Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

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 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 out** 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.

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Pearson

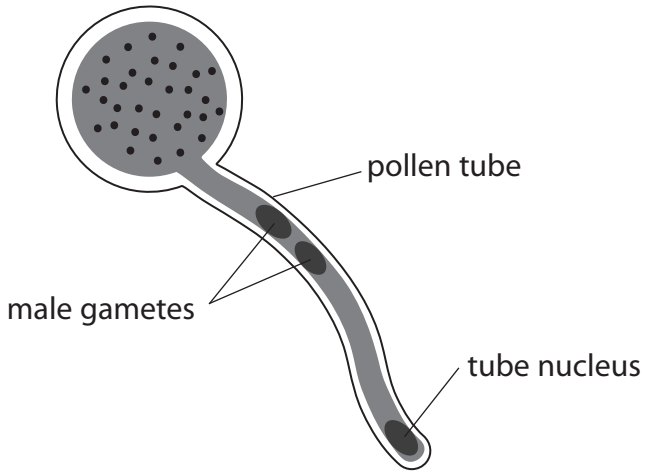
Answer ALL questions.

Write your answers in the spaces provided.

1 Pollen grains will germinate, and the pollen tubes will grow, in water but not as quickly as they do on the stigma.

This difference is thought to be due to several factors, such as calcium ions, sucrose and compounds containing boron. These factors are present on the stigma and in the style.

The diagram shows a germinating pollen grain.



(a) (i) Explain the role of the pollen tube in plant reproduction.

(3)

(ii) Explain why pollen tubes grow in the same direction from the stigma, after pollination.

(2)

(b) The effect of sucrose solutions of different concentrations on the growth of pollen grains was investigated.

The percentage of pollen grains that germinated and the length of the pollen tubes were measured, one hour after they were placed in the sucrose solution.

(i) State **two** dependent variables in this investigation.

(2)

1

2

(ii) Explain why changes in temperature will affect this investigation.

(2)

(c) A solution containing calcium ions has to be added to the sucrose solutions.

These solutions were made using:

- a 2.0 mol dm^{-3} sucrose solution
- a solution containing calcium ions and water

(i) Describe how you would make 10 cm^3 of a 0.4 mol dm^{-3} sucrose solution using these two solutions.

(3)

(ii) The calcium ion solution is alkaline.

State how the pH of the sucrose solutions used in this investigation could be adjusted to a required value.

(1)

