

Plants

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	Edexcel
Topic	Cells, Development, Biodiversity and Conservation
Sub-Topic	Plants
Booklet	Question paper 1

Time Allowed: 39 minutes

Score: /32

Percentage: /100

Grade Boundaries:

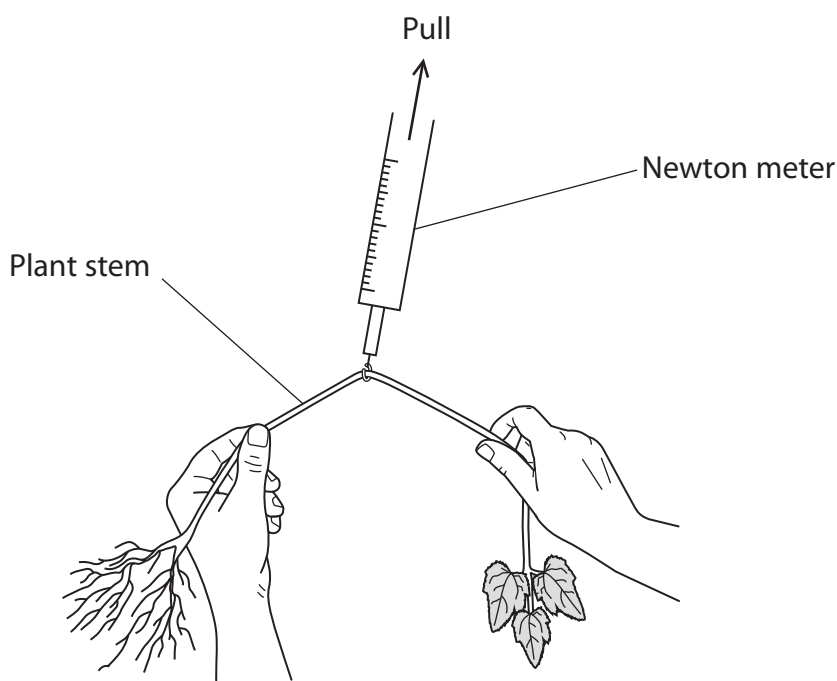
A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- 1 Plants living in rivers and lakes experience pulling forces from water currents and waves. These forces may damage or destroy the plants and it is important to know what forces they can withstand.

Scientists investigated the force needed to break a plant stem. This force is called the breaking strength.

In one series of experiments, they investigated the relationship between the cross-sectional area of stems and the forces needed to break them.

These forces were measured with a newton meter, as shown in the diagram below. The meter was pulled until each stem broke and the forces were recorded.



(a) (i) Name the dependent variable in this experiment.

(1)

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(ii) Assuming that the stem is circular, suggest how stem cross-sectional area could be determined accurately.

(2)

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(iii) The stems were collected from various lakes and taken back to the laboratory. Suggest how these stems should be pre-treated before the experiment.

(2)

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(iv) Name **one** environmental variable that should be controlled **during** this experiment.

Describe how this variable could be controlled.

(2)

Variable.....

How controlled.....

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(v) Identify **three** health and safety risks for this experiment.

Explain how each risk could be minimised.

(3)

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(b) One experiment was carried out using Canadian pondweed, *Elodea canadensis*.

