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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

2027192025

COMBINED SCIENCE **0653/63**

Paper 6 Alternative to Practical **October/November 2022**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

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1 **(a)** Fig. 1.1 shows a photograph of a section of a star fruit (carambola) containing three seeds.

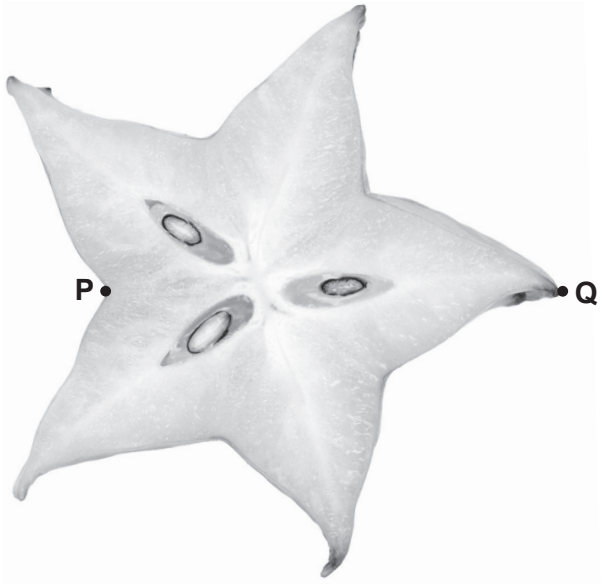

Fig. 1.1

(i) The distance between points **P** and **Q** on Fig. 1.1 represents the width of the star fruit.

Measure the width **PQ** on Fig. 1.1.

width **PQ** = ... mm [1]

(ii) The actual width of the star fruit is 80 mm.

Calculate the magnification of the photograph in Fig. 1.1.

Use the equation shown.

$$\text{magnification} = \frac{\text{width of } \mathbf{PQ} \text{ in Fig. 1.1}}{\text{actual width of star fruit}}$$

magnification = ... [1]

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(iii) In the box, make a large, detailed pencil drawing of the star fruit shown in Fig. 1.1.

[3]

(iv) On your drawing in **(a)(iii)**, add a label line and the letter **S** to show one of the seeds. [1]

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(b) A student investigates the nutrient content of the star fruit.

Procedure

The student:

- puts a small sample of the star fruit into each of four test-tubes
- adds a different test solution to each test-tube
- shakes the test-tubes and observes the results.

Table 1.1 shows the test solutions used and the colour after testing.

Table 1.1

test-tube	test solution used	colour of test solution **before** testing	colour of test solution **after** testing	conclusion
1	iodine solution		blue-black	
2	Benedict's solution		blue	no reducing sugar present
3	biuret solution		blue	
4	universal indicator	green	red	

(i) Complete the third column of Table 1.1 by adding the colour of the test solutions **before** testing. [3]

(ii) Complete the last column of Table 1.1 by stating a conclusion for each test. [3]

(iii) State why the conclusion for the Benedict's test may **not** be correct.

.....

..... [1]

[Total: 13]

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2 A student investigates the effect of heat on solid sodium hydrogencarbonate.

Procedure

The student:

- adds 1.0 g of solid sodium hydrogencarbonate to a test-tube
- heats the sodium hydrogencarbonate using the blue flame of a Bunsen burner for five minutes
- allows the test-tube to cool down
- measures the mass of the solid remaining in the test-tube.

The student repeats the procedure using different masses of sodium hydrogencarbonate.

The results are shown in Table 2.1

Table 2.1

mass of sodium hydrogencarbonate heated / g	mass of solid remaining in the test-tube / g
1.0	0.8
2.0	2.7
3.0	2.5
4.0	3.4
5.0	4.2
6.0	
7.0	

(a) Fig. 2.1 shows the balance readings for 6.0 g and 7.0 g of sodium hydrogencarbonate heated.

