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

CANDIDATE NAME	
CENTRE NUMBER	
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T9T898973 9

BIOLOGY **9700/31**

Advanced Practical Skills 1 **May/June 2011**

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.
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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 each question.
- 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 Enzyme **E** catalyses the hydrolysis of starch to glucose.
The end-point of the reaction can be found by measuring the time taken for all the starch to be hydrolysed.

You are required to investigate the effect of the independent variable, copper sulfate concentration, on enzyme **E**.

You are provided with:

labelled	contents	hazard	concentration / %	volume / cm^3
E	amylase solution	irritant	1	10
S	starch solution	none	1	50
C	copper sulfate solution	harmful irritant	0.03	20
W	distilled water	none	–	100
iodine	iodine in potassium iodide solution	irritant	–	50

Copper sulfate can inhibit enzyme **E**.
The extent of inhibition depends on the concentration of the copper sulfate solution. A student investigated the inhibition of enzyme **E** at concentrations of copper sulfate solution greater than 0.03% and found that the enzyme was completely inhibited.

The student suggested the hypothesis:

concentrations of copper sulfate solution below 0.03% will continue to inhibit the enzyme.

You are required to investigate this hypothesis by carrying out a serial dilution of copper sulfate solution which reduces the concentration by ten-fold between each successive dilution.

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Fig. 1.1 shows how to make the first concentration of 0.003% copper sulfate solution.

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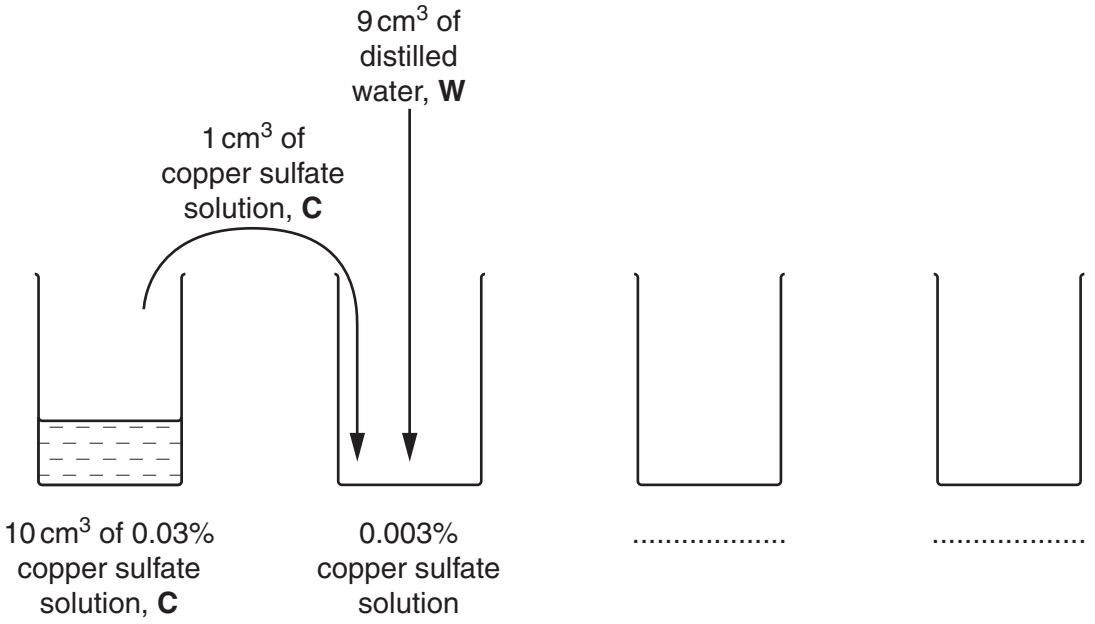


Fig. 1.1

(a) (i) Complete Fig. 1.1 to show how you will make **two** further concentrations of copper sulfate solution. [3]

Proceed as follows:

1. Prepare the concentrations of copper sulfate solution as shown in Fig. 1.1 in the containers provided. Use the syringe labelled '**For copper sulfate**'.

2. Label test-tubes with the concentrations of copper sulfate solutions and label another test-tube **W**.

3. Wipe the tile clean with a damp paper towel and then dry the tile. Label the tile, as shown in Fig. 1.2. The numbers indicate the sampling times in seconds.

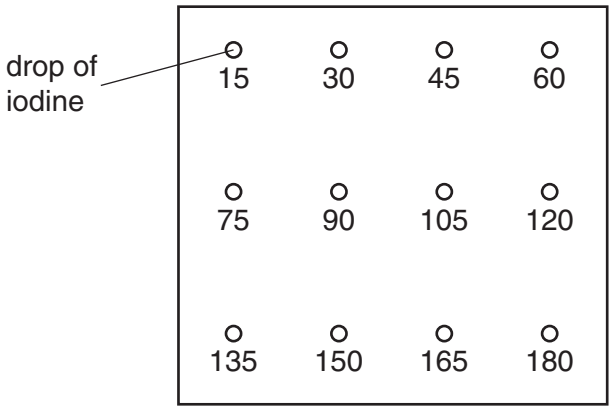


Fig. 1.2

4. Put one drop of **iodine** on the tile at each sampling time, as shown in Fig. 1.2.

5. Put 1 cm^3 of **W** into the labelled test-tube.

6. Put 3 cm^3 of **S** into the same test-tube. Mix well.

7. Put 0.5 cm^3 of **E** into the same test-tube. Mix and start timing.

8. Use a glass rod to stir the mixture.

9. After 15 seconds use the glass rod to transfer a drop of the mixture to the **iodine** drop, labelled 15, on the tile.

10. Immediately clean the glass rod with a paper towel.

11. Repeat steps **8** to **10** at 15 second intervals until the **iodine** drop does not change colour. If the **iodine** drop changes colour at 180 seconds, record 'more than 180' as your result (for step 12).

12. Record the time taken to reach the end-point.

13. Repeat steps **3** to **12** replacing the 1 cm^3 of **W** with 1 cm^3 of the **lowest** concentration of copper sulfate solution.

14. Repeat step **13** with the other concentrations of copper sulfate solution.

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

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[5]

(iii) The student's hypothesis stated that "concentrations of copper sulfate solution below 0.03% will continue to inhibit the enzyme".

Explain how your results provide evidence for the support or the rejection of this hypothesis.

.....

.....

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.....

..... [2]

For Examiner's Use

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

.....

..... [1]

(v) A colorimeter could have been used to determine the end-point.
Describe **three** other modifications to this investigation which would improve the confidence in your results.

.....

.....

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.....

.....

..... [3]

Table 1.1 shows the results of an investigation into the effect of the concentration of copper sulfate solution on a protein suspension. A protein suspension was mixed with different concentrations of copper sulfate solution.
After a set time, the percentage absorbance of light was measured using a colorimeter.

Table 1.1

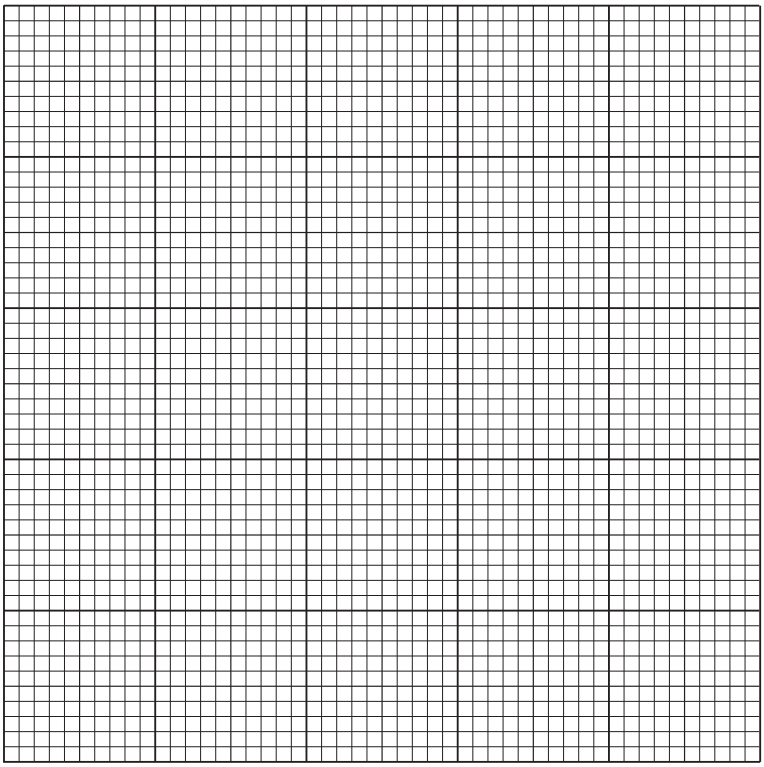
copper sulfate concentration / mol dm^{-3} × 10^{-3}	absorbance of light by protein suspension / %					
	trial 1	trial 2	trial 3	trial 4	trial 5	mean
25.0	100	99	100	99	100	100
12.5	97	95	80	97	94	96
5.5	78	81	79	82	80	80
3.5	84	59	58	58	62	
1.5	9	11	10	9	8	9

(b) (i) Draw a circle around each of the anomalous results **and** complete the table. [2]

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

For Examiner's Use



[4]

(iii) Explain the effect of copper sulfate solution on the protein suspension.

