Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME											
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COMBINED SCIENCE **0653/52**

Paper 5 Practical Test **October/November 2024**

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 or correction fluid.
- 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	
1	
2	
3	
4	
Total	

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

1 You are provided with one half of an onion on a white tile.

(a) In the box, make a large and detailed pencil drawing of the cut surface of the onion.

[3]

(b) **(i)** Measure the diameter *d* of the cut surface of the onion on the white tile.

d = ... mm [1]

(ii) Draw a straight line on your drawing in **(a)** to show the diameter of the cut surface of the onion.

Measure the length *D* of the line on your drawing in **(a)**.

D = ... mm [1]

(iii) Calculate the magnification of your drawing.

Use the equation shown.

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

magnification = ... [1]

(c) Add a few drops of iodine solution to the cut surface of the onion on the white tile.

Record the result of the test and state a conclusion.

result ....

conclusion ....
[1]

[Total: 7]

2 Plants such as onions need minerals in the soil to grow.

Fig. 2.1 shows an onion plant.

Fig. 2.1

Plan an investigation to determine the relationship between the concentration of minerals in the soil and the growth of onion plants.

You are provided with:

- onion plants
- soil
- planting containers
- 10% mineral solution
- distilled water.

You may also use any other common laboratory apparatus.

You are not required to do this investigation.

In your plan, include:

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

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

....

....

....

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....

....

.... [7]

3 You are going to investigate the white solid provided, **solid H**.

(a) Procedure

step 1 Measure the mass of an empty test-tube. Record this value in Table 3.1.

step 2 Place three spatulas of **solid H** into the test-tube.

step 3 Measure the total mass of the test-tube and **solid H**. Record this value in Table 3.1.

step 4 Hold the test-tube with a test-tube holder.

step 5 Heat the test-tube in a blue Bunsen burner flame for at least three minutes. Record your observation in Table 3.1.

step 6 Leave the test-tube to cool down.

Continue with **(f)** while you are waiting for the test-tube to cool down.

step 7 When cool, measure the mass of the test-tube and its contents. Record this value in Table 3.1.

Table 3.1

mass of empty test-tube at **step 1** / g	
mass of test-tube and **solid H** at **step 3** / g	
mass of test-tube and contents at **step 7** / g	
observation during heating in **step 5**	

[4]

(b) Calculate the mass of **solid H** heated.

Use the equation shown.

mass of **solid H** = mass at **step 3** – mass at **step 1**

mass of **solid H** = ... g [1]

(c) The mass of **solid H** changes when it is heated.

(i) Calculate the change in mass of **solid H**.

Use the equation shown.

change in mass = mass at **step 3** – mass at **step 7**

change in mass = ... g [1]

(ii) Suggest a reason for this change in mass.

....

.... [1]

(iii) Calculate the percentage change in mass of **solid H**.

Use the equation shown.

$$\text{percentage change in mass} = \frac{\text{change in mass in } \textbf{(c)(i)}}{\text{mass of } \textbf{solid H} \text{ in } \textbf{(b)}} \times 100$$

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

percentage change in mass = ... % [2]

(d) Explain why it is important to heat **solid H** with a blue Bunsen burner flame instead of a yellow flame.

....

.... [1]

(e) Explain how to improve the procedure to make sure that **solid H** has the maximum change in mass.

....

....

.... [1]

(f) You are going to add **solid H** to dilute nitric acid. You will need to identify the gas that is formed.

Procedure

- Add about 3 cm depth of dilute nitric acid to a clean test-tube.
- Add a spatula of **solid H** to the test-tube.

Identify the gas formed.

You may need to add more **solid H** to the dilute nitric acid if the mixture stops fizzing.

Describe the test and observation used to identify the gas.

test ....

observation ....

identity of gas ....
[2]

[Total: 13]

Check that you have completed (a)–(e).

4 You are going to investigate the stretching of identical springs.

The apparatus has been assembled for you as shown in Fig. 4.1.

