UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
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8693310933

BIOLOGY **9700/31**

Paper 31 Advanced Practical Skills **May/June 2010**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

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Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
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Answer **all** questions.
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.
You are advised to spend one hour on each question.

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1	
2	
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For Examiner's Use

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

1 The enzyme **E** catalyses the hydrolysis of sucrose to produce fructose and glucose.

You are required to investigate the progress of this enzyme-catalysed reaction by finding the time taken for the decolourization of potassium permanganate.

The products of the hydrolysis of sucrose will change the colour of potassium permanganate as follows:

purple $\longrightarrow$ colourless

Test-tube **Z** shows the colourless end-point.

To follow the time course of this reaction take samples from the reaction mixture and test them with potassium permanganate.

(a) (i) Decide how often you will take these samples. You should **not** sample for longer than 20 minutes.

Write your sampling times in the space below.

[2]

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(ii) Prepare the space below to record

- the time you remove each sample and
- the time at which the end-point is reached and
- the time taken to reach the end-point.

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[5]

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You are provided with

- 1% enzyme solution, labelled **E**
- 10% sucrose solution, labelled **S**
- 1 mol dm^{-3} sulfuric acid, labelled **A**
- 0.01% potassium permanganate solution, labelled **P**.

The sulfuric acid and potassium permanganate are harmful.
If any comes into contact with your skin wash immediately under cold water.
It is recommended that you wear safety goggles/glasses.

Proceed as follows:

1. Label the test-tubes with the sampling times that you have decided to use.
2. Put 2.5 cm^3 of **A** into each test-tube.
3. Put 1 cm^3 of **P** into each test-tube. Gently shake each test-tube.
4. Put 30 cm^3 of **S** into a beaker.
5. Put 4 cm^3 of **E** into the beaker containing **S**.
6. Immediately stir the reaction mixture in the beaker and start timing.
7. At each of your sampling times, remove 5 cm^3 of the reaction mixture and add to the appropriate test-tube, mixing well.
8. Immediately start timing and record the time taken to reach the end-point.

(b) Describe a suitable control for this investigation.

.....

.....[1]

(c) **(i)** Identify **two** significant sources of error in this investigation.

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..... [2]

(ii) State **one** variable which was not controlled in this investigation and how it could have been controlled.

.....

..... [1]

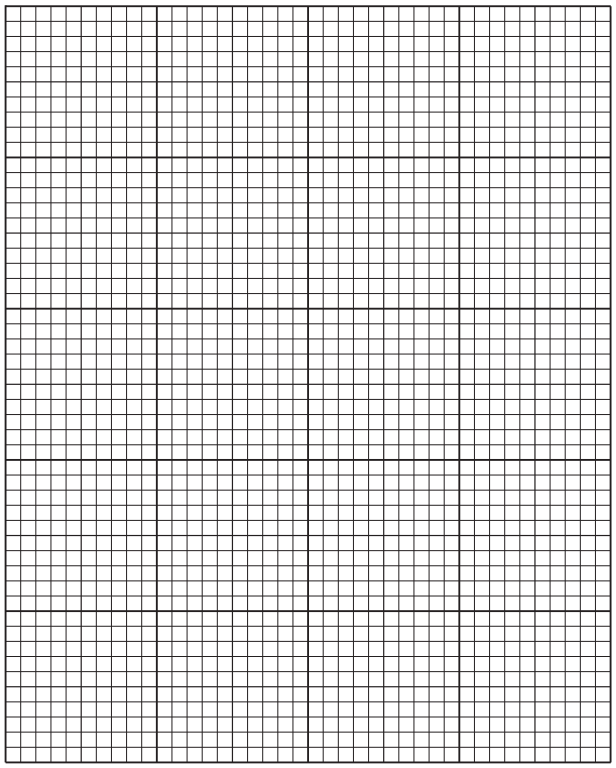
Table 1.1 shows the results for a similar investigation which measured the mass of reducing sugars produced over a period of 400 seconds.

For Examiner's Use

Table 1.1

time / s	mass of reducing sugars / mg
60	0.32
120	0.64
180	0.95
300	1.55
400	2.05

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



[4]

(ii) Use your graph to find the rate of hydrolysis of the sucrose by finding the gradient of the line.

Show on your graph where you took the readings to calculate the gradient. [2]

Show all the steps in your calculation.

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

(iii) The student repeated the investigation for 600 seconds and found that the results for the enzyme-catalysed reaction between 60 and 400 seconds were similar to the results in Table 1.1 but after 400 seconds the mass of reducing sugars produced remained the same.

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Explain why the mass of reducing sugars increased and then remained the same.

.....

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..... [2]

[Total: 21]

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2 **J1** is a slide of a stained transverse section showing a tubular part of the digestive system of a mammal.

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You are not expected to have studied this material.

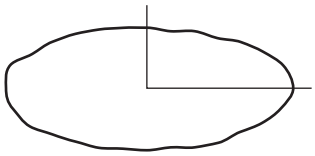


Fig. 2.1

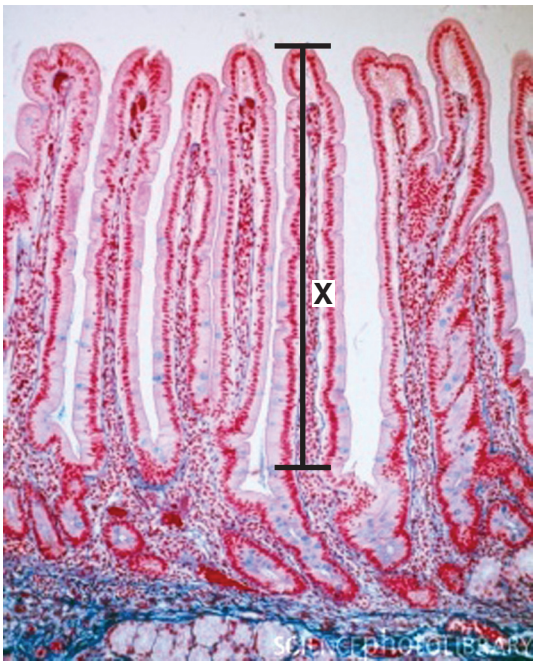
(a) Draw a large plan diagram of a quarter of the tube as shown in Fig. 2.1.

Labels are not required.

[4]

Fig. 2.2 is a photomicrograph showing a transverse section through a different part of the digestive system in the same mammal, showing a number of similar structures.

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x 50

Fig. 2.2

(b) (i) Calculate the actual length, shown by line **X**, of one of the structures.

Show all the steps in your calculation.

.....μm [2]

(ii) Explain how you would find the mean length of the structures shown in Fig. 2.2.

.....

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.....

.....

..... [2]

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(iii) Prepare the space below so that it is suitable for you to compare and contrast the specimen on **J1** and that in Fig. 2.2.

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Record your observations in the space you have prepared.

[5]

(iv) Suggest how the structures in Fig. 2.2 are adapted for absorption.

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..... [1]

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[Turn over

Fig. 2.3 is a photomicrograph showing some cells from the lining of the digestive system.

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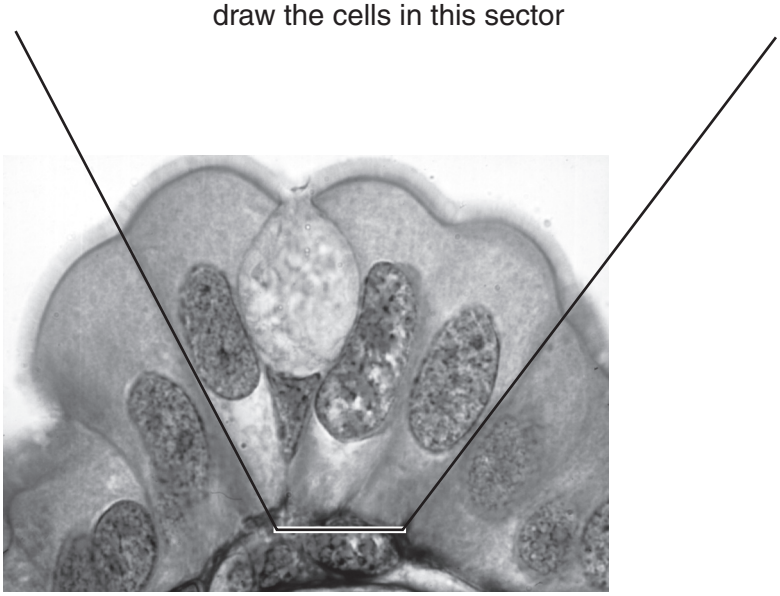


Fig. 2.3

(c) Make a large, labelled drawing of the complete cells shown in the sector on Fig. 2.3.

