Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Wednesday 21 May 2025

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 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions.

Write your answers in the spaces provided.

1 Trifluralin is a chemical used to stop the growth of weeds in fields of crops.

Mitosis is a process that is essential for the growth of weeds.

(a) State the **four** stages of mitosis in the order in which they occur.

(2)

1 .....

2 .....

3 .....

4 .....

(b) The effect of trifluralin on mitosis in wheat plants was investigated.

Wheat grains were germinated on moist filter paper.

The wheat seedlings were transferred to Petri dishes containing discs of filter paper, as shown in the photograph.



(Source: © Africa Studio / Shutterstock)

The filter paper discs were soaked in a solvent or the solvent containing 7 mg cm^{-3} of trifluralin.

The Petri dishes containing the seedlings were incubated at 25 °C.

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(i) Explain why a temperature of 25 °C was used.

(2)

(ii) State the independent variable in this investigation.

(1)

(iii) Give **two** reasons why the grains were germinated before being transferred to the Petri dishes.

(2)

1

2

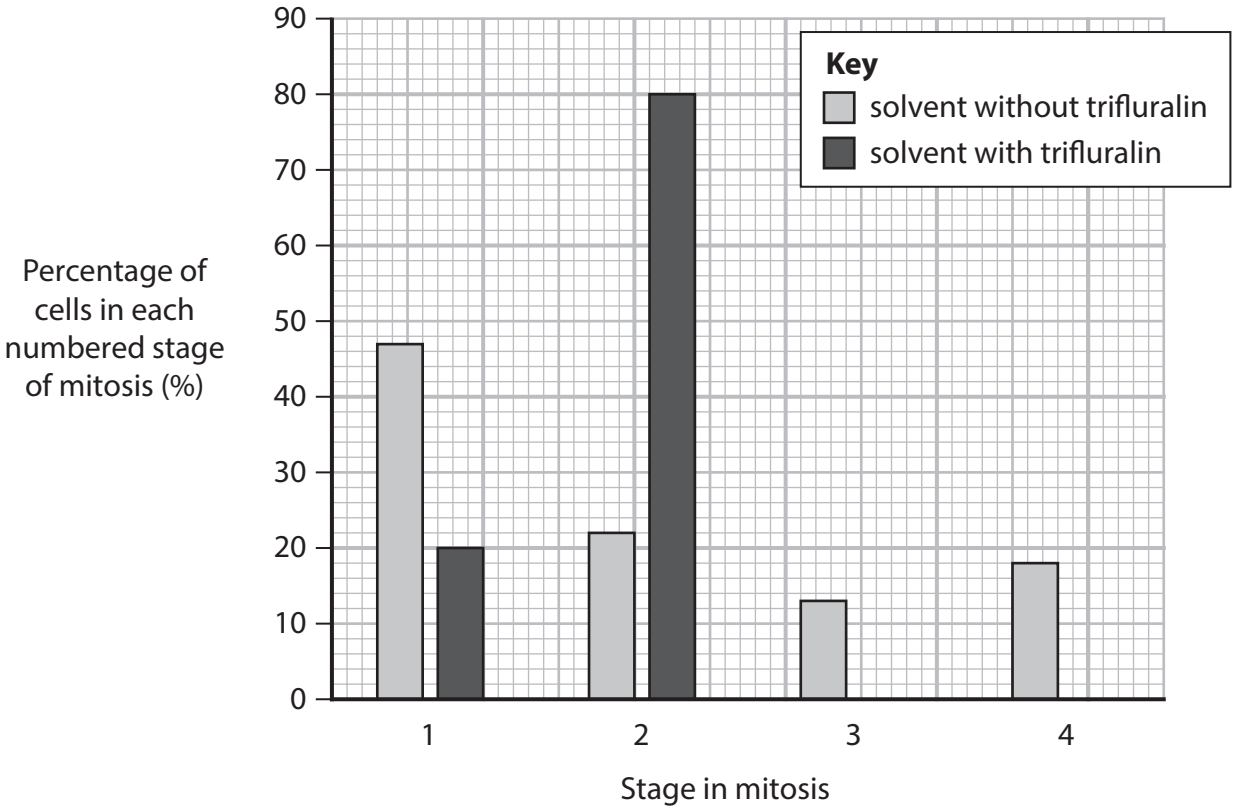
(iv) Explain why some seedlings were placed in the solvent **without** trifluralin.