6.0 g of sodium hydrogencarbonate

7.0 g of sodium hydrogencarbonate

Fig. 2.1

Record in Table 2.1 these readings to **one** decimal place. [2]

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(b) (i) On the grid, plot a graph of mass of solid remaining in the test-tube (vertical axis) against mass of sodium hydrogencarbonate heated.

[3]

(ii) Circle the anomalous point on the graph. [1]

(iii) Draw the best-fit straight line. [1]

(iv) Describe the relationship between the mass of solid remaining in the test-tube and the mass of sodium hydrogencarbonate heated.

.....

..... [1]

(v) Use your graph to estimate the mass of solid remaining in the test-tube when 4.7 g of solid sodium hydrogencarbonate is heated.

mass of solid remaining in the test-tube = ... g [1]

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(c) The student concludes that when sodium hydrogencarbonate is heated it breaks down to form a gas.

(i) Explain how the results in Table 2.1 support this conclusion.

.....

..... [1]

(ii) The student thinks that the gas given off is carbon dioxide.

Describe the test for carbon dioxide and state the observation for the positive result.

test .....

observation .....

[1]

(d) Suggest why the student heats the test-tube with the blue flame of a Bunsen burner instead of the yellow flame.

.....

..... [1]

(e) The student thinks there is still some unreacted sodium hydrogencarbonate left in the test-tube after heating for five minutes.

Suggest what the student does to test if there is any unreacted sodium hydrogencarbonate left in the test-tube.

.....

..... [1]

[Total: 13]

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3 A student determines the thermal energy lost by a beaker of water when an ice cube melts in the water.

(a) The student measures 100 cm^3 of water and pours it into a beaker.

Suggest a suitable piece of apparatus to measure 100 cm^3 of water.

..... [1]

(b) The student measures the initial temperature T_i of the water.

Fig. 3.1 shows the thermometer reading.

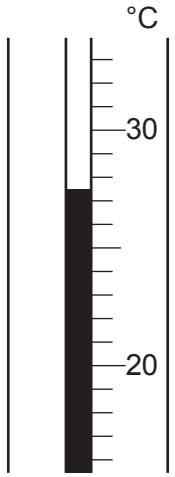

Fig. 3.1

Record the initial temperature T_i of the water to the nearest 0.5 °C.

T_i = ... °C [1]

(c) Procedure

The student:

- adds an ice cube to the beaker of water
- waits for the ice cube to melt
- stirs the water
- measures the final temperature T_f of the water.

Suggest why stirring the water improves the accuracy of the measurement of T_f.

.....

..... [1]

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(d) The final temperature $T_f = 10.5\,°C$.

Calculate the change in temperature ΔT of the water in the beaker.

Use your answer in **(b)** and the equation shown.

$$\Delta T = T_i - T_f$$

ΔT = ... °C [1]

(e) Calculate the thermal energy E lost by the water in the beaker as the ice cube melts.

Use the equation shown.

$$E = 420 \times \Delta T$$

Give your answer to **two** significant figures.

E = ... J [2]

(f) The thermal energy lost by the water is less than the thermal energy needed to melt the ice cube.

Suggest where the extra thermal energy comes from.

.....

..... [1]

[Total: 7]

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4 A student wants to determine whether the resistance of a wire is related to the metal used to make the wire.

The student has wires made of three different metals: constantan, nichrome and tungsten.

The resistance R of a wire is calculated using the equation:

$$R = \frac{V}{I}$$

where V is the potential difference (p.d.) across the wire and I is the current in the wire.

Plan an investigation to determine whether the resistance of a wire is related to the metal used to make the wire.

You are provided with:

- constantan wires of different lengths and thicknesses
- nichrome wires of different lengths and thicknesses
- tungsten wires of different lengths and thicknesses.

You may use any common laboratory apparatus in your plan.

Include in your plan:

- the apparatus you will use, you may include a circuit diagram
- a brief description of the method, including the measurements you will make
- which variables you will keep constant
- a results table to record your measurements (you are not required to enter any readings in the table)
- how you will process your results to draw a conclusion.

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