[5]

[Total: 19]

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Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1483573731

BIOLOGY **9700/32**

Paper 32 Advanced Practical Skills **May/June 2010**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

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

1 Yeast cells contain enzymes which catalyse the breakdown of glucose to produce carbon dioxide and water.

The carbon dioxide reacts with water and forms a weak acid.

Bromothymol blue is a pH indicator and changes colour as shown in Table 1.1.

Table 1.1

pH	colour of bromothymol blue
8	blue
7	green
6	yellow

You are required

- to immobilise the yeast cells in sodium alginate beads
- to follow a student's procedure to investigate the independent variable, changing the surface area of the beads.

You are provided with

- 15 cm^3 of yeast suspension, labelled **Y**
- 15 cm^3 of 2.0 % sodium alginate solution, labelled **S**
- 50 cm^3 of 1.5 % calcium chloride solution, labelled **C**
- 40 cm^3 of 2.0 % glucose solution, labelled **G**
- 50 cm^3 of bromothymol blue, labelled **B**
- 20 cm^3 of sodium hydroxide solution, labelled **A**

1. Put 20 cm^3 of **C** into a large test-tube.

2. Put 5 cm^3 of **S** into a small beaker or container.

3. Collect 5 cm^3 of **Y from below the froth** and put it into the same container as **S**. Mix well.

4. Use a 5 cm^3 syringe to collect 2 cm^3 of the mixture **S** and **Y**.

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5. Suspend the 5 cm^3 syringe over the large test-tube containing **C** as shown in Fig. 1.1.

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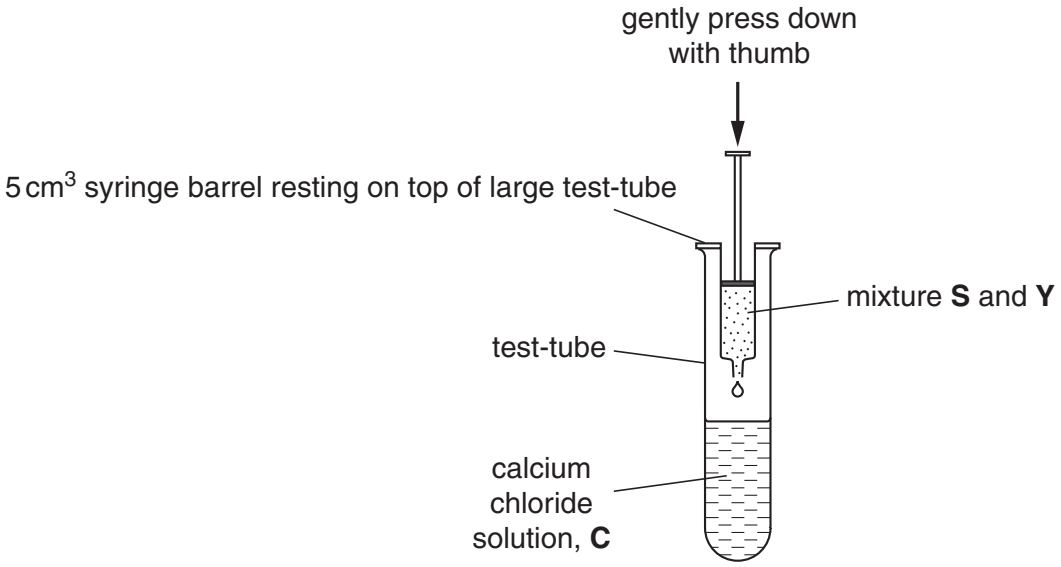


Fig. 1.1

6. Gently press down on the plunger of the 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.

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[Turn over

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You will need to calculate the mean surface area of the beads. Use blunt forceps to pick up the beads.

To do this

- decide on the number of beads you will measure
- use the 2 mm × 2 mm grid to measure each bead
- calculate the surface area of each bead using the formula

  surface area = $4\pi r^2$ where $\pi = 3.14$, r = radius of a bead
- calculate the mean surface area of the beads.

(a) (i) Prepare the space below to show your measurements and calculations.

Show all the steps in your calculation of the mean.

mean surface area of the beads .....mm^2 [5]

A student suggested that it was possible to investigate the independent variable, surface area, by changing the number of beads. The maximum number of beads used was 20. Decide the other numbers of beads to use and state the different number of beads you will use.

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Carry out the student's procedure.

9. Label as many small test-tubes as you will need with the number of beads for each test-tube.

10. Put 10 cm^3 of solution **G** into each test-tube.

11. Put 1 cm^3 of **B** into each test-tube. Put the bung in each test-tube in turn and mix.

12. If the contents of the test-tube are not blue, add one drop at a time of **A** to the contents of each test-tube to turn them all the same blue colour.

13. Put the required number of beads into each test-tube.

14. Put the bung in each test-tube in turn and mix contents. Mix every 2 minutes for 6 minutes.

15. Record your observations after each 2 minutes, up to 6 minutes.

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

[7]

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[Turn over

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(iii) The student realised that there were two independent variables in this procedure.

State the **two** independent variables.

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..... [1]

(iv) Suggest how you would make **three** improvements to the student's procedure.

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..... [3]

A student set up the apparatus as shown in Fig. 1.2 as another way to measure the carbon dioxide produced by immobilised yeast cells over a period of 75 minutes. The student measured the distance the liquid moved in the capillary tubing.

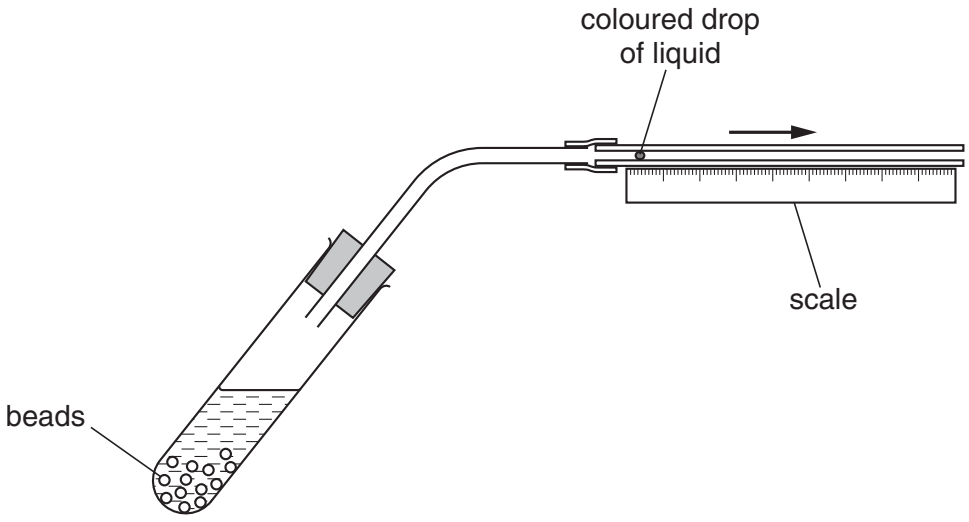


Fig. 1.2

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The student's results are shown in Table 1.2.

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Table 1.2

time /min	total distance moved by the liquid in the capillary tube /mm
0	0
15	3
30	10
45	18
60	19
75	19

(b) Describe and explain the results shown in Table 1.2.

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..... [3]

[Total: 19]

2 **M1** is a slide of a stained transverse section through a plant organ.

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(a) **(i)** Draw a large plan diagram of a half of the specimen as shown in Fig. 2.1.

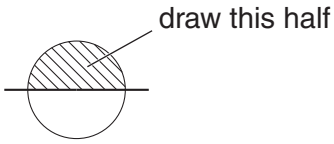


Fig. 2.1

Label the xylem and the cortex.

