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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5080526289

BIOLOGY **9700/33**

Advanced Practical Skills 1 **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 **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 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:

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(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]

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(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.

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..... [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.

.....

.....

.....

.....

.....

.....

..... [3]

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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.

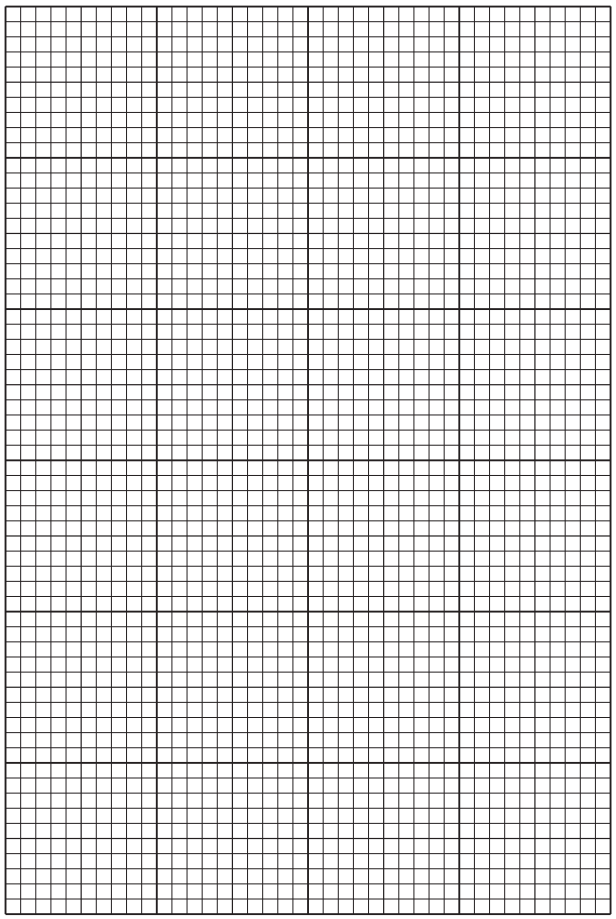
Table 1.1

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.

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[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.

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(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.

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[4]

Fig. 2.1 shows a diagram 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 **0.01 mm**.