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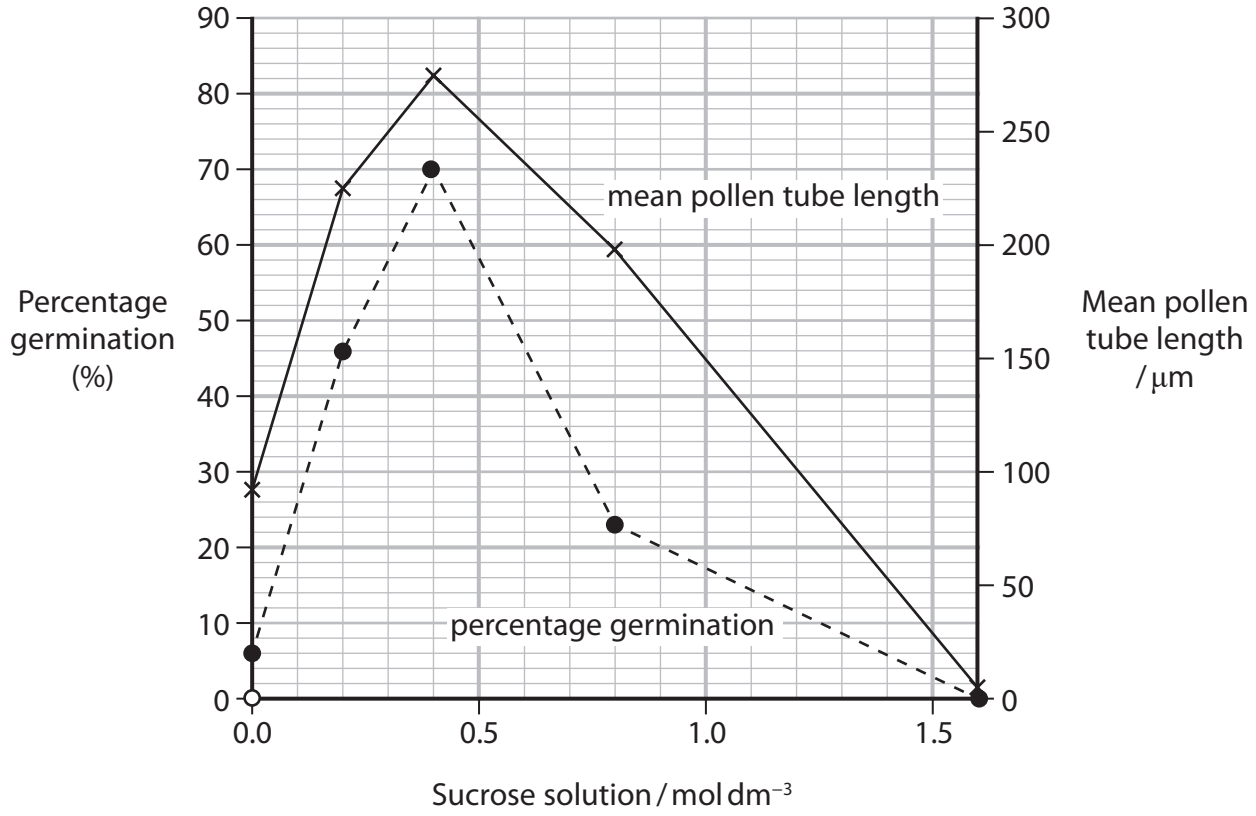
(d) The graph shows the results of this investigation.



(i) Draw a suitable table to show the results for percentage germination.

(3)

(ii) Comment on the conclusion that both percentage germination and mean pollen tube growth have the same optimum sucrose concentration.

(3)

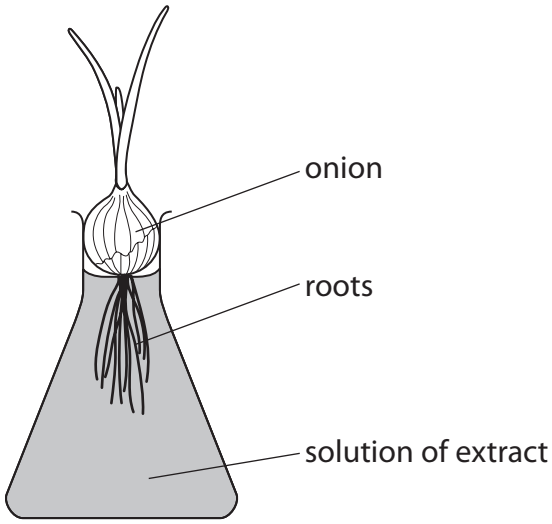
(Total for Question 1 = 19 marks)

2 *Psychotria* species are rainforest plants that are widely used as herbal medicines. It has been suggested that extracts from these plants could be used to inhibit cell division.

The effect of extracts from two species of this plant on the mitotic index of onion roots was investigated.

Two concentrations of extract, 1.0 mg cm^{-3} and 7.0 mg cm^{-3}, were made from each of two species of *Psychotria*, species A and species B.

Onion roots were grown in each concentration of extract and a control, as shown in the diagram.

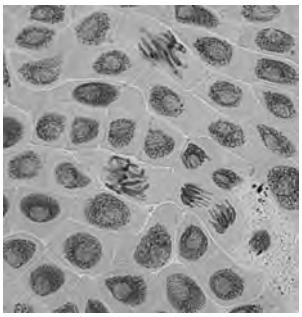


After 24 hours the mitotic index was determined for these roots.

