



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Advanced Level

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**BIOLOGY**

**9700/52**

Paper 5 Planning, Analysis and Evaluation

**May/June 2010**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**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 pen.  
You may use a soft 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.

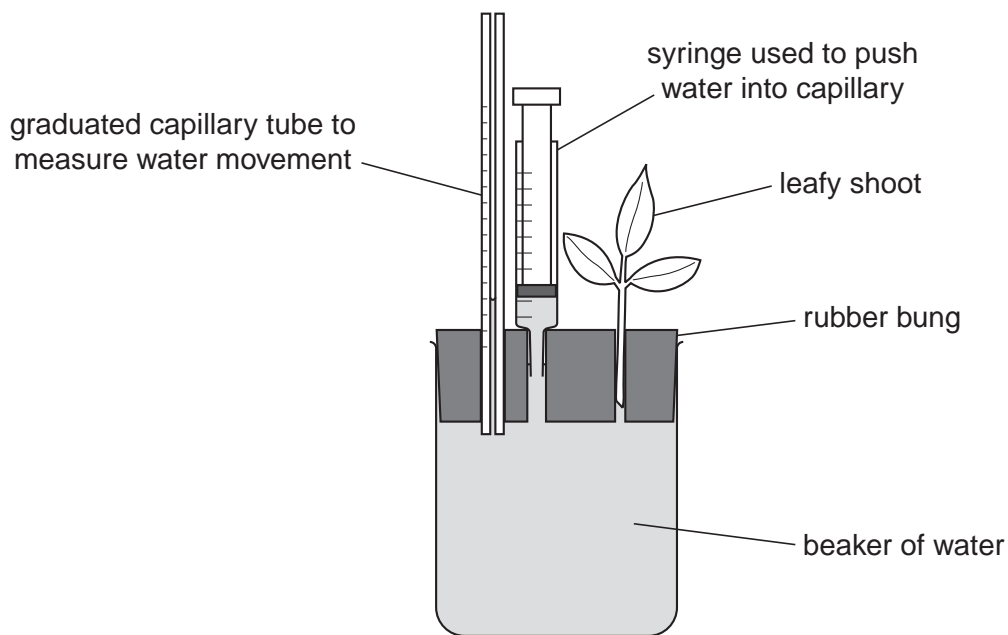
At the end of the examination, fasten all your work securely together.  
The number of marks is given in brackets [ ] at the end of each question or part question.

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| 1                  |  |
| 2                  |  |
| <b>Total</b>       |  |

This document consists of 7 printed pages and 1 blank page.



1 Fig. 1.1 shows one type of potometer used by a student to investigate transpiration.



**Fig. 1.1**

**(a) (i)** Suggest a hypothesis the student could test about the transpiration of a mesophyte (a plant adapted to a moist environment) and a xerophyte (a plant adapted to a dry environment).

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..... [1]

**(ii)** Using this potometer, outline a procedure that the student could use to test this hypothesis.

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..... [8]

(iii) The capillary tube measures the distance moved by the water. Explain how the actual volume of water lost can be calculated.

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..... [2]

(b) Sketch a graph to predict the expected results of the investigation.

[2]

- (c) (i) The student then measured the surface area of the leaves by tracing the outline on a grid and counting the number of squares covered by the leaves. This area was doubled.

Mesophyte:

surface area of leaves =  $36 \text{ cm}^2$

water loss in 30 minutes =  $0.018 \text{ cm}^3$

Calculate the rate of water loss in  $\text{cm}^3 \text{ m}^{-2} \text{ min}^{-1}$ .

Show all the steps in your calculation.

