Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8869013690

BIOLOGY **0610/51**

Paper 5 Practical Test **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages and **4** blank pages.

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1 You are going to measure the distance moved by different concentrations of citric acid through agar.

You are provided with a Petri dish labelled **agar plate**.

The agar in the Petri dish contains Universal Indicator which will change colour in the presence of acid.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(iii).

You should use the safety equipment provided while you are carrying out the practical work.

Step 1 Label three test-tubes **A**, **B** and **C** and place them in a test-tube rack.

Step 2 Make three solutions, each containing a different concentration of citric acid, in the labelled test-tubes.

Use the volumes of 5% citric acid and distilled water shown in Table 1.1 to make the solutions.

Table 1.1

	test-tube		
	A	**B**	**C**
volume of 5% citric acid solution / cm^3	1.0	2.0	10.0
volume of distilled water / cm^3	9.0	8.0	0.0
percentage concentration of citric acid solution	0.5	1.0	5.0

Step 3 Turn the Petri dish over so the base side is up. Use a marker pen to draw three lines to divide the base into approximately equal sections. Label the sections **A**, **B** and **C** as shown in Fig. 1.1.

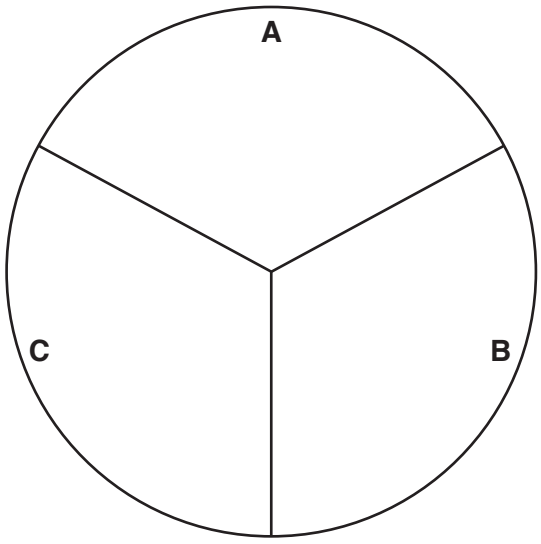


Fig. 1.1

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Step 4 Turn the Petri dish so the base side is down. Use a straw to cut a hole in the centre of each section of the agar in the Petri dish, as shown in Fig. 1.2.

Hold the straw vertically and push through the agar to the bottom of the layer. As you remove the straw twist it slightly to pull out the agar. Squeeze the end of the straw gently to push the agar you have removed onto a paper towel.

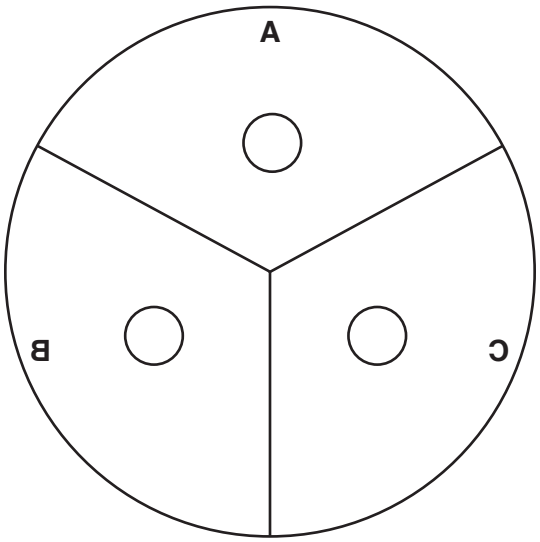


Fig. 1.2

Step 5 Use a pipette to transfer three drops of solution from test-tube **A** into the hole in the agar in section **A** of the Petri dish.

Do not let the solution drip onto the surface of the agar.

Step 6 Use a clean pipette to repeat step 5 for the solution in test-tube **B** and the hole in the agar in section **B** of the Petri dish.

Step 7 Use a clean pipette to repeat step 5 for the solution in test-tube **C** and the hole in the agar in section **C** of the Petri dish.

Step 8 Start the stop-clock and leave the Petri dish for five minutes.

Step 9 After five minutes observe the appearance of the agar around each of the holes.

(a) (i) Describe the appearance of the agar around the holes in **A**, **B** and **C** after five minutes.

.....

.....

..... [1]

Step 10 Leave the Petri dish for a further 25 minutes. During this time, continue with the other questions.

Step 11 After a total of 30 minutes use the ruler to measure the distance the citric acid has travelled from the edge of the hole in section **A**. You may need to use the hand lens.

