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* 0000800000001 * DFD

CAMBRIDGE
International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 4 1 1 9 3 4 4 6 9 5 *

BIOLOGY **9700/53**

Paper 5 Planning, Analysis and Evaluation **May/June 2026**

1 hour 15 minutes

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. Do **not** use correction fluid or tape.
- 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 30.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

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1 A student planned to investigate the rate of respiration in germinating seeds and then determine the respiratory quotient (RQ) of the germinating seeds.

The student used the respirometer shown in Figure 1.1 for the investigation.

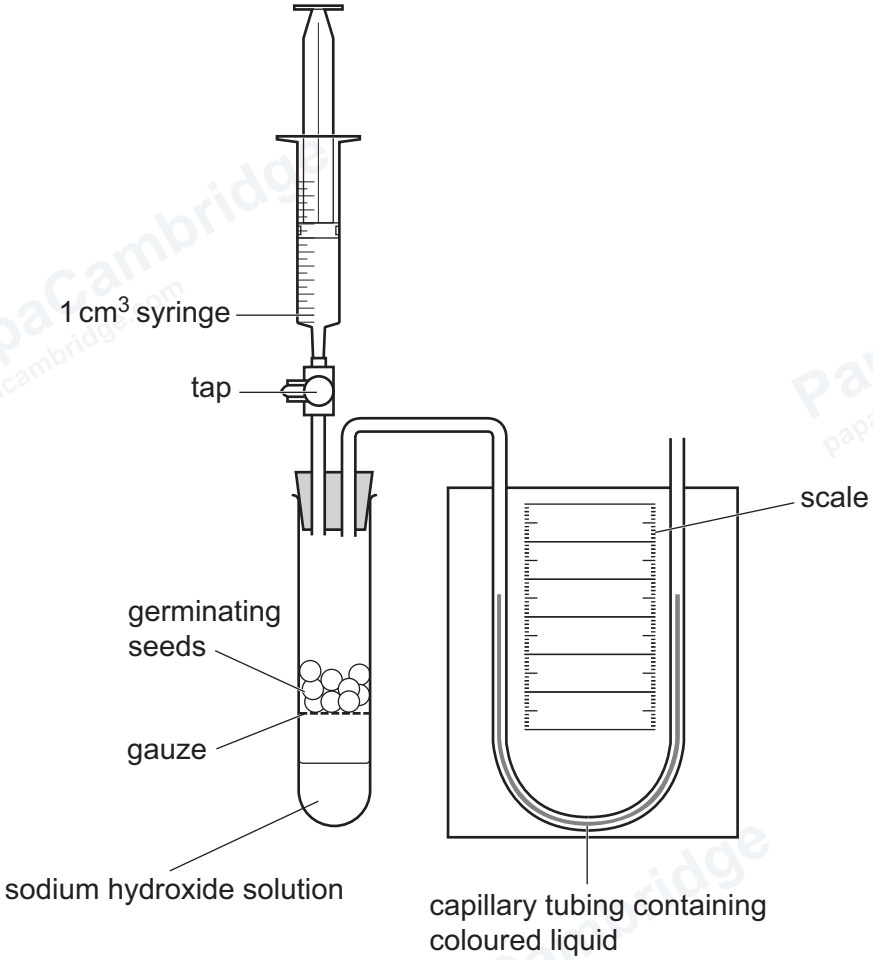


Figure 1.1

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(a) The student investigated the effect of temperature on the rate of respiration in the germinating seeds.

The student planned to use a temperature range of 10–50 °C in the investigation.

The student read that in some species:

- at lower temperatures, the rate of respiration approximately doubles for each 10 °C increase in temperature
- the optimum temperature for respiration is approximately 40 °C.

(i) Sketch a curve on Figure 1.2 to show the results that you predict the student will produce from this investigation.

Include labelled axes. Do **not** include units or values on the axes.

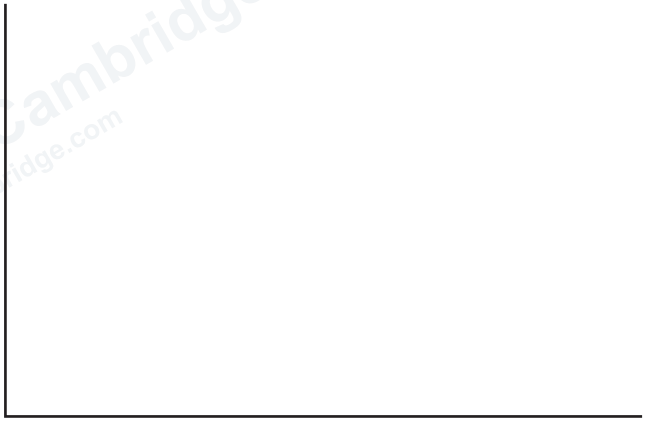


Figure 1.2

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(ii) The student was supplied with the respirometer in Figure 1.1, standard laboratory equipment and standard laboratory chemicals.