[3]

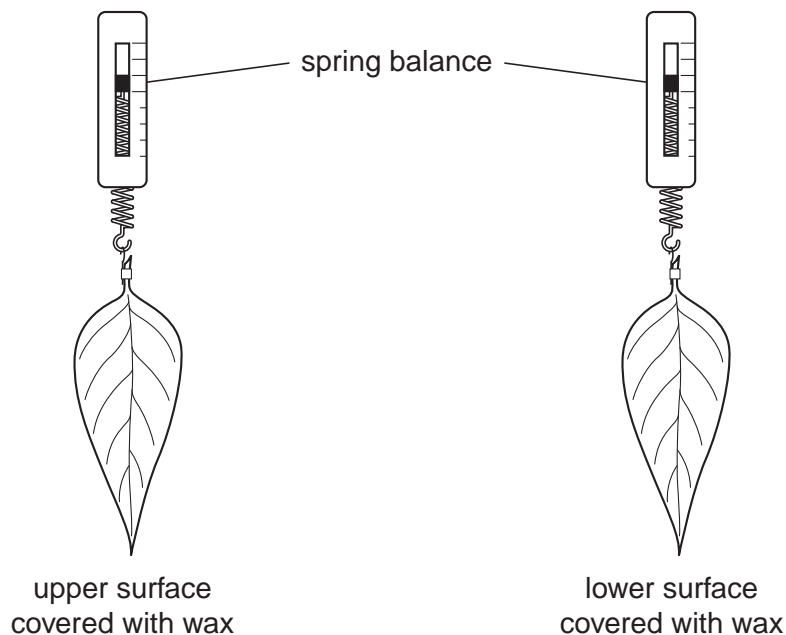
- (ii) State a statistical test that the student could use to find out if the difference in water loss between the two types of leaf is significant. State a reason for your choice.

.....

..... [2]

- (d) In a further investigation the student measured the loss in mass of each type of leaf.

Fig. 1.2 shows the experimental set-up.



**Fig. 1.2**

Table 1.1 shows the results of this investigation.

**Table 1.1**

| day                  | loss in mass/g per day |           |                    |           |
|----------------------|------------------------|-----------|--------------------|-----------|
|                      | upper side covered     |           | lower side covered |           |
|                      | mesophyte              | xerophyte | mesophyte          | xerophyte |
| 1                    | 4.25                   | 0.55      | 1.15               | 0.05      |
| 2                    | 3.20                   | 0.35      | 1.00               | 0.05      |
| 3                    | 1.55                   | 0.20      | 0.75               | 0.00      |
| 4                    | 0.50                   | 0.10      | 0.95               | 0.05      |
| 5                    | 0.05                   | 0.04      | 1.00               | 0.00      |
| total loss in mass/g | 9.55                   | 1.24      | 4.85               | 0.15      |

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State three conclusions that can be drawn from these results.

1. ....  
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2. ....  
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3. ....  
..... [3]

[Total: 21]

2 The effects of the concentration of two amino acids was tested on the growth of fibroblast cells from mice. The following procedure was used:

- a culture of 2000–3000 cells was added to a growth medium containing all the required nutrients other than the amino acids being tested
- a total of ten cultures were used for each concentration of amino acid
- the cells in the culture were fed every two days with fresh amino acid solution
- after 6 days five cell samples from each of the cultures were counted
- the proportional increase in cell number was calculated for each culture.

Table 2.1 shows the results of this investigation.

**Table 2.1**

|               | mean proportional increase in cell number                |     |     |     |     |     |     |      |      |      |
|---------------|--|-----|-----|-----|-----|-----|-----|------|------|------|
|               | concentration of amino acid added/ $\text{mmol dm}^{-3}$ |     |     |     |     |     |     |      |      |      |
|               | 0.0  | 0.1 | 0.2 | 0.5 | 1.0 | 2.5 | 5.0 | 10.0 | 20.0 | 40.0 |
| glutamine     | 0.5  | 1.0 | 5.2 | 7.6 | 8.7 | 6.3 | 1.2 | 1.3  | 0.0  | 0.0  |
| glutamic acid | 0.4  | 0.2 | 0.1 | 0.3 | 0.4 | 0.4 | 0.4 | 0.6  | 0.8  | 0.3  |

(a) State two variables that should be controlled in this investigation. For each, suggest a method by which it might be controlled.

1. ....

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2. ....

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..... [4]

(b) Explain how the proportional increase in cell number is calculated.

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..... [1]

(c) The hypothesis tested was

**Growth of fibroblasts is stimulated by glutamine and inhibited by glutamic acid.**

Assess how far the results support the hypothesis.

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..... [4]

[Total: 9]

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