

You are reminded that you have only one hour for each question in the practical examination. You should read carefully through the whole of each question and then plan your use of the time to make sure that you finish all the work that you would like to do.

For
Examiner's
Use

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

- 1 Plant cells contain an enzyme, catalase, which catalyses the breakdown of hydrogen peroxide into oxygen and water.

You are required

- to immobilise the catalase in sodium alginate beads
- to investigate the independent variable, hydrogen peroxide concentration.

When a bead is dropped into hydrogen peroxide it will sink and then the release of oxygen causes the bead to rise.

You are provided with

- 50 cm³ of 10% hydrogen peroxide solution, labelled **H**
- 100 cm³ of distilled water, labelled **W**
- 10 cm³ of a plant extract containing catalase, labelled **P**
- 15 cm³ of 2% sodium alginate solution, labelled **S**
- 30 cm³ of 1.5% calcium chloride solution, labelled **C**.

Proceed as follows:

1. Put 10 cm³ of **C** into a large test-tube.
2. Put 5 cm³ of **S** into a small beaker.
3. Put 3 cm³ of **P** into the same beaker and mix well.
4. Use a 5 cm³ syringe to collect 2 cm³ of the mixture, **S** and **P**.
5. Suspend the 5 cm³ syringe over the large test-tube containing **C** as shown in Fig. 1.1.

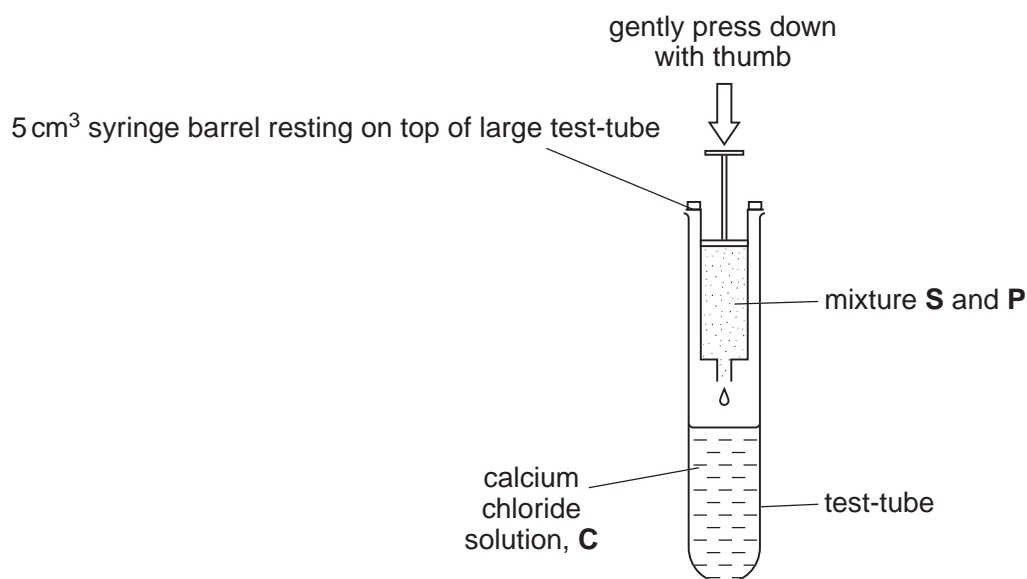


Fig. 1.1

3

6. Gently press down on the plunger of the 5 cm³ syringe with your thumb to release a drop into solution **C**. The drop should form a bead.
7. Repeat step 6 to make the number of beads that you think you will need.
8. Tip the contents of the large test-tube into a Petri dish or shallow container.
- (a) (i) Decide on the concentrations of hydrogen peroxide you will use in your investigation.

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You will need to make up 10 cm³ of each hydrogen peroxide concentration.

Prepare the space below to show

- the concentrations of hydrogen peroxide
- the volumes of hydrogen peroxide
- the volumes of distilled water.

[4]

9. Put 10 cm³ of **H** into a small test-tube in a test-tube rack.
10. Pick up a bead using blunt forceps.
11. Drop the bead into **H** and immediately start the stop clock, stop watch or note the time on a clock.
12. Record the time taken for the bead to reach the surface.

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13. Repeat steps 9 to 12 with each concentration of **H** that you have chosen to use.

(A bead may sink to the bottom of the tube. If it does not rise to the surface after three minutes, stop the experiment and record >3 minutes.)

(ii) Prepare the space below to record your results.

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A student investigated the evolution of oxygen during the breakdown of hydrogen peroxide. Immediately the catalase and the hydrogen peroxide were mixed, a stop clock was started and the volume of oxygen released in each minute for five minutes was recorded.