.....

.....

.....

.....

..... [2]

[Total: 22]

2 **J1** is a slide of a stained transverse section through a leaf.

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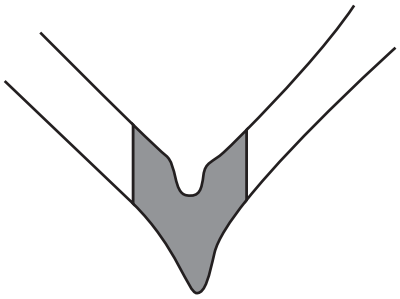


Fig. 2.1

(a) Draw a large plan diagram of the part of the leaf indicated by the shaded area in Fig. 2.1.

Label the xylem and an air space.

[5]

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(b) Make a large drawing of six cells from the part of the leaf indicated by the shaded area in Fig. 2.2.

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The cells should be two adjacent (touching) cells from the epidermis and two adjacent cells from each of the next two layers.

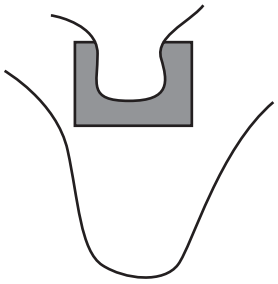


Fig. 2.2

Label one epidermal cell.

[5]

Fig. 2.3 is a photomicrograph of a transverse section through a leaf of a different plant species.

For Examiner's Use



Fig. 2.3

(c) The actual length of line **Y** is 785 μm.
Use this measurement to calculate the magnification of Fig. 2.3.

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

magnification × .....[3]

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(d) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on **J1** and in Fig. 2.3.

Record your observations in the space you have prepared.

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[5]

[Total: 18]

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CANDIDATE NAME									
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5697327874

BIOLOGY **9700/32**

Advanced Practical Skills 2 **May/June 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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You are reminded that you have **two hours** to complete questions 1, 2 and 3.
It is expected that each question will take you approximately **40 minutes**.

Question 2 does not require any apparatus or the use of a microscope. You should **plan your work** so that you complete this question whenever you have spare time.

You may start with **either** Question 1 **or** Question 3, which require the use of apparatus or a microscope.
At the start of the second hour, you should begin the work for the other question, **either** Question 1 **or** Question 3.

You should:

- Read carefully through **the whole** of each question.
- 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 Doctors use the analysis of urine to help diagnose some medical conditions. One such medical condition is diabetes which results in glucose being released in urine if the condition is untreated.

You are provided with:

labelled	contents	hazard	concentration / %	volume / cm^3
G	glucose solution	none	4	30
S1	unknown glucose concentration representing urine	none	–	15
S2	unknown glucose concentration representing urine	none	–	15
W	distilled water	none	–	100
Benedict's solution	Benedict's solution	harmful irritant	–	50

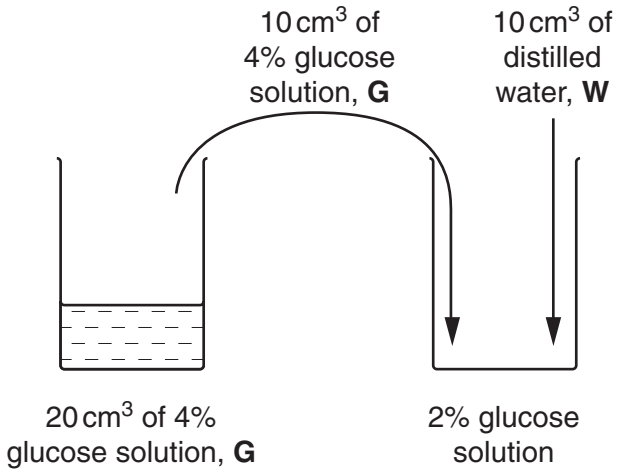
You are required to find the glucose concentrations of solutions **S1** and **S2**.

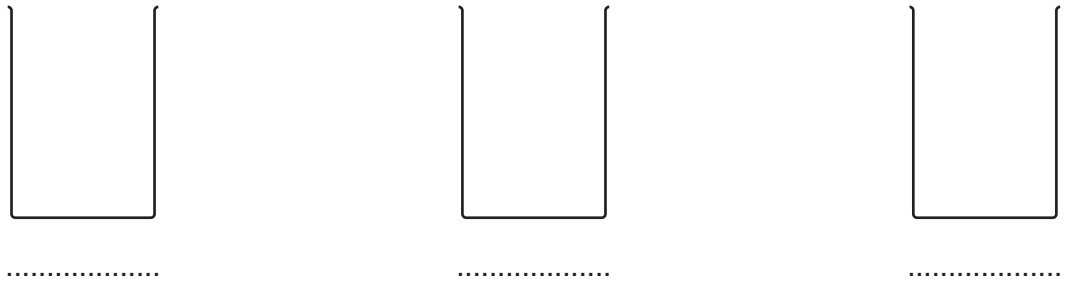
You are required to carry out a serial dilution of glucose solution, **G**, to reduce the concentration of the glucose solution by half between each successive dilution.

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Fig. 1.1 shows how to make the first concentration of 2% glucose solution.

For Examiner's Use





....

Fig. 1.1

(a) (i) Complete Fig. 1.1 to show how you will make **three** further concentrations of glucose solution, **G**. [3]

(ii) Complete Table 1.1 to show the volumes of solutions you intend to use in your investigation.

Table 1.1

solution	**volume / cm^3**
Benedict's	
each concentration of **G**	
S1	
S2	

[2]

Proceed as follows:

For Examiner's Use

1. Prepare the dilutions of **G** as shown in Fig. 1.1 in the containers provided.

2. Label test-tubes with the concentrations of **G**.

3. Label test-tubes **S1** and **S2**.

4. Set up a water-bath and, testing each test-tube separately, test all the concentrations of **G** and the solutions **S1** and **S2** for the presence of glucose. Start timing when the test-tube is placed into the hot water-bath. If there is no colour change after 300 seconds, record 'more than 300' as your result (for step 5).

5. Observe the test-tube very carefully for the first sign of a colour change. This is the end-point of the reaction. **As soon as you see this colour change**, record the time taken for the reaction to reach the end-point.

(b) (i) State **one** variable, other than the volume of each solution, which needs to be kept the same in this investigation. Describe how you will keep this variable the same.

.....

.....

..... [1]

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

[4]

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(c) (i) Estimate the concentration of glucose in solutions **S1** and in **S2**.

For Examiner's Use

S1 .....

S2 ..... [1]

(ii) State which solution, **S1** or **S2**, is most likely to be from an untreated diabetic.

untreated diabetic ..... [1]

[Total: 12]

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Question 2 starts on page 7

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2 The diameter of a tube, which carries urine in a mammal, was measured at different distances along its length. The diameter of the tube was found to vary along its length.