(2)

(c) After 12 hours of incubation, root samples were taken from seedlings in each Petri dish.

The root samples were examined to determine which stages of mitosis were present and how many cells were in each stage.

The bar chart shows the percentage of cells in each stage of mitosis, numbered 1 to 4.



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(i) Describe how a root sample could have been prepared and examined to obtain these results.

(4)

(ii) There were 98 cells seen in total in the samples from the seedlings in the solvent with trifluralin.

Calculate how many cells were at stage 2 in the samples from the seedlings in the solvent with trifluralin.

(2)

Answer ..... cells

(iii) Explain the effect that trifluralin could have on the processes in mitosis.

(3)

(Total for Question 1 = 18 marks)

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QUESTION 2 BEGINS ON THE NEXT PAGE

2 Some alcohols, such as methanol, increase the permeability of cell membranes.

Cholesterol can reverse this effect.

(a) Membrane permeability in the presence of these chemicals was investigated.

Beetroot cells contain a red pigment called betalain. Membrane permeability of the beetroot cells was estimated by measuring the loss of betalain from slices of beetroot.

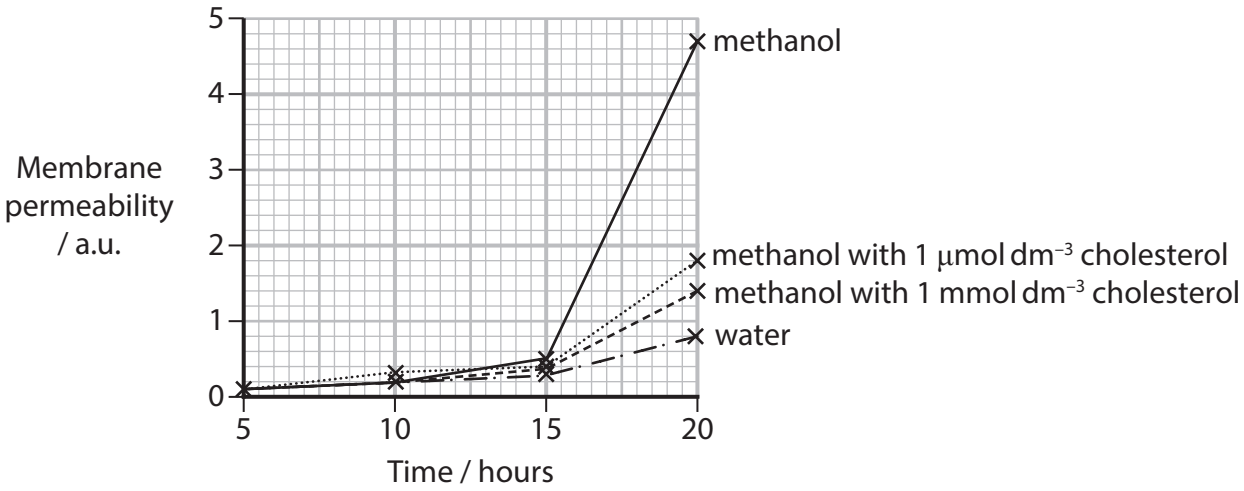
Samples of beetroot were immersed in four liquids:

- methanol only
- methanol with 1μmol dm^{-3} cholesterol
- methanol with 1mmol dm^{-3} cholesterol
- water.

Samples of each solution were taken every five hours.

Membrane permeability was estimated from these samples.

The graph shows the results of this investigation.



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(i) Justify each step of a method that could be used to obtain the results shown in the graph.