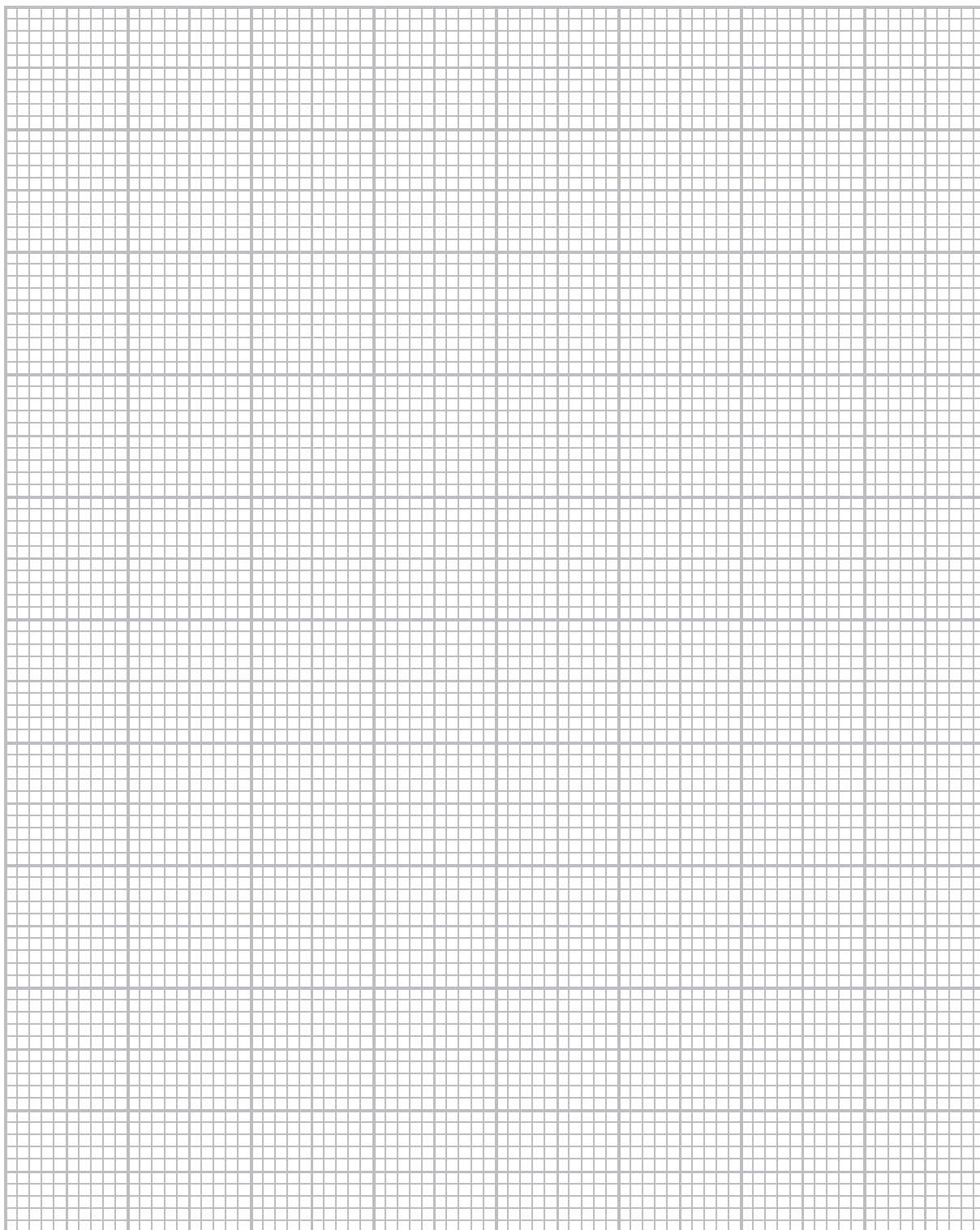
The results of this experiment are shown in the table below.

Cross-sectional area of stem / m ² × 10 ⁻⁶	Mean breaking strength / N	Standard deviation
0.4	2.5	0.4
0.7	3.9	0.2
0.9	5.2	0.1
1.5	8.0	0.3
2.0	10.9	0.5
2.5	13.1	0.4

- (i) Plot the means and the standard deviations, in a suitable graphical form, on the axes provided below. Draw a line of best fit.

(4)

Mean breaking strength / N



Cross-sectional area of stem / $\text{m}^2 \times 10^{-6}$

(ii) What conclusion can be drawn from these results?

(1)

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(iii) With reference to the standard deviations, comment on the validity of this conclusion.

(2)