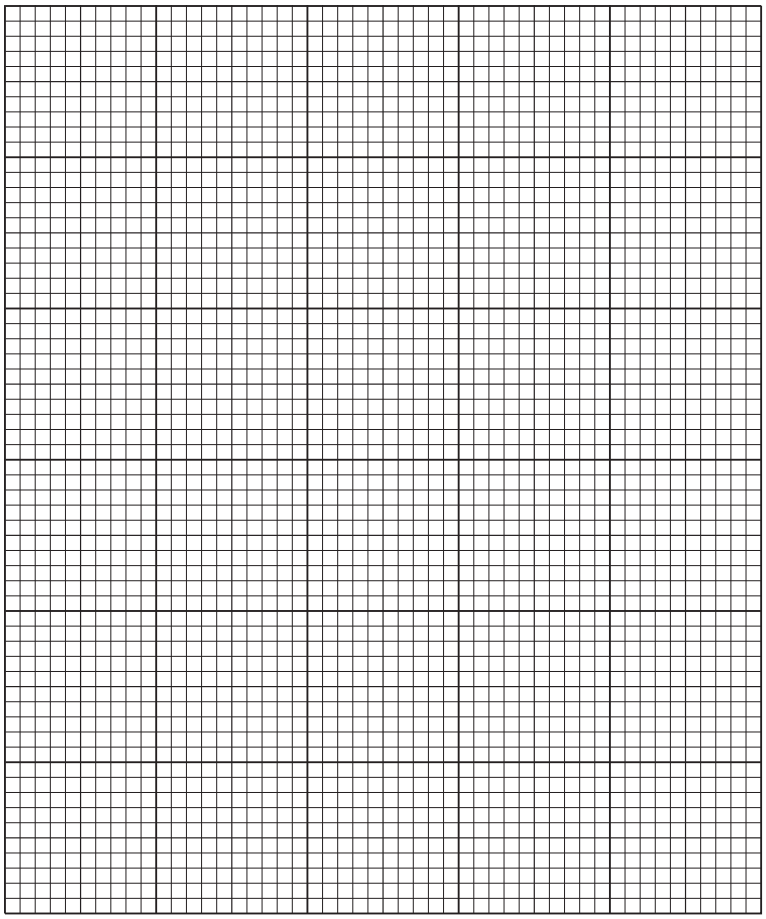
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The results are shown in Table 2.1.

Table 2.1

distance along the tube / cm	diameter of the tube / mm
0.5	1.8
4.5	2.4
12.5	3.8
20.0	5.1
24.0	5.8

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



[4]

Fig. 2.1 is a photomicrograph of the transverse section through this tube.

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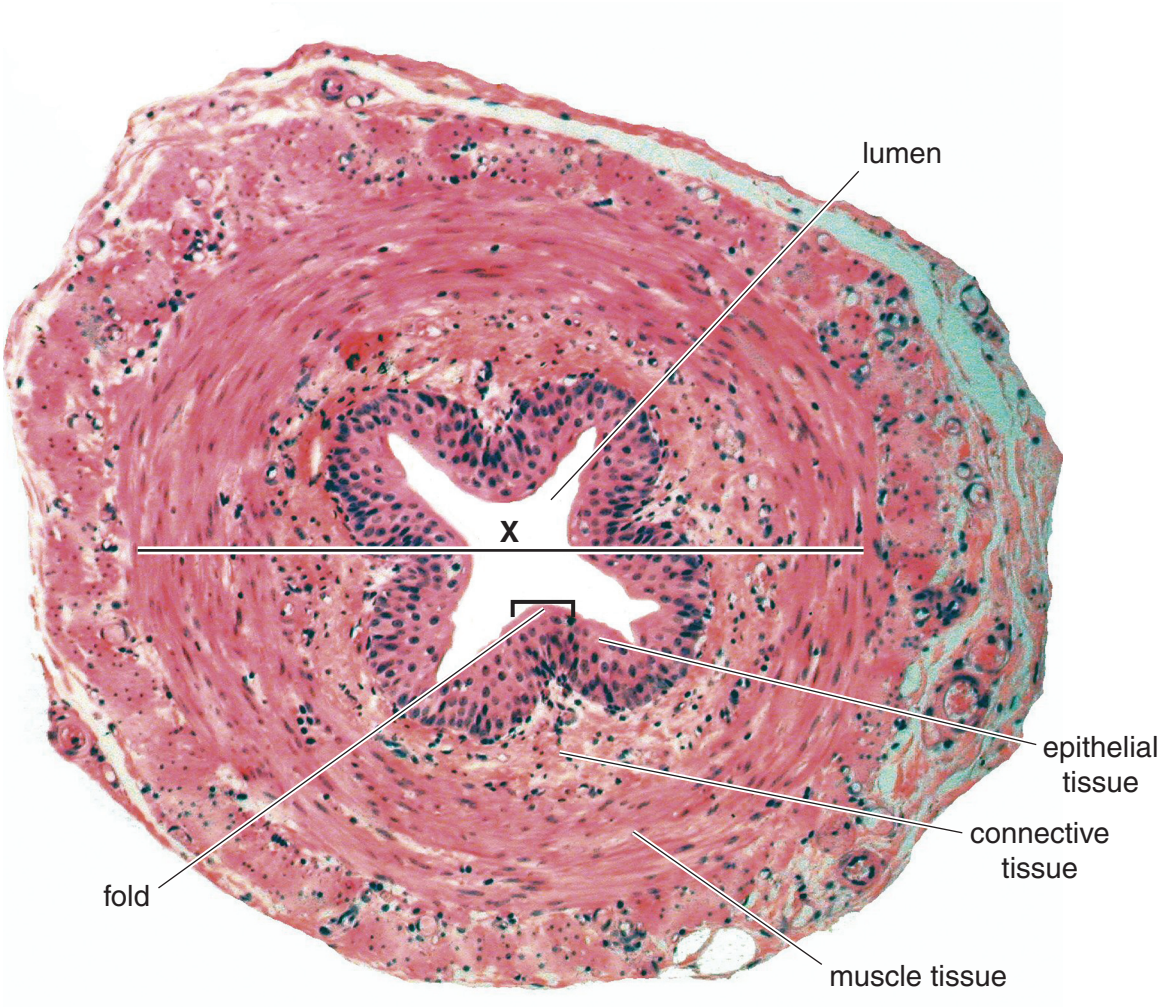


Fig. 2.1 magnification × 22

(b) (i) Calculate the actual diameter of the tube shown by line **X** in Fig. 2.1.

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

[4]

(ii) Use the actual diameter of the tube calculated in **(ii)** and your graph in **(a)(i)** to estimate the distance along the length of the tube, where the section was cut.

.....[1]

(iii) Describe how you would find the **mean** diameter of the tube shown in Fig. 2.1.

.....

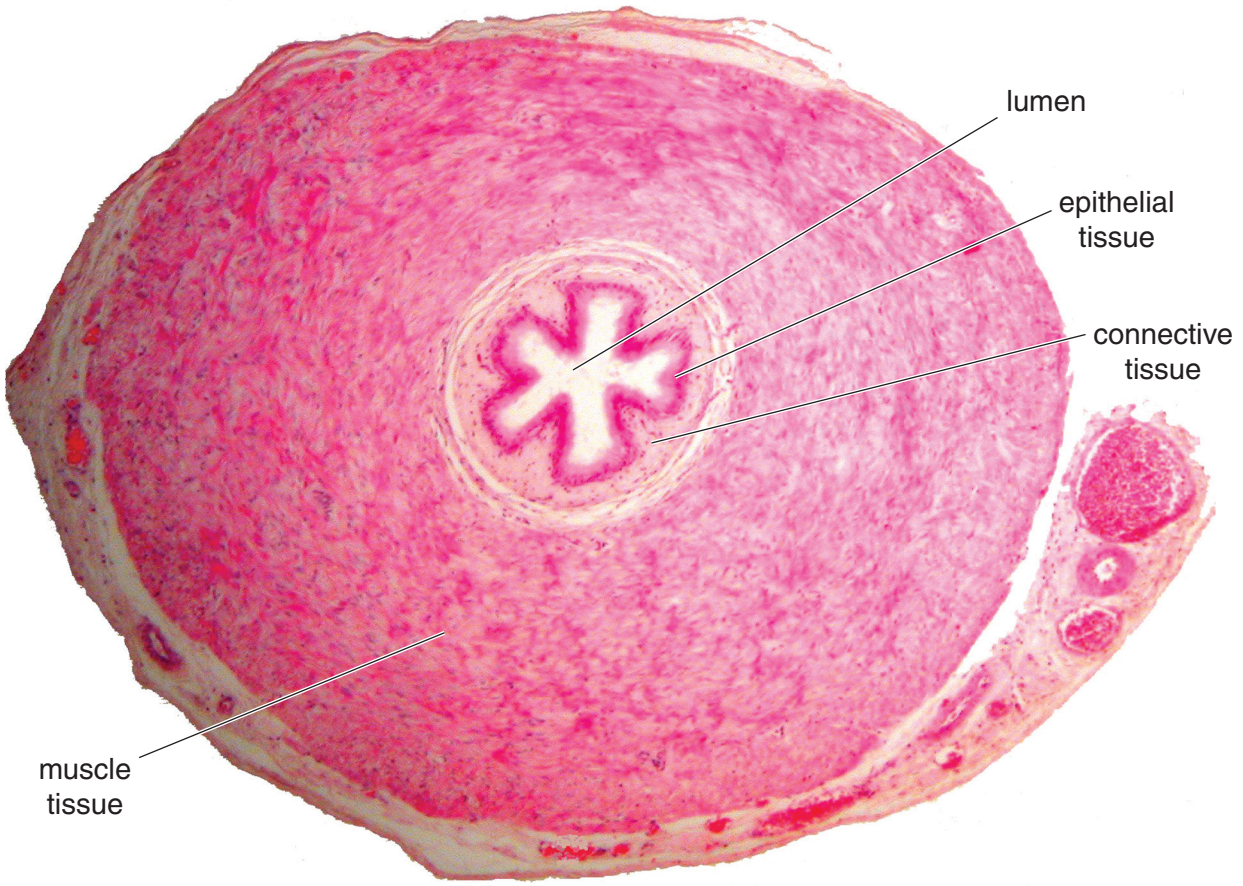
.....

