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

CANDIDATE NAME

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5657597129

BIOLOGY **9700/31**

Advanced Practical Skills 1 **October/November 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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	

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You are reminded that you have **only one hour** for each question in the practical examination.

For Examiner's Use

You should:

- read carefully through **the whole** of Question 1 and Question 2
- then plan your use of **the time** to make sure that you finish all the work that you would like to do.

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

1 You are required to investigate how much glucose diffuses from a plant tissue extract through a partially permeable wall of Visking (dialysis) tubing.

Fig. 1.1 shows the apparatus you will set up for this investigation.

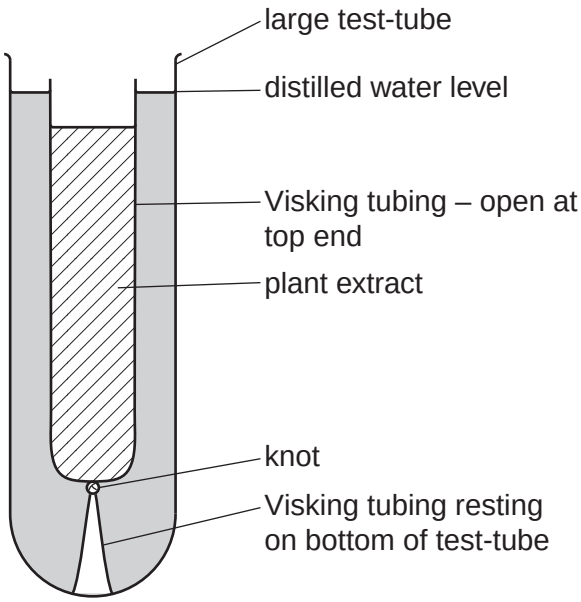


Fig. 1.1

You are provided with:

labelled	contents	hazard	volume /cm^3
P	plant tissue extract	none	20
W	distilled water	none	100
G	1% glucose solution	none	25
Benedict's solution	Benedict's solution	harmful irritant	30

labelled	contents	hazard	details	quantity
V	Visking tubing in distilled water	none	15 cm length in distilled water	1

Proceed as follows:

For Examiner's Use

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. Without mixing **P**, put some of **P** into the Visking tubing to the level shown in Fig. 1.1.

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 the large test-tube.

(a) (i) State the volume of **W** needed to reach the water level as shown in Fig. 1.1.

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

6. Put the volume of **W**, as decided in **(a)(i)**, into the large test-tube.

7. Put the large test-tube with the Visking tubing into a test-tube rack and leave for 20 minutes.

   During the 20 minutes:
   - set up a boiling water-bath ready for step 11
   - make a serial dilution of 1% solution **G** which reduces the concentration of **G** by **half** between each successive dilution.

You will need to make up 20 cm^3 of each concentration of solution **G**.

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(ii) Complete Fig. 1.2 to show how you will make **four** further concentrations of **G**, starting with the 1% solution, **G**.

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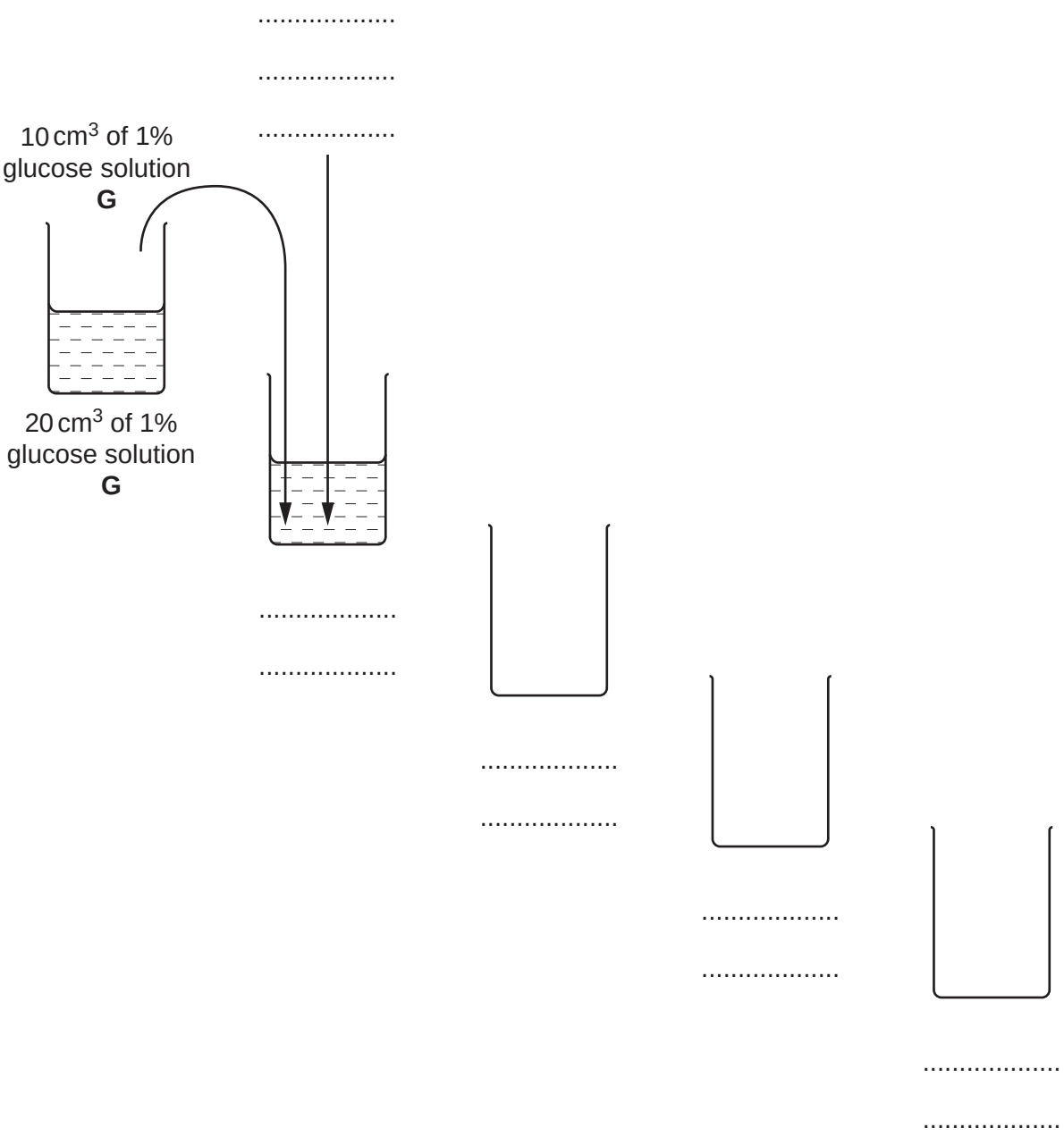


Fig. 1.2 [3]

8. Prepare the concentrations of **G** as decided in **(a)(ii)** in the containers provided.

9. After 20 minutes, which started at step 7, remove the Visking tubing and put it into the container labelled **'for waste'**.

10. Pour the water from the large test-tube into a container and label it **S**.

11. Carry out the Benedict's test on all 6 solutions (five of **G** and one of **S**).

    You will need to use 2 cm^3 of each of the solutions of **G** and **S** with 2 cm^3 of Benedict's solution.

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12. Test each solution separately and record the time taken for the first appearance of any colour change. If there is no colour change after 120 seconds record ‘more than 120’.

For Examiner's Use

(iii) Prepare the space below and record your results.

[4]

For Examiner's Use

(iv) Complete Fig. 1.3 below to show

- the positions of each of the percentage concentrations of solution **G**
- the letter **S** to show where the sample fits in the series of concentrations.

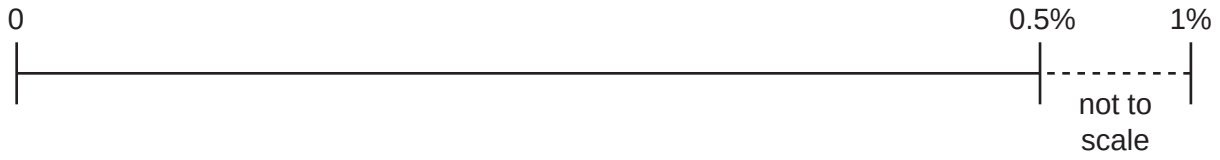


Fig. 1.3 [2]

(v) A colorimeter could **not** have been used in this investigation.

Describe **three other** modifications to this investigation which would improve the confidence in your results.

.....

.....

.....

.....

.....

.....

.....[3]

In a similar investigation, a student investigated how changing the concentration of glucose solution (independent variable) in the Visking tubing affected the quantity of glucose diffusing through the wall into the surrounding solution.
After 20 minutes a dye was added to the surrounding solution. This produced different intensities of colour depending on the glucose concentration in the surrounding solution.

A colorimeter was used to measure the absorbance of light by the coloured solution.

Other variables were considered and kept to a standard.

The student's results are shown in Table 1.1.

