



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Advanced Level

CANDIDATE  
NAME

CENTRE  
NUMBER

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**BIOLOGY**

**9700/05**

Paper 5 Planning, Analysis and Evaluation

**October/November 2007**

**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 pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE ON 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	
<b>Total</b>	

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



1 The procedure below was used to immobilise a culture of unicellular algae in alginate beads.

- A concentrated culture of algae was mixed with sodium alginate solution.
- A syringe without a plunger was clamped above a beaker of calcium chloride solution.
- The mixture of algae and sodium alginate was poured into the barrel of the syringe and allowed to drip into calcium chloride solution.
- The calcium chloride solution was swirled gently so balls were formed.
- After 15 minutes the balls of immobilised algae were washed in distilled water.

(a) These balls of immobilised algae and hydrogen carbonate indicator solution were used to test the hypothesis:

**The rate of photosynthesis varies with the intensity of light.**

(i) Sketch a graph of the results that you would expect from this investigation.

[2]

(ii) Suggest three ways in which the independent variable might be varied.

1. ....

.....

2. ....

.....

3. ....

..... [3]

(iii) State **one** reason why the algal balls were washed in distilled water.

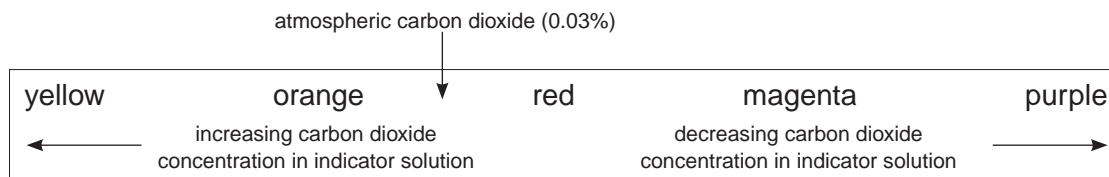
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..... [1]

(b) Hydrogen carbonate indicator is sensitive to pH changes.

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Fig. 1.1 shows the range of colours.



**Fig. 1.1**

(i) Describe how hydrogen carbonate indicator could be used to measure the dependent variable.

.....

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.....

.....

..... [3]

(ii) State how reliability of measurement can be achieved,

.....

..... [1]

accuracy of measurement can be achieved.

.....

.....

.....

..... [2]

[Total: 12]

- 2 Students were asked to drink coffee to test the hypothesis that caffeine decreases reaction time.

The coffee was made by dissolving 2 g of instant coffee in 200 cm<sup>3</sup> of hot water.

A computer programme was used to measure their reaction time before and after drinking the coffee.

Table 2.1 shows the results of this investigation.

**Table 2.1**

subject	age	sex	reaction time / ms	
			before coffee	after coffee
A	15	male	0.17	0.16
B	17	female	0.15	0.17
C	19	female	0.18	0.15
D	16	male	0.19	0.17
E	17	male	0.14	0.12
F	20	male	0.17	0.14
G	18	male	0.21	0.15
H	16	female	0.17	0.16

- (a) (i) Calculate, to the nearest whole number, the percentage difference in the mean reaction time due to coffee intake.

..... [1]

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

dependent .....

independent ..... [2]

- (iii) Identify three uncontrolled variables in this investigation.

1. ....

2. ....

3. .... [1]

(b) Discuss the extent to which these results support the hypothesis.

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..... [4]

[Total: 8]

- 3 (a) Grassland, grazed by goats, was compared to grassland ungrazed for varying amounts of time. Moths were trapped, their numbers counted and then the moths were released. The effect of grazing on a species of rare moth was investigated. A chi-squared ( $\chi^2$ ) test was used to test the significance of the results obtained.

(i) State the null hypothesis.

..... [1]

(ii) Complete Table 3.1 to calculate the value of  $\chi^2$  from the equation below.

$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad \begin{array}{l} O = \text{Observed result} \\ E = \text{Expected result} \end{array}$$

**Table 3.1**

site	O	E	$(O - E)^2$	$\frac{(O - E)^2}{E}$
grazed for 2 years	36			
ungrazed for 10 years	90			
ungrazed for 30 years	114			

$\chi^2 =$  ..... [4]

Table 3.2 shows some chi-squared values.

**Table 3.2**

degrees of freedom	probability greater than			
	0.10	0.05	0.01	0.001
1	2.71	3.84	6.64	10.83
2	4.60	5.99	9.21	13.82
3	6.25	7.82	11.34	16.27
4	7.78	9.49	13.28	18.46
10	15.99	18.31	23.21	29.59
20	28.40	31.41	37.57	45.31

- (b) (i) State the number of degrees of freedom. .... [1]
- (ii) State the probability of the value calculated for  $\chi^2$ . .... [1]
- (iii) Explain the significance of these results and suggest the consequences to this species of moth if grazing land is increased.

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..... [3]

[Total: 10]

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