.....[2]

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Fig. 2.2 is a photomicrograph of a transverse section of a different tube from a mammal.

For Examiner's Use



magnification × 90

Fig. 2.2

(iv) Prepare the space below so that it is suitable for you to record the observable differences between the specimens in Fig. 2.1 and in Fig. 2.2.

Record your observations in the space you have prepared.

[5]

[Total: 16]

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

For Examiner's Use

(a) **(i)** Draw a large plan diagram of the whole of the transverse section.

Label the epidermis and xylem.

[5]

(ii) Calculate the ratio of the total diameter of the stem to the diameter of the central pith.

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

[1]

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(b) (i) State one observable feature of the epidermis that supports the conclusion that this is a stem from a plant growing in a dry habitat.

For Examiner's Use

Explain how this feature reduces water loss.

feature .....

explanation .....

.....

.....[1]

(ii) Make a large drawing of three adjacent (touching) cells from the central pith.

Label the cell wall.

[5]

[Total: 12]

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3957864060

BIOLOGY **9700/33**

Advanced Practical Skills 1 **May/June 2011**

2 hours

Candidates answer on the Question Paper.

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

1 Urea reacts with water to form ammonium carbonate.

$$\text{urea} + \text{water} \longrightarrow \text{ammonium carbonate}$$

Enzyme **E** catalyses this reaction.

Aqueous ammonium carbonate produces ammonium ions. This forms an alkaline solution which causes red litmus paper to turn blue. This will be used to indicate the end-point of the reaction.

Animals release urea into the soil in urine and ammonium carbonate is produced as part of the nitrogen cycle.

You are provided with:

labelled	contents	hazard	concentration / %	volume / cm^3
E	urease solution	irritant	10	25
W	distilled water	none	–	100
U	urea solution	none	–	25

labelled	contents	hazard	details	quantity
red litmus paper	–	–	total length of about 5 cm	1 strip

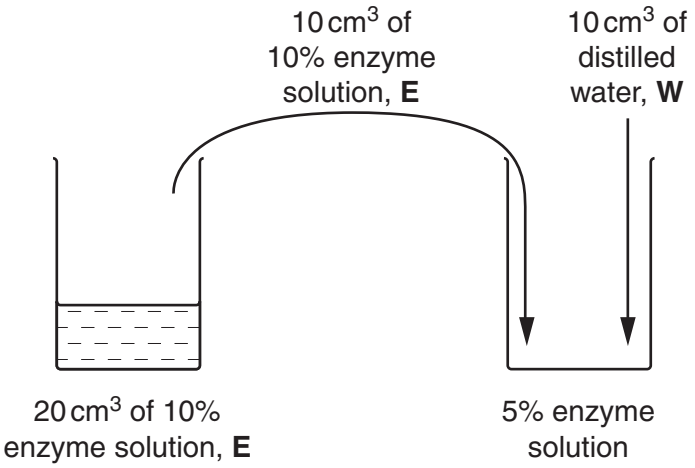
You are required to investigate the independent variable, enzyme **E** concentration on the formation of ammonium carbonate.

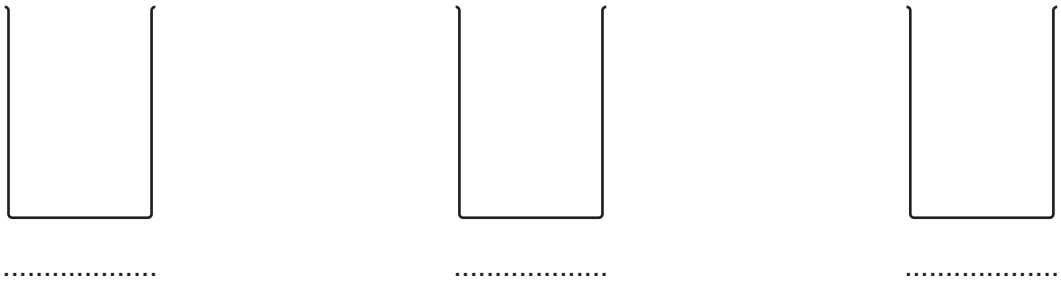
You are required to carry out a serial dilution of enzyme **E**, to reduce the concentration of the enzyme solution by half between each successive dilution.

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Fig. 1.1 shows how to make the first concentration of 5% enzyme **E** solution.

For Examiner's Use





....

Fig. 1.1

(a) (i) Complete Fig. 1.1 to show how you will make **three** further concentrations of enzyme **E** solution. [3]

As part of this investigation you are required to set up a suitable control.

(ii) Describe how you will set up this control using the apparatus provided.

.....

.....[1]

Proceed as follows:

For Examiner's Use

1. Prepare the concentrations of **E** as shown in Fig. 1.1 in the containers provided.

2. Label test-tubes with the concentrations of **E** and the **control**.

3. Cut the red litmus paper into lengths of 0.5 cm. Add one piece of litmus paper to each test-tube.

4. Put 2 cm^3 of **U** into each test-tube.

5. Put 2 cm^3 of the **lowest** concentration of **E** into the labelled test-tube and mix well.

6. Repeat step 5 with each of the other concentrations of **E** and the control. Immediately start timing.

7. Record the time taken for the first appearance of blue colour in each piece of litmus paper. This is the end-point of the reaction.
   If a piece of litmus paper does not reach the end-point in ten minutes, record 'more than 600' for that dilution as your result.

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

[5]

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(iv) Calculate the rate of reaction for the 10% **E** concentration.

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rate of reaction .....[1]

(v) Identify **one** significant error in your investigation.

.....

.....[1]

(vi) Suggest how you would make **two** improvements to this investigation.

.....

.....

.....

.....

.....[2]

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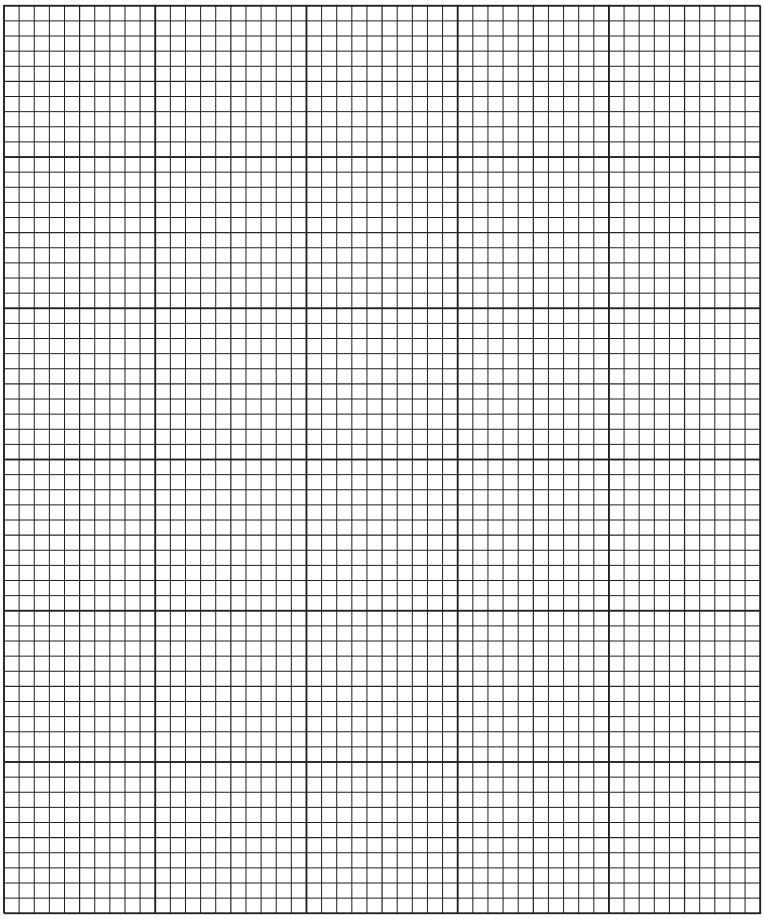
An investigation on global nitrogen fixation, from 1990 to 2000, studied the quantities of nitrogen fixed by different methods.