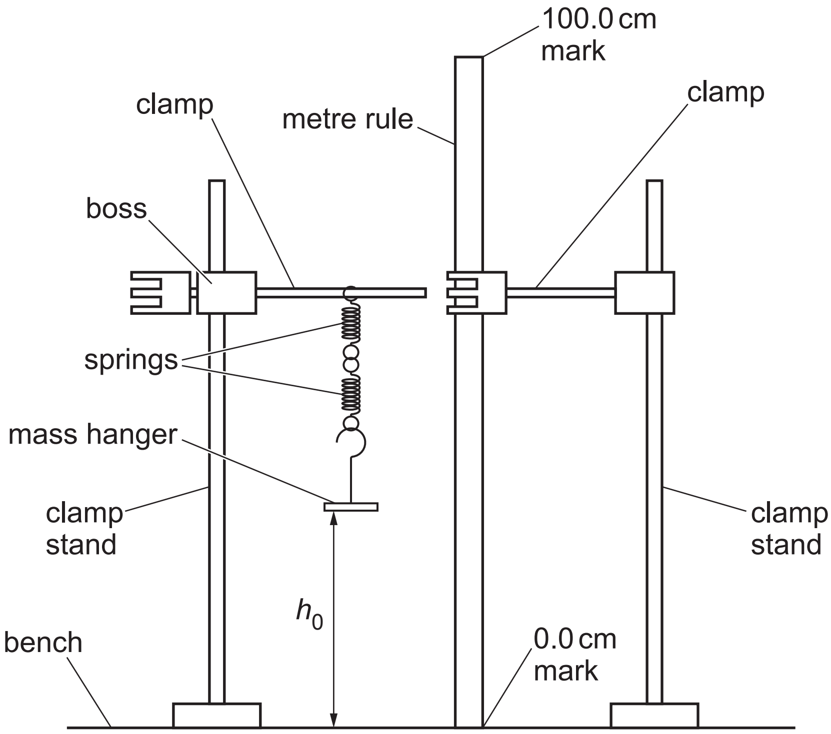


Fig. 4.1

Do **not** adjust the height of the clamps.

(a) The height of the bottom of the mass hanger above the bench is h_0.

(i) Use the set square to help you take the reading of height h_0 on the metre rule.

Record h_0 to the nearest 0.1 cm.

h_0 = ... cm [1]

(ii) Using the set square improves the accuracy of your reading of h_0 on the metre rule.

Draw on Fig. 4.1 to show the position of the set square when taking the h_0 reading. [1]

(iii) Describe how you avoid a parallax (line-of-sight) error when taking the reading of h_0 on the metre rule.

....

.... [1]

(b) Add load L to the mass hanger, where $L = 0.5\,N$.

(i) Record to the nearest 0.1 cm the new height h of the bottom of the mass hanger above the bench.

h = ... cm [1]

(ii) Calculate the extension e of the springs.

Use your values from **(a)(i)** and **(b)(i)** and the equation shown.

$$e = h_0 - h$$

e = ... cm [1]

(c) Repeat **(b)** for loads of L = 1.0 N, 1.5 N, 2.0 N and 2.5 N.

Record all your values of h and e in Table 4.1.

Table 4.1

L / N	h / cm	e / cm
0.0	–	0.0
0.5		
1.0		
1.5		
2.0		
2.5		

[2]

(d) Using a set square helps overcome one practical difficulty when reading h on the metre rule.