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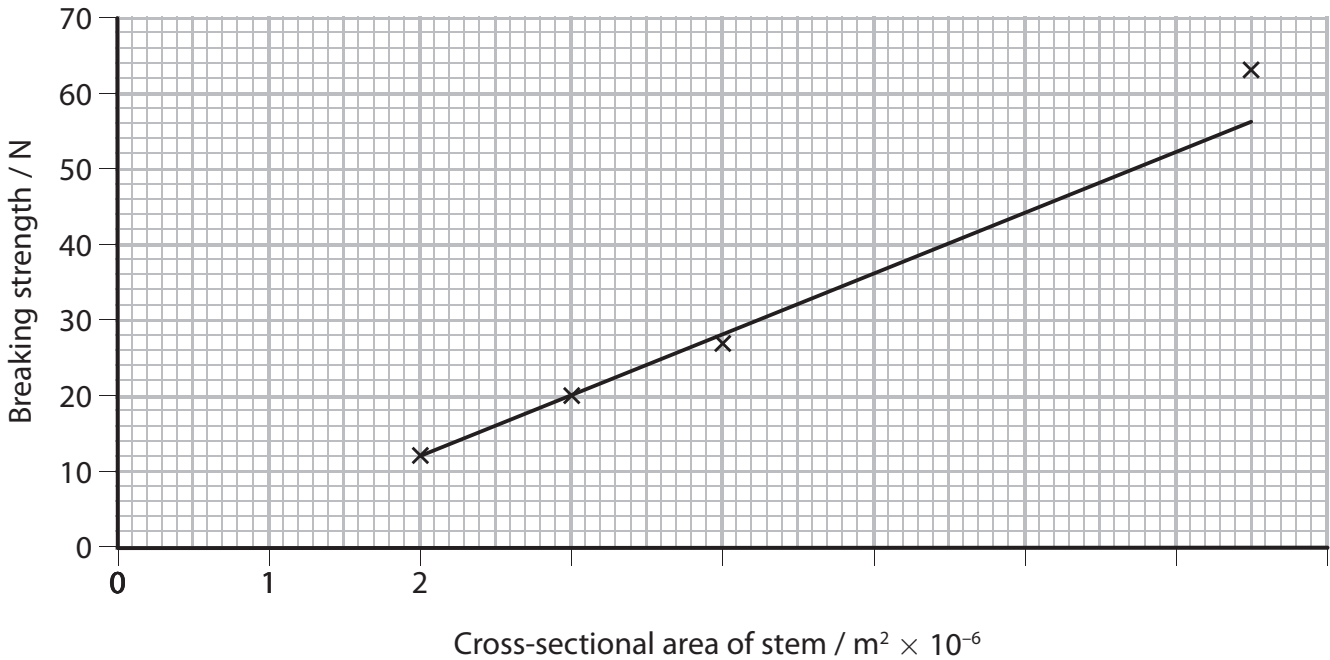
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(c) In another experiment, the scientists used stems of bladderwort, *Utricularia vulgaris*. The graph below shows the results of this experiment.



Compare the results shown in these two experiments.

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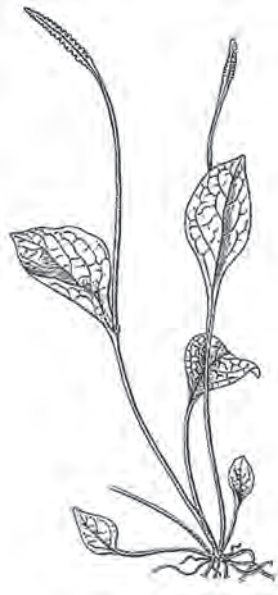
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(Total for Question 1 = 20 marks)

2 The diagram below shows a fern from the family Ophioglossaceae, commonly as adder's-tongue ferns.

known



There are many species in this family. Some of the species have different diploid numbers of chromosomes. The diploid numbers range from 240 to 1250 chromosomes.

A student investigated the relationship between diploid number and the proportion of time spent by cells in different phases of the cell cycle.

She prepared root tip squashes from Ophioglossaceae species with different numbers of chromosomes. She then determined the stage of mitosis of each cell in a sample from each species.

(b) (i) Suggest **two** variables that should be controlled when the pieces of plant root tissue are selected.

(2)

1

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2

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(ii) Choose **one** of the variables you identified in part (i). Describe the effect on mitosis if this variable was not controlled.
Give a reason for your answer.

(2)

Variable

Effect on mitosis

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Reason

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(c) For each root tip squash, the student recorded the number of cells in each stage of mitosis.

Suggest how she could estimate the proportion of time a cell spends in each stage.

(2)

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(d) The student found that, as the diploid number increased, the proportion of time cells spent in prophase increased.

Using your knowledge of mitosis, suggest why the proportion of time spent in prophase increased.

(2)

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(Total for Question 2 = 13 marks)