Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMBINED SCIENCE **0653/52**

Paper 5 Practical Test **May/June 2023**

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 **12** pages. Any blank pages are indicated.

DC (DE/SG) 316016/2

1 You are going to investigate okra, a fruit which contains many seeds.

You are provided with a section of okra on a white tile.

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

[3]

(b) **(i)** Measure the diameter of the section of okra on the white tile.

diameter of okra on white tile = ... mm [1]

(ii) Suggest why it is difficult to measure the diameter of the okra accurately.

....

.... [1]

(iii) Measure the diameter of your drawing in **(a)**.
Draw a line on your drawing to show where you have measured.

diameter of your drawing = ... mm [1]

(iv) Calculate the magnification of your drawing.

Use the equation shown.

$$\text{magnification} = \frac{\text{diameter of your drawing}}{\text{diameter of okra on white tile}}$$

magnification = ... [1]

[Total: 7]

2 The enzyme amylase breaks down starch to form a reducing sugar.

Plan an investigation to determine the relationship between temperature and the time taken to completely break down starch by amylase. Iodine is a brown solution that turns blue/black in the presence of starch.

You are provided with:

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

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 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 results table.

[7]

3 You are going to investigate a white solid **H**.

(a) (i) Procedure

- Measure the mass of the clean dry test-tube labelled **H**.
- Record this mass in Table 3.1.
- Place two spatula loads of solid **H** into the test-tube.
- Measure the mass of the test-tube and solid **H**.
- Record this mass in Table 3.1.
- Using the test-tube holder, heat solid **H** safely for one minute using a blue Bunsen burner flame.
- Observe solid **H** during heating.
- Lay the test-tube on the laboratory mat and allow the test-tube to cool down.

Table 3.1

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

[2]

(ii) Describe your observation of solid **H** during heating.

.... [1]

While you are waiting for the test-tube to cool down do part (b).

(iii) When the test-tube is cool, measure the mass of the test-tube and the solid after heating.

Record this mass in Table 3.1. [1]

(iv) Describe your observation of the solid after cooling.

.... [1]

(v) 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]

(vi) 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]

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

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

.... [1]

(viii) Calculate the percentage loss in mass.

Use the equation shown.

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

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

percentage loss in mass = ... [2]

(ix) Explain why it is a good idea to heat solid **H** for at least five minutes rather than one minute.

....

.... [1]

(x) 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) Put about 3 cm depth of dilute hydrochloric acid in a clean test-tube.

Add one spatula load of solid **H**.

Describe **one** observation.

.... [1]

Go back to (a)(iii) to finish question (a).

[Total: 13]

4 You are going to measure the focal length F of a convex lens.

Arrange the equipment as shown in Fig. 4.1.

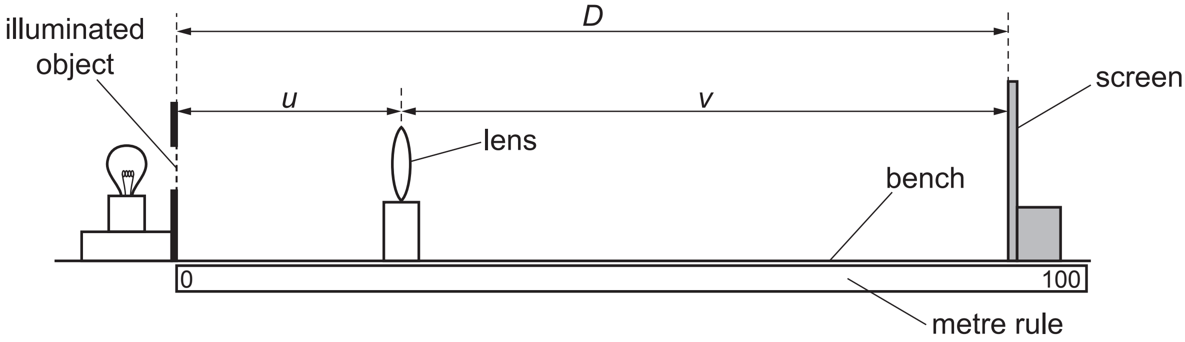


Fig. 4.1

(a) Procedure

- Switch on the lamp.
- Place the illuminated object (a triangle) at the 0 cm mark on the metre rule.
- Place the lens at a distance u = 10.0 cm from the illuminated object.
- Place the screen at a distance D = 95.0 cm from the illuminated object.

An out of focus, fuzzy image appears on the screen.

