

Write your name here

Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Biology

Advanced

Unit 6: Practical Biology and Investigative Skills

Tuesday 24 January 2017 – Afternoon

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.

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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(a) Describe an experiment to investigate the effect of detergent concentration on membrane permeability.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

(1)

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

(2)

(iii) Choose **one** of the variables you have identified in (ii). 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 could be controlled

Effect on the results if this variable is not controlled

(c) Suggest why detergents affect the permeability of cell membranes.

(2)

(Total for Question 1 = 12 marks)



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2 *Rhynchophorus ferrugineus* is a species of insect.

The adult female lays eggs on the date palm tree. The eggs hatch into larvae that feed on the date palm trees and reduce crop yield.

The photograph below shows a larva of *R. ferrugineus*.



Magnification $\times 10$

These larvae can be killed using different insecticides.

Insecticide **A** and insecticide **B** are used to kill these larvae.

A student wanted to investigate which insecticide, **A** or **B**, was more effective at killing these larvae.

(a) Write a null hypothesis for this investigation.

(2)

.....

.....

.....

.....

(b) Samples of tissue from a date palm tree were each infected with 40 larvae.

Insecticide **A** was applied to some samples and insecticide **B** was applied to other samples.

A student recorded the number of larvae still alive after seven days. The results are shown below.

Insecticide **A**

11, 15, 7, 12, 10, 14, 8, 11, 9, 13, 10

Insecticide **B**

6, 4, 5, 6, 8, 15, 8, 7, 7, 3, 4, 9, 10

Calculate the mean number of larvae still alive for each insecticide.

In the space below, draw a suitable table to show the raw data and your calculated mean numbers.

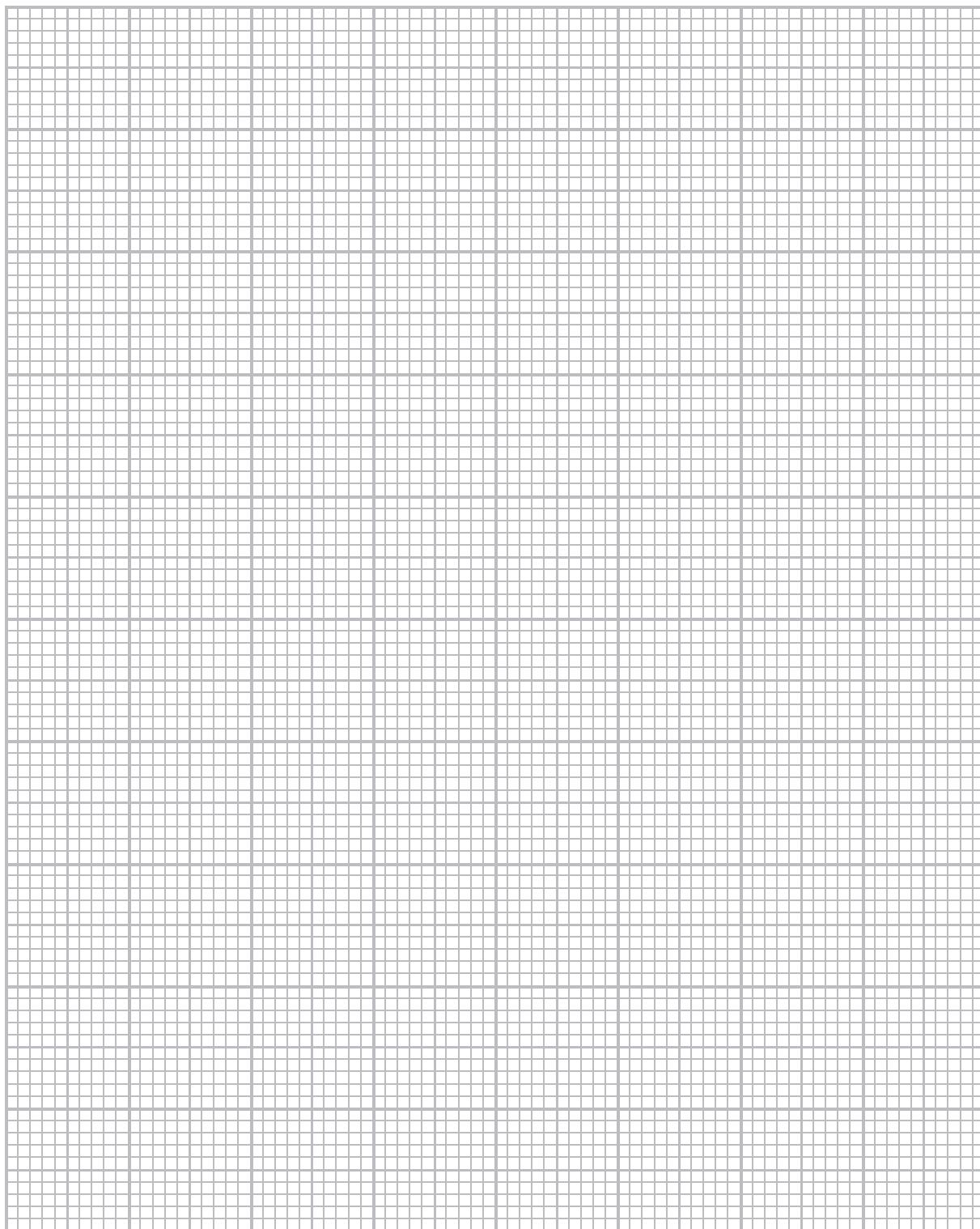
(4)



- (c) On the graph paper below, draw a suitable graph to compare the mean number of larvae still alive for insecticide **A** and for insecticide **B**.

Indicate on your graph the variability of the data.

(3)



- (d) The student carried out a Mann-Whitney U test to analyse the data. This statistical test determines if the data obtained for insecticide **A** and for insecticide **B** are significantly different.

The calculation for this test produced a result of $U = 21$.

For the difference between the two insecticides to be significant, this U value has to be equal to, or smaller than, the critical value ($U \leq \text{critical value}$).

The table shows the critical values for the Mann-Whitney U test at $p = 0.05$, for four different sample sizes of insecticide **A** and insecticide **B**.

Sample size for insecticide A	Sample size for insecticide B			
	9	11	13	15
9	17	23	28	34
11	23	30	37	44
13	20	28	37	45
15	24	34	44	54

What conclusions can be drawn from this investigation?

Use information from the table and your graph to explain your answer.

(4)



(e) Suggest why the conclusions from this investigation may not be valid.

(3)

(Total for Question 2 = 16 marks)



3 Proteases are enzymes that hydrolyse proteins.

Casein is a protein. When casein is suspended in water, it produces a white cloudy liquid.

When a protease is added to a casein suspension, the liquid will gradually become clear and colourless.

(a) Suggest why the liquid becomes clear and colourless.

(2)

(b) Inhibitors of proteases reduce the activity of these enzymes.

The cow's foot plant (*Bauhinia bauhiniodes*) grows in the Amazon rainforest.
The leaves produce an inhibitor of proteases.

Plan an investigation to determine how the age of the leaves of this plant affects the production of protease inhibitor.

Your answer should give details under the following headings.

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

(3)



- (ii) A detailed method, including an explanation of how important variables are to be controlled or monitored and how the investigation should be carried out safely and ethically.

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

(10)

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P 4 8 3 5 9 A 0 1 1 1 2

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

(4)

(iv) The limitations of your proposed method.

(3)

(Total for Question 3 = 22 marks)

TOTAL FOR PAPER = 50 MARKS

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