



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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**COMBINED SCIENCE**

**0653/61**

Paper 6 Alternative to Practical

**October/November 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.

- 1 (a) A student investigates the effect of the concentration of a salt solution on the activity of the enzyme pepsin.

Pepsin breaks down the proteins in milk to produce a clear liquid.

- The student prepares a water-bath at 40 °C.
- She adds 2 cm<sup>3</sup> of milk to each of four test-tubes, **A**, **B**, **C** and **D**.
- She then adds the volumes of water and salt solution shown in Table 1.1 to the four test-tubes.

**Table 1.1**

test-tube	volume of 15% salt solution /cm <sup>3</sup>	volume of water /cm <sup>3</sup>	final percentage concentration of salt solution	time taken for milk to become clear /s
<b>A</b>	2	0	15	
<b>B</b>	1	1		
<b>C</b>	0	2	0	
<b>D</b>	0	2	0	

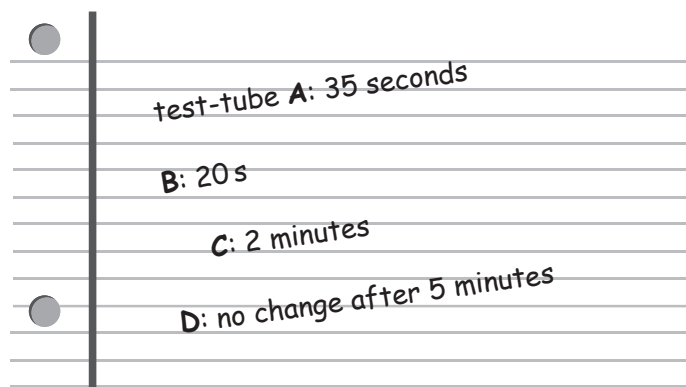
- (i) Calculate the final percentage concentration of salt solution in test-tube **B**.

Record your answer in Table 1.1.

[1]

- (ii)
- The student places the four test-tubes into the water-bath.
  - She puts 1 cm<sup>3</sup> pepsin solution into each of test-tubes **A**, **B** and **C** and mixes well.
  - She puts 1 cm<sup>3</sup> water into test-tube **D** and mixes well.
  - She starts the stop-clock.
  - She records the time taken for the milk in each test-tube to become clear.
  - If the milk has not become clear after 5 minutes she records the time as **>300**.

Fig. 1.1 shows the student's results.



**Fig. 1.1**

Complete Table 1.1 using the student's results shown in Fig. 1.1.

[3]

(iii) Use the results in Table 1.1 to place test-tubes **A**, **B**, **C** and **D** in order of speed of milk clearing.

fastest to clear .....  
↓ .....  
↓ .....  
↓ .....  
slowest to clear .....

[2]

(iv) Suggest the purpose of test-tube **D**.

.....  
..... [1]

(v) Explain why the test-tubes were placed in a water-bath.

.....  
..... [1]

(b) The method in (a) can be extended to find a more accurate value of the percentage concentration of salt solution needed for the pepsin to work the fastest.

Suggest additional values to those in Table 1.1 of the percentage concentration of salt solution that should be used.

.....  
..... [2]

(c) State how you could test the milk to find out if it contains protein.

Include the result for a positive test and a negative test.

test .....  
positive test result .....  
negative test result ..... [3]

[Total: 13]

2 A student has samples of two different colourless aqueous solutions, **E** and **F**.

(a) (i) She adds one drop of each solution onto universal indicator paper.

**E** turns the paper red, pH 1 and **F** turns the paper dark blue, pH 12.

Suggest what **type** of substance is in each of **E** and **F**.

type of substance in **E** .....

type of substance in **F** .....

[1]

(ii) She places some of solution **E** in a test-tube and adds a piece of magnesium ribbon.

She bubbles the gas released into limewater. The limewater does **not** go milky.

Draw the apparatus she should use for this test.

[1]

(iii) She adds magnesium to another sample of solution **E**. This time she tests the gas given off with a lighted splint and it pops.

State the identity of the gas.

..... [1]

(iv) She places some of solution **E** into each of two test-tubes and adds a little dilute nitric acid to each test-tube.

