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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 | | | | |

5675225908 4

BIOLOGY **9700/36**

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

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

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

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

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

For Examiner's Use	
1	
2	
Total	

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

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

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You should:

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

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

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

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

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

You are provided with:

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

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

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

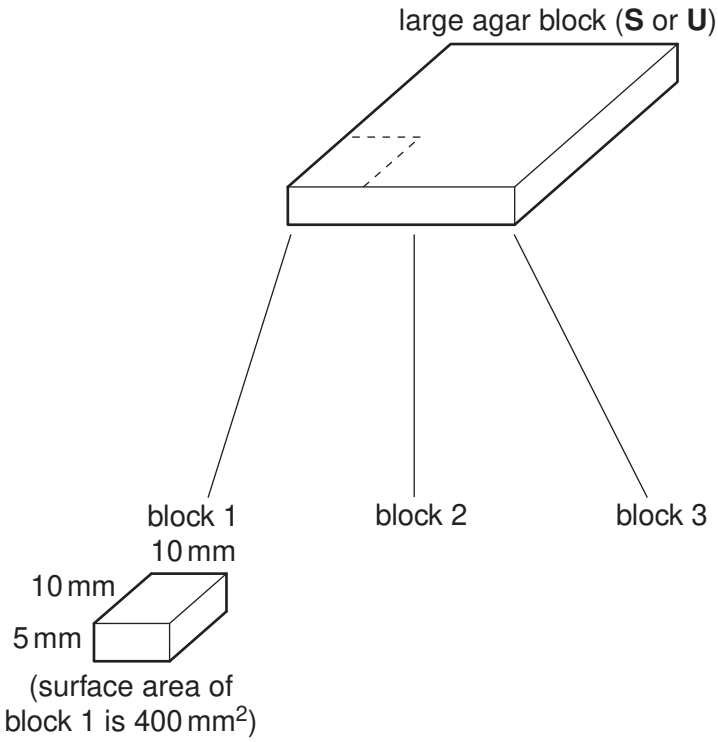

Fig. 1.1

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

(a) (i) Complete Table 1.1.

Table 1.1

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

[3]

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

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

Proceed as follows:

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

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

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

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

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

   Start timing.

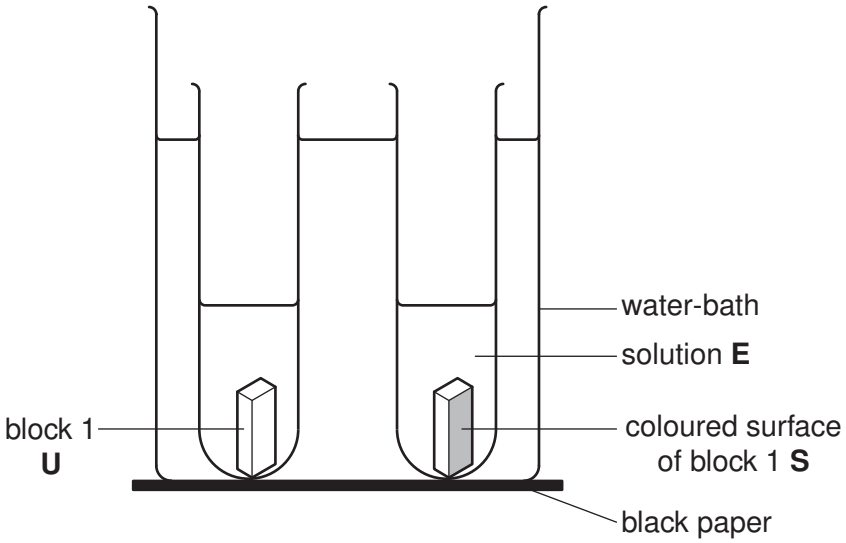

Fig. 1.2

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

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

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

temperature of water ..... °C

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

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[5]

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

.....

.....

.....

.....[2]

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

.....

.....

.....

.....

.....

.....

.....[3]

For Examiner's Use

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

Fig. 1.3 shows the apparatus used.

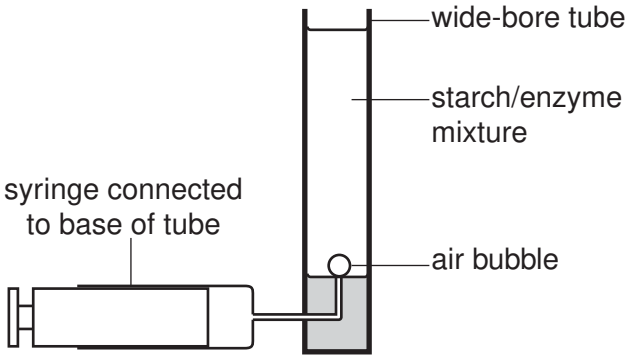

Fig. 1.3

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

Other variables were considered and kept to a standard.

