Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

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| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | |

**BIOLOGY** **0610/61**

Paper 6 Alternative to Practical **October/November 2017**

**1 hour**

Candidates answer on the Question Paper.

No Additional Materials are required.

**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.

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

This document consists of **9** printed pages and **3** blank pages.

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CAMBRIDGE International Examinations

**1** Fruits such as apples and bananas contain chemicals called polyphenols. An enzyme, polyphenol oxidase, is also present. It catalyses a reaction which converts the polyphenols into brown-coloured compounds.

This reaction happens when the cells are damaged and exposed to oxygen in the air.

$$\text{polyphenols + oxygen} \xrightarrow{\text{polyphenol oxidase}} \text{brown-coloured compounds}$$

Some students investigated the effect of pH on the enzyme polyphenol oxidase in apples.

The students were provided with one apple, distilled water and four solutions labelled **B**, **C**, **D** and **E**. Each solution had a different pH.

Step 1 Five Petri dishes were labelled **A**, **B**, **C**, **D** and **E**.

Step 2 20 $cm^3$ of distilled water was added to Petri dish **A**.

Step 3 20 $cm^3$ of solution **B** was poured into the Petri dish labelled **B**.

Step 4 Step 3 was repeated using solutions **C**, **D** and **E** and the Petri dishes labelled **C**, **D** and **E**.

Step 5 Universal Indicator paper and a pH colour chart were used to find the pH of each of the solutions in the five Petri dishes.

Step 6 Six slices were cut from an apple and put on to separate white tiles. The apple slices were cut to approximately the same size.

Step 7 Each apple slice was chopped into small pieces and then crushed with a spatula.

Step 8 One of the crushed apple slices was put into each of the solutions in Petri dishes **A**, **B**, **C**, **D** and **E**. A lid was put on to each of the Petri dishes and they were left for two minutes.

Step 9 The crushed apple from the remaining slice was left uncovered, on the white tile and was labelled **control**.

Step 10 The lid of Petri dish **A** was removed and the liquid was poured away, leaving only the crushed apple in the Petri dish. **The Petri dish lid was not replaced.**

Step 11 Step 10 was repeated for Petri dishes **B**, **C**, **D** and **E**.

Step 12 The students looked at the colour of the crushed apple slice in each Petri dish at 0 minutes, 10 minutes and 20 minutes.

The students used the key shown in Table 1.1 to identify the colour intensity value for each crushed apple slice.

**Table 1.1**

| colour of the crushed apple slice | no brown colour | light brown | dark brown |
|---|---|---|---|
| | | | |
| colour intensity value | 1 | 2 | 3 |

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Fig. 1.1 shows the students' results.

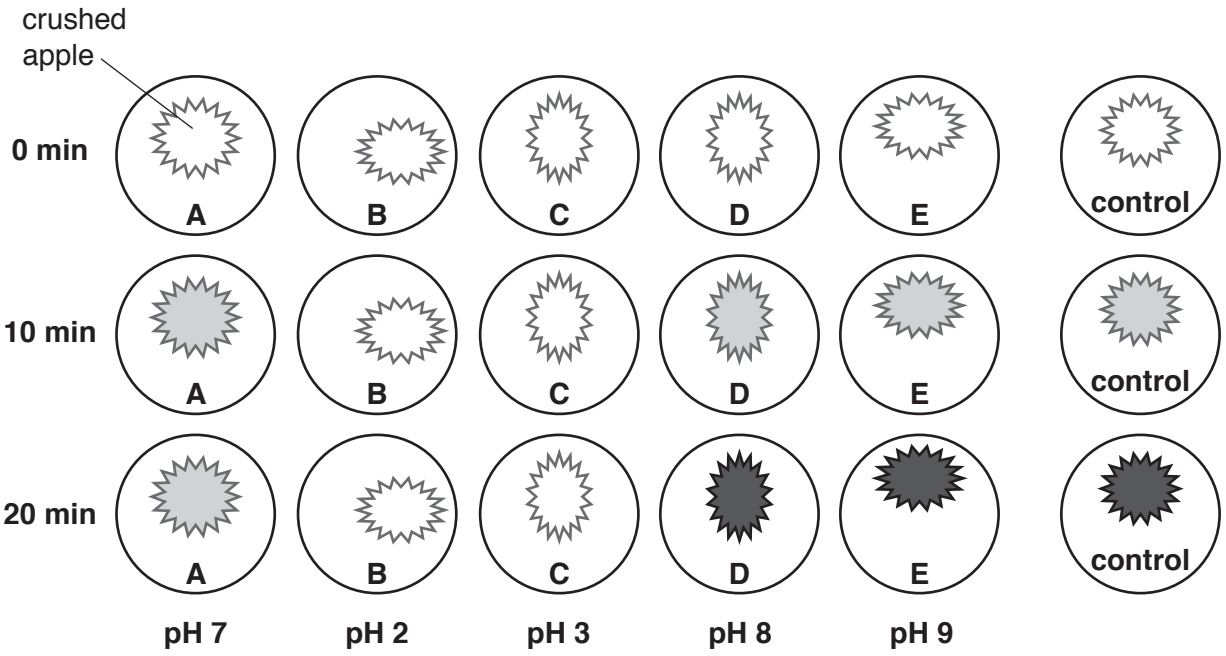


**Fig. 1.1**

**(a) (i)** Prepare a table to record the results.

View solution

Your table should include:
- the colour intensity value for the crushed apple slices
- the pH of each solution.

