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COMBINED SCIENCE **0653/52**

Paper 5 Practical Test **May/June 2026**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

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. Do **not** use correction fluid or tape.
- 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 [ ].
- Notes for use in qualitative analysis are provided in the question paper.

For Examiner's Use	
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2	
3	
4	
Total	

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

DC (WW/TC) 359081/3

[Turn over

1 **(a)** You are going to investigate the structure of a tomato.

You are provided with a slice of tomato on a white tile.

(i) In the box, make a large clear pencil drawing of the cut surface of the tomato.

[3]

(ii) Measure the diameter *d* of the cut surface of the tomato on the white tile.

Record your value to the nearest mm.

d = ... mm [1]

(iii) Draw a line on your drawing in **1(a)(i)** to show the diameter of the cut surface of the tomato.

Measure the diameter *D* of your drawing in **1(a)(i)**.

Record your value to the nearest mm.

D = ... mm [1]

(iv) Calculate the magnification of your drawing.

Use the equation shown.

$$\text{magnification} = \frac{D}{d}$$

magnification = ... [1]

(b) Tomatoes contain vitamin C.

DCPIP is a blue solution used to test for vitamin C.

State the final colour observed for a positive test with DCPIP.

..... [1]

[Total: 7]

2 A student states,

'Unripe tomatoes do **not** contain reducing sugars. Ripe tomatoes do contain reducing sugars.'

Figure 2.1 shows an unripe (green) tomato and a ripe (red) tomato.

unripe (green) tomato

ripe (red) tomato

Figure 2.1

Plan an investigation to test whether the student's statement is correct.

You are provided with:

- a supply of green and red tomatoes
- Benedict's solution

You may use any common laboratory apparatus.

You are not required to do this investigation.

In your plan, include:

- the apparatus needed
- a brief description of the method
- what you will measure and the observations you will make
- which variables you will keep constant
- how you will process your results to form a conclusion.

You may include a results table (you are **not** required to enter any readings in the table).

.....

.....

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..... [7]

3 You are going to investigate a solid metal carbonate.

When heated, the metal carbonate breaks down to make the metal oxide and carbon dioxide gas.

(a) Procedure

You will be asked in **3(b)** to write down your observations of the solid during the procedure.

step 1 Use a balance to measure the mass of a clean dry test-tube. Record this mass M_1 in Table 3.1 to the nearest 0.1 g.

step 2 Add three spatula loads of the metal carbonate to the test-tube.

step 3 Use the balance to measure the mass of the test-tube and metal carbonate. Record this mass M_3 in Table 3.1 to the nearest 0.1 g.

step 4 Heat the test-tube gently for about three minutes using a blue Bunsen burner flame.

step 5 Leave the test-tube to cool down.

While the test-tube is cooling down do part 3(f).

step 6 Use the balance to measure the mass of the test-tube and the metal oxide. Record this mass M_6 in Table 3.1 to the nearest 0.1 g.

Table 3.1

M_1 mass of clean dry test-tube (**step 1**)/g	
M_3 mass of test-tube and metal carbonate (**step 3**)/g	
M_6 mass of test-tube and metal oxide (**step 6**)/g	

[3]

(b) Describe your observations of the solid during the procedure.

.....

..... [1]

(c) Describe how you can change the procedure to confirm that **all** the metal carbonate has been broken down into the metal oxide.

.....

..... [1]

(d) **(i)** Use Table 3.1 to calculate the mass of metal carbonate heated.

mass of metal carbonate = ... g [1]

(ii) Use Table 3.1 to calculate the mass of metal oxide made.

mass of metal oxide = ... g [1]

(iii) Calculate the percentage by mass of metal oxide formed from the metal carbonate.

Use the equation shown.

$$\text{percentage} = \frac{\text{mass of metal oxide}}{\text{mass of metal carbonate}} \times 100$$

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

percentage = ... [2]

(e) In **step 4** it is important to heat the test-tube with a blue Bunsen burner flame and **not** a yellow flame.

Suggest why.

.....

..... [1]

(f) You are going to identify the cation (positive ion) present in the metal carbonate.

(i) Procedure

step 7 Place one spatula load of the metal carbonate into a boiling tube.

step 8 Add 3 cm depth of dilute nitric acid to the boiling tube. The mixture will bubble and form a colourless solution.

step 9 Add about 1 cm depth of the solution from **step 8** into two separate clean test-tubes.

step 10 Use a clean dropping pipette to add drops of aqueous ammonia to one of the test-tubes. Keep adding aqueous ammonia until there is no further change. Record your observations in Table 3.2.

step 11 Use a clean dropping pipette to add drops of aqueous sodium hydroxide to the other test-tube. Keep adding aqueous sodium hydroxide until there is no further change. Record your observations in Table 3.2.

Table 3.2

test	observations
step 10 adding aqueous ammonia	
step 11 adding aqueous sodium hydroxide	

[2]

(ii) Identify the cation (positive ion) present in the metal carbonate.