The results are shown in Table 1.1.

Table 1.1

method of fixation	example of method	nitrogen fixed / millions tonnes of nitrogen per year
industrial (I)	formation of nitrogen dioxide e.g. car engines	23
agricultural (A)	fixation by leguminous plants e.g. peas and beans	39
depositional (D)	fixation by lightning	54
natural (N)	fixation in any uncultivated areas e.g. lakes, woodlands, seas	108
fertiliser production (F)	production of inorganic fertilisers e.g. ammonium nitrate	77

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



[4]

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Natural fixation in the years 1840–1850 was 123 million tonnes per year.
Natural fixation in the years 1990–2000 was 108 million tonnes per year.

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(ii) Calculate the percentage decrease from 1840–1850 to 1990–2000.

You may lose marks if you do not show your working.

.....% [2]

(iii) Suggest **one** reason for the difference in the natural fixation between 1840–1850 and 1990–2000.

.....

.....

.....[1]

[Total: 20]

2 **K1** is a slide of a stained transverse section through a leaf.

For Examiner's Use

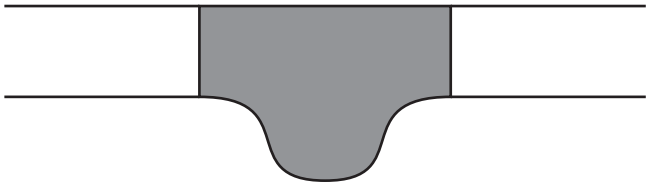


Fig. 2.1

(a) **(i)** Draw a large plan diagram of the part of the leaf indicated by the shaded area in Fig. 2.1.

Label the vascular bundle and the palisade layer.

[5]

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(ii) From **K1**, make a large drawing of one epidermal cell with one attached, whole trichome (hair).

Label the trichome (hair) and the epidermal cell.

[5]

(iii) State **two** observable features of **K1** which support the conclusion that this is a leaf from a plant growing in a dry habitat.
Explain how these features reduce water loss.

.....

.....

.....

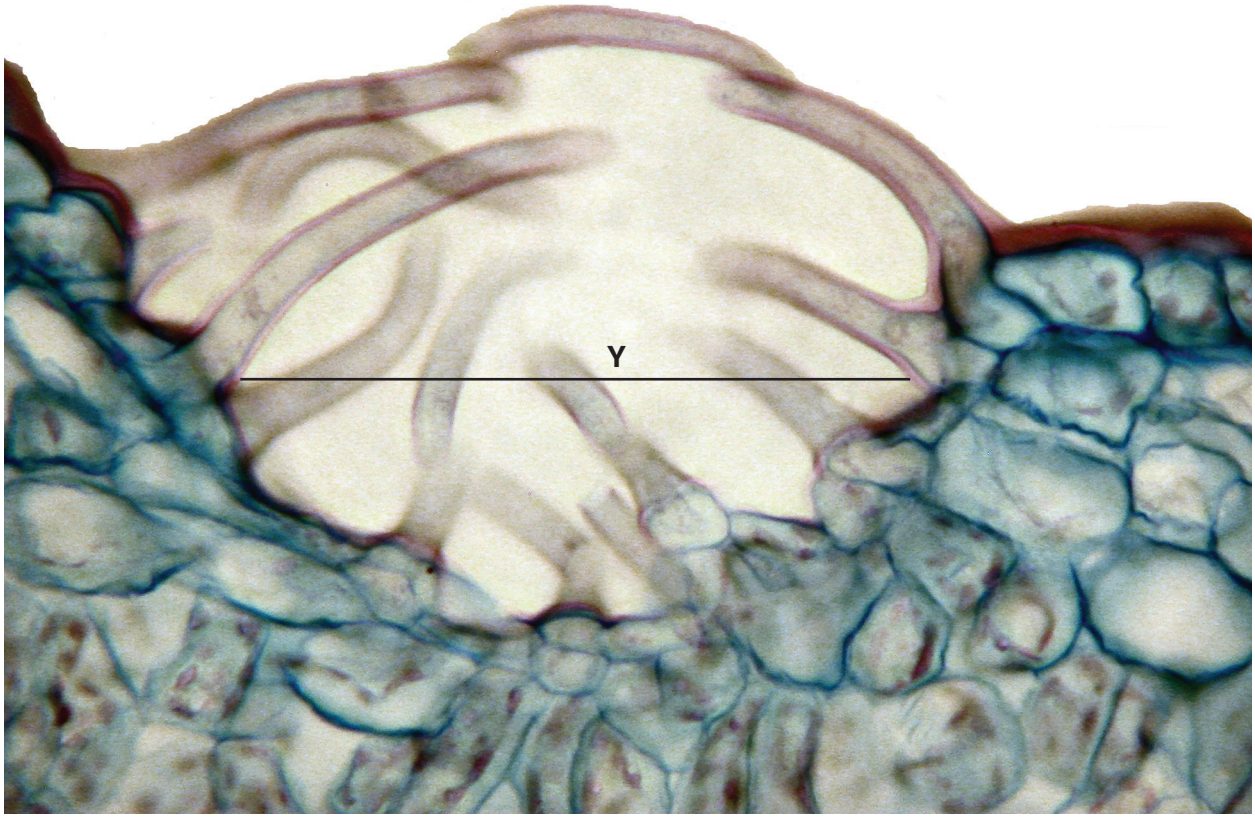
.....[2]

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[Turn over

Fig. 2.2 is a photomicrograph of a transverse section of a leaf from a different plant species.

For Examiner's Use



magnification × 350

Fig. 2.2

(b) (i) Use the magnification to calculate the **actual length** of line **Y** in μm.

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

.....μm [3]

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(ii) Prepare the space below so that it is suitable for you to record the observable similarities and differences between the specimens on **K1** and in Fig. 2.2.

For Examiner's Use

Record your observations in the space you have prepared.

[5]

[Total: 20]

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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				

1912382525

BIOLOGY **9700/34**

Advanced Practical Skills 2 **May/June 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

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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.
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1	
2	
Total	

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You should:

- Read carefully through **the whole** of each question.
- 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 In some countries, certain plants have seasonal growth. During the summer plants transport sucrose from the leaves to store it as starch in the roots.

Table 1.1 summarises the changes in the leaves and roots during the year.

Table 1.1

season	leaves	roots
summer	leaves synthesize sucrose	sucrose stored as starch
winter	no leaves	starch stored
spring	leaves growing	starch converted to glucose

You are required to identify the source of four plant extracts. These have been taken from

- a root in winter
- a root in spring
- phloem sap in summer
- phloem sap in winter

(a) (i) Use the information in Table 1.1 to predict which substances you would expect to be present in each of the four plant extracts, then complete Table 1.2.

Key: ✓ (tick) substance present in plant extract
✗ (cross) substance absent from plant extract

Table 1.2

source of plant extract	substances present in each of the plant extracts		
	starch	**sucrose**	**glucose**
root in winter			
root in spring			
phloem sap in summer			
phloem sap in winter			

[2]

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One sample was taken from each of the four plant extracts shown in Table 1.2.

You are required to identify from which plant extract each of the four samples **S1**, **S2**, **S3** and **S4** was taken.

You are provided with:

Table 1.3

labelled	contents	hazard	volume / cm^3
Benedict's solution	Benedict's solution	harmful irritant	If you require more of any of these reagents, please ask the Invigilator.
Biuret	copper sulfate sodium hydroxide	harmful irritant	
iodine	iodine in potassium iodide solution	irritant	
hydrochloric acid	hydrochloric acid	irritant	
sodium hydrogen carbonate	sodium hydrogen carbonate	none	

(ii) Describe the tests that show that sucrose is present in a plant extract.

.....

.....

.....

.....

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.....

.....