[5]

(ii) Make a high-power drawing of

- a group of three complete touching xylem vessels

and

- a group of three complete touching cortex cells.

Label a cell wall and a lumen.

xylem vessels

cortex cells

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[5]

Fig. 2.2 is a photomicrograph showing part of an organ from a plant of a different species.

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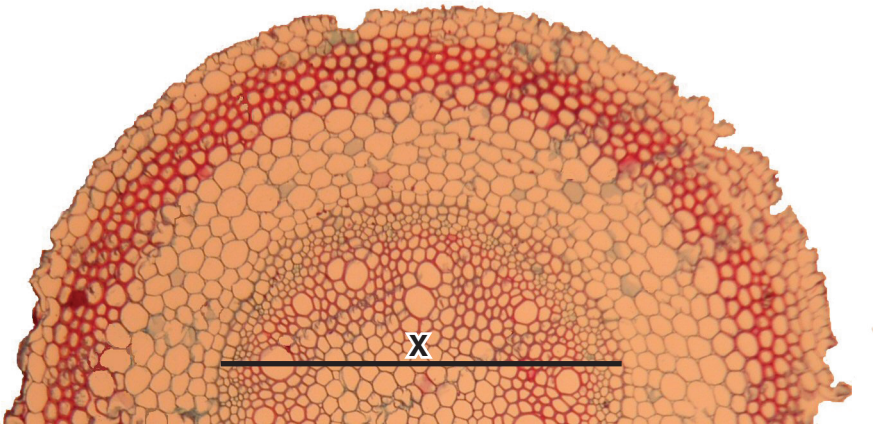


Fig. 2.2

The actual length of the line **X** is 1900 μm.

(b) (i) Calculate the magnification of the specimen shown in Fig. 2.2.

Show all the steps in your calculation.

[3]

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(ii) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on slide **M1** and in Fig. 2.2.

Record your observations in the space you have prepared.

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[4]

A student investigated water absorption by a plant.

The apparatus was set up by the student as shown in Fig. 2.3.

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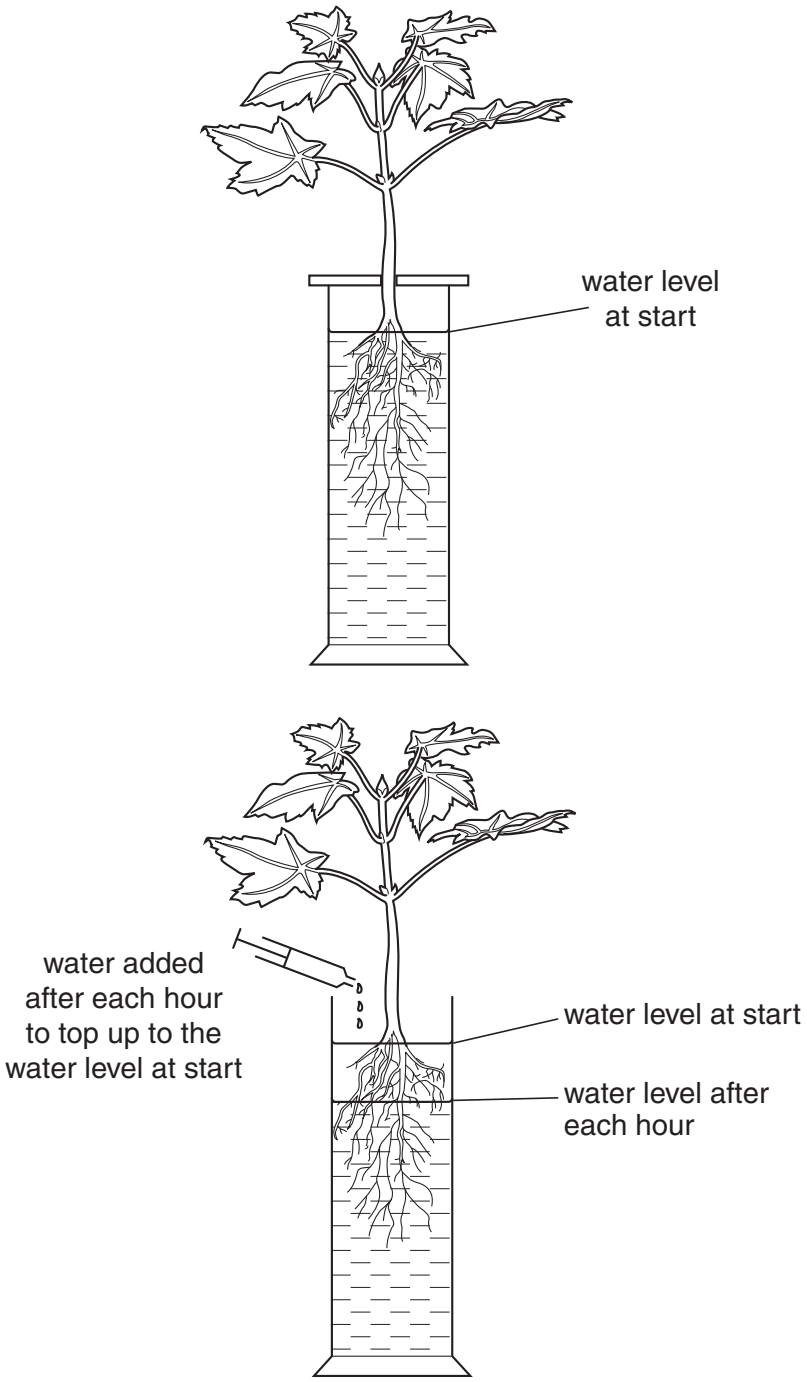


Fig. 2.3

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The volume of water added to top up the water level was recorded each hour for a total of 5 hours.

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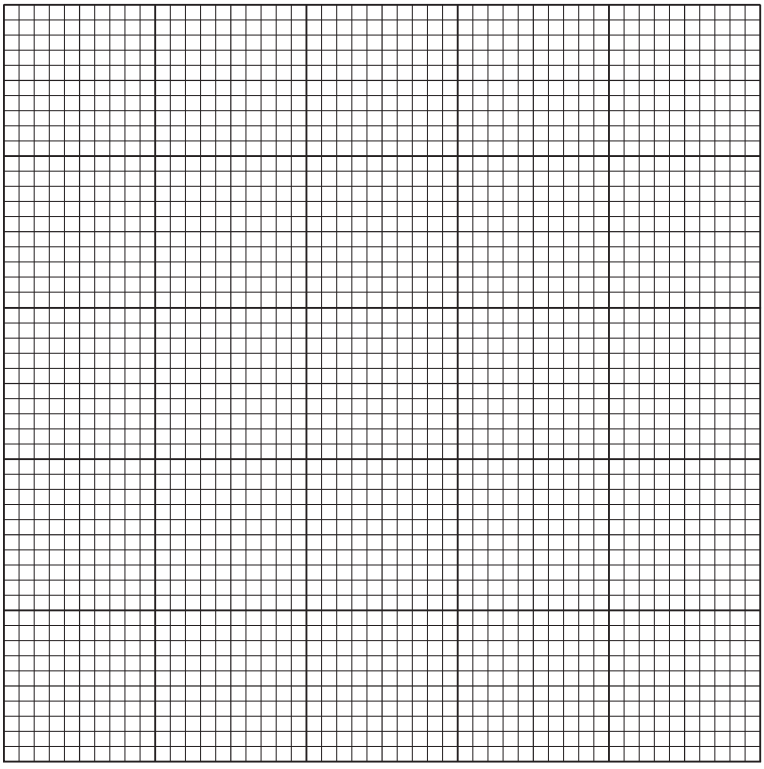
From this data the student calculated the volume of water absorbed by the plant.

The student's results are shown in Table 2.1.

Table 2.1

time /hours	volume of water absorbed /$cm^3\,hr^{-1}$
1	0.9
2	1.5
3	2.1
4	2.3
5	1.6

(c) Plot a graph of the data shown in Table 2.1.



[4]

[Total: 21]

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

1 You are required to investigate how much glucose diffuses through selectively permeable Visking (dialysis) tubing in 15 minutes.

