UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

0875576693

BIOLOGY **9700/05**

Paper 5 Planning, Analysis and Evaluation **May/June 2009**

1 hour 15 minutes

Candidates answer on the Question Paper.

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 **all** 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	
3	
Total	

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

UNIVERSITY *of* CAMBRIDGE
International Examinations

1 **(a)** Fig. 1.1 shows a simple apparatus that can be used to identify the tissue that conducts water up a stem. A cut shoot was placed in dye solution.

After several hours the dye accumulated in the leaves.

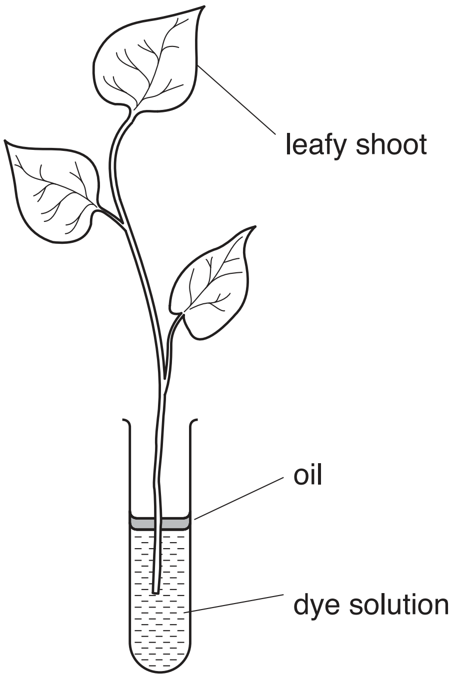

Fig. 1.1

(i) The stem was further investigated to locate the tissue that conducts water.

Describe a method by which the tissue through which water is conducted in the stem can be identified.

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....[2]

(ii) Explain why a cut shoot is used rather than an intact plant with roots.

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....[2]

(b) (i) Describe how this apparatus could be set up and used to find the rate of movement of water up the stem.

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....[6]

(ii) State how the rate of water movement is calculated.

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....[1]

(iii) Predict the effect on the rate of water movement of adding a respiratory inhibitor to the dye solution.

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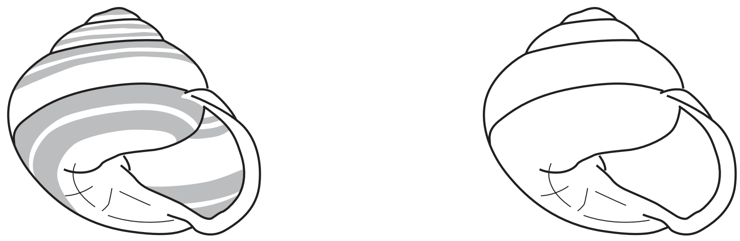
....[1]

[Total: 12]

2 **(a)** A species of snail is found in a variety of habitats. The shells of these snails may have dark bands on the surface of the shell (banded) or may not have any bands on the shell (unbanded). These shells are shown in Fig. 2.1.



banded snail **unbanded snail**

Fig. 2.1

These snails are eaten by birds. The birds break the shell of the snail on a stone and eat the soft body. The shell remains are left by the stones.

In an investigation all the snails were removed from two areas where trees were growing. One area had birds that feed on this snail, the other area did not. An equal number of banded and unbanded snails were released into both areas.

- In the area with the predatory birds the types of broken snail shells found around the stones were counted over a two week period.
- In the area without predatory birds the same number of living snails was collected and the number of banded and unbanded snails counted after two weeks.

Table 2.1 shows the results of this investigation.

Table 2.1

	number	
	unbanded snails	banded snails
broken snail shells found around stones in area with predatory birds	149	271
shells of living snails in area without predatory birds	206	214

(i) Identify the independent variable and the dependent variable in this investigation.

independent ....

dependent ....[2]

(ii) Suggest an explanation for the results of this investigation.

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....[3]

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(b) In another investigation in a different area, the population of this snail was investigated using a capture/recapture method.

A sample of the snail population was collected and marked. These snails were then released and at a later time another sample was collected and the number of marked individuals counted.

The population was estimated using the formula:

$$\frac{\text{number of animals marked in the first sample x total number of animals in the second sample}}{\text{number of marked animals in the second sample}}$$

Table 2.2 shows the results of two different investigations of the same population.

- In **investigation 1**, the second sample was collected 24 hours after release.
- In **investigation 2**, the second sample was collected 72 hours after release.

Table 2.2

number of snails	**investigation 1**	**investigation 2**
total first sample all marked	255	200
total second sample	400	360
number of marked shells in second sample	150	30
estimate of total population		2400

(i) Complete Table 2.2 by calculating the total population estimated from **investigation 1**.

Write your answer in Table 2.2. [1]

(ii) Suggest why the procedure used to estimate the population means that the estimate made from **investigation 1** is more likely to be reliable than the estimate from **investigation 2**.

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....[2]

[Total: 8]

[Turn over

3 The yeast *Rhodotorula glutinis* produces an enzyme, α-arabinofuranosidase, that could be used in the production of compounds to enhance the flavour and smell of fruit juices. The effect of the initial pH of the culture medium on the growth rate of this yeast was tested. Three continuous culture systems were set up, each with a different initial pH. The cultures were sampled at hourly intervals for 20 hours at each pH. The mean growth rate was then calculated.

The mean growth rates with their standard deviations are shown in Table 3.1.

Table 3.1

pH	mean growth rate /arbitrary units h^{-1}
4.0	0.156 ± 0.001
5.2	0.197 ± 0.013
7.0	0.037 ± 0.011

(a) (i) Suggest why a continuous culture system was used to test the growth rate of this yeast.

....

....[1]

(ii) Identify two variables that should be controlled during the fermentation.

1 ....

2 ....[2]

(b) (i) Explain how the mean values in Table 3.1 were obtained.

....

....[1]

(ii) State what the standard deviations tell you about these results.

....

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....[2]

(iii) State whether or not the data in Table 3.1 indicate that the difference in growth rate of *R. glutinis* at pH 5.2 is significantly different from the growth rate at pH 4.0.

Give a reason for your answer.

....

....[1]

(iv) A *t*-test was carried out on the results for pH 4.0 and pH 5.2 and gave the value,

***t* = 2.4**

State the number of degrees of freedom for this *t*-test.

....[1]

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(c) Based on the findings of the *t*-test, a student concluded that pH 5.2 was optimum for the production of the enzyme α-arabinofuranosidase by *R. glutinis*. Suggest two reasons why this conclusion may not be valid.

1...

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2...

....[2]

[Total: 10]

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