

Cambridge IGCSE™

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COMBINED SCIENCE

0653/62

Paper 6 Alternative to Practical

May/June 2023

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 **12** pages.

- 1 Fig. 1.1 is a section through okra, a fruit which contains five seeds.

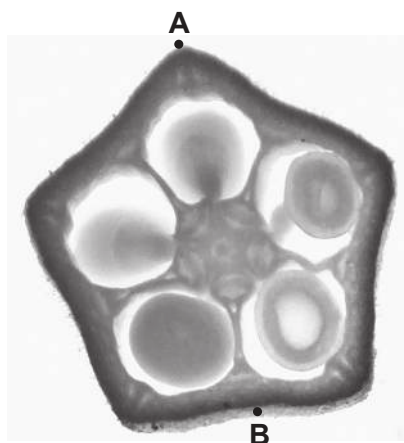


Fig. 1.1

- (a) In the box provided, draw a large, clear pencil drawing of the section of okra.

[3]

- (b) (i) The distance between point **A** and point **B** on Fig. 1.1 represents a diameter of the okra.

Measure the distance between point **A** and point **B** on Fig. 1.1.

distance on Fig. 1.1 = mm [1]

- (ii) Suggest why the distance between point **A** and point **B** is only an estimate of the diameter of the okra in Fig. 1.1.

.....
 [1]

- (iii) Measure the distance between the same two points on your drawing as in (b)(i).

Mark **A** and **B** on your drawing to show where you have measured.

distance on your drawing = mm [1]

- (iv) Calculate the magnification of your drawing.

Use the equation shown.

$$\text{magnification} = \frac{\text{distance on your drawing}}{\text{distance on Fig. 1.1}}$$

magnification = [1]

[Total: 7]

- 2 The enzyme amylase breaks down starch to form a reducing sugar.
Iodine is a brown solution that turns blue/black in the presence of starch.

Plan an investigation to determine the relationship between temperature and the time taken to completely break down starch by amylase.

You are provided with:

- 1% amylase solution
- 1% starch solution
- iodine solution.

You may also use any other common laboratory apparatus.

In your plan include:

- the additional apparatus needed
- a brief description of the method and an explanation of any safety precautions you will take
- what you will measure
- which variables you will keep constant
- how you will process your results to draw a conclusion.

You may include a labelled diagram if you wish.

You may include a table that can be used to record the results if you wish.

You do **not** need to include any results in your table.

[7]

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

(a) **Procedure**

The student:

- measures the mass of an empty test-tube and records this mass in Table 3.1
- places some solid **H** into the test-tube
- measures the mass of the test-tube and solid **H** and records this mass in Table 3.1
- heats solid **H** for one minute using the blue flame of a Bunsen burner
- lets the test-tube cool down
- measures the mass of the test-tube and the solid after heating and records this mass in Table 3.1.

Table 3.1

	mass /g
empty test-tube	16.23
test-tube and solid H before heating	
test-tube and the solid after heating	

- (i) Suggest why the student lets the test-tube and the solid cool down before measuring its mass.

.....
..... [1]

- (ii) Fig. 3.1 shows two of the balance readings.



Fig. 3.1

Record in Table 3.1 these readings to **two** decimal places. [2]

- (iii) Calculate the mass of solid **H** in the test-tube before heating.

Use the equation shown.

mass of solid H before heating	=	mass of test-tube and solid H before heating	–	mass of empty test-tube
--	---	--	---	-------------------------

mass of solid **H** before heating = g [1]

- (iv) Calculate the mass of the solid in the test-tube after heating.

Use the equation shown.

mass of the solid after heating	=	mass of test-tube and the solid after heating	–	mass of empty test-tube
------------------------------------	---	--	---	-------------------------

mass of the solid after heating = g [1]

- (v) There is a loss in mass when solid **H** is heated.

Suggest **one** reason for this loss in mass.

..... [1]

- (vi) Calculate the percentage loss in mass.

Use the equation shown.

percentage loss in mass = $\frac{\text{mass of solid **H** before heating} - \text{mass of the solid after heating}}{\text{mass of solid **H** before heating}} \times 100$

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

percentage loss in mass = [2]

- (vii) Explain why it is better to heat solid **H** for at least five minutes rather than one minute.

.....
..... [1]

- (viii) State **one** reason why the test-tube must be heated with a blue Bunsen burner flame rather than a yellow Bunsen burner flame.

.....
..... [1]

- (b) The student puts some solid **H** into dilute hydrochloric acid.

The mixture forms a colourless solution and bubbles of carbon dioxide gas are seen.

- (i) Describe the test to confirm that the gas made is carbon dioxide.

Include the observation for a positive result.

test
observation [1]

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

..... [1]

- (iii) The student adds aqueous sodium hydroxide to the colourless solution.