You are provided with

- 25 cm^3 of 10% glucose solution, labelled **G**
- about 20 cm of Visking (dialysis) tubing in a container of distilled water, labelled **V**
- 100 cm^3 of distilled water, labelled **W**
- 20 cm^3 of 0.1 % glucose solution, labelled **S1**
- 20 cm^3 of 0.2 % glucose solution, labelled **S2**
- 20 cm^3 of 0.3 % glucose solution, labelled **S3**
- 100 cm^3 of Benedict's solution, labelled **Benedict's solution**.

Proceed as follows:

1. Tie a knot in the Visking tubing as close as possible to one end so that it seals the end.

2. To open the other end, wet the Visking tubing and rub the tubing gently between your fingers.

3. Use a syringe to put 10 cm^3 of **G** into the open end of the Visking tubing.

4. Rinse the outside of the Visking tubing by dipping it into the water in the container labelled **V**.

5. Put the Visking tubing into a large test-tube in a test-tube rack.

6. Fold the open end of the Visking tubing over the top of the large test-tube as shown in Fig. 1.1.

7. Use an elastic band to hold the Visking tubing in place.

8. Use a syringe to put some of **W** into the large test-tube so that it surrounds the Visking tubing.

9. Immediately start a stop clock, stop watch or record the time on a clock to time for 15 minutes.

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(a) Draw on Fig. 1.1 a line to show the level of water in the large test-tube. [1]

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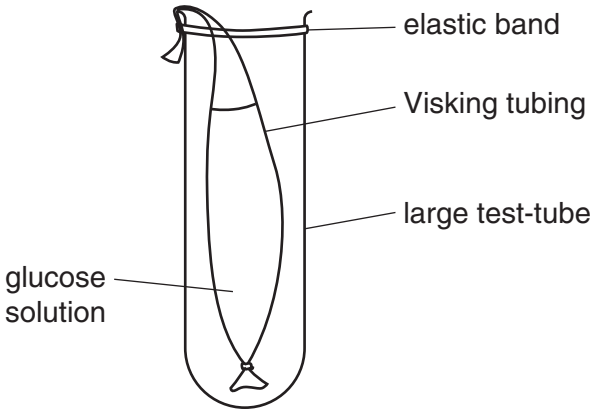


Fig. 1.1

To find out how much glucose has diffused out of the Visking tubing after 15 minutes, you are provided with solutions **S1**, **S2** and **S3**.

In order to find how much glucose has diffused from inside the Visking tubing into the water you will need to test a sample of the water with Benedict's solution.

You should record the time taken for the first appearance of any green colour.

The result will be compared with the time taken for the first appearance of any green colour obtained from testing solutions **S1**, **S2** and **S3** with Benedict's solution.

To do this you need to use the same procedure.

(b) State the volume of Benedict's solution and the volume of the solutions (**S1**, **S2** and **S3**) and the **sample** you are testing.

volume of Benedict's solution ..... cm^3

volume of each solution (**S1**, **S2** or **S3**) ..... cm^3

volume of **sample** ..... cm^3 [1]

(c) State **one** variable, other than volume, which needs to be kept constant when you do the tests and describe how you will keep this variable constant.

.....

.....

.....[2]

10. After 15 minutes, pour the water from around the Visking tubing into a beaker or container and label it **sample**.

11. Now test all four solutions, **sample**, **S1**, **S2** and **S3**.

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(d) (i) Prepare the space below and record your results.

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[4]

(ii) Estimate the concentration of glucose in the sample.

.....[1]

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(iii) Suggest how you might modify this investigation to find the effect of temperature on the rate of diffusion of glucose through Visking tubing.

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.....[2]

(e) A student investigated the rate of diffusion of a coloured solution through agar. A Petri dish containing a layer of agar had a small well of 1 cm diameter, cut so that 10 drops of the coloured solution could be placed in the well. The distance the coloured solution diffused from the edge of the well was measured at 15 minute intervals.

Fig. 1.2 shows the surface view of the Petri dish after 75 minutes.

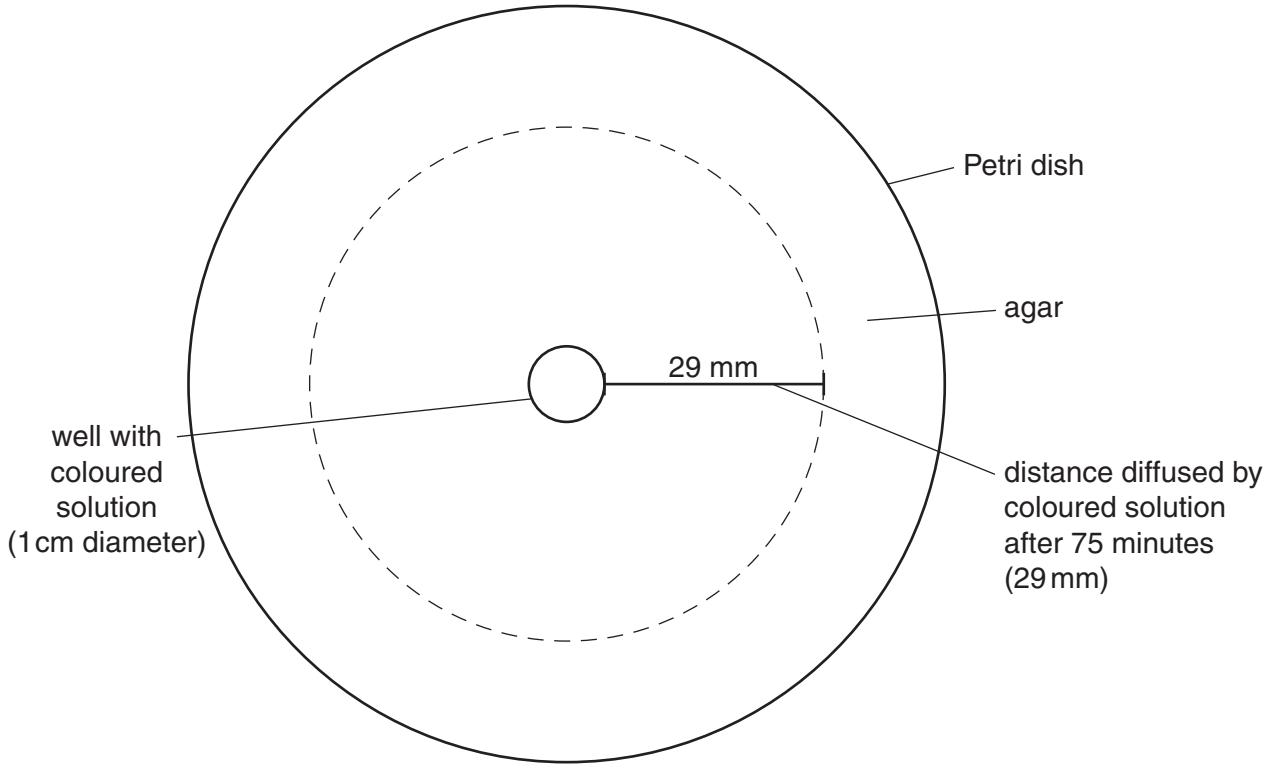


Fig. 1.2

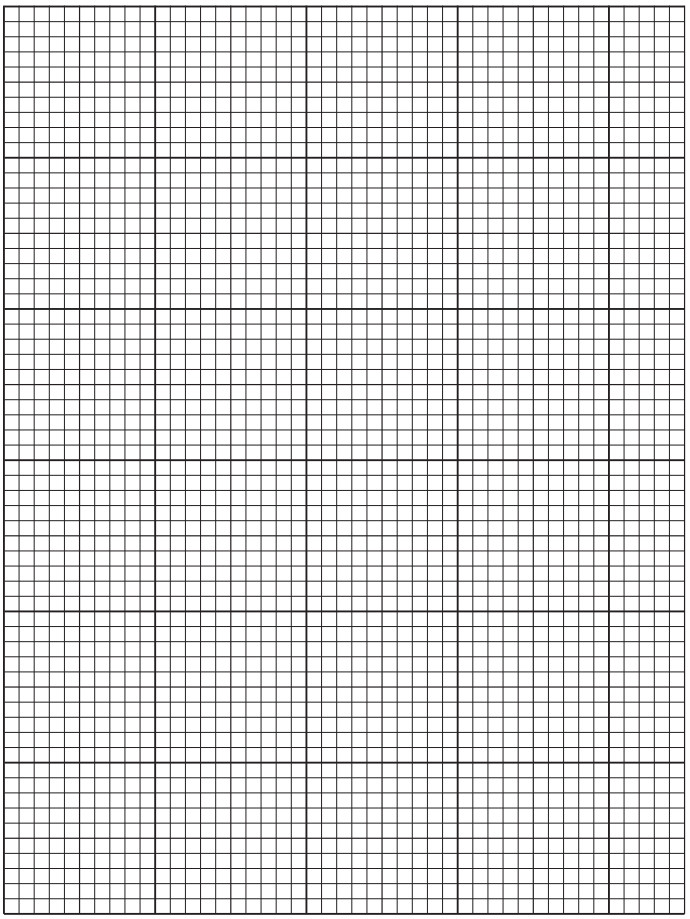
The results of the student's investigation are shown in Table 1.1.