.....[2]

For Examiner's Use

Select the appropriate reagents from those provided in Table 1.3 and carry out tests to identify the samples **S1**, **S2**, **S3** and **S4**.

For Examiner's Use

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

[4]

(iv) Complete Table 1.4 to match the samples, **S1**, **S2**, **S3** and **S4**, with each plant extract.

Table 1.4

source of plant extract	sample
a root in winter	
a root in spring	
phloem sap in summer	
phloem sap in winter	

[1]

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A student investigated the effect of different concentrations of sodium chloride solution on root tissues. A separate sample of root tissue was put into a starting volume of each concentration of sodium chloride solution. After a set time the root tissue was removed and the final volume of each solution was recorded. The change in volume for each concentration was calculated.

For Examiner's Use

(b) (i) State **three** variables which the student should keep the same in this investigation. Describe how the student would keep each of these variables the same.

.....

.....

.....

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.....

.....[4]

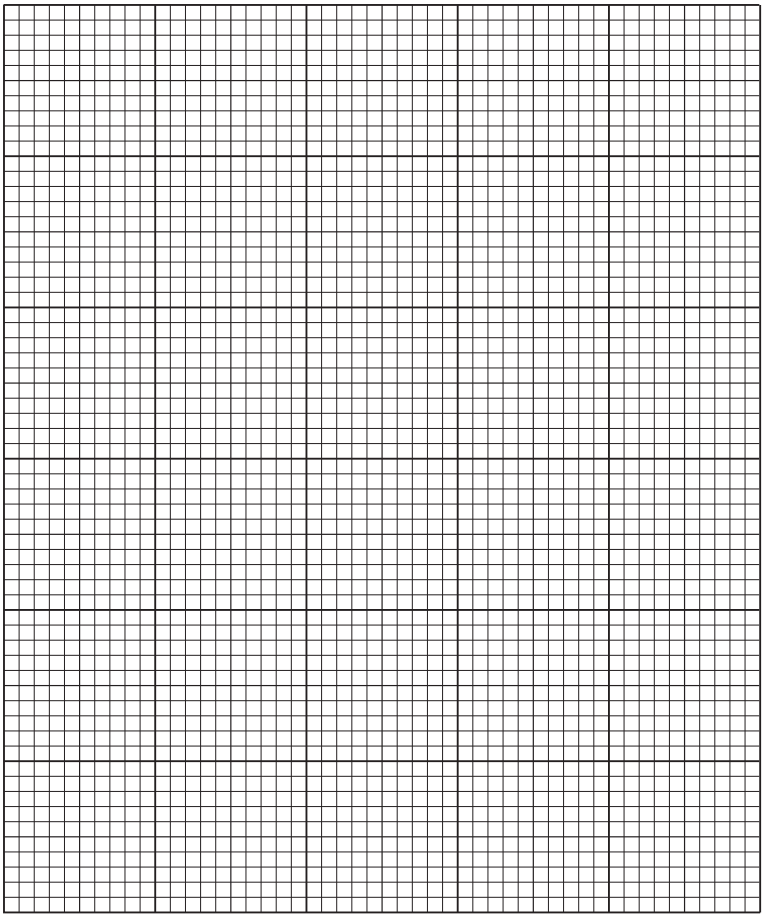
The results of the student's investigation are shown in Table 1.5.

For Examiner's Use

Table 1.5

concentration of sodium chloride / mol dm^{-3}	change in volume of solution / cm^3
0.00	–6.0
0.25	+1.0
0.50	+4.5
0.80	+5.2
1.00	+5.2

(ii) Plot a graph of the data shown in Table 1.5.



[4]

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(iii) Show on your graph the sodium chloride concentration where there is no change in volume of solution. [1]

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Use this information to estimate the sodium chloride concentration where there is no change in volume of solution.

..... $mol\,dm^{-3}$ [1]

(iv) Use your graph to explain the effect of the different concentrations of sodium chloride solution on the root cells.

.....

.....

.....

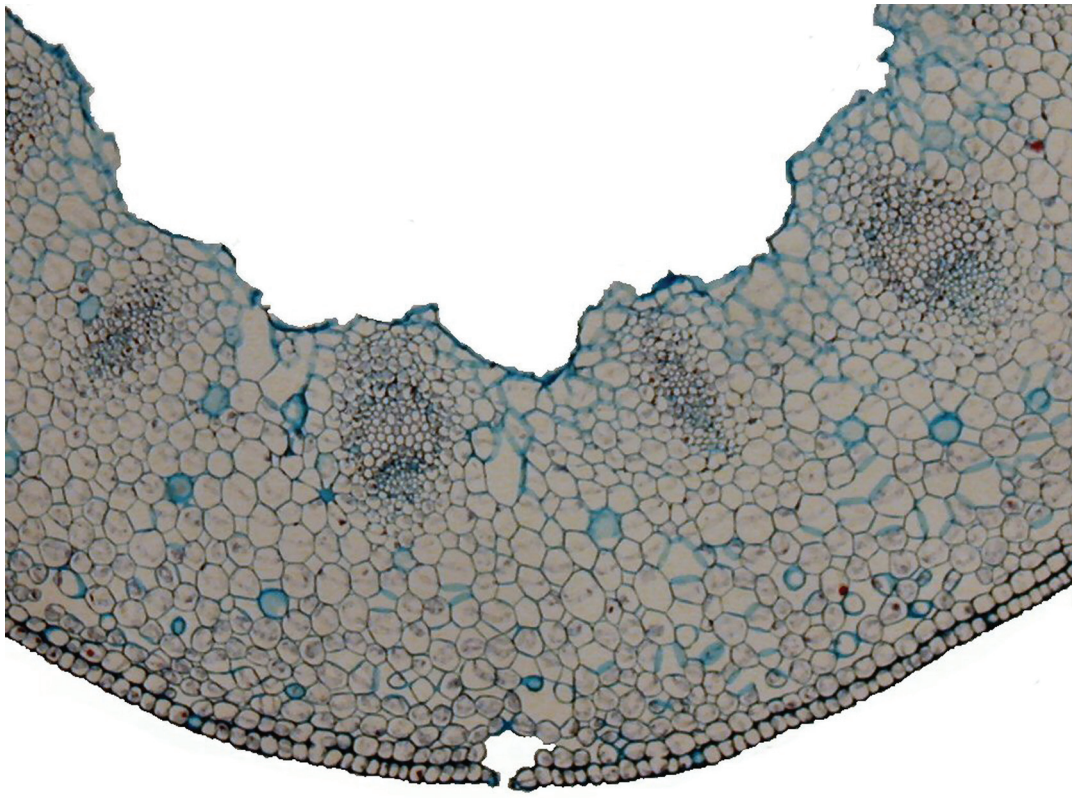
.....

.....[3]

[Total: 22]

2 Fig. 2.1 is a photomicrograph of a transverse section through part of a stem.

For Examiner's Use



magnification × 100

Fig. 2.1

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

Label the epidermis.

[6]

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Fig. 2.2 is a photomicrograph of a transverse section through part of a different plant organ from a different plant species.

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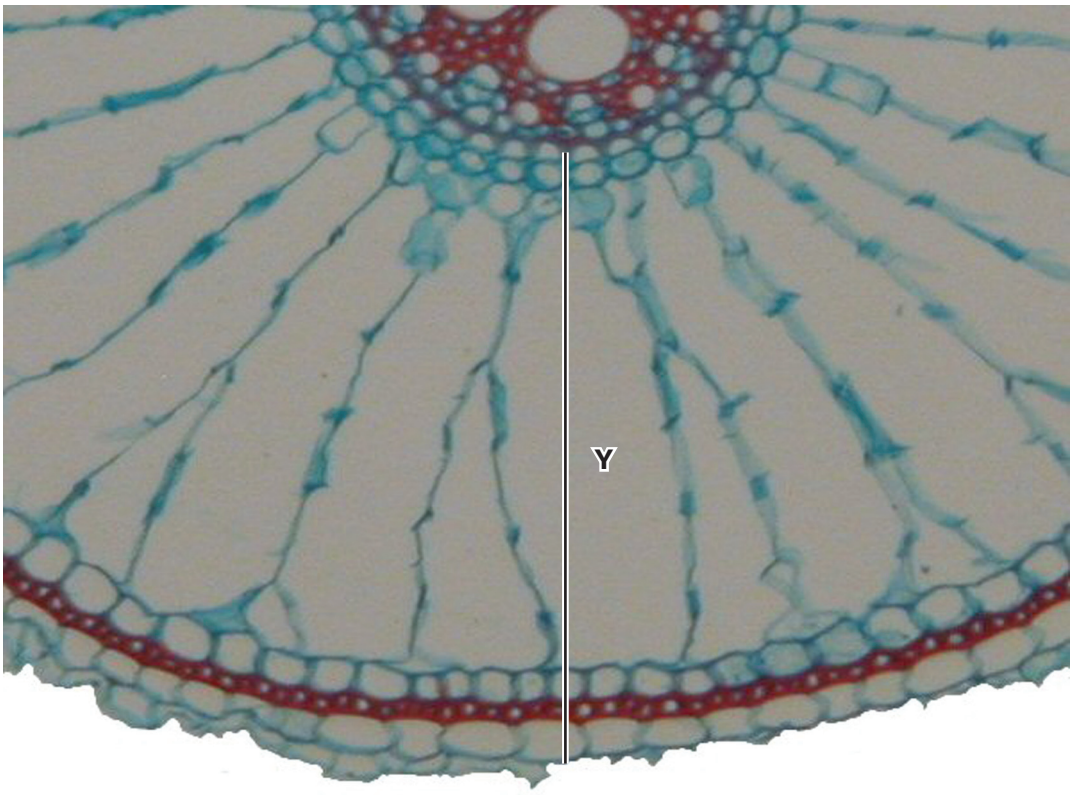


