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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7325310788

BIOLOGY **9700/31**

Advanced Practical Skills 1 **May/June 2013**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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1	
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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
- 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 provided with solutions **S1**, **S2**, **S3**, **S4** and **S5** which represent extracts from different tissues of a plant, including the xylem.

You are required to identify which biological molecule may be present in each of the plant extracts.

Four of the solutions contain one type of biological molecule, which could be:
- glucose
- protein
- starch
- sucrose.

Each solution contains **one** type of biological molecule, but the same type of biological molecule may be present in more than one of **S1**, **S2**, **S3**, **S4** and **S5**.
For example, glucose may be present in **S1 AND S2**.

The solution from the xylem does not contain any of these biological molecules.

You are provided with:

labelled	**hazard**	**volume / cm^3**
S1, **S2**, **S3**, **S4** and **S5**	none	25

Proceed as follows:

(a) (i) As you carry out each test to identify the presence or absence of the biological molecule in **S1**, **S2**, **S3**, **S4** and **S5**, complete the following:

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Decide which biological molecule to identify in the **first test**.

For Examiner's Use

First test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **first test** and record your observations.

solutions tested	observations of colour

Use these observations to complete the sentence.

Solution(s) ..... contain(s) the biological molecule ..... .

Decide which biological molecule to identify in the **second test**.

Second test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **second test** and record your observations.

solutions tested	observations of colour

Use these observations to complete the sentence.

Solution(s) ..... contain(s) the biological molecule ..... .

Decide which biological molecule to identify in the **third test**.

For Examiner's Use

Third test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **third test** and record your observations.

solutions tested	observations of colour

Use these observations to complete the sentence.

Solution(s) ..... contain(s) the biological molecule ..... .

Decide which biological molecule to identify in the **fourth test**.

For Examiner's Use

Fourth test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **fourth test** and record your observations.

solutions tested	observations of colour

Use these observations to complete the sentence.

Solution(s) ..... contain(s) the biological molecule ..... .

From these observations, the remaining solution ..... contains

..... .

[15]

(ii) Identify which of the solutions **S1**, **S2**, **S3**, **S4** and **S5** is most likely to be the plant extract from the **phloem**.

.....[1]

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A student identified the presence of reducing sugars in two plant extracts and was then required to find the **concentration** of reducing sugars in the two plant extracts.

For Examiner's Use

(b) Describe how the student would find the concentration of reducing sugars in each plant extract.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 19]

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Question 2 starts on page 8

For Examiner's Use

2 Fig. 2.1 shows a photomicrograph of a transverse section through part of a plant stem showing the eyepiece graticule scale as seen using a microscope.

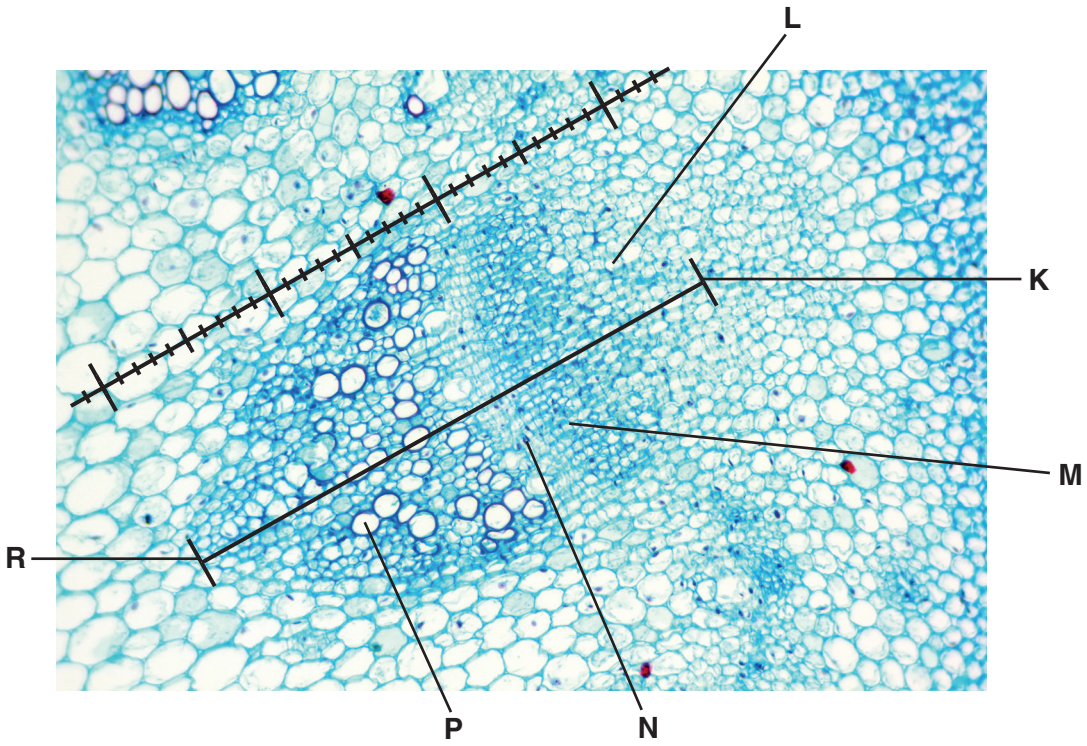


Fig. 2.1

An eyepiece graticule scale can be used to measure the layers of tissues and to help draw a plan diagram with the correct shape and proportions of the tissues, without needing to calibrate the eyepiece graticule scale.

(a) (i) The length of the vascular bundle (from **K** to **R**) in Fig. 2.1 was measured using the eyepiece graticule scale and recorded in Table 2.1.

Table 2.1

layer	**L**	**M**	**N**	**P**	length from **K** to **R**
number of eyepiece graticule scale divisions					30

Complete Table 2.1 by finding the thickness of each of the different layers, **L**, **M**, **N** and **P** using the line between **K** and **R** and the eyepiece graticule scale. [2]

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The length (from **K** to **R**) of the vascular bundle in eyepiece graticule divisions was used to make a scale drawing of the outline of the vascular bundle as shown in Fig. 2.2.

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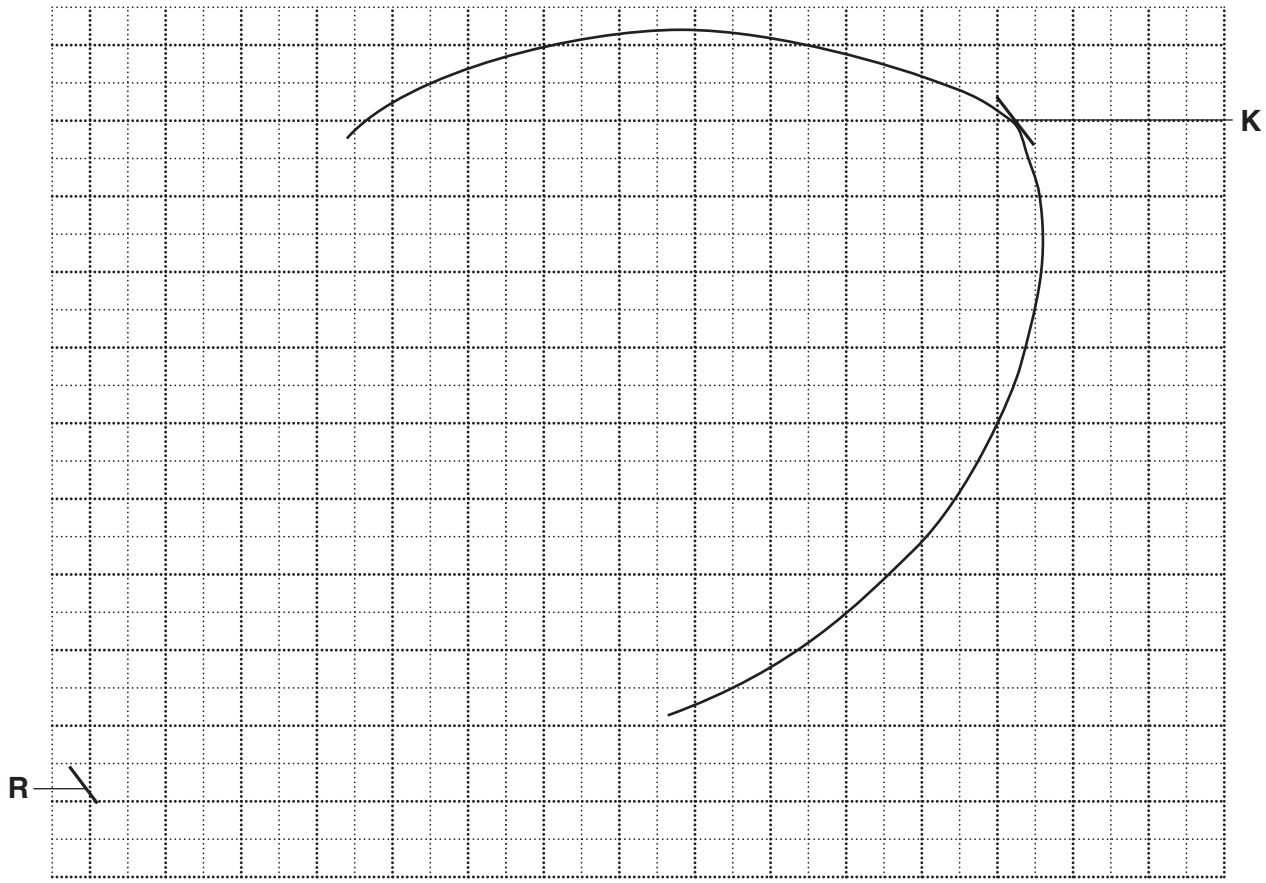


Fig. 2.2

(ii) Complete the plan diagram of the vascular bundle to show the proportion and shape of each of the tissues. Use the values in Table 2.1 to help you. [3]

(iii) Using Fig. 2.2, count the total number of 1 cm by 1 cm squares occupied by the vascular bundle and count the total number of 1 cm by 1 cm squares occupied by the xylem.

Count any 'half square' or 'more than half' as one square.

State the ratio of the area occupied by the vascular bundle to that of the xylem.

You will lose marks if you do not **show** all the steps in finding the ratio, including indicating counted squares on Fig. 2.2.

ratio .....[2]

Some scientists investigated the rate of transpiration during part of a day.