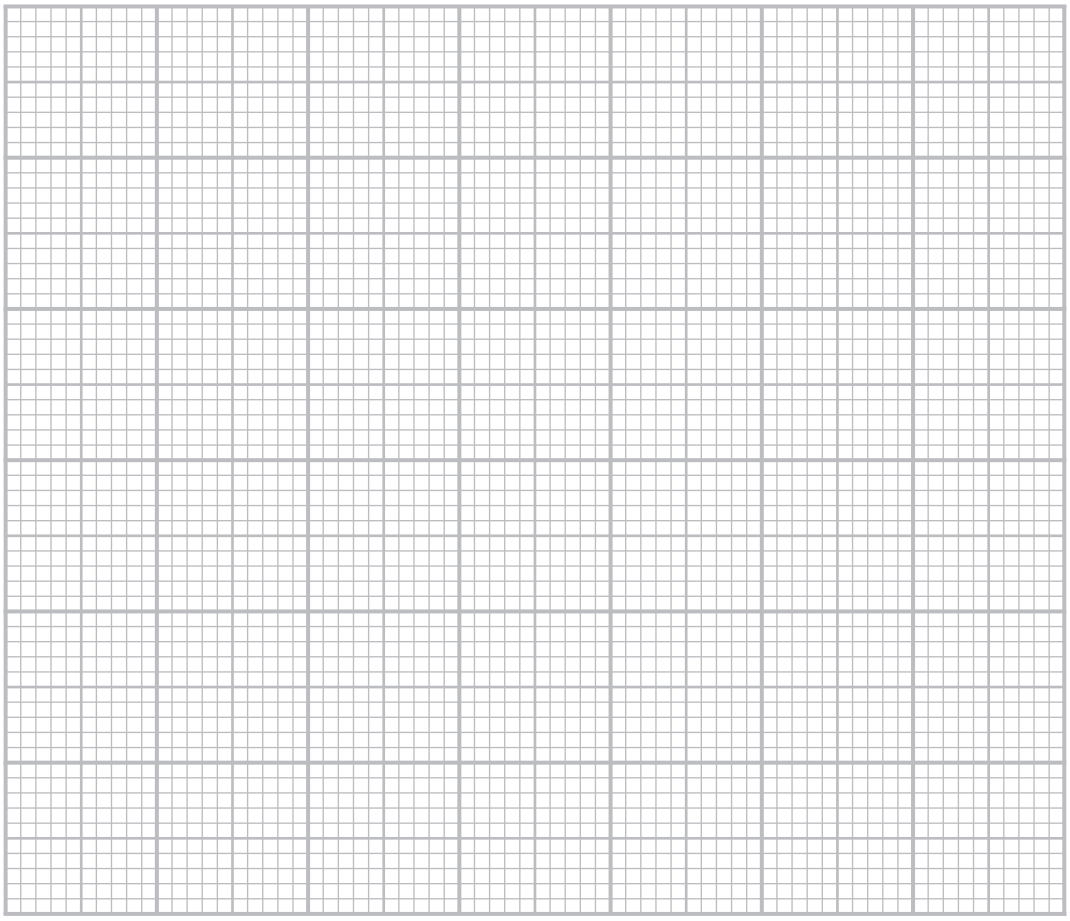
(5)

(ii) Draw a table that includes **only** the results obtained at 20 hours.

(3)

(iii) Plot a suitable graph for the results obtained at 20 hours.

(4)



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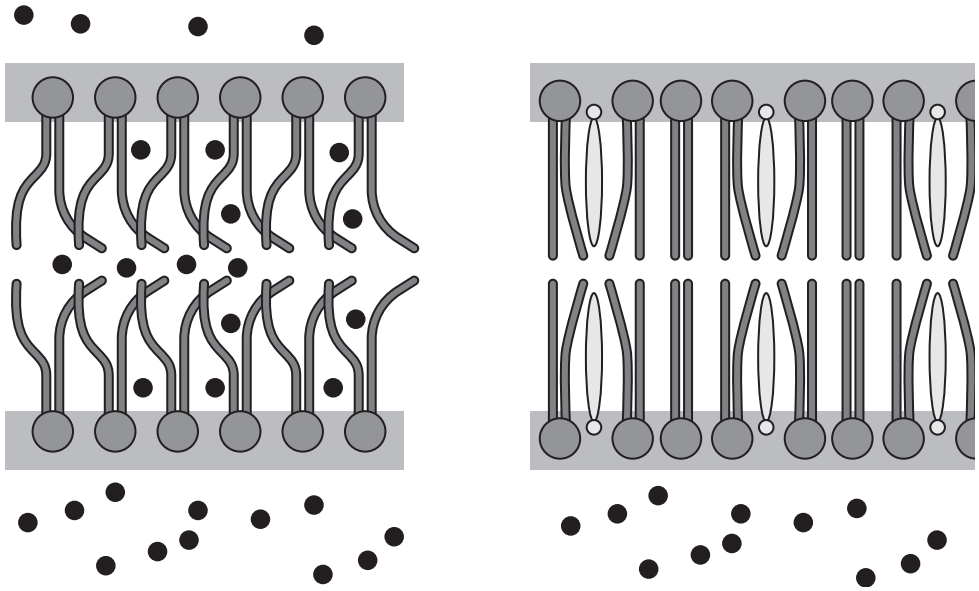
(b) The diagrams show parts of membranes around beetroot cells **soon after the experiment started**.

