Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

3514925829

COMBINED SCIENCE **0653/52**

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 **12** printed pages.

DC (CE/TP) 175275/2

Cambridge Assessment International Education

1 You are going to find the concentration of vitamin C in two samples of fruit juice, **A** and **B**.

Iodine solution and starch can be used to estimate the concentration of vitamin C in a sample of fruit juice. Iodine solution is added to a starch and fruit juice mixture until the solution remains blue-black.

The more iodine solution that needs to be added to the sample to produce a permanent blue-black colour, the higher the concentration of vitamin C in the sample.

(a)
- Put 20 cm^3 of fruit juice **A** into a beaker.
- Add 1 cm^3 starch solution to the fruit juice using the smaller syringe.
- Measure 10 cm^3 iodine solution into another beaker using the larger syringe.
- Use a pipette to add a few drops of the iodine solution to the fruit juice and starch mixture and stir well for 5 seconds.
- Continue adding iodine solution and stirring until the colour remains blue-black.
- Pour the **remaining** iodine solution into a measuring cylinder.

Record in Table 1.1 the volume of iodine solution **remaining** for experiment **1**.

Table 1.1

fruit juice **A** experiment	volume of iodine solution remaining / cm^3	volume of iodine solution added / cm^3	average volume, V_A, of iodine solution added / cm^3
1			
2			

[1]

(b) Wash out the beakers and repeat the procedure in **(a)**.

Record in Table 1.1 the volume of iodine solution **remaining** for experiment **2**. [1]

(c) (i) Calculate the volume of iodine solution that has been **added** in each experiment.

Record these values in Table 1.1.

[1]

(ii) Calculate the average volume, V_A, of iodine solution added. Record this value in Table 1.1.

[1]

(d) Repeat **(a)**, **(b)** and **(c)** with fruit juice **B**.

Record the values in Table 1.2.

Table 1.2

fruit juice **B** experiment	volume of iodine solution remaining / cm^3	volume of iodine solution added / cm^3	average volume, V_B, of iodine solution added / cm^3
1			
2			

[2]

(e) State what can be concluded about the vitamin C concentration in fruit juice **A** compared to fruit juice **B**. Use your results in Table 1.1 and Table 1.2.

....

.... [1]

(f) **(i)** Calculate the concentration of vitamin C in fruit juice **A** using the equation shown:

$$\text{concentration} = \frac{V_A \times 0.025}{20}$$

Give your answer to an appropriate number of significant figures.

concentration = ... g/cm^3 [2]

(ii) Suggest **one** improvement to this experiment that would give a more accurate estimate of the concentration of vitamin C in fruit juice **A**.

....

.... [1]

(g) You are provided with half of a fruit that contains vitamin C.

In the box below, make a large detailed drawing of the cut surface of the fruit.

[3]

[Total: 13]

2 You are going to carry out tests on powder **E** to identify it.

(a)
- Heat the powder **E** in the hard-glass test-tube.
- Bubble the gas formed into limewater.
- Remove the delivery tube from the limewater **before** you stop heating.
- The powder which remains in the test-tube is powder **F**.

(i) Describe the appearance of powder **E** and powder **F**.

powder **E** ....

powder **F** ....
[1]

(ii) Describe what happens to the appearance of the limewater as the gas passes through it and identify the gas.

appearance of limewater ....

identity of gas ....
[1]

(iii) State the identity of the anion in **E**.

.... [1]

(b)
- Put 20 cm^3 of dilute sulfuric acid into a small beaker.
- Add the powder **F** and heat for about 3 minutes.
- Stir the mixture.
- Filter a little of the mixture into each of two test-tubes to about 1 cm depth.
- The liquid in the test-tubes is solution **G**.

(i) Add aqueous sodium hydroxide to **one** of the test-tubes of solution **G**.

Describe the appearance of solution **G** and the observations when aqueous sodium hydroxide is added to it.

appearance of solution **G** ....

observation when aqueous sodium hydroxide is added ....

....
[1]

(ii) Dip the wooden splint into the **other** test-tube of solution **G** and leave to soak for about 1 minute.

Hold the splint in a Bunsen burner flame.

Record the immediate flame colour.

.... [1]

(iii) State the identity of the cation in **E**, **F** and **G**.

