Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMBINED SCIENCE **0653/61**

Paper 6 Alternative to Practical **October/November 2024**

1 hour

You must answer on the question paper.

No additional materials are needed.

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 [ ].

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

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1 Fig. 1.1 is a photograph showing the cut surface of an onion.

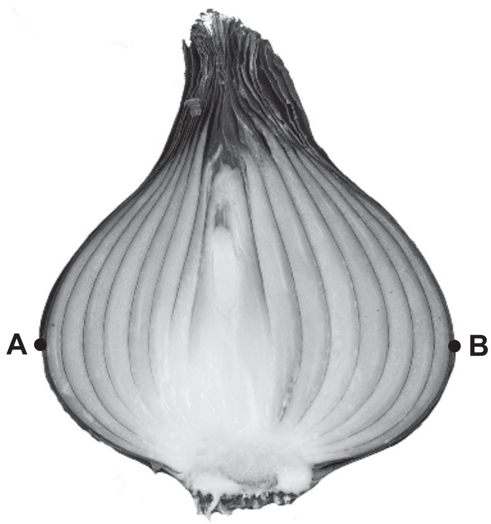

Fig. 1.1

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

[3]

(b) The photograph in Fig. 1.1 shows the onion in actual size.

The horizontal distance from point **A** to point **B** in Fig. 1.1 represents the diameter *d* of the onion.

(i) Measure the diameter *d* of the onion in Fig. 1.1.

d = ... mm [1]

(ii) Add point **A** and point **B** to your drawing in **(a)**.

Measure the horizontal distance *D* from point **A** to point **B** 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) A few drops of iodine solution are added to the cut surface of the onion.

Complete the observation.

observation ....

conclusion ....no starch present..

[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.

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).

[7]

3 A student investigates a white solid, **solid H**.

Procedure

The student:

step 1 measures the mass of an empty test-tube and records the value in Table 3.1

step 2 places some **solid H** into the test-tube

step 3 measures the total mass of the test-tube and **solid H** and records the value in Table 3.1

step 4 heats this test-tube using a blue Bunsen burner flame for three minutes

step 5 leaves the test-tube to cool down

step 6 measures the mass of the test-tube and its contents and records the value in Table 3.1.

(a) Explain **two** safety precautions needed when heating **solid H** to avoid injury to the student or to other students.

1 ....

....

2 ....

....

[2]

(b) Fig. 3.1 shows the balance readings from **step 3** and **step 6**.

18.260 g	17.616 g
mass at **step 3**	mass at **step 6**

Fig. 3.1

Record in Table 3.1 these balance readings to **two** decimal places.

Table 3.1

mass of empty test-tube at **step 1** / g	16.45
mass of test-tube and **solid H** at **step 3** / g	
mass of test-tube and contents at **step 6** / g	

[2]

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(c) 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]

(d) The mass of **solid H** decreases when it is heated.

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

Use the equation shown.

decrease in mass = mass at **step 3** – mass at **step 6**

change in mass = ... g [1]

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

....

.... [1]

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

Use the equation shown.

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

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

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

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

....

.... [1]

(f) The teacher tells the student that the decrease in mass of **solid H** is smaller than expected.

Describe how to improve the procedure to make sure that **solid H** has the maximum decrease in mass.

....

.... [1]

(g) The student adds some **solid H** to dilute nitric acid.

A colourless solution and a colourless gas are formed.

(i) The student tests the gas with limewater.

A white precipitate is formed.

Identify the anion (negative ion) present in **solid H**.

.... [1]

(ii) The student adds aqueous ammonia slowly to the colourless solution in **(g)**.

A white precipitate forms.

The precipitate is soluble in excess aqueous ammonia, giving a colourless solution.

Identify the cation (positive ion) present in **solid H**.

.... [1]

[Total: 13]

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4 A student investigates the stretching of a pair of identical springs.

The student assembles the apparatus as shown in Fig. 4.1.