Fig. 2.2

(b) (i) Prepare the space below so that it is suitable for you to record **three** observable differences between the specimens in Fig. 2.1 and in Fig. 2.2.

Record your observations in the space you have prepared.

[4]

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(ii) The actual length of line **Y** is 495 μm. Use this measurement to calculate the magnification of Fig. 2.2.
You may lose marks if you do not show your working or if you do not use appropriate units.

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magnification × ..... [4]

(c) You are provided with a sample of plant material, labelled **P**.

You are required to prepare a slide of the xylem vessels from this plant material.

Proceed as follows:

1. Using forceps extract long thin strands of **P** containing xylem vessels as shown in Fig. 2.3.

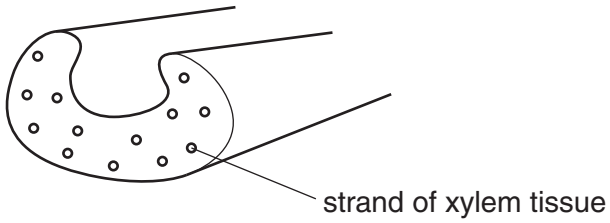


Fig. 2.3

2. Put the strands onto a microscope slide.

3. Add two drops of water and carefully lower a cover slip onto the strands.

4. Put the paper towel over the cover slip and gently press to separate the xylem vessels from surrounding tissue.

5. Look carefully under high power to find two xylem vessels which show different patterns of thickening in the walls.

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Make large drawings of two different patterns of thickening in the walls of the xylem vessels.

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Label the part of the vessel where lignin is found.

[4]

[Total: 18]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5275197120

BIOLOGY **9700/35**

Advanced Practical Skills 1 **May/June 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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1 When plant tissue is soaked in methylene blue the tissue is coloured blue.
Ethanol affects the selective permeability of cell membranes.

You are provided with:

labelled	contents	hazard	concentration / %	volume / cm^3
E	ethanol	flammable	10	40
W	distilled water	none	–	100

labelled	contents	hazard	details	quantity
P	stained plant tissue	methylene blue will stain your skin	same cross-sectional area, stained with methylene blue and washed	3 pieces

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

It is recommended that you wear safety goggles/glasses.

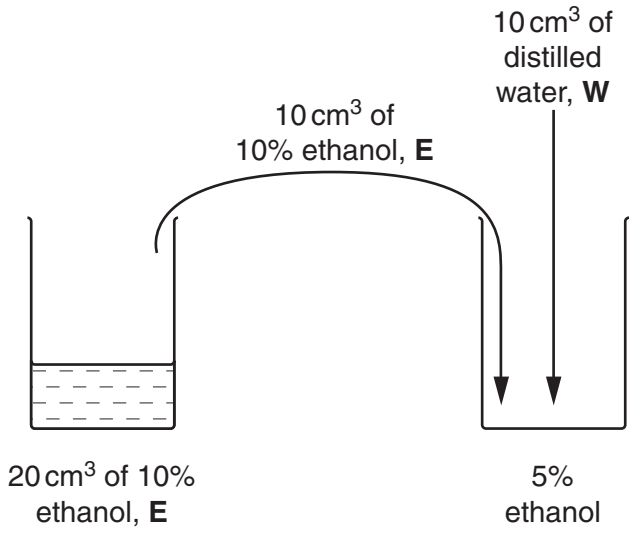
You are required to investigate the effect of the independent variable, ethanol concentration, on samples of plant tissue which have been soaked in methylene blue.

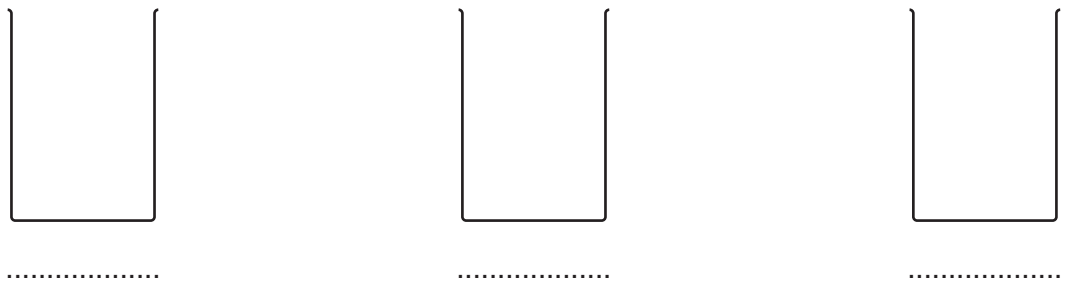
You are required to carry out a serial dilution of ethanol, **E**, to reduce the concentration of the ethanol by half between each successive dilution.

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Fig. 1.1 shows how to make the first concentration of 5% ethanol.

For Examiner's Use





....

Fig. 1.1

(a) (i) Complete Fig. 1.1 to show how you will make **three** further concentrations of ethanol, **E**. [3]

As part of this investigation you are required to set up a suitable control.

(ii) Describe how you will set up this control using the apparatus provided.

.....

.....[1]

Proceed as follows

(Always use blunt forceps when handling the plant tissue to avoid contact with the methylene blue.)

1. Prepare the concentrations of **E** as shown in Fig. 1.1 in the containers provided.
2. Label test-tubes with the concentrations of **E** and the **control**.
3. Put 5 cm^3 of each dilution of **E** and the control into the labelled test-tubes.

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4. Remove the pieces of plant tissue from the container, labelled **P**, and place them onto a white tile.

5. Cut the ends off each piece of plant tissue.

6. Cut the plant tissue into **equal** lengths. These should be between 0.75 and 1 cm in length. The pieces should not get stuck to the side of the test-tube.

7. Empty the coloured water from the container, labelled **P**.

8. Place the samples back into the empty container, labelled **P**.

9. To remove excess methylene blue change the water five times, either using a syringe or by pouring off the water. Do not touch the plant tissue.

10. Remove the pieces of plant tissue from the beaker of water and place them on a paper towel to blot off excess water.

11. Add one piece of plant tissue to each test-tube and immediately start timing.

12. Observe the test-tubes after 10 minutes. You may find it helpful to mix the contents.

13. Record your observations.

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

For Examiner's Use

[4]

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(iv) You used syringes to measure the volumes of the ethanol used.

State the volume of the smallest division on the syringe .....

State the degree of uncertainty in using the syringe to measure the volumes.

.....[1]

(v) Explain the effect of the ethanol on the plant tissue.

.....

.....

.....

.....

.....

.....

.....[3]

(vi) In step 5, the ends of the pieces of plant tissue were cut off.
If the ends had not been cut off how would the results have been affected?

.....

.....[1]

A student carried out a similar investigation into the effect of pH on samples of coloured plant tissue. The samples were placed in different buffer solutions. After 10 minutes, the samples were removed. The buffer solutions were placed in a colorimeter to measure the percentage absorbances.

