

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

20 JANUARY 2020 (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 2020006



TEST CODE 01212032

JANUARY 2020

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

CHEMISTRY

Paper 032 – General Proficiency

Alternative to School-Based Assessment

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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01212032/J/CSEC 2020



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NOTHING HAS BEEN OMITTED.

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Answer ALL questions.

1. Heat changes in chemical reactions can be measured using a calorimeter.

In this experiment, you are required to determine the heat changes which occur when sodium hydroxide is dissolved in water.

You have been provided with the following:

- Access to a top-loading balance
- 1 Burette
- 1 Insulated container
- 1 Thermometer (graduated at 0.1 °C/0.2 °C)
- 2 Watch glasses
- 1 Spatula
- 1 Stop-watch
- Distilled water
- Sodium hydroxide pellets (approximately 4 g)
- 1 Pair of safety goggles
- 1 Glass funnel

The procedure for the experiment is outlined below. Carry out each step carefully and record all observations in Table 1 **on page 6**.

Procedure

1. Using a burette, measure 50 cm³ of distilled water and place it into the insulated container provided.
2. Measure the initial temperature of the water in the insulated container and record the value (to one decimal place) in the second column (at t = 0) in Table 1 **on page 6**.
3. Using a spatula and a watch glass, measure 2.0 g of sodium hydroxide pellets on the top-loading balance.
4. Transfer the sodium hydroxide pellets to the insulated container containing the water. Stir the contents with the thermometer and record the temperature every minute for seven minutes. Record each temperature reading to one decimal place in the appropriate spaces in Table 1 **on page 6**.

GO ON TO THE NEXT PAGE



(a)

TABLE 1: TEMPERATURE OF SOLUTION OVER SEVEN MINUTES

Time, t , (min)	0	1	2	3	4	5	6	7
Temperature, θ , ($^{\circ}\text{C}$)								

(5 marks)

(b) Using the axes provided on the grid on page 7, plot a graph of temperature against time using the data in Table 1. Include a title for your graph. **(6 marks)**

(c) From your graph, calculate the MAXIMUM temperature change which occurs when 2.0 g of sodium hydroxide is dissolved in 50 cm³ of water. You should indicate on your graph how you arrived at your answer.

Maximum temperature change

(2 marks)

(d) State whether the reaction was exothermic or endothermic. Give a reason for your answer.

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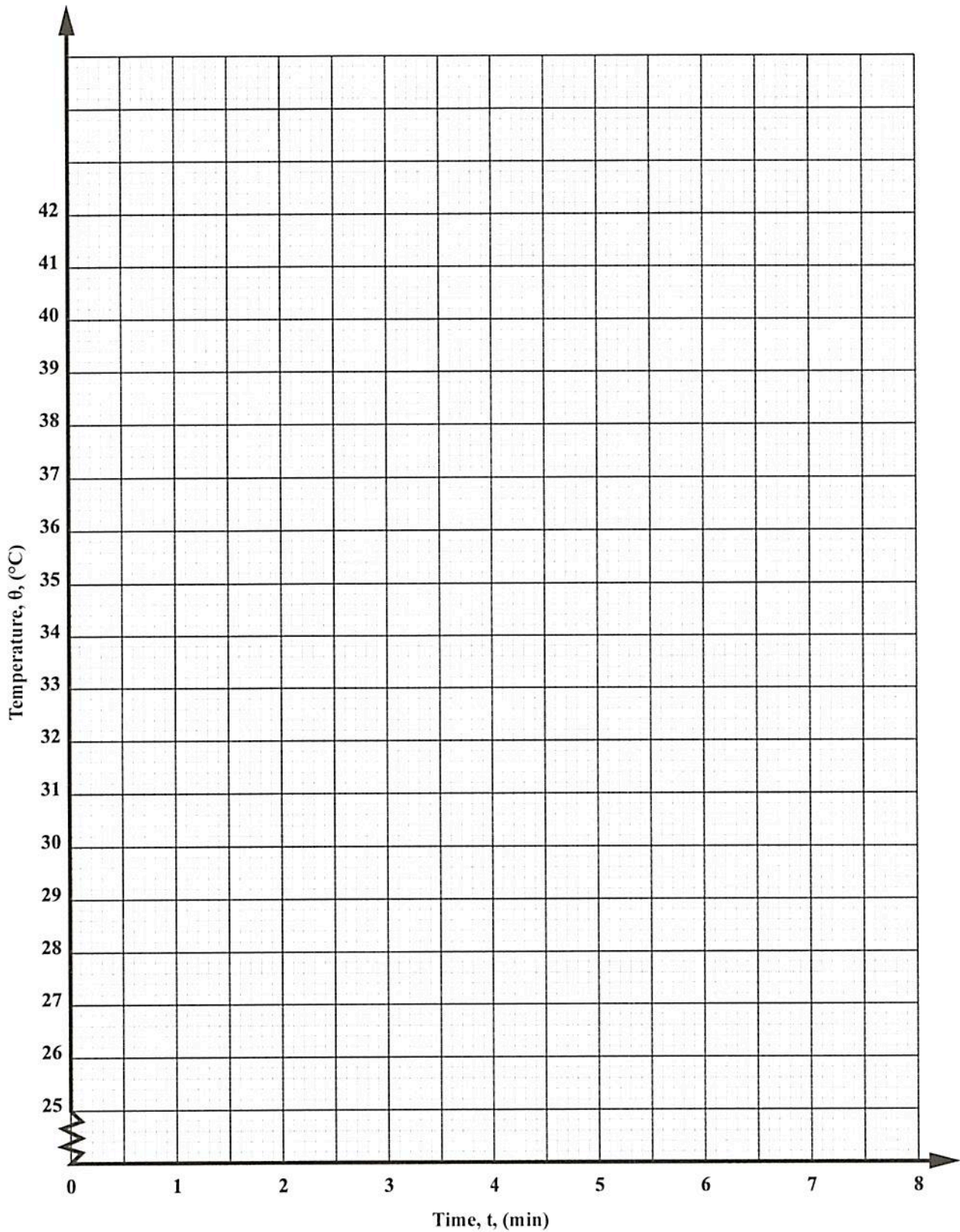
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(2 marks)





