UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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	
Total	

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.

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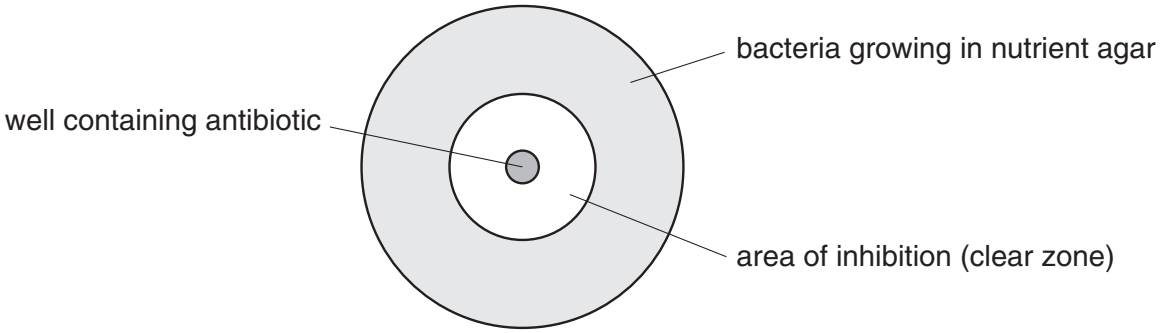

Fig. 1.1

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.

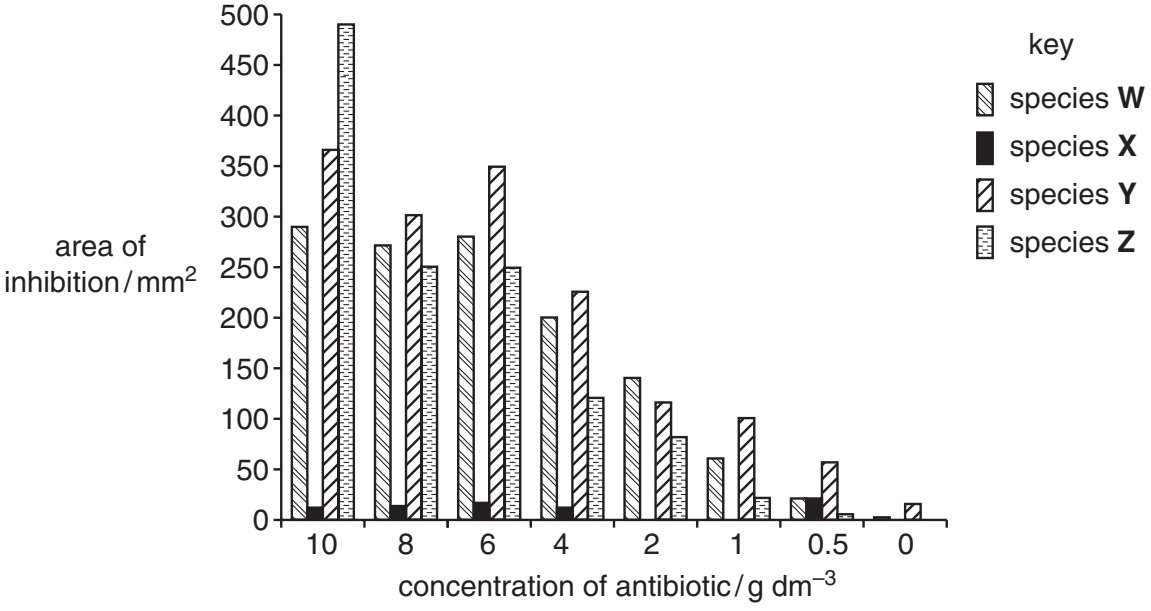

Fig. 1.2

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

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.....

..... [1]

(ii) The student identified four measurements as anomalous.

Species **X** at 0.5 g dm^{-3}

Species **Y** at 8.0 g dm^{-3}

Species **Y** at 0.0 g dm^{-3}

Species **Z** at 10.0 g dm^{-3}

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

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

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[4]

[Total: 7]

[Turn over

2 A student carried out an investigation using epidermal strips from leaves of a plant growing at the side of the road. These epidermal strips were used to test the hypothesis:

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The lower epidermis of the leaves of this plant has more stomata per unit area than the upper epidermis.

(a) (i) State the independent and dependent variables in this investigation.

independent variable .....

.....

dependent variable .....

..... [1]

The student presented the results of the investigation as shown in Table 2.1.

Table 2.1

	number of stomata / mm^{-2}											
	upper epidermis						lower epidermis					
	leaf 1	leaf 2	leaf 3	leaf 4	leaf 5	mean	leaf 1	leaf 2	leaf 3	leaf 4	leaf 5	mean
strip 1	30	27	35	32	29	31	32	37	39	33	36	
strip 2	33	29	38	30	32		36	31	40	35	38	
strip 3	31	32	30	31	27		36	34	37	32	35	
strip 4	34	29	33	36	30		39	30	32	38	31	

(ii) Describe a procedure by which the student could have obtained these results.

