UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **5090/03**

Paper 3 Practical Test **May/June 2008**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As specified in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

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

Answer **both** questions.
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 **9** printed pages and **3** blank pages.

1 The maximum size of most living cells is determined by the ratio of their surface area to their volume. As cells increase in size, their volume increases proportionally more than their surface area, thus limiting the ability of the surface area to supply the cell with all the nutrients the cell needs.

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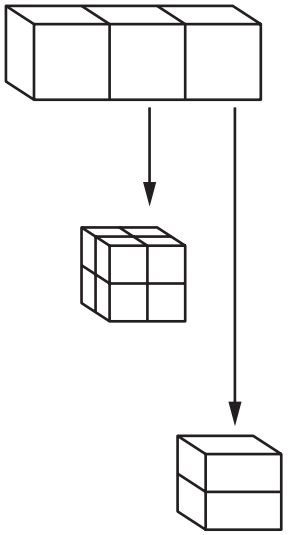
You are going to investigate the relationship between the volume and surface area in model cells made of agar jelly, and the absorption of a liquid by those model cells.

You have been provided with a block of red-coloured agar, measuring approximately 3 cm × 1 cm × 1 cm, labelled **A1**.
You have also been provided with a solution, labelled **A2**.

Read through the following instructions before you attempt question (a).

- Using a sharp knife or scalpel, cut the agar block into three cubes, each approximately 1 cm × 1 cm × 1 cm.
- Place one of these cubes into a large test-tube.



- Cut one of the remaining cubes into 8 blocks so that each block is approximately 0.5 cm × 0.5 cm × 0.5 cm.
- Put all 8 blocks into another large test-tube.

- Cut the remaining cube into two equal pieces.
- Put these two equal pieces into a third large test-tube.

The agar blocks in the test-tubes are the model cells.

When solution **A2** is added to the test-tubes it will diffuse into the agar causing the blocks to change colour from red to pale orange. You are going to measure the time it takes for the blocks in each of the test-tubes to change colour completely after **A2** is added.

(a) Prepare a table in the space below in which to record

- the **total** surface area of the blocks in each test-tube,
- the time **A2** was added,
- the time the colour had changed completely,
- the time taken for the colour to change.

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[5]

Cut up the agar block as instructed on page 2, placing the pieces appropriately in the test-tubes.

Calculate the **total** surface areas of the agar blocks in each test-tube and record them in your table.

Add solution **A2** to each test-tube until all the blocks are covered.
Record the times at which you do this appropriately in your table.

Record the times in your table when the colour of the **blocks** has **completely** changed from red to pale orange (in each test-tube).

While waiting for changes to occur continue to work through the rest of this paper.

Complete your table.

(b) A student carried out a similar experiment and went on to compare the surface area to volume ratio with the time taken for the blocks to lose their red colour.