..... [1]

[Total: 13]

Turn over

4 You are going to determine the period T of a V-shaped pendulum.

(a) The apparatus shown in Figure 4.1 is assembled for you.

Do **not** adjust the apparatus.

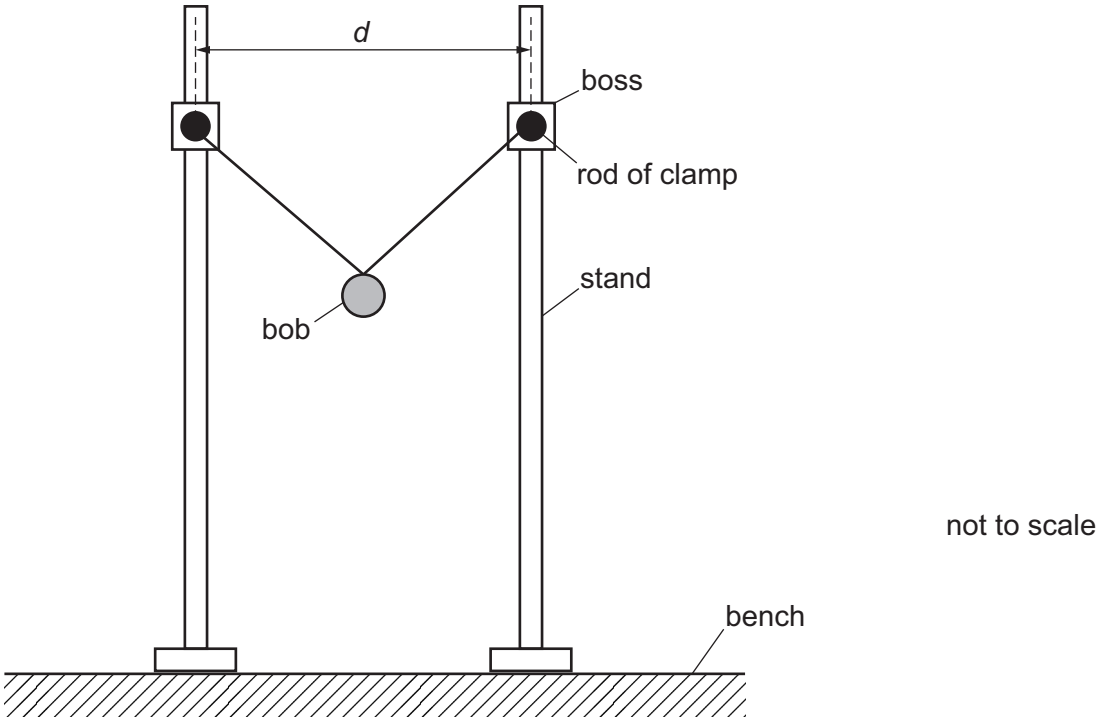


Figure 4.1

The horizontal distance d is the distance between the centre of the two rods.

(i) Measure the distance d.

Record in Table 4.1 this distance d to the nearest cm. [1]

(ii) State **one** practical difficulty in measuring d.

.....

..... [1]

(iii) Calculate d^2 for your value of d.

Record in Table 4.1 this value of d^2.

Table 4.1

d / cm	d^2 / cm^2	time for 10 oscillations / s		average time for 10 oscillations / s	T / s	T^4 / s^4
		trial 1	trial 2			
10	100	11.8	12.2	12.0	1.20	2.1
20	400	12.0	11.8	11.9	1.19	2.0
30	900	11.5	11.7	11.6	1.16	1.8
50	2500	10.0	10.4	10.2	1.02	1.1

[1]

(b) The period T is the time it takes for the pendulum to complete one oscillation.

In one oscillation the bob moves **away** from you from **A** to **B** and back to **A** as shown in Figure 4.2.
Figure 4.2 is viewed from the side.

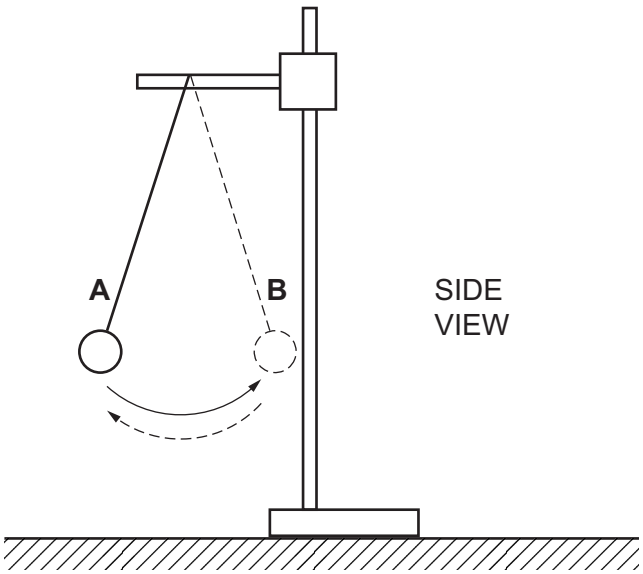


Figure 4.2

(i) Procedure

- Pull the pendulum bob **towards** you through a short distance and release it.
- Start the stop-watch at the same time.
- Measure the time taken for 10 oscillations of your pendulum.