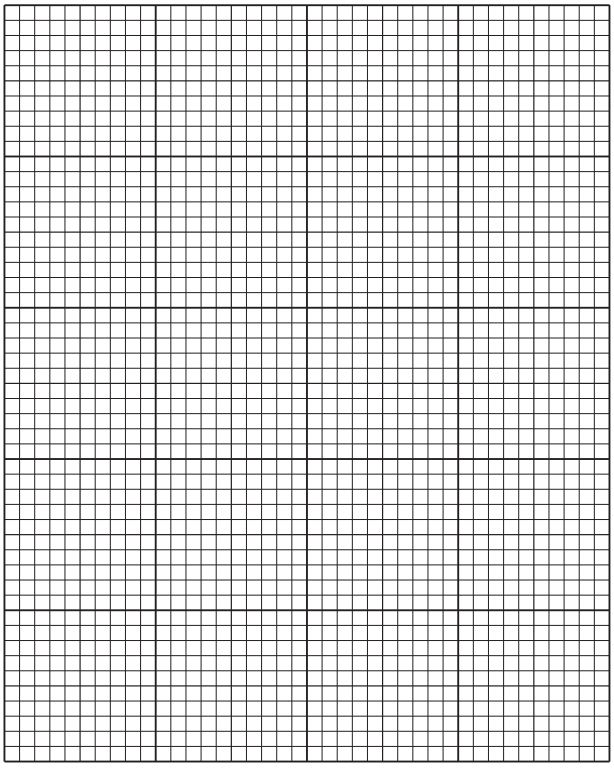
The results are shown in Table 2.2.

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Table 2.2

time of day /hours	rate of transpiration /g cm^{-2} hr^{-1}
06.00	0.6
08.00	1.9
10.00	2.2
12.30	2.2
15.00	1.5
18.30	0.4

(b) (i) Plot a graph of the data shown in Table 2.2. [4]



(ii) From your graph, state the rate of transpiration at 14.30 hours.

Show on your graph where you obtained the rate of transpiration.

.....[1]

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J1 is a slide of a transverse section through another plant stem. This plant grows mainly in Europe and Asia.
This stem shows a layer of stained cells close to the epidermis and just beneath these cells is another tissue close to the vascular bundles.

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(c) Make a large drawing of one group of **three** whole adjacent (touching) cells

- from the layer of stained cells close to the epidermis, as observed on the specimen **J1**.

Make a large drawing of one group of **three** whole adjacent (touching) cells

- from the cells between the layer of stained cells and the vascular bundles, as observed on the specimen **J1**.

The drawings should show any difference in size (linear magnification) observed between each group of cells.

layer of stained cells

cells between the layer of stained cells and the vascular bundles

[4]

Question 2 continues on page 12

Fig. 2.3 shows a photomicrograph of a transverse section through part of a different plant stem.

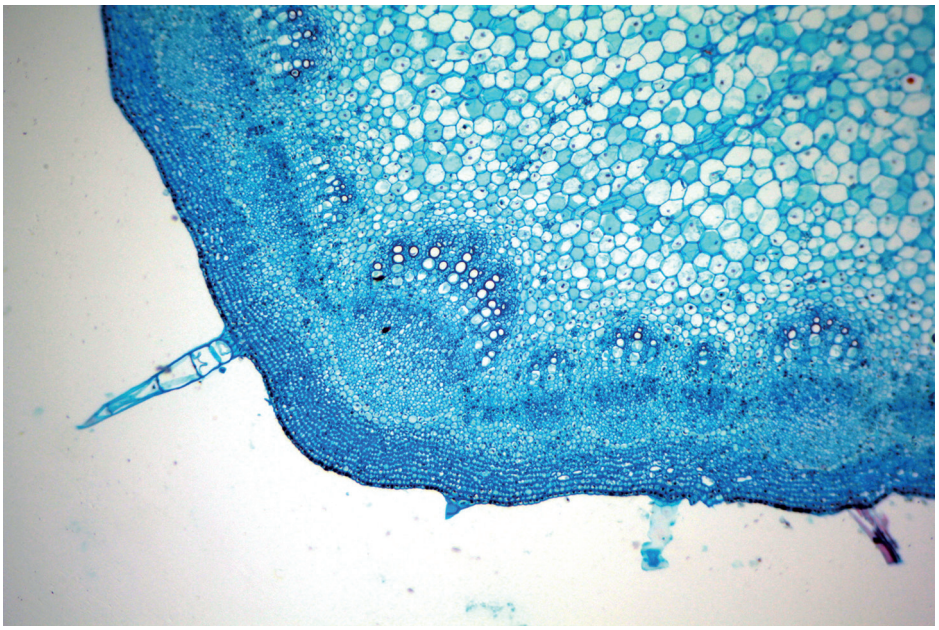


Fig. 2.3

(d) Prepare the space below so that it is suitable for you to record the 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: 21]

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General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3751526322

BIOLOGY **9700/32**

Advanced Practical Skills 2 **May/June 2013**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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You should:

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

1 Yeast cells use enzymes as part of their metabolic reactions. Some of these reactions release oxygen from hydrogen peroxide solution.

You are required to investigate the effect of temperature (independent variable) on the release of oxygen from hydrogen peroxide solution.

You are provided with:

labelled	contents	hazard	volume /cm^3
Y	yeast cell suspension	none	20
H	hydrogen peroxide solution	irritant harmful	20

Proceed as follows:

You are required to change the temperature of **Y** during the investigation.

1. Put the beaker containing **Y** into a large beaker (**W**) which will be the water-bath as shown in Fig. 1.1.

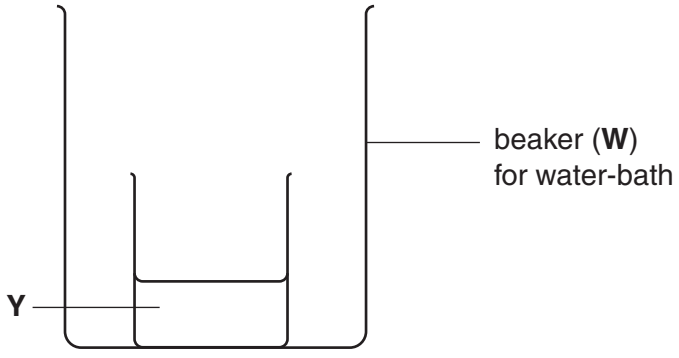


Fig. 1.1

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(a) (i) Decide what level of water you will start with in **W**.

Show on Fig. 1.1 the level of water in **W**. [1]

2. Put hot water from the beaker provided into **W** to **below** the level you decided.

Add hot water and cold water as needed to obtain a water-bath of between 40 °C and 45 °C. Adjust the volume of water to the level you decided in **(a)(i)**. *The beaker may float but should not spill its contents.*

3. Keep **Y** (in **W**) at a temperature between 40 °C to 45 °C.

Fig. 1.2 shows the apparatus set up to measure the release of oxygen from hydrogen peroxide solution. The oxygen released into **B** can be measured (dependent variable) by counting the number of bubbles.

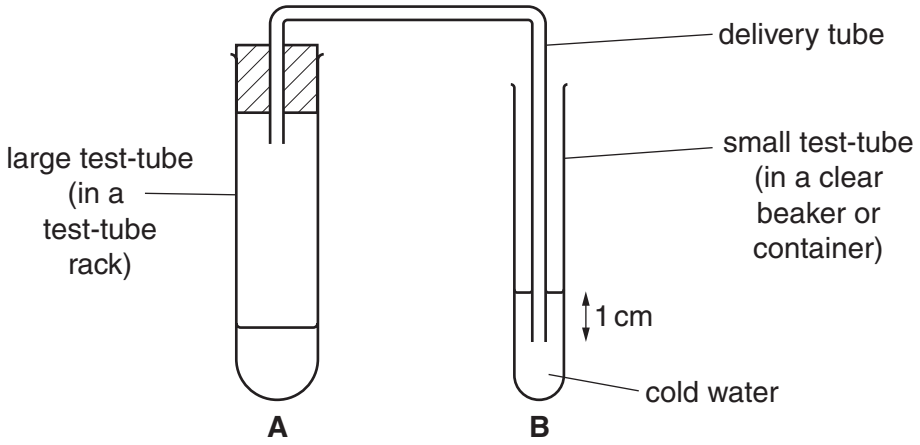


Fig. 1.2

The end of the delivery tube should be 1 cm below the level of the water in test-tube **B** as shown in Fig. 1.2.

(ii) Decide how you will standardise the position of the delivery tube in test-tube **B** as shown in Fig. 1.2.

Describe how you standardised the position of the tube.

..... [1]

4. Put water from the beaker or container, labelled **cold**, into test-tube **B** as shown in Fig. 1.2.

5. Remove the small beaker or container containing **Y** from **W**.

6. Record the temperature of **Y**. .....

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[Turn over

7. Stir **Y** and put 1 cm^3 into the large test-tube **A**. Put the beaker containing **Y** back into **W**.

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The reaction will start as soon as you add **H** (in step 8).
You are required to count the number of bubbles released into **B** by making a small mark on Grid 1.1 for each bubble as it is released for the intervals shown below.

If the number of bubbles is too many to record for any one time, record 'too many' for that interval.

Example

1st 30 s
IIII II II IIIIIII
15

Grid 1.1 – for recording higher temperature

1st 30 s	2nd 30 s	3rd 30 s	4th 30 s	5th 30 s	6th 30 s	7th 30 s	8th 30 s

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8. Put 4 cm^3 of **H** into the large test-tube **A**, immediately put in the bung and start timing and recording.

9. After 4 minutes, remove the bung from test-tube **A**.
You are provided with a container labelled '**for waste**' and a container labelled '**for washing**' so you can re-use the large test-tube **A**.

10. Decide on a lower temperature for your next investigation.

    Adjust the temperature of **W** and put the beaker containing **Y** into **W** for **5 minutes**.

    After this 5 minutes, record the temperature of **Y** .....

11. Repeat steps 7 to 9.
Use Grid 1.2 to record your readings.

Grid 1.2 – for recording lower temperature

1st 30 s	2nd 30 s	3rd 30 s	4th 30 s	5th 30 s	6th 30 s	7th 30 s	8th 30 s

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[Turn over

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

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[6]

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

.....

.....

.....

..... [2]

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

For Examiner's Use

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.....

..... [3]

In a similar investigation, some scientists investigated the effect of the concentration of hydrogen peroxide on the release of oxygen from hydrogen peroxide solution, using yeast as a source of enzymes. The breakdown of hydrogen peroxide solution was measured by the time taken to collect 20 cm^3 of oxygen.

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The results are shown in Table 1.1.

