CAMBRIDGE
International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **5090/42**

Paper 4 Alternative to Practical **May/June 2026**

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. 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 40.
- 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 investigated the vitamin C content of a fruit juice, **X**, using DCPIP.

DCPIP is a dark blue solution that becomes completely colourless when vitamin C is added to it.

When the percentage concentration of a vitamin C solution is high, fewer drops of that solution are needed to completely decolourise the DCPIP.

The student was provided with:

- dark blue DCPIP solution
- four different vitamin C solutions of known percentage concentrations
- fruit juice **X** with an unknown vitamin C concentration
- a spotting tile
- six teat pipettes.

(a) They followed these instructions.

- Add 2 drops of DCPIP to each of 5 of the wells on the spotting tile.
- Add drops of 0.25% vitamin C solution to the DCPIP in the first well until the DCPIP turns completely colourless. Count the drops as you add them and record this number.
- Add drops of 0.50% vitamin C solution to the DCPIP in the second well until the DCPIP turns completely colourless. Count the drops as you add them and record this number.
- Add drops of 0.75% vitamin C solution to the DCPIP in the third well until the DCPIP turns completely colourless. Count the drops as you add them and record this number.
- Add drops of 1.00% vitamin C solution to the DCPIP in the fourth well until the DCPIP turns completely colourless. Count the drops as you add them and record this number.

Some of the student's results are shown in Table 1.1.

Table 1.1

....	....
1.00	5
0.75	.....
0.50	.....
0.25	24

(i) Insert the headings for each column in Table 1.1. [2]

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(ii) Figure 1.1 shows the tally counts of the number of drops of 0.75% and 0.50% concentration of vitamin C solutions needed to turn DCPIP completely colourless.

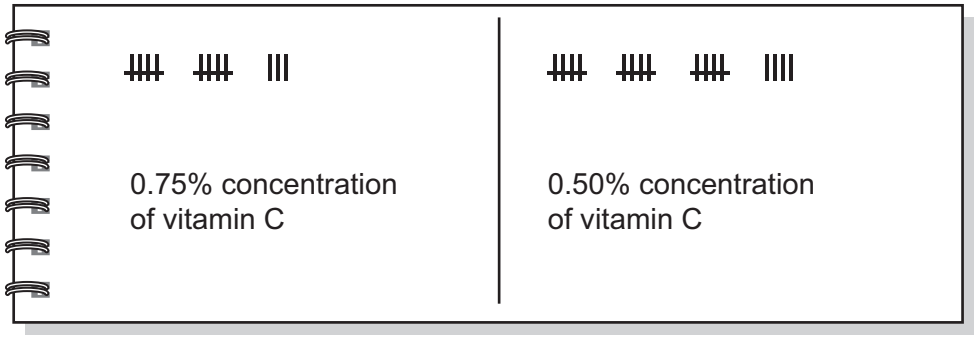


Figure 1.1

Use the student's results in Figure 1.1 to complete Table 1.1. [1]

(iii) The student used a clean teat pipette to add drops of fruit juice **X** to the DCPIP in the fifth well until the DCPIP turned completely colourless.

The number of drops of fruit juice **X** needed to turn the DCPIP completely colourless was 22.

Use the results in Table 1.1 to estimate the percentage concentration of vitamin C in fruit juice **X** and explain how you made your estimate.

percentage concentration of vitamin C in fruit juice **X** .....

explanation .....

.....

.....

[2]

(b) (i) Describe **one** possible source of error in this investigation.

.....

..... [1]

(ii) Suggest a suitable control for this investigation.

.....

..... [1]

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(c) Some students want to find the percentage concentration of vitamin C in a different fruit juice, **Y**, using DCPIP and a different method of measuring.

Using a clean syringe, 0.5 cm^3 of DCPIP is added to each of 5 test-tubes.

1.0% concentration of vitamin C solution is added to one test-tube until the DCPIP turns completely colourless. The volume of 1.0% vitamin C solution added is recorded.

0.8% concentration of vitamin C solution is added to the second test-tube until the DCPIP turns completely colourless. The volume of 0.8% vitamin C solution added is recorded.

The process is repeated using the final 3 test-tubes with 0.6%, 0.4% and 0.2% concentrations of vitamin C solutions.

The students repeat the whole procedure several times and calculate the mean result for each percentage concentration as shown in Table 1.2