Record in Table 4.1 this time for trial 1 to the nearest 0.1 s. [1]

(ii) Repeat the procedure in **4(b)(i)**.

Record in Table 4.1 this time for trial 2. [1]

(iii) Calculate the average time for 10 oscillations.

Record this time in Table 4.1. [1]

(iv) Calculate the period T.

Use the equation shown.

$$T = \frac{\text{average time for 10 oscillations}}{10}$$

Calculate T^4.

Use the equation shown.

$$T^4 = T \times T \times T \times T$$

Record in Table 4.1 your values of T and T^4. [1]

(v) You have measured the time for 10 oscillations.

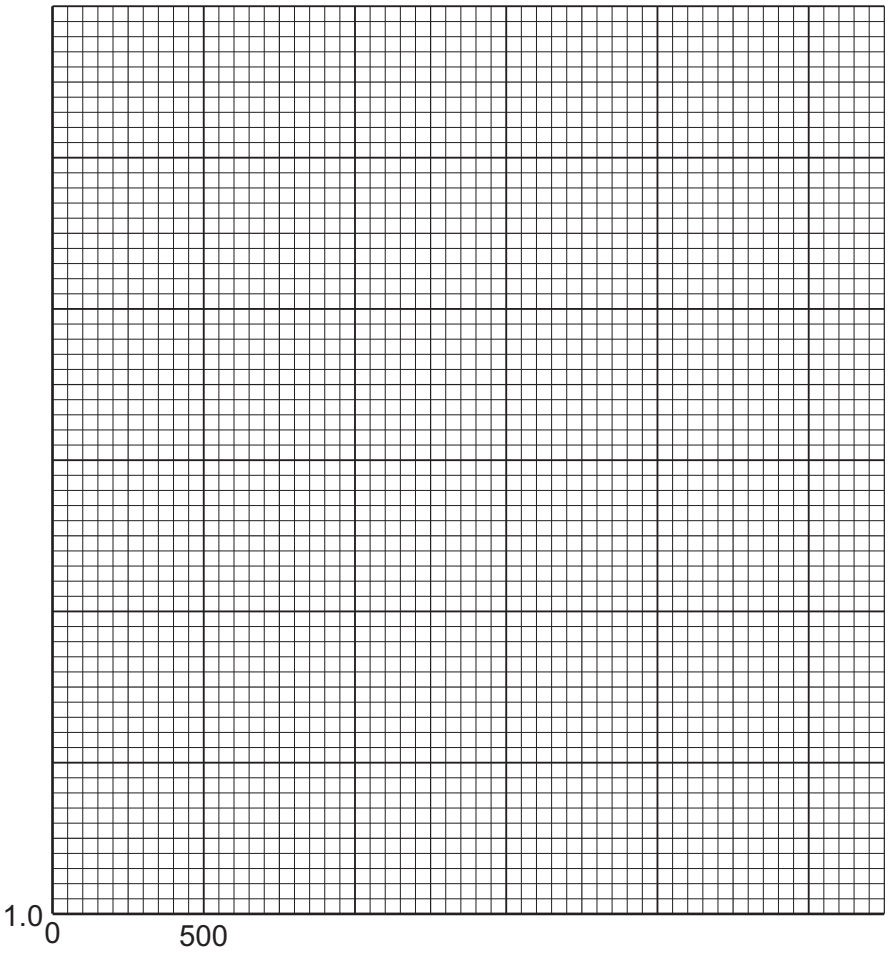
Suggest **one** practical reason why the time is measured for 10 oscillations rather than for 1 oscillation.

.....

..... [1]

(c) **(i)** On the grid, plot a graph of T^4 (vertical axis) against d^2.

.....



.....

[3]

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

(d) One safety hazard in this experiment is that the stands may fall over.

Name **one** piece of equipment that stops the stands from falling over.

..... [1]

[Total: 13]

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NOTES FOR USE IN QUALITATIVE ANALYSIS

Tests for anions

anion	test	test result
carbonate, CO_3^{2-}	add dilute acid, then test for carbon dioxide gas	effervescence, carbon dioxide produced
chloride, Cl^- [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide, Br^- [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
iodide, I^- [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
sulfate, SO_4^{2-} [in solution]	acidify with dilute nitric acid, 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(II), 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, ppt. turns brown near surface on standing	green ppt., insoluble in excess, ppt. turns brown near surface on standing
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

