Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | Candidate Number

Thursday 17 October 2019

Morning (Time: 1 hour 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 **black** 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.

Turn over ▶

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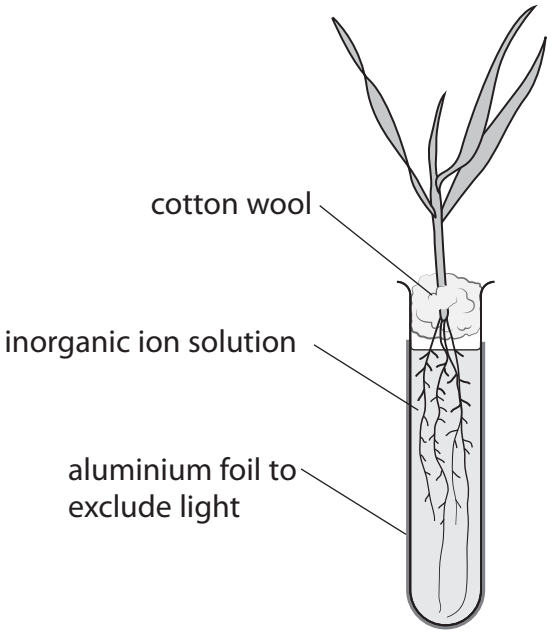
Pearson

Answer ALL questions.

Write your answers in the spaces provided.

1 The effect of mineral deficiency on plant growth can be studied.

The diagram shows a plant growing in a solution of inorganic ions.



(a) (i) Name an inorganic ion needed for the synthesis of each of the following.

(3)

Amino acids .....

Chlorophyll .....

Middle lamella .....

(ii) Devise an experiment, which will produce valid data, to investigate the deficiency of a named inorganic ion on the growth of a plant.

(4)

(b) The table shows the results of an investigation into the effect of nitrate ion deficiency on the growth of a plant.

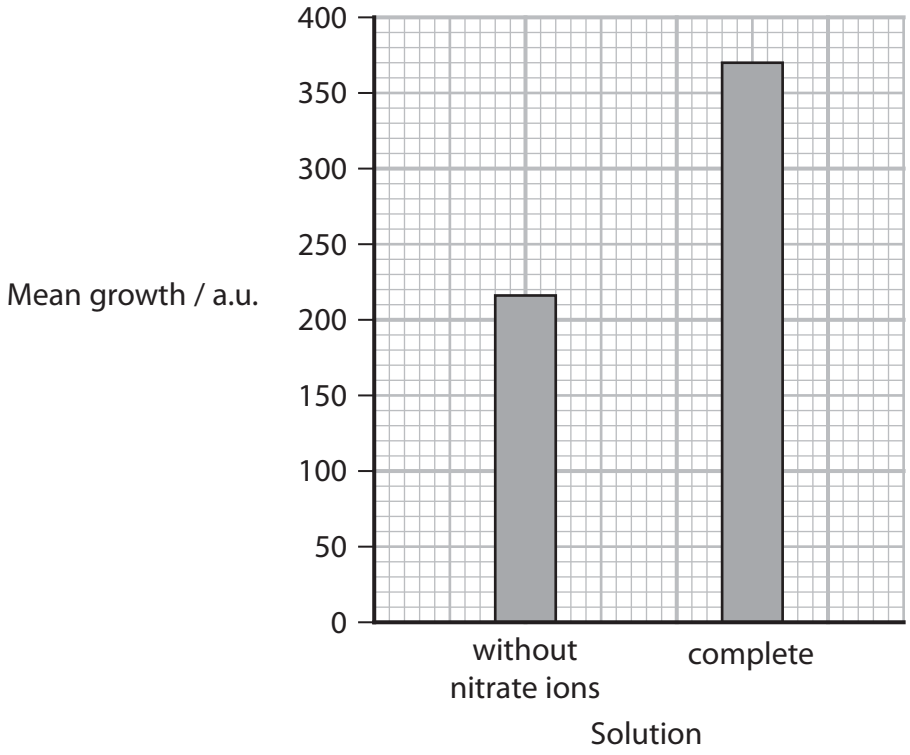
Solution	Growth after 21 days / a.u.										Mean growth / a.u.	Standard deviation
complete	380	370	387	378	369	368	359	358	360	381	371	±17.4
without nitrate ions	220	197	231	189	225	230	204	235	236	193	216	±9.7

(i) Calculate the difference in the mean daily growth rate of the plants grown in these two solutions.

