Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5132729552

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **October/November 2018**

2 hours

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 document consists of **10** printed pages and **2** blank pages.

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Before you proceed, read carefully through the **whole** of Question 1 and Question 2.

Plan the use of the **two hours** to make sure that you finish all the work that you would like to do.

If you have enough time, think about how you can improve the confidence in your results, for example by obtaining and recording one or more additional measurements.

You will **gain marks** for recording your results according to the instructions.

1 The enzyme, **E**, hydrolyses (breaks down) the protein in milk.

A mixture of milk and **E** changes from cloudy to clear as a result of the hydrolysis of protein.

The end-point is reached when the mixture is clear.

You will need to:

- investigate the activity of enzyme **E** on milk, at a range of temperatures from 70 °C to 30 °C
- record the time taken to reach the end-point for each temperature.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume /cm^3
E	0.5% enzyme solution	irritant	20
M	milk	none	50

If **E** comes into contact with your skin, wash off immediately under cold water.
It is recommended that you wear suitable eye protection.

You will test the activity of the enzyme **E**, at 70 °C and at 30 °C.

(a) (i) State **three other** temperatures that you will use to show the effect of temperature on the activity of **E**.

..... [1]

Read step 1 to step 10 before proceeding.

1. Set up a water-bath and heat to 70 °C.

2. Put 1 cm^3 of **E** into each of five test-tubes.

3. Put **one** of the test-tubes into the water-bath and leave for 2 minutes.

While you are waiting continue with other parts of Question 1.

4. After 2 minutes, stir **M** and put 3 cm^3 of **M** into the test-tube in the water-bath. Mix gently using a glass rod.

5. Immediately start timing.

6. Record in **(a)(ii)** the time taken for the mixture to become clear (the end-point). You may find it easier to judge the end-point if the black card is held behind the mixture.

   If the end-point is not reached by 180 seconds, record 'more than 180'.

7. Adjust the temperature of the water-bath so that it is at the highest temperature stated in **(a)(i)**.

8. Repeat step 3 to step 6.

9. Adjust the temperature of the water-bath and repeat step 3 to step 6 with the other temperatures stated in **(a)(i)**.

10. Adjust the temperature of the water-bath to 30 °C and repeat step 3 to step 6.

(ii) Record your results in an appropriate table.

[5]

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(iii) A student carried out the same procedure at 80 °C and recorded the time taken to reach the end-point as 75 seconds.

Calculate the **rate** of enzyme activity at 80 °C.

Show your working.

rate of enzyme activity = ... s^{-1} [2]

(iv) The student identified two significant sources of error in the investigation as shown in Table 1.2.

Complete Table 1.2 to suggest how to make an improvement to reduce each of the sources of error the student identified.

Table 1.2

significant source of error	how to make an improvement
difficult to judge when the end-point is reached	
difficult to maintain the temperature of the water-bath	

[2]

(v) Suggest how the student could set up an appropriate control for this investigation.

.....

..... [1]

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(b) A scientist carried out an experiment to investigate the effect of pH on the activity of a different enzyme that hydrolyses the protein in milk.

Buffer solutions were used to change the pH and the investigation was carried out at the optimum temperature for this enzyme. All other variables were kept constant.

The results are shown in Table 1.3.

Table 1.3

pH	activity of enzyme /arbitrary units
1.5	78
2.0	95
3.0	91
4.5	36
6.0	13

(i) State the independent variable in this investigation.

..... [1]

(ii) Plot a graph of the data shown in Table 1.3 on the grid in Fig. 1.1.

Use a sharp pencil for drawing graphs.

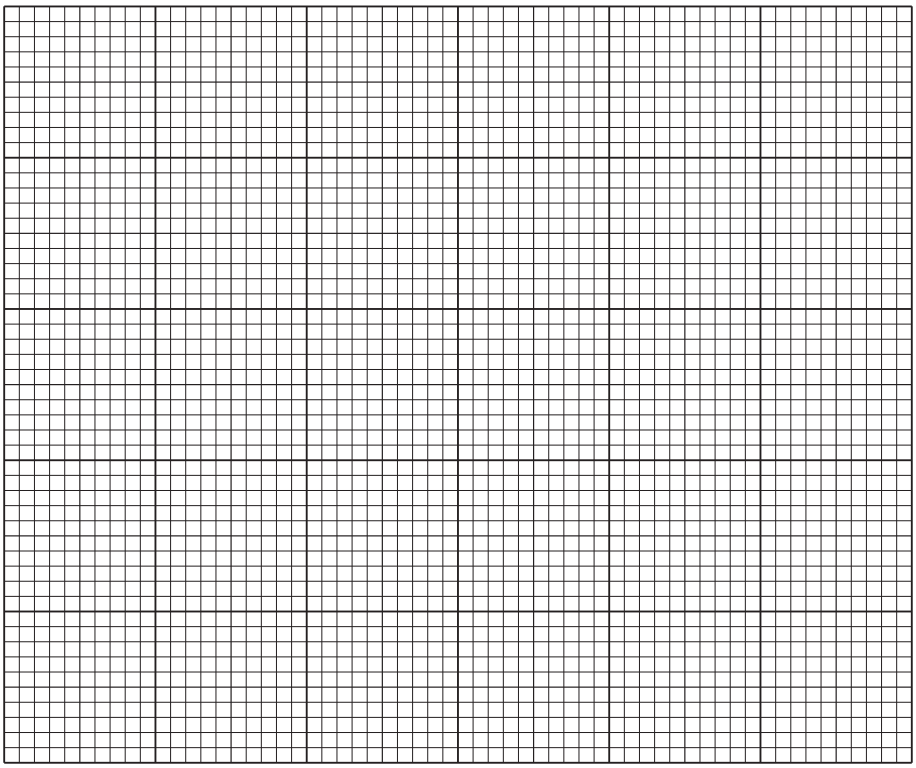


Fig. 1.1

[4]

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(iii) With reference to Fig. 1.1 describe the effect of pH on the activity of the enzyme.

