Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

COMBINED SCIENCE **0653/62**

Paper 6 Alternative to Practical **May/June 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **11** printed pages and **1** blank page.

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Cambridge Assessment International Education

[Turn over

1 A student investigates the effects of the enzyme pectinase on fruit.

(a) Pectinase is an enzyme that breaks down plant cell walls, and juice is released.

An apple is finely chopped and divided between two beakers, labelled **A** and **B**:

- 5% pectinase solution is added to the chopped apple in beaker **A**
- water is added to the chopped apple in beaker **B**
- both beakers are left overnight.

Fig. 1.1 shows the two beakers.

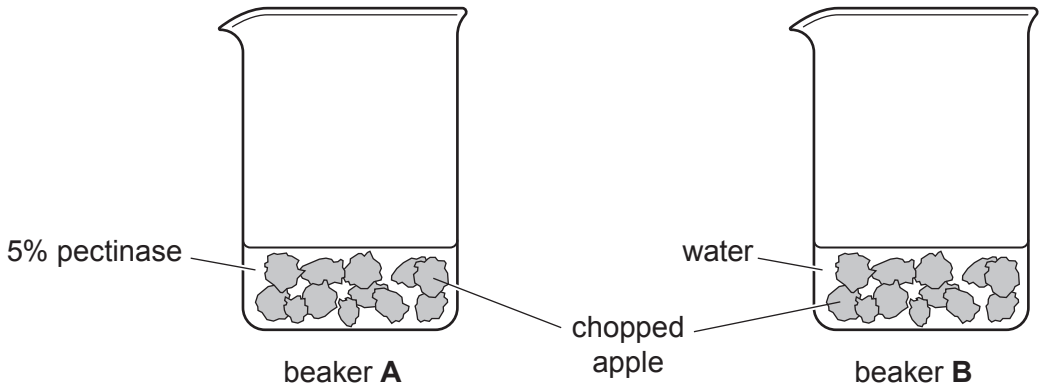

Fig. 1.1

(i) Explain the purpose of using water instead of pectinase in beaker **B**.

.....

..... [1]

(ii) State **two** variables that should have been controlled when beaker **A** and beaker **B** were left overnight.

variable 1 .....

variable 2 .....

[2]

(b) After leaving overnight, the juice is separated from the apple in each beaker and the volume of juice is measured.

(i) Draw and label the apparatus you could use to separate the chopped apple from the juice in beaker **A**.

[3]

(ii) The volume of apple juice collected from beaker **A** and from beaker **B** is shown in Fig. 1.2.

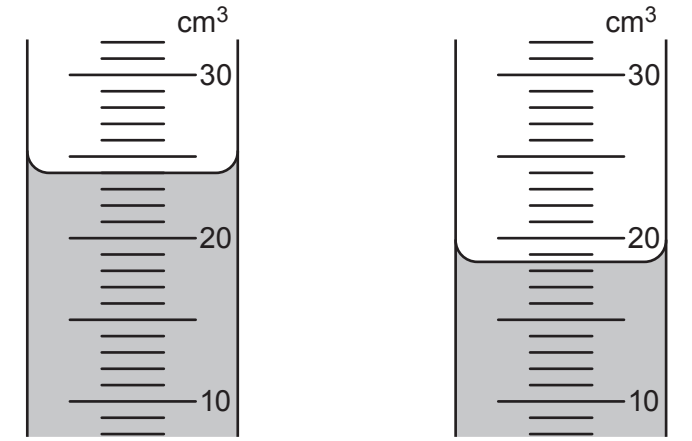

Fig. 1.2

Read and record the volume of juice from each beaker to the nearest 0.5 cm^3.

volume of juice from beaker **A** = ... cm^3

volume of juice from beaker **B** = ... cm^3

[1]

[Total: 7]

2 A plant loses water from its leaves through transpiration.

A student states:

A plant in humid air will lose less water than a plant in dry air.

Plan an investigation to test whether this statement is correct.

In your answer, include:

- the apparatus needed, including a labelled diagram if you wish
- a brief description of the method, including how you will treat variables and any safety precautions
- the measurements you will make
- how you will process your results
- how you will use your results to draw a conclusion.

