Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Tuesday 23 January 2024

Morning (Time: 1 hour 20 minutes)

Paper reference **WBI16/01**

Biology

Advanced

UNIT 6: Practical Biology and Investigative Skills

You must have:
Scientific calculator, ruler, HB pencil

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.*

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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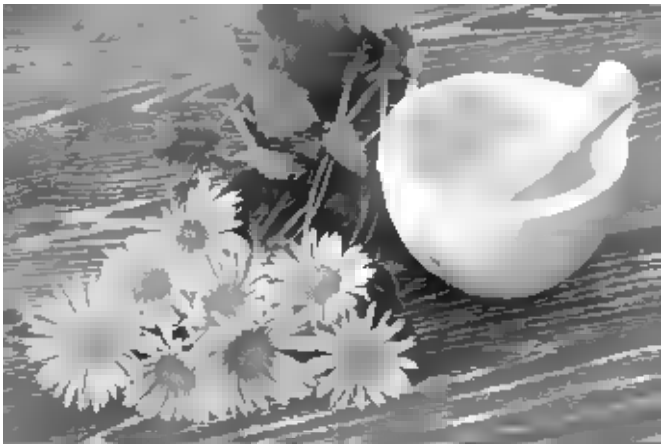
Pearson

Answer ALL questions.

1 The photograph shows parts of *Tussilago farfara*. This is a native species of plant that grows in North Africa and Central Asia.



This plant can be used as a medicine.

(a) Describe how the antibacterial activity of different parts of this plant could be compared.

(6)

(b) Scientists have isolated antibacterial compounds from plants such as *Tussilago farfara*.

(i) State what is meant by the terms bacteriostatic and bactericidal antibiotics.

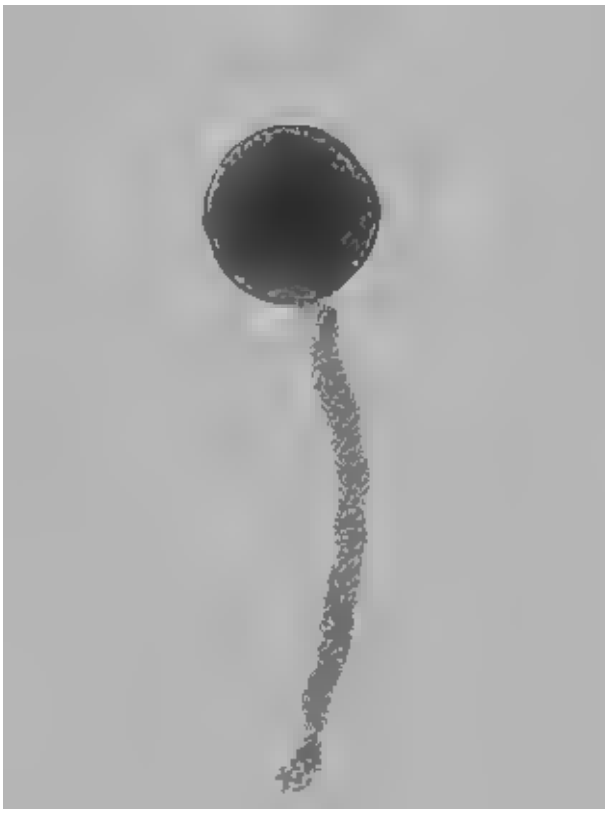
(2)

(ii) Explain how the code of practice for prescribing antibiotics helps to control infections.