.... [1]

(c) Describe an alternative test that you could use to identify the cation in solution **G**. State the observation for a positive result.

Do **not** carry out this test.

test ....

observation ....

.... [1]

[Total: 7]

3 Fizzy drinks are fizzy because they have carbon dioxide dissolved in them.

The carbon dioxide is dissolved under pressure. As soon as the top is taken off a bottle of fizzy drink, the carbon dioxide gas starts to bubble out of the drink.

If the top is left off the bottle, the carbon dioxide will start to leave the drink. The drink will eventually 'go flat' (not fizzy) when all of the carbon dioxide has left the drink. This will also happen if the drink is poured into a glass.

The drink will lose all of its carbon dioxide more quickly if it is heated.

Plan an experiment to compare the **amount** of dissolved carbon dioxide in the three fizzy drinks, lemon soda, orange soda and sparkling water.

You may use any common laboratory apparatus and samples of lemon soda, orange soda and sparkling water.

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.

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.... [7]

4 You are going to investigate how the period of a simple pendulum changes as its length changes.

(a) A pendulum of length l = 50.0 cm has been set up for you as shown in Fig. 4.1.
The length l of a pendulum is the distance from the point of support to the centre of the bob.

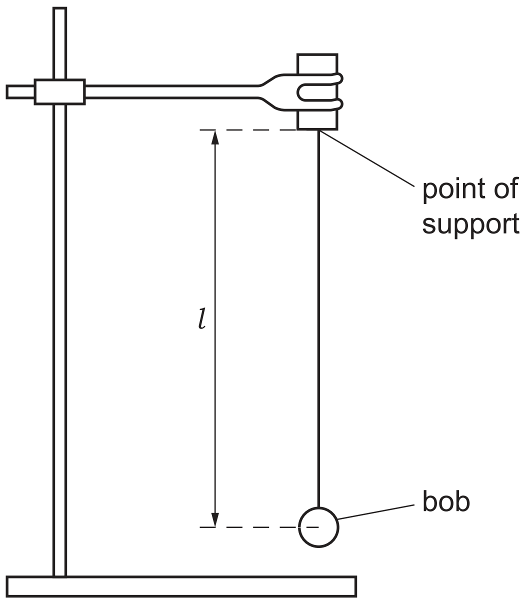


Fig. 4.1

The period T of a pendulum is the time taken for one complete swing (oscillation) of the pendulum. This is shown in Fig. 4.2. The period is the time for the bob to swing from **Q** to **P**, then to **R** and then back to **Q** again.

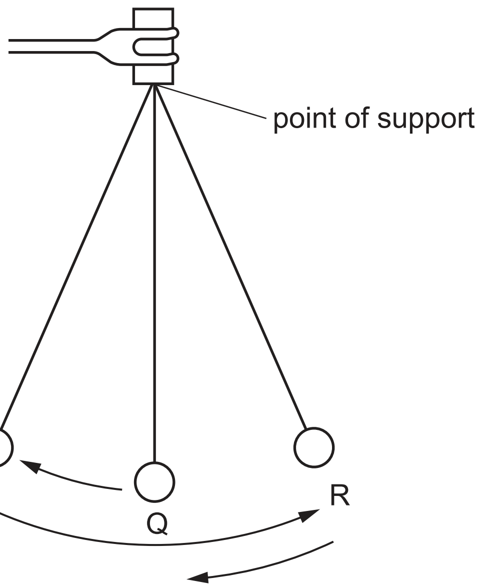


Fig. 4.2

(i) Pull the pendulum bob a small distance to one side (between 5–10 cm) and release it. Measure the time for 10 complete oscillations and record this time to the nearest 0.01 s in Table 4.1. [1]

Table 4.1

length l/cm	time for 10 oscillations/s		average time for 10 oscillations/s	period T/s	T^2/s^2
	1st	2nd			
50.0					
40.0					
35.0					
25.0					
20.0					

(ii) Repeat **(a)(i)**.

Calculate the average time for 10 oscillations.
Record in Table 4.1 this average time to the nearest 0.01 s. [1]

(iii) Repeat **(a)(i)** and **(a)(ii)** for lengths l = 40.0, 35.0, 25.0 and 20.0 cm. [2]

(iv) Describe **one** technique that you used to ensure your timings of 10 complete oscillations were as accurate as possible.