A white precipitate forms which is soluble in excess aqueous sodium hydroxide.

Tick (✓) the name of the cation present in the colourless solution.

ammonium	☐	calcium	☐
copper(II)	☐	iron(III)	☐
zinc	☐		

[1]

[Total: 13]

- 4 A student does an experiment to determine the focal length F of a convex lens.

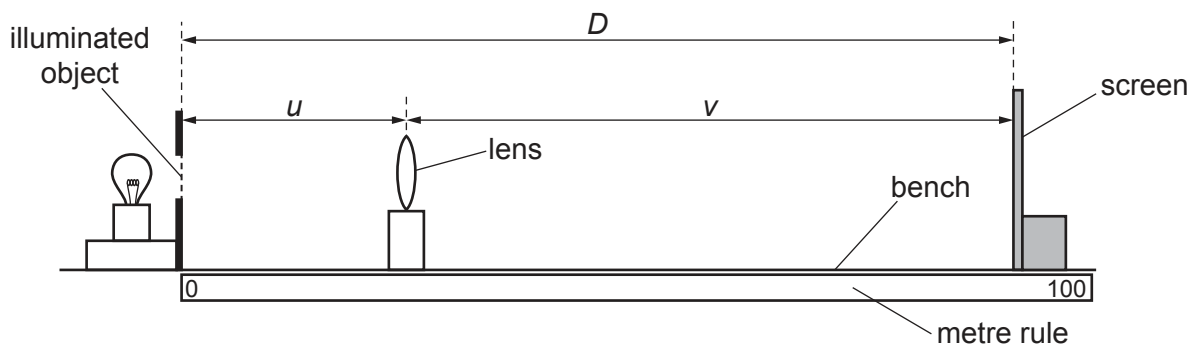


Fig. 4.1

(a) Procedure

The student:

- arranges the equipment as shown in Fig. 4.1
- switches on the lamp
- places the illuminated object (a triangle) at the 0 cm mark on the metre rule
- places the lens at a distance $u = 10.0$ cm from the illuminated object
- places the screen at a distance $D = 95.0$ cm from the illuminated object.

An out of focus fuzzy image appears on the screen.

- moves the lens slowly towards the screen until the image formed is in focus, and as sharp as possible
- measures u and v and records the values in Table 4.1.

- (i) The illuminated object is 1.5 cm high. Fig. 4.2 shows the actual size of the image on the screen.

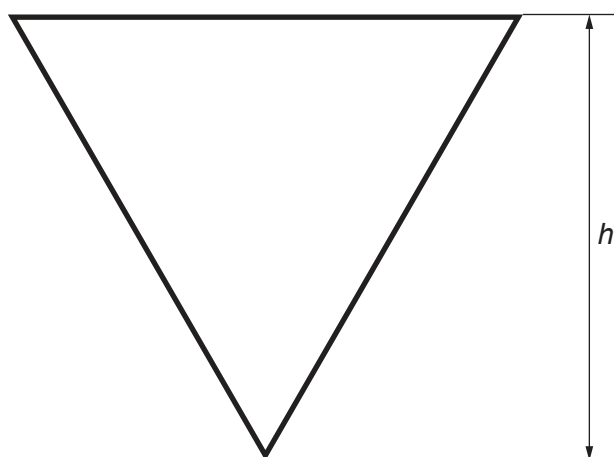


Fig. 4.2

Measure and record the height h of the image.

$h = \dots\dots\dots$ cm [1]

- (ii) The student repeats the procedure for values of $D = 85.0\text{ cm}$, 75.0 cm , 70.0 cm and 65.0 cm .

Fig. 4.3 shows the lens and part of the metre rule when the image is in focus for $D = 75.0\text{ cm}$.

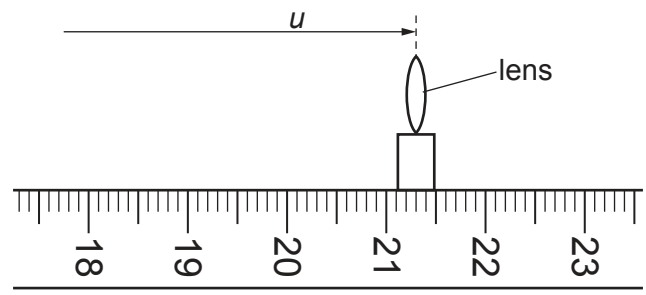


Fig. 4.3

Record the value of u shown on the metre rule in Table 4.1 in the row for $D = 75.0\text{ cm}$.

