

Please check the examination details below before entering your candidate information

Candidate surname				Other names							
<b>Pearson Edexcel</b>				Centre Number				Candidate Number			
<b>International</b>				[ ] [ ] [ ] [ ] [ ] [ ]				[ ] [ ] [ ] [ ] [ ] [ ]			
<b>Advanced Level</b>											
<b>Friday 10 May 2019</b>											
Morning (Time: 1 hour 30 minutes)						Paper Reference <b>WBI06/01</b>					
<b>Biology</b>											
<b>Advanced</b>											
<b>Unit 6: Practical Biology and Investigative Skills</b>											
<b>You must have:</b> 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 ►

P56152A

©2019 Pearson Education Ltd.

1/1/1/1/



  
Pearson

**Answer ALL questions.**

- 1 The photograph below shows a field trial of several varieties of durum wheat (*Triticum durum*) growing in West Africa.



This field trial identified three varieties of durum wheat that tolerate temperatures above 37°C. These varieties also gave a good yield of grain after only 100 days from planting.

Observing mitosis can be an indicator of the rate of growth of a plant. This can be recorded by calculating the mitotic index.

The mitotic index (MI) can be calculated using the formula

$$\text{MI} = \frac{\text{number of cells in mitosis}}{\text{total number of cells}} \times 100$$

A sample of tissue from one variety of durum wheat was analysed with the following results.

Number of cells in mitosis = 41

Number of cells not in mitosis = 121

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





(ii) State **two** abiotic factors, other than temperature, that could affect the yield of grain. (1)

.....  
.....

(iii) Choose **one** of the factors you have identified in (ii). Explain how this factor could be controlled. Describe what effect it could have on the results if it is not controlled. (2)

Abiotic factor .....

How this factor could be controlled .....

.....  
.....

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

.....  
.....  
.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(c) Explain why some varieties of durum wheat can grow at high temperatures.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

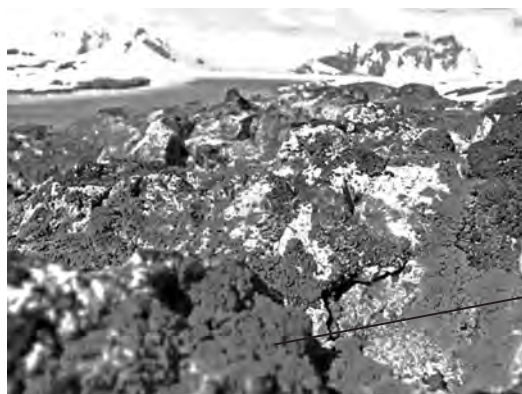
DO NOT WRITE IN THIS AREA

**BLANK PAGE**



- 2 Lichens are living organisms that grow on rocks. Bacteria can be found in lichens.

The photograph below shows lichens growing on rocks in the Antarctic.



lichens

© Maksym Deliyergiyev / Shutterstock

A scientist removed samples of lichen. In the laboratory, two types of bacteria, **A** and **B**, were extracted from these lichen samples.

The scientist carried out an investigation to test the effect of an antibiotic on these bacteria.

The bacteria were spread onto agar plates.

Discs containing the antibiotic lincomycin were then placed on the surface of the agar.

The plates were then incubated at 28°C for 24 hours.

The diameter of each inhibition zone was measured.

The results of this investigation are shown below.

Type **A** diameter of each inhibition zone (mm)

37 26 30 37 25 22 33 36 35 36 37 22 22 30 25

Type **B** diameter of each inhibition zone (mm)

21 25 32 32 18 17 28 31 29 30 31 17 16 25 20



P 5 6 1 5 2 A 0 7 2 0



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

(2)

.....

.....

.....

.....

(b) Calculate the mean diameter of the inhibition zones for each type of bacteria.

Prepare a suitable table to display the **raw data** and your calculated **mean** for each type of bacteria.