(2)

(Total for Question 1 = 10 marks)

2 The photograph shows a pollen tube growing in a culture medium on a glass slide.



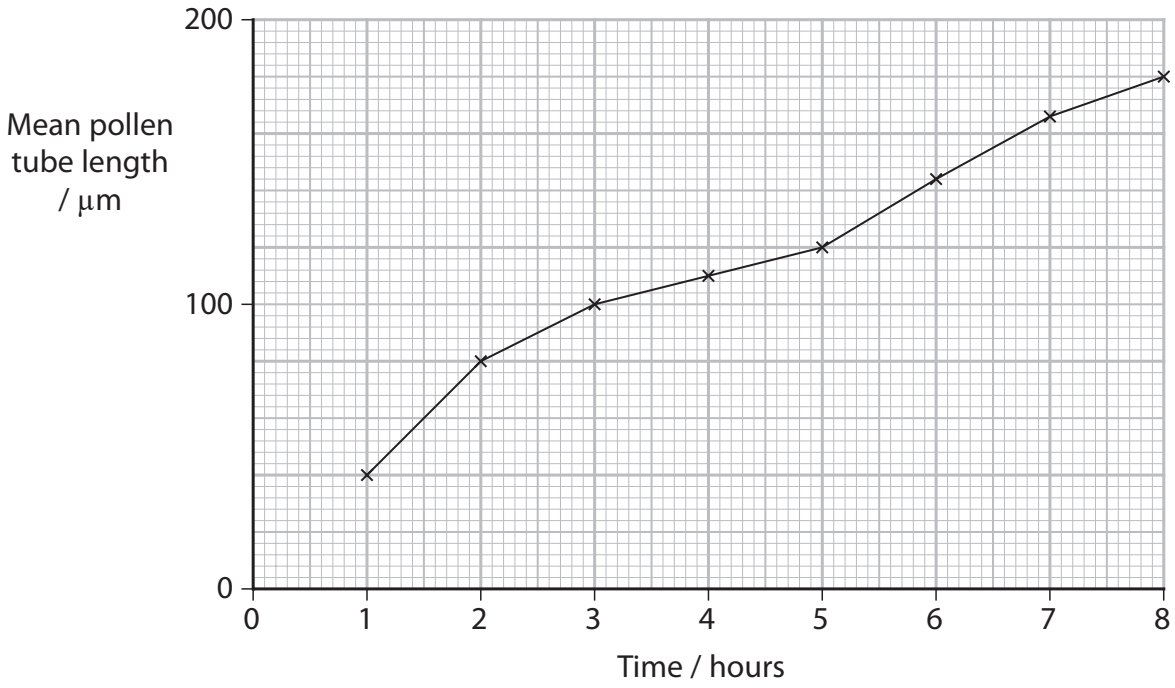
Pollen grains were placed on glass slides covered in growth medium.

Eight slides were incubated at 24 °C.

After one hour, one slide was placed under a microscope and the lengths of 10 pollen tubes were measured.

The measurements were repeated at hourly intervals with the remaining seven slides.

The graph shows the results.



(a) Calculate the mean rate of growth of the pollen tubes between one and five hours.

Include units with your answer.

(2)

Answer .....

(b) Explain how changes in temperature could affect the rate of growth of pollen tubes.

(2)

(c) Abiotic variables were controlled in this investigation.

(i) State **two** abiotic variables other than temperature that could affect this investigation.

(2)

First variable

Second variable

(ii) Choose **one** of the variables you have identified in (i).

Describe how this variable can be controlled.

(1)

Variable

Method of control

(iii) Suggest what effect not controlling this variable would have on the results.

(1)

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(d) Describe how this method can be modified to investigate the effect of age of pollen on the rate of growth of pollen tubes.

(2)

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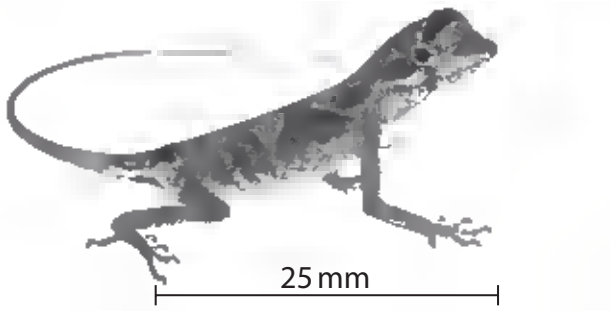
(Total for Question 2 = 10 marks)

3 The photograph shows a lizard native to a Caribbean island near the equator.



This small lizard lives in tropical vegetation between 1 m to 3 m above the ground.