[5]

**(ii)** List the pH values from the most effective to the least effective in preventing the browning of the apple.

..... [1]

**(iii)** State the purpose of the control set up in step 9.

.....

.....

..... [1]

Table 1.2 shows the pH of some household products.

**Table 1.2**

| household product | olive oil | lemon juice | milk | water | salt water | baking soda |
|---|---|---|---|---|---|---|
| pH | no value | 2.0 | 6.6 | 7.0 | 7.6 | 9.0 |

**(iv)** Suggest which of the household products in Table 1.2 should be used to prevent cut apples from going brown. Explain your choice.

household product .....

explanation .....

.....

[2]

**(b) (i)** State **one** variable that was kept constant in the investigation described.


View solution

Describe how this variable was kept constant.

variable .....

how it was kept constant .....

.....

[2]

**(ii)** Explain why the lids were not put back on to the Petri dishes after the solutions were poured away in steps 10 and 11.

.....

.....

..... [1]

**(iii)** State the main hazard in steps 6 and 7 and describe how to reduce the risk of this hazard.

.....

.....

..... [1]

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**(c)** Explain why the method used to find the colour intensity value for the crushed apple slices in step 12 is a source of error.

.....

.....

..... [1]

**(d)** Identify **one** source of error in steps 6, 7 or 8 and suggest an improvement for this error.

View solution

source of error .....

.....

improvement .....

.....

.....

[2]

**(e)** The enzyme polyphenol oxidase and the substrate polyphenol can be extracted from crushed apples. The substrate turns brown when the enzyme is present.

View solution

Some students were provided with extracts of the enzyme and the substrate.

Describe a method the students could use to find the optimum temperature of the enzyme.

.....

.....

.....

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.....

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.....

.....

..... [6]

**(f)** In another experiment, enzymes were extracted from two different fruits.

These enzyme extracts were heated at 65 °C for a total of 60 minutes.

During this time samples were removed every 15 minutes.

The samples were tested to find out how much enzyme activity remained.

Table 1.3 shows the results of the experiment.

**Table 1.3**

| sample time /min | percentage of enzyme activity remaining | |
|---|---|---|
| | apricot | avocado |
| 0 | 100 | 100 |
| 15 | 5 | 40 |
| 30 | 0 | 25 |
| 45 | 0 | 20 |
| 60 | 0 | 10 |

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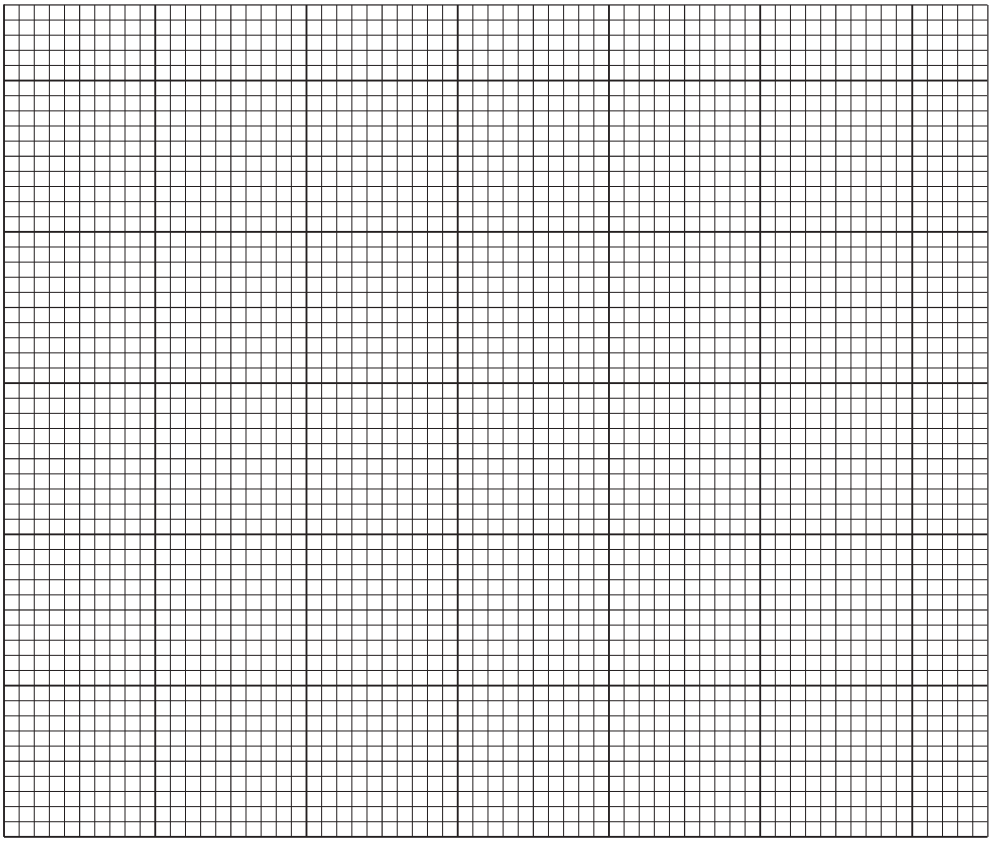
**(i)** Plot a line graph on the grid of enzyme activity against sample time.