.....

.....

.....

.....

..... [2]

(iv) Explain why the activity of the enzyme at pH6 is different from the activity at pH3.

.....

.....

.....

.....

..... [2]

(v) The scientist decided that the optimum pH for this enzyme had not been identified accurately.
Suggest how the experiment could be modified to find a more accurate value for the optimum pH.

.....

.....

.....

.....

..... [2]

[Total: 22]

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2 **L1** is a slide of a stained transverse section through a plant stem.

You are not expected to be familiar with this specimen.

Use a sharp pencil for drawing.

(a) **(i)** Select a field of view so that you can observe the epidermis and the vascular bundles.

Draw a large plan diagram from the selected field of view which has:

- part of the epidermis
- only **two** smaller outer vascular bundles
- only **one** larger inner vascular bundle
- any other observable tissues.

Use **one** ruled label line and label to identify the xylem.

You are expected to draw the correct shape and proportions of the different tissues.

[5]

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(ii) Observe the cells of the epidermis on **L1**.

Select **one** group of **four** adjacent, touching epidermal cells. Each cell must touch at least one of the other cells.

Make a large drawing of this group of **four** cells.

Use **one** ruled label line and label to identify the cell wall of **one** cell.

You are expected to draw the correct shape and proportions of the different cells.

[5]

(iii) The presence of air spaces supports the conclusion that the plant grows in water.

Suggest why the plant on **L1** contains many air spaces.

.....

.....

..... [1]

Fig. 2.1 is a photomicrograph of a stained transverse section through a stem of a different type of plant.

You are not expected to be familiar with this specimen.

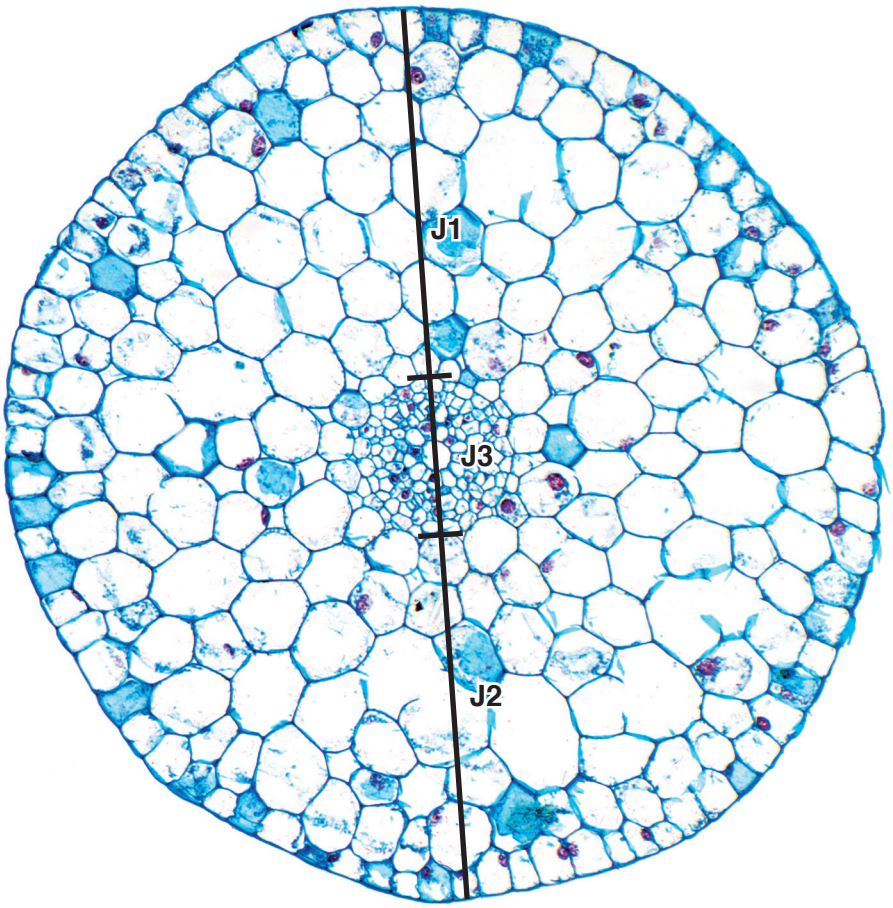


Fig. 2.1

(b) Determine the simplest whole number ratio of the total length of **J1** and **J2** (the cortex) to the length of **J3** (vascular tissue).

Show your working and use appropriate units.

ratio ..... [4]

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(c) Observe the stem on **L1** and the stem in Fig. 2.1 and identify the differences between them.

Record the observable differences in Table 2.1.

Table 2.1

feature	**L1**	**Fig. 2.1**

[3]

[Total: 18]

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