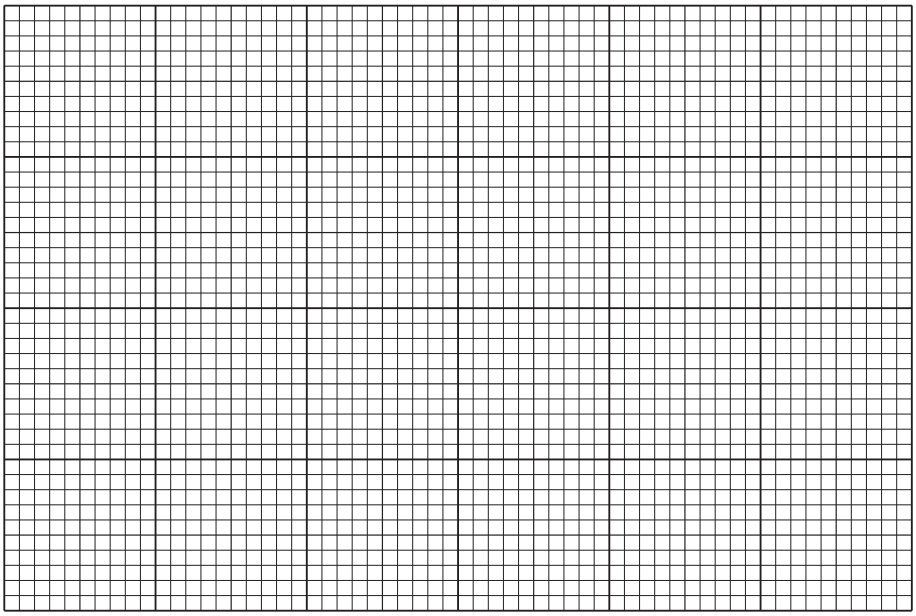
Table 1.1

concentration of glucose solution inside the Visking tubing / arbitrary units	**absorbance of light by the coloured solution / arbitrary units**
10	0.750
15	1.100
20	1.475
25	1.850
30	1.900

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

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[4]

(ii) Explain the difference in the results for the glucose concentration at 10 arbitrary units and at 15 arbitrary units.

.....

.....

.....[1]

(iii) Explain the difference in the gradients of the line between the glucose concentrations of 10 arbitrary units and 25 arbitrary units **and** between 25 arbitrary units and 30 arbitrary units.

.....

.....

.....[1]

(iv) The student used a measuring cylinder to measure the volumes of glucose solution. The smallest division on the measuring cylinder scale was 0.2 cm^3.

State the actual error in measuring a volume of 5 cm^3 using this measuring cylinder.

5 cm^3 ± ..... cm^3 [1]

[Total: 20]

2 **J1** is a slide of a transverse section through a plant root.

For Examiner's Use

(a) **(i)** Describe one observable feature on **J1** which identifies this specimen as a root.

.....

..... [1]

(ii) Draw a large plan diagram of the whole specimen on **J1**.

On your diagram, use a label line and label to show the cortex.

[4]

(iii) Make a large drawing of one group of four complete touching xylem vessels as observed on the specimen on **J1.**

For Examiner's Use

On your drawing, use a label line and label to show one lumen.

Annotate your drawing with one observable feature.

[5]

Fig. 2.1 shows a diagram of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

For Examiner's Use

One division, on either the stage micrometer scale or the eyepiece graticule, is the distance between two adjacent lines.

The length of one division on this stage micrometer is **0.1 mm.**

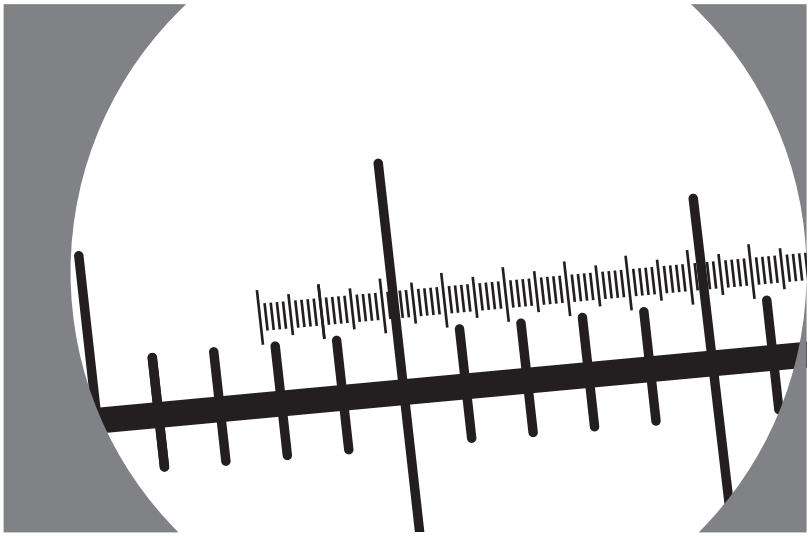


Fig. 2.1

(b) (i) Using this stage micrometer, where one division is **0.1 mm**, calculate the actual length of one eyepiece graticule unit using Fig. 2.1 by completing Fig. 2.2.

Step 1

1 eyepiece graticule unit = ☐ divided by ☐ = …… mm

Step 2

Convert the answer to a measurement with the unit most suitable for use in light microscopy.

☐ multiplied by ☐ = ……

Fig. 2.2 [3]

Fig. 2.3 is a photomicrograph showing part of an organ from a plant of a different species.

For Examiner's Use

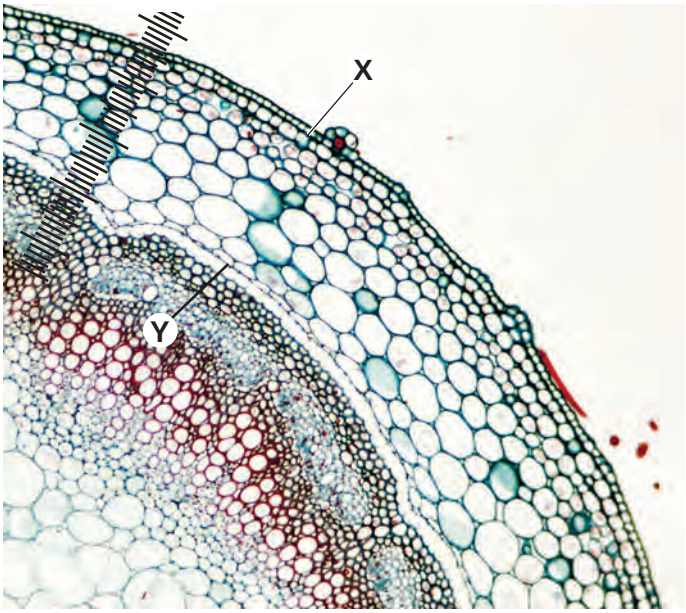


Fig. 2.3

(ii) Fig. 2.3 shows a photomicrograph taken using the same microscope with the same lenses as Fig. 2.1.

Use the calibration of the eyepiece graticule unit from **(b)(i)** and Fig. 2.3 to calculate the actual length of the plant tissue from **X** to **Y.**

You will lose marks if you do not show all the steps in your calculation and do not use the appropriate units.

[2]

Question 2 continues on page 12.

Fig 2.3 is shown again here to help you answer **(c)**.

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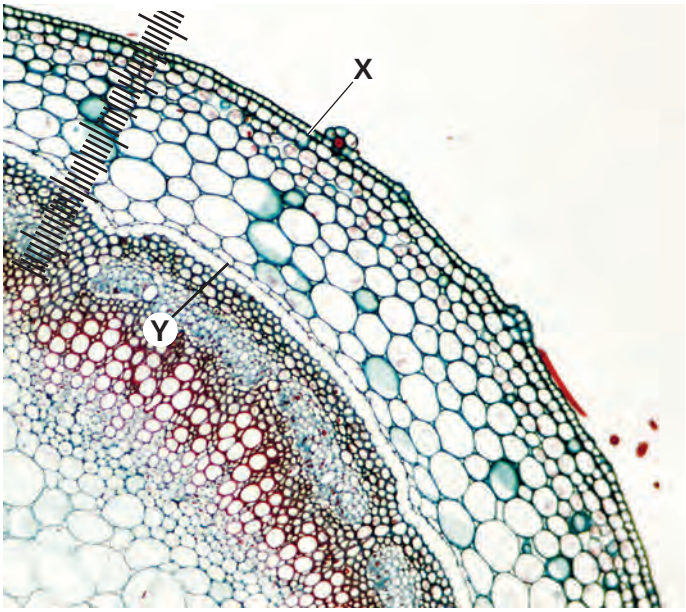


Fig. 2.3

(c) Prepare the space below so that it is suitable for you to record observable differences between the specimen on slide **J1** and in Fig. 2.3, to include:

- the vascular tissue
- at least two other tissues.

[5]

[Total: 20]

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BIOLOGY **9700/33**

Advanced Practical Skills 1 **October/November 2012**

2 hours

Candidates answer on the Question Paper.

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1 An enzyme catalyses the hydrolysis (breakdown) of sucrose to reducing sugars. This enzyme is essential in a seed to provide reducing sugars so that the seed can grow.

A student suggested the hypothesis:

"seeds soaked in a sucrose solution release the enzyme which will hydrolyse the sucrose solution into reducing sugars".

You are required to:

- soak seeds in a sucrose solution to enable the enzyme to hydrolyse the sucrose to reducing sugars
- show the release of the enzyme by testing for reducing sugars in the solution surrounding the seeds
- make different concentrations from a solution of reducing sugars
- carry out Benedict's test on the reducing sugars and on the solution surrounding the seeds and use the results to estimate the concentration of reducing sugars in the solution surrounding the seeds.