She adds aqueous barium nitrate to the first test-tube and a white precipitate forms.

She adds aqueous silver nitrate to the second test-tube and a colourless solution is seen.

Identify the anion contained in **E**.

..... [1]

(v) Suggest the identity of solution **E**.

..... [1]

- (b) She places some of solution **F** into a test-tube and slowly adds aqueous iron(II) sulfate. A green precipitate forms.

State **one** of the possible identities of solution **F**.

..... [1]

- (c) Suggest **one** other test which would confirm the identity of solution **F** given in (b). Give the result of this test.

test .....

test result .....

[1]

[Total: 7]

3 Sea water contains a number of dissolved salts such as sodium chloride. The water may also contain small insoluble particles suspended in the water.

Plan an experiment to compare the amount of **dissolved** salts in samples of water from the Dead Sea and from the Baltic Sea.

You may use any common laboratory apparatus and samples of water from the Dead Sea and from the Baltic Sea.

Include in your answer:

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

.....

.....

.....

.....

.....

.....

.....

.....







4 A student investigates the cooling of water in a drinks cup.

- (a) She adds  $150 \text{ cm}^3$  of hot water to a cup. She puts a lid on the cup and lowers the thermometer into a hole in the lid, so that the bulb is in the hot water, as shown in Fig. 4.1.

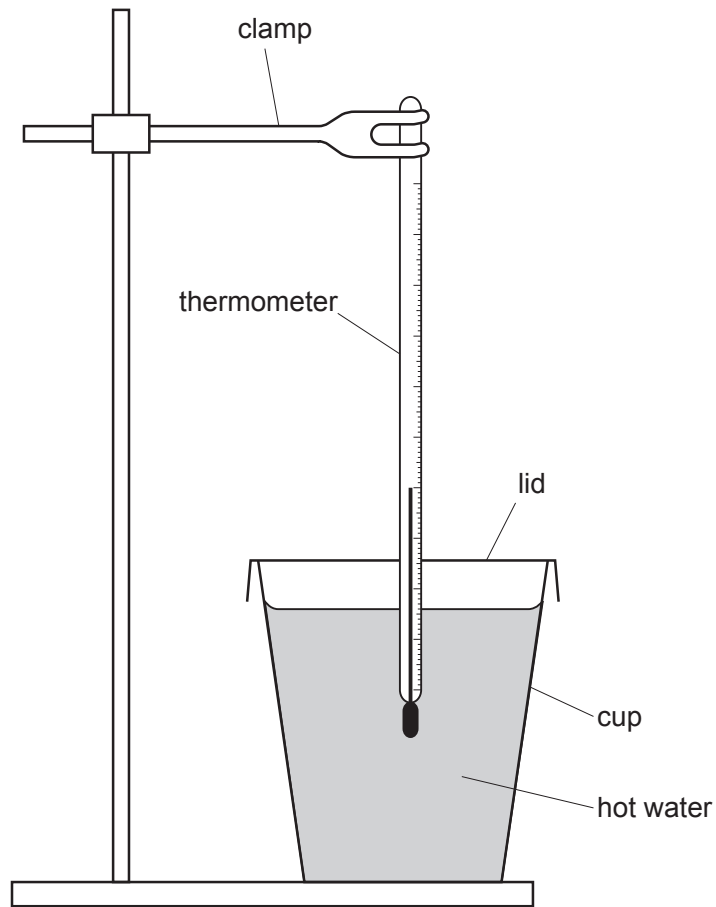


Fig. 4.1

She waits for the reading on the thermometer to stop rising and then starts the stop-clock.

- (i) Fig. 4.2 shows the maximum temperature reading on the thermometer at time  $t = 0$ .

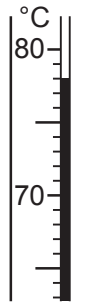


Fig. 4.2

Read and record this temperature in Table 4.1.

[1]

Table 4.1

time $t$ /min	temperature of water / .....	
	cup with lid	cup <b>without</b> lid
0		78.0
1	76.0	75.0
2	74.5	72.5
3	73.0	70.0
4	72.0	67.5
5	71.0	

- (ii) She measures the temperature of the water every minute for five minutes and records the results in Table 4.1.