This lizard uses specialised toepads to hold on to the vegetation.

A scientist sampled the lizards along a 2 km transect. The toepad area of a front limb of each lizard was measured.

The lizards were then released.

A hurricane struck the island with the highest winds ever recorded.

The scientist repeated the sampling method along the same transect after the hurricane.

The results of this investigation are shown below.

Surface area in mm^2 of toepad before the hurricane, sample **A**

0.9	**1.3**	**1.1**	**1.2**	**1.3**	**1.5**	**1.6**	**0.8**	**0.7**

Surface area in mm^2 of toepad after the hurricane, sample **B**

0.8	**1.3**	**1.5**	**1.8**	**1.3**	**1.5**	**1.6**	**1.9**	**1.8**

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

(1)

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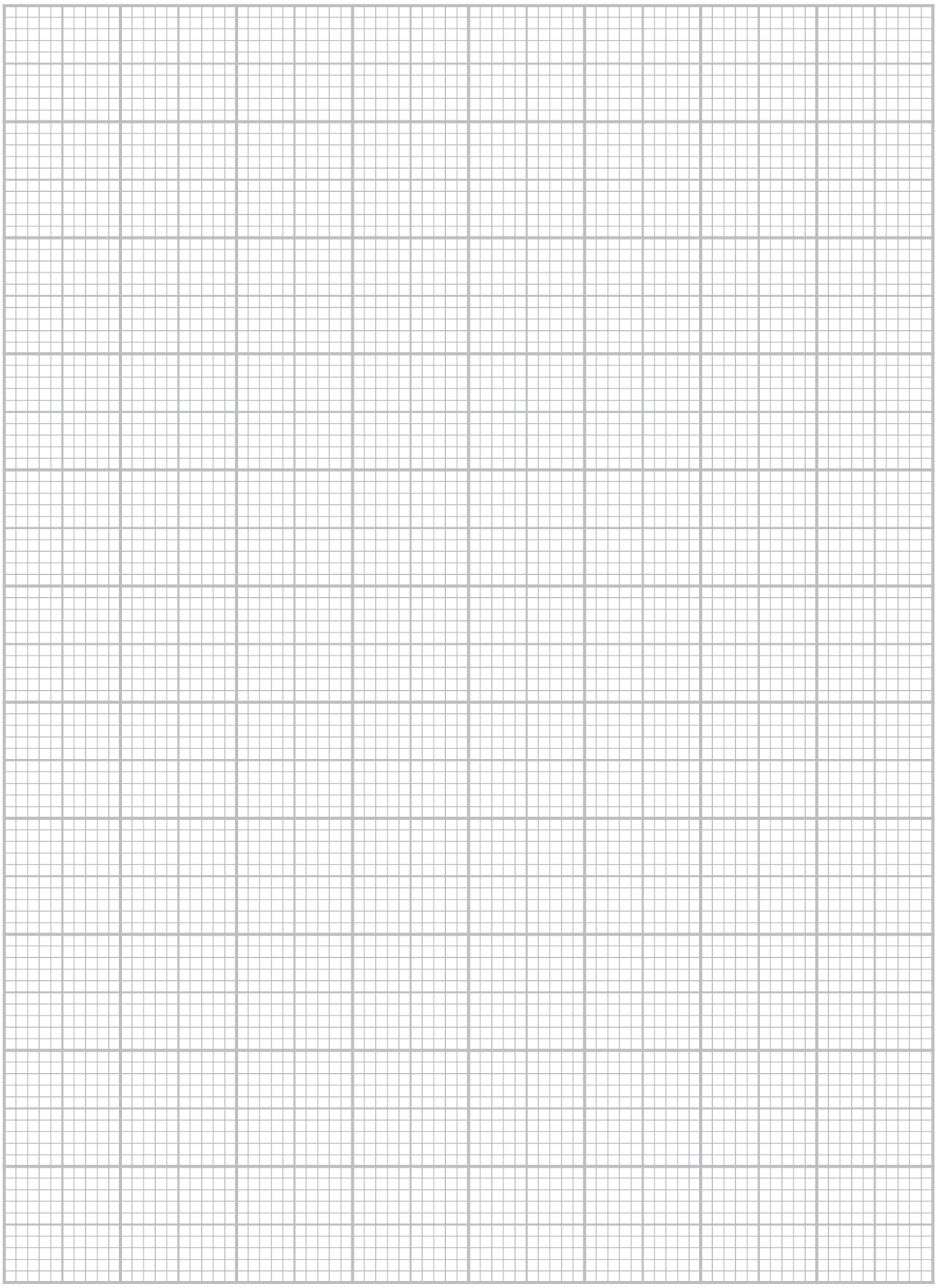
(b) Draw a suitable table to display the **data** and your calculated **means** for the toepad area of sample **A** and the toepad area of sample **B**.