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

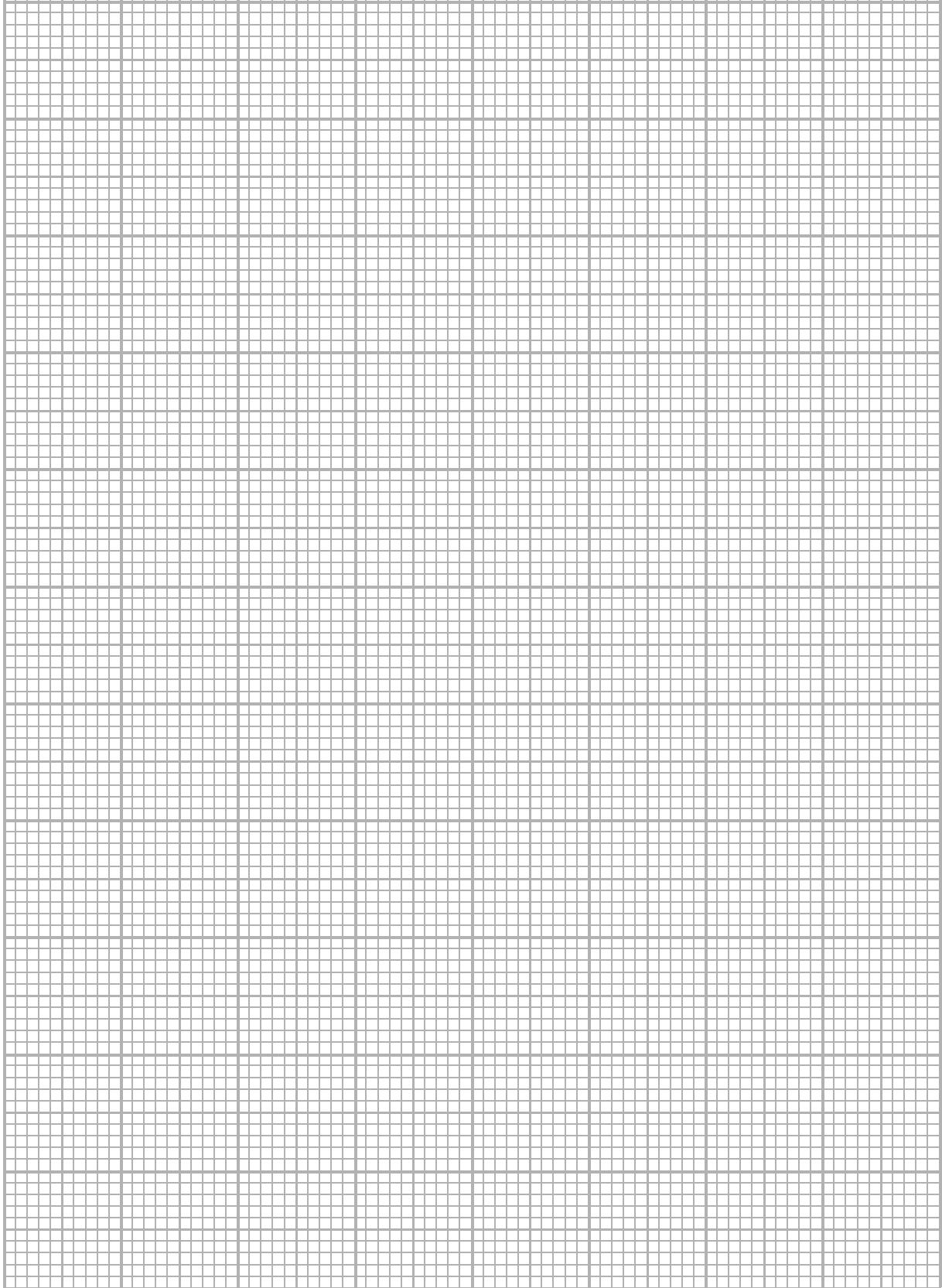




(c) On the graph paper below, draw a suitable graph to show the mean diameter of the inhibition zone for each type of bacteria.

Include an indication of the variability of the data.

(3)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(d) The scientist applied a  $t$  test to the data. A value of  $t = 2.44$  was calculated.

The table below shows critical values of  $t$  for different degrees of freedom at different levels of significance.

The number of degrees of freedom 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.

degrees of freedom	$p = 0.05$	$p = 0.01$	$p = 0.005$
11	2.20	3.11	3.50
12	2.18	3.05	3.43
13	2.16	3.01	3.37
14	2.14	2.98	3.33
15	2.13	2.95	3.29
16	2.12	2.92	3.25
17	2.11	2.90	3.22
18	2.10	2.88	3.20
19	2.09	2.86	3.17
20	2.09	2.84	3.15
21	2.08	2.83	3.14
22	2.07	2.82	3.12
23	2.07	2.81	3.10
24	2.06	2.80	3.09
25	2.06	2.79	3.08
26	2.06	2.78	3.07
27	2.05	2.77	3.06
28	2.05	2.76	3.05
29	2.04	2.76	3.04
30	2.04	2.75	3.03

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA







DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



- 3 Some people with illnesses secrete fewer digestive enzymes from the pancreas than healthy people.

One of the enzymes secreted by the pancreas is protease.

Protease is an enzyme that hydrolyses proteins to form amino acids.

The activity of protease can be investigated using a solution of the protein casein as a substrate. This solution changes from white to colourless as the protein is hydrolysed.

A student formed the following hypothesis:

*The greater the concentration of protease the faster the rate of hydrolysis of casein.*

Plan an investigation to provide evidence 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)

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





(c) 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.]

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Large writing area with horizontal dotted lines.



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

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



(e) The limitations of your proposed method.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

**TOTAL FOR PAPER = 50 MARKS**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**

Every effort has been made to contact copyright holders to obtain their permission for the use of copyright material. Pearson Education Ltd. will, if notified, be happy to rectify any errors or omissions and include any such rectifications in future editions.