Table 1.1

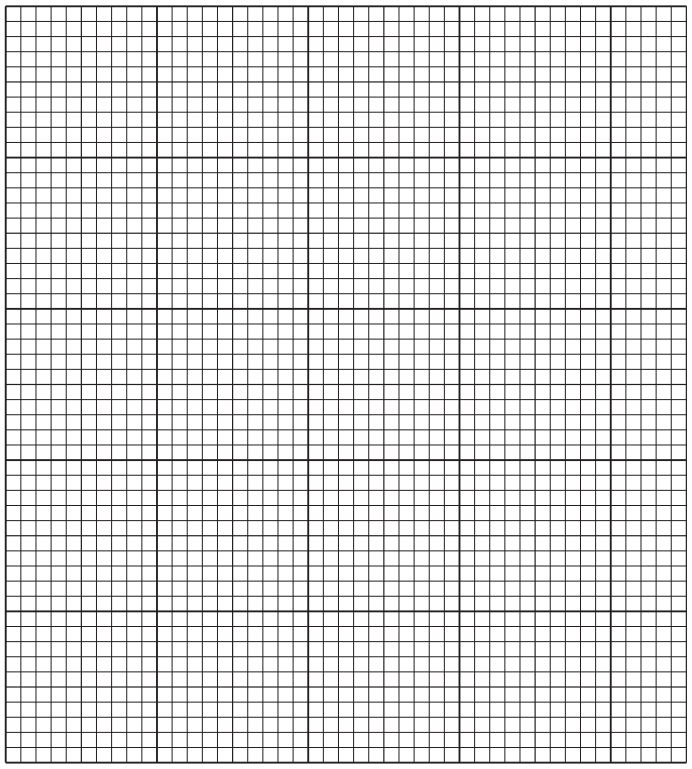
percentage concentration of hydrogen peroxide	time taken to collect 20 cm^3 of oxygen/s					
	trial 1	trial 2	trial 3	trial 4	trial 5	mean
4	46	48	48	47	45	47
6	28	28	20	27	26	27
8	21	17	18	17	21	19
12	12	13	14	9	14	
16	11	9	10	9	11	10
20	8	9	9	8	10	9

(b) (i) **Two** of the values in Table 1.1 are anomalous.

Draw a circle around each of these values. [1]

(ii) Complete Table 1.1 by calculating the missing value. [1]

(iii) Plot a graph of the data shown in Table 1.1. [4]



(iv) Using the data in Table 1.1 and your graph, explain the results for the investigation.

For Examiner's Use

.....

.....

.....

..... [2]

[Total: 21]

Question 2 starts on page 10

2 **M1** is a slide of a stained transverse section through a plant stem.
This plant species is a native of the Mediterranean region.

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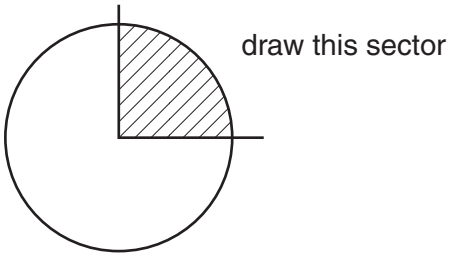


Fig. 2.1

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

On your diagram, use a ruled label line to show the pith.

[5]

(ii) The cells in each corner of the stem are different from the cells in the centre of the stem.

For Examiner's Use

Make a large drawing of one group of **three** whole, adjacent (touching) cells

- from the tissue in one corner, as observed on the specimen on **M1**.

Make a large drawing of one group of **three** whole, adjacent (touching) cells

- from the tissue in the centre of the stem, as observed on the specimen on **M1**.

On your drawing, use a ruled label line and label to show **one** cell wall.

cells from the tissue in one corner

cells from the tissue in the centre of the stem

[5]

For Examiner's Use

(iii) Use the eyepiece graticule scale to find the **mean width** of the:

- cells in the centre of the stem
- cells in a corner of the stem.

State the **ratio** of the mean width of the cells in the centre of the stem to the mean width of the cells in a corner.

Note: You are **not** required to calibrate the eyepiece graticule scale with a stage micrometer.

You will lose marks if you do not show all the steps in finding the ratio.

[3]

(iv) The cells in the corner of the stem on **M1** carry out the function of support.

Suggest **one** observable feature which supports this conclusion.

.....

.....

..... [1]

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

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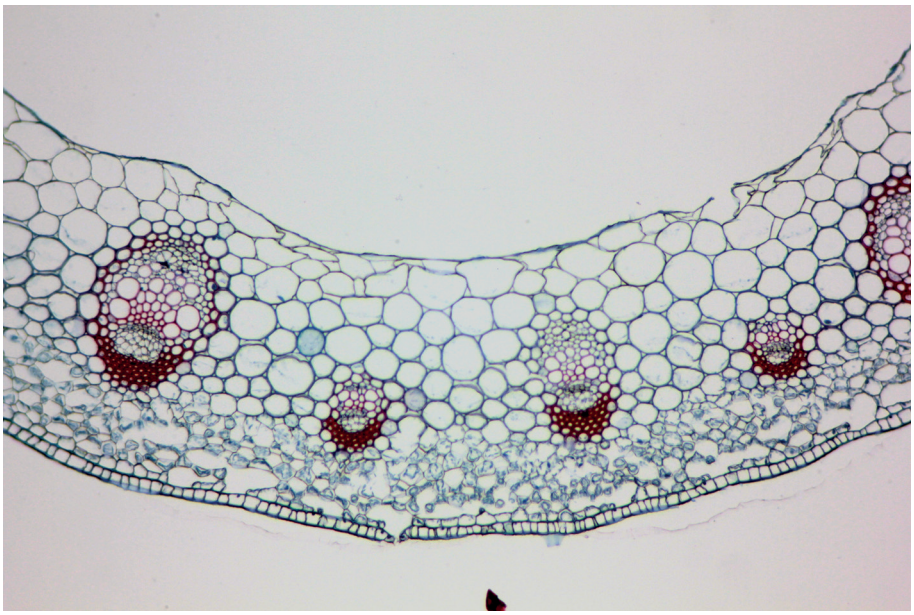


Fig. 2.2

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

- the vascular tissue
- at least two other tissues.

[5]

[Total: 19]

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Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4988720324

BIOLOGY **9700/33**

Advanced Practical Skills 1 **May/June 2013**

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 Enzyme, **E** hydrolyses (breaks down) one substrate (biological molecule) present in one of the solutions **S1**, **S2** or **S3**.

You are required to:
- identify which biological molecule may be present in each solution, **S1**, **S2** and **S3**
- identify which of the biological molecules in the solutions **S1**, **S2** and **S3** can be hydrolysed by **E.**

The solutions contain one type of biological molecule which may be:
- glucose
- starch
- sucrose.

Each solution contains **one** type of biological molecule, but the same type of biological molecule may be present in more than one of **S1**, **S2** and **S3**.
For example glucose may be present in **S1 AND S2**.

You are provided with:

labelled	**hazard**	**volume /cm^3**
S1, **S2** and **S3**	none	25
E	irritant	15

Read to the end of page 6 before proceeding.

Proceed as follows:

(a) As you carry out each test to identify the presence or absence of the biological molecule in **S1**, **S2** and **S3**, complete the following:

Question 1(a) continues on page 4

Decide which biological molecule to identify in the **first test**.

For Examiner's Use

First test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **first test** and record your observations.

solutions tested	observations of colour

Use these observations to complete the sentence.

Solution(s) ..... contain(s) the biological molecule ..... .

Decide which biological molecule to identify in the **second test**.

Second test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **second test** and record your observations.

solutions tested	observations of colour

Use these observations to complete the sentence.

Solution(s) ..... contain(s) the biological molecule ..... .

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Decide which test you will use to **check** the identity of the **third** biological molecule.

For Examiner's Use

Third test: Test for .....

Describe how you used the reagents to carry out this test.

.....

.....

.....

Carry out the **third test** and record your observation.

solution tested	observation of colour

Use this observation to complete one of the following sentences.

Solution(s) ..... contain(s) the biological molecule ..... .

OR

Solution ..... does not contain any of these biological molecules, glucose, starch or sucrose.

[11]

Enzyme, **E** hydrolyses (breaks down) one biological molecule (substrate) present in **one** of the solutions **S1**, **S2** or **S3**.

For Examiner's Use

(b) (i) State which of the biological molecules, glucose, starch or sucrose **cannot** be hydrolysed by the enzyme, **E**.

.....[1]

You are required to identify which of the other **two** biological molecules is hydrolysed by the enzyme, **E** using the procedure shown in Fig. 1.1 on **each** solution.

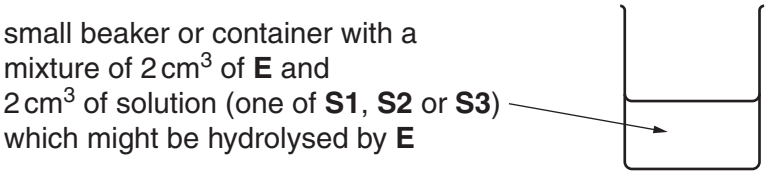


Fig. 1.1

Set up two beakers as shown in Fig. 1.1.
Leave the mixtures for 5 minutes so that **E** can carry out the hydrolysis.
After 5 minutes, test the mixtures to find out whether **E** has hydrolysed the biological molecule to its products.

(ii) Prepare the space below to record:
- the biological molecule tested for
- the observations.

[4]

(iii) From your observations, state which of the solutions (**S1**, **S2**, **S3**) is hydrolysed by the enzyme, **E**. Explain the reason for your answer.

For Examiner's Use

solution .....

reason .....
[1]

(c) Describe **how** you would modify this procedure to investigate the effect of temperature on the enzyme, **E**.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 20]

For Examiner's Use

2 Fig. 2.1 shows a photomicrograph of a transverse section through part of a plant stem showing the eyepiece graticule scale as seen using a microscope.

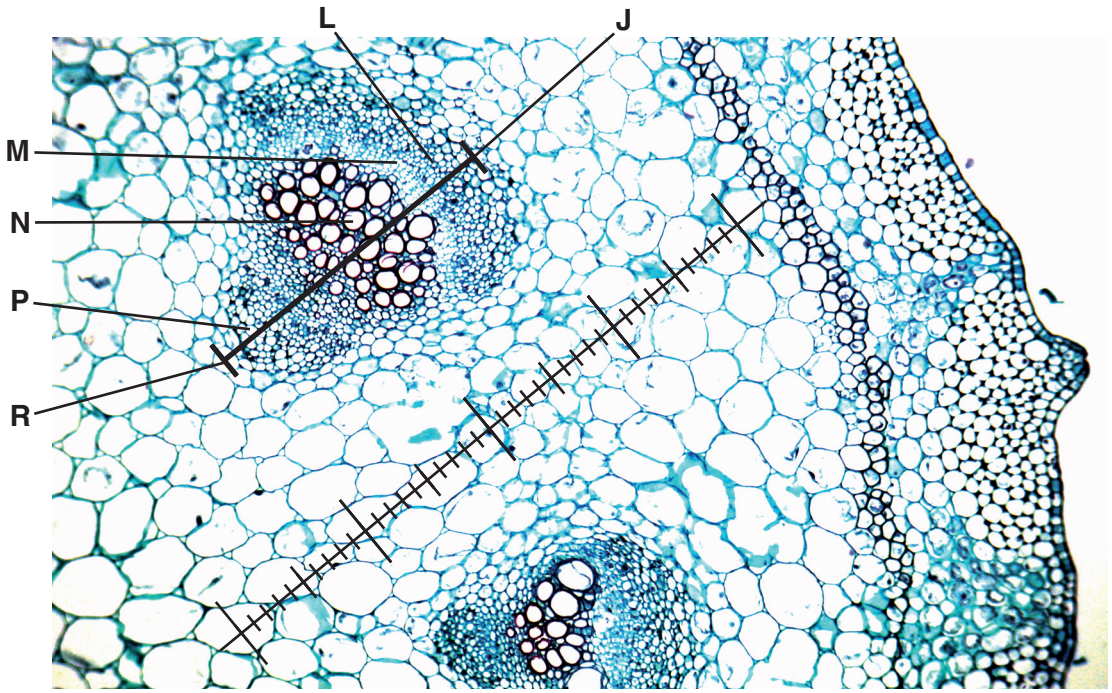


Fig. 2.1

An eyepiece graticule scale can be used to measure the layers of tissues and to help draw a plan diagram with the correct shape and proportions of the tissues, without needing to calibrate the eyepiece graticule scale.