Diagram A shows part of a membrane with methanol only.

Diagram B shows part of a membrane with methanol and cholesterol.



KEY

betalain molecule ●

..... 

..... 

(i) Complete the key by naming the molecules.

(2)

(ii) Complete diagram A by labelling the inside and outside of the cell.

(1)

(iii) Draw an arrow next to diagram A to show the net movement of betalain during the experiment.

(1)

(Total for Question 2 = 16 marks)

3 Cassava is an important crop because of the high starch content of the roots.

The value of the crop depends on the starch content, so this must be assessed accurately.

The photograph shows a whole and a sliced cassava root.



(Source: © Picture Partners / Alamy Stock Photo)

(a) (i) Describe the structure of starch.

(3)

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(ii) Explain how colour standards can be used as a semi-quantitative method of estimating the concentration of starch in a sample.

(3)

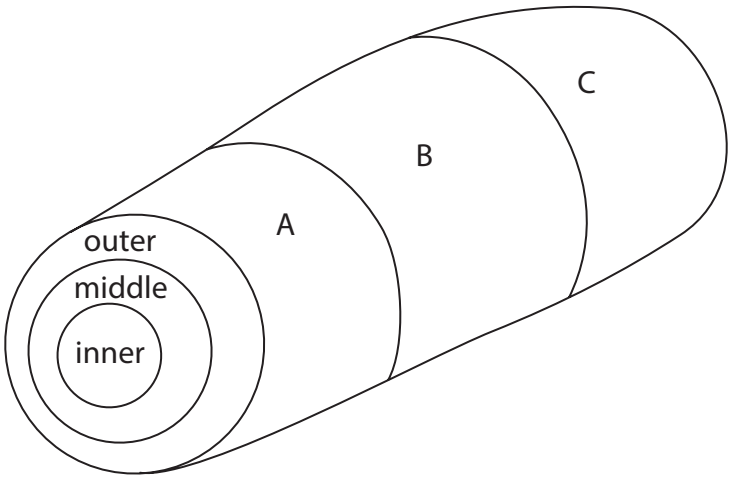
(iii) Describe the difference between a result obtained from a quantitative test and a result obtained from a semi-quantitative test.

(2)

(b) The starch content of nine regions of a cassava root was investigated.

The root was cut into three sections, A, B and C. Each of these sections has an outer, middle and inner layer.

The nine regions are shown in the diagram and the table.



The starch content was measured in each region in grams per hundred grams of tissue.

The table shows the results of this investigation.

Layer of section	Starch content in regions / g per 100 g of tissue		
	A	B	C
outer	31.40	31.79	29.76
middle	33.65	33.26	32.14
inner	30.06	29.64	30.56

(i) Calculate the percentage difference between the highest and lowest values obtained from these nine regions.

Use the formula:

$$\text{Percentage difference} = \left(\frac{\text{difference between two values}}{\text{mean of the two values}} \right) \times 100$$

(2)

Answer ..... %

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(ii) Describe how to determine the total mass of starch present in section B of this root.

(3)

(iii) Describe how this investigation could be extended to determine the variability in the concentration of starch in different cassava roots.

(3)

(Total for Question 3 = 16 marks)

TOTAL FOR PAPER = 50 MARKS

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