For Examiner's Use

Table 1.1

time / min	distance diffused from well by coloured solution / mm
0	0
15	14
30	22
45	26
60	28
75	29

(i) Plot a graph to show the results in Table 1.1.



[4]

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(ii) Use the graph to calculate the rate of diffusion of the solution between 10 minutes and 20 minutes.

Show on your graph where you took the readings. [1]

Show all the steps in your calculation. [1]

[2]

(iii) Describe and explain the trend in the rate of diffusion shown in the graph you have drawn in **(e)(i)**.

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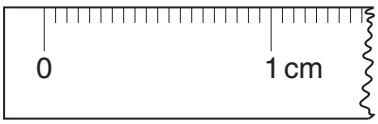
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.....[2]

(f) The ruler used to measure the distances in Table 1.1 is shown in Fig. 1.3.



magnification x 3

Fig. 1.3

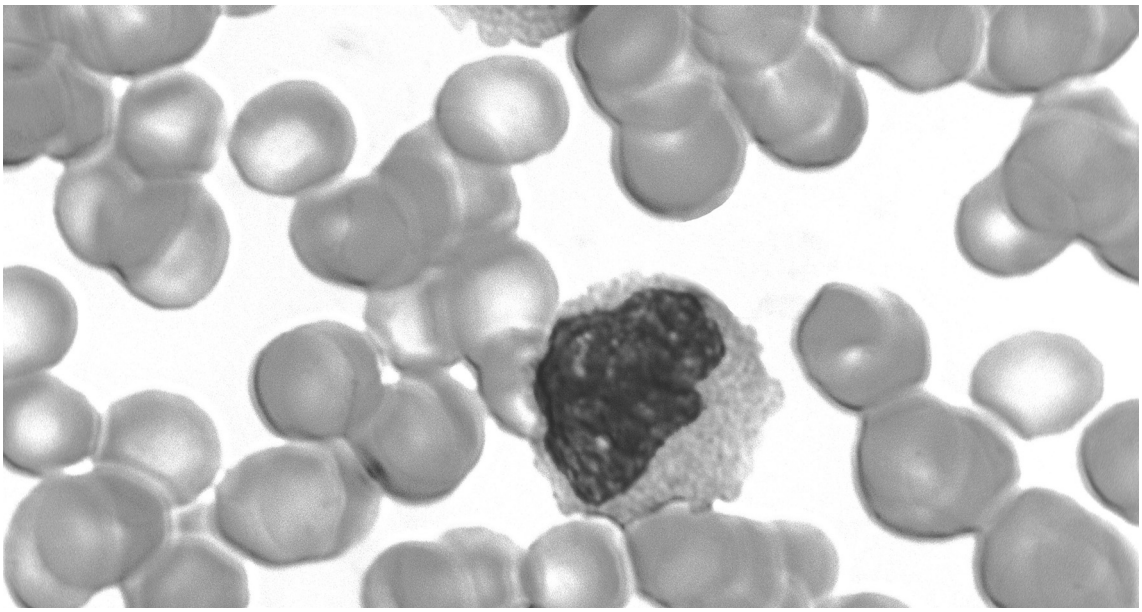
State the uncertainty of the measurements using this ruler.

.....[1]

[Total: 22]

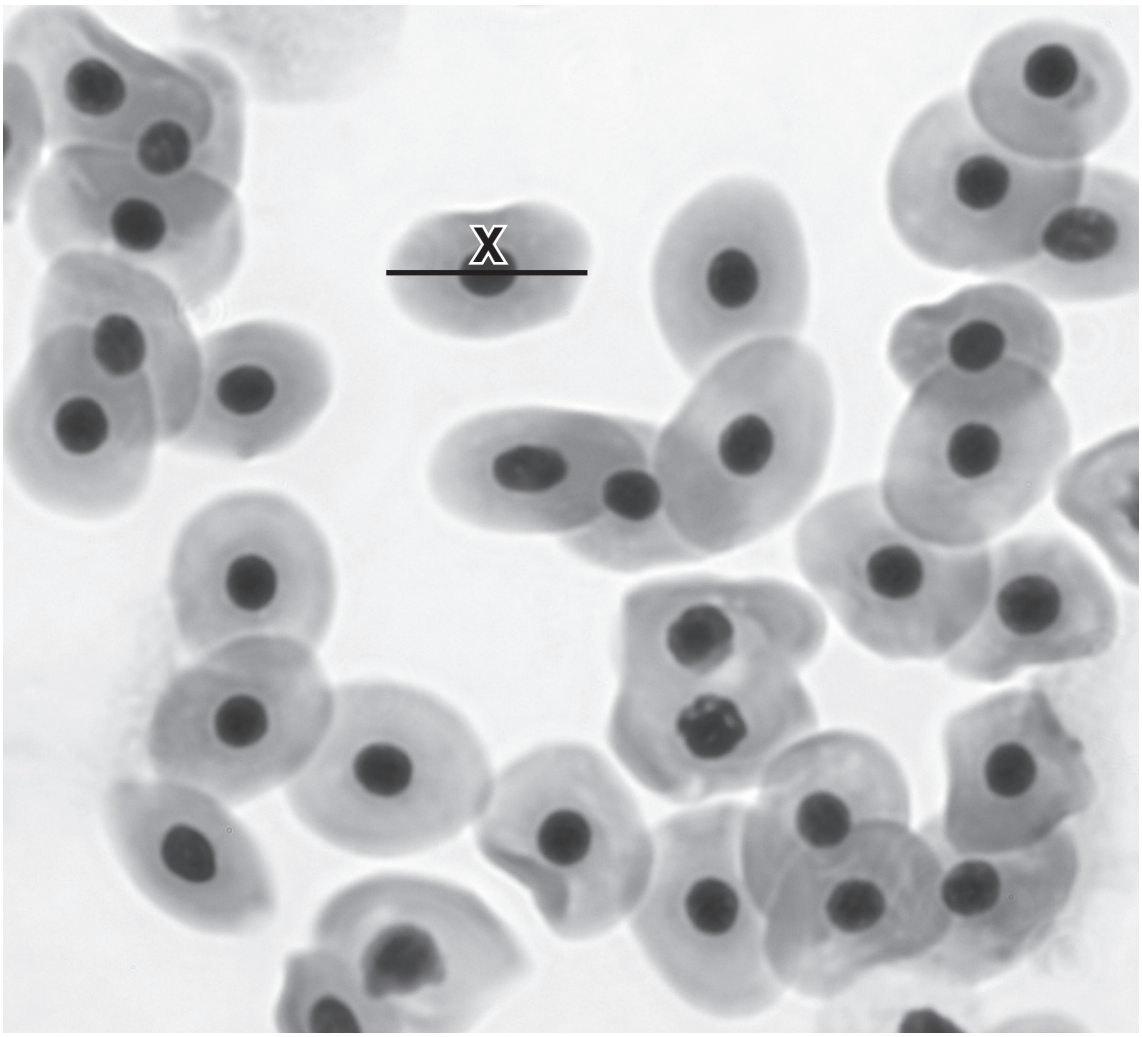
2 Fig. 2.1 and Fig. 2.2 are photomicrographs of blood taken from two different types of organisms.