(a) (i) The length of the vascular bundle (from **J** to **R**) in Fig. 2.1 was measured using the eyepiece graticule scale and recorded in Table 2.1.

Table 2.1

layer	**L**	**M**	**N**	**P**	length from **J** to **R**
number of eyepiece graticule scale divisions					20

Complete Table 2.1 by finding the thickness of each of the different layers **L**, **M**, **N** and **P**, labelled in Fig. 2.1, using the line between **J** and **R** and the eyepiece graticule scale. [2]

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The length (from **J** to **R**) of the vascular bundle in eyepiece graticule divisions was used to make a scale drawing of the outline of the vascular bundle as shown in Fig. 2.2.

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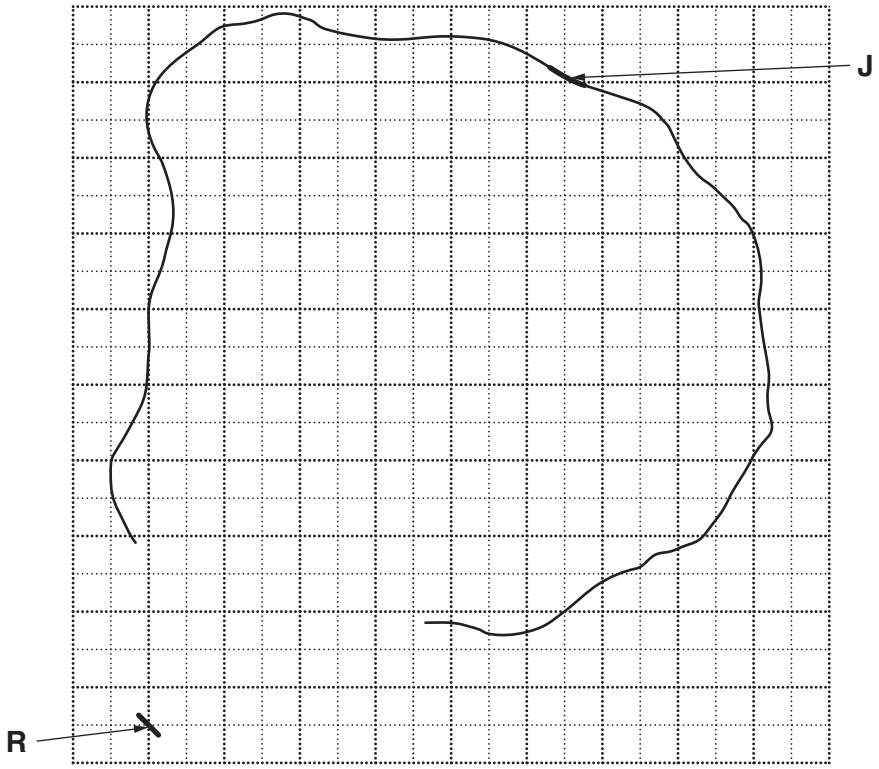


Fig. 2.2

(ii) Complete the plan diagram of the vascular bundle to show the proportion and shape of each of the tissues. Use the values in Table 2.1 to help you. [3]

(iii) Using Fig. 2.2, count the total number of 1cm by 1cm squares occupied by the vascular bundle and count the total number of 1cm by 1cm squares occupied by the xylem.

Count any 'half square' or 'more than half' as one square.

State the ratio of the area occupied by the vascular bundle to that of the xylem.

You will lose marks if you do not show all the steps in finding the ratio including indicating counted squares on Fig. 2.2.

ratio .....[2]

K1 is a slide of a transverse section through another plant stem.
This plant grows mainly on the African continent.
This stem shows small vascular bundles close to the epidermis and then larger vascular bundles nearer to the centre.

For Examiner's Use

(b) Draw a large plan diagram of a sector of the specimen on **K1** to show:

- the epidermis
- three small vascular bundles beneath the epidermis
- one large vascular bundle nearer to the centre
- other observable features.

[3]

Fig 2.1 is shown again here to help you answer **(c)**.

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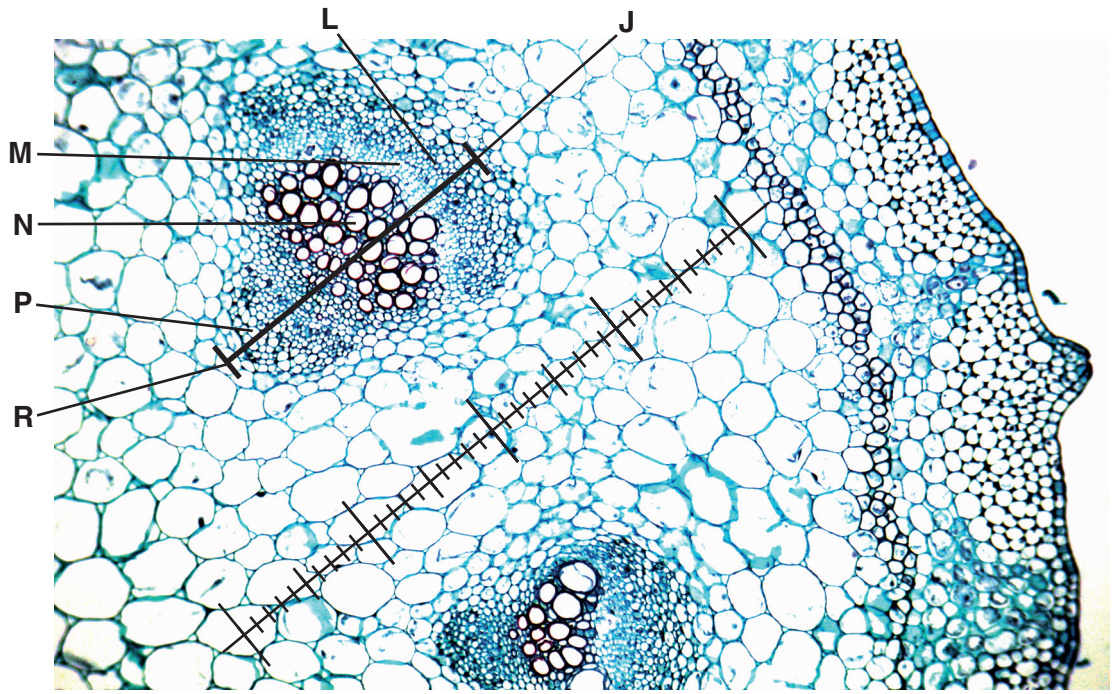


Fig. 2.1

(c) Select observable features shown on the specimen on **K1** which are different from or **not** observable in Fig. 2.1.

Prepare the space below so that it is suitable for you to record each feature **and describe** how each feature is different from Fig. 2.1.

[4]

Question 2 continues on page 12

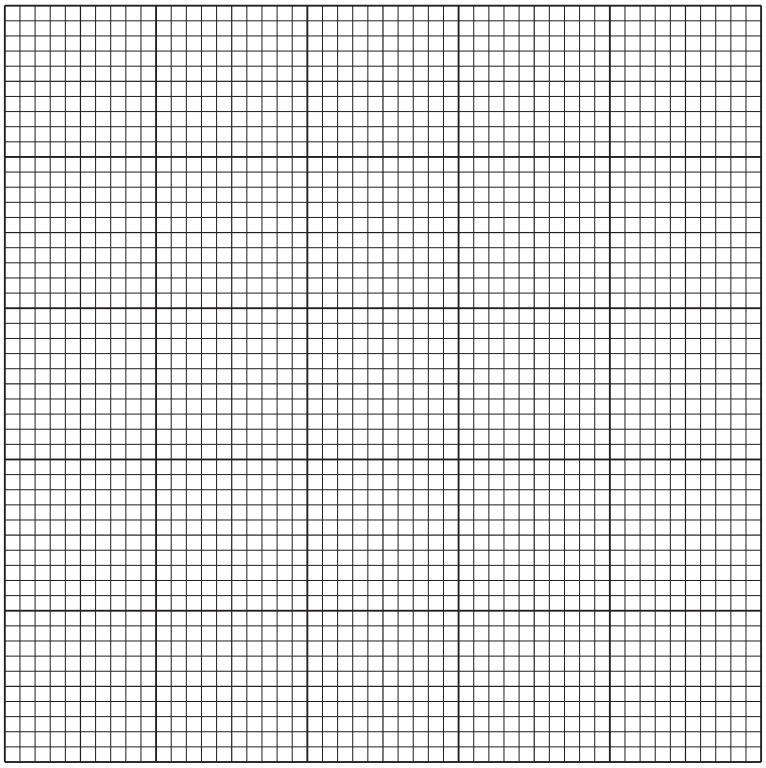
Some scientists investigated the flow rate in xylem during 22 hours.
The results are shown in Table 2.2.

For Examiner's Use

Table 2.2

time of day /hours	flow rate in xylem /mg min^{-1}
00.00	0.140
06.00	0.105
09.00	0.220
17.00	0.455
22.00	0.200

(d) (i) Plot a graph of the data shown in Table 2.2.



[4]

(ii) Use the data to describe the trend in the flow rate in the xylem between 10.00 and 17.00 hours.

.....

.....

.....[2]

[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	

6193688676

BIOLOGY **9700/34**

Advanced Practical Skills 2 **May/June 2013**

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, paperclips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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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 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 Yeast cells use enzymes as part of their metabolic reactions. Some of these reactions release carbon dioxide.

You are required to investigate the hypothesis that:

The rate of release of carbon dioxide from yeast cells will decrease with time.

Carbon dioxide reacts with water to form a weak acid. The indicator, **P**, can be used to show the change in pH.

The pink indicator, **P**, will become colourless when carbon dioxide is added. This is the end-point as shown in Fig. 1.1.