Table 4.1

D	u	v	uv
/cm	/cm	/cm	/
95.0	19.2	75.8	1460
85.0	20.5	64.5	1320
75.0			
70.0	22.2	47.8	1060
65.0	24.8	40.2	997

[1]

- (iii) Calculate the distance v for $D = 75.0\text{ cm}$ and record the value in Table 4.1. [1]

- (iv) Calculate the product uv and record it for $D = 75.0\text{ cm}$ in the final column of Table 4.1.

Use the equation shown.

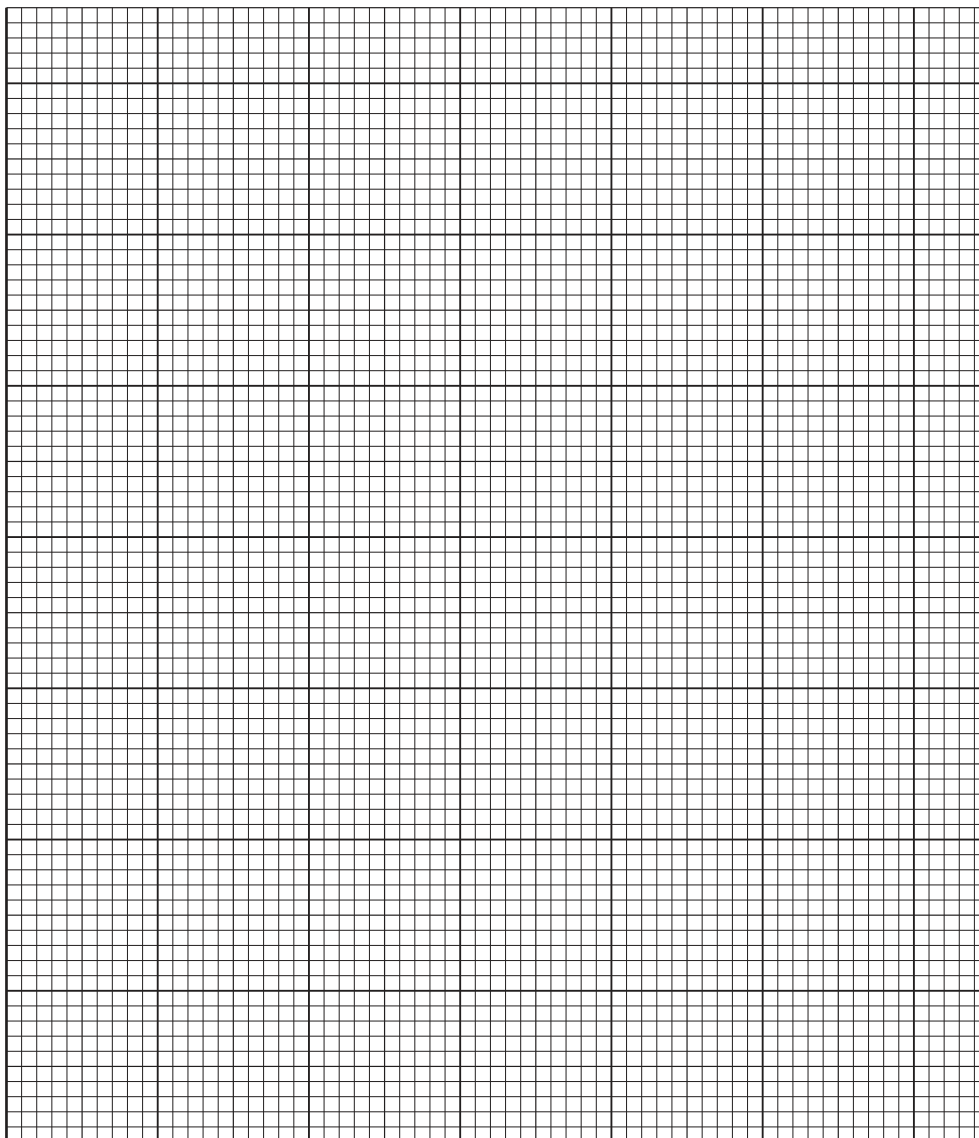
$$uv = u \times v$$

[1]

- (v) Add the unit to the column heading for uv in Table 4.1. [1]

- (b) (i) On the grid, plot a graph of uv (vertical axis) against D .

Do **not** start your graph from the origin (0, 0).



[3]

- (ii) Draw the best-fit straight line.

[1]

- (c) The focal length F of the lens is equal to the gradient of your line.

Calculate the gradient of your line.

Indicate on your graph the values you choose to calculate the gradient.

$F =$ [2]

- (d) (i) F can also be calculated without plotting a graph, by using the results for one value of D .

Suggest why plotting a graph and calculating a gradient to find the value of F gives a more accurate answer than calculating F for one value of D .

.....
..... [1]

- (ii) State **one** precaution that makes the readings as accurate as possible.

.....
..... [1]

[Total: 13]

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