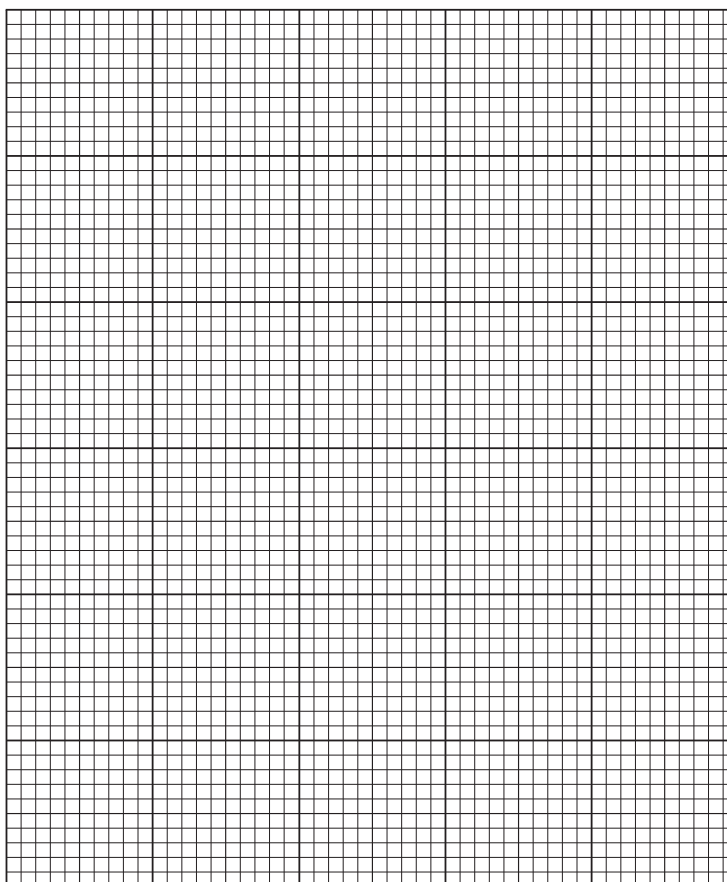
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The student's results are shown in Table 1.1.

Table 1.1

time /min	volume of oxygen collected in each minute /cm ³					
	trial 1	trial 2	trial 3	trial 4	trial 5	mean
1	3.0	2.8	3.0	2.9	2.8	2.9
2	0.6	0.8	0.8	0.7	0.9	0.8
3	0.4	0.5	0.6	0.6	0.7	0.6
4	0.3	0.3	0.4	0.5	0.5	0.4
5	0.1	0.2	0.2	0.1	0.3	0.2

(b) (i) Plot a graph of the data shown in Table 1.1.



[4]

8

2 N1 is a slide of a stained transverse section through a plant organ.

(a) (i) Draw a large plan diagram of a sector to include only three vascular bundles.

Draw a circle around one of the vascular bundles on your plan diagram.

Label the xylem.

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- (ii) Draw three complete cells from the epidermis which are touching.

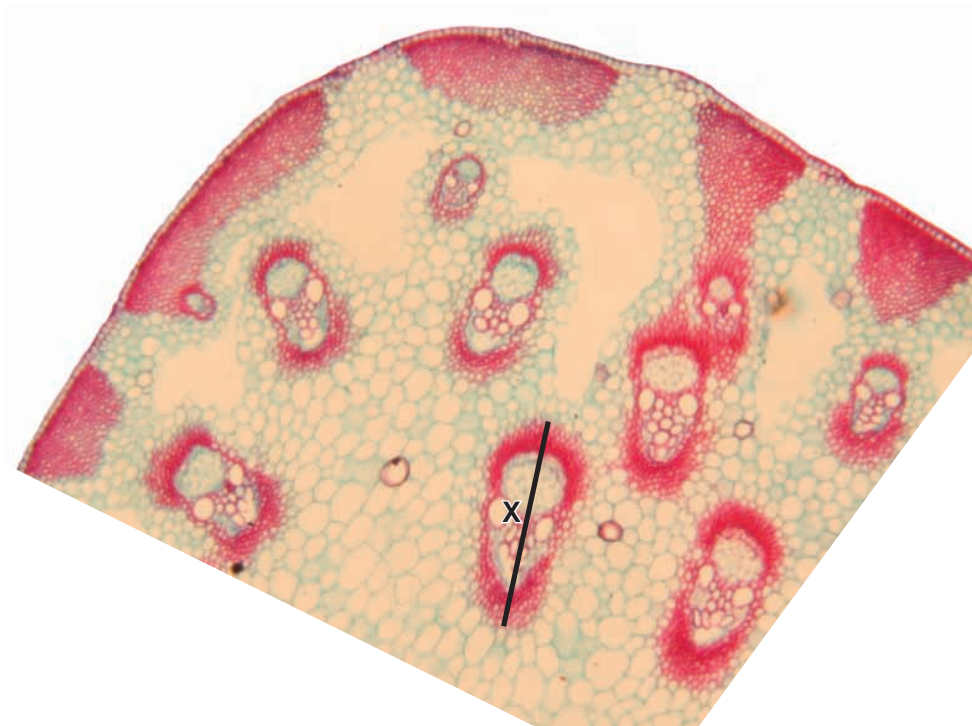
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Draw three complete touching cells between the inner edge of a vascular bundle and the centre of the specimen. This drawing should show any difference in size observed between these cells and the two epidermal cells.

[4]

Fig. 2.1 is a photomicrograph of a transverse section of part of an organ from a different plant species.

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magnification $\times 110$

Fig. 2.1

- (b) (i)** Calculate the **actual length**, in μm , of the structure shown by line X.
Show all the steps in your calculation.

Answer μm [2]

- (ii)** Using Fig. 2.1, find the mean **actual length** of these structures.
Prepare the space below and record your results.

[3]

- (iii) Draw a large plan diagram of the specimen as shown in Fig. 2.1.

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[1]

- (iv) Annotate your plan diagram (make notes with label lines) to show three differences between your diagram and the specimen on slide **N1**. [3]

[Total: 18]

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