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.

Turn over

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P 7 1 8 7 0 A 0 1 2 0

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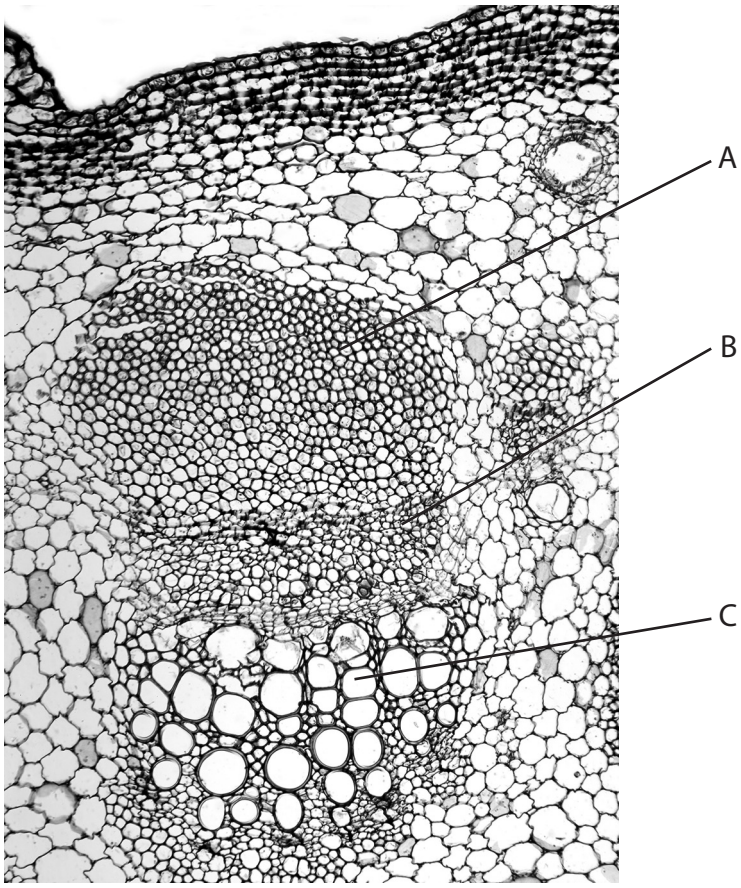
Answer ALL questions.

Write your answers in the spaces provided.

1 A student used a microscope to study the tissues in a plant stem and the cell of an animal.

The photograph shows a vascular bundle in a transverse section of the plant stem, as seen using a light microscope.



(Source: © DR KEITH WHEELER/SCIENCE PHOTO LIBRARY)

(a) (i) Describe how you would use the information in the photograph to identify structures A and C.

(2)

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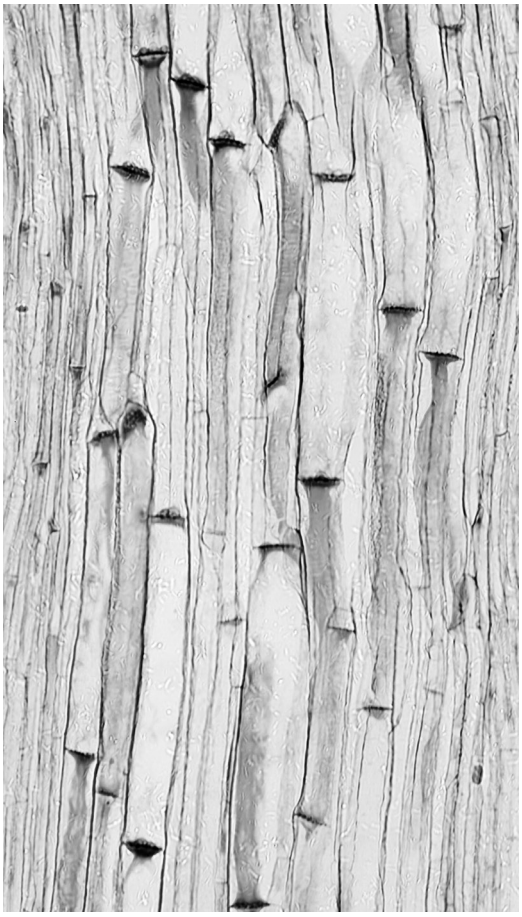
(ii) A longitudinal section was taken through one of the labelled tissues A, B or C. The photograph shows a view of some of the cells in this tissue, as seen using a light microscope.