You are provided with:

labelled	**contents**	**hazard**	**volume / cm^3**
S	sucrose solution	none	15
R	0.4% reducing sugars solution	none	30
W	distilled water	none	100
Benedict's solution	Benedict's solution	harmful irritant	60

labelled	**hazard**	**details**
seeds	none	dried

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Proceed as follows:

For Examiner's Use

(a) (i) You will need to select 10 seeds to use in the investigation.

State which variable you will need to standardise (keep the same) when selecting the seeds.

..... [1]

1. Select your 10 seeds and put them into a large test-tube. Put 3 cm^3 of **S** into the same test-tube and leave for 20 minutes.

2. Set up a water-bath and heat the water to a suitable temperature to test for reducing sugars using the Benedict's test.

(ii) State the temperature you will need to maintain in the water-bath to carry out the Benedict's test.

temperature ..... [1]

(iii) You will need to make dilutions of the 0.4% solution of **R**, so that the concentration of **R** is reduced by 0.1% between each successive dilution.

You will need 10 cm^3 of each concentration.

Prepare the space below to show the

- concentration of **R**
- volume of **R**
- volume of distilled water, **W**.

[3]

For Examiner's Use

(iv) You will need to test the different concentrations of **R** and 2 cm^3 of the solution surrounding the seeds.

State the volume of Benedict's solution and the volume of each of the concentrations of **R**.

volume of Benedict's solution .....

volume of each concentration of **R** .....
[1]

3. Make the dilutions of **R** you decided in **(a) (iii)**.

4. Using the volumes you decided in **(a) (iv)** carry out the Benedict's test on your concentrations of **R**.
Record the time taken for the first appearance of a colour change. If there is no colour change after 180 seconds record 'more than 180'.

5. After the seeds have been soaked for 20 minutes, carry out the Benedict's test on the solution surrounding the seeds.

(v) Prepare the space below and record your results.

[4]

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(vi) Estimate the concentration of reducing sugars in the solution that surrounded the seeds.

For Examiner's Use

..... [1]

The student's hypothesis was:

"seeds soaked in a sucrose solution release the enzyme, **E**, which will hydrolyse the sucrose solution into reducing sugars".

(vii) State whether your results support this hypothesis.

.....

Use your results to explain your answer.

.....

.....

.....

[2]

(b) Describe how you could modify this procedure to investigate the effect of temperature on the release of the enzyme from the seeds.

.....

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.....

.....

.....

.....

..... [3]

For Examiner's Use

Scientists investigated the effect of pH on the activity of the same enzyme found in leaves and in the bark of rubber trees.

A standard volume and concentration of sucrose solution was mixed with the same volume of extract from either leaves or bark.

The activity of the enzyme was measured by finding out the concentration of reducing sugars produced in an hour.

The scientist's results are shown in Table 1.1.

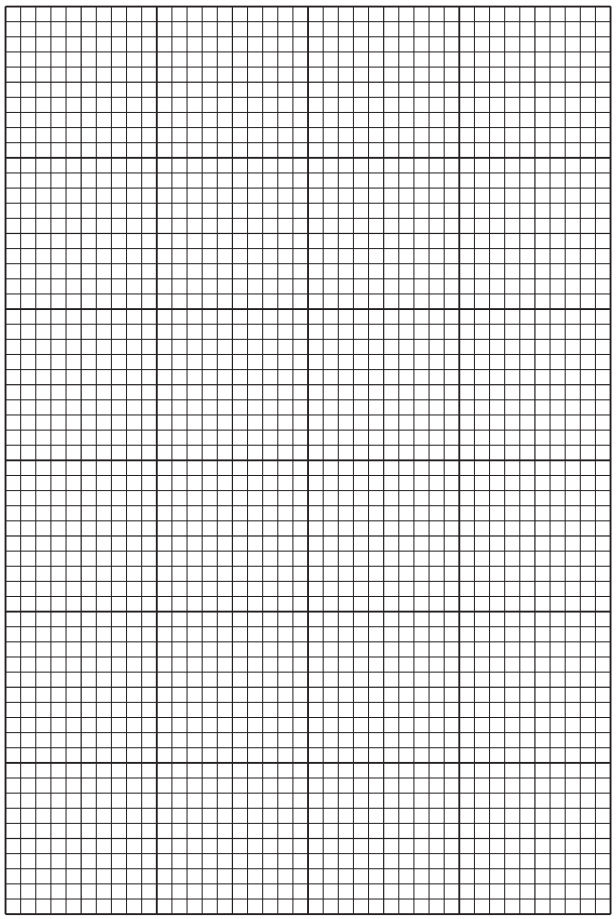
Table 1.1

pH	activity of enzyme concentration of reducing sugars / mmol hour^{-1}	
	in leaves	in bark
4.0	8	10
5.3	53	19
6.4	33	30
7.2	18	32
7.8	7	18

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

For Examiner's Use



[4]

(ii) Use the data to describe the trend for the activity of the enzyme in the **leaves**.

.....

.....

..... [1]

(iii) Explain the change in the activity of the enzyme in the **leaves** between pH 5.3 and pH 6.4.

.....

.....

..... [1]

[Total: 22]

2 **K1** is a slide of a stained transverse section through a plant root. This plant species is a native of Bangladesh, India and Pakistan.

For Examiner's Use

(a) **(i)** Draw a large plan diagram of the whole specimen on **K1**.

On your diagram use a label line and label to show the cortex.

[5]

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(ii) Make a drawing of one group of five complete cells from the centre of the root.

For Examiner's Use

[4]

Fig. 2.1 shows a diagram of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

For Examiner's Use

One division, on either the stage micrometer scale or the eyepiece graticule, is the distance between two adjacent lines.

The length of one division on this stage micrometer is **0.01 mm**.

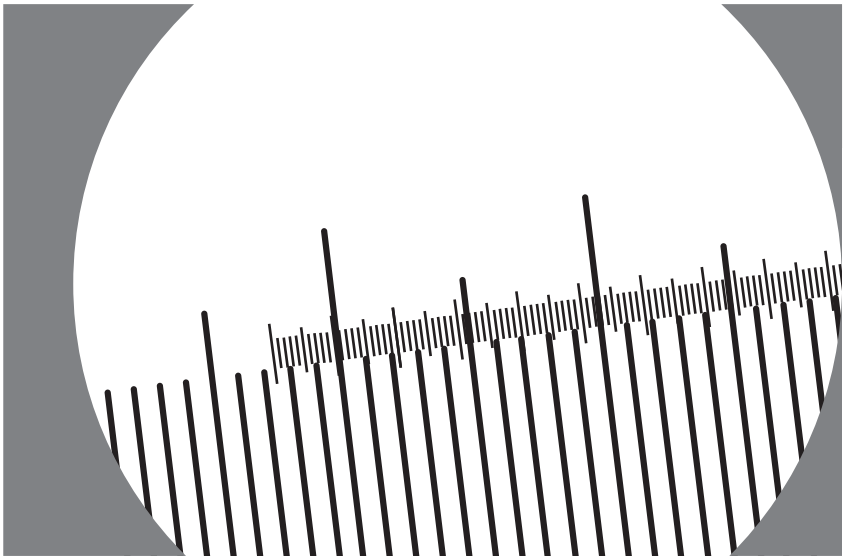


Fig. 2.1

(b) (i) Using this stage micrometer, where one division is **0.01 mm**, calculate the actual length of one eyepiece graticule unit using Fig. 2.1 by completing Fig. 2.2.

Step 1

1 eyepiece graticule unit = [ ] divided by [ ] = ...mm

Step 2

Convert the answer to a measurement with the unit most suitable for use in light microscopy.

[ ] multiplied by [ ] = ...

Fig. 2.2

[3]

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Fig. 2.3 is a photomicrograph showing part of an organ from a plant of a different species.

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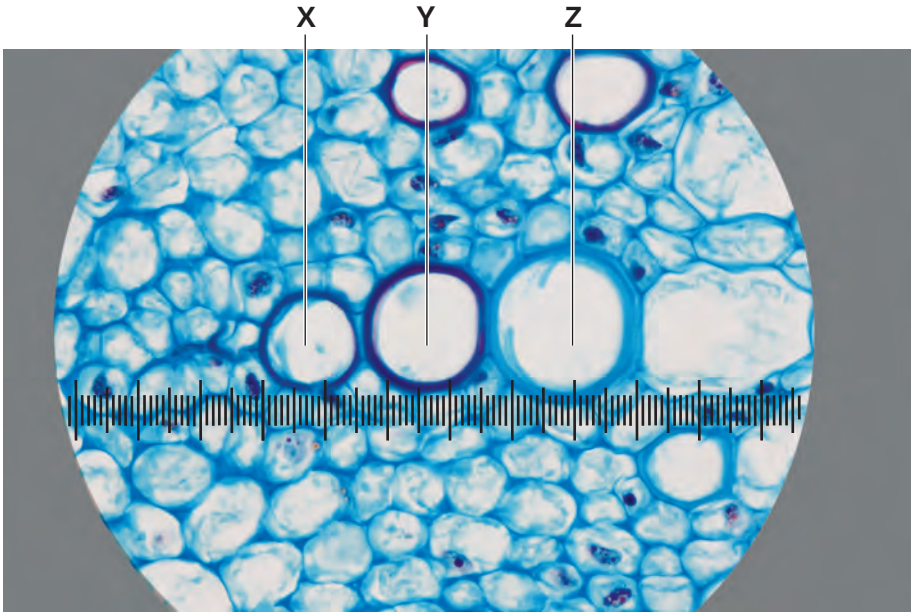


Fig. 2.3

(ii) Fig. 2.3 shows a photomicrograph taken using the same microscope with the same lenses as Fig. 2.1.
Use the calibration of the eyepiece graticule unit from **(b)(i)** and Fig. 2.3 to calculate the actual total length of the cells labelled **X**, **Y** and **Z**.

