Please check the examination details below before entering your candidate information

| Candidate surname | Other names |
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| | |

**Pearson Edexcel**
**International Advanced Level**

Centre Number | Candidate Number

**Time** 1 hour and 20 minutes

**Paper reference** **WBI13/01**

# Biology

## International Advanced Subsidiary / Advanced Level
## UNIT 3: Practical Skills in Biology I

**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.*
- **Show all your working in calculations and include units where appropriate.**

### 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.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

*Turn over* ▶

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**Answer ALL questions.**

**Write your answers in the spaces provided.**

**1** Some plant extracts have been shown to have antimicrobial properties.

(a) Describe a method that can be used to study the antimicrobial properties of a plant extract.

**(5)**

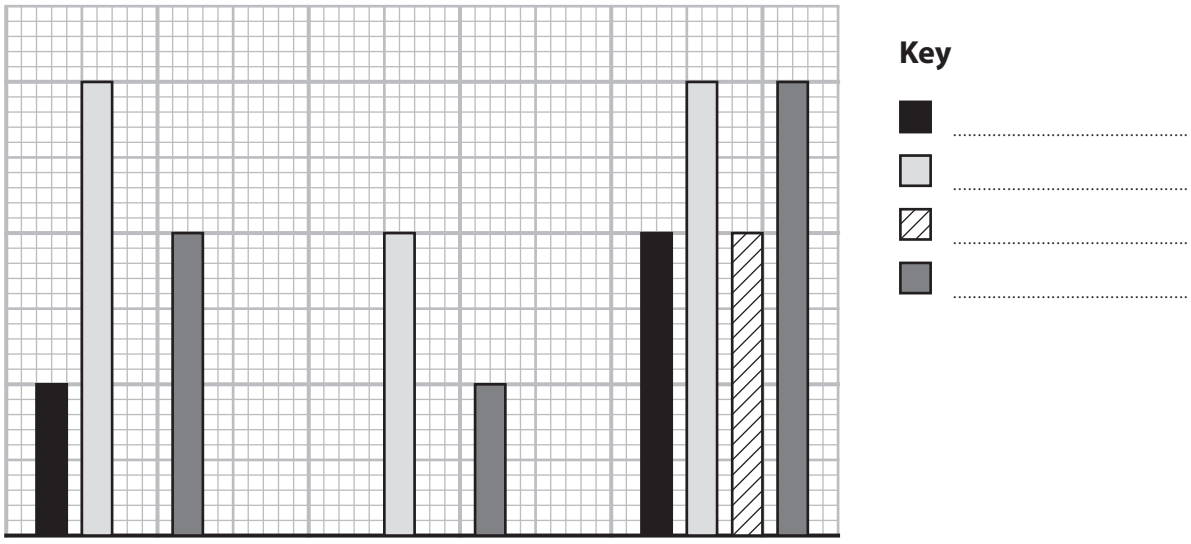
(b) The antimicrobial properties of extracts from four species of plant (A, B, C and D) were investigated using three types of bacteria.

The antimicrobial effect was scored on a scale of 0 to 3, where 0 is no effect and 3 is a very large effect.

The table shows the results of this investigation.

| Type of bacteria | Score for each species of plant | | | |
|---|---|---|---|---|
| | A | B | C | D |
| *B. subtilis* | 1 | 3 | 0 | 2 |
| *P. vulgaris* | 0 | 2 | 0 | 1 |
| *S. aureus* | 2 | 3 | 2 | 3 |

The results were plotted as a bar chart.




(i) Complete the bar chart by labelling the axes and key, using the information in the table.

**(3)**

(ii) Evaluate the antimicrobial effects of these extracts.

Use the data to support your answer.

**(4)**

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

**2** Flowering plants produce seeds that can be stored in a seed bank. This is done to conserve the biodiversity of plants.

(a) (i) Describe how seeds are treated and then stored in a seed bank.

**(3)**

(ii) State what is meant by the term **biodiversity**.

**(2)**

(b) The longer seeds are stored in seed banks, the less likely they are to germinate. This is due to ageing.

Ageing of seeds can affect the growth of roots when the seeds germinate.

Determining the mitotic index of roots is one way to study growth of roots.

(i) Describe how the mitotic index of roots can be determined.