Record your results in the table you have prepared in **1(a)(iii)**.

Step 12 Repeat step 11 for the holes in section **B** and section **C** of the Petri dish.

(ii) Describe how you decided where to measure the distance travelled by the citric acid solution.

.....

.....

..... [1]

(iii) Prepare a table to record your results.

You should include:
- the concentration of the citric acid solutions
- the distance moved by each solution in the agar.

Record your results in the table as you carry out the practical work.

[4]

(iv) State a conclusion for your results.

.....

.....

..... [1]

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(v) The citric acid moves through the agar by diffusion. The diffusion coefficient is used to show the effect of concentration on diffusion.

The formula to calculate the diffusion coefficient is:

$$\text{diffusion coefficient} = \frac{(\text{distance travelled})^2}{\text{time}}$$

Calculate the diffusion coefficient for a 10% solution of citric acid that travelled 14 mm in 30 minutes.

Give your answer to two significant figures.

Space for working.

..... mm^2 per minute
[2]

(b) (i) State **two** variables that have been kept constant in this investigation.

1 .....

2 .....
[2]

(ii) Identify **one** source of error in this investigation and suggest how the error could affect the results.

error .....

.....

effect on results .....

.....

.....
[2]

(c) Describe how you could adapt this method to find the effect of temperature on the rate of diffusion. Agar melts at 70 °C.

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..... [6]

[Total: 19]

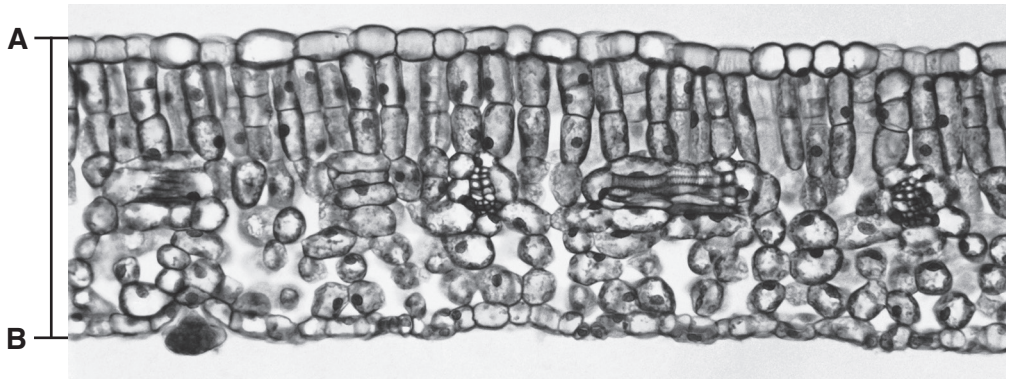
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[Turn over

2 **(a)** Fig. 2.1 is a photomicrograph of a cross-section of part of a leaf.



magnification ×100

Fig. 2.1

(i) Draw a large diagram to show the layers present in the leaf section shown in Fig. 2.1.

Do not draw any cells.

[3]

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(ii) Measure the thickness of the leaf along the line **AB** on Fig. 2.1.

length of line **AB** .....

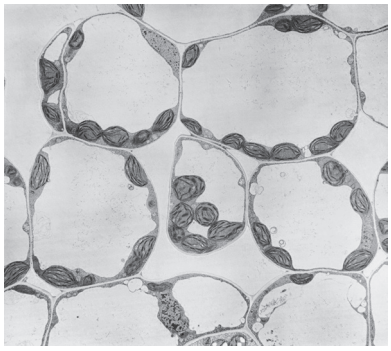
Calculate the actual thickness of the leaf using your measurement and the formula.

Include the units.

$$\text{magnification} = \frac{\text{length of line } \mathbf{AB} \text{ on Fig. 2.1}}{\text{actual thickness of leaf}}$$

.....
[3]

(iii) Fig. 2.2 shows a photomicrograph of cells from one type of tissue found in leaves.



magnification ×300

Fig. 2.2

Label the layer on your drawing, with the letter **X**, to show where this type of tissue is found. [1]

(b) Scientists carried out an investigation into the effect of light on the growth of leaves.

Plants of the same species (**A**) were grown in three different light intensities.

The plants were grown in the same soil and kept in glasshouses with automatic watering.

A sample of 100 leaves was selected at random and collected from plants in each of the three different light intensities. A total of 300 leaves were collected.

The scientists studied the variations in the size and structure of the leaves in each sample.

