



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 2008**

**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 IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.

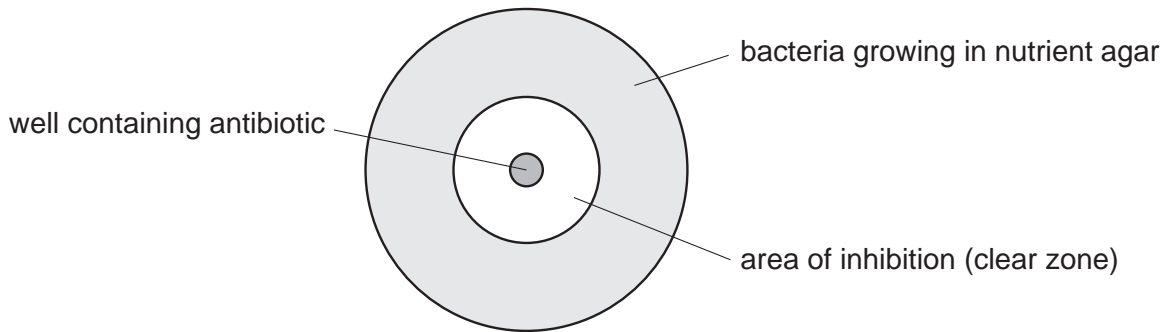
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
<b>Total</b>	

This document consists of **8** printed pages and **4** blank pages.



- 1 Fig. 1.1 shows an experimental set up used by a student to test the antibiotic penicillin on a range of different bacteria.



**Fig. 1.1**

Pure cultures of different types of bacteria were mixed with nutrient agar and poured into Petri dishes. Once the agar was set, a well was cut in the agar in the centre of each Petri dish, using a cork borer. Different concentrations of penicillin were added to the wells. After incubation for 24 hours at 20°C the size of the zone of inhibition was measured.

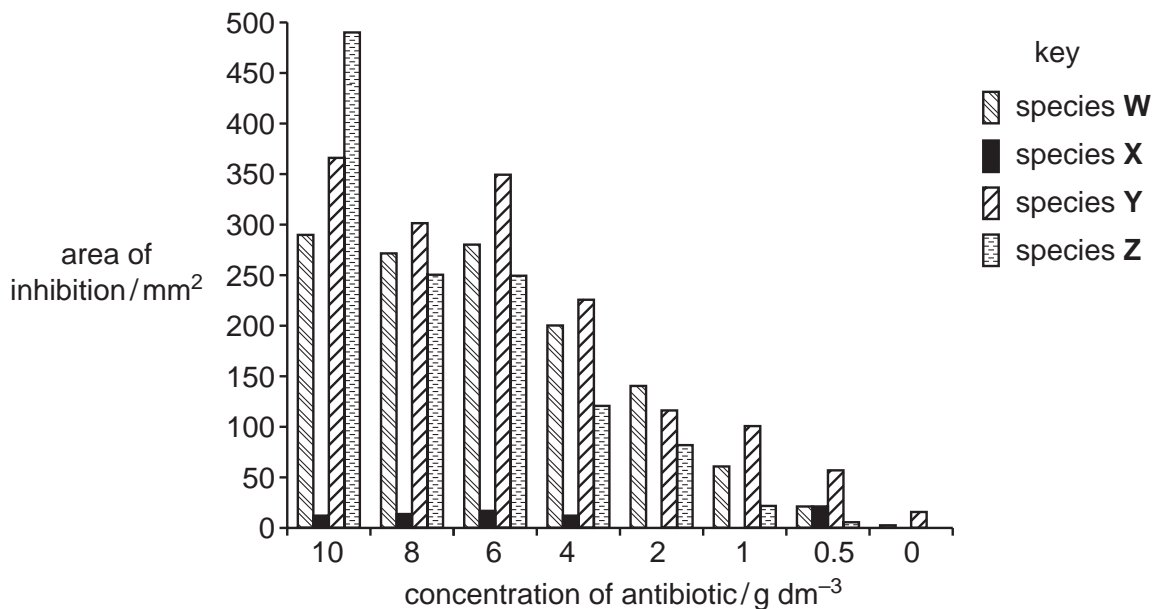
- (a) Suggest two variables, other than time and temperature of incubation, which should be controlled.

1. ....

2. ....

[2]

Fig. 1.2 shows a graph of the results plotted by the student.



**Fig. 1.2**

(b) (i) Describe the general trend shown by these results.

.....  
..... [1]

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(ii) The student identified four measurements as anomalous.

- Species X at  $0.5 \text{ g dm}^{-3}$
- Species Y at  $8.0 \text{ g dm}^{-3}$
- Species Y at  $0.0 \text{ g dm}^{-3}$
- Species Z at  $10.0 \text{ g dm}^{-3}$

Suggest **two** reasons why these four measurements may be anomalous.

.....  
.....  
.....  
.....  
.....

Suggest **two** reasons why some of these measurements may **not** be anomalous.

.....  
.....  
.....  
.....  
.....

[4]

[Total: 7]



- (b) (i) Calculate the mean number of stomata per mm<sup>2</sup> on the lower epidermis.

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Answer ..... [1]

- (ii) Use the information and formula below to calculate the standard error for these results.

$s$  = standard deviation

$$S_M = \text{standard error} = \frac{s}{\sqrt{n}}$$

upper epidermis:  $s = 2.96$

lower epidermis:  $s = 3.04$

Standard error, upper epidermis .....

Standard error, lower epidermis ..... [2]

Standard error is used to calculate confidence limits. These indicate how certain the student can be that the true mean of a whole population lies within the range of the estimated sample mean.

Table 2.2 shows some values of  $t$ .

**Table 2.2**

degrees of freedom ( $\nu$ )	10	12	14	16	18	20	22	24	26	28	30	40	50	60
$t$ values when probability = 0.05	2.23	2.18	2.14	2.12	2.10	2.09	2.07	2.06	2.06	2.05	2.04	2.02	2.01	2.00
$t$ values when probability = 0.01	3.17	3.06	2.98	2.92	2.88	2.85	2.82	2.80	2.78	2.76	2.75	2.70	2.68	2.66

- (iii) State the number of degrees of freedom for **one** epidermis for the data in **Table 2.1** (page 4).

..... [1]

6

- (iv) Use information from Table 2.2 and the formula below to calculate the confidence intervals at 95% certainty for the upper epidermis and for the lower epidermis of the leaves.

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$$\text{confidence interval at 95\%} = t \times S_M$$

Express your answer in the form, mean  $\pm$  confidence interval.

Show your working.

upper epidermis .....  $\pm$  .....

lower epidermis .....  $\pm$  .....

[4]

[Total: 15]

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**Question 3 starts on Page 8.**



(i) Outline how electrophoresis is used to obtain a genetic fingerprint.

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.....  
.....  
..... [3]

(ii) State why gene probes can be used to locate specific alleles of genes.

.....  
..... [1]

(iii) State what conclusions can be drawn about the alleles of the genes located in Fig. 3.1.

.....  
.....  
.....  
..... [2]

[Total: 8]



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