- Move the lens slowly towards the screen until the image formed is in focus, and as sharp as possible.

(i) Measure the distances u and v to the nearest 0.1 cm.

Record u and v in the first row of Table 4.1.

Table 4.1

D / cm	u / cm	v / cm	uv / ....
95.0			
85.0			
75.0			
70.0			
65.0			

[1]

(ii) Repeat the measurements for the four other values of D shown in Table 4.1.

Record the distances u and v in Table 4.1 against the correct values of D.

[2]

(iii) Calculate the product *uv* and record it for each value of *D* in the final column of Table 4.1. Use the equation shown.

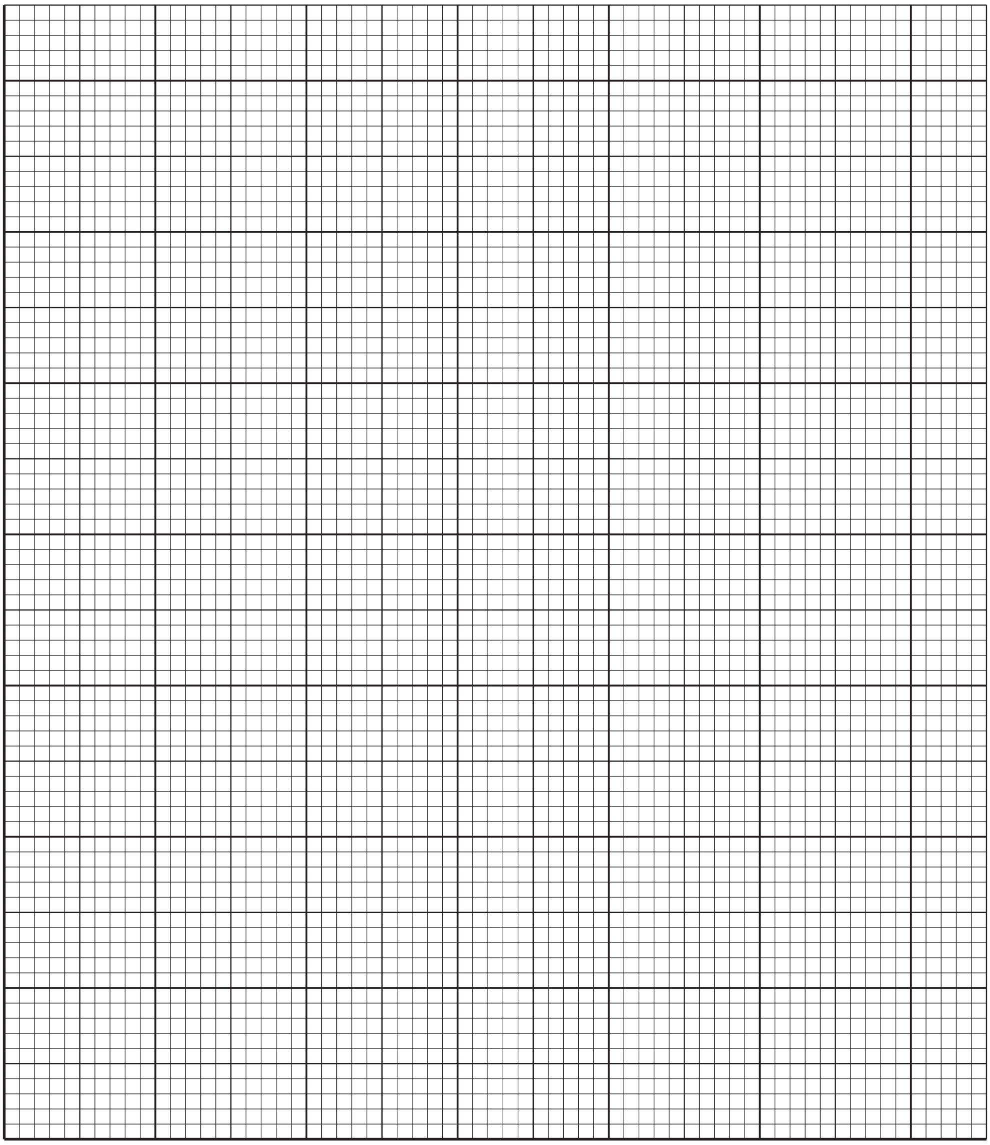
$$uv = u \times v$$

[1]

(iv) 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*.

You do **not** need to 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 you take when doing the experiment to make your readings as accurate as possible.

....

.... [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