(Source: © DR KEITH WHEELER/SCIENCE PHOTO LIBRARY)

Deduce which of the tissues A, B or C these cells come from.

(3)

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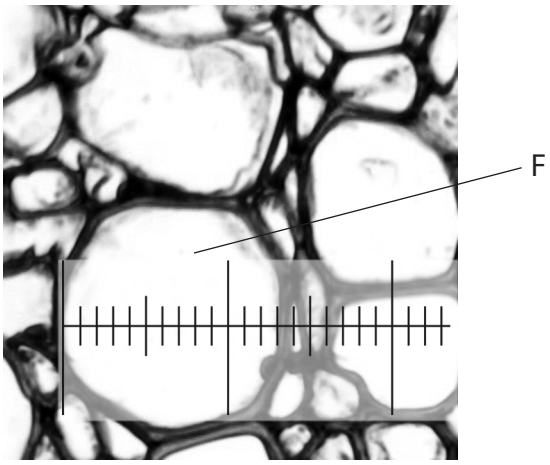
(iii) This photograph shows a high-power view of some of the cells in tissue C in the vascular bundle.

Each of the smallest units on the eyepiece graticule shown in the photograph is 3×10^{-6} m.



(Source: © DR KEITH WHEELER/SCIENCE PHOTO LIBRARY)

Assume that the cell labelled F in the photograph is circular.

Calculate the cross-sectional area of cell F.

(2)

Answer .....

(iv) A cell in tissue B of the vascular bundle has a cross-sectional area of 6.13×10^{-11} m^2.

Calculate how many times larger the cross-sectional area of cell F is than this cell in tissue B.

Give your answer to **three** significant figures.

(1)

Answer .....

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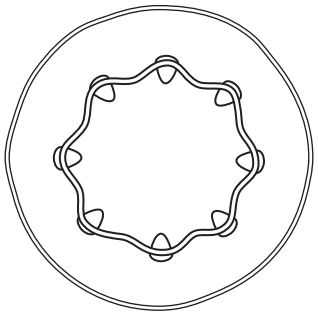
(v) In another part of the investigation, a plan of the tissues in the stem was drawn.



Describe how a thin section of a stem could be prepared and viewed using a light microscope, in order to draw this plan.

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(b) (i) The photograph shows an animal cell. This photograph was taken using an electron microscope.

(Source: © DR GOPAL MURTI/SCIENCE PHOTO LIBRARY)

Draw this cell as the student would see it under high power of a light microscope.

Label your diagram to show the nucleus, the nucleolus and the nuclear envelope.

(3)

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(ii) State **one** difference and **one** similarity between the nuclear envelope and the cell membrane.

(2)

Difference

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Similarity

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(Total for Question 1 = 16 marks)