You will lose marks if you do not show all the steps in your calculation and do not use the appropriate units.

[2]

Question 2 continues on page 12

Fig. 2.4 is a photomicrograph of a transverse section of an organ from a different plant species.

For Examiner's Use



Fig. 2.4

(c) Prepare the space below so that it is suitable for you to record observable differences between the specimen on slide **K1** and in Fig. 2.4. to include:

- the vascular tissue
- at least two other tissues.

[4]

[Total: 18]

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Question 1 Fig. 2.3 © DR KEITH WHEELER / SCIENCE PHOTO LIBRARY

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BIOLOGY **9700/34**

Advanced Practical Skills 2 **October/November 2012**

2 hours

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2	
Total	

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

After the enzyme and milk are mixed, the protein is hydrolysed and the mixture will change from cloudy to clear. The end-point is reached when the mixture is clear.

You are required to:

- make different concentrations of the enzyme solution, **E**
- investigate the effect of different concentrations of **E**, by finding the time taken to reach the end-point.

You are provided with:

labelled	contents	hazard	volume / cm^3
E	1.0 % enzyme solution	irritant	20
W	distilled water	none	50
S	milk	none	50

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(a) (i) You will need to make dilutions of the 1.0% solution of **E**, so that the concentration of **E** is reduced by 0.2% between each successive dilution.

For Examiner's Use

You will need 5 cm^3 of each concentration.

Prepare the space below to show the:

- concentrations of **E**
- volumes of **E**
- volumes of distilled water, **W**.

[3]

(ii) Decide on a control you will use.

Describe how you will set up a control using the apparatus provided.

.....

..... [1]

Proceed as follows:

For Examiner's Use

1. Prepare the concentrations of **E** and the control as decided in **(a) (i)** and **(ii)**.
2. Set up a water-bath and adjust the temperature to between 35 °C and 40 °C. Maintain the temperature of the water-bath.
3. Put 1 cm^3 of the lowest concentration of **E** into a test-tube and put the test-tube into the water-bath.
4. Repeat step 3 for all the concentrations of **E** and the control prepared in step 1.
5. Leave the test-tubes for 2 minutes.
6. Remove the test-tubes containing the three highest concentrations of **E**.
7. Put 3 cm^3 of **S** into each test-tube and mix well.
8. Record the time taken for each test-tube to reach the end-point. If the end-point is not reached by 240 seconds, record 'more than 240'.
9. Repeat steps 6 to 8 with the remaining test-tubes in the water-bath.

(iii) Prepare the space below and record your results.

[5]

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(iv) Identify a significant source of error in your investigation.

For Examiner's Use

.....

..... [1]

(v) Suggest how you would modify this investigation to find the effect of pH on the **rate** of hydrolysis of the protein in milk.

.....

.....

.....

.....

.....

.....

..... [3]

Gelatine is made up of protein which is hydrolysed by the enzyme protease.

For Examiner's Use

A student investigated the effect of pH 4.0 and pH 6.4 on the activity of protease.

One piece of gelatine, with an area of 200 mm^2, was placed in a Petri dish and covered with a solution of protease maintained at pH 4.0.

The area of gelatine was recorded at intervals for 90 minutes.

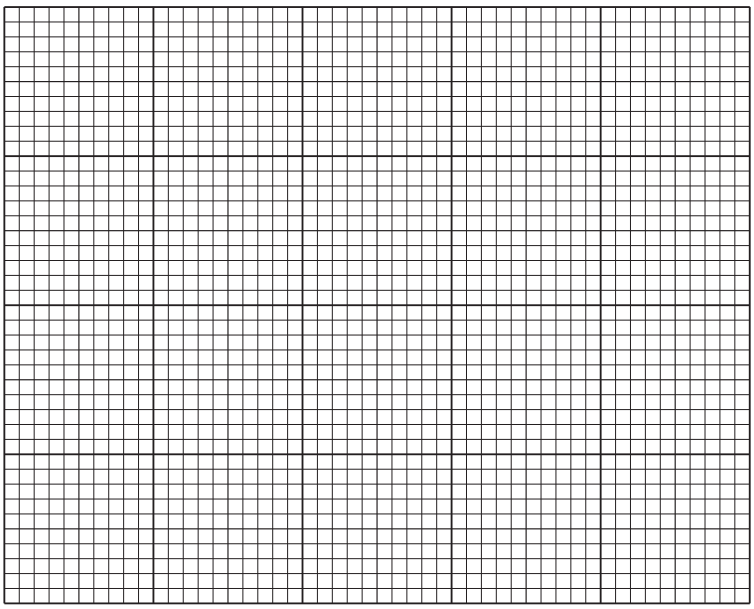
The investigation was repeated with another piece of gelatine and a solution of protease maintained at pH 6.4.

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

Table 1.1

time / minutes	**area of gelatine / mm^2**	
	pH 4.0	**pH 6.4**
0	200	200
30	165	190
45	105	185
60	50	145
90	0	100

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



[4]

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(ii) Describe the trends shown by the data.

For Examiner's Use

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.....

.....[2]

(iii) Explain the difference in the effect of pH 4.0 and pH 6.4 on the activity of protease.

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.....

.....

.....

.....[3]

[Total: 22]

2 **M1** is a slide of a transverse section of a leaf. The plant is native to the Himalayas.

For Examiner's Use

(a) **(i)** Draw a large plan diagram of the whole section of the leaf on **M1**.

On your diagram, use a label line and label to show the xylem.

[5]

(ii) Choose one group of three touching palisade cells which have different shapes and make a large drawing of the group.

On your drawing, use a label line and label to show a chloroplast.

For Examiner's Use

[5]

Fig. 2.1 is a photomicrograph of a transverse section of a different type of leaf from the same plant.

For Examiner's Use

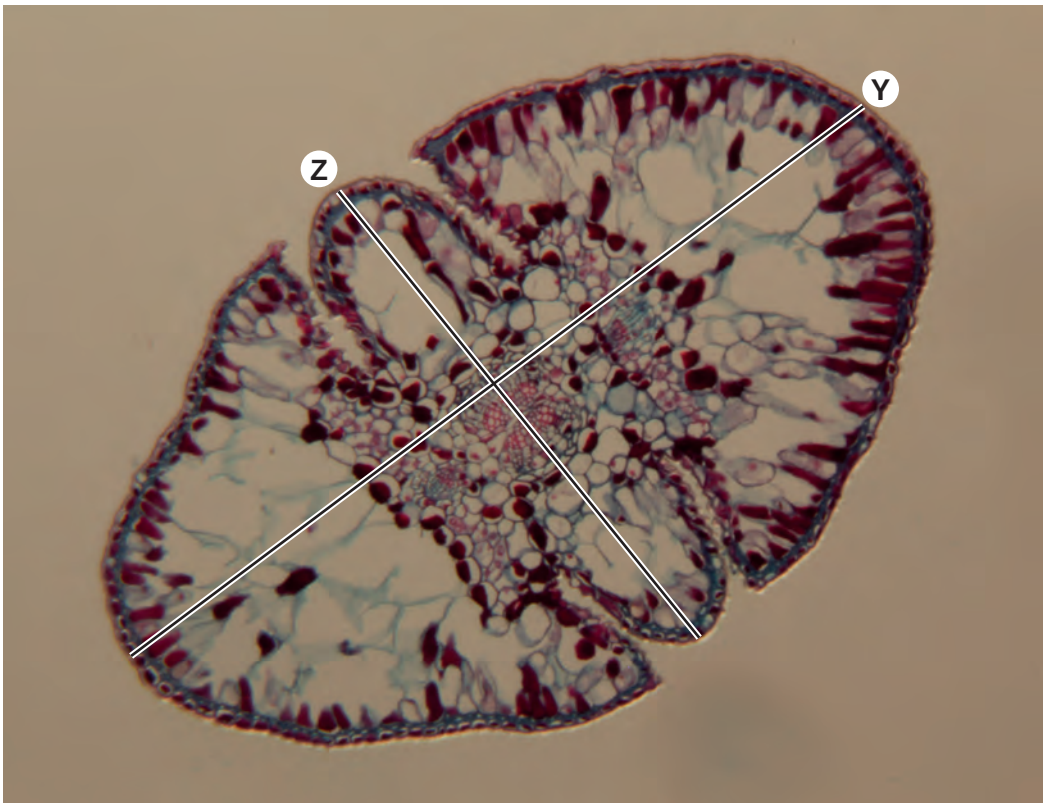


Fig. 2.1

(b) Use the lines **Y** and **Z** shown on Fig. 2.1, to calculate the ratio of **Y** to **Z**.

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

[3]

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(c) (i) Fig. 2.2 shows the outline of a plan diagram of the specimen shown in Fig. 2.1. Within this outline, complete the plan diagram of the specimen. [2]

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(ii) You are required to annotate Fig. 2.2 to describe three observable differences between Fig. 2.1 and **M1**.

Draw label lines to three different features and use only the labels, **P**, **Q** and **R**.