(2)

Answer .....

(ii) The bar chart shows the mean growth after 21 days.



Complete the bar chart by showing the standard deviations.

Explain what the standard deviations indicate about the results of this investigation.

(3)

(Total for Question 1 = 12 marks)

2 The flow chart shows how garlic root tips can be treated to observe mitosis in the root cells.

Step 1
Root tips were placed in hydrochloric acid in a water bath at 55 °C, left for five minutes and then rinsed with water

↓

Step 2
Root tips were then placed in acetic orcein in a water bath at 55 °C and left for five minutes

↓

Step 3
Root tips were placed on a microscope slide and broken apart using mounted needles

↓

Step 4
A coverslip was placed over the root tips and squashed gently

↓

Step 5
The slide was then viewed first using low power and then high power of a microscope

(a) (i) Give **one** reason why each of the following steps was taken.

(3)

Step 2 .....

.....

.....

Step 4 .....

.....

.....

Step 5 .....

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(ii) Explain **one** safety precaution that must be taken when carrying out this procedure.

(2)

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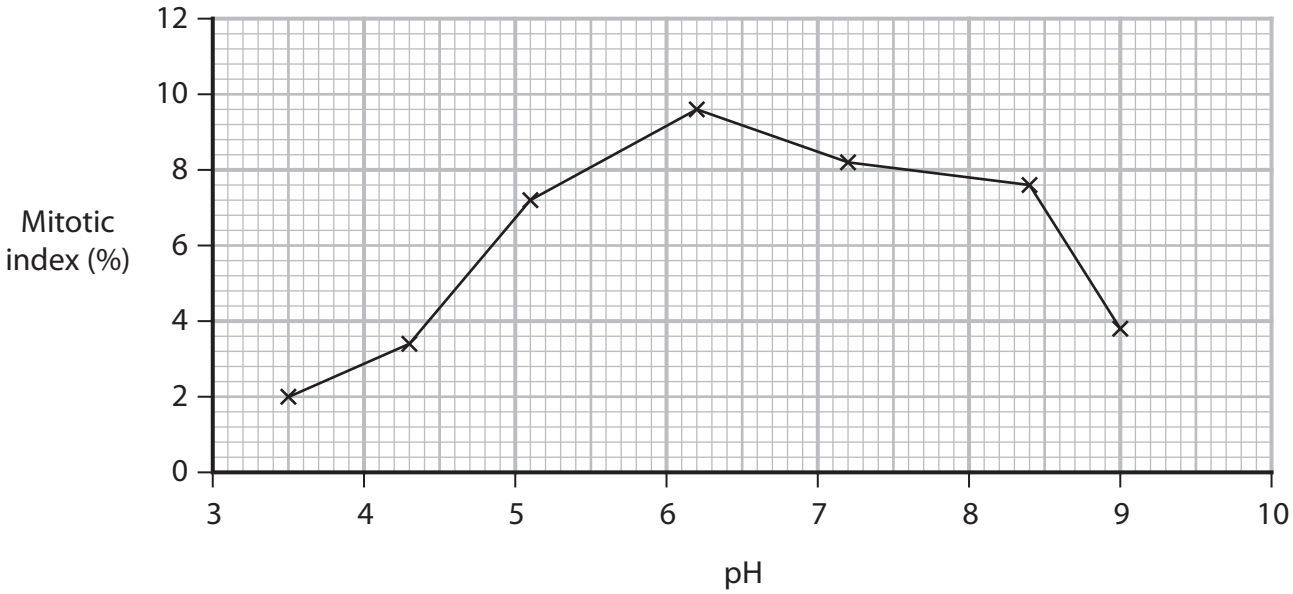
(b) Describe how the procedure shown in the flow chart could be used to investigate the effect of pH on the mitotic index.

(5)

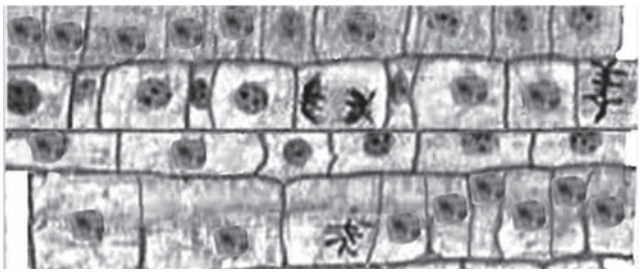
(c) The graph shows the results of an investigation into the effect of pH on mitotic index.