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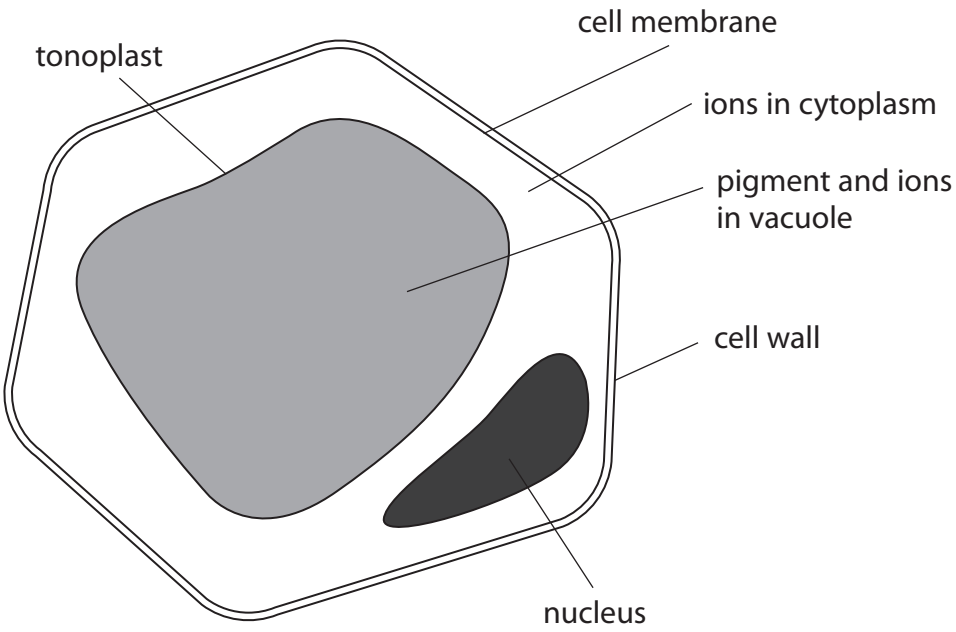
2 Plant cells have a cell membrane and a tonoplast.

The diagram shows these structures and the location of pigment and ions.



(a) Name **three** membrane-bound structures found in some plant cells that are not shown in the diagram.

(2)

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3 .....

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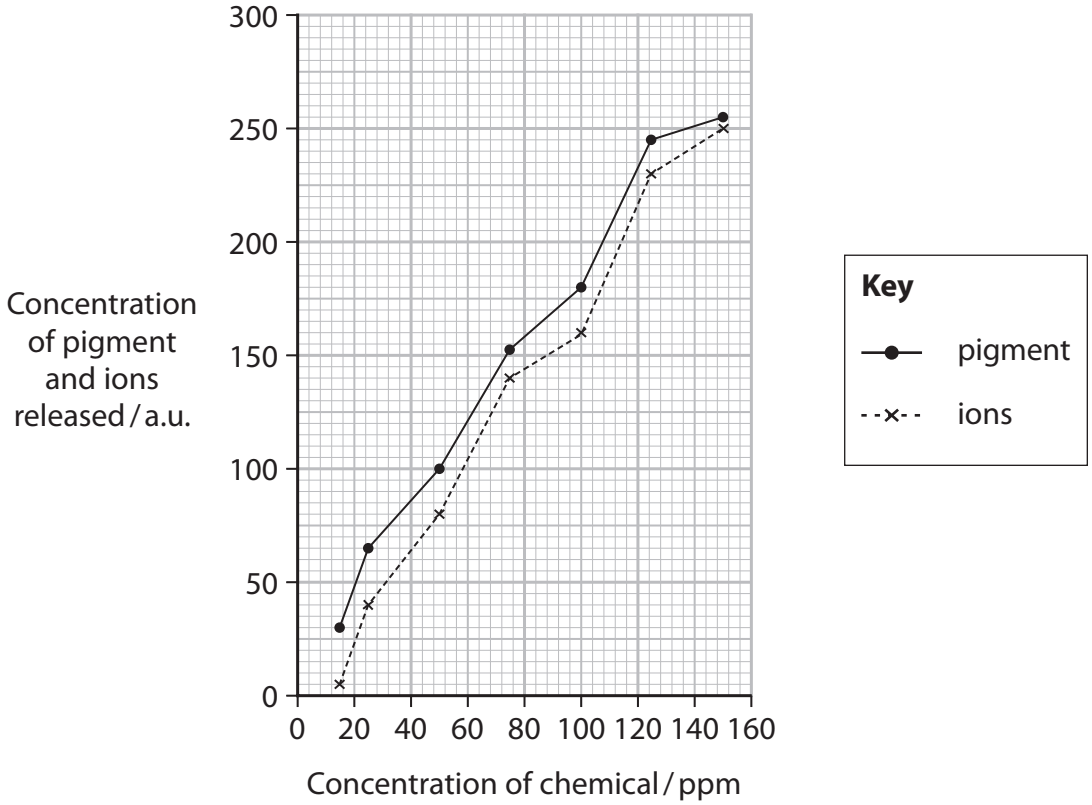
(b) A chemical has been shown to affect the permeability of both the tonoplast and the cell membrane.