Next to each letter, describe how each feature on Fig. 2.1 differs from **M1**. [3]

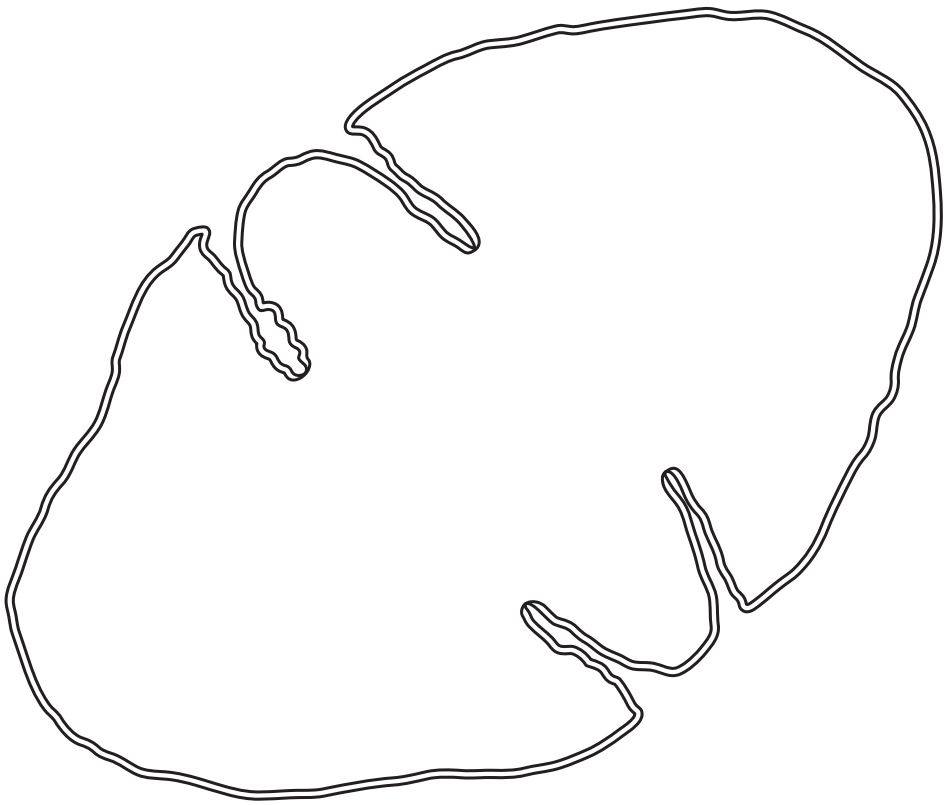


Fig. 2.2

[Total: 18]

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General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0756041585

BIOLOGY **9700/35**

Advanced Practical Skills 1 **October/November 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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 **12** printed pages.

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You are reminded that you have **only one hour** for each question in the practical examination.

For Examiner's Use

You should:

- Read carefully through **the whole** of Question 1 and Question 2
- Plan your use of **the time** to make sure that you finish all the work that you would like to do.

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

1 Yeast cells contain an enzyme, catalase, which catalyses the hydrolysis (breakdown) of hydrogen peroxide into oxygen and water with the transfer of heat to the surroundings.

The progress of this enzyme-catalysed reaction can be followed by measuring the temperature at intervals of time.

You are required to:

- make different concentrations of the copper sulfate solution, **C**
- investigate the effect of different concentrations of **C** (the independent variable).

You are provided with:

labelled	**contents**	**hazard**	**volume / cm^3**
C	3% copper sulfate solution	harmful irritant	25
H	hydrogen peroxide solution	harmful irritant	50
W	distilled water	none	50
Y	yeast suspension	low	20

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You are required to make a serial dilution of 3% copper sulfate solution, **C** which reduces the concentration of **C** by a factor of ten between each successive dilution.

You will need to make up 10 cm^3 of each concentration of solution **C**.

(a) (i) Complete Fig. 1.1 to show how you will make **two** further concentrations of **C**, starting with the 3% solution, **C**.

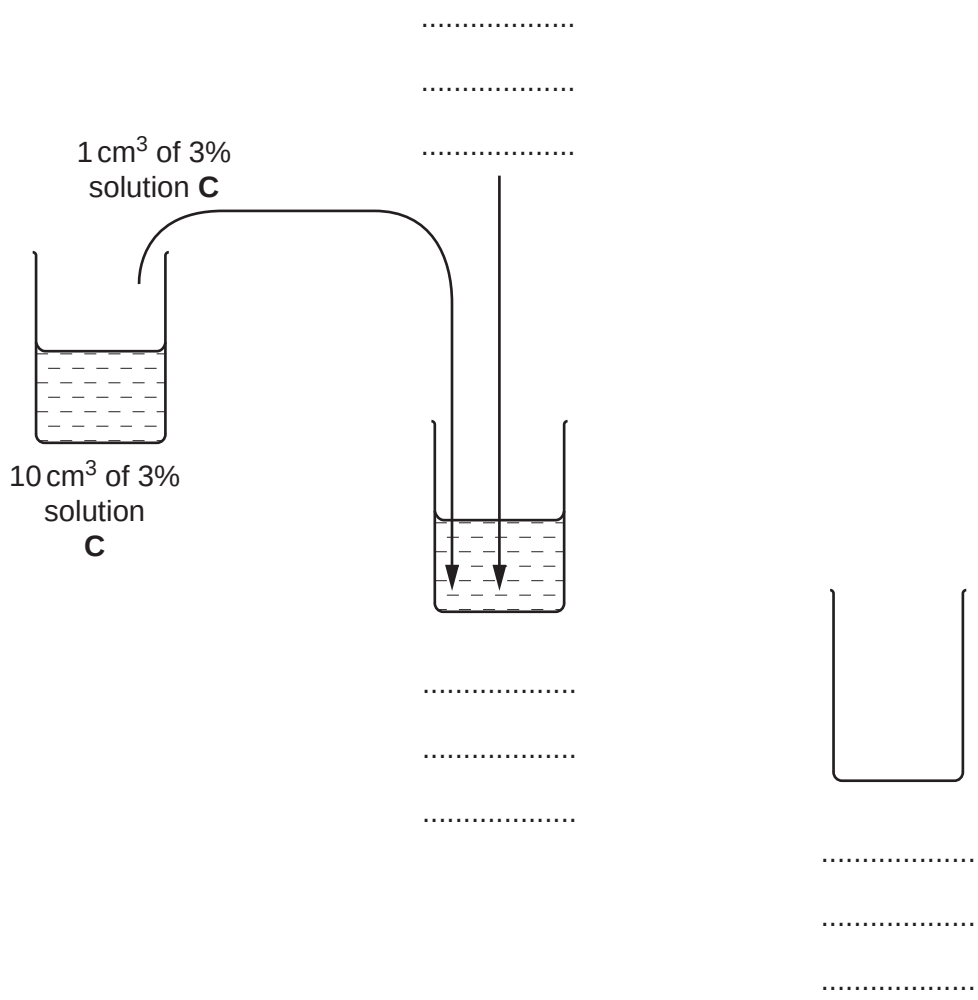


Fig. 1.1

[3]

Proceed as follows:

1. Make the concentrations of **C** as stated in **(a)(i)**.
2. Label test-tubes with **W** and with the concentrations of **C**.
3. Put 1 cm^3 of **W** into the test-tube labelled **W** and put 5 cm^3 of **H** into the same test-tube. Mix well.
4. Put a thermometer into the contents of the test-tube. Record the temperature.
5. Stir **Y** and put 1 cm^3 of **Y** into the same test-tube. Mix well.
6. Start timing and record the temperature of the contents of the test-tube every 30 seconds up to 210 seconds.

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7. Repeat steps 3 to 6 replacing the 1 cm^3 of **W** with 1 cm^3 of the lowest concentration of **C**.

8. Repeat step 7 with the other concentrations of **C**.

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

[5]

(iii) Explain the effect of the 3% copper sulfate solution on the enzyme-catalysed reaction.

.....

.....

.....[1]

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

.....

.....

.....

.....

.....[2]

For Examiner's Use

(v) Describe **three** modifications to this investigation which would improve the confidence in your results.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(vi) Describe how you would set up a control for this investigation.

.....

..... [1]

(vii) State the value of the smallest division on the scale of your thermometer.

smallest division .....

State the actual error in measuring a temperature of 30 °C using this thermometer.

30 °C ± ..... °C
[1]

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[Turn over

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In a similar investigation, a student investigated how changing the concentration of catalase solution (independent variable) affected the hydrolysis of hydrogen peroxide.

The student stopped the reaction after one minute by adding a high concentration of sodium azide.

A dye was added which reacted with the hydrogen peroxide that had not been hydrolysed. This produced different intensities of colour depending on the quantity of the remaining hydrogen peroxide in the solution.

A colorimeter was used to measure the absorbance of light by the coloured solution.

Other variables were considered and kept to a standard.