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magnification × 2500

Fig. 2.1



magnification × 700

Fig. 2.2

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(a) (i) Make large, labelled drawings of two different types of cell from Fig. 2.1 and one cell from Fig. 2.2.

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Indicate on the photomicrographs the cells that you have drawn.

[4]

(ii) Prepare the space below so that it is suitable for you to compare and contrast the cells in Fig. 2.1 and Fig. 2.2.

Record your observations in the space which you have prepared.

[5]

(iii) Calculate the actual diameter of the cell shown by the line **X** in Fig. 2.2.

Show all the steps in your calculation.

For Examiner's Use

.....μm [2]

(iv) Suggest how you would obtain a mean diameter for cells of this type.

.....

.....

.....[1]

K1 is a slide showing transverse sections through blood vessels.

For Examiner's Use

(b) (i) Draw a large plan diagram of two different blood vessels shown in **K1**.

[5]

(ii) Suggest **one** way in which these blood vessels are adapted for transport.

.....[1]

[Total: 18]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1978982822

BIOLOGY **9700/34**

Paper 32 Advanced Practical Skills **May/June 2010**

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 a pencil for any diagrams, graphs or rough working.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.
You are advised to spend one hour on each question.

For Examiner's Use	
1	
2	
Total	

This document consists of **11** printed pages and **1** blank page.

DC (KN/CGW) 15996/4
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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 cm^3 of 10 % hydrogen peroxide solution, labelled **H**
- 100 cm^3 of distilled water, labelled **W**
- 10 cm^3 of a plant extract containing catalase, labelled **P**
- 15 cm^3 of 2 % sodium alginate solution, labelled **S**
- 30 cm^3 of 1.5 % calcium chloride solution, labelled **C**.

Proceed as follows:

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

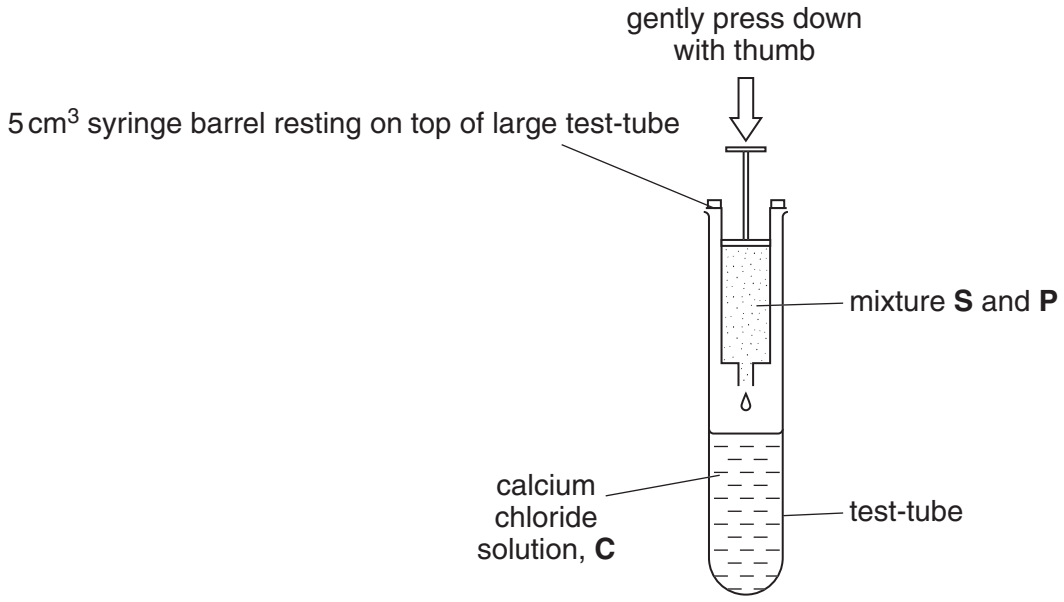


Fig. 1.1

6. Gently press down on the plunger of the 5 cm^3 syringe with your thumb to release a drop into solution **C**. The drop should form a bead.

For Examiner's Use

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.

You will need to make up 10 cm^3 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 cm^3 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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[Turn over

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.)

For Examiner's Use

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

[5]

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(iii) Identify **three** significant errors in your investigation.

For Examiner's Use

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.....[3]

(iv) Suggest how you would make **three** improvements to this investigation.

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.....[3]

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.

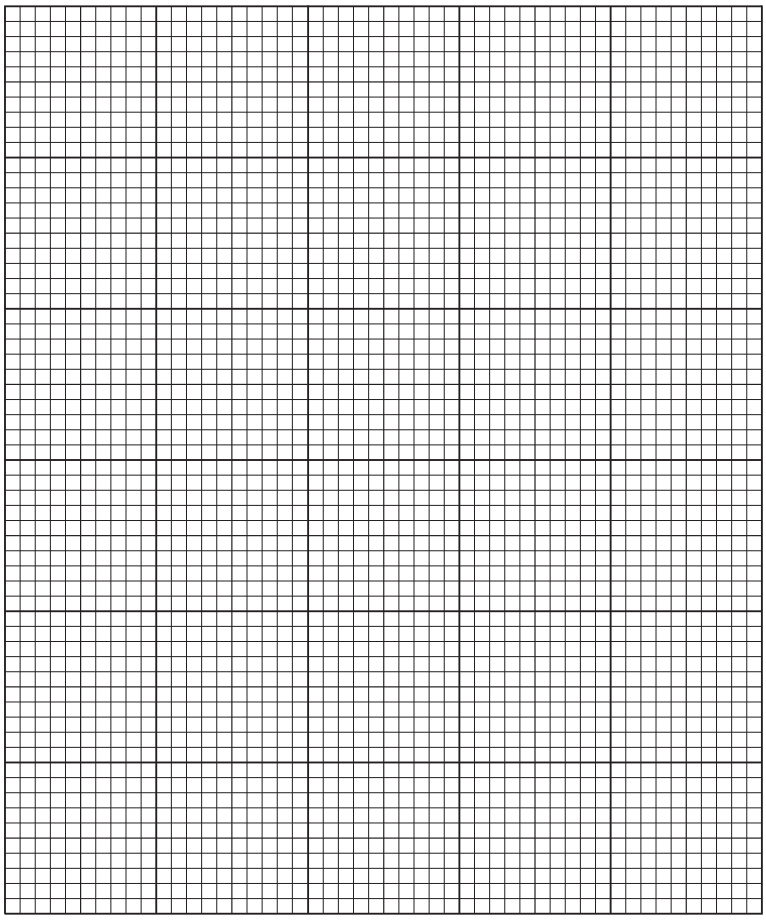
For Examiner's Use

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]

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(ii) Describe and explain the results of the student's investigation.

For Examiner's Use

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.....[3]

[Total: 22]

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

For Examiner's Use

(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.