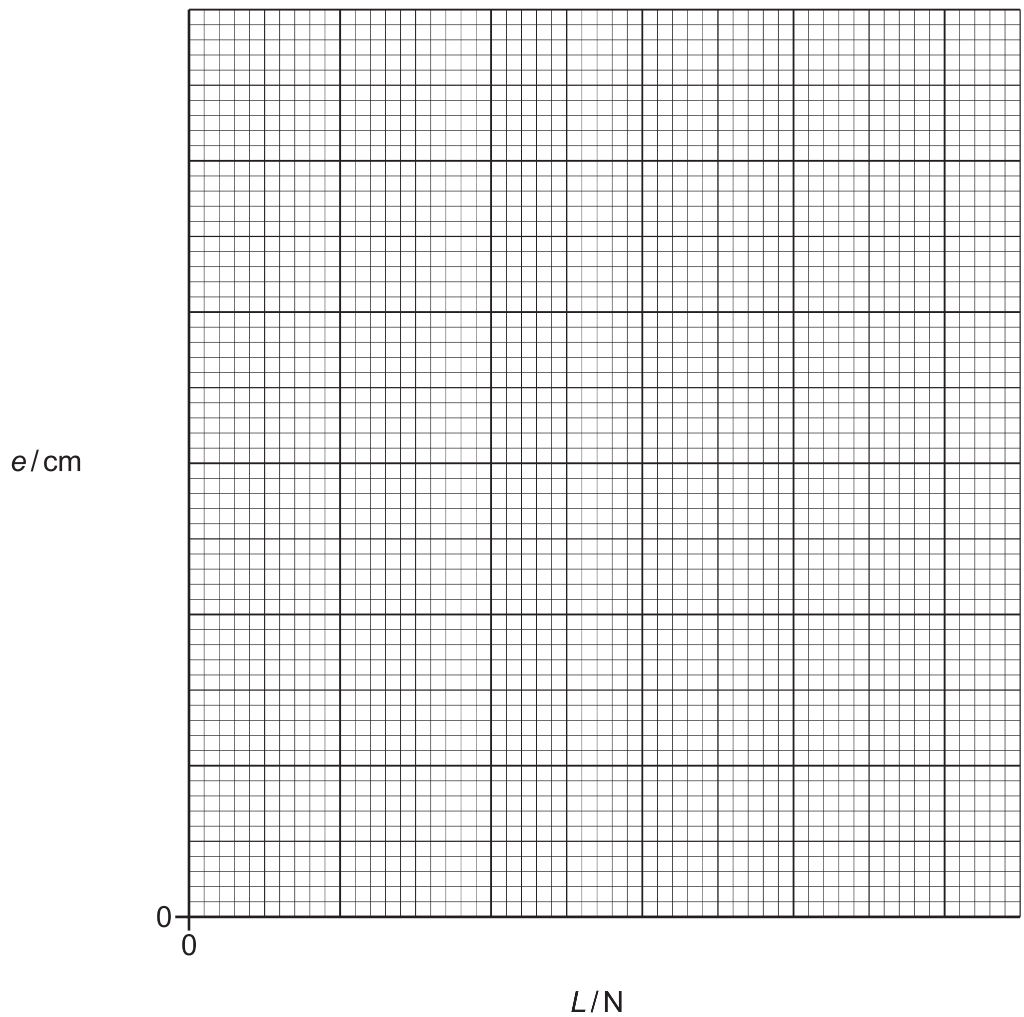
Describe **one** other practical difficulty in measuring h.

....

.... [1]

(e) **(i)** On the grid, plot a graph of *e* (vertical axis) against *L*.

Start both axes from the origin (0, 0).



[2]

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

(f) You are now going to investigate the stretching of a **single** spring.

- Carefully remove the loads from the mass hanger.
- Remove the mass hanger from the springs.
- Remove the pair of springs from the clamp.
- Suspend the **single** spring from the clamp.
- Suspend the mass hanger from the **single** spring on the clamp.

(i) Record to the nearest 0.1 cm the **new** value of h_0.

h_0 = ... cm

- Add a load L to the mass hanger, where L = 1.0 N.

Record to the nearest 0.1 cm the **new** value of h.

h = ... cm

Calculate the extension e_s of the **single** spring.

Use your **new** values for h_0 and h and the equation shown.

$$e_s = h_0 - h$$

e_s = ... cm
[1]

(ii) You do **not** need to make any other measurements for the single spring.

On the grid in **(e)(i)**, plot extension e_s against load L = 1.0 N.

Use this plot to draw an estimated line of best fit for the single spring. Label your estimated line of best fit, **single spring**.

[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	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(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	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