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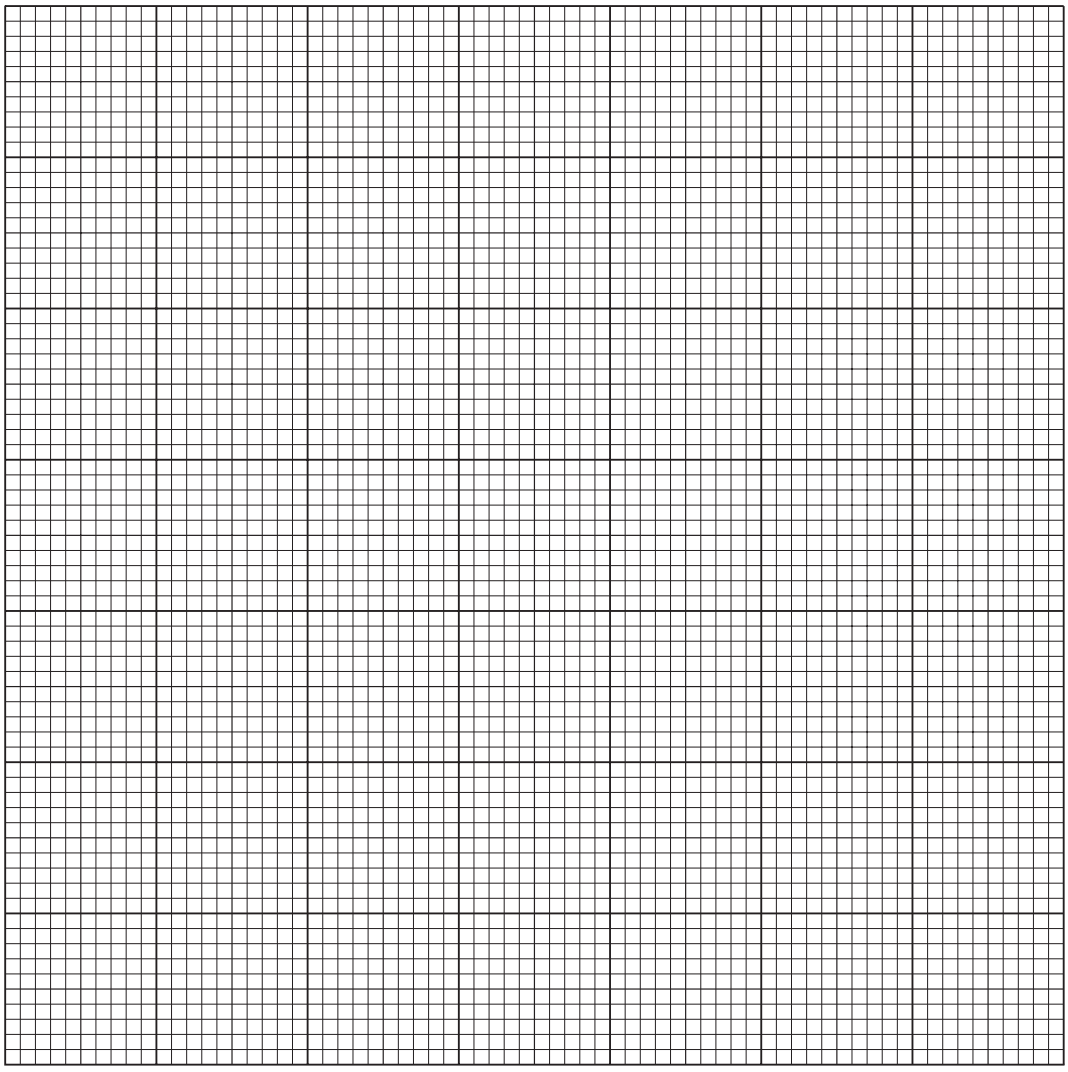
The results are shown in Table 1.1.

Table 1.1

$\frac{\text{surface area}}{\text{volume}}$	time / secs
1.5	120
2	105
3	84
4	60
6	30

(i) Construct a graph of these results on the grid below.



[5]

For Examiner's Use

(ii) State the relationship between the surface area to volume ratio of the blocks and the time taken for substances to diffuse into them that is shown by the graph you have drawn.

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.....[1]

(c) Suggest **two** possible sources of experimental error, other than variations in temperature, which may have affected the results of **your** investigation.

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.....[2]

(d) Describe how the structure and function of a living animal cell differs from the model cells in the movement of substances into the cell.

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.....[2]

(e) Design, **but do not carry out**, an experiment to investigate the effect of temperature on the time taken for a block of agar to change colour when placed in **A2**.

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Include full practical details.

You may use the space below to draw a diagram if you wish.

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.....[6]

[Total : 21]

2 You are provided with two leaves, **L1** and **L2**, from the same plant, kept under the same conditions.

For Examiner's Use

After it was picked, leaf **L1** received no treatment.

(a) (i) Make a large, labelled drawing of **L1**.

[4]

(ii) Measure and record the width of **L1** at its widest point.

width of **L1** .....

Draw a straight line across the widest point of your **drawing of L1**.