(i) Draw a suitable table for the results shown in the graph.

(3)

(ii) The photograph shows 35 cells from a root tip at one of the pH values investigated.



Calculate the mitotic index of this root tip.

Using the graph, determine the pH at which this root tip was grown.

(3)

Mitotic index ..... %

pH .....

(iii) Explain why the mitotic index is affected by pH, as shown by the graph.

(4)

(Total for Question 2 = 20 marks)

3 Antimicrobial chemicals can be used in food preservation to reduce the risk of food poisoning.

Antimicrobial chemicals derived from plants may be used in food preservation.

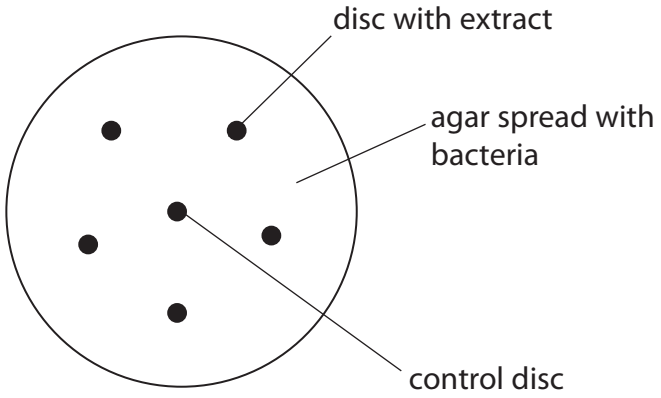
An investigation was carried out to assess the antimicrobial properties of extracts from five plants: clove, cumin, ginger, pomegranate and thyme.

Two types of bacteria were used, type **A** and type **B**.

Filter paper discs were placed in each extract for 10 minutes and then allowed to dry.

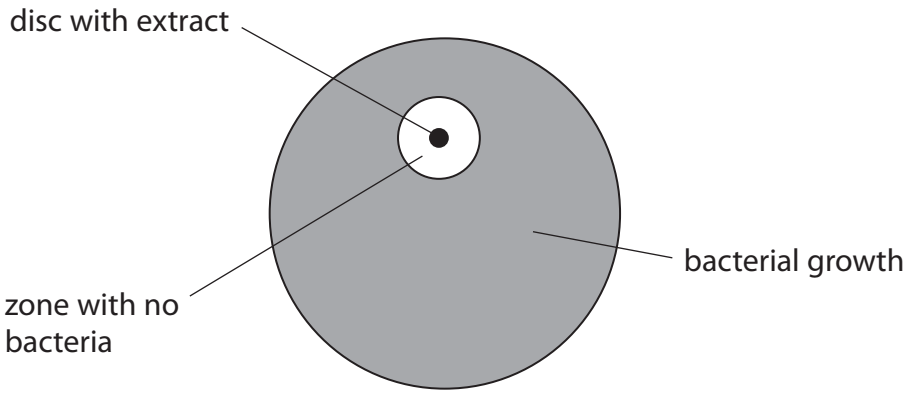
Five discs, one for each extract, were placed onto an agar plate spread with bacteria of type **A**. This was repeated for bacteria of type **B**.
A control disc was added to each plate.

The diagram shows one agar plate after this procedure was completed.



These plates were kept at 5 °C for two hours, and then incubated at 30 °C for 24 hours.

The diagram shows a typical result for one disc.



After this time, the antimicrobial effect was assessed by determining the area of the zone with no bacteria (zone of inhibition).

(a) (i) State the dependent variable in this investigation.

(1)

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(ii) Suggest why the plates were kept at 5 °C, before they were incubated.

(1)

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(iii) Describe how the area of a zone of inhibition could be determined.

(2)

(iv) Describe the control disc used in this investigation.

(2)

(b) The table shows the results of this investigation.