In one investigation, the permeability of the tonoplast and the cell membrane was measured when the chemical was added to pieces of plant tissue. The concentration of the pigment and ions outside the tissue was used as a measure of the permeability.

The graph shows some data from this investigation.



(i) Draw a table to show the results for the concentration of ions outside the cells.

(3)

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(ii) Comment on the effect of increasing the concentration of the chemical on the permeability of the membranes to both the pigment and the ions.

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(iii) Devise a method that could be used to obtain the data for the pigment shown in the graph.

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(c) In another investigation, changes in permeability of the membranes were measured over time.

The table shows data for the first three hours.

Time after addition of chemical / hours	Permeability to ions / a.u.	Permeability to pigment / a.u.
0	0.01	0.00
1	0.02	0.00
2	0.03	0.00
3	0.05	0.03

Explain the effect of this chemical on the permeability of the membranes to ions and to pigment over time.

Use the information in the table and in the diagram of a plant cell.

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(Total for Question 2 = 17 marks)

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3 In an investigation, the water potential of a potato was compared with that of a yam.

(a) State what is meant by the term **water potential**.

(2)

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(b) In the investigation, six cylinders were cut from each of a single yam and a single potato.

In each case, one cylinder was placed in distilled water and the others were placed in solutions of different concentrations of sucrose (mol dm^{-3}). The mass of each cylinder was measured at the start and after one hour.

(i) Describe how the mass could be measured in a valid and accurate way.

(2)

Valid

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Accurate

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(ii) State the independent variable in this investigation.

(1)

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(iii) In this investigation, the tubes containing the cylinders and the solutions were kept at the same temperature.

Explain the effect on this investigation if the yam cylinders had been kept in solutions at 20°C and the potato cylinders in solutions at 25°C.

(3)

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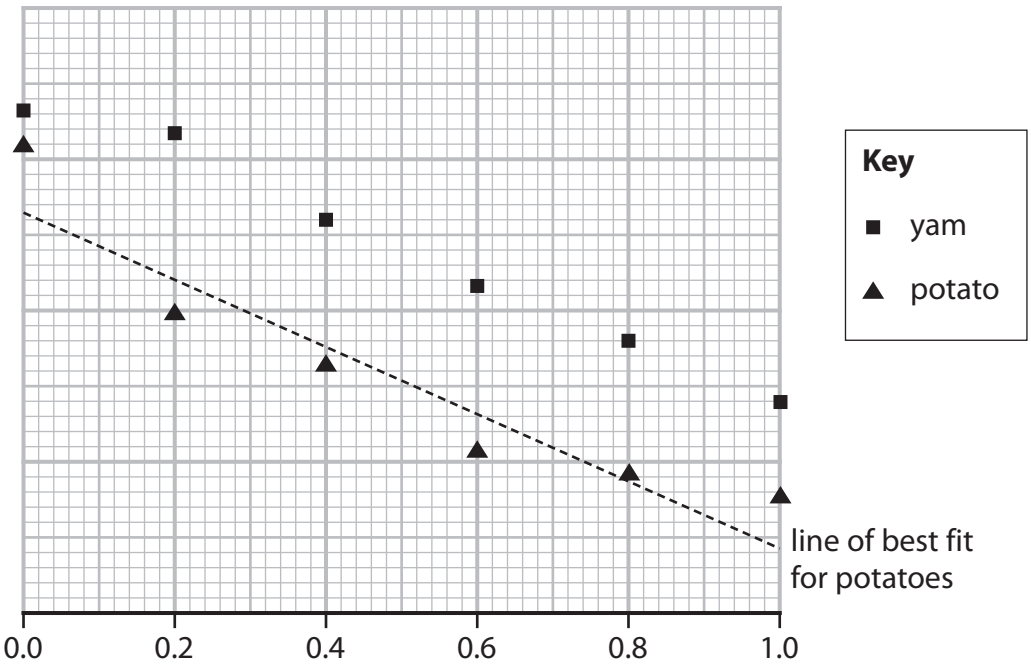
(c) The graph shows the results obtained in this investigation.