Describe a method the student could use to take the measurements needed for calculating the rates of respiration at different temperatures.

The description of your method should be set out in a logical way and be detailed enough for another person to follow.

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(iii) The diameter of the capillary tubing shown in Figure 1.1 was 1 mm.

The student used this value and the measurements that were taken to calculate a rate of respiration at each temperature.

Describe each step in the calculation that the student used to determine a rate of respiration.

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(b) The student then decided to determine the RQ of germinating seeds from four different species of plant. The seeds of all the species are known to respire aerobically.

For each species of plant, the student placed the germinating seeds in the respirometer and then measured the volume of oxygen used and the volume of carbon dioxide produced in one minute. The student decided to carry out all the measurements at 30 °C.

The results are shown in Table 1.1.

Table 1.1

species of plant	mean volume of oxygen used in one minute / mm^3	mean volume of carbon dioxide produced in one minute / mm^3
A	0.065	0.055
B	0.056	0.059
C	0.027	0.021
D	0.052	0.045

(i) Use Table 1.1 to calculate the RQ of species **A**.

RQ = ... [1]

(ii) The student suggested that the results for one of the species were **not** as expected and the procedure should be repeated for that species.

With reference to Table 1.1, state the species, **A**, **B**, **C** or **D**, for which the procedure should be repeated. Give a reason for your choice.

species .....

reason .....

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[2]

(iii) Suggest an error in the procedure that could explain the results for the species you stated in **1(b)(ii)**.

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..... [1]

[Total: 19]

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2 Approximately 50% of cases of coronary heart disease are thought to be a result of high blood pressure. Approximately 25% of adults worldwide have high blood pressure.

Blood pressure changes during the cardiac cycle, so the measurement of blood pressure uses two values: systolic blood pressure and diastolic blood pressure.

A person who is described as having high blood pressure will have a resting systolic blood pressure of 140 mm Hg or higher and a resting diastolic blood pressure of 90 mm Hg or higher.

There is some evidence that eating garlic can have positive effects on human health, including benefits to the cardiovascular system.

The storage organ (bulb) of the garlic plant, *Allium sativum*, is eaten worldwide. Figure 2.1 shows a garlic bulb.



Figure 2.1

Garlic extract can be obtained from garlic bulbs and placed into capsules that can be swallowed.

Scientists investigated the effect of eating garlic capsules on the blood pressure of people that had been diagnosed with high blood pressure.

The investigation studied 84 men and women of various ages. Each person was randomly placed in one of four groups and asked to follow a specific treatment for 12 weeks.

- 21 people ate one garlic capsule each day.
- 21 people ate two garlic capsules each day.
- 21 people ate four garlic capsules each day.
- 21 people were placed in a control group.

All the people continued taking any medication for high blood pressure that they had previously been prescribed.

The resting systolic blood pressure of each person was measured at the start of the investigation and at intervals during the 12 weeks.

(a) Identify the independent variable **and** the dependent variable in this investigation.

independent variable .....

dependent variable .....

[2]

(b) Suggest a suitable treatment for the people in the control group.

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..... [1]

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(c) The results for the blood pressure measurements are shown in Table 2.1.

The standard errors (SE) for each value are shown in brackets.

Table 2.1

number of weeks after the start of the investigation	mean resting systolic blood pressure / mm Hg (± SE)			
	control group	1 garlic capsule each day	2 garlic capsules each day	4 garlic capsules each day
0	148.8 (± 2.8)	148.7 (± 2.8)	149.3 (± 2.6)	149.4 (± 2.7)
4	142.8 (± 2.9)	137.7 (± 2.8)	144.5 (± 2.7)	138.3 (± 2.7)
8	140.0 (± 2.9)	135.2 (± 2.8)	131.4 (± 2.6)	132.6 (± 2.9)
12	138.1 (± 3.1)	138.8 (± 3.1)	126.8 (± 2.8)	132.4 (± 3.0)

(i) Resting systolic blood pressure is a quantitative variable.

State the type of **data** represented by the resting systolic blood pressure.

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(ii) Outline the conclusions that can be made from the data in Table 2.1.

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(iii) The scientists decided that the *t*-test was **not** an appropriate choice of statistical test for the investigation.

Suggest **two** reasons why the *t*-test is **not** an appropriate choice of statistical test for the investigation.

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(d) Suggest **two** changes that could be made to the investigation method that may increase confidence in the conclusions.

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