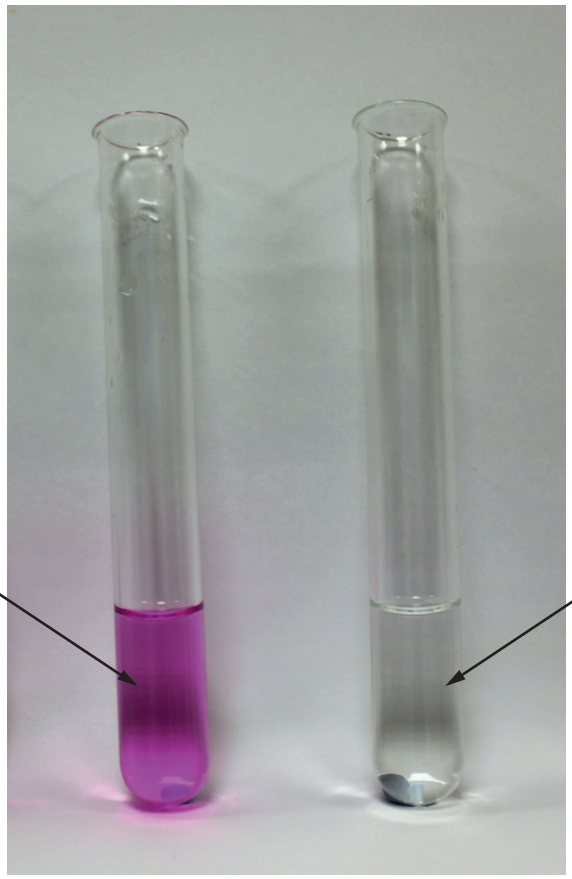


Fig. 1.1

You are provided with:

For Examiner's Use

labelled	contents	hazard	volume / cm^3
Y	yeast cell suspension	none	20
P	indicator solution	flammable	10
A	alkali solution	irritant	20
W	distilled water	none	100

You will need to standardise the pink colour before you start the readings.

Proceed as follows:

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

For steps 2 and 3, you must use **one** pipette to add the drops of **P** and a **different** pipette to add the drops of **A**.

2. Put 2 drops of **P** into the same test-tube. The solution should remain colourless. Insert the bung and with your finger holding the bung in place, mix the solution.

3. You are required to put drops of **A** into the solution until it becomes a pink colour. The colour should not be darker than the pink colour shown in Fig. 1.1.

(a) (i) Decide how you will use this test-tube to standardise the five other test-tubes you require.

State the **variables** which you will standardise when setting up these test-tubes to take the readings.

.....

.....[1]

4. Set up the five test-tubes as you have described in **(i)**.

(ii) Describe how you standardised the colour in these five test-tubes.

.....

.....[1]

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Fig. 1.2 shows how to use the apparatus provided.

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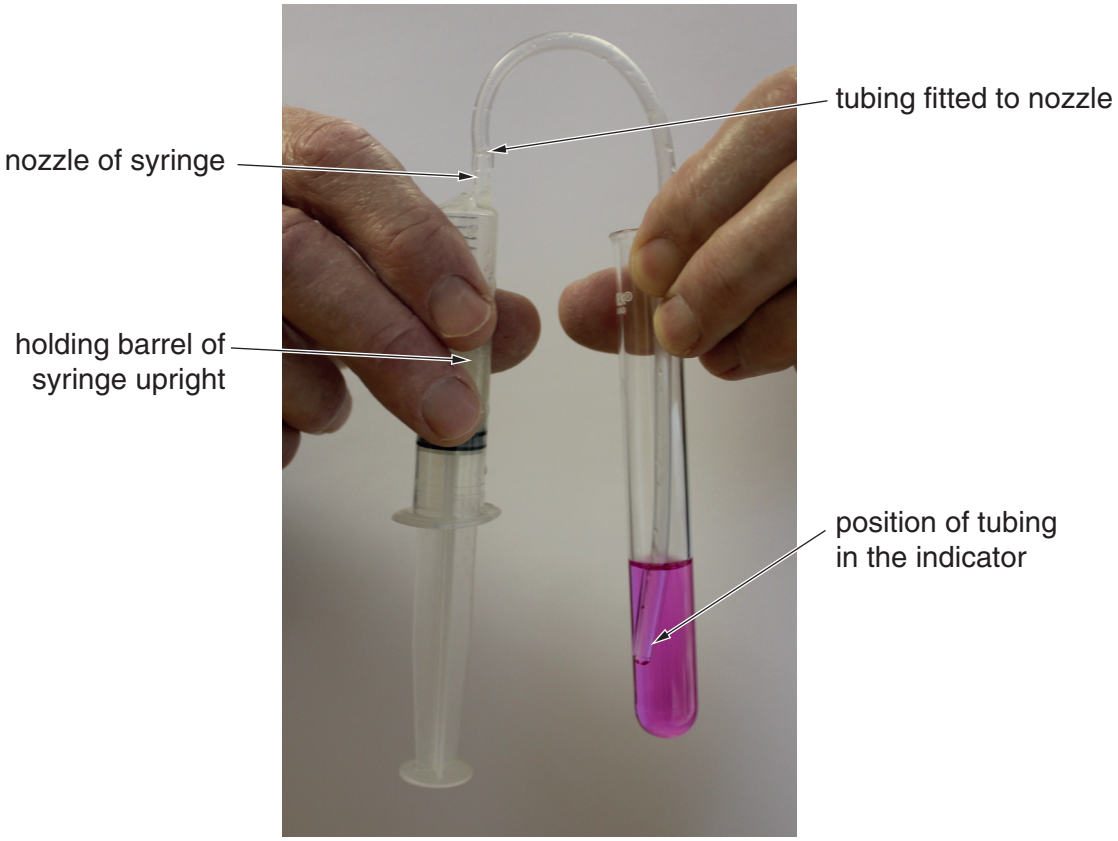


Fig. 1.2

The tubing from the syringe needs to reach into the test-tube so that it is below the surface of the indicator solution as shown in Fig. 1.2.

(iii) Decide how you will standardise the position of the tubing in each test-tube, without cutting the tubing. You may find Fig. 1.2 helpful.

Describe how you standardised the position of the tubing.

.....[1]

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You are required to:

- take five readings as shown in Fig. 1.3
- leave **Y** in the syringe for 10 minutes
- take another five readings as shown in Fig. 1.3.

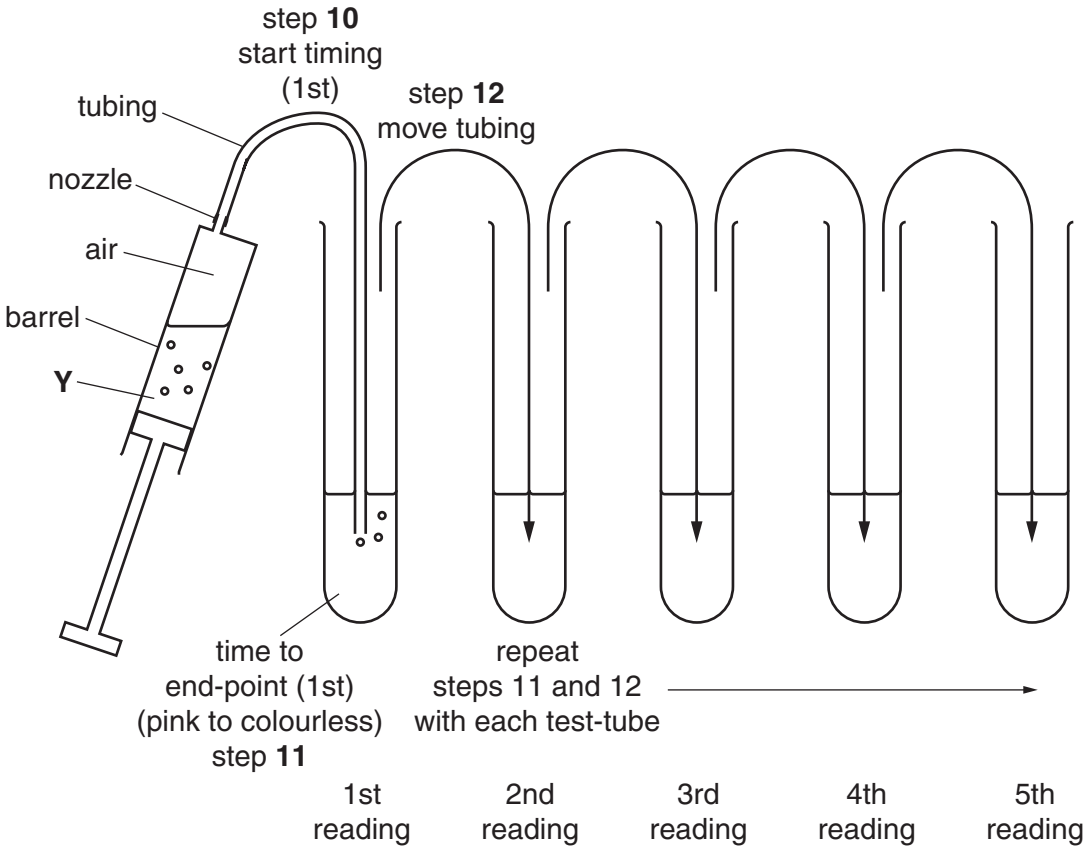


Fig. 1.3

The tubing must be transferred from one test-tube to the next as quickly as possible, after reaching the end-point.

Read up to the end of step 17 before proceeding.

To avoid the time delay in stopping and starting the timing, you must **not** stop the timer at any of the end-points, just record the time.

From your readings you will be required to calculate the time taken to reach the end-point in each test-tube.

(iv) Consider the units of the values recorded on your timer or clock.

State the:

- smallest value which your timer shows .....
- smallest unit of time you have decided to record ..... .

[1]

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(v) Complete Table 1.1 with the raw data, recording the time when the tubing is put into the indicator and the time when the end-point is reached.
Repeat for each test-tube.
After 10 minutes, complete Table 1.2 with the second set of raw data.

Table 1.1 – first five readings

		time		time		time		time		time
start of reading	1st		2nd		3rd		4th		5th	
end-point	1st		2nd		3rd		4th		5th	
space for any processing of the results										

Table 1.2 – readings after 10 minutes

		time		time		time		time		time
start of reading	1st		2nd		3rd		4th		5th	
end-point	1st		2nd		3rd		4th		5th	
space for any processing of the results										

[3]

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5. Remove the tubing from the syringe nozzle.

6. Use this syringe to take up 5 cm^3 of **Y** from below the froth.

7. Clean the outside of the syringe to remove any of **Y**.

8. Holding the barrel of the syringe with the nozzle pointing upwards, pull out the plunger to the 10 cm^3 mark. There is now 5 cm^3 of air in the syringe.
   The syringe should be kept upright to avoid **Y** from entering the tubing.
   Do **not** press the plunger.