....

....

.... [1]

(v) Explain why it is better to time 10 oscillations rather than one oscillation to determine the period T.

....

....

.... [2]

(vi) Calculate the period T (the time for one complete oscillation) for each length of the pendulum.

Record your values of T in Table 4.1.

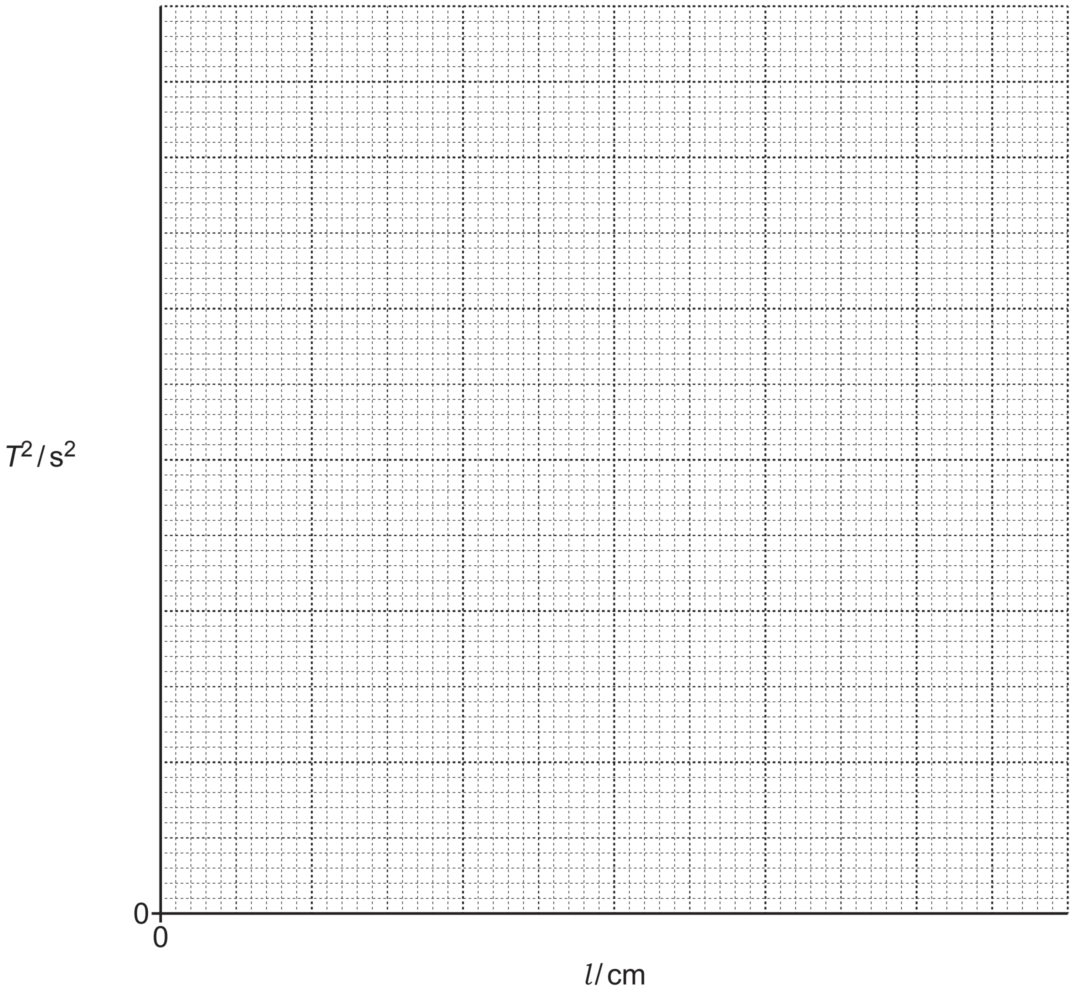
[1]

(vii) Calculate T^2 for each length of the pendulum.

Record these values in Table 4.1 to **two** decimal places.

[1]

(b) **(i)** On the grid, plot a graph of T^2 against l.



[2]

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

(c) Describe the relationship between the length l of the pendulum and T^2.

....

.... [1]

[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