[5]

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

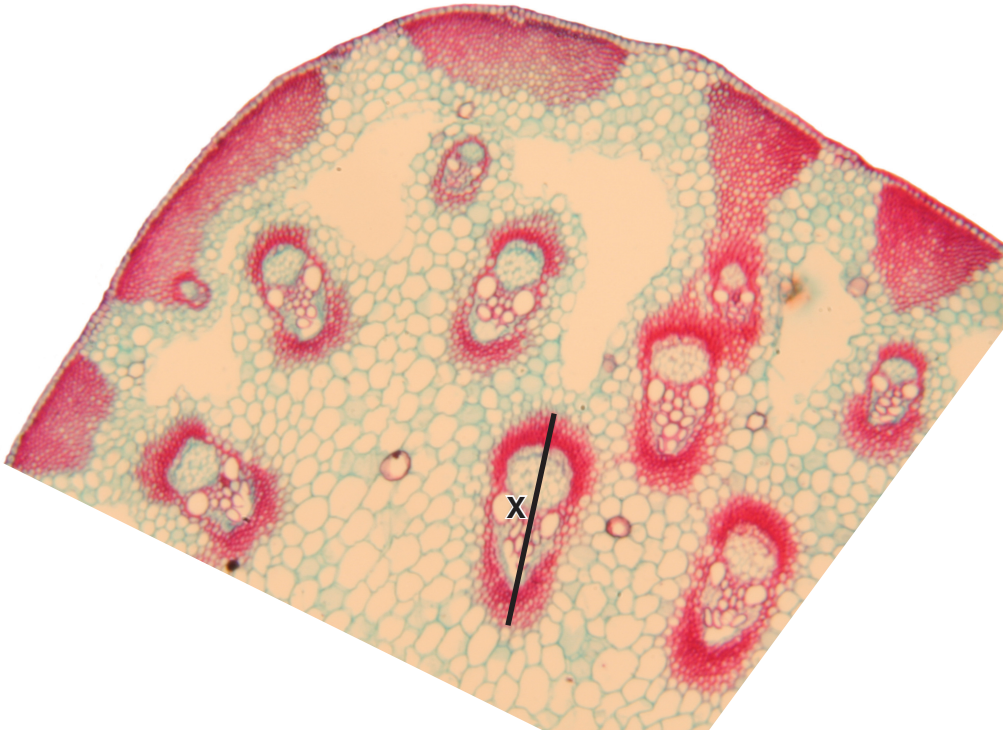
For Examiner's Use

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.

For Examiner's Use



magnification ×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]

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(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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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8419007050

BIOLOGY **9700/35**

Paper 31 Advanced Practical Skills **May/June 2010**

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 a pencil for any diagrams, graphs or rough working.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.
You are advised to spend one hour on each question.

For Examiner's Use	
1	
2	
Total	

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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 You are required to find the water potential of two solutions, **A** and **B**.

The water potential of a plant tissue can be found by immersing the plant tissue in sucrose solutions of different water potential.

Sucrose solutions **A** and **B** are the solutions in which tissues from two different species of plant did not change in mass after immersion for 30 minutes as shown in Fig. 1.1.

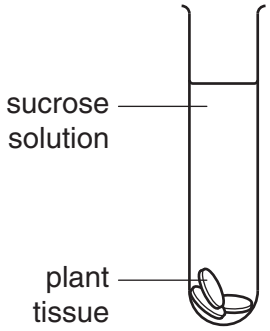


Fig. 1.1

(a) (i) Use two of the following words to complete the sentences below.

gains **less** **loses** **more**

If the plant tissue ..... water then the sucrose solution will become more dilute.

This will change the solution so that it becomes ..... dense. [1]

A blue dye is added to the two solutions, **A** and **B**, so that they can be seen.

A drop of the coloured solution is placed into a known concentration of sucrose solution.

Fig. 1.2 shows how the drop is released.

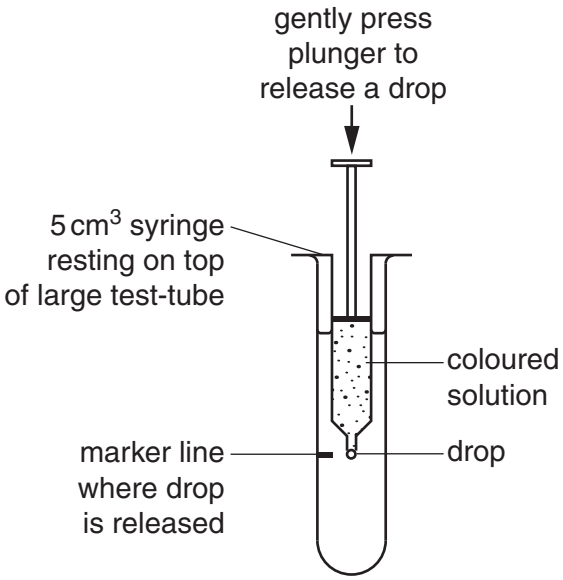
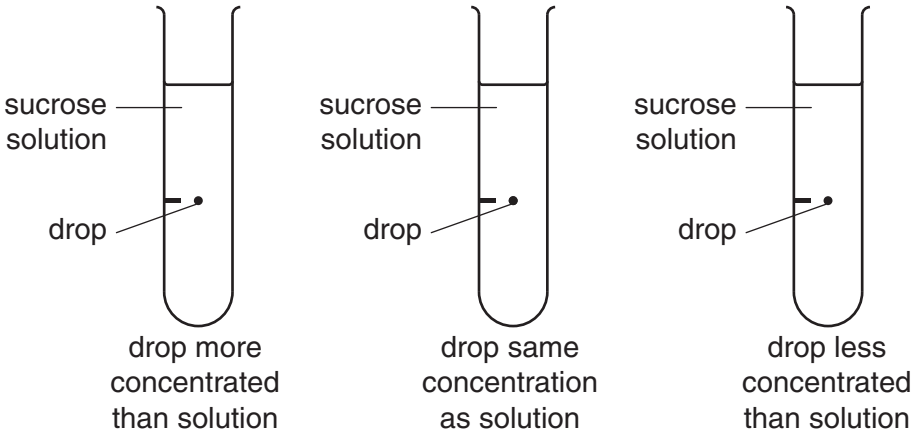


Fig. 1.2

Immediately the drop is released the syringe is removed.

The drop may move up, move down or remain at the same level.

(ii) Show clearly on the diagrams below how you would expect to see the drop move.



[2]

You are provided with

- 200 cm^3 of 1.0 mol dm^{-3} sucrose solution in a beaker, labelled **S**
- 200 cm^3 of distilled water in a beaker, labelled **W**

- 10 cm^3 of sucrose solutions **A** and **B**
- 10 cm^3 of 0.01% methylene blue, labelled **D**.

If any methylene blue comes into contact with your skin wash off immediately with water.

It is recommended that you wear safety goggles/glasses.

To find the concentration of sucrose in samples **A** and **B** you will need to dilute the 1.0 mol dm^{-3} sucrose solution to provide a range of concentrations.

(iii) Decide on the concentrations of sucrose solution that you will prepare using the 1.0 mol dm^{-3} sucrose solution and distilled water.

You will need to make up 50 cm^3 of each sucrose solution.

Prepare the space below to show

- the concentrations of sucrose solution
- the volumes of 1.0 mol dm^{-3} sucrose solution
- the volumes of distilled water.

[3]

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Make up the sucrose solutions that you have chosen in the containers provided.

For Examiner's Use

1. Place a 5 cm^3 syringe on top of the large test-tube and use the glass marker to draw a line on the test-tube at the same height as the end of the syringe nozzle as shown in Fig. 1.2.

2. Use a 5 cm^3 syringe to collect 4.0 cm^3 of **A** and place it in a Petri dish. With a pipette, add sufficient drops of **D** to turn the solution blue and stir.

3. Use the same syringe to collect 1.0 cm^3 of the coloured solution **A**. Wipe the syringe with a paper towel and label the syringe **A**.

4. Repeat steps 2 and 3 with sample **B** and label the second syringe **B**.

5. Put 35 cm^3 of one of your sucrose solutions into the large test-tube.

6. As shown in Fig. 1.2, put syringe **A** into the large test-tube so the end of the nozzle is level with the mark.

   Hold the syringe vertically and very gently push out a drop of the coloured solution.

7. Immediately observe the movement of the drop.

8 Record your observations.

9. Repeat steps 6 to 8 with sample **B** in syringe **B**.

10. Empty and wash the large test-tube.

11. Repeat steps 5 to 10 with each sucrose solution that you have made and record all your observations.

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[Turn over

(iv) Prepare the space below to record your observations.

For Examiner's Use

[6]

(v) Use your results to estimate the sucrose concentration of

sample **A**.....mol dm^{-3}

sample **B**..... mol dm^{-3}.

[2]

In order to find the water potential of the solutions **A** and **B** a graph is required showing the relationship between sucrose concentration and water potential.