**(4)**

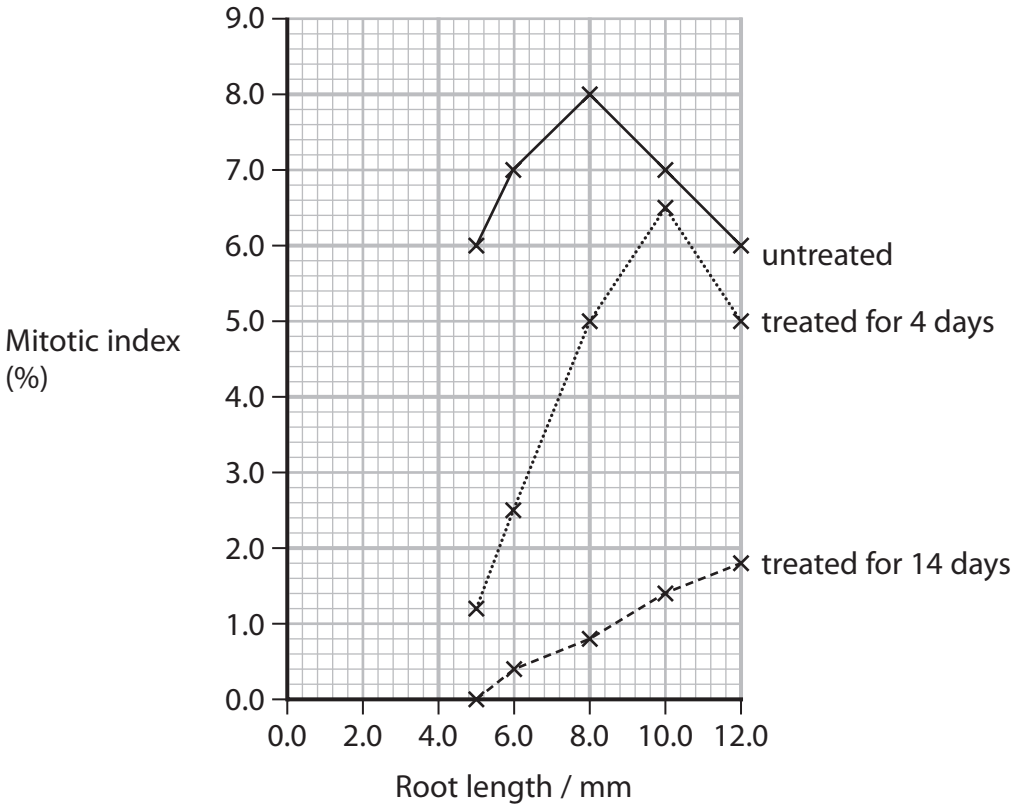
(ii) Seeds can be treated to artificially age them.

In an investigation, untreated and treated samples of seeds were germinated and the roots allowed to grow.

Roots of different lengths from the untreated seeds, seeds treated for 4 days and seeds treated for 14 days were selected.

The mitotic index of these roots was determined.

The graph shows the results of this investigation.




There were 14 cells undergoing mitosis in 8 mm roots from seeds treated for 4 days.

Calculate the total number of cells that were counted when the mitotic index was determined.

**(3)**

Total cells counted .....

(iii) Draw a table to show the data on the effect of root length on mitotic index in seeds treated for 14 days.

**(3)**

(iv) Identify the conclusions that can be drawn from these data.

**(3)**

(v) The graph does not show the standard deviations of the means for mitotic index.

Describe how the investigation could be modified to allow standard deviations to be obtained.

**(2)**

**(Total for Question 2 = 20 marks)**

**3** Pollen grains germinate in a solution that contains sucrose and boric acid.

The effect of boric acid concentration on the percentage germination of pollen grains was studied.

(a) State the dependent variable in this study.

**(1)**

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(b) In this study, the solutions used were maintained at pH 6.

Explain why this pH was maintained.

