Write your name here

| Surname | Other names |
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| | |

**Pearson Edexcel**
**International**
**Advanced Level**

Centre Number | | | | | |

Candidate Number | | | | |

# Biology

## Advanced

## Unit 6: Practical Biology and Investigative Skills

Friday 11 May 2018 – Morning
**Time: 1 hour 30 minutes**

Paper Reference
**WBI06/01**

**You must have:**
Calculator, HB pencil, ruler

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

### Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- Candidates may use a calculator.

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

*Turn over* ▶

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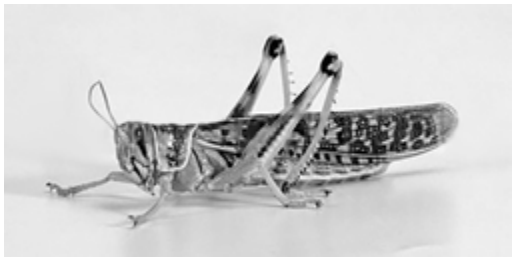
Pearson

**Answer ALL questions.**

**1** The photograph below shows a locust, *Locusta migratoria*.



Magnification ×1.0

Locusts are found in many countries. They are active insects in warm conditions.

The locust obtains oxygen from the air by contracting and relaxing its abdomen.

This action moves air into and out of the body to ventilate it.

(a) Describe an experiment to compare the rate of ventilation of locusts at two different temperatures.

**(5)**

(b) (i) State **two** abiotic variables, other than the independent variable, that could affect this experiment.

**(2)**

.....

.....

(ii) Choose **one** of the abiotic variables you have identified in (i). Explain how this variable could be controlled. Describe what effect it could have on the results if it is not controlled.

**(2)**

Variable.....

How this variable is controlled.....

.....

Effect it could have on the results if it is not controlled.

.....

.....

(c) Suggest why temperature has an effect on the rate of ventilation in locusts.

**(3)**

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**(Total for Question 1 = 12 marks)**

**2** The photograph below shows a curaua plant.

Magnification ×0.1

Fibres can be extracted from the leaves of curaua plants. These fibres can be used in the manufacture of some materials.

If a fertiliser is applied to the plants during their growth, more fibres can be extracted from their leaves.

An investigation was carried out in a laboratory to study the effect of fertiliser on the growth of these plants.

A complete fertiliser and a fertiliser without potassium ions were used.

The mineral content of the dry leaves was determined after 150 days.

The results are shown below.

**Complete fertiliser**
Mineral content of dry leaves / g $kg^{-1}$
24.3 33.1 26.7 30.6 32.0 28.4 20.5 24.8 19.9 29.9 23.5 20.3 19.6 19.8 24.6

**Fertiliser without potassium ions**
Mineral content of dry leaves / g $kg^{-1}$
8.9 9.6 10.3 10.5 7.4 18.2 13.9 14.2 15.2 7.4 17.2 13.8 16.7 15.8 9.9

(a) Write a suitable null hypothesis for this investigation.

**(2)**

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(b) Calculate the mean mineral content for each set of results.