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..... [7]

3 A student investigates the amount of precipitate formed when barium nitrate solution and sodium sulfate solution react together.

Barium nitrate solution and sodium sulfate solution are both colourless. They react together to form a white precipitate.

Method

A. She labels seven test-tubes **1**, **2**, **3**, **4**, **5**, **6** and **7**.

B. Using a measuring cylinder she adds 3 cm^3 barium nitrate solution into each test-tube.

C. Using a measuring cylinder she adds 1 cm^3 sodium sulfate solution into test-tube **1** and stirs with a glass rod.

D. She adds 2 cm^3 sodium sulfate solution into test-tube **2** and stirs with a glass rod.

E. She adds 3 cm^3, 4 cm^3, 5 cm^3, 6 cm^3 and 7 cm^3 sodium sulfate solution into test-tubes **3**, **4**, **5**, **6** and **7**, as shown in Table 3.1. She stirs each test-tube with a glass rod.

F. After 5 minutes, she uses a ruler to measure the height in mm of the solid precipitate in each test-tube. She records these heights in Table 3.1.

Table 3.1

test-tube number	volume of sodium sulfate solution added / cm^3	height of precipitate / mm
1	1	7
2	2	14
3	3	
4	4	28
5	5	
6	6	36
7	7	36

(a) Fig. 3.1 shows the heights of precipitate for test-tubes **3** and **5**.

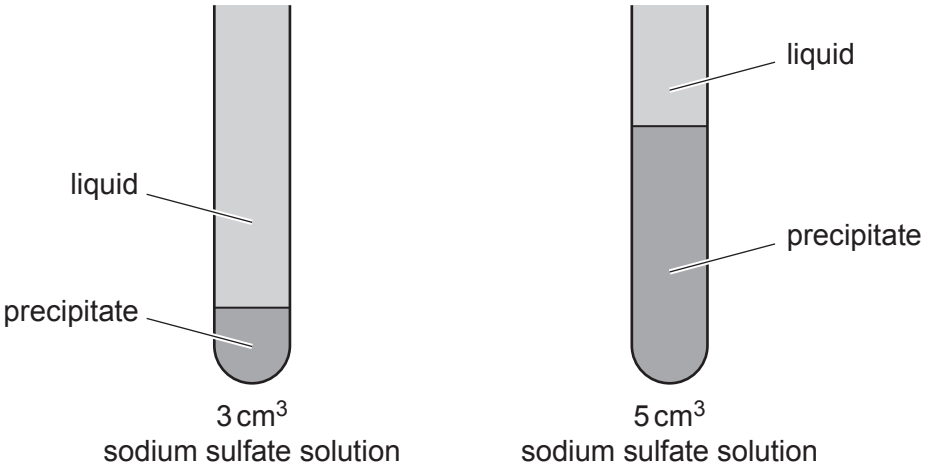
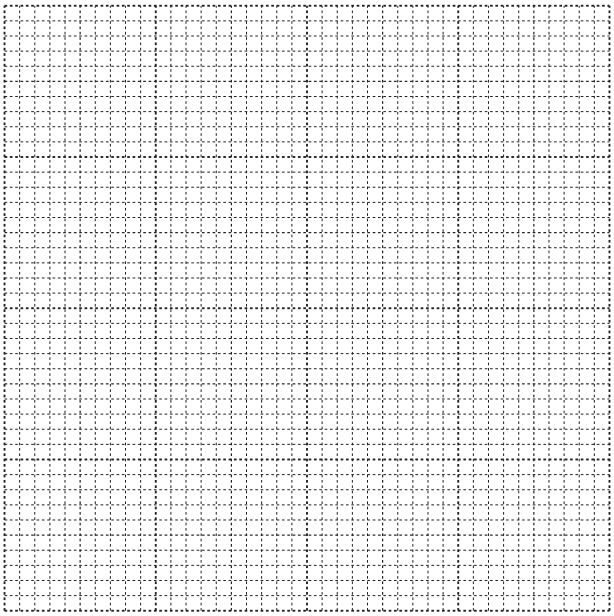


Fig. 3.1

Measure the heights to the nearest mm and record them in Table 3.1. [2]

(b) (i) On the grid provided plot the graph of height of precipitate (vertical axis) against volume of sodium sulfate solution added. [3]



(ii) Circle the anomalous point on the graph.

