

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

18 JANUARY 2019 (p.m.)



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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FORM TP 2019006



TEST CODE 01212032

JANUARY 2019

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

CHEMISTRY

Paper 032 – General Proficiency

Alternative to School-Based Assessment

2 hours and 10 minutes

023

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.**

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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. The heat of neutralization can be determined by measuring the temperature change when various volumes of acid are reacted with an alkali. In this experiment, you are to determine the heat of neutralization between potassium hydroxide and dilute hydrochloric acid.

You are provided with the following reagents:

- A solution of 0.5 mol dm^{-3} hydrochloric acid, Solution A
- A solution of 0.5 mol dm^{-3} potassium hydroxide, Solution B
- A thermometer ($0\text{--}100^\circ\text{C}$)
- A burette (50 cm^3)
- A calorimeter (with a small hole to insert the thermometer)
- A measuring cylinder (50 cm^3)
- A wash bottle of distilled water
- A small glass funnel

Procedure:

1. Place Solution A in the burette and measure 10 cm^3 into the calorimeter.
2. Measure the temperature of Solution A to the nearest 0.5°C and record the value in the Initial Temperature of Solution A column in Table 1 on **page 6**.
3. Using the measuring cylinder, accurately measure 40 cm^3 of Solution B.
4. Pour this volume of Solution B into the calorimeter containing Solution A.
5. Stir with the thermometer and measure the highest temperature reached to the nearest 0.5°C .
6. Record the temperature value in the Highest Temperature of Mixture column in Table 1.
7. Calculate the rise in temperature and record this value in the Temperature Rise column of Table 1.
8. Empty the calorimeter and rinse it with water.
9. Repeat Steps 1–8 using the different volumes of Solution A and Solution B shown in Table 1.

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(a) (i) **TABLE 1: HEAT OF NEUTRALIZATION EXPERIMENT BETWEEN POTASSIUM HYDROXIDE AND DILUTE HYDROCHLORIC ACID**

Volume of Solution A/cm ³	Volume of Solution B/cm ³	Initial Temperature of Solution A/°C	Highest Temperature of Mixture/°C	Temperature Rise/°C
10	40			
20	30			
30	20			
40	10			

(8 marks)

(ii) Write a balanced chemical equation for the reaction.

.....
.....

(1 mark)

(b) Use the data from Table 1 to plot a graph of temperature rise against the volume of Solution A using the axes provided in Figure 1 on **page 7**. Draw two best fit intersecting straight lines. (6 marks)

(c) From the graph drawn in (b), determine the **largest** temperature rise, ΔT , and the corresponding volume of Solution A needed to cause this rise.

(i) $\Delta T =$ °C (1 mark)

(ii) Volume of Solution A = cm³ (1 mark)