**(2)**

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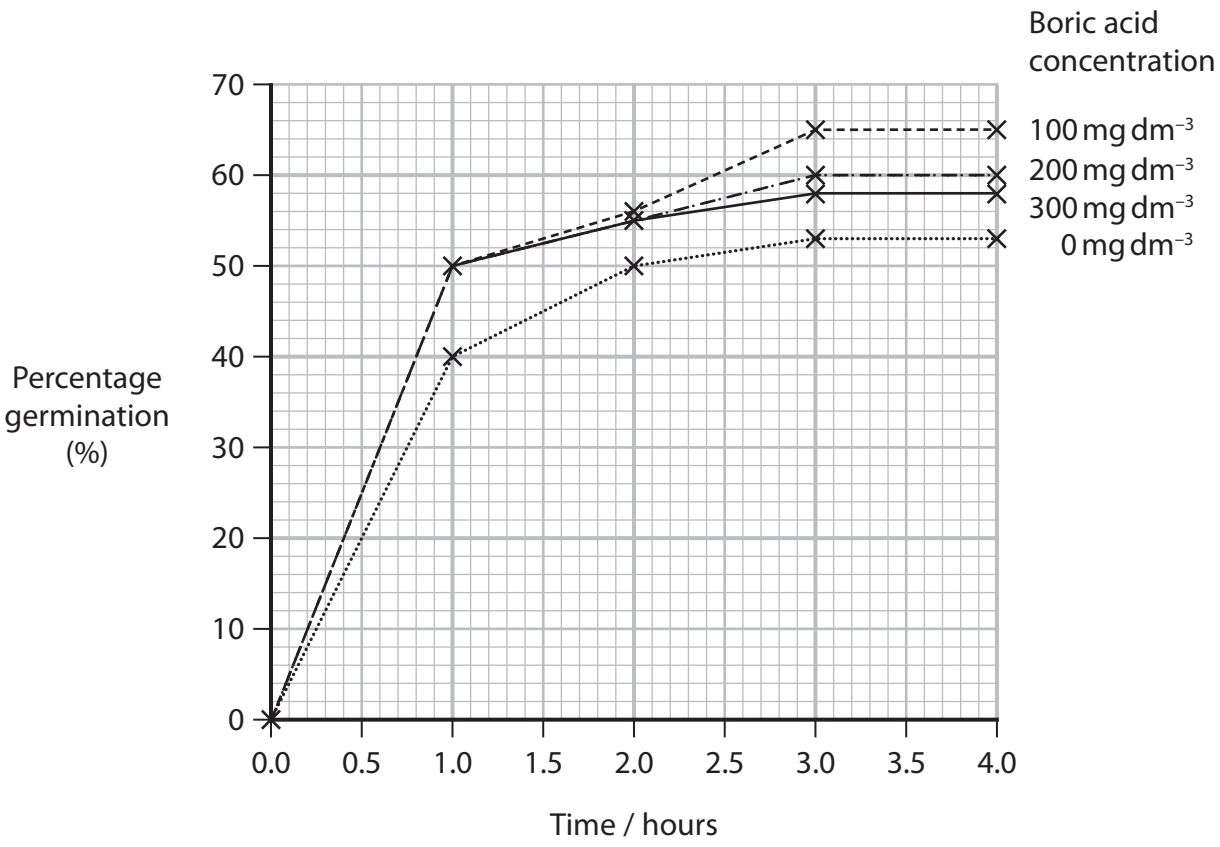
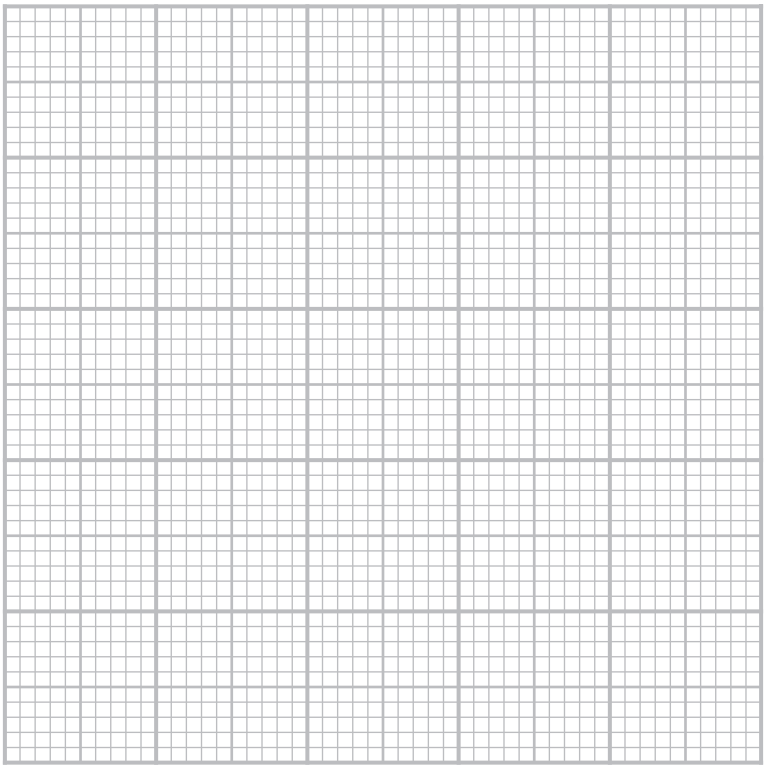
(c) The graph shows the results of this study.



(i) Draw a graph to show how boric acid concentration affects germination at 4 hours.

Join the points with straight lines.

**(5)**



(ii) Describe the effect of boric acid concentration on pollen grain germination at 4 hours.