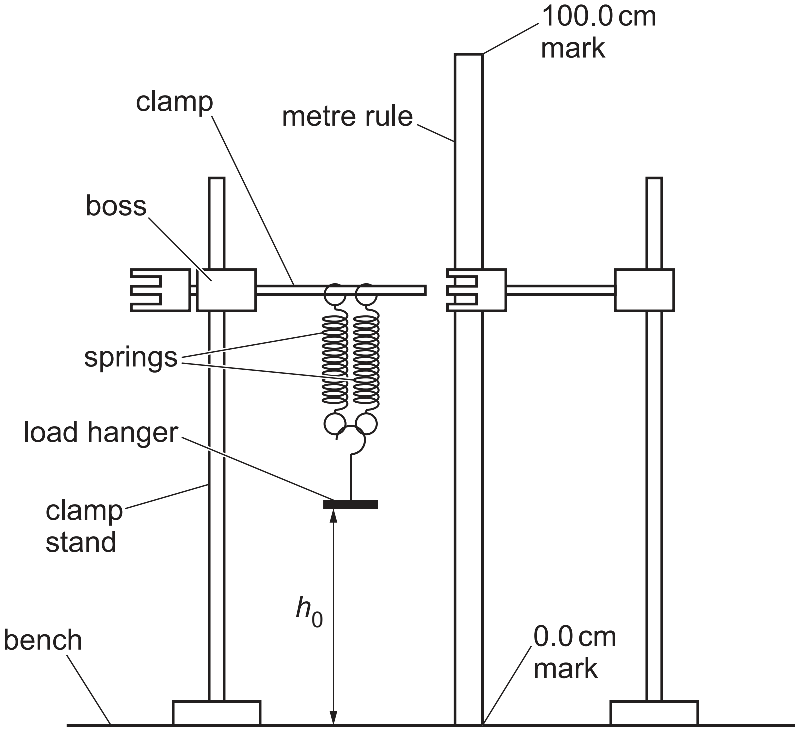

Fig. 4.1

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

The student uses a set square to help take the reading of height h_0 on the metre rule. The student does **not** move the metre rule.

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

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

(ii) Describe how the student avoids a parallax (line-of-sight) error when taking the reading of h_0 on the metre rule.

....

.... [1]

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(iii) Fig. 4.2 shows the bottom of the load hanger with the metre rule next to it.

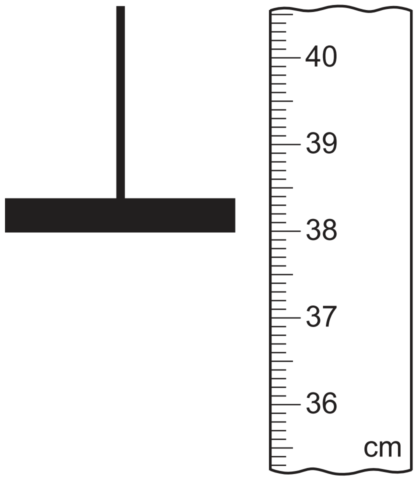


Fig. 4.2

Record h_0 to the nearest 0.1 cm.

h_0 = ... cm [1]

(b) Procedure

The student:

- adds a load L to the load hanger, where L = 1.0 N
- measures to the nearest 0.1 cm the new height h of the bottom of the load hanger above the bench.

The student repeats the procedure for loads of L = 2.0 N, 3.0 N, 4.0 N and 5.0 N.

Table 4.1 shows some of the student's data.

Table 4.1

L / N	h / cm	e / cm
0.0	–	0.0
1.0	35.9	
2.0	34.0	
3.0		
4.0	30.3	
5.0	28.4	

(i) Fig. 4.3 shows the load hanger next to the metre rule for load L = 3.0 N.