Plant extract	Area of zone of inhibition / mm^2	
	Bacteria type A	Bacteria type B
clove	196	111
cumin	71	0
ginger	186	0
pomegranate	269	158
thyme	243	0

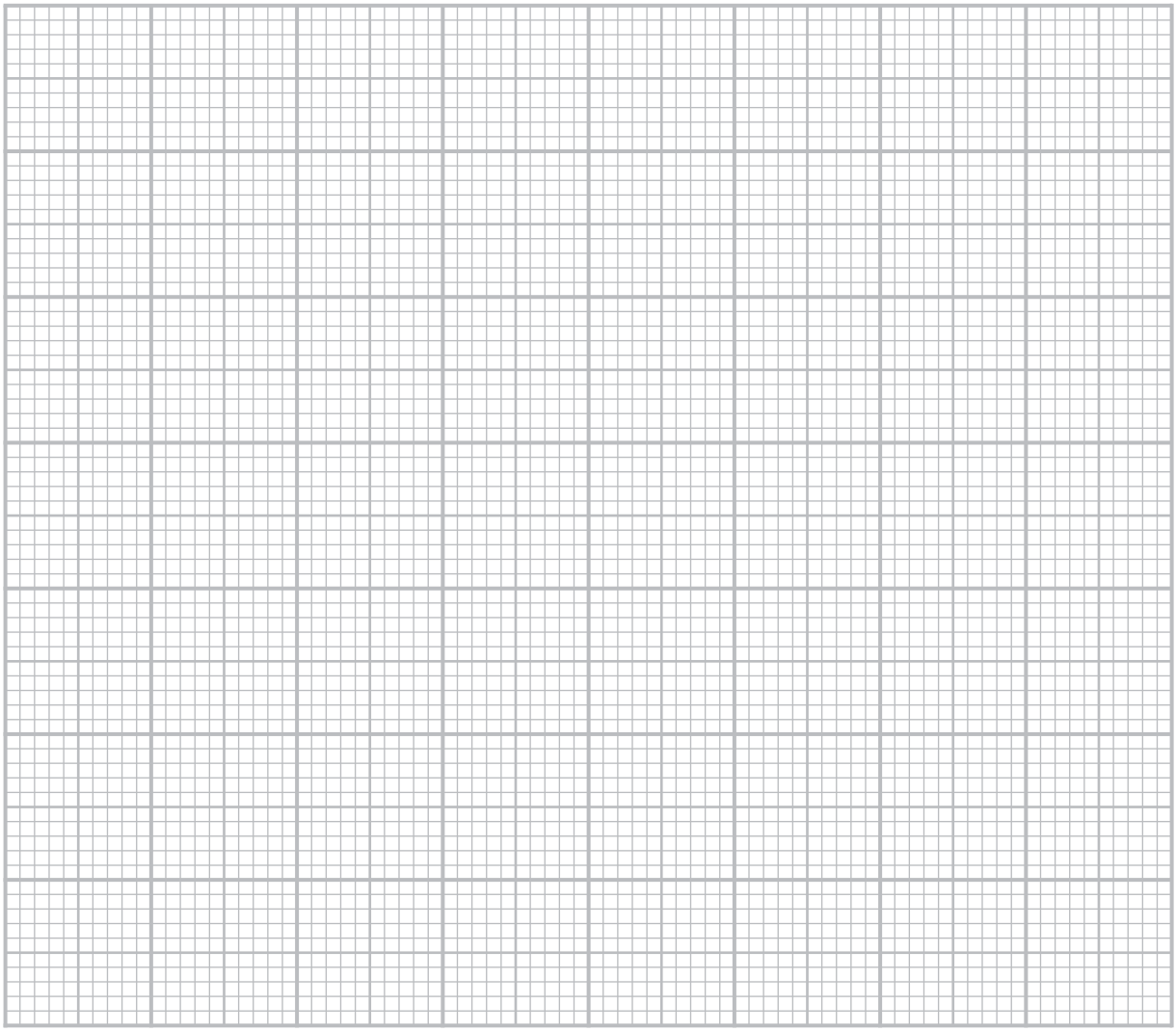
(i) Calculate the percentage difference between the inhibitory effect of clove extract on type **A** and type **B** bacteria.

(2)

Answer .....%

(ii) Plot a suitable graph to show the results of this investigation.

(5)



(iii) Comment on the results of this investigation into the preservation of food using plant extracts.

(3)

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(c) This method can be used to suggest that an extract has an antimicrobial effect. Other factors can affect the size of the zone of inhibition.

State **two** factors, other than the antimicrobial effect, that could affect the area of the zone of inhibition in this investigation.

(2)

1 .....

.....

2 .....

.....

(Total for Question 3 = 18 marks)

TOTAL FOR PAPER = 50 MARKS