UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8601301401

BIOLOGY **9700/05**

Paper 5 Planning, Analysis and Evaluation **May/June 2008**

1 hour 15 minutes

Candidates answer on the Question Paper.

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 soft 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.

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1	
2	
3	
Total	

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1 **(a)** 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.

Percentage cover is a simple, non-destructive method of estimating biomass.

A student thought that there would be a relationship between the percentage cover of seaweed and the numbers of the mollusc.
The student carried out an investigation on a public beach to test the hypothesis:

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

Fig. 1.1 shows a quadrat used to measure percentage cover of the seaweed and the mollusc.
Fig. 1.2 shows how these quadrats were placed on the beach along a transect line.

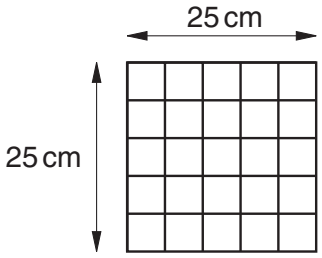


Fig. 1.1

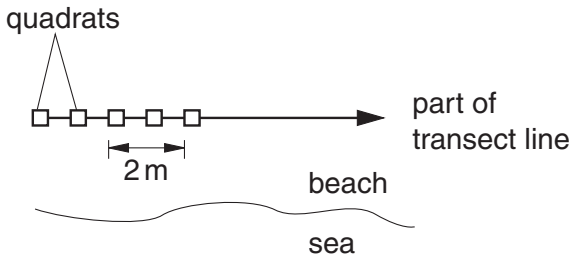


Fig. 1.2

The percentage cover of seaweed was measured by counting the number of squares in which it occurred and the number converted to a percentage. The molluscs were measured by counting the total number in the quadrat, both on the seaweed and on the surrounding rocks. The student made 20 measurements at one metre intervals along a transect line parallel to the sea. A further two transect lines were laid in the same area, the measurements repeated and the mean calculated.

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

independent variable .....

dependent variable ..... [1]

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

1. .....

.....

2. .....

..... [2]

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

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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 number of *Littorina littorea*	3	2	4	3	4	2	3	1	3	2	2	2	0	2	2	3	1	3	3	3
mean percentage cover of *Fucus spiralis*	42	40	79	31	72	21	24	39	56	15	11	35	24	43	27	0	15	16	13	40

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

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..... [1]

Fig. 1.3 shows the graph that the student plotted.

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Graph to show the relationship between *Littorina littorea* and *Fucus spiralis*

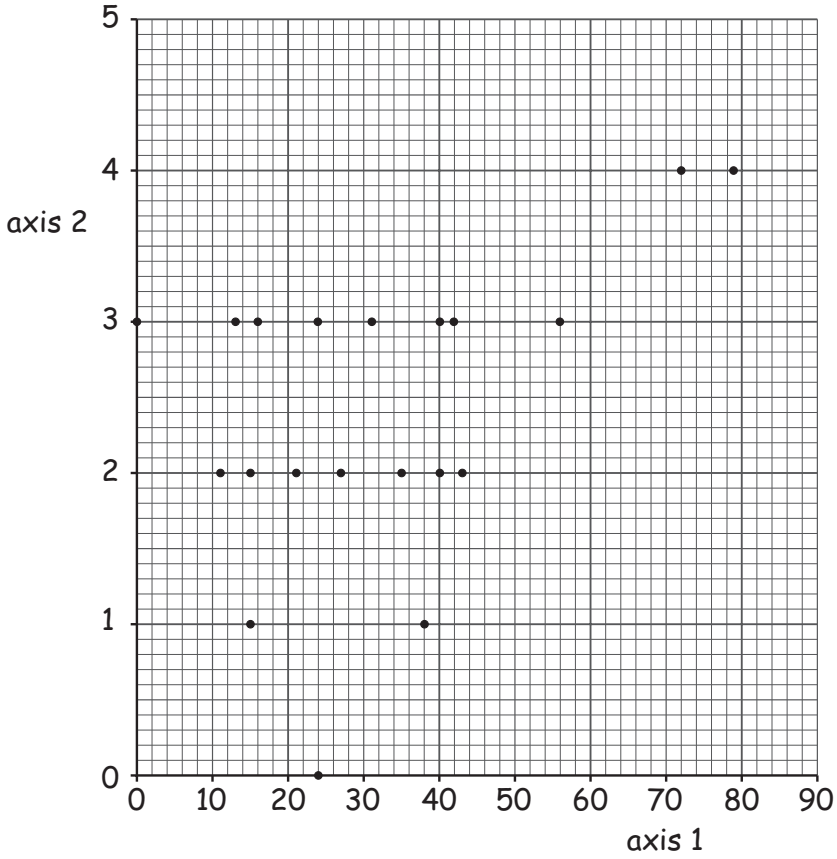


Fig. 1.3

(ii) State suitable labels for the graph axes.

axis 1 .....

axis 2 ..... [1]

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

.....

..... [1]

(iv) State the extent to which the result of the investigation support the hypothesis.

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..... [1]

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(v) Suggest **one** factor, other than the amount of *Fucus spiralis*, which may have influenced the number of *Littorina littorea*.

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..... [1]

[Total: 8]

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2 Fig. 2.1 shows a simple apparatus used to measure the rate of photosynthesis.