9. Holding the barrel of the syringe upright, fit the tubing onto the nozzle of the syringe.

10. As shown in Fig. 1.2 and Fig. 1.3, put the end of the tubing into **P** in the first test-tube and start timing.
    Both the syringe and the test-tube contents need to be gently mixed by shaking until the end-point is reached.

11. Record in Table 1.1 the time shown on the timer when the end-point is reached. The colourless end-point can be compared with the contents of **E**.
    Do **not** stop the timer.

12. Immediately, transfer the tubing into **P** in the next test-tube and record in Table 1.1 the start time shown on the timer (start of second reading).
    Both the syringe and the test-tube contents need to be gently mixed by shaking until the end-point is reached.

13. Repeat steps 11 and 12 with the remaining three test-tubes.

14. After the 5th reading, stop timing. Remove the syringe with the tubing from the test-tube.

15. Leave **Y** in the syringe for 10 minutes. (The syringe should be kept upright so that **Y** is not able to enter the tubing).

16. During the 10 minutes, repeat step 4. You are provided with a container labelled, '**for waste**' and a container labelled '**for washing**', so you can re-use your test-tubes.

17. After 10 minutes, repeat steps 10 to 14 and record the results in Table 1.2.

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Depending on the timer or clock which you have used you may find the following examples helpful, so that you can process your results to find the time taken to reach the end-point.

For Examiner's Use

Example 1: using stop clock or stopwatch

	minutes:seconds	
start time	1:54	= 114 seconds
end-point time	2:18	= 138 seconds
time taken to reach end-point		= 24 seconds

Example 2: using clock times

	hours:minutes:seconds	
start time	9:10:50	difference in time
end-point time	9:11:14	24 seconds
time taken to reach end-point		= 24 seconds

(vi) Using your results from Table 1.1, complete Table 1.3 below to show the calculation to find the time taken to reach the end-point in your first test-tube.

Table 1.3

1st start time	
1st end-point time	
time taken to reach end-point	=

[1]

Question 1 continues on page 10

(vii) Combining the processed results from Table 1.1 and Table 1.2, prepare the space below to record **only** the processed results. This will enable the trend to be observed.

For Examiner's Use

[4]

(b) Identify **three** significant sources of error in this investigation.

.....

.....

.....

.....

.....

.....

.....[3]

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

For Examiner's Use

.....

.....

.....

.....

.....

.....

.....[3]

The original hypothesis was:

The rate of release of carbon dioxide from yeast cells will decrease with time.

(d) State whether your results support this hypothesis.
Use your results to explain your answer.

.....

.....

.....

.....

.....

.....

.....[2]

[Total: 20]

2 **N1** is a slide of a transverse section through a plant leaf. This plant grows mainly in Spain.

For Examiner's Use

(a) Draw a large plan diagram of the whole section of the plant leaf on **N1.**

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

[5]

The vascular bundle is surrounded by a ring of large cells.

For Examiner's Use

(b) Make a large drawing of **one** group of adjacent (touching) cells, as observed on the specimen on **N1**, made up of four whole cells from this ring of large cells.

[4]

(c) Use the eyepiece graticule scale to measure the:

- diameter of the vascular bundle including the ring of cells
- width of the xylem tissue.

State the ratio of the diameter of the vascular bundle to the width of the xylem.

Note: You are **not** required to calibrate the eyepiece graticule scale with a stage micrometer.

You will lose marks if you do not show all the steps in finding the ratio.

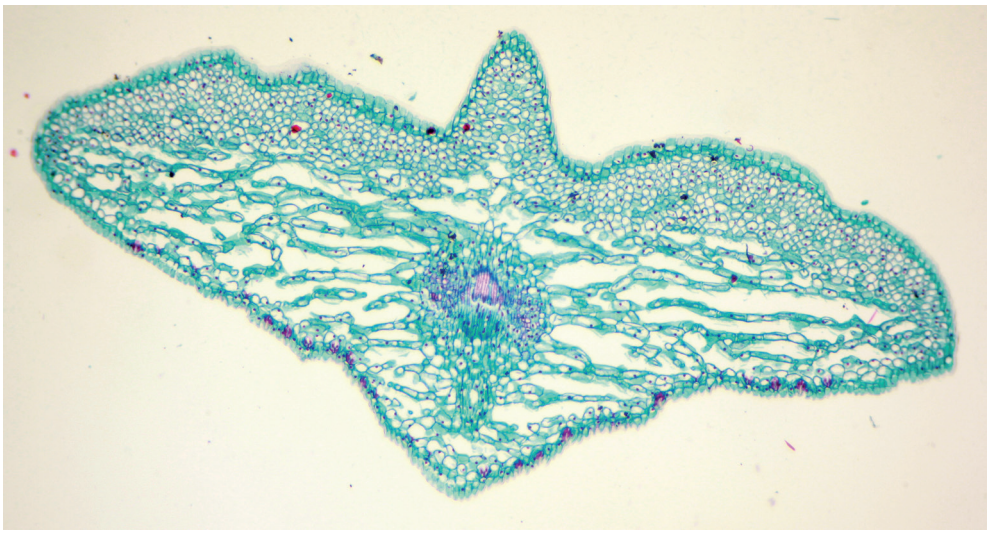
[2]

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[Turn over

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Fig. 2.1 shows a photomicrograph of a transverse section through a leaf from a different species. This plant grows mainly in China.



magnification ×100

Fig. 2.1

(d) Prepare the space below so that it is suitable for you to record observable differences between the specimens on slide **N1** and in Fig. 2.1.

[4]

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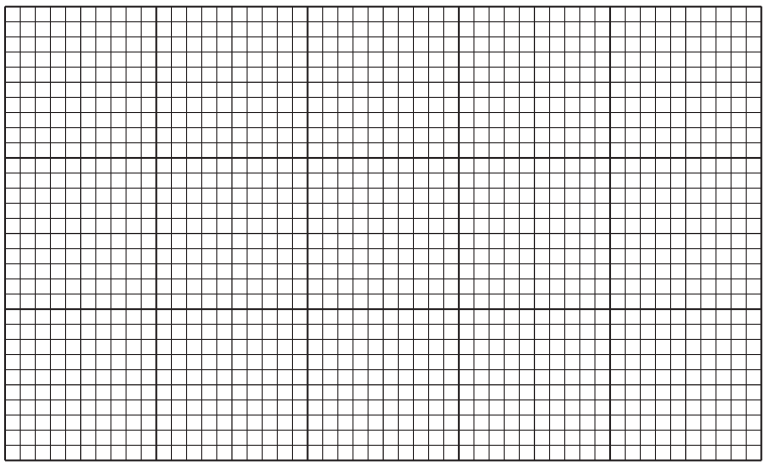
Both the specimen on **N1** and Fig. 2.1 are from plants which are adapted to survive in dry conditions.
Some scientists investigated the water potential in the leaf cells of a tree living in dry conditions over a period of 22 hours.
The results are shown in Table 2.1.

For Examiner's Use

Table 2.1

time of day / hours	water potential in the leaf cells / MPa
00:00	–1.0
02:00	–1.1
06:00	–1.5
08:00	–2.0
12:00	–3.0
18:00	–1.7
22:00	–1.4

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



[4]

(ii) Suggest how transpiration may explain the difference in the water potential in the leaf cells between 12:00 hours and 22:00 hours.

.....

.....

.....[1]

[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

6651147019

BIOLOGY **9700/35**

Advanced Practical Skills 1 **May/June 2013**

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 **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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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.

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 Glucose solutions change the colour of pink potassium manganate(VII) solution, **PM**.

Fig. 1.1 shows the colour change from pink to the colourless end-point.

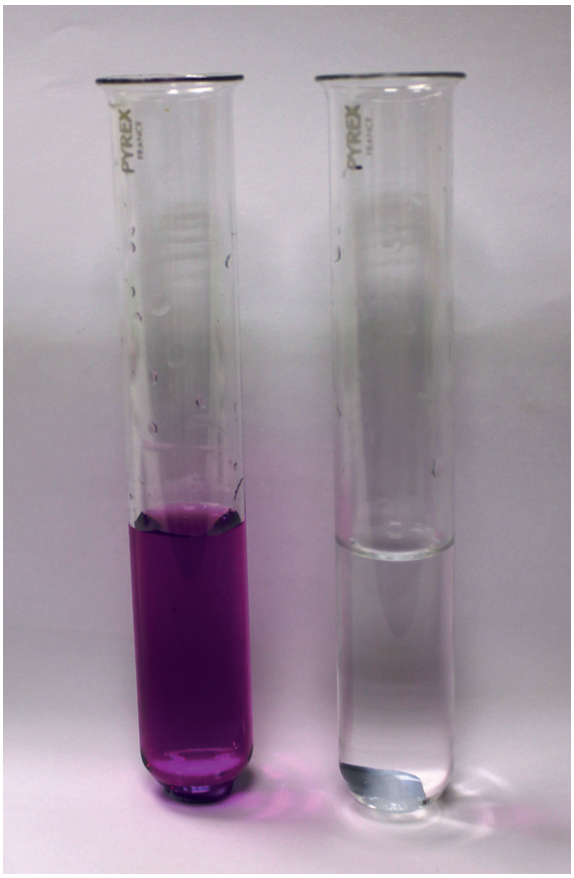


Fig. 1.1

The rate of the colour change depends on the concentration of the glucose solution. The greater the concentration of glucose solution the faster the end-point is reached.

You are required to:

- make different concentrations of glucose solution
- find, for each glucose solution, the time taken for **PM** to change to colourless
- estimate the unknown concentrations of the glucose solutions, **U1** and **U2**.

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You are provided with:

labelled	contents	hazard	volume/cm^3
G	20% glucose solution	none	100
W	distilled water	none	200
S	sulfuric acid	**harmful**	40
PM	potassium manganate(VII) solution	**harmful**	20
U1	glucose solution	none	20
U2	glucose solution	none	20

Sulfuric acid and potassium manganate(VII) solution 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. Using the 20% glucose solution, **G**, as a starting concentration you are required to make up 20 cm^3 of each of four different concentrations of glucose solutions, 6%, 8%, 10%, 12%.

(a) (i) Complete Table 1.1 to show how you will make the four glucose solutions 6%, 8%, 10% and 20%.

Table 1.1

volume of 20% glucose solution/cm^3	volume of distilled water/cm^3	final percentage concentration of glucose
		6
		8
		10
12	8	12

[2]

2. Make all the glucose solutions as in Table 1.1, in the containers provided.

3. Put 10 cm^3 of each glucose solution into four separate test-tubes.

4. Using the syringe labelled **S**, put 5 cm^3 of **S** into each test-tube. Insert the bung and, with your finger holding the bung in place, gently mix the solution in each test-tube. Do **not** turn the test-tube upside-down.

