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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9367560015

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.

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1	
2	
3	
Total	

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

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

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- 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.

.....

..... [1]

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

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Fig. 1.1 shows the range of colours.

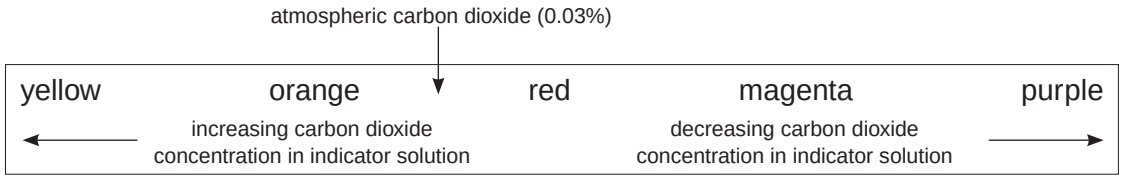


Fig. 1.1

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

.....

.....

.....

.....

.....

..... [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^3 of hot water.
A computer programme was used to measure their reaction time before and after drinking the coffee.

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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]

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

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..... [4]

[Total: 8]

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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 (χ^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 χ^2 from the equation below.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

O = Observed result
E = Expected result

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			

χ^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**

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(b) (i) State the number of degrees of freedom. ..... [1]

(ii) State the probability of the value calculated for χ^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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