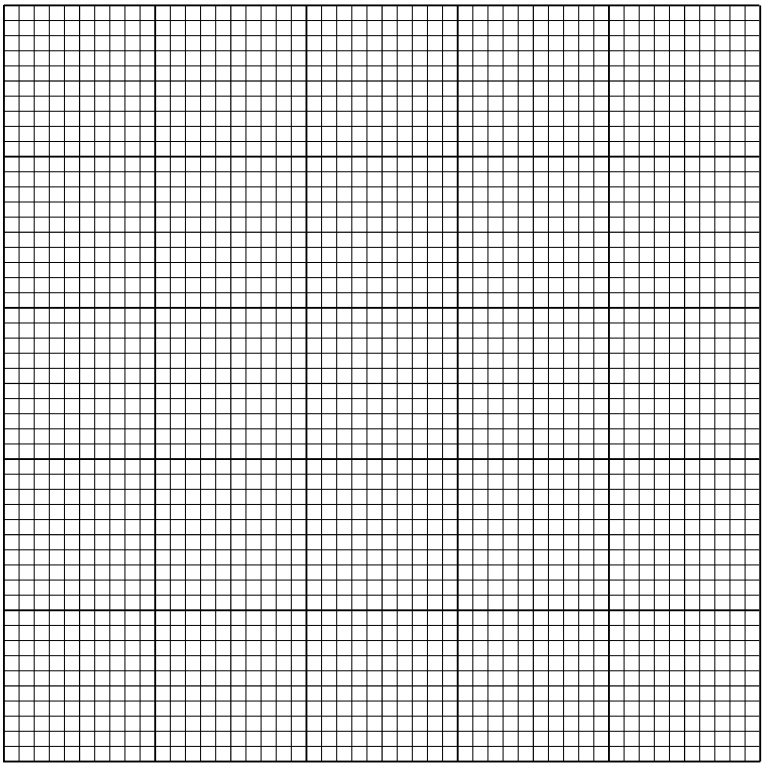
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The results of this investigation are shown in Table 1.1.

Table 1.1

pH of buffer solutions	absorbance / %
4.0	83
6.0	39
7.3	10
7.8	38
8.5	78

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



[4]

(ii) Another sample of plant tissue was placed in a buffer solution and the absorbance was 46%. Use your graph to estimate the pH of the buffer solution at this absorbance.

.....

.....[2]

(iii) State **two** variables that need to be kept the same in this investigation. Describe how to keep each of these variables the same.

For Examiner's Use

.....

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.....

.....

.....[3]

[Total: 22]

2 Fig. 2.1 is a photomicrograph of a transverse section through a root.

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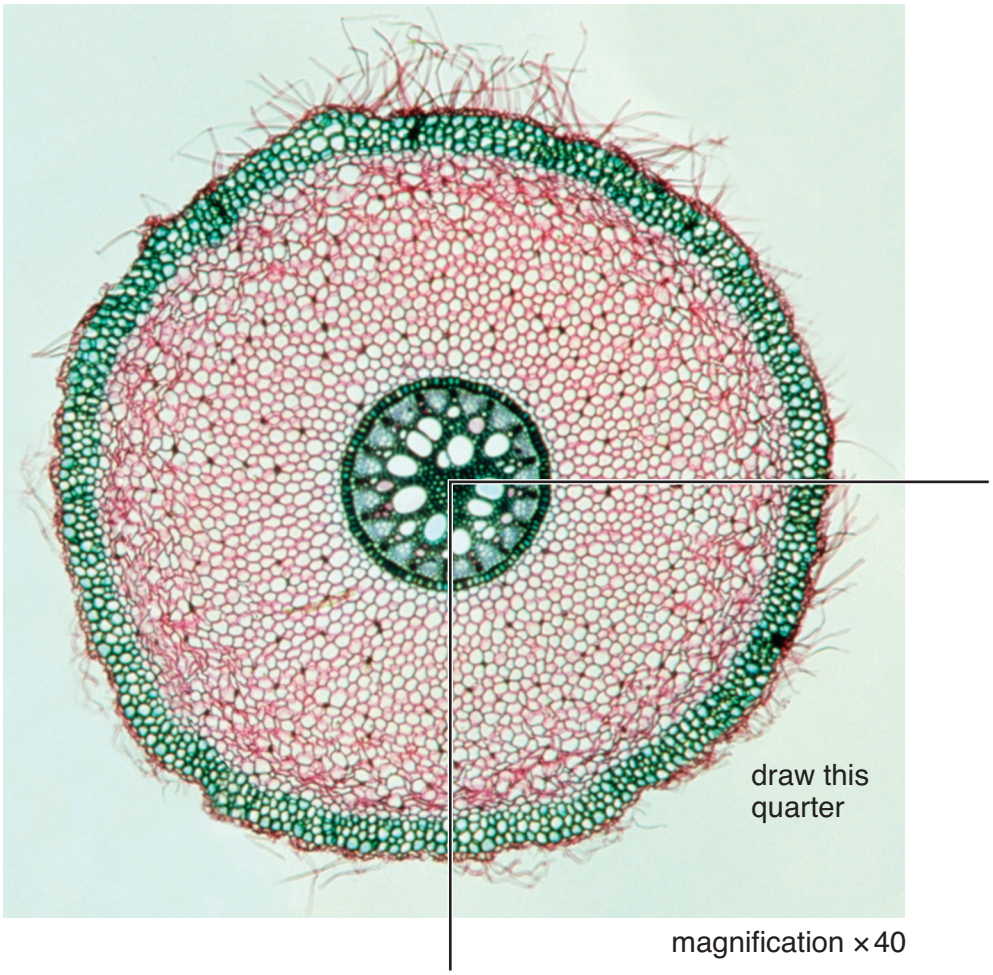


Fig. 2.1

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

Label the xylem.

[5]

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Fig. 2.2 is a photomicrograph of a transverse section through a root of a different plant species.

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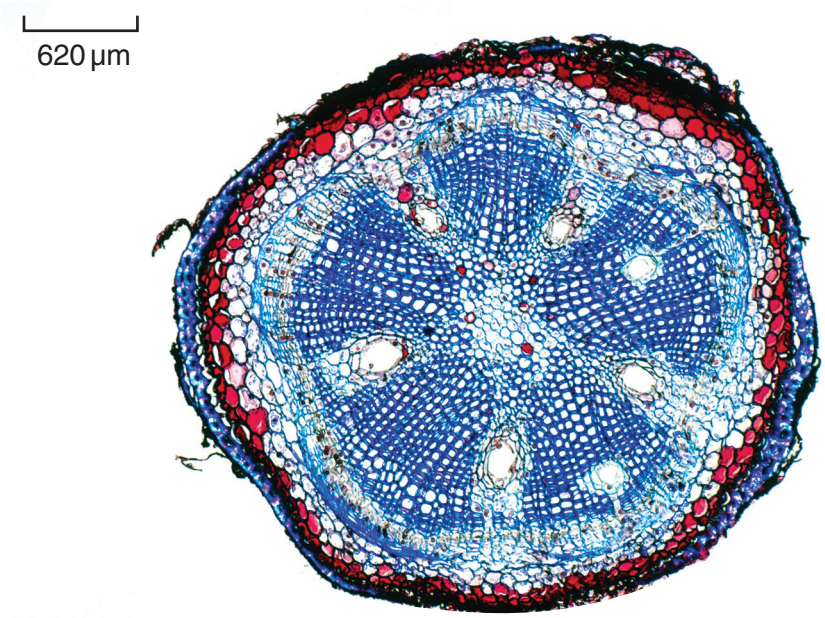


Fig. 2.2

(b) (i) Prepare the space below so that it is suitable for you to record the observable differences between the specimens in Fig. 2.1 and in Fig. 2.2.

Record your observations in the space you have prepared.

[4]

(ii) Use the scale bar to calculate the magnification of Fig. 2.2.

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

magnification × ..... [4]

(c) You are provided with a sample of banana, labelled **B**.

For Examiner's Use

Proceed as follows

1. Rub the cut end of the banana slice onto the centre of the microscope slide. Repeat until you can see an observable smear of banana tissue.

2. Add two drops of **iodine** onto the smear and carefully lower the cover slip onto the banana tissue in the smear.

3. Put the paper towel over the cover slip and gently press to separate the cells.

4. Look carefully under high power to find three cells with different shapes.

   Make a large drawing of these three cells.

   Label the cell wall and any observable internal structures of these cells.

[5]

[Total: 18]

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Fig. 2.1 Claude Nuridsany and Marie Perennou/Science Photo Library
Fig. 2.2 J.C. Revy, ISM/Science Photo Library

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