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When adding **PM** to the first glucose solution, you must **not** stop the timer, **just record the time**. When adding **PM** to the other glucose solutions, or at any of the end-points, do **not** stop the timer, just record the time.

From your timer readings you will be required to calculate the time taken to reach the end-point in each test-tube.

(ii) Consider the units of the values recorded on your timer or clock.

State the:

- smallest value which your timer or clock shows .....
- smallest unit of time you have decided to record ..... .

[1]

Read up to step 11 before proceeding.

Proceed as follows:

5. Using the syringe labelled **PM**, put 2 cm^3 of **PM** into the test-tube containing the lowest concentration of glucose solution as shown in Fig. 1.2.

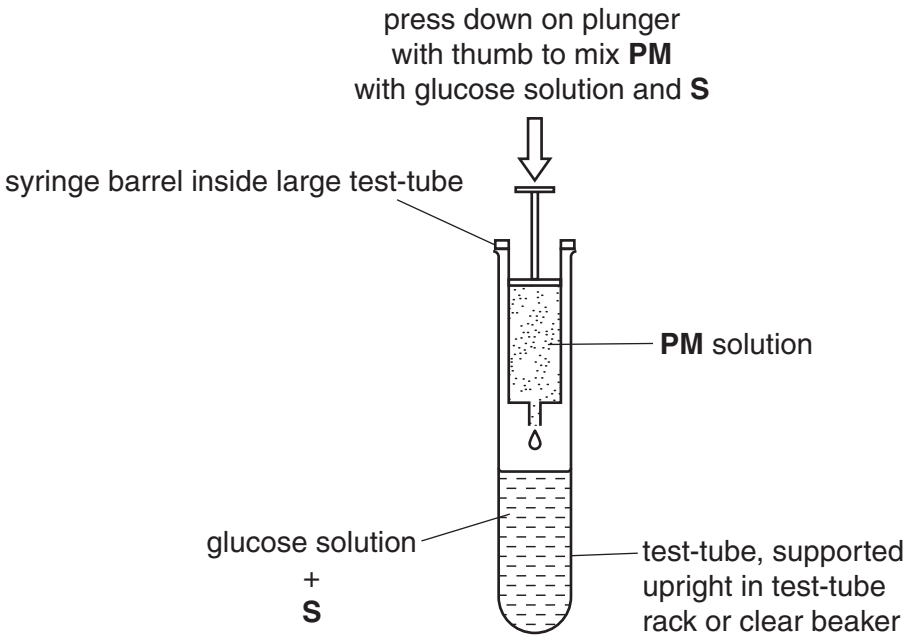


Fig. 1.2

6. Start timing and record the start time from your timer on Fig. 1.3 on page 5.

7. Immediately, put 2 cm^3 of **PM** into the test-tube containing next highest concentration of glucose solution.

8. Record start time from your timer on Fig. 1.3 on page 5.

9. Immediately, repeat steps 7 and 8 for the remaining concentrations of glucose solution.

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10. Observe the four test-tubes and record the time on Fig. 1.3 when each end-point is reached.

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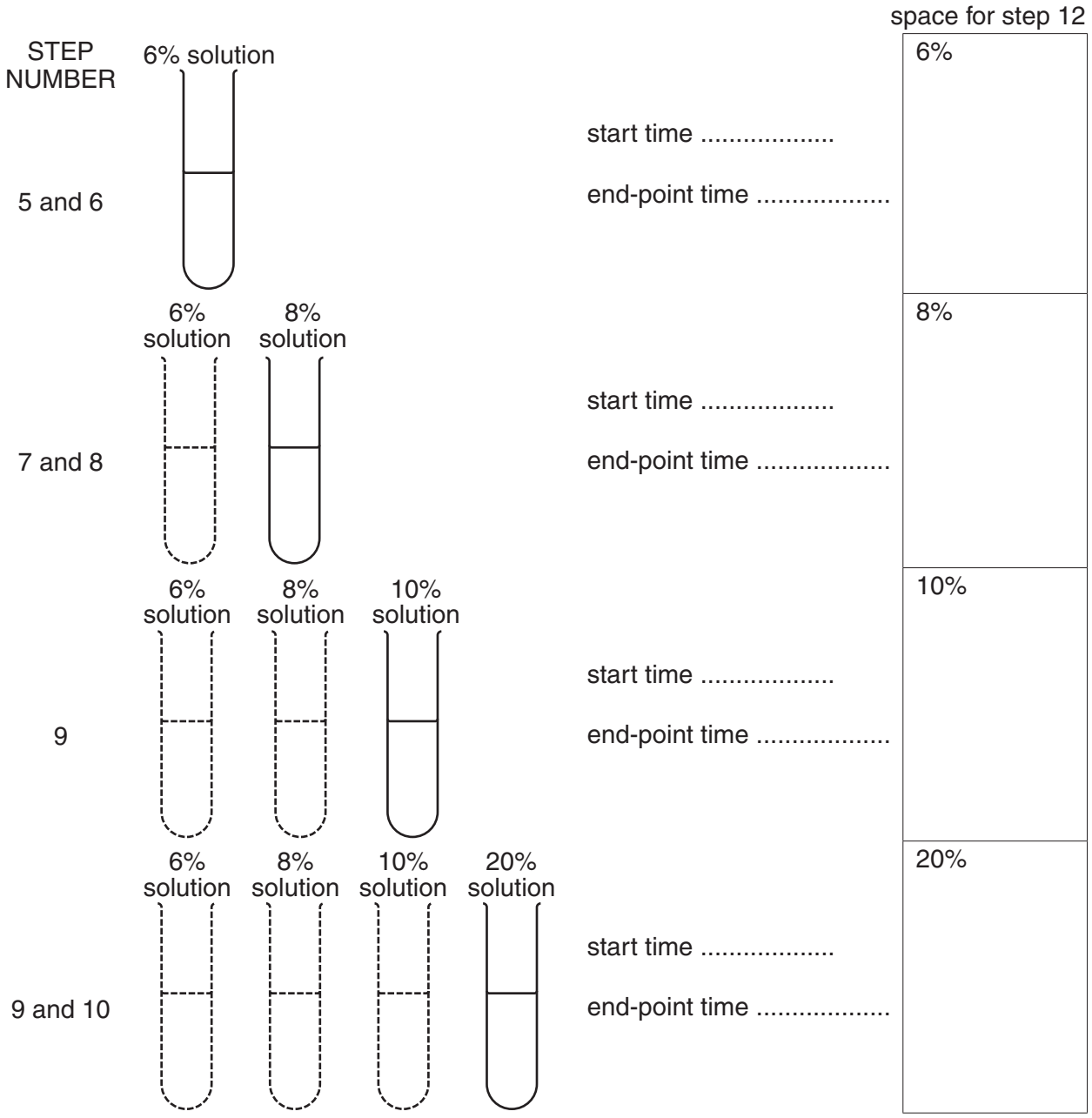


Fig. 1.3

You are required to estimate the glucose concentration of solutions, **U1** and **U2** using the same procedure.

(iii) State one variable, which you will standardise when setting up the test-tubes to find the end-points for **U1** and **U2**.

.....

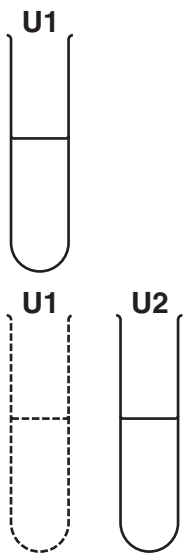
.....[1]

(iv) Describe how you will standardise this variable.

.....

.....[1]

11. Use the same procedure to obtain the end-points for the solutions, **U1** and **U2** and record your times on Fig. 1.4.



start time .....

end-point time .....

space for step 12

U1

U2

start time .....

end-point time .....

Fig. 1.4 [3]

Depending on the timer or clock you have used, you may find the following examples helpful so that you can process your results for **(v)** and for Step 12 to find the time taken to reach the end-point.

For Examiner's Use

Example 1: using stop-clock or stopwatch

start time	minutes:seconds 1:24	= 84 seconds
end-point time	2:55	= 175 seconds
time taken to reach end-point		= 91 seconds

Example 2: using clock times

start time	hours:minutes:seconds 9:10:00	difference in time 1 minute 31 seconds
end-point time	9:11:31	
time taken to reach end-point		= 91 seconds

(v) Using your results **from Fig. 1.3**, complete Table 1.2 to show the calculation to find the time taken for 6% glucose solution to reach the end-point.

Table 1.2

6% solution start time		
6% solution end-point time		
time taken to reach end-point	=	

[1]

12. Use the space on Fig. 1.3 and Fig. 1.4 for processing your readings to find the time taken to reach the end-point for the other glucose solutions, and for **U1** and **U2**.

(vi) Using **only** these processed results, prepare the space below to record the time taken to reach the end-point for **all six** solutions.

For Examiner's Use

[4]

Glucose solutions may be used for different purposes, for example:

Glucose tolerance test solutions, containing 25% glucose.

Sports drink solutions, containing 8% glucose.

Oral Rehydration solutions, containing 2% glucose.

(b) Suggest which of the above solutions is **U2**.

.....[1]

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

For Examiner's Use

.....

.....

.....[1]

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

.....

.....

.....

.....

.....

.....

.....[2]

[Total: 17]

Question 2 starts on page 10

2 Fig. 2.1 shows a photomicrograph of a transverse section through part of a plant stem showing an eyepiece graticule scale as seen using a microscope.

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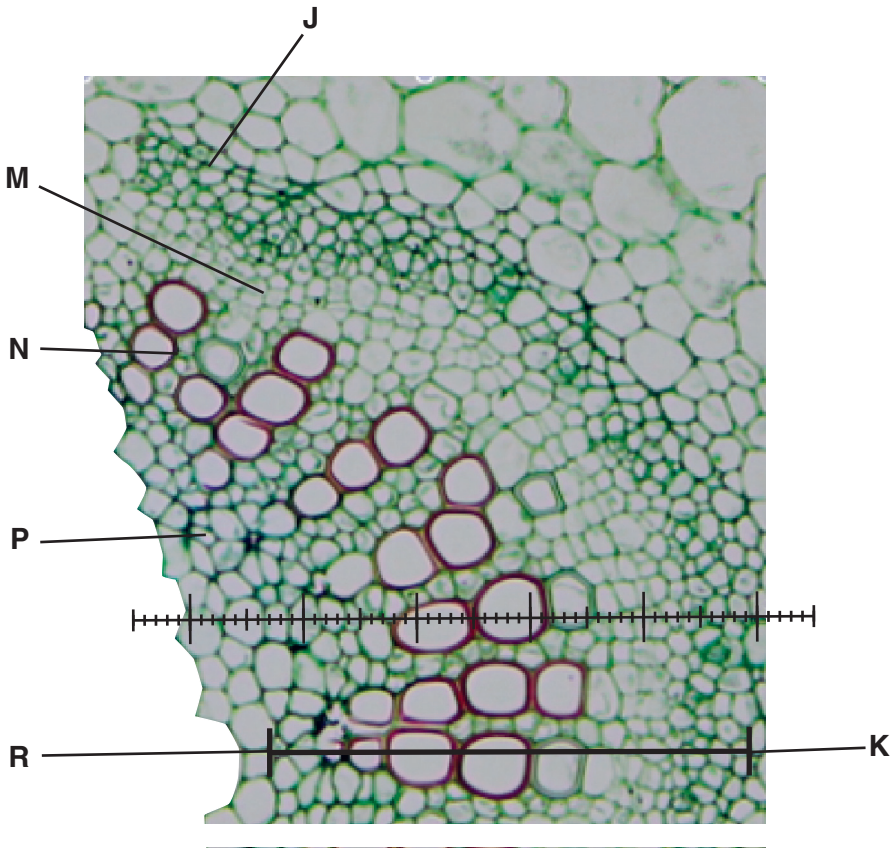


Fig. 2.1

An eyepiece graticule scale can be used to measure the layers of tissues and to help draw a plan diagram with the correct shape and proportions of the tissues, without needing to calibrate the eyepiece graticule scale.