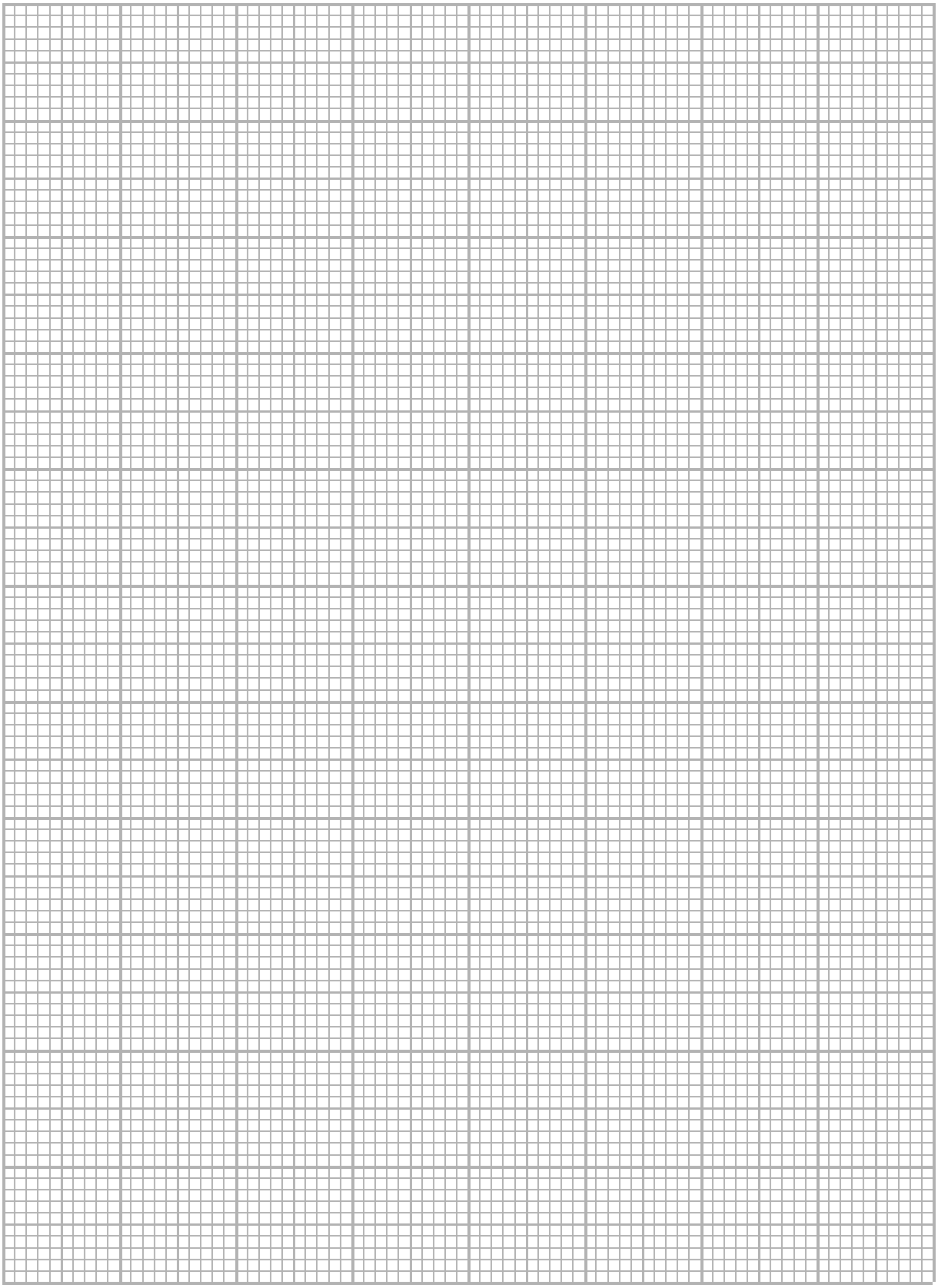
Prepare a table to display the **raw data** and your calculated **means**.

**(3)**

(c) On the graph paper below, draw a graph to show the mean mineral content for each set of results.

Include an indication of the variability of the data.

**(3)**



(d) A student applied a *t*-test to these data and calculated a *t* value of 8.19.

The number of degrees of freedom for this test is calculated using the formula

$$\text{Degrees of freedom} = (n_1 - 1) + (n_2 - 1)$$

where $n_1$ and $n_2$ represent the size of each sample.

The table below shows critical values of *t*.

| Degrees of freedom | p = 0.05 | p = 0.025 | p = 0.01 |
|---|---|---|---|
| 15 | 2.13 | 2.49 | 2.95 |
| 16 | 2.12 | 2.47 | 2.92 |
| 17 | 2.11 | 2.46 | 2.90 |
| 18 | 2.10 | 2.44 | 2.88 |
| 19 | 2.09 | 2.43 | 2.86 |
| 20 | 2.09 | 2.42 | 2.84 |
| 21 | 2.08 | 2.41 | 2.83 |
| 22 | 2.07 | 2.41 | 2.82 |
| 23 | 2.07 | 2.40 | 2.81 |
| 24 | 2.06 | 2.39 | 2.80 |
| 25 | 2.06 | 2.38 | 2.79 |
| 26 | 2.06 | 2.38 | 2.78 |
| 27 | 2.05 | 2.37 | 2.77 |
| 28 | 2.05 | 2.37 | 2.76 |
| 29 | 2.04 | 2.36 | 2.76 |
| 30 | 2.04 | 2.36 | 2.75 |

What conclusion can be drawn from this investigation?

Use your graph and the information in this table to explain your answer.

**(4)**

(e) Suggest why it may **not** be possible to draw valid conclusions from an investigation in which curaua plants were grown in a field.

Give reasons for your answer.

**(4)**

**(Total for Question 2 = 16 marks)**

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**3** The photograph below shows a sunflower seedling, one week after germination.

Magnification ×1

A student noticed that the rate of growth of sunflower seedlings is affected by environmental conditions.

The student decided to investigate the effect of temperature on the rate of growth of sunflower seedlings.

The student formed the following hypothesis.

The higher the temperature the faster the rate of growth of sunflower seedlings.

Plan an investigation, that you could carry out in a laboratory, to support or reject this hypothesis.

Your answer should give details under the following headings.

(a) A consideration of whether there are any safety issues you would need to take into account.

**(2)**

(b) Suggestions for preliminary practical work that you might undertake to ensure your proposed method would provide meaningful data.

**(3)**

(c) A detailed method, including an explanation of how important variables are to be controlled or monitored.

*[2 marks are available in this section for the quality of written communication.]*

**(10)**

(d) A clear explanation of how your data are to be recorded, presented and analysed in order to draw conclusions from your investigation.

**(4)**

(e) The limitations of your proposed method.

**(3)**

**(Total for Question 3 = 22 marks)**

**TOTAL FOR PAPER = 50 MARKS**

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