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

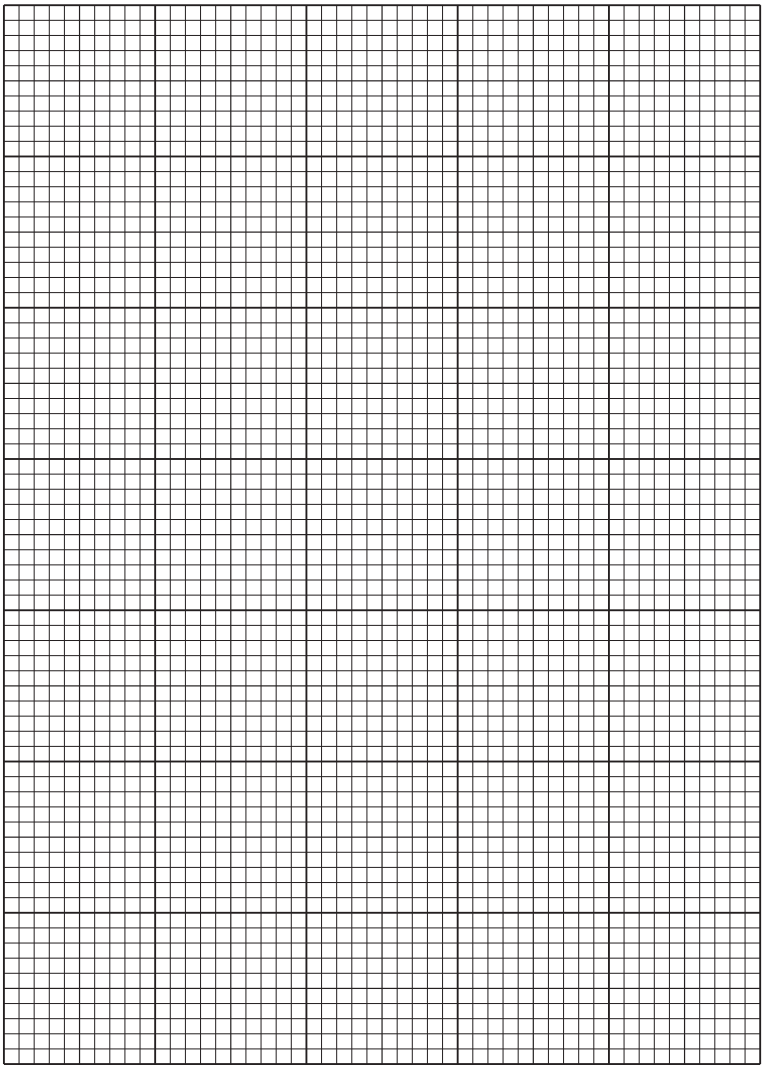
Table 1.1

concentration of catalase solution / arbitrary units	**absorbance of light by the coloured solution / arbitrary units**
10	1.34
14	1.12
30	0.66
50	0.04
100	0.02

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

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[4]

(ii) Explain the relationship between the concentration of catalase solution and the hydrolysis of hydrogen peroxide.

.....

.....

.....

.....

.....[2]

[Total: 22]

For Examiner's Use

2 **L1** is a slide of a transverse section showing a tubular part of the digestive system of a mammal.

You are not expected to have studied this material.

(a) Draw a large plan diagram showing only the features of the wall of the tube as in the sector shaded in Fig. 2.1.

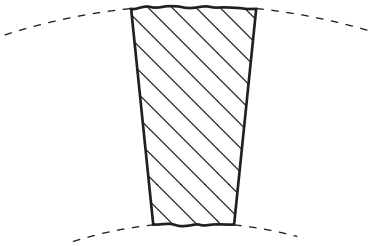


Fig. 2.1

On your diagram, use a label line and label to show the position of the lumen.

Annotate your diagram to describe one difference between the innermost layer and outermost layer.

[5]

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Fig. 2.2 shows a diagram of a view of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

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One division, on either the stage micrometer scale or the eyepiece graticule, is the distance between two adjacent lines.

The length of one division on this stage micrometer is **0.1 mm**.

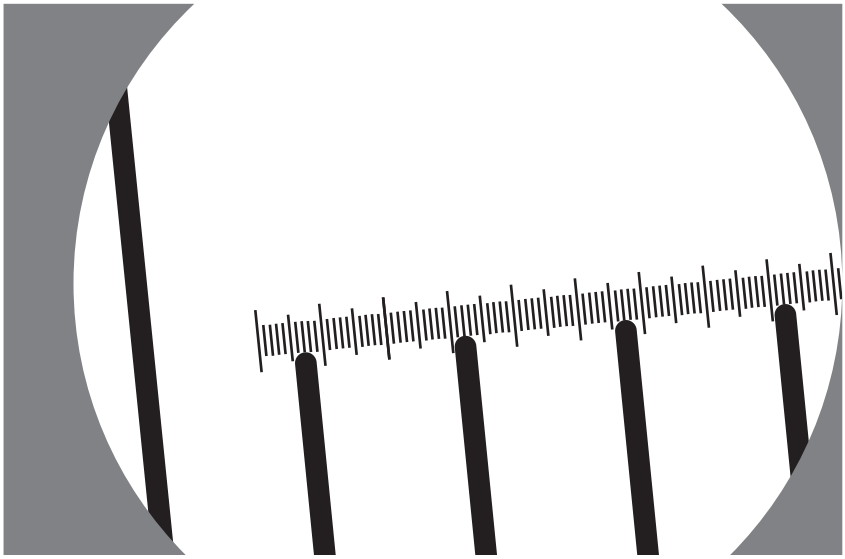


Fig. 2.2

(b) (i) Using this stage micrometer, where one division is **0.1 mm**, calculate the actual length of one eyepiece graticule unit using Fig. 2.2 by completing Fig. 2.3.

Step 1

1 eyepiece graticule unit = [ ] divided by [ ] = ... mm

Step 2

Convert the answer to a measurement with the unit most suitable for use in light microscopy.

[ ] multiplied by [ ] = ...

Fig. 2.3

[3]

Fig. 2.4 is a photomicrograph showing a transverse section through a part of the specimen on slide **L1**.

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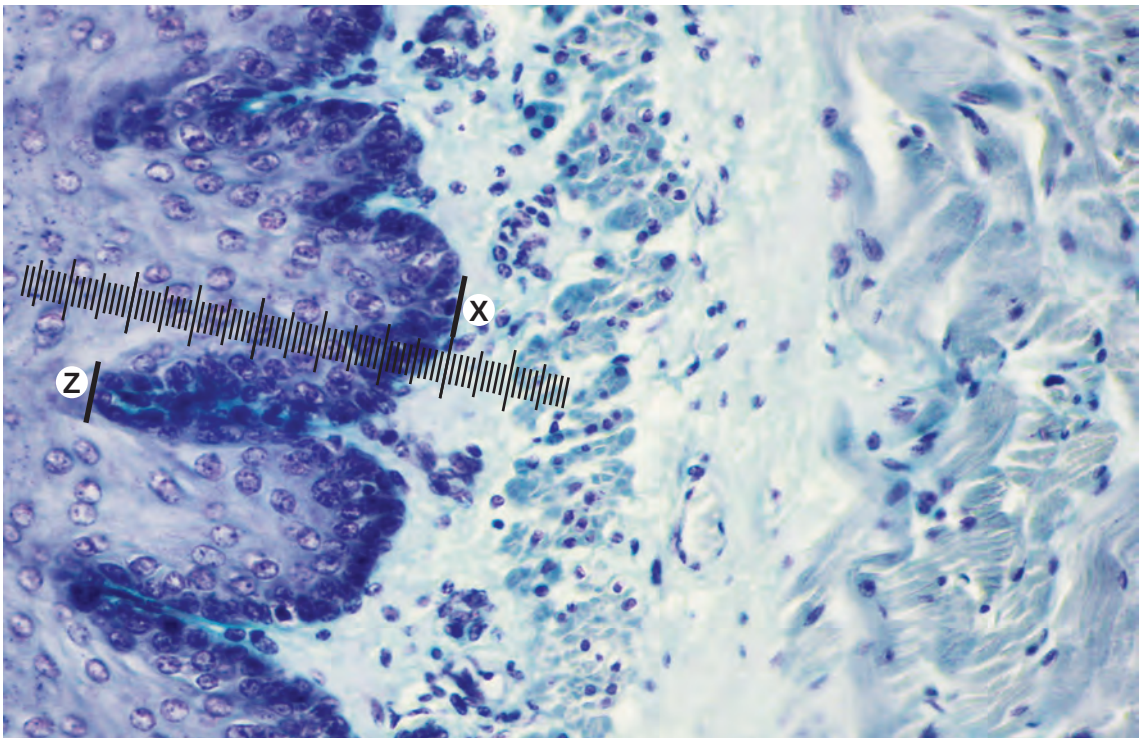


Fig. 2.4

(ii) Fig. 2.4 shows a photomicrograph taken using the same microscope with the same lenses as Fig. 2.2.
Use the calibration of the eyepiece graticule unit from **(b)(i)** and Fig. 2.4 to calculate the actual length of the fold shown by **X** to **Z**.

You will lose marks if you do not show all the steps in your calculation and do not use the appropriate units.

[2]

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Fig. 2.5 is a photomicrograph showing a transverse section through a part of the specimen on slide L1.

