Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0123456789

BIOLOGY **9700/05**

Paper 5 Planning, Analysis and Evaluation **For Examination from 2016**

SPECIMEN PAPER

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.
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.

This document consists of **8** printed pages.

CAMBRIDGE International Examinations

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1 A type of mollusc, *Littorina littorea*, is a consumer of a seaweed, *Fucus spiralis.* This seaweed has leaf-like branches and grows attached to rocks on the seashore.

A student thought that there would be a relationship between the quantity of seaweed and the numbers of the mollusc.

The student carried out an investigation on a rocky shore to test the hypothesis:

The number of *Littorina littorea* is proportional to the quantity of *Fucus spiralis*.

Fig. 1.1 shows a quadrat used to measure the quantity of seaweed and the numbers of the mollusc.

Fig. 1.2 shows how these quadrats were placed on the rocky shore along a transect line.

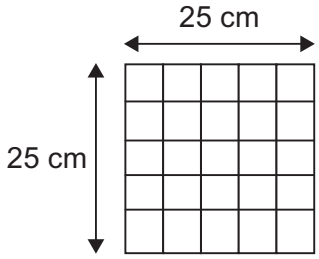

Fig. 1.1

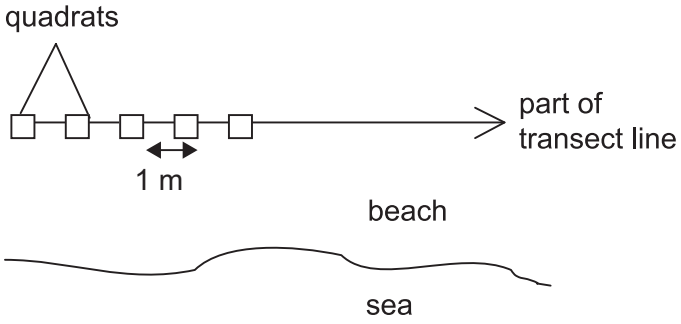

Fig. 1.2

During the investigation the student:

- estimated the quantity of seaweed by counting the number of squares in which it occurred and converting the number to a percentage
- counted the total number of molluscs in the quadrat, both on the seaweed and on the surrounding rocks
- made 20 measurements at one metre intervals along a transect line parallel to the sea
- repeated the measurements using a further two transect lines in the same area and same distance from the sea.

(a) (i) Identify the independent and the dependent variable in this investigation.

independent variable .....

dependent variable ..... [2]

(ii) Describe two ways in which the student has attempted to standardise this investigation.

1. .....

.....

2. .....

..... [2]

(iii) Suggest **two** environmental variables that cannot be standardised in this investigation.

.....

..... [1]

(b) The results of the student's investigation are summarised in Table 1.1.

Table 1.1

sample number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
mean percentage of *Fucus spiralis*	42	40	79	31	72	21	24	39	56	15	11	35	24	43	27	0	15	16	13	40
mean number of *Littorina littorea*	2	2	4	3	4	2	3	1	3	2	2	2	0	2	2	3	1	3	2	3

(i) Suggest **one** reason why the student identified the values of sample 13 as anomalous.

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..... [1]

Fig.1.3 shows the graph the student plotted.