(a) (i) The length of the vascular bundle (from **K** to **R**) in Fig. 2.1 was measured using the eyepiece graticule scale and recorded in Table 2.1.

Table 2.1

layer	**J**	**M**	**N**	**P**	length from **K** to **R**
number of eyepiece graticule scale divisions					43

Complete Table 2.1 by finding the thickness of the different layers **L**, **M**, **N** and **P**, labelled in Fig. 2.1, using the line between **R** and **K** and the eyepiece graticule scale. [2]

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The length (from **K** to **R**) of the vascular bundle in eyepiece graticule divisions was used to make a scale drawing of the outline of the vascular bundle as shown in Fig. 2.2.

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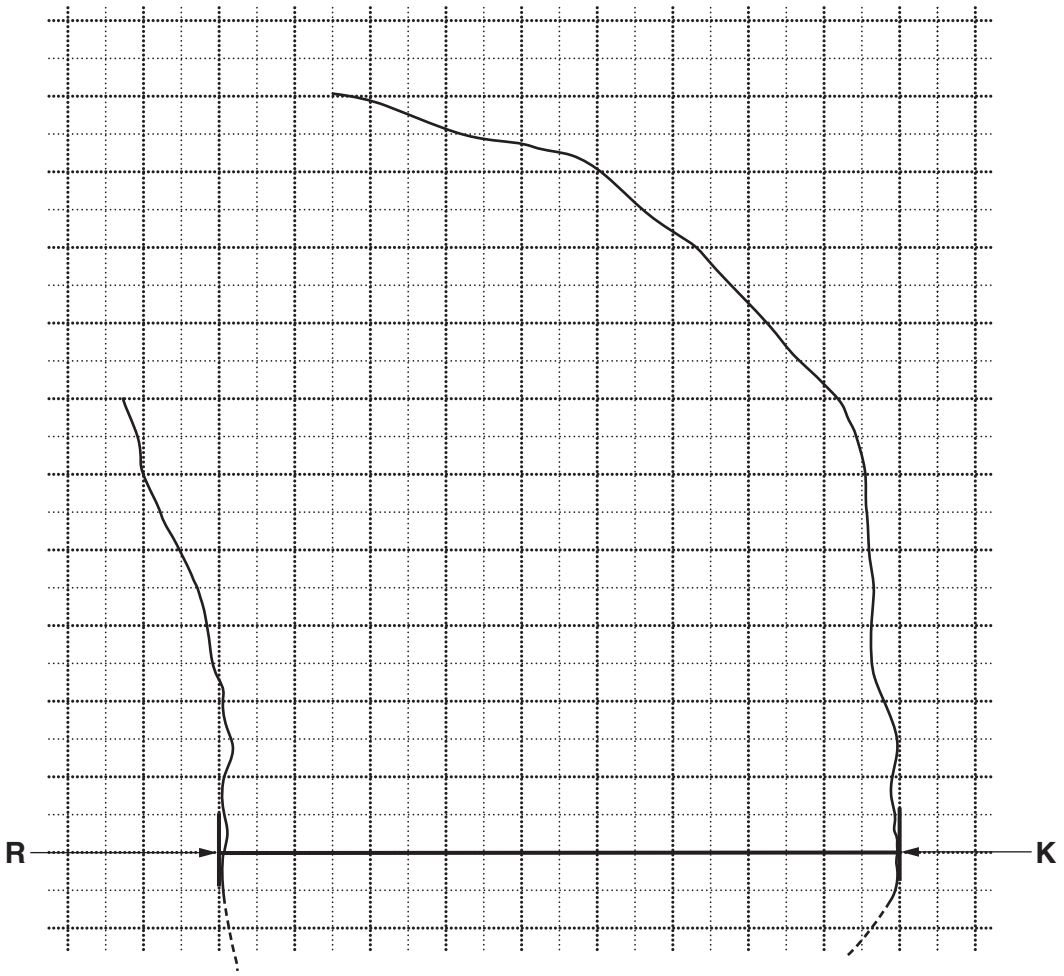


Fig. 2.2

(ii) Complete the plan diagram of this part of the vascular bundle to show the proportions and shape of each of the tissues. Use the values in Table 2.1 to help you. [3]

(iii) Using Fig. 2.2, count the total number of 1 cm by 1 cm squares occupied by the vascular bundle and count the total number of 1 cm by 1 cm squares occupied by the xylem tissue.

Count any 'half square' or 'more than half' as one square.

State the ratio of the area occupied by the vascular bundle to that of the xylem tissue.

You will lose marks if you do not show all the steps in finding the ratio, including indicating counted squares on Fig. 2.2.

ratio ..... [2]

L1 is a slide of a transverse section through the same plant stem as in Fig. 2.1.
This plant grows mainly in Europe and Asia.
This stem shows a stained tissue, close to the epidermis, in the four corners of the stem.
Near to the centre of the stem is a different tissue.

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(b) Make a large drawing of one group of **three** whole, adjacent (touching) cells

- from the tissue in one corner, as observed on the specimen on **L1**.

Make a large drawing of one group of **three** whole, adjacent cells

- from the tissue near to the centre of the stem, as observed on the specimen on **L1**.

The drawings should show any difference in size (linear magnification) observed between each group of cells.

On your drawing, use a ruled label line and label to show one cell wall.

cells from the tissue in one corner

cells from the tissue near to the centre of the stem

[5]

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

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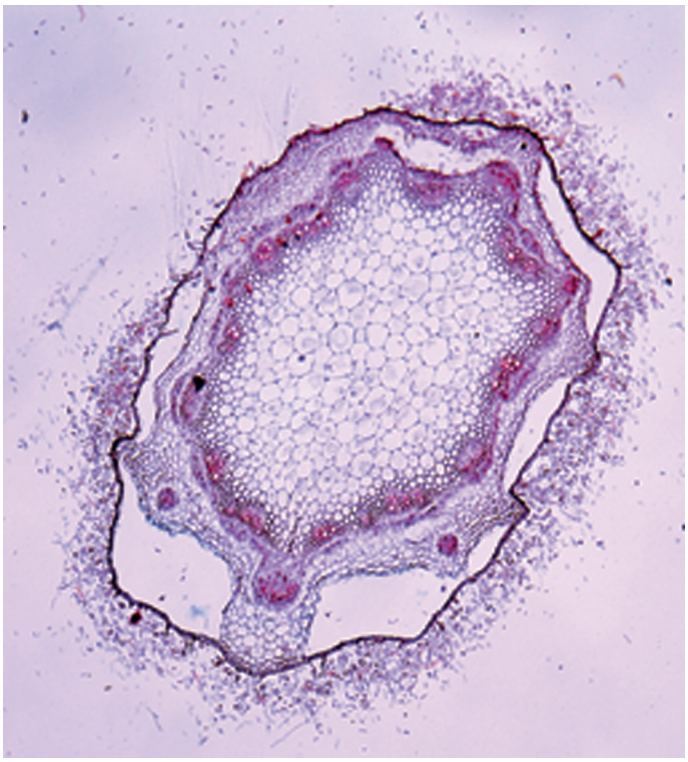


Fig. 2.3

(c) Prepare the space below so that it is suitable for you to record observable differences between the specimens on slide **L1** and in Fig. 2.3 to include:

- the vascular tissue
- at least two other tissues.

[4]

Some scientists carried out an investigation into the **uptake** of glucose by five different types of plant tissues during the course of 25 minutes.

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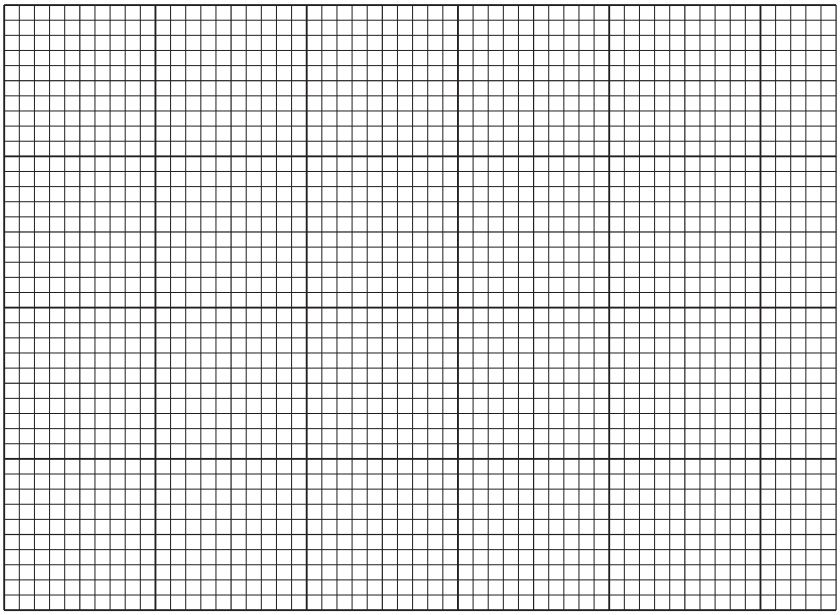
A piece of each type of plant tissue was placed in a solution of glucose.
The starting concentration of this glucose solution was 0.8 arbitrary units which was lower than the concentration inside the plant cells in each tissue.

The results **after 25 minutes** are shown in Table 2.2.

Table 2.2

type of plant tissue	concentration of glucose in the cells/arbitrary units
A	2.0
B	6.5
C	4.2
D	5.6
E	3.2

(d) (i) Plot a chart of the data shown in Table 2.2.



[4]

(ii) Describe and explain the results shown in the chart you have drawn.

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.....[3]

[Total: 23]

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