Measure and record the length of your line.

length of line .....[2]

(iii) Calculate the magnification of your drawing.
Show your working.

magnification .....[2]

Leaf **L2** was tested for starch by being

- dipped in boiling water,
- heated in alcohol,
- placed in iodine solution.

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(b) Suggest why each of the following processes was performed on **L2**.

(i) Dipped in boiling water .....

..... [1]

(ii) Heated in alcohol .....

..... [1]

(iii) Placed in iodine solution .....

..... [1]

(c) Examine leaves **L1** and **L2** carefully.

L1 is a leaf at the beginning of an experiment and **L2** a leaf at the end of that experiment. Give a full explanation for any conclusions than can be made from this experiment.

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..... [3]

(d) Fig. 2.1 is a photomicrograph of a section through another dicotyledonous leaf.

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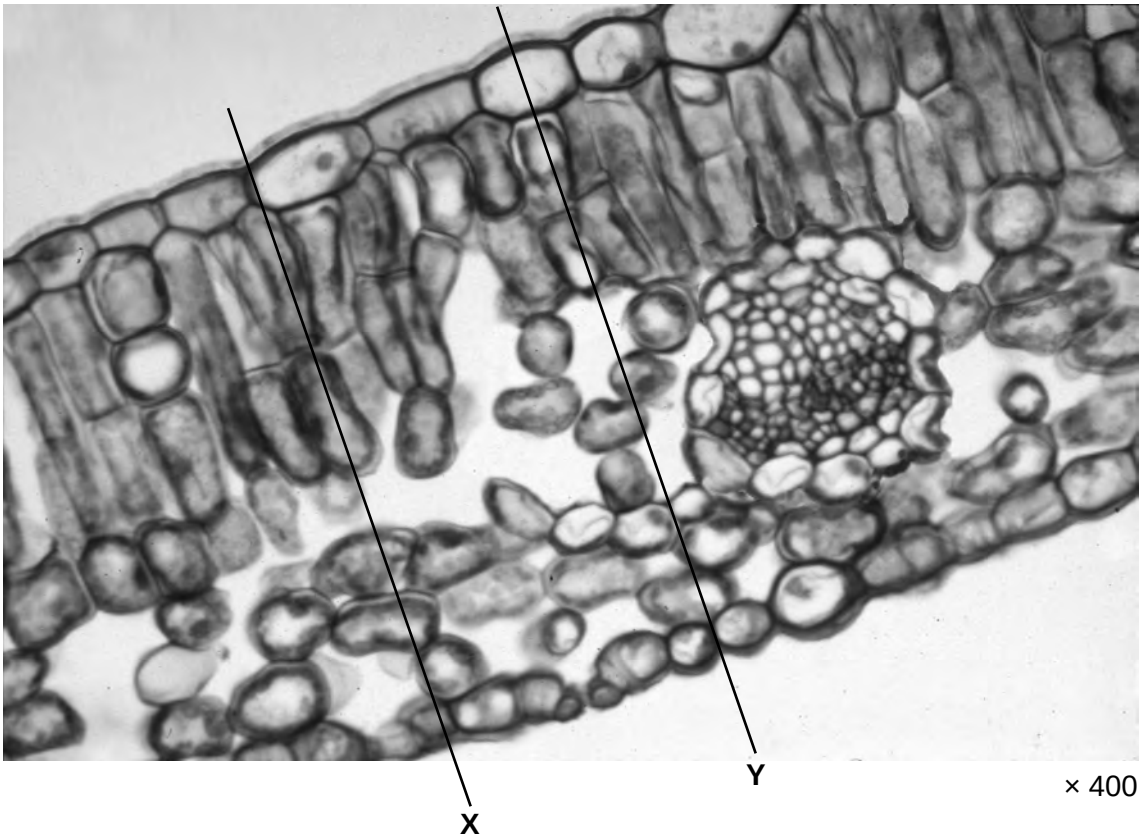

Fig. 2.1

Make a large, labelled drawing of the cells between lines labelled **X** and **Y**.

[5]

[Total : 19]

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