(3)

(c) Draw a suitable graph to show the mean toepad area for sample **A** and for sample **B**.

Include an indication of the variability of the data.

(3)



(d) The scientist analysed the data with a *t* test using the formula:

$$t = \frac{(\bar{x}_A - \bar{x}_B)}{\sqrt{\frac{(S_A)^2}{n_A} + \frac{(S_B)^2}{n_B}}}$$

Where:

$\bar{x}$ is the mean value for each treatment

n is the number of samples for each treatment

$(S_A)^2 = 0.095$ and $(S_B)^2 = 0.115$

(i) Calculate the value of *t*.

(3)

Answer .....

(ii) The table shows the critical values of *t* for different degrees of freedom.

The number of degrees of freedom = $(n_A - 1) + (n_B - 1)$

Degrees of freedom	p = 0.05
8	2.31
9	2.26
10	2.23
11	2.20
12	2.18
13	2.16
14	2.15
15	2.13
16	2.12
17	2.11
18	2.10

Describe the conclusions that can be drawn from this investigation.

Use the information in the table to support your answer.

(2)

(e) Describe how the scientist could extend this investigation to collect more data to either support or reject the hypothesis.

(2)

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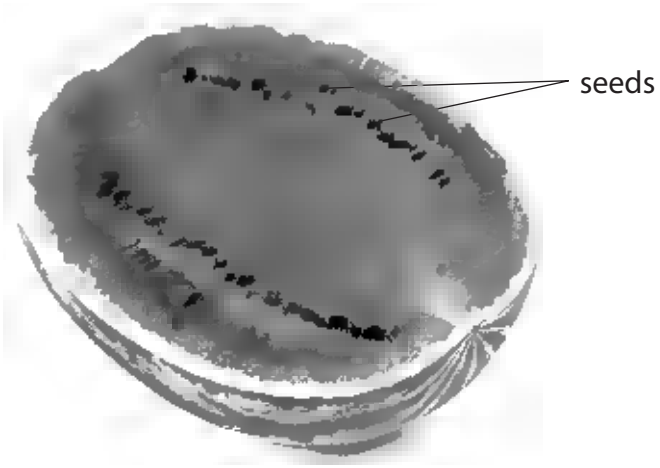
(Total for Question 3 = 14 marks)

4 The photograph shows half a watermelon fruit, *Citrullus lanatus*, containing seeds.



Watermelon plants are grown in all parts of the world.

Watermelon seeds can be diploid with 22 chromosomes or tetraploid with 44 chromosomes.

Tetraploid seeds have different food stores and thicker seed coats than diploid seeds.

Watermelon seeds respire their food stores during germination to develop into seedlings.

A student formed the following hypothesis:

Tetraploid seeds have a higher respiratory quotient (RQ) than diploid seeds

Plan an investigation to find evidence to support or reject this hypothesis.

(a) Describe preliminary practical work that you might undertake to ensure your proposed method would provide quantitative results.

(2)

(b) Devise a detailed method, including how you would control and monitor important variables.

(9)

(c) Describe how your results should be recorded, presented and analysed in order to draw conclusions from your investigation.

(3)

(d) Suggest **two** limitations of your proposed method.

(2)

(Total for Question 4 = 16 marks)

TOTAL FOR PAPER = 50 MARKS

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