Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

4730169385

COMBINED SCIENCE **0653/51**

Paper 5 Practical Test **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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.
Notes for Use in Qualitative Analysis for this paper are printed on page 12.

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

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

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[Turn over

1 **(a)** You are going to investigate 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 clearer liquid.

- Half-fill a large beaker with the hot and cold water provided to make a water-bath with a temperature between 35 °C and 40 °C. It may be necessary to add more hot water to maintain this temperature.
- Label four test-tubes **A**, **B**, **C** and **D**.
- On the back of **each** test-tube, approximately 1 cm from the base, draw a small **X** as shown in Fig. 1.1.

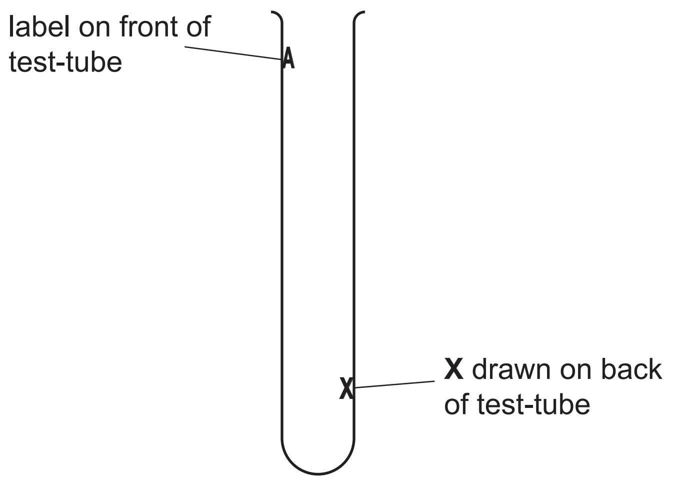

Fig. 1.1

- Use a syringe to add 2 cm^3 of milk to each of the test-tubes **A**, **B**, **C** and **D**.
- Add the volumes of water and 15% salt solution to the four test-tubes, as shown in Table 1.1.

Table 1.1

test-tube	volume of 15% salt solution / cm^3	volume of water / cm^3	final percentage concentration of salt solution	time taken for **X** to become visible / s
A	2	0	15	
B	1	1		
C	0	2	0	
D	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)
- Place the four test-tubes into the water-bath.
- Put 1 cm^3 pepsin solution into each of the test-tubes **A**, **B** and **C** and shake gently to mix.
- Put 1 cm^3 water into test-tube **D** and shake gently to mix.
- Start the stop-clock.

Measure the time taken for the **X** on each test-tube to become visible when viewed through the mixture.

Record in Table 1.1 these times to the nearest second.
If the **X** is not visible after 5 minutes record this time as **>300**. [3]

(iii) Explain why the value recorded for the time taken for **X** to become visible (milk to become clear) is only an estimate.

....

.... [1]

(iv) Use your 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]

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

....

.... [1]

(vi) 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 confirm it contains protein.

Include the result for a positive test.

test ....

positive test result ....
[2]

[Total: 13]

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2 **E** and **F** are two different colourless aqueous solutions.

You are going to carry out tests on **E** and **F** and identify each of them.

(a) **(i)** Place a drop of each solution onto universal indicator paper using a stirring rod.

State the pH of each solution.

pH of **E** = ...

pH of **F** = ...

[1]

(ii) Place about 2 cm depth of **E** into a test-tube.

Add a small piece of magnesium ribbon and test the gas given off.

State the test you use and the observation which identifies the gas given off. Identify the gas.

test on gas and observation ....

identity of gas ....

[1]

(iii) Place about 1 cm depth of **E** into each of two test-tubes.

Into one test-tube of **E**, add a little dilute nitric acid followed by 1 cm depth of aqueous barium nitrate. State your observation.

observation ....

Into the other test-tube of **E**, add a little dilute nitric acid followed by the same depth of aqueous silver nitrate. State your observation.

observation ....

[1]

(b) Suggest the identity of **E**.

.... [1]

(c) Place about 1 cm depth of **F** into a test-tube.

Add aqueous iron(II) sulfate until it is in excess.

Record your observations.

....

.... [1]

(d) The test in **(c)** gives more than one possible identity for solution **F**.

(i) State **one** of the possible identities of **F**.

.... [1]

(ii) Suggest **one** other test which would confirm the identity of solution **F** given in **(d)(i)**. Give the result of this test.

Do **not** do this 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.

Do **not** do this investigation.

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.

....

....

....

....

[7]

4 You are going to investigate the cooling of water in a drinks cup.

(a) Add 150 cm^3 of hot water to the cup using a measuring cylinder.
Place the lid on the cup. Adjust the clamp and lower the thermometer into the hole so that the bulb is in the hot water. The apparatus is shown in Fig. 4.1.

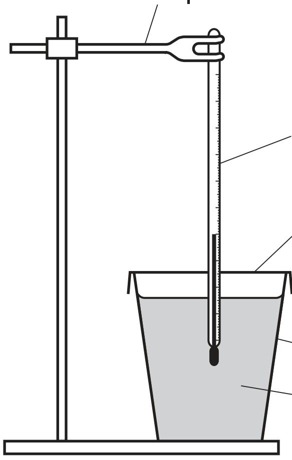

Fig. 4.1

Wait for the reading on the thermometer to stop rising and then start the stop-clock.

(i) Record in Table 4.1 this maximum temperature to **two** significant figures at time t = 0. [1]

Table 4.1

time t / min	temperature of water /	
	cup with lid, **L**	cup without lid, **N**
0		
1		
2		
3		
4		
5		

(ii) Read and record in Table 4.1 the temperature of the water every minute for five minutes. [2]

(b) Remove the thermometer from the cup.
Take off the lid from the cup.
Empty the water from the cup.

(i) Repeat **(a)** **without** the lid placed on the cup. [2]

(ii) Complete the heading in Table 4.1. [1]

(c) Use your 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.

Draw separate lines of best fit for each experiment. Label each line.

[5]

(d) 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]

[Total: 13]

NOTES FOR USE IN QUALITATIVE ANALYSIS

Tests for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify, then add aqueous barium nitrate	white ppt.

Tests for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Tests for gases

gas	test and test result
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint

Flame tests for metal ions

metal ion	flame colour
lithium (Li^+)	red
sodium (Na^+)	yellow
potassium (K^+)	lilac
copper(II) (Cu^{2+})	blue-green