Title

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- (e) Calculate the heat change in kilojoules, kJ, which occurs when 2.0 g of sodium hydroxide is dissolved in 50 cm³ of water.

(Heat change = mass of solution × specific heat capacity of the solution × temperature change, that is $Q = m \times c \times \Delta T$)

(Assume that the specific heat capacity of the solution is 4.2 Jg⁻¹°C⁻¹ and that the mass of 1 cm³ of solution is 1 gram.)

Show all units used in the calculation.

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(5 marks)

- (f) Calculate the number of moles of sodium hydroxide used in the experiment (given RAM Na = 23; O = 16; H = 1).

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(2 marks)

- (g) Calculate the heat change when one mole of sodium hydroxide is dissolved in water.

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(2 marks)



(h) State TWO safety precautions that should be taken when conducting the experiment.

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(2 marks)

Total 26 marks



2. Solutions X and Y contain unknown cations and anions. Tests were conducted on EACH solution to determine the identities of the ions present.

Read carefully the tests performed on each solution and inferences made in Table 2. Record under the appropriate column in Table 2 the expected observations that would support the inferences made.

TABLE 2: QUALITATIVE ANALYSIS OF SOLUTIONS X AND Y

	Test	Observation	Inference
(a)	<ul style="list-style-type: none">• To a portion of Solution X in a test tube, add two drops of aqueous sodium hydroxide solution.• Add aqueous sodium hydroxide drop wise with intermittent shaking until no further change is seen.• Leave the test tube to stand for a few minutes.	<ul style="list-style-type: none">•••• <p style="text-align: right;">(3 marks)</p>	<p>Fe²⁺ ions present</p> <p>Fe³⁺ formed</p>
(b)	<ul style="list-style-type: none">• To a portion of Solution X, add three drops of dilute nitric acid followed by three drops of silver nitrate.• Then add ammonia solution.	<ul style="list-style-type: none">•••• <p style="text-align: right;">(2 marks)</p>	<p>Cl⁻ ions present</p>



	Test	Observation	Inference
(c)	<ul style="list-style-type: none"> To a portion of Solution Y in a test tube, add two drops of aqueous sodium hydroxide solution. Add aqueous sodium hydroxide drop wise with intermittent shaking until no further change is seen. To a portion of Solution Y in a test tube, add two drops of dilute ammonia solution. Add aqueous sodium hydroxide drop wise with intermittent shaking until no further change is seen. 	<ul style="list-style-type: none"> <p style="text-align: right;">(4 marks)</p>	<p>Zn²⁺ or Ca²⁺ or Al³⁺ present</p> <p>Ca²⁺ ions absent</p> <p>Zn²⁺ or Al³⁺</p> <p>Al³⁺ ions confirmed</p>
(d)	<ul style="list-style-type: none"> To a portion of Solution Y in a test tube, add a few drops of dilute hydrochloric acid, and then a few drops of barium chloride solution. 	<ul style="list-style-type: none"> <p style="text-align: right;">(1 mark)</p>	<p>SO₄²⁻ present</p>

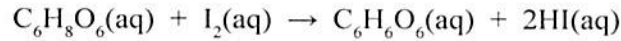
Total 10 marks



3. The Frutzee and Juicee brand of fruit juices are popular among teenagers. Jabari claims that the Frutzee brand has a higher vitamin C content than the Juicee brand.

Plan and design an experiment to test Jabari’s claim.

It should be noted that fruit juices contain vitamin C (ascorbic acid, C₆H₈O₆) and can be oxidized under acidic conditions by iodine according to the following equation:



- (a) Procedure

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(4 marks)

- (b) Apparatus and materials

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(2 marks)

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(c) Data to be collected

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(1 mark)

(d) Discussion as it relates to the hypothesis

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(2 marks)

(e) Variables to be controlled

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(1 mark)

(f) TWO procedural precautions to be taken

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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.



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: _____