(a) Describe a safe method to observe the stages of mitosis in these roots.

(5)

(b) The photograph shows part of a root tip from this investigation.



(Source: © Rattiya Thongdumhyu/shutterstock)

Calculate the mitotic index of this root tip.

Give your answer to 2 significant figures.

(2)

Answer .....

(c) The table shows data from this investigation.

Source of extract solution	Extract concentration / mg cm^{-3}	Mitotic index
Species A	1.0	4.7
	7.0	1.2
Species B	1.0	4.2
	7.0	1.9
Control	0.0	7.4

(i) Plot a suitable graph to show the data in the table.

(4)

(ii) Describe how this investigation could be modified to determine if the differences between the mitotic indices are significant.

(4)

(Total for Question 2 = 15 marks)

3 Many food crops, such as potatoes and bananas, contain starch. The starch content can affect the taste and cooking properties of the food.

Potatoes can be boiled or baked. Potatoes with a high starch content are good for baking and those with a lower starch content are good for boiling.

It is suggested that King Edward and Russet potatoes are better for baking and Nicola and Purple Congo potatoes are better for boiling.

A student decided to test these suggestions.

A standard set of starch solutions was prepared and tested.

The table shows the results.

Starch concentration (%)	Colour of solution after addition of iodine solution
1.0	black
0.1	dark blue
0.01	pale blue
0.001	very pale blue
0.0001	pale brown

(a) Describe how the data in the table could have been obtained using a 1% starch solution.

(4)

(b) The table shows the results for the four potato varieties.

Potato variety	Colour
King Edward	black
Nicola	very pale blue
Purple Congo	pale blue
Russet	dark blue

Discuss the extent to which these results support the suggestions about the use of these potato varieties.

(4)

(c) Suggest how this investigation could be adapted to produce quantitative data.

(2)

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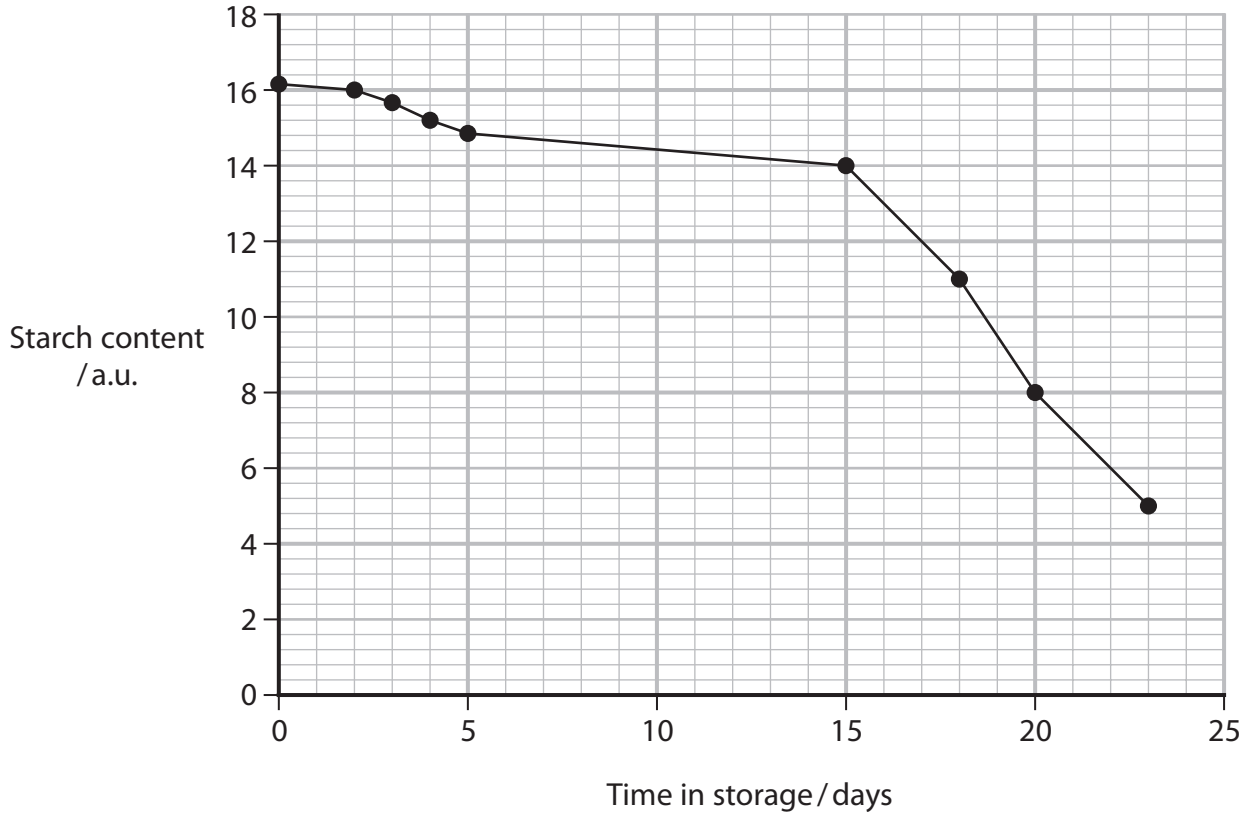
(d) It is suggested that the change in the taste and consistency of stored bananas is due to changes in their starch content.

