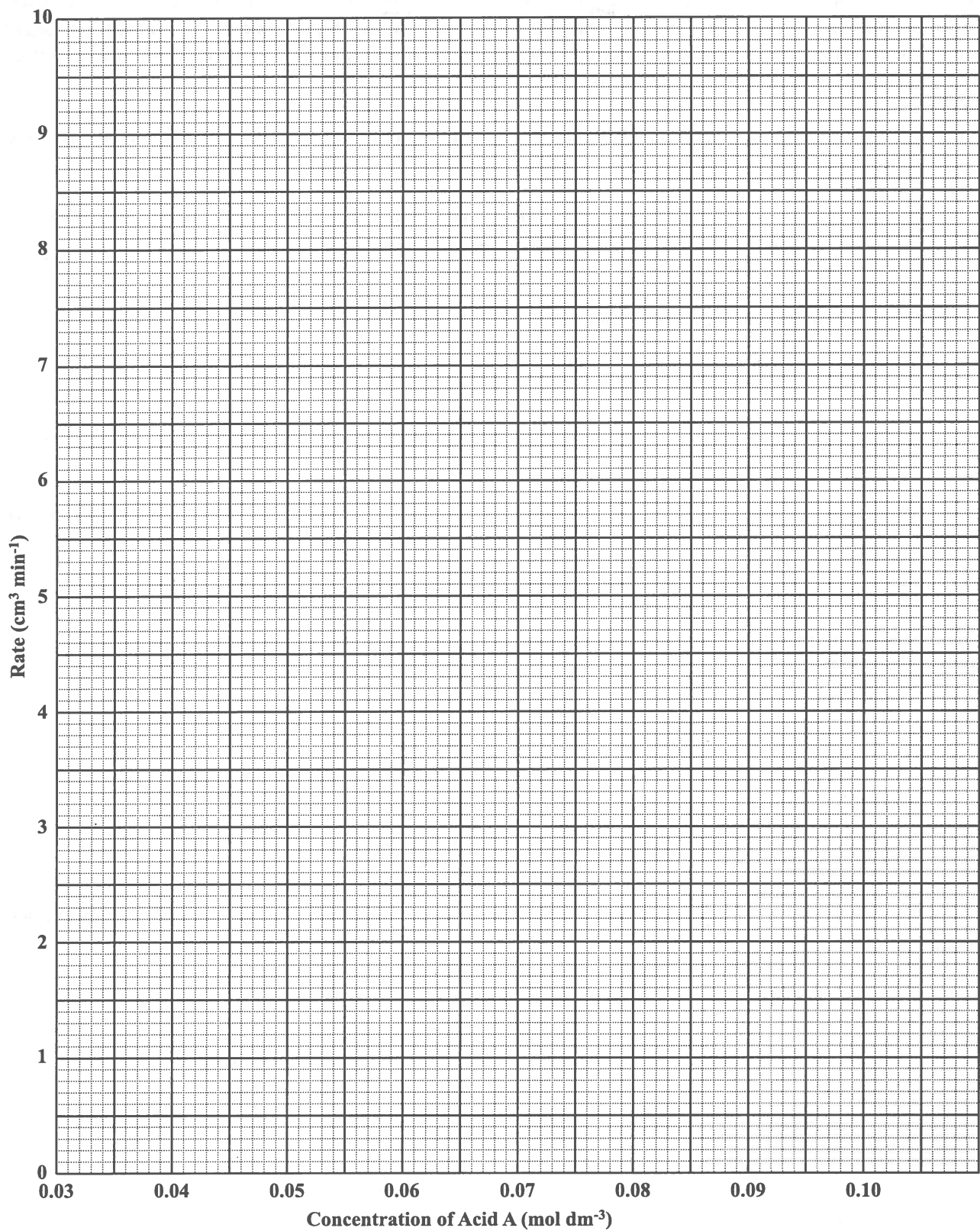


Figure 1. Plot of rate against acid concentration

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3. StainBlast, a commercial stain remover, is advertised as being effective at removing rust stains from clothing. Lime juice contains a number of naturally occurring organic acids, and it is proposed that a homemade solution of table salt (sodium chloride) and lime juice is more effective than StainBlast at removing rust stains.

Plan and design an experiment to determine which stain removal agent is more effective at removing rust stains from clothing.

Hypothesis: A solution of table salt and lime juice is better than StainBlast at removing rust stains.

Your answer should include the following:

- (a) Apparatus and materials

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(2 marks)

- (b) Procedure

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(3 marks)

- (c) TWO controlled variables

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(2 marks)

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(d) Data to be collected

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(2 marks)

(e) Discussion of the results as they relate to the hypothesis

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(2 marks)

(f) ONE precaution to be taken during the experiment.

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(1 mark)

Total 12 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



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EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No.

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CANDIDATE'S RECEIPT

INSTRUCTIONS TO CANDIDATE:

1. **Fill in all the information requested clearly in capital letters.**

TEST CODE:

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SUBJECT: CHEMISTRY – Paper 032

PROFICIENCY: GENERAL

REGISTRATION NUMBER:

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FULL NAME: _____
(BLOCK LETTERS)

Signature: _____

Date: _____

2. **Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.**
3. **Keep it in a safe place until you have received your results.**

INSTRUCTION TO SUPERVISOR/INVIGILATOR:

Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

Signature: _____
Supervisor/Invigilator

Date: _____



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