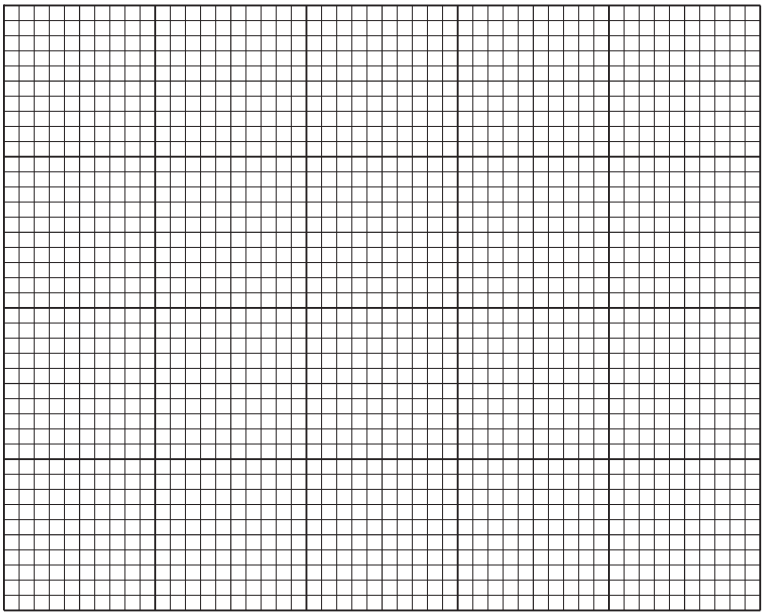
For Examiner's Use

Table 1.1 shows the water potential of different sucrose concentrations.

Table 1.1

sucrose concentration / mol dm^{-3}	water potential / kPa x 10^2
0.15	–5.0
0.35	–12.0
0.55	–19.0
0.75	–26.0
1.00	–35.0

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



[4]

(ii) Using your results and your graph estimate the water potential of sample **A**.

Show clearly on your graph how you obtained the water potential. [1]

water potential of sample **A** .....[1]

(iii) Describe how you would improve the investigation to obtain a more accurate estimate of the water potential of sample **A**.

For Examiner's Use

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.....[3]

[Total: 23]

2 **L1** is a slide of a stained transverse section of the trachea from a mammal.

The slide shows the C-shaped ring of cartilage.

(a) **(i)** Draw a large plan diagram of half of the trachea showing the ends of the cartilage ring.

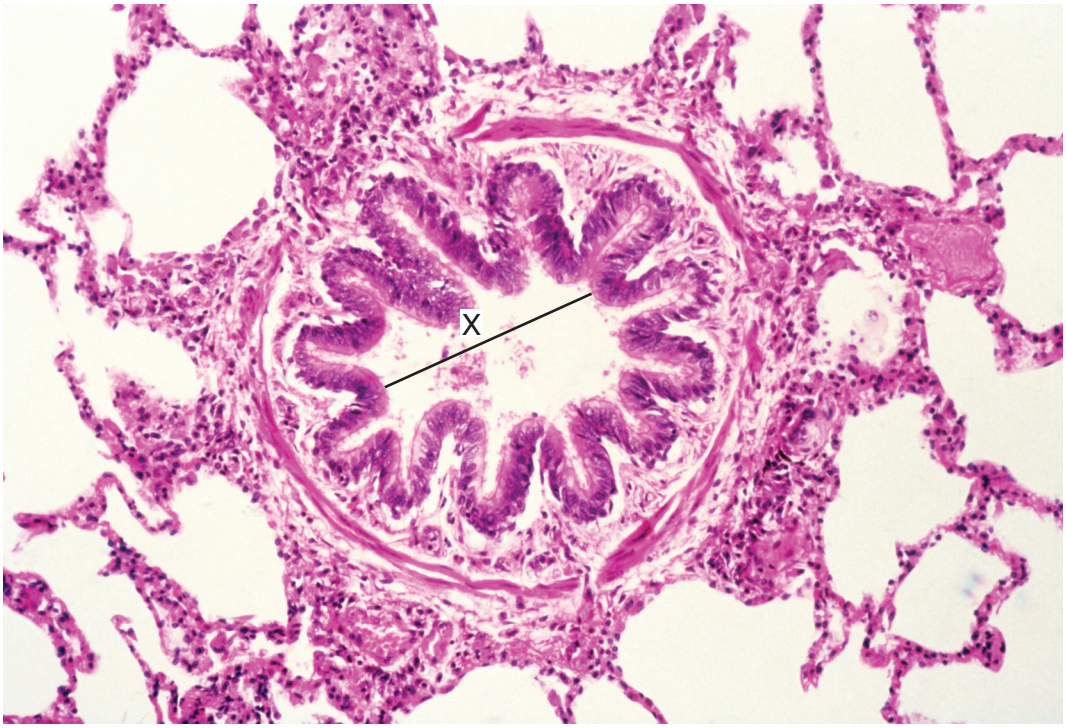
Label the diagram.

[5]

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Fig. 2.1 is a photomicrograph of a transverse section through a different tubular structure from an animal.

For Examiner's Use



magnification x70

Fig. 2.1

(ii) Prepare the space below so that it is suitable for you to compare and contrast the specimens on slide **L1** and in Fig. 2.1.

Record your observations.

[5]

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[Turn over

(iii) Calculate the actual distance across the lumen of the structure shown by line **X** in Fig. 2.1.

Show all the steps in your calculation.

For Examiner's Use

[3]

Fig. 2.2 shows a photomicrograph of structures labelled **Z**.

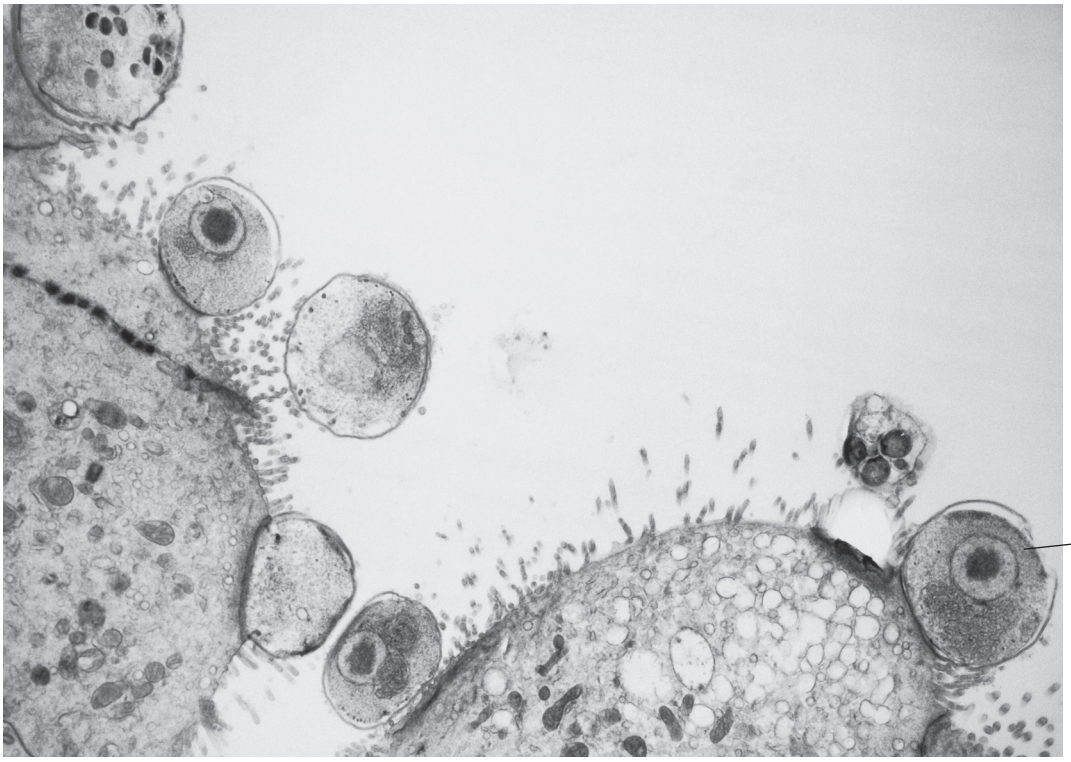


Fig. 2.2

(b) Make a large drawing of three of these structures, which must be complete, to show the differences between them.

Draw a circle on Fig. 2.2 around each of the structures **Z** which you have drawn.

For Examiner's Use

[4]

[Total: 17]

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