An investigation of the content of starch in stored bananas produced the following results.



(i) Calculate the rate of decrease in starch content from day 15 to day 23.

Include units in your answer.

(2)

Answer .....

(ii) Describe the changes in starch content during the 23 days of this investigation.

(2)

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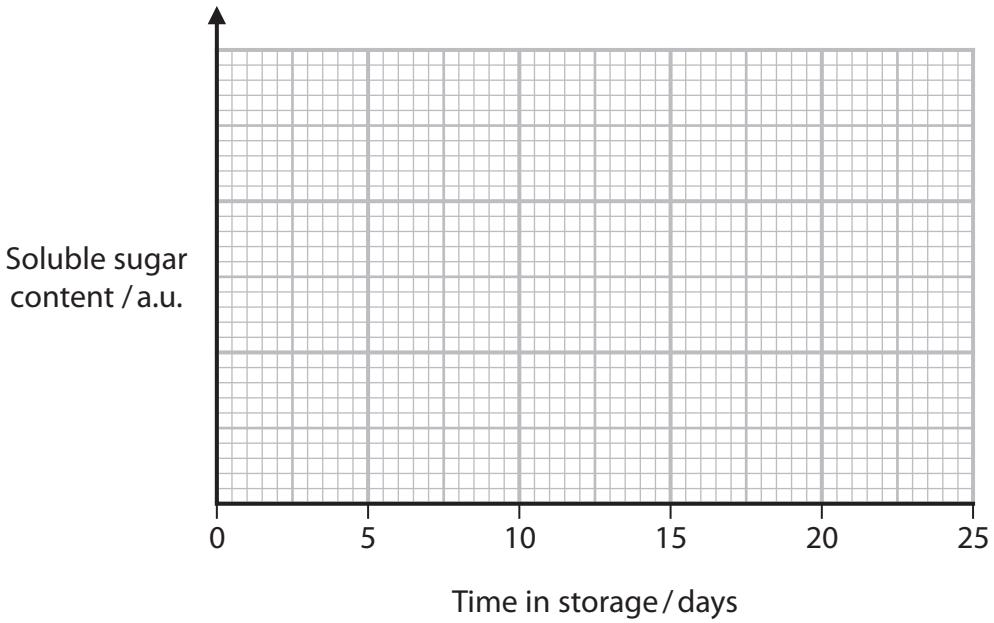
(iii) Sketch a graph to show the soluble sugar content of these bananas during storage.

(2)



(Total for Question 3 = 16 marks)

TOTAL FOR PAPER = 50 MARKS

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