Complete the heading in Table 4.1.

[1]

- (iii) She empties out the hot water and repeats the experiment using the same cup **without** a lid.

Fig. 4.3 shows the thermometer reading after 5 minutes for the cup **without** a lid.

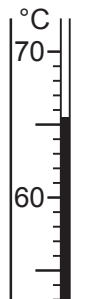


Fig. 4.3

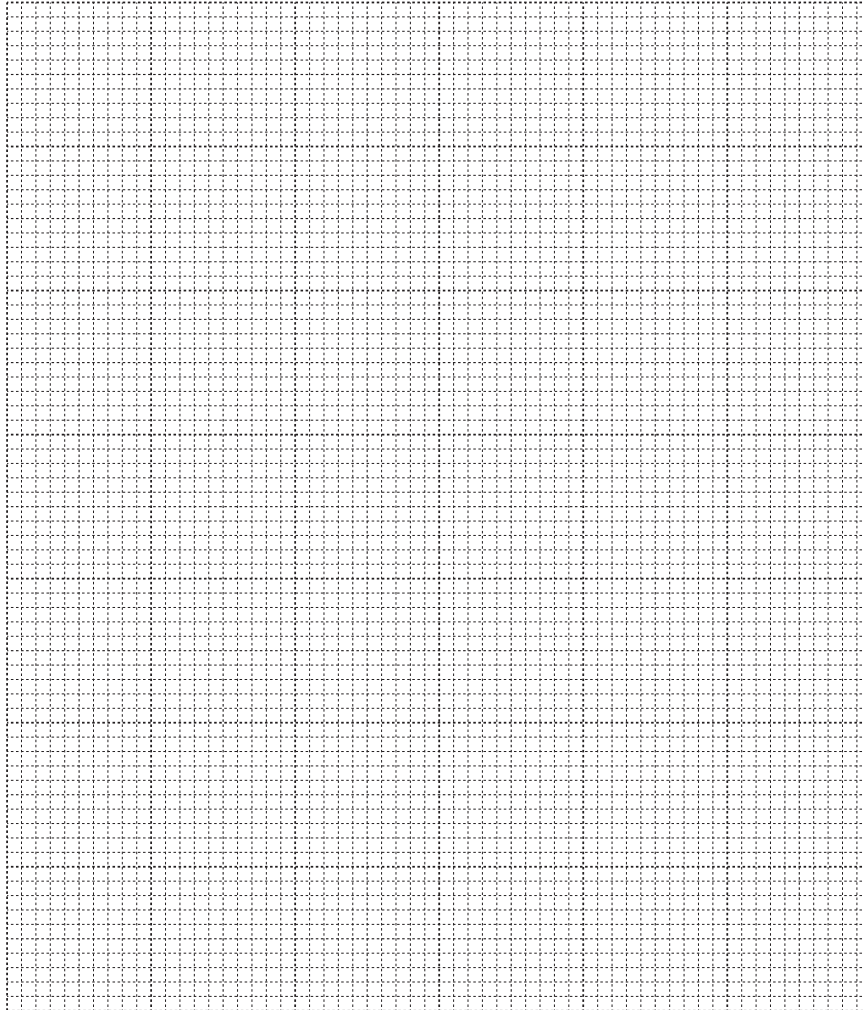
Read and record this temperature in Table 4.1.

[1]

- (iv) Suggest one practical precaution that she should take to ensure that her temperature readings are as accurate as possible.

.....  
..... [1]

- (b) (i) Use the results in Table 4.1 to plot a graph of temperature of water (vertical axis) against time  $t$  for each experiment. The vertical axis does not need to start at 0.



[3]

- (ii) Draw separate lines of best fit for each experiment. Label each line. [2]

- (c) (i) Describe **one** similarity and **one** difference in the way that the temperature of the water changes with time in the two experiments.

similarity .....

.....

difference .....

.....

[2]

- (ii) Predict the temperature of the water in the cup with a lid after 3.5 minutes.

Show on your graph how you arrived at your answer.

temperature = ..... [2]

[Total: 13]

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