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(i) Complete the graph by adding a y-axis scale, y- and x-axes labels and a line of best fit for the yam.

The highest percentage change for the yam is 26% and the lowest percentage change for the yam is –12%.

(3)

(ii) The equation for a straight line is $y = mx + c$.

Calculate m for the line of best fit for the potato data and write down the equation for this line.

(3)

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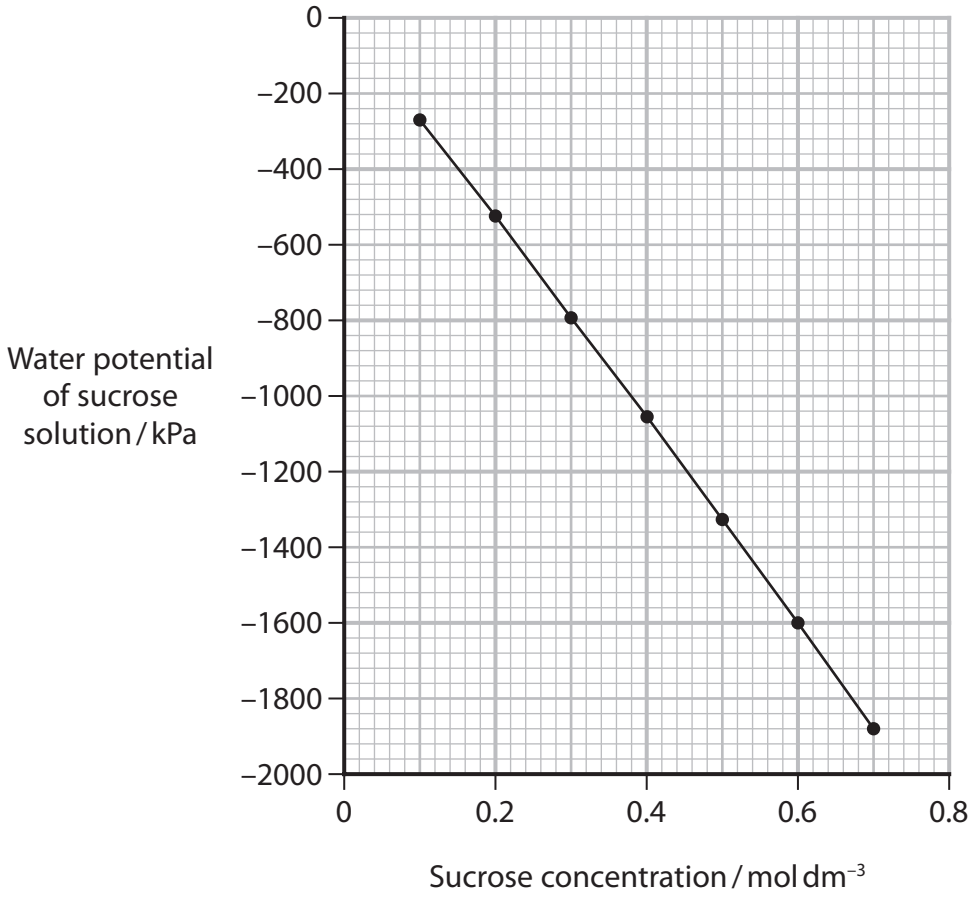
(iii) Different concentrations of sucrose solutions have different water potentials.

The graph shows the water potentials for sucrose solutions of different concentrations.

Determine the water potential for the potato cylinders.

Use your completed graph and this graph to determine the water potential.

(2)



Value read from completed graph .....

Water potential of the potato ..... kPa

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(iv) The water potential for the yam was –1890 kPa.

Suggest why there is a difference between the water potential of the yam and the water potential of the potato.

(1)

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(Total for Question 3 = 17 marks)

TOTAL FOR PAPER = 50 MARKS

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