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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Monday 15 June 2020

Morning (Time: 1 hour 30 minutes) | Paper Reference **WBI06/01**

Biology

Advanced

Unit 6: Practical Biology and Investigative Skills

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.

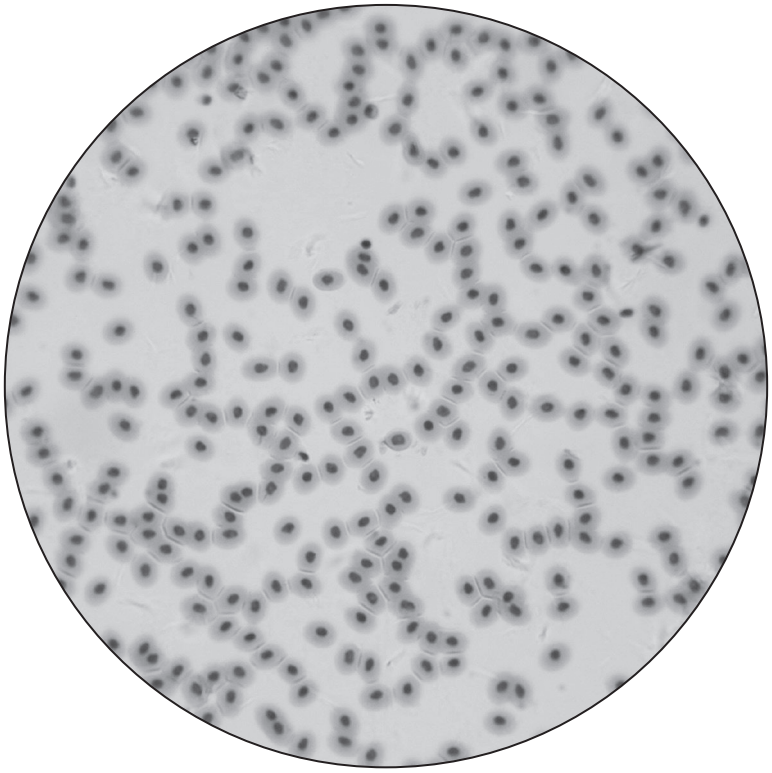
Advice

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

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Answer ALL questions.

1 The photograph below shows some red blood cells of a bird, as seen using a light microscope.



Source: © Artem Povarov/Alamy Stock Photo

Magnification ×600

A student made several slides to observe the cell structure. Some of the slides looked the same as the photograph. However, on other slides either no or very few red blood cells were seen.

Detergent had been used to clean these slides before adding a sample of blood.

The student thought that contamination with detergent could explain why very few red blood cells could be seen on some of the slides.

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(a) Describe an experiment to investigate the effect of the presence of detergent on the number of red blood cells on the slides.

(5)

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

(2)

1 .....

2 .....

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(ii) Choose **one** of the 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

.....

.....

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(c) Suggest how the presence of detergent could affect red blood cells.

(3)

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(Total for Question 1 = 12 marks)

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2 The photograph below shows a chilli plant, *Capsicum annuum*.



Magnification ×1.0

Chilli plants can be infected by the chilli mottle virus.

Infected chilli plants grow more slowly than uninfected chilli plants.

In an investigation, samples of cells were taken from 15 infected chilli plants and 15 uninfected chilli plants.

The volumes of the nucleus and the cytoplasm of the cells were determined using a light microscope.

The ratio of the nucleus to cytoplasm volumes was recorded for these cells.

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

(2)

.....

.....

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(b) The ratios obtained from this investigation are shown below.

Infected plants

0.153 0.099 0.145 0.192 0.164 0.163 0.213 0.169 0.132 0.249 0.205 0.255
0.224 0.207 0.193

Uninfected plants

0.124 0.056 0.098 0.064 0.068 0.119 0.100 0.102 0.068 0.073 0.099 0.094
0.103 0.155 0.144

Calculate the mean ratios for the infected plants and for the uninfected plants.

Prepare a suitable table to show these ratios and your calculated **mean** ratios.