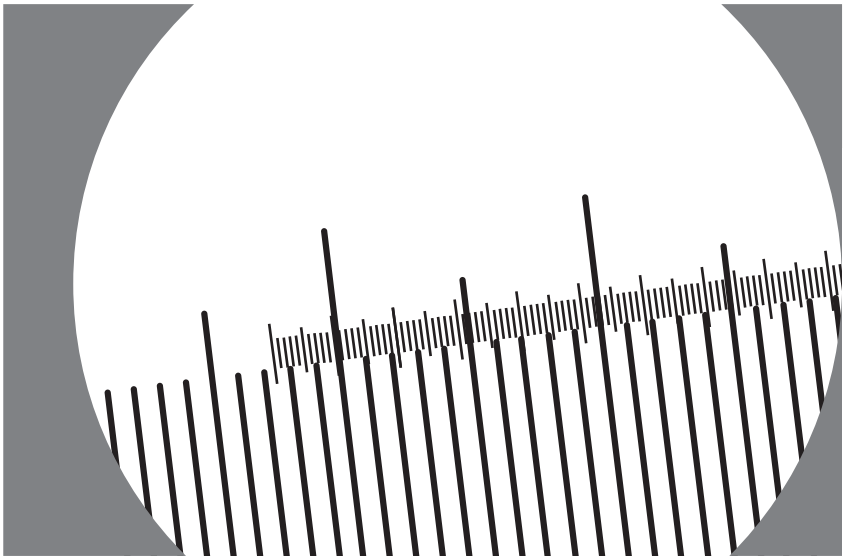


Fig. 2.1

(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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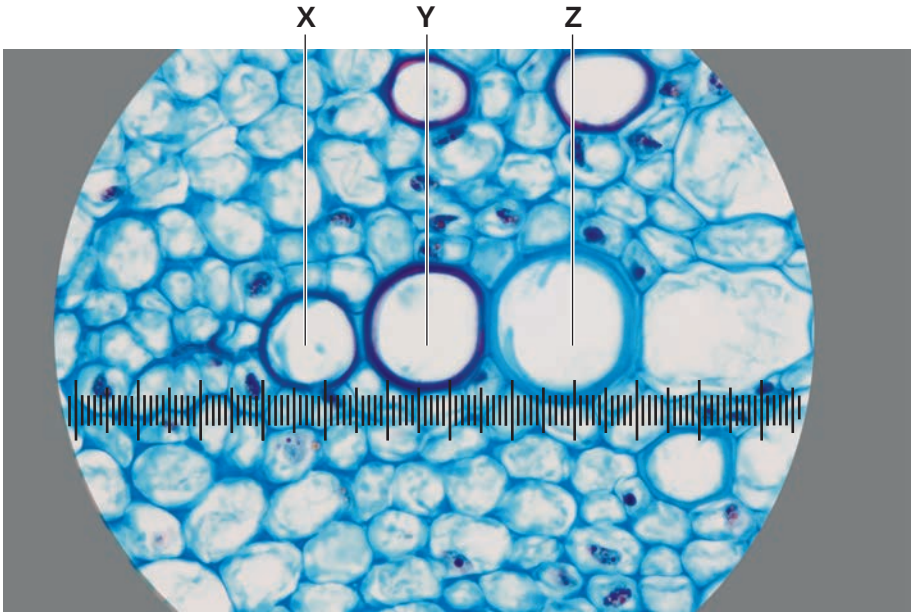


Fig. 2.3

(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.

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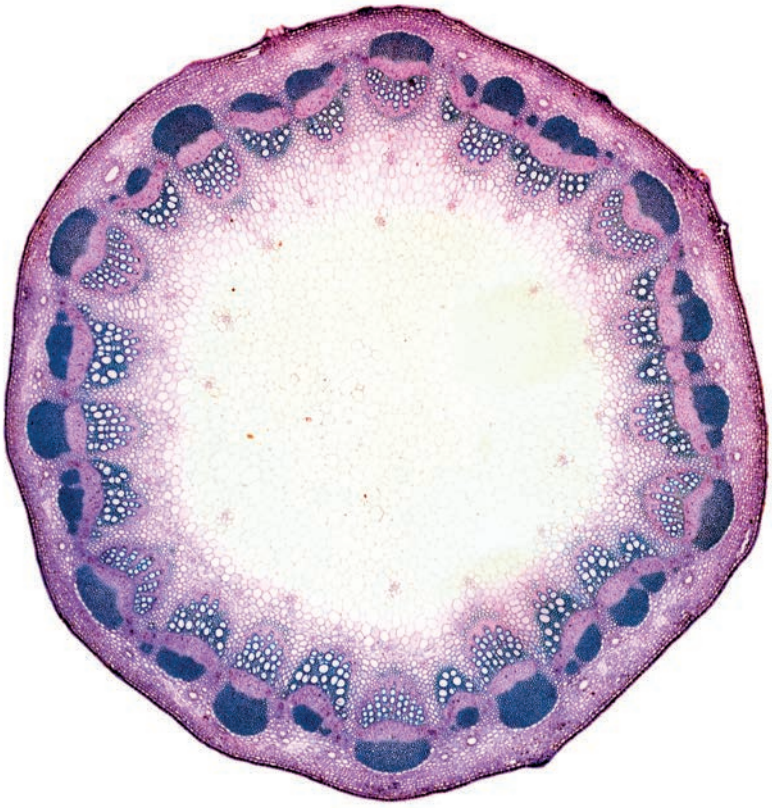


Fig. 2.4

(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]

Copyright Acknowledgements:

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

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