**(2)**

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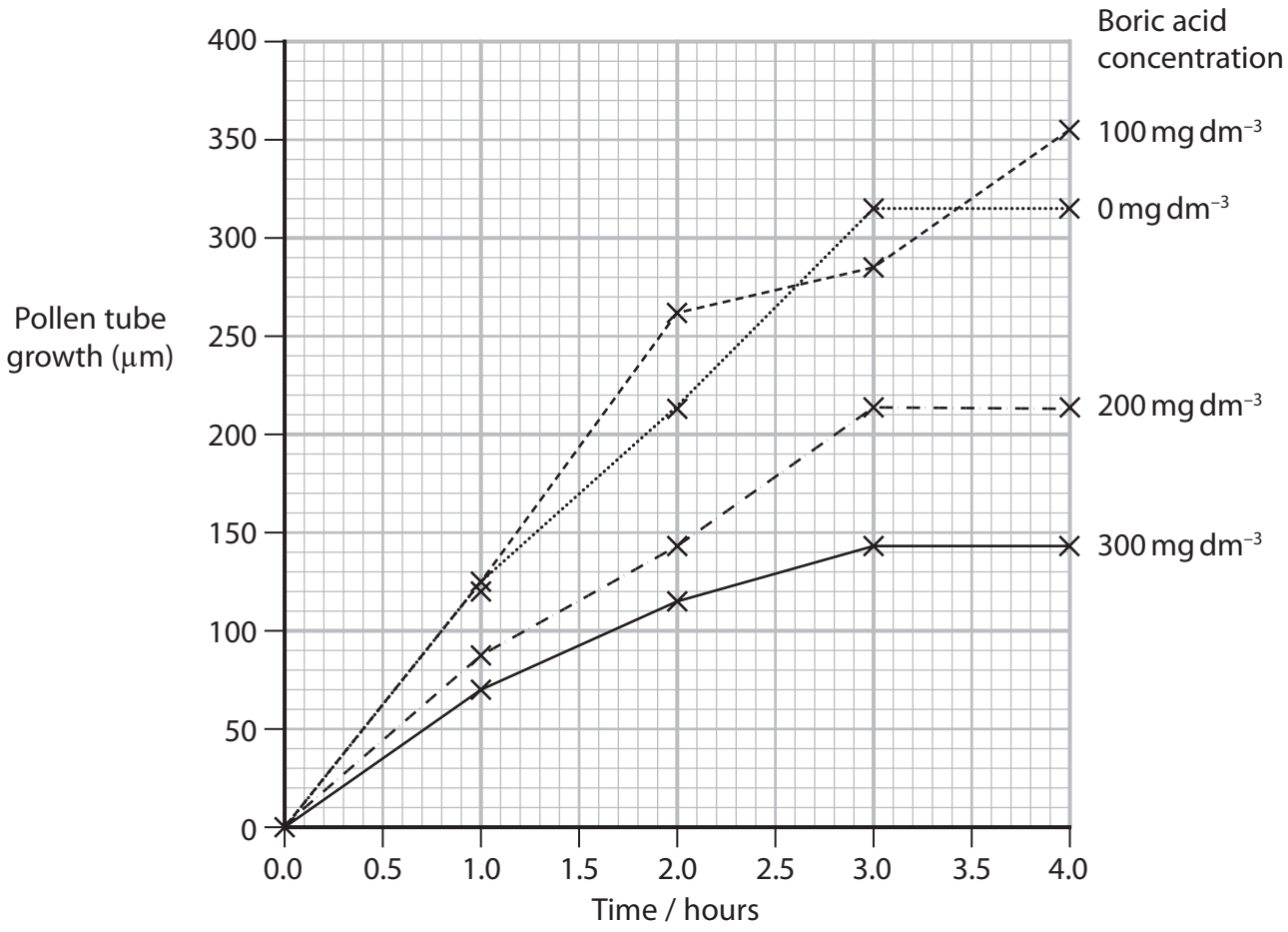
(d) In another study, the effect of boric acid concentration on pollen tube growth was investigated.

The graph shows the results of this study.




(i) During the first two hours, the rate of pollen tube growth at a boric acid concentration of 100 mg $dm^{-3}$ is 130.5 μm $hour^{-1}$.

Calculate the percentage increase in the rate of pollen tube growth between the rate at 0 mg $dm^{-3}$ and the rate at 100 mg $dm^{-3}$, during the first two hours.

**(2)**

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(ii) Describe how the results shown in the graph could have been obtained.

You are provided with a 500 mg $dm^{-3}$ boric acid solution.

**(4)**

(e) Compare and contrast the effect of boric acid concentration on pollen grain germination with its effect on pollen tube growth.

Use the information given in this question.

**(2)**

**(Total for Question 3 = 18 marks)**

**TOTAL FOR PAPER = 50 MARKS**

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