Suggest what might have happened to cause this anomaly.

.....

.....
[1]

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

(iv) Describe the relationship between height of precipitate and volume of sodium sulfate solution.

..... [1]

(v) Use your graph to determine the height of precipitate formed when 1.5 cm^3 sodium sulfate solution is added to 3 cm^3 barium nitrate solution.

Show clearly on your graph how you arrived at your answer.

height = ... mm [1]

(vi) The volume of sodium sulfate solution added to the barium nitrate solution continues to be increased. Predict what happens to the height of the precipitate formed. Explain your answer.

prediction .....

.....

explanation .....

..... [2]

(c) State and explain **two** improvements that could be made to the experiment to make the results more accurate.

1. improvement .....

   explanation .....

   .....

2. improvement .....

   explanation .....

   .....

[2]

[Total: 13]

4 A student investigates ice melting in a beaker of water.

(a) He uses a measuring cylinder and a balance to determine the mass m_w of 100 cm^3 of water.

$$m_w = 100.05\,g$$

(i) Describe how he uses this apparatus to find the mass m_w of the water.

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.....

..... [2]

(ii) The student pours 100 cm^3 water into a beaker and measures the temperature of the water. Fig. 4.1 shows the thermometer reading.

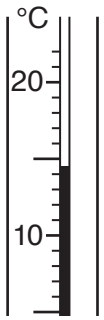

Fig. 4.1

Read and record the temperature T_i of the water to the nearest 0.5 °C.

T_i = ... °C [2]

(iii) He takes an ice cube and measures its mass. Fig. 4.2 shows the reading on the balance.

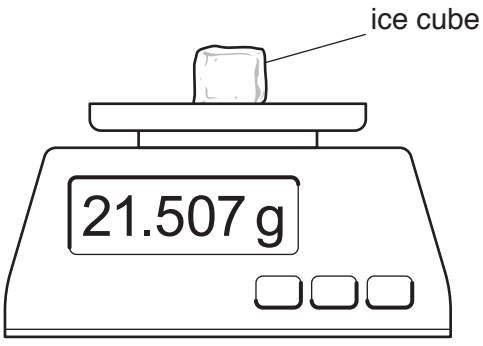

Fig. 4.2

Read and record the mass m_i of the ice cube to the nearest 0.01 g.

m_i = ... g [1]

(b) The student then carries out the following procedure:

- He adds the ice cube to the beaker of water and immediately starts the stop-clock.
- After 3 minutes he stirs the water.
- He measures and records the temperature T_f of the water.

$$T_f = 7.0\,°C$$

- He removes the ice cube immediately, dries it and measures its final mass m_f.

$$m_f = 9.95\,g$$

(i) Explain how stirring the water improves the accuracy of the temperature measurement.

.....

..... [1]

(ii) Explain why it is important to dry the ice cube to get an accurate measure of its final mass.

.....

..... [1]

(c) (i) Calculate the drop in temperature T_d of the water during the experiment. Use your answer to **(a)(ii)**, the data in **(b)** and the equation shown:

$$T_d = T_i - T_f$$

T_d = ... °C [1]

(ii) Calculate the thermal energy E_l lost by the water. Use the data in **(a)**, your answer to **(c)(i)** and the equation shown.
Give your answer to a suitable number of significant figures.

$$E_l = m_w \times 4.2 \times T_d$$

E_l = ... J [2]

(d) (i) Calculate the mass m_m of ice that melted in the experiment. Use your answer to **(a)(iii)**, the data in **(b)** and the equation shown:

$$m_m = m_i - m_f$$

m_m = ... g [1]

(ii) 334 J of thermal energy is needed to melt 1 g of ice and change it into water.

Calculate the energy E_m used to melt the ice in this experiment. Use your answer to **(d)(i)** and the equation shown:

$$E_m = m_m \times 334$$

E_m = ... J [1]

(e) In this experiment the amount of thermal energy needed to melt the ice cube is greater than the thermal energy lost by the water.

Suggest where the extra energy used to melt the ice comes from.

.....

..... [1]

[Total: 13]

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