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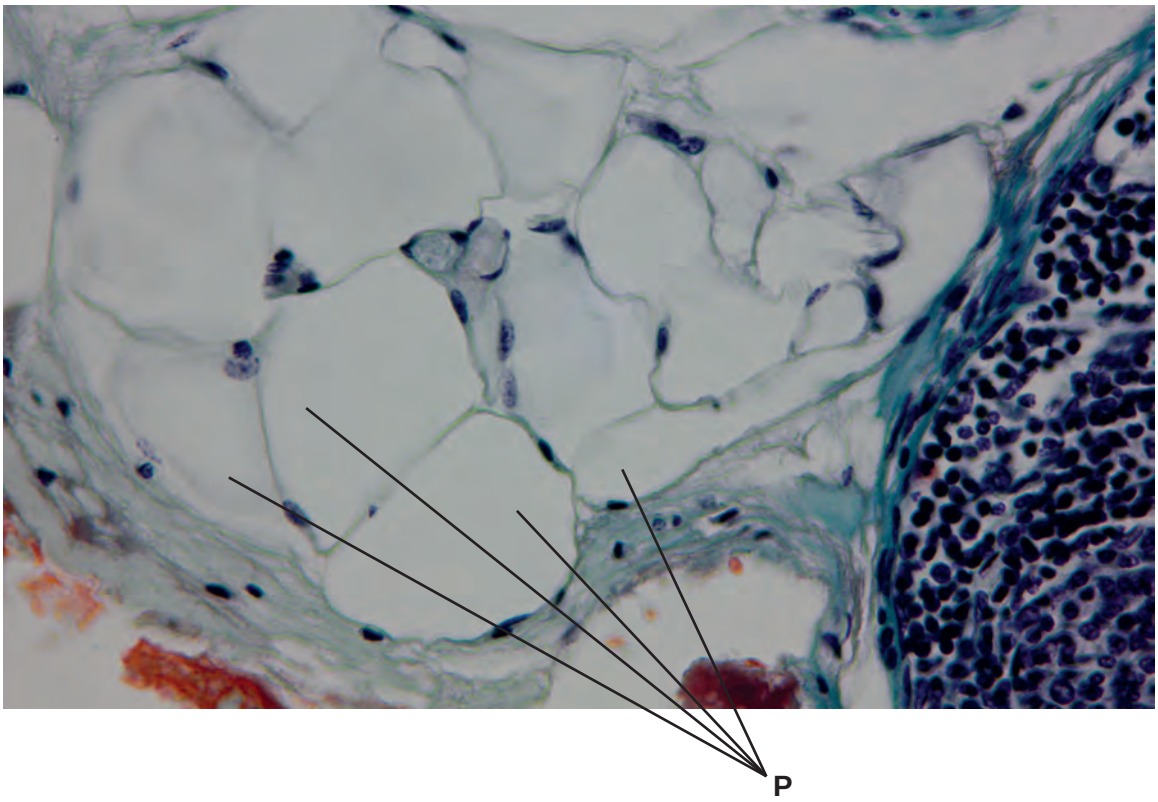


Fig. 2.5

(c) Make a large drawing of the four cells, labelled **P**, on Fig. 2.5.

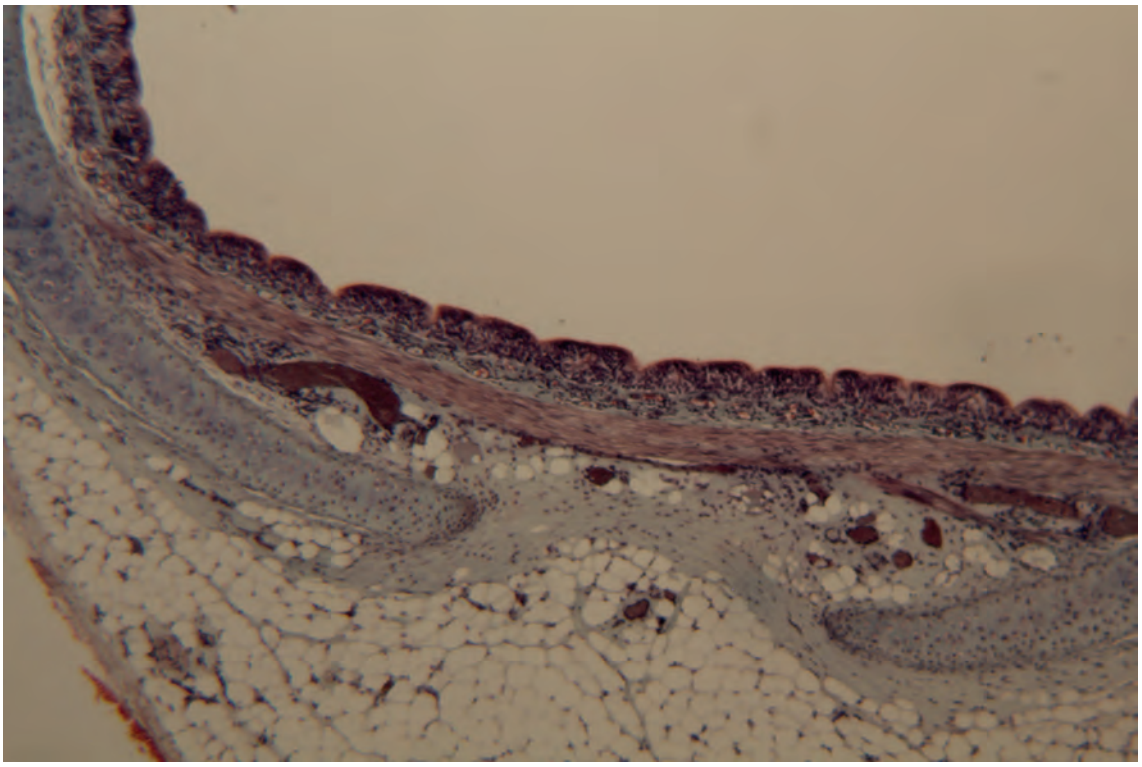
On your drawing, use a label line and label to show one nucleus.

[4]

Question 2 continues on page 12

Fig. 2.6 is a photomicrograph showing a transverse section through a different organ in the same mammal.

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×40

Fig. 2.6

(d) Prepare the space below so that it is suitable for you to record **two** observable differences between the specimen on slide **L1** and in Fig. 2.6.

[4]

[Total: 18]

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5675259084

BIOLOGY **9700/36**

Advanced Practical Skills 2 **October/November 2012**

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

Answer **both** questions.
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.

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1	
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Total	

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You are reminded that you have **only one hour** for each question in the practical examination.

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You should:

- read carefully through **the whole** of Question 1 and Question 2
- plan your use of **the time** to make sure that you finish all the work that you would like to do.

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

1 You are required to investigate the effect of surface area (independent variable) on the diffusion of solution **E** into agar blocks with different surface areas.

- agar block, **S**, contains starch which has been stained blue by iodine solution
- agar block, **U**, contains starch only

As solution **E** diffuses into the agar block it hydrolyses (breaks down) the starch and the iodine loses its colour.

You are provided with:

labelled	contents	hazard
S	agar block containing starch and iodine	irritant
U	agar block containing starch only	none
W	distilled water	none
E	solution of **E**	irritant

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You will need to cut three different sizes of agar block from each of the large agar blocks (block **S** and block **U**).

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Fig. 1.1 shows you the measurements of the **largest** size of block you will cut (block 1).

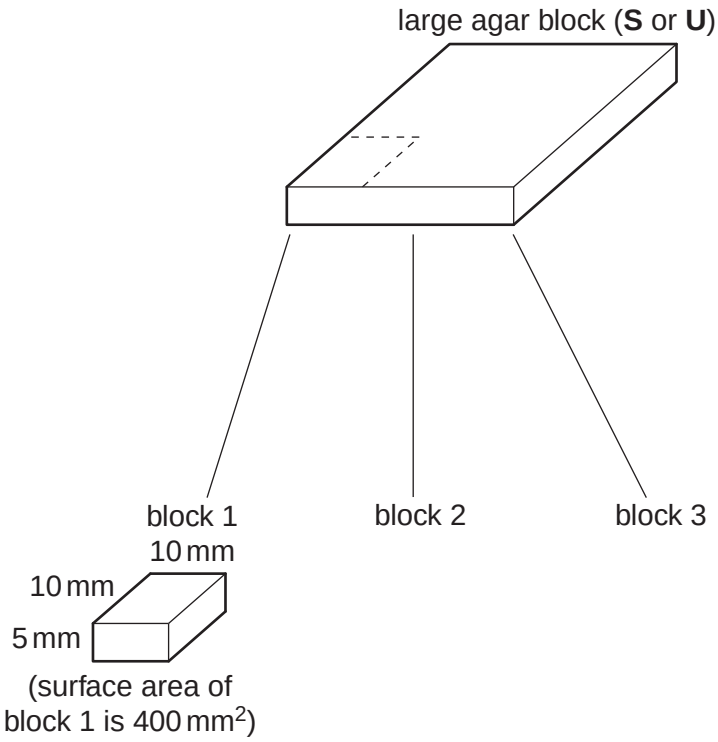


Fig. 1.1

You may use the space on Fig. 1.1 to work out how to cut the two further sizes of blocks, **smaller** than block 1, with different surface areas (blocks 2 and 3).

(a) (i) Complete Table 1.1.

Table 1.1

block	width measurement / mm	length measurement / mm	depth measurement / mm	surface area / mm^2
1	10	10	5	400
2			5	
3			5	

[3]

You must **not** touch the agar blocks with your hands.

You can use the mounted needle, blunt forceps and paper towel to handle the blocks.

Proceed as follows:

1. Prepare the different sized blocks 1, 2 and 3 as you decided in **(a)(i)** so that you have one stained and one unstained block of each size.

2. Cover the blocks with damp paper towel to prevent evaporation.

3. Put the beaker or container provided on to a piece of black card and put hot water between 50 °C and 55 °C into the beaker.

4. Put 5 cm^3 of solution **E** into six test-tubes and put them into the water-bath. Leave for 5 minutes.

5. Use a mounted needle to put block 1 from **S** and block 1 from **U** into two separate test-tubes in the water-bath as shown in Fig. 1.2. Be careful not to break up the blocks as you lower them into the solution **E**.

   Start timing.

