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**Pearson Edexcel**  
International  
Advanced Level

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**Biology**  
Advanced  
**Unit 6: Practical Biology and Investigative Skills**

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|---|------------------------------------|
| Tuesday 23 January 2018 – Afternoon<br><b>Time: 1 hour 30 minutes</b> | Paper Reference<br><b>WBI06/01</b> |
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| <b>You must have:</b><br>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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- 2 Larvae of a species of shoot fly have recently become a pest of wheat plants grown in Egypt.

A wheat plant has several shoots. The flies lay eggs on the shoots and the eggs hatch into larvae.

These larvae feed on the shoots and reduce the yield of wheat.

The infection of two varieties of wheat, Giza and Sakha, by the larvae of shoot flies was investigated.

Ten plants of each variety were selected at random and the number of shoots infected with larvae was recorded.

This was repeated to obtain the 12 samples of each wheat variety shown below.

Wheat variety Giza

Number of shoots with larvae 10 12 15 17 12 6 13 10 12 13 7 8

Wheat variety Sakha

Number of shoots with larvae 4 6 5 13 7 6 13 9 14 11 10 7

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

(2)

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- (b) Calculate the mean number of shoots with larvae for each variety of wheat.

Draw a suitable table to include the **raw data** and the calculated **mean** for each variety of wheat.

(3)

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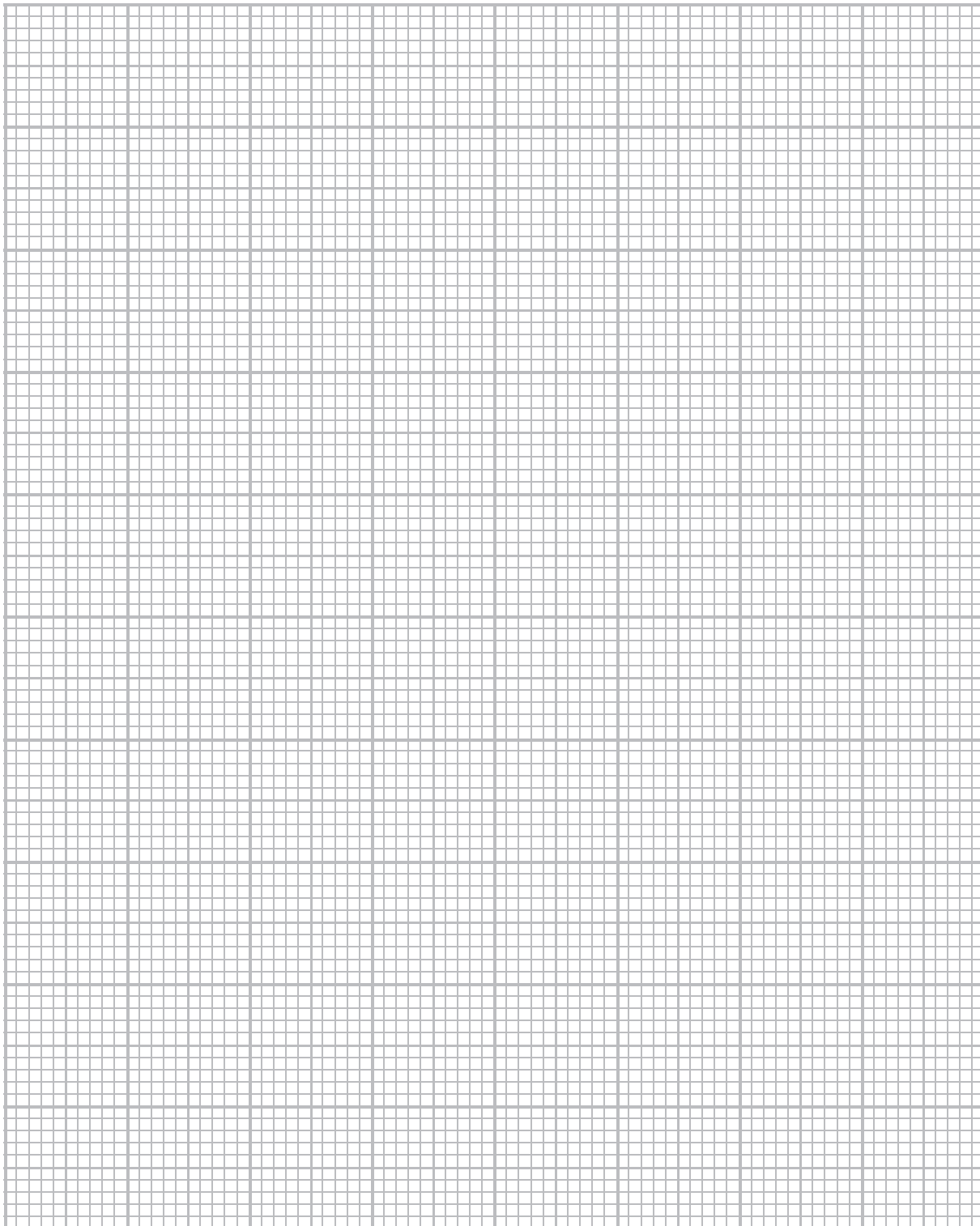
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- (c) On the graph paper below, draw a suitable graph to show the mean number of shoots with larvae for each variety of wheat. Include an indication of the variability of the data.

(3)



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- (d) A Mann-Whitney U test was used to analyse the data. This statistical test determines if the difference between the two sets of data is significant.

The calculations produced a U value of 44.

For the difference to be significant, the U value has to be equal to, or less than, the critical value shown in the table below.

The table shows the critical values for the Mann-Whitney U test at  $p = 0.05$ .

$N_1$  and  $N_2$  are the number of samples in each set of data.

| $N_1 / N_2$ | 10 | 11 | 12 | 13 | 14 | 15 |
|-------------|----|----|----|----|----|----|
| 10          | 23 | 26 | 29 | 33 | 36 | 39 |
| 11          | 26 | 30 | 33 | 37 | 40 | 44 |
| 12          | 29 | 33 | 37 | 41 | 45 | 49 |
| 13          | 33 | 37 | 41 | 45 | 50 | 54 |
| 14          | 36 | 40 | 45 | 50 | 55 | 59 |
| 15          | 39 | 44 | 49 | 54 | 59 | 64 |



Using your graph and the table of critical values, explain the conclusion that can be drawn from this investigation.

(4)

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- 3 The photograph below shows an adult brine shrimp.



Magnification  $\times 10$

Brine shrimps live in salt water and feed on microscopic plants such as algae.

Adult brine shrimps produce large numbers of eggs that can hatch rapidly. Each egg is less than 0.2 mm in diameter.

If the environmental conditions become unfavourable, the eggs can survive for many years before hatching.

- (a) Suggest **two** ways in which brine shrimps benefit from the ability of their eggs to hatch rapidly.

(2)

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(b) Plan an investigation to determine the effect of copper ions on the rate of hatching of brine shrimp eggs.

Your answer should give details under the following headings.

- (i) A description of appropriate preliminary work that you might carry out to ensure that your proposed method would provide meaningful data.

(4)

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

(10)

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

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

(4)

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(iv) The limitations of your proposed method.

(3)

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**(Total for Question 3 = 23 marks)**

**TOTAL FOR PAPER = 50 MARKS**

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