(3)

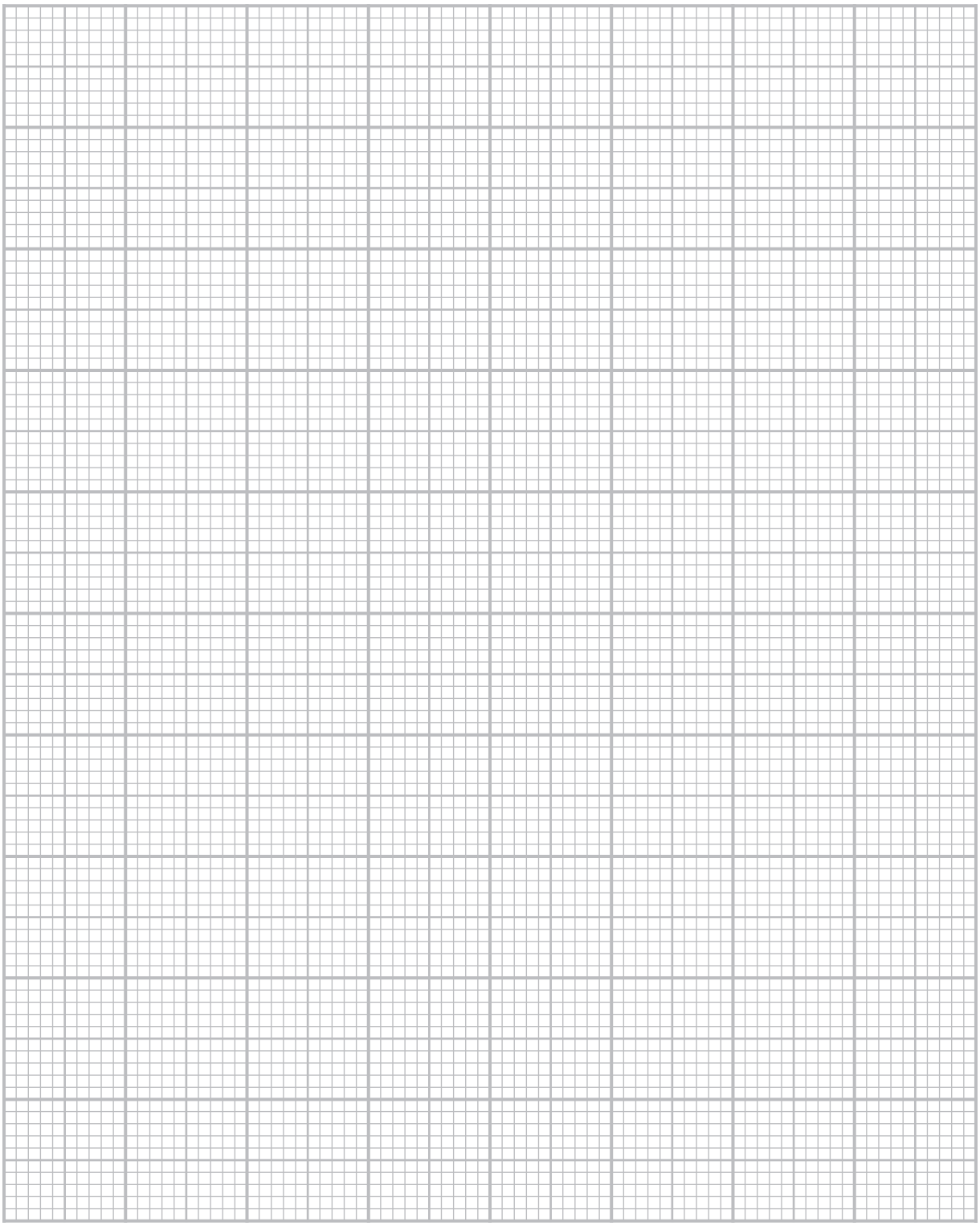
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(c) On the graph paper below, draw a suitable graph to show the mean ratios for infected and uninfected chilli plants.

Include an indication of the variability of the data.

(3)



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(d) A student applied a *t*-test to these data and calculated a *t* value of 6.41.

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 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

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What conclusion can be drawn from this investigation?

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

(4)

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(e) Suggest why it may **not** be reasonable to draw valid conclusions from the results of this investigation.

Give reasons for your answer.

(4)

(Total for Question 2 = 16 marks)

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3 The photograph below shows wild rue, *Perganum harmala*.



Source: © Bob Gibbons/Alamy Stock Photo

Magnification $\times 0.5$

Wild rue is used by humans to treat damaged skin.

This plant is thought to have antimicrobial properties.

A student formed the following hypothesis:

An extract of rue flowers has a greater inhibition of bacterial growth than an extract of rue leaves.

Plan an investigation to find 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)

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

(3)

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(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.]

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(d) 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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(e) The limitations of your proposed method.

(3)

(Total for Question 3 = 22 marks)

TOTAL FOR PAPER = 50 MARKS

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