You should plot the data for the apricot and for the avocado.

View solution



[5]

**(ii)** State a conclusion for these results.

View solution

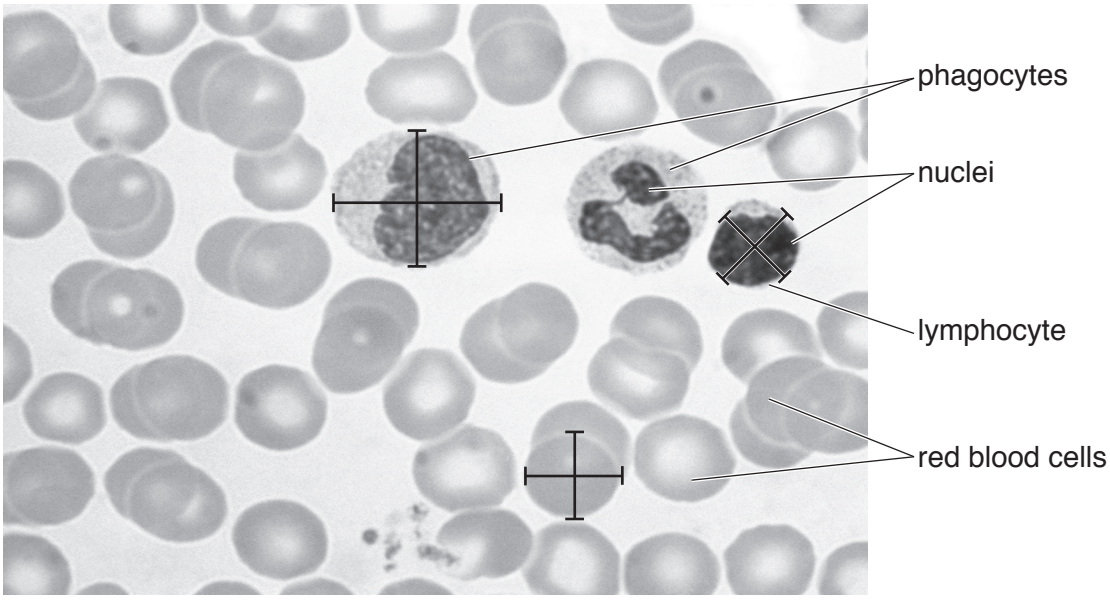
.....

.....

.....[1]

[Total: 28]

**2** Fig. 2.1 is a photomicrograph of some blood cells.




magnification ×1500

**Fig. 2.1**

View solution

**(a) (i)** State **two** visible differences between the red blood cells and the white blood cells (phagocytes and lymphocytes) in Fig. 2.1.

1 .....

.....

2 .....

.....

[2]

**(ii)** Make a large drawing of the two cells labelled **phagocytes** in Fig. 2.1.

View solution

[4]

**(b) (i)** Measure the diameters of the three marked blood cells, along both the lines drawn on each of the cells, in Fig. 2.1. Record these measurements in Table 2.1.

View solution

Add the missing units to Table 2.1.

Calculate the average diameter for each type of blood cell and write your results in Table 2.1.

**Table 2.1**

| type of blood cell | diameter 1 / ..... | diameter 2 / ..... | average diameter / ..... |
|---|---|---|---|
| red blood cell | | | |
| lymphocyte | | | |
| phagocyte | | | |

[3]

**(ii)** Calculate the actual average diameter of the red blood cell using your answer in **2(b)(i)** and the following equation.

View solution

$$\text{magnification} = \frac{\text{average diameter of the red blood cell in Fig. 2.1}}{\text{actual average diameter of the red blood cell}}$$

Give your answer in micrometres (μm) to the nearest whole number. 1 mm = 1000 μm

Show your working.

.....μm
[3]

[Total: 12]

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