(i) Suggest why the scientists used large samples of leaves.

.....

..... [1]

(ii) Suggest why the leaves in each light intensity were selected at random.

.....

..... [1]

(iii) A grid, divided into millimetre squares, was used to measure the surface area of the leaves.

Outline how the grid could have been used.

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..... [2]

(iv) State the variable that was changed (independent variable) in this investigation.

..... [1]

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(c) The scientists collected data from one other plant species (**B**).

Table 2.1 shows the results.

Table 2.1

light intensity / arbitrary units	average leaf area / mm^2	
	species **A**	species **B**
100	3600	2800
50	3900	3400
10	6500	2900

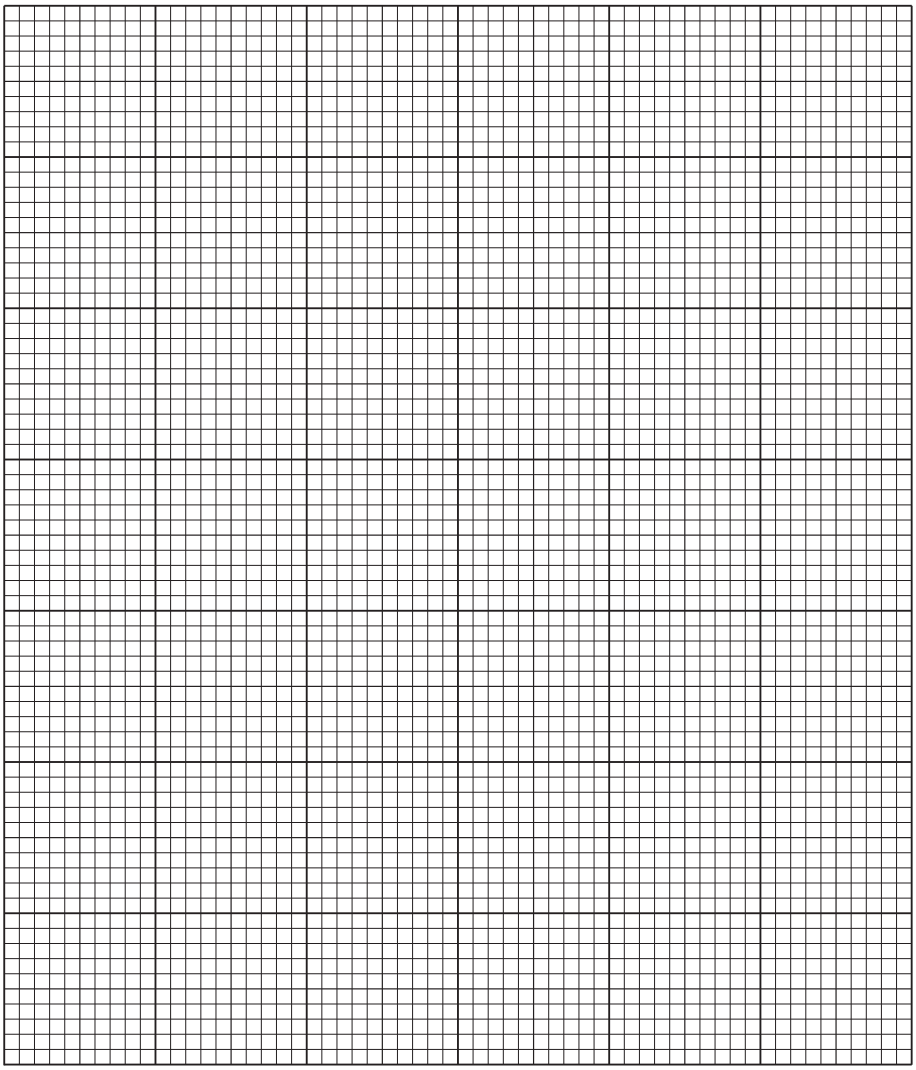
(i) Calculate the percentage difference in the average leaf area for species **A** from a light intensity of 50 arbitrary units to 10 arbitrary units.

Show your working and give your answer to the nearest whole number.

..... %
[2]

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(ii) Plot a bar chart on the grid to show the average leaf area for species **A** and **B**, at each light intensity.



[4]

(iii) Describe the trends shown in your graph for species **A** and species **B**.

.....

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..... [2]

(iv) The scientists want to determine more precisely the light intensity that results in the largest leaf area for species **B**.

Suggest how the method used in the investigation could be modified to achieve this.

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..... [1]

[Total: 21]

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