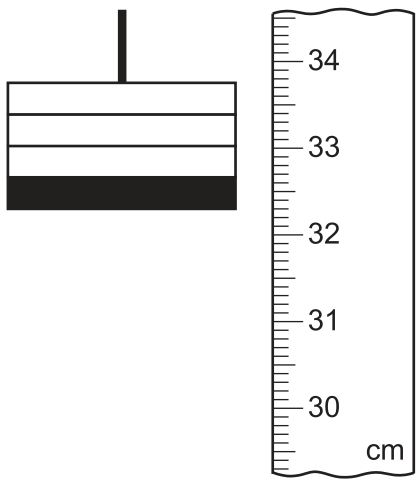


Fig. 4.3

Record in Table 4.1 the new height h for load L = 3.0 N. [1]

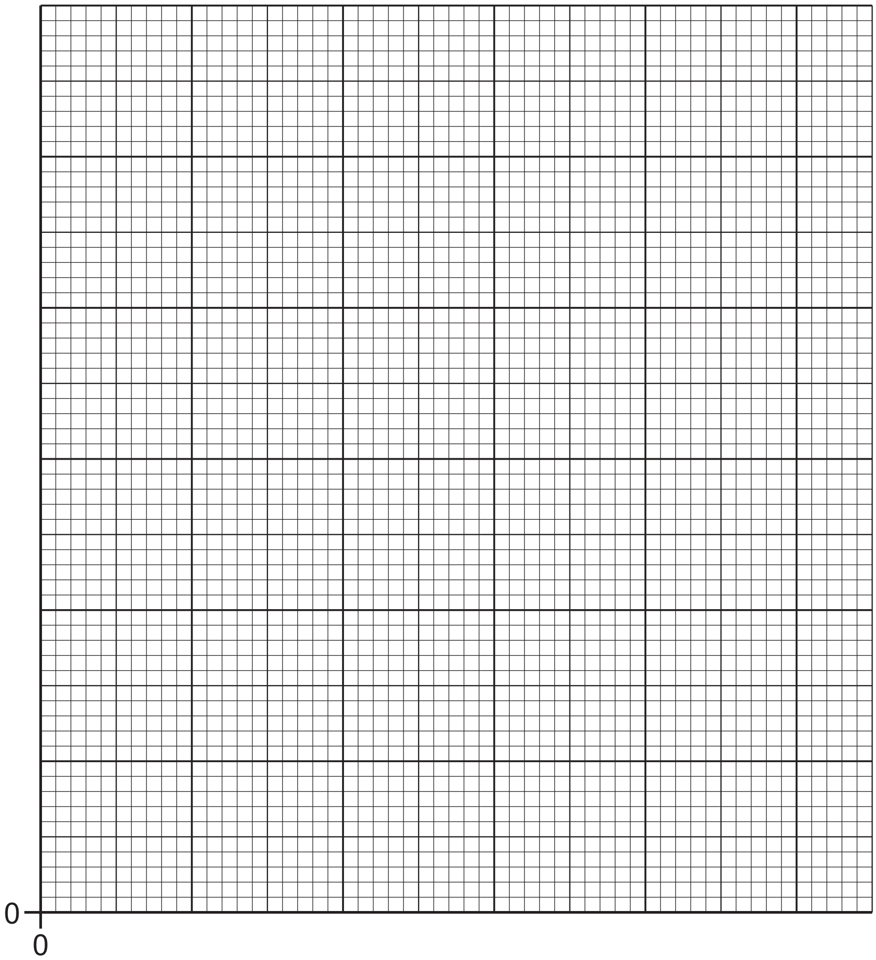
(ii) The extension e of the springs is calculated using the equation shown.

$$e = h_0 - h$$

Use the equation shown and your value of h_0 from **(a)(iii)** to complete Table 4.1. [2]

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

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



[3]

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

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

Suggest **one** other practical difficulty encountered when reading h.

....

.... [1]

(d) The student now investigates the stretching of a **single** spring.

The student:

- suspends the empty load hanger from a single spring
- records the new value of h_0
- adds a load L to the load hanger, where $L = 2.0\,\text{N}$
- records the new value of h.

(i) The new values of h_0 and h recorded by the student are:

$$h_0 = 35.8\,\text{cm}$$

$$h = 28.1\,\text{cm}.$$

Use the student's new values and the equation shown to calculate the extension e_s of the single spring.

$$e_s = h_0 - h$$

e_s = ... cm [1]

(ii) On the grid in **(b)(iii)**, plot extension e_s against load $L = 2.0\,\text{N}$.

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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