Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

0674730717

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **May/June 2016**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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 Grassland is an important breeding habitat for some birds. These birds feed on plant material and invertebrates. Biodiversity of the habitat is maintained by domestic herbivores, such as sheep, cows and goats, grazing on growing plant material.

A group of students investigated the effect of grazing by domestic herbivores on the plant biodiversity of a grassland as measured by Simpson's Index of Diversity. They investigated two areas. One area was grazed by herbivores and the other area was not grazed for many years because it was surrounded by a fence to keep out the herbivores.

(a) State the data that the students would have collected from the grazed and ungrazed areas to calculate Simpson's Index of Diversity.

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..... [2]

(b) Describe a random (unbiased) method which the students could have used to collect the data needed to calculate the biodiversity of the plant species in the two areas.

The description of your method should be detailed enough for another person to follow.

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[8]

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The students also investigated the effect grazing had on the height of one particular species of plant. Their hypothesis was:

The mean height of the plant is greater in the ungrazed grassland than the grazed grassland.

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

independent variable .....

dependent variable ..... [1]

(d) Table 1.1 shows the results of their investigation.

Table 1.1

sample number	height of plant/mm	
	grazed area	ungrazed area
1	586	858
2	549	873
3	526	864
4	589	901
5	545	847
6	538	862
7	573	864
8	549	879
9	604	864
10	611	888
mean	567	870
mode	549	
median	561	

(i) Complete Table 1.1 by writing the values of the mode and median for the ungrazed area. [1]

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

Give your answers to 3 significant figures.

$S_M = \frac{s}{\sqrt{n}}$

S_M = standard error

s = standard deviation

n = sample size (number of observations)

grazed area: $s = 29.5$

ungrazed area: $s = 15.7$

standard error, grazed area = ...

standard error, ungrazed area = ... [2]

Standard error is used to calculate 95% Confidence Intervals (CI).

The values for the grazed area are 548.3 mm to 585.7 mm.

(iii) Use the formula below to calculate the confidence intervals for the **ungrazed** area.

$$95\%\ \text{CI} = \text{mean} \pm 2\ S_M$$

Show your working.

ungrazed area .....mm to .....mm [2]

(iv) State what information is gained by calculating the confidence intervals.

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..... [2]

(e) The students used the mark-release-recapture method to estimate the population of an invertebrate animal found living on the grassland. They used the formula:

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

State two precautions the students should have taken to ensure that the results they obtained were valid.

1. .....

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2. .....

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..... [2]

(f) The population of an invertebrate that feeds on seeds was estimated in both the grazed and ungrazed areas. Predict which area would have the greatest population and give a reason for your choice.

choice .....

reason ..... [1]

[Total: 21]

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Question 2 starts on page 8

2 Medical researchers carried out an investigation into the effect of smoking in a country. A group of male volunteers had their peak expiratory flow rate (PEFR) measured as shown in Fig. 2.1.



Fig. 2.1

PEFR measures the maximum speed of airflow through the bronchi during breathing out in dm^3 per minute ($dm^3\,min^{-1}$). Peak flow readings are lower when the airways are constricted.

The volunteers were grouped according to the number of packets of cigarettes that they smoked per year. Each packet contains 20 cigarettes.

Table 2.1 shows the results of the investigation.

Table 2.1

group	**1**	**2**	**3**	**4**	**5**
number of packets of cigarettes smoked per year	0	1–50	51–100	101–150	151–230
mean number of packets smoked per group ± *s*	0	30.61 ± 10.47	73.80 ± 16.52	127.27 ± 9.66	189.22 ± 27.51
mean age of volunteers ± *s* /years	26.42 ± 5.61	22.82 ± 3.28	26.66 ± 3.59	28.90 ± 4.20	36.22 ± 3.21
mean PEFR ± *s* /$dm^3\,min^{-1}$	513.43 ± 87.58	494.70 ± 79.22	443.33 ± 45.14	350.90 ± 32.38	300.00 ± 46.90
number of volunteers tested	64	14	15	12	8

s = standard deviation

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(a) State **three** variables which **should have been** standardised in this investigation.

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..... [3]

(b) The medical researchers made two conclusions based on the data shown in Table 2.1.

1. An increase in the number of packets smoked decreases the PEFR measurement.

2. The number of packets smoked increases with age.

State how the results from Table 2.1 support these conclusions and how they do not support these conclusions.

support

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do not support

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..... [3]

(c) (i) State a null hypothesis for a statistical test to find out whether the data in Table 2.1 supports the conclusion that:

An increase in the number of packets smoked decreases the PEFR measurement.

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..... [1]

(ii) State **two** ways in which the data for **group 5** is less trustworthy compared with the data for the other groups.

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..... [2]

[Total: 9]

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