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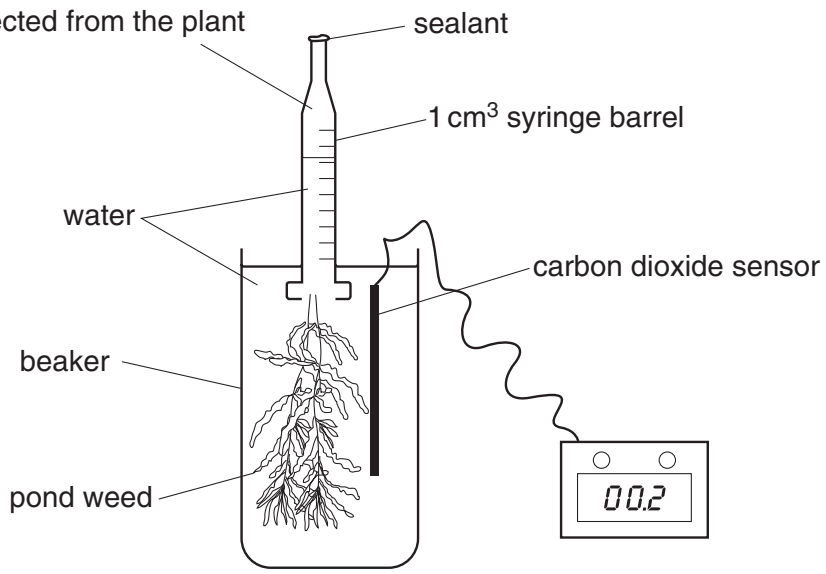


Fig. 2.1

(a) (i) Using this apparatus, plan an investigation to show the effect of carbon dioxide concentration on the rate of photosynthesis.

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(ii) Sketch a graph in the space below to show the expected result of the investigation.

Explain your expected result .....

.....

..... [3]

(b) The student measured the amount of oxygen in the gas collected by using an oxygen absorbent. These results were used to calculate the rate of photosynthesis.

(i) State how the rate of photosynthesis is calculated from the student's results.

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..... [2]

(ii) Suggest why the gas collected is not pure oxygen.

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..... [1]

[Total: 14]

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3 Fig. 3.1 is a section of a human kidney.

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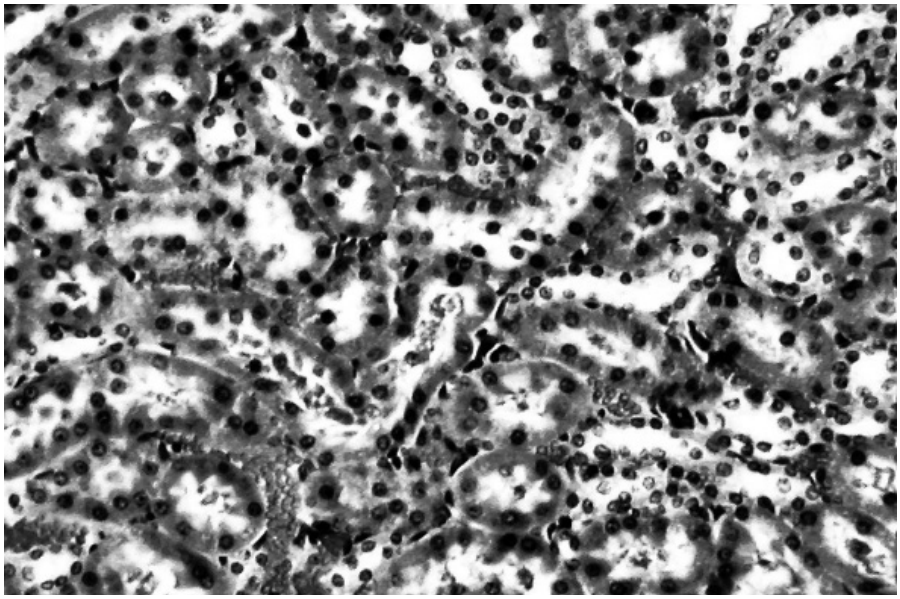


Fig. 3.1

(a) A student investigated the proximal convoluted tubule and distal convoluted tubule of the human kidney using a microscope and slide showing similar detail to the one shown in Fig. 3.1. The mean diameter and the mean lumen diameter of twenty cross sections of each type of tubule was measured as shown in Fig. 3.2 using an eyepiece graticule.

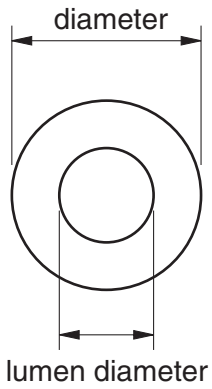


Fig. 3.2

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Table 3.1 shows the results of this investigation.

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Table 3.1

	tubule diameter		lumen diameter	
	proximal tubule	distal tubule	proximal tubule	distal tubule
mean diameter / μm	65	35	22	20
standard deviation	0.89	0.99	2.26	2.27

(i) Explain how the student measured and calculated the actual diameters of the tubules.

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..... [2]

(ii) State how the standard deviation indicates the reliability of the results for the diameter of the proximal and distal tubules.

.....

..... [1]

(iii) A *t*-test was carried out and gave the value $t = 2.09$.

Table 3.2 shows the critical values at $p < 0.05$ for the *t*-test.

Table 3.2

degrees of freedom	18	19	20	21	22	23	24	25	26	27	28	29	30	40	60	∞
critical value	2.10	2.09	2.09	2.08	2.07	2.06	2.06	2.06	2.06	2.05	2.05	2.04	2.04	2.02	2.00	1.96

The number of degrees of freedom is 38.

State and explain the meaning of these results.

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..... [2]

(b) Based on the findings of the *t*-test the student concluded that the difference in lumen diameter was due to the thickness of the brush border of the columnar cells in the proximal tubule.

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Evaluate the extent to which the information provided enables a valid and reliable conclusion to be drawn.

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Suggest **one** reason why the student's conclusion may not be valid.

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..... [1]

[Total: 8]

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