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

Table 1.2

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

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

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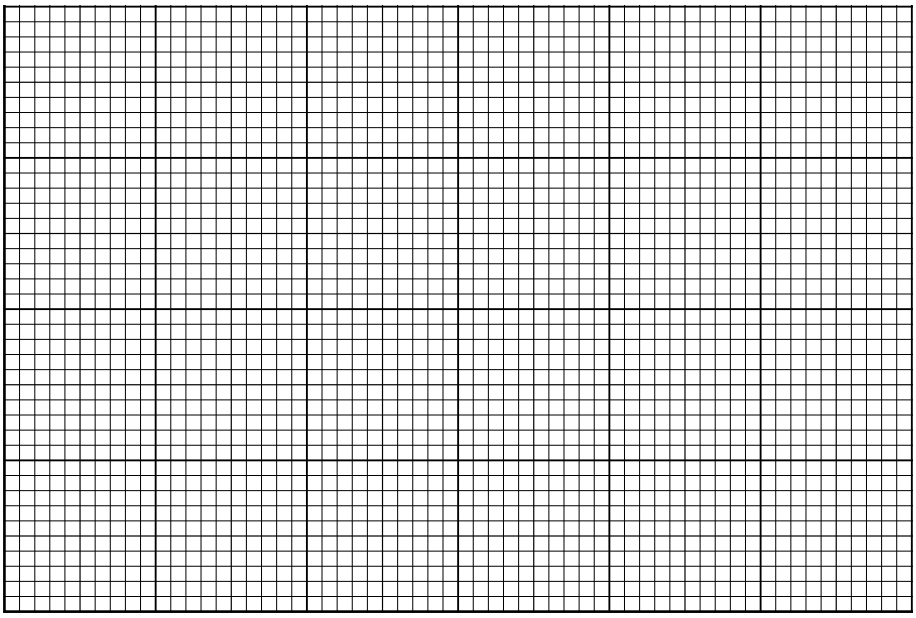

[4]

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

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

speed of bubble .....
[2]

(iii) Explain the reason for the results:

between 12 seconds and 17 seconds

.....

.....

.....

between 25 seconds and 30 seconds.

.....

.....

.....

.....

.....[3]

[Total: 22]

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

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

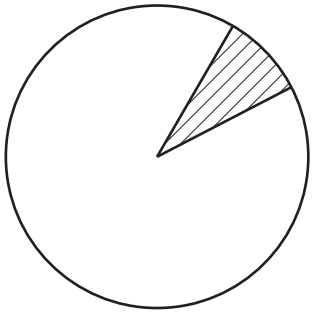

Fig. 2.1

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

[5]

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

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Make a large drawing of this group.

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

[4]

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

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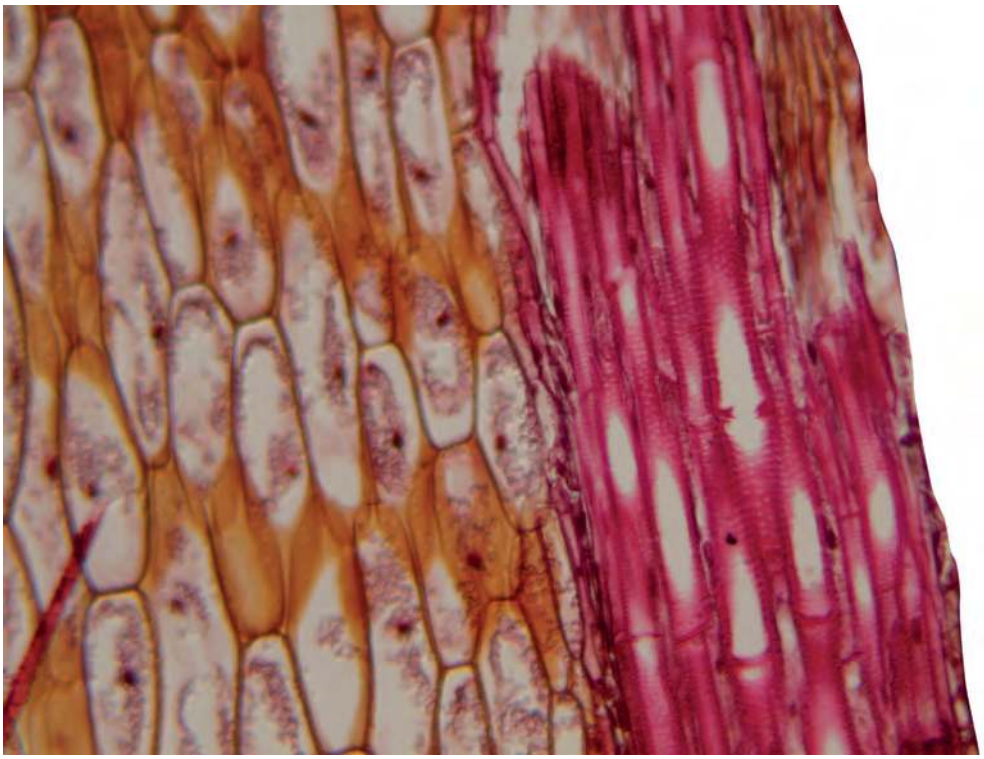

Fig. 2.2

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

[4]

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

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[5]

[Total: 18]

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