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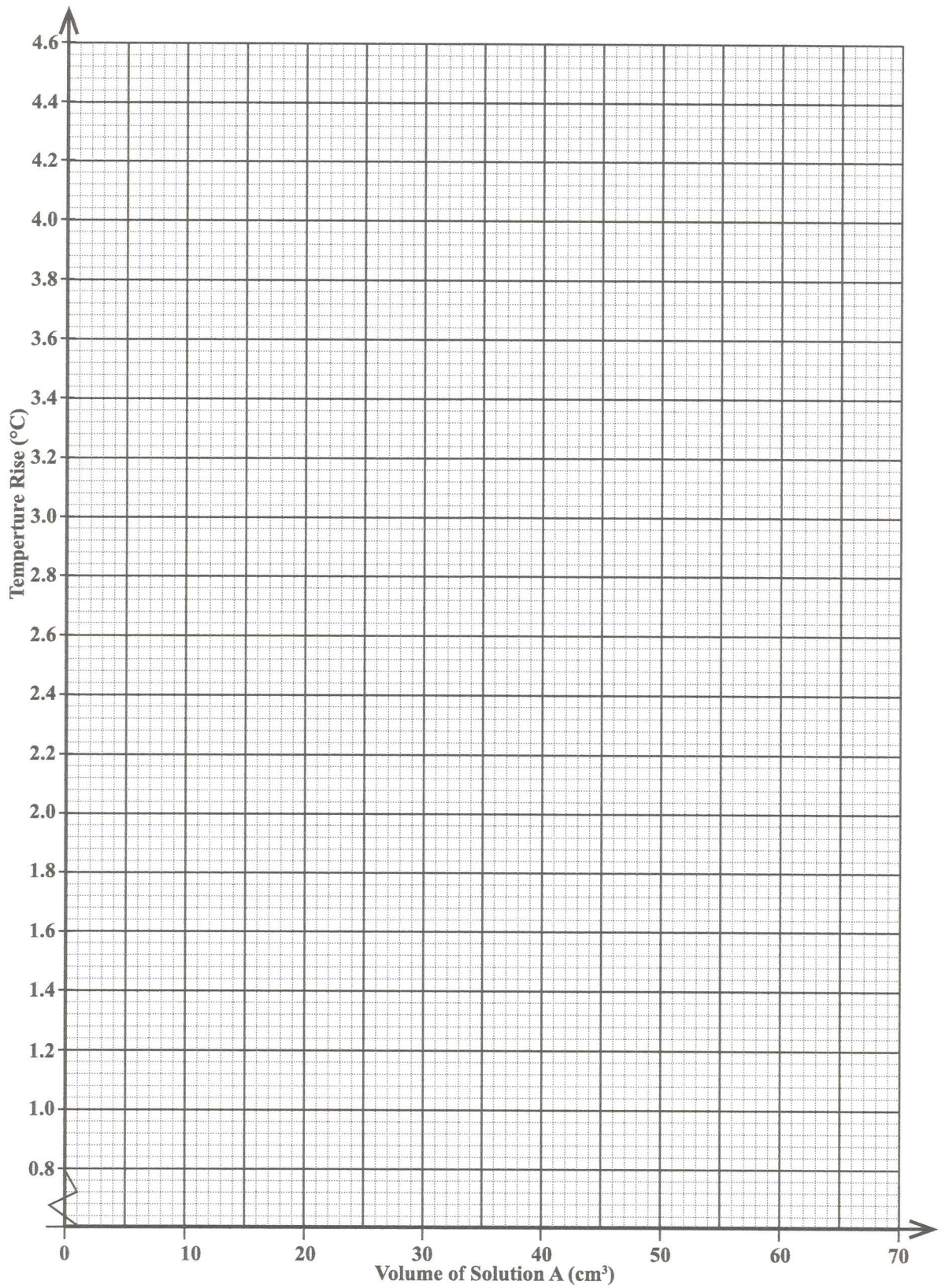


Figure 1. Temperature Rise against Volume of Solution A

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- (d) Calculate the heat change at the point of neutralization for the reaction between potassium hydroxide and hydrochloric acid.

[Use $\Delta H = m \times c \times \Delta T$. Note: The specific heat capacity of solution is $4.2 \text{ J/g}^\circ\text{C}$. Assume that the density of the solution is 1 g/cm^3 .]

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(3 marks)

- (e) Calculate the number of moles of hydrochloric acid used in the experiment.

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(2 marks)

- (f) Calculate the enthalpy change (ΔH) for the reaction between potassium hydroxide and hydrochloric acid. Include an appropriate sign for ΔH .

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(2 marks)

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- (g) List ONE source of error that should be taken in the experiment.

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(1 mark)

- (h) List ONE precaution that should be taken in the experiment.

.....
(1 mark)

Total 26 marks



2. A student conducts the following tests on Solution C and Solution D. The inferences made are recorded in Table 2. Complete Table 2 to show all possible observations.

TABLE 2: RESULTS OF TESTS CONDUCTED ON SOLUTION C AND SOLUTION D

	Test	Observation	Inference
(a)	To a portion of Solution C , aqueous sodium hydroxide is added dropwise until in excess and then heated. The gas evolved is tested with moist red litmus.	• • •	NH_4^+ , Na^+ or K^+ present Confirms NH_4^+ present
		(3 marks)	
(b)	To another portion of Solution C , dilute nitric acid followed by silver nitrate is added dropwise. This is then followed by the addition of aqueous ammonia.	• •	Cl^- present
		(2 marks)	
(c)	To a portion of Solution D , aqueous sodium hydroxide is added until in excess.	• •	Al^{3+} , Pb^{2+} or Zn^{2+} present
		(2 marks)	
(d)	To another portion of Solution D , aqueous ammonia is added dropwise until in excess.	• •	Al^{3+} or Pb^{2+} present
		(2 marks)	

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3. You are provided with two unknown organic compounds, **Liquid E** and **Liquid F**, of which one is an alkane and the other an alkene. You are also provided with a solution of acidified potassium manganate (VII).

Plan and design an experiment to determine which liquid is the alkene and which liquid is the alkane.

In your response include the following:

- (a) Aim

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(1 mark)

- (b) Hypothesis

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(1 mark)

- (c) Procedure

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(3 marks)

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(d) Apparatus and reagents

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(2 marks)

(e) One precaution to be taken during the experiment

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(1 mark)

(f) Data to be collected

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(2 marks)

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

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(2 marks)

Total 12 marks

END OF TEST

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



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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: _____