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..... [6]

(b) (i) Calculate the mean number of stomata per mm^2 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 = 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 (v)	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]

(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 ± confidence interval.

Show your working.

upper epidermis ..... ± .....

lower epidermis ..... ± .....

[4]

[Total: 15]

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Question 3 starts on Page 8.

3 The International HapMapProject intends to develop chromosome maps that describe the common patterns of human genetic variation. Researchers in Canada, China, Japan, Nigeria, the United Kingdom and the United States will collaborate to obtain genetic information and make the findings available around the world.

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(a) Suggest how the researchers can control,

(i) variation between individuals .....

.....

(ii) variation between ethnic groups. .....

.....

[2]

(b) Fig. 3.1 shows DNA fingerprints from a group of ten people (**A** – **J**). The presence or absence of different alleles of some genes have been located by using specific probes that fluoresce different colours.

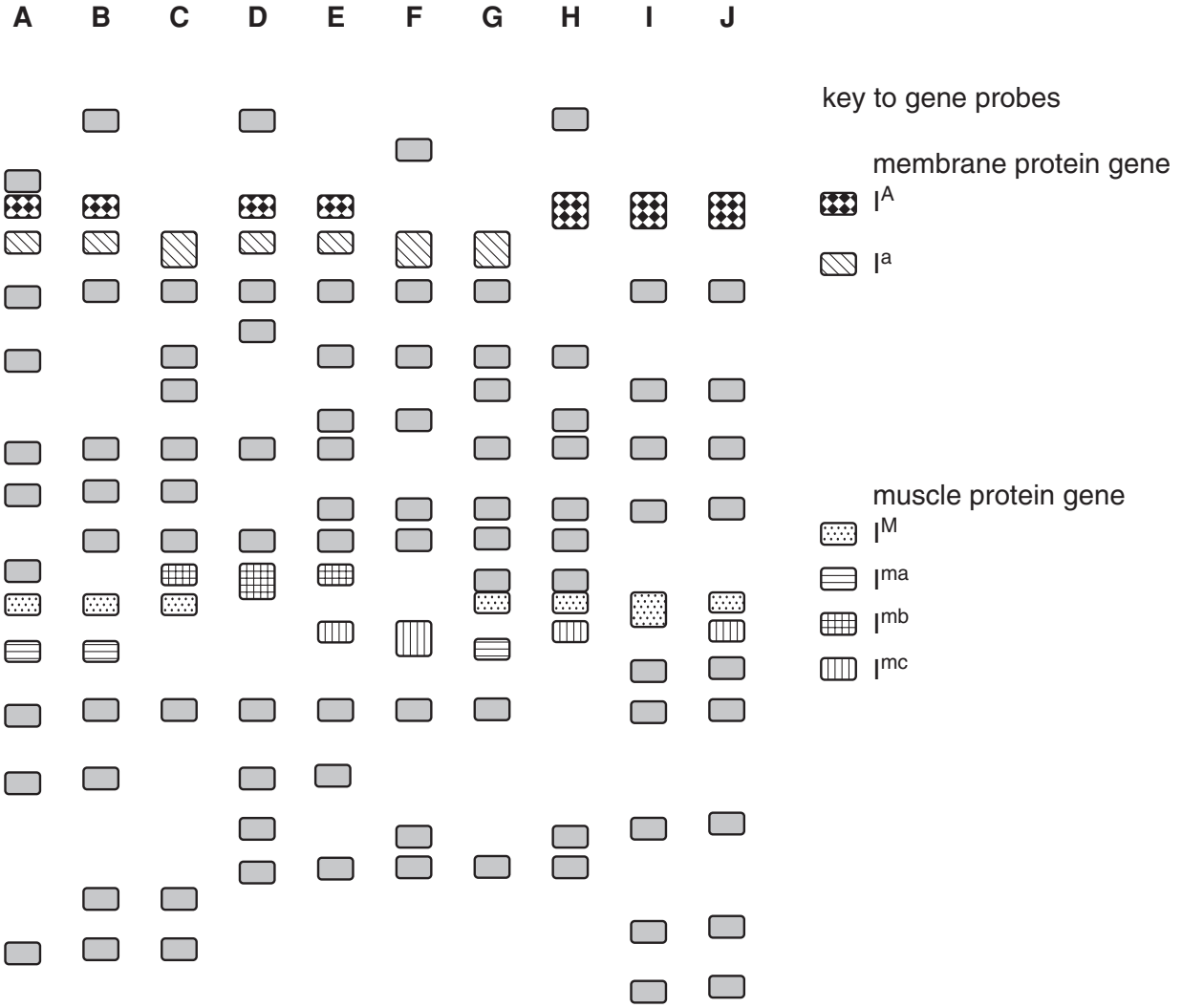

Fig. 3.1

(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.

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..... [1]

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

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..... [2]

[Total: 8]

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