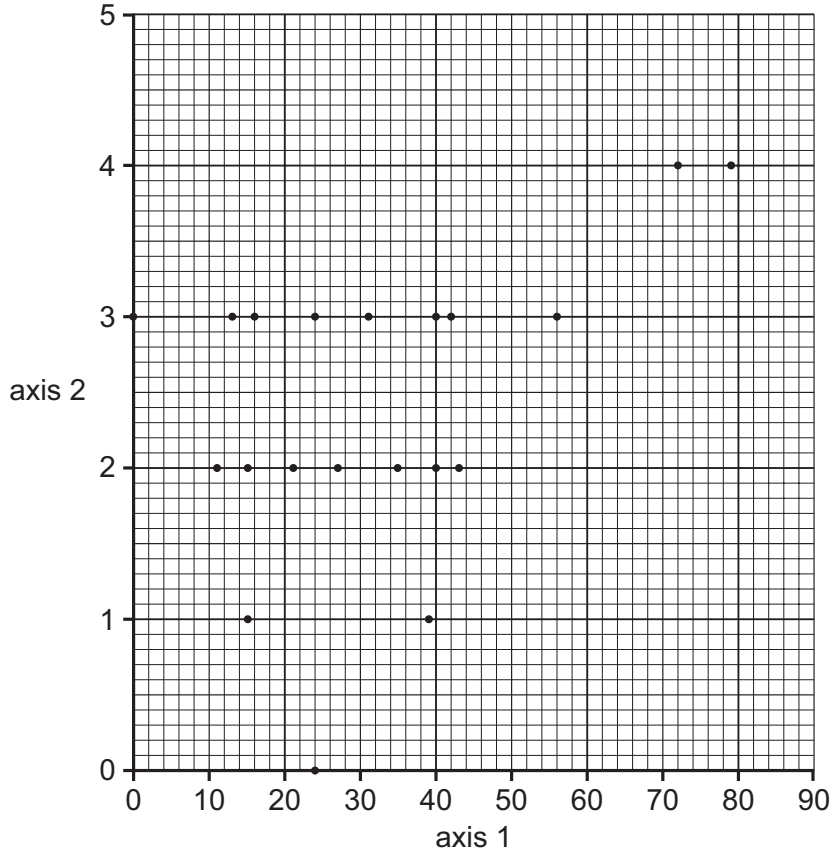

Fig. 1.3

(ii) Suggest suitable labels and units for the graph axes.

axis 1 .....

axis 2 ..... [2]

(iii) State what the graph suggests about the relationship between *Littorina littorea* and *Fucus spiralis.*

.....

..... [1]

(c) The student decided to test the data using Spearman's rank correlation.

(i) State **one** reason why the data is suitable for this statistical test.

.....

..... [1]

Table 1.2 shows the data table the student used for this statistical test.

Table 1.2

sample	*Fucus spiralis*	*Littorina littorea*	**rank *Fucus***	**rank *Littorina***	**D**	**D^2**
1	42	2	16	8	8	64
2	40	2	14.5	8	6.5	42.25
3	79	4	20	19.5	0.5	0.25
4	31	3	11	15.5	4.5	20.25
5	72	4	19	19.5	0.5	0.25
6	21	2	7.5	8	0.5	0.25
7	24	3	9	15.5	6.5	42.25
8	39	1	13	1.5	11.5	132.25
9	56	3	18	15.5	2.5	6.25
10	15	2	4.5	8	3.5	12.25
11	11	2	2	8	6	36
12	35	2	12	8	4	16
13	24	0	7.5	1	6.5	42.25
14	43	2	17	8		
15	27	2	10	8	2	4
16	0	3	1	15.5	14.5	210.25
17	15	1	4.5	1.5	3	9
18	16	3	6	15.5	9.5	90.25
19	13	2	3	8	5	25
20	40	3	14.5	15.5	1	1

(ii) Complete Table 1.2 by writing in the values of **D** and **D^2** for sample number **14**. [1]

(iii) The formula for Spearman's rank correlation is $r_s = 1 - \left(\frac{6 \times \Sigma D^2}{n^3 - n}\right)$

The student calculated that the $\sum D^2 = 787$

Calculate the r_s value for the data in Table 1.2. Show your working.

r_s ..... [2]

(iv) State what this value indicates about the relationship between *Fucus spiralis* and *Littorina littorea.*

.....

..... [1]

(d) Factors other than the quantity of *Fucus spiralis* may have influenced the number of *Littorina littorea.*

Suggest **one abiotic** and **one biotic** factor that might influence the number of *Littorina littorea.*

abiotic factor .....

.....

biotic factor .....

..... [2]

[Total: 16]

2 **(a)** A student investigated the rate of respiration in two different tissues, **A** and **B,** using the redox dye methylene blue as an indicator.

The student made a suspension of each tissue using the following procedure:

- a sample of each tissue was homogenised in a blender with ice-cold osmotic buffer
- osmotic buffer was added to each homogenate and stirred to make a suspension
- the two suspensions were incubated at 20 °C before testing.

The results of this investigation are shown in Table 2.1.

Table 2.1

	time for methylene blue to become colourless / s^{-1}											
	test 1	test 2	test 3	test 4	test 5	test 6	test 7	test 8	test 9	test 10	mean time $\pm s$	rate / s^{-1}
Tissue **A**	70	56	59	54	52	56	55	75	59	50	55 ± 3.14	18×10^{-3}
Tissue **B**	124	126	136	126	122	125	121	123	124	125	124 ± 1.73	8×10^{-3}

Outline the procedure the student could use to obtain these results.

Your method should be detailed enough for another person to use.

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(b) (i) **On Table 2.1**, indicate by placing a circle around each value, **two** results that are anomalous. [1]

(ii) Describe how the student calculated the mean values shown in Table 2.1.

.....

..... [1]

(iii) Suggest why the method of measuring the dependent variable may have caused some results to be anomalous.

.....

..... [1]

(iv) Suggest **one** way, other than using a redox dye, in which the rates of respiration of the two tissues could be determined.

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..... [1]

(c) State **two** conclusions that can be made from the data in Table 2.1.

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..... [2]

[Total: 14]