* 0000800000001 *

Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7654776609

BIOLOGY **5090/41**

Paper 4 Alternative to Practical **May/June 2025**

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 **8** pages.

[Turn over

1 A student investigated the effect of gravity on germinating seeds. Eight pea seeds were used.

As they germinated, the pea seeds first produced radicles (roots). The length of the radicle can be measured between the dotted lines as shown in Fig. 1.1.

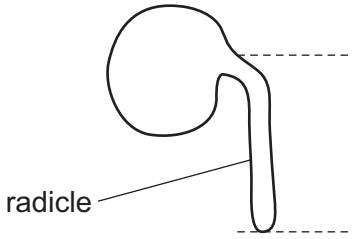

Fig. 1.1

The student attached four of the seeds with germinating radicles to the cork base on each of two electric motors, as shown in Fig. 1.2. The cork was kept wet during the investigation and the apparatus was kept in the dark.

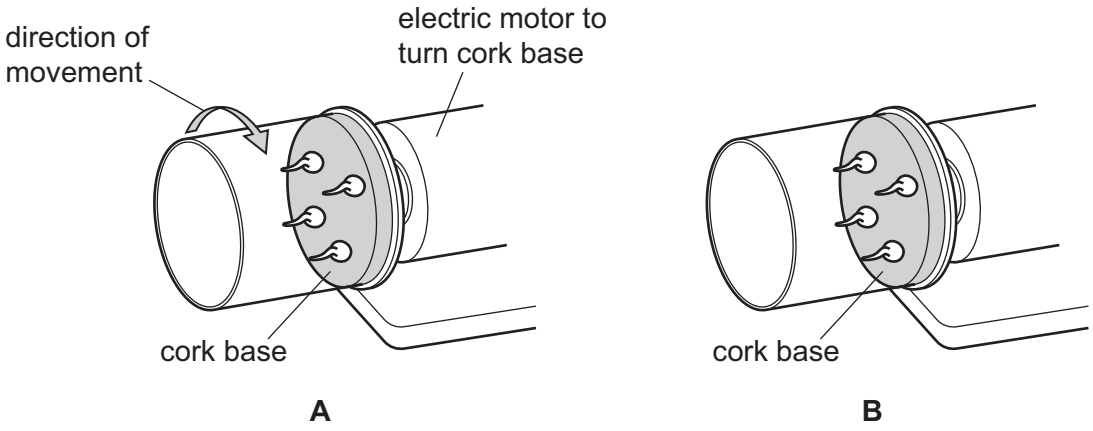

Fig. 1.2

The student then switched on motor **A** so that the cork base rotated very slowly for two days, turning in the direction indicated by the arrow.

Motor **B** was not switched on so the cork base did not rotate.

Fig. 1.3 shows the pea radicles after 2 days.

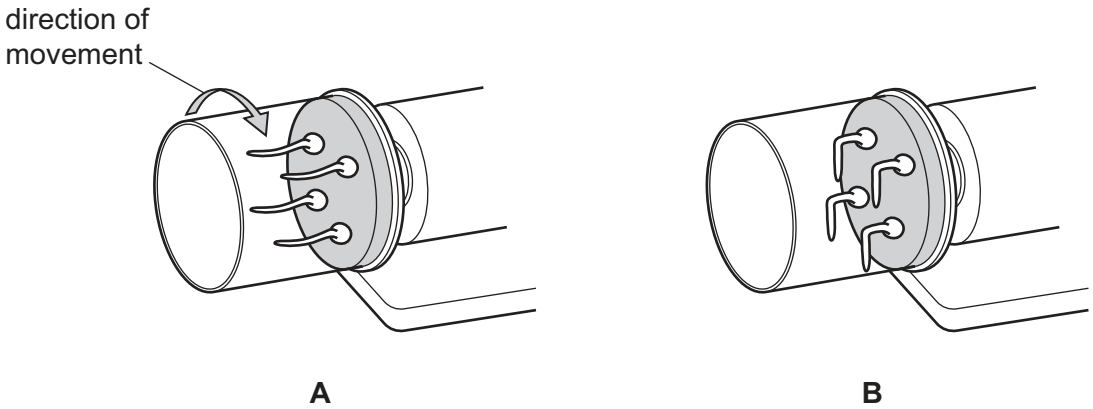

Fig. 1.3

(a) Fig. 1.4 shows the actual size of the four germinating peas from **A** after two days.

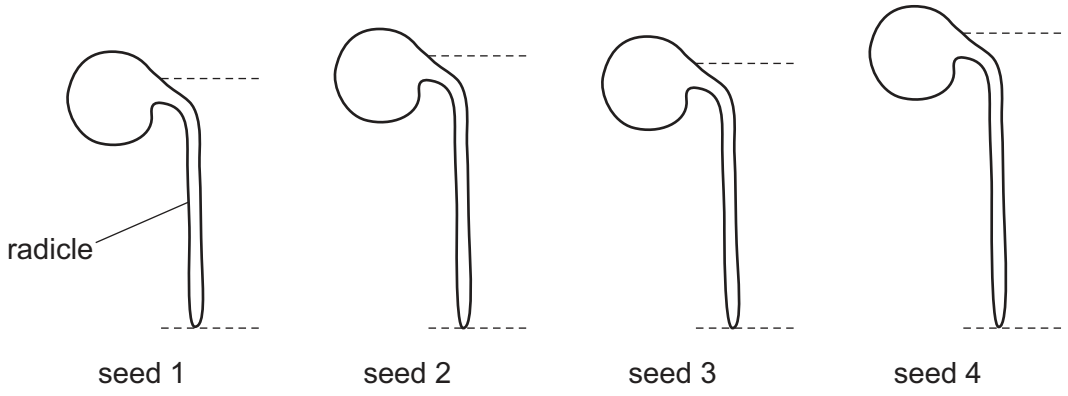

Fig. 1.4

Fig. 1.5 shows the lengths recorded (in millimetres) in the student's notebook for the four radicles from **B** after two days.