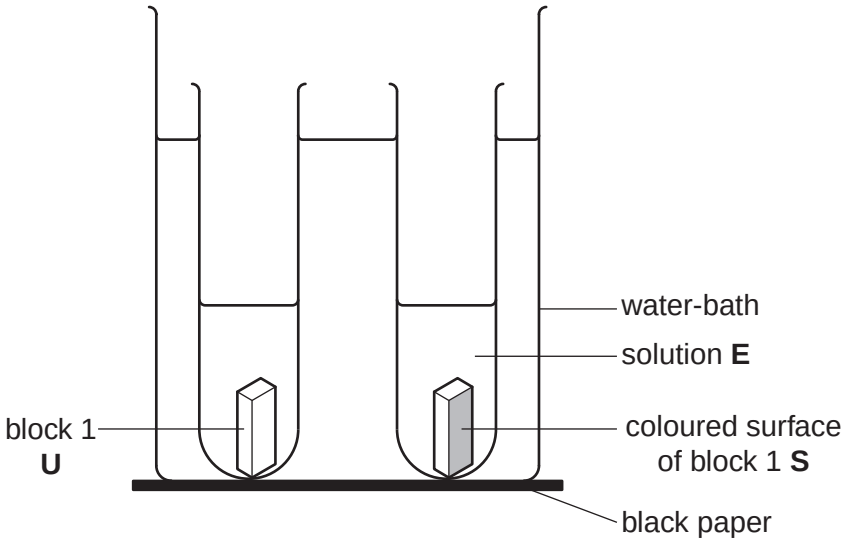


Fig. 1.2

6. Observe the coloured surface of the block from **S**. Record the time taken for the colour to disappear. Use block **U** as a standard colour. If the colour does not disappear by 360 seconds, record 'more than 360'.

7. Repeat steps 5 and 6 with blocks 2 and 3 from **S** and **U**.

8. Record the temperature of the water in the water-bath.

temperature of water ..... °C

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

For Examiner's Use

[5]

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

.....

.....

.....

.....[2]

(iv) Describe **three** modifications to this investigation which would improve the confidence in your results.

.....

.....

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.....

.....

.....

.....[3]

A student investigated the time course of an enzyme-catalysed reaction using the hydrolysis of starch by an enzyme.

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Fig. 1.3 shows the apparatus used.

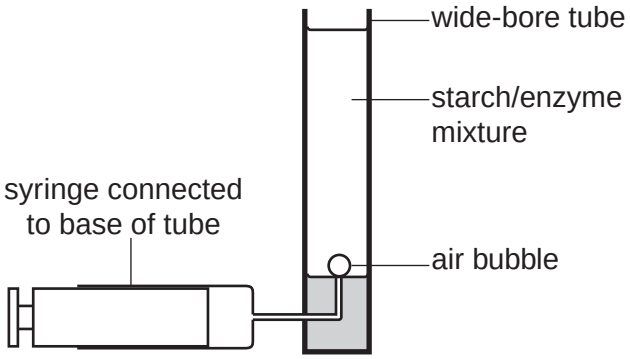


Fig. 1.3

To measure the progress of the enzyme-catalysed reaction a bubble was released into the mixture. As the concentration of starch decreases the bubble rises faster.

Other variables were considered and kept to a standard.

The data from the student's investigation are shown in Table 1.2.

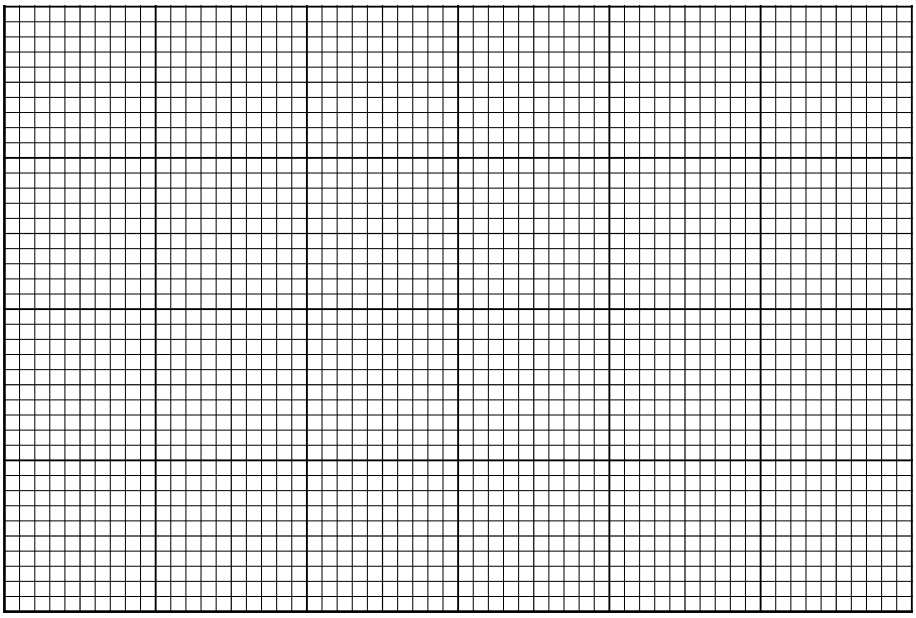
Table 1.2

time when bubble is released / s	speed of the bubble / cm s^{-1}
7	3.4
12	4.0
20	6.0
25	7.8
30	7.9

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(b) (i) Plot a graph of the data shown in Table 1.2.

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[4]

(ii) If a bubble was released at 10 seconds, use your graph to estimate the speed of the bubble.

Show on the graph how you estimated the speed of the bubble.

speed of bubble .....
[2]

(iii) Explain the reason for the results:

between 12 seconds and 17 seconds

.....

.....

.....

between 25 seconds and 30 seconds.

.....

.....

.....

.....

.....[3]

[Total: 22]

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

For Examiner's Use

(a) **(i)** Draw a large plan diagram of a sector of the organ, as shown by the shaded area in Fig. 2.1, to include one complete vascular bundle.

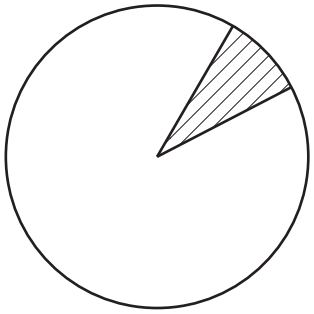


Fig. 2.1

On your diagram, use a label line and label to show the phloem.

[5]

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(ii) From the specimen on **N1**, choose one group made up of two large xylem vessels and the smaller xylem cells between them.

Make a large drawing of this group.

On your drawing, use a label line and label to show a lumen.

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[4]

Fig. 2.2 is a photomicrograph showing a longitudinal section of a root from a different plant species.

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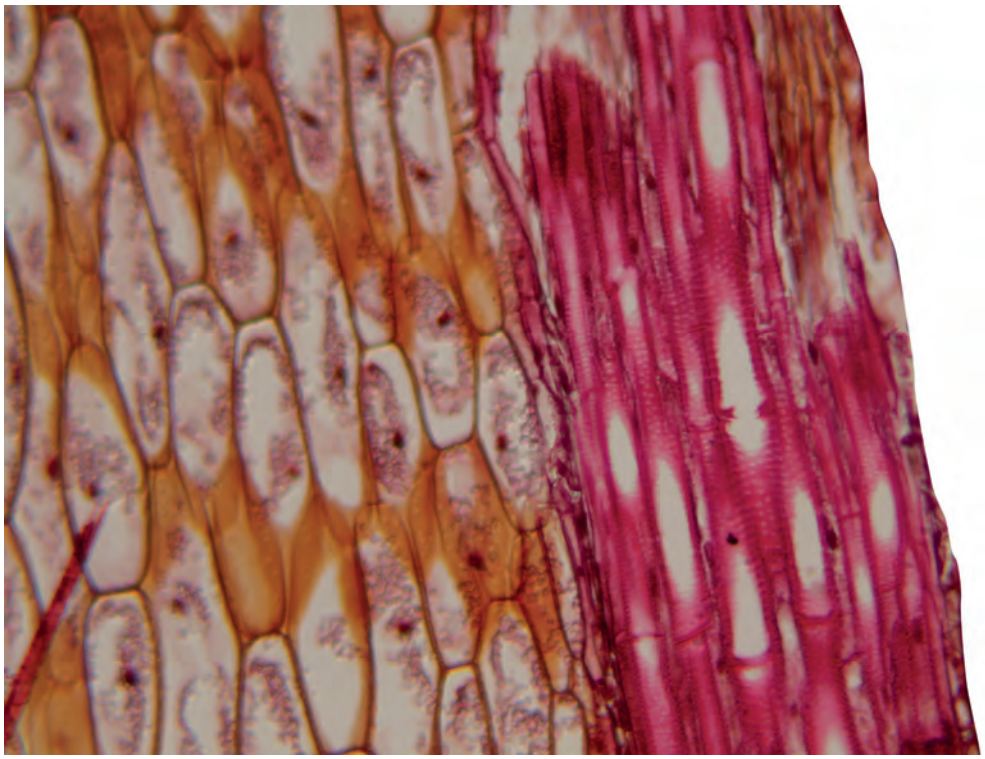


Fig. 2.2

(b) (i) Calculate the ratio of the mean length to the mean width of cells in the cortex.

[4]

(ii) Prepare the space below so that it is suitable for you to record observable differences between the cortex and xylem tissues in Fig. 2.2.

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[5]

[Total: 18]

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