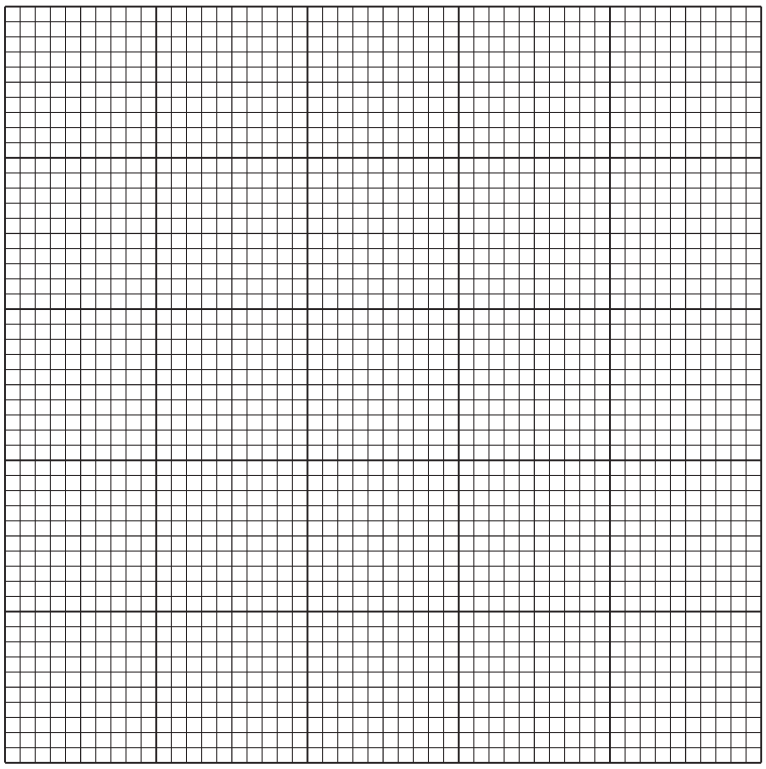
Table 1.2

percentage concentration of vitamin C solution	**mean volume of vitamin C solution needed to turn DCPIP completely colourless / cm^3**
1.0	9
0.8	13
0.6	17
0.4	20
0.2	25

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(i) On the grid, construct a line graph of the data in Table 1.2.

Join your plotted points with ruled, straight lines.



[4]

(ii) The students then add fruit juice **Y** to 0.5 cm^3 of DCPIP in a test-tube until the DCPIP turns completely colourless. They repeat this several times. The mean volume of fruit juice **Y** needed to turn 0.5 cm^3 of DCPIP completely colourless was 14 cm^3.

Use your graph to estimate the vitamin C concentration in fruit juice **Y**.

Show your working on your graph.

percentage concentration of vitamin C in fruit juice **Y** ..... [2]

(iii) Suggest how the students can improve this whole investigation to produce a more precise value for the concentration of vitamin C in fruit juice **Y**.

.....

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..... [2]

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(iv) Suggest **two** reasons why the method in **1(c)** gives more accurate results than the method in **1(a)**.

.....

.....

.....

..... [2]

(v) Scurvy is a disease caused by a lack of vitamin C.

Compare the concentration of vitamin C in fruit juice **X** with the concentration of vitamin C in fruit juice **Y**.

State and explain which fruit juice would be best to prevent scurvy.

.....

..... [1]

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(d) (i) Lemon juice contains vitamin C. The vitamin C in lemon juice is destroyed at high temperatures.

A student has some lemon juice that is 20 °C. They find that the minimum volume of lemon juice at 20 °C that is required to turn DCPIP completely colourless is 10 cm^3.

The student heats the lemon juice to a high temperature and allows it to cool. When more than 10 cm^3 of this lemon juice is added to DCPIP, the DCPIP remains blue. This shows that the vitamin C in the lemon juice has been destroyed at a high temperature.

Plan an investigation using the method in **1(c)** to find the lowest temperature at which vitamin C in lemon juice is destroyed.

.....

.....

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..... [6]

(ii) State the independent variable in this investigation.

..... [1]

[Total: 25]

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2 **(a)** Figure 2.1 is a photomicrograph of onion cells.

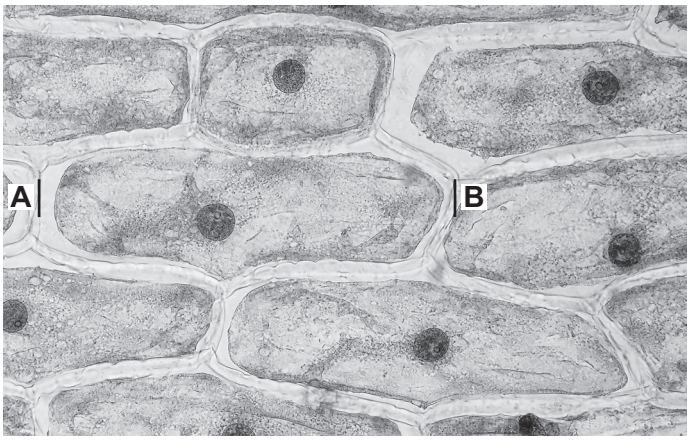


Figure 2.1

(i) On Figure 2.1, draw a line to a cell wall and label it **W**. [1]

(ii) In the space, make a large drawing of the **three whole** cells as they appear in Figure 2.1.

[5]

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(b) (i) **On Figure 2.1**, draw a straight line to join **A** and **B**.

On your drawing, draw a straight line in the same position and label it **A–B**. [1]

(ii) Measure and record the lengths of these **two** lines.

length of line **A–B** on Figure 2.1 .....

length of line **A–B** on your drawing .....
[2]

(iii) Calculate the magnification of your drawing compared to Figure 2.1.

Record your answer to **one** decimal place.

Space for working.

magnification × ..... [3]

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(c) Figure 2.2 is a photomicrograph of some cheek cells.

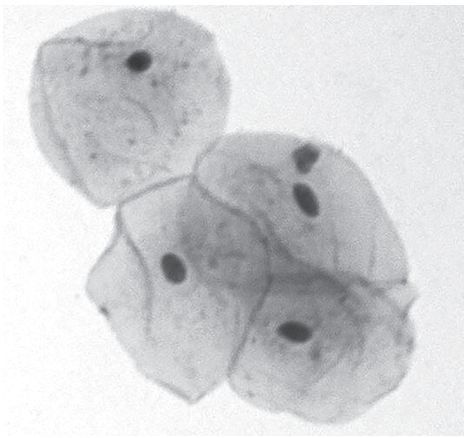


Figure 2.2

Describe **two** visible differences and **one** similarity between the onion cells in Figure 2.1 and the cheek cells in Figure 2.2. The figures are not to the same scale.

difference 1 .....

.....

difference 2 .....

.....

similarity .....

.....

[3]

[Total: 15]

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