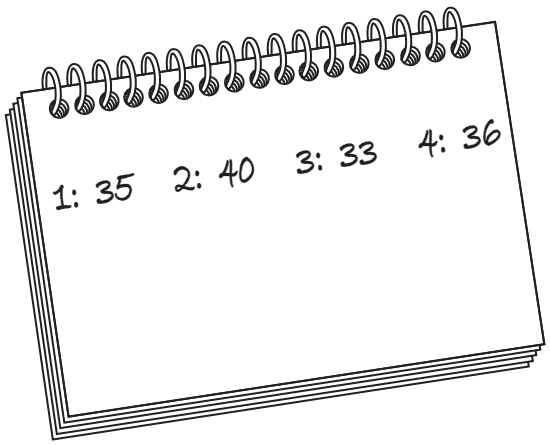

Fig. 1.5

You are going to measure and record the length of each radicle from **A** (the distance between the dotted lines in Fig 1.4).

(i) In the space below construct a table in which to record your measurements from **A** and the student's measurements from **B**.

[4]

(ii) Measure and record in your table the lengths of the radicles from **A** in Fig. 1.4. [2]

(iii) Record the student's measurements in your table for the radicles from **B** in Fig. 1.5. [1]

(iv) Calculate the mean lengths of the radicles from **A** and **B** and record them to 1 decimal place.

A mean length ..... mm

B mean length ..... mm [2]

(v) Use Fig. 1.3 and the mean lengths in **(iv)** to suggest what the student should conclude about the response of radicles to gravity.

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..... [3]

(b) Suggest why the student should repeat the investigation several times to obtain results for more pea seeds.

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..... [2]

(c) Suggest why the apparatus was kept in the dark during the investigation.

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..... [2]

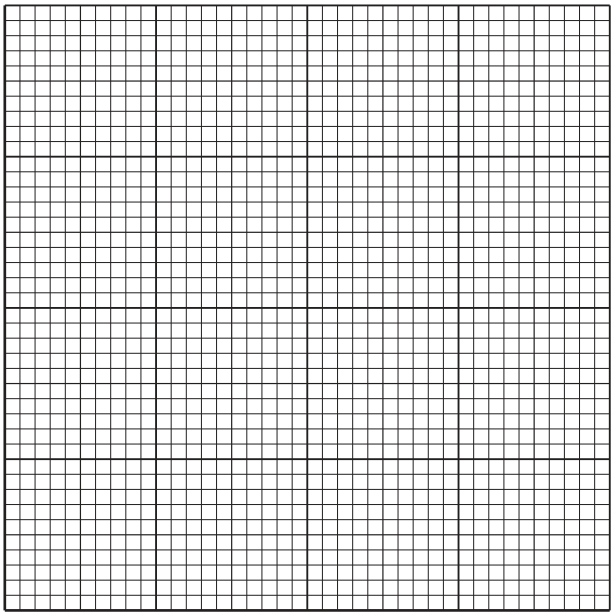
(d) Another student investigated the growth of the shoots (plumules) of germinating pea seeds for eight days.

The student's results are shown in Table 1.1.

Table 1.1

time / days	mean height of shoot / mm
0	3
2	6
4	10
6	13
8	16

(i) Construct a graph of the data in Table 1.1 on the grid below. Join your plotted points with ruled, straight lines. [4]



(ii) Use your graph to estimate the mean height of the pea shoots on day 5.

Show your working on the graph.

mean height ..... [3]

[Total: 23]

2 Fig. 2.1 shows part of the shoot of a pea seedling.

Fig. 2.1

(a) (i) Make a large drawing in the space below of the pea seedling as it appears in Fig. 2.1.

[5]

(ii) The leaves of the pea shoot are green.

Describe how you would prepare a leaf from the shoot and then carry out a test on it to show that it contains starch.

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..... [3]

[Total: 8]

3 **(a)** Urine tests can be used to diagnose diseases.

Indicator paper strips are dipped into a sample of urine. They detect substances excreted in the urine sample that are not normally present in the urine of a healthy person.

Three examples of indicator paper strips are:

- Diastix® to detect glucose
- Albustix® to detect protein
- Ketostix® to detect ketones.

Patients with diabetes excrete glucose and ketones.
Patients with nephritis excrete protein.
Patients with malnutrition excrete ketones.

Table 3.1 shows the results of tests on the urine samples of four individuals (**D**, **E**, **F** and **G**). A tick (✓) indicates a positive test and a cross (✗) indicates a negative test.

Table 3.1

indicator test strip	urine sample			
	D	**E**	**F**	**G**
Diastix®	✗	✓	✗	✗
Albustix®	✓	✗	✗	✗
Ketostix®	✗	✓	✗	✓

(i) State and explain which individual is healthy.

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..... [1]

(ii) State and explain which individual has diabetes.

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..... [2]

(b) The pH of urine in healthy humans is normally 6.5. The pH of urine can be measured using universal indicator paper strips.

A scientist wants to determine whether the pH of human urine is affected by the volume of water drunk. For her investigation she selects 20 healthy female volunteers of similar age and weight.

Plan a method the scientist could use for her investigation.

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..... [6]

[Total: 9]