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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Monday 4 May 2020

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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Answer ALL questions.

Write your answers in the spaces provided.

1 Pieces of plant tissue, placed in a solution of salt (sodium chloride) in water, may gain or lose mass or remain unchanged.

(a) Explain the changes that occur when the mass increases.

(3)

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(b) A student investigated the water potential of potato tissue by measuring the change in mass of pieces of potato in a range of concentrations of salt solutions.

The table shows the results of this investigation.

Concentration of salt solution / mol dm^{-3}	Mean percentage change in mass (%)
0.0	+17.0
0.2	+8.0
0.4	–6.0
0.6	–14.0
0.8	–20.5
1.0	–25.0

(i) Describe a method that could have been used to obtain these results.

(5)

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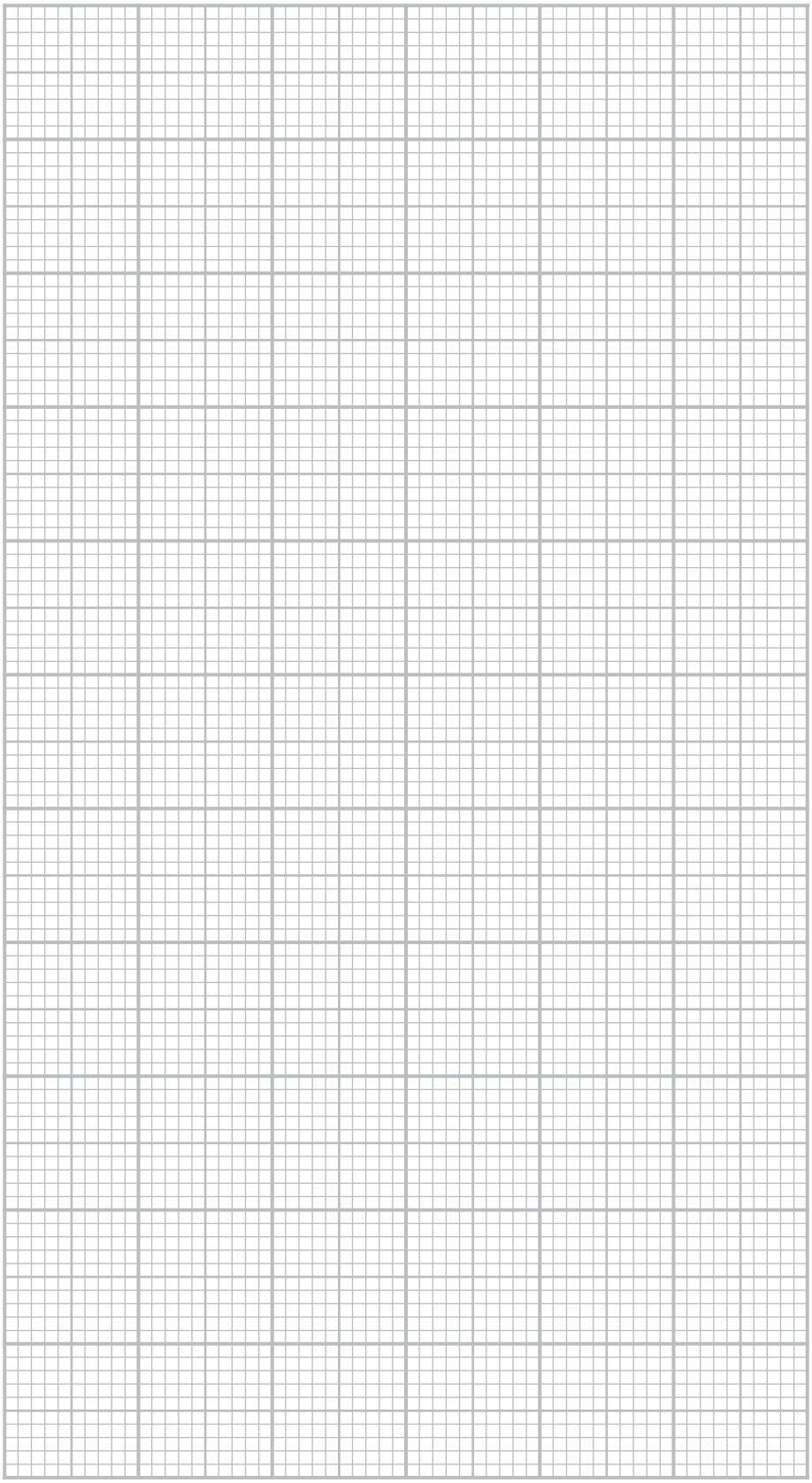
(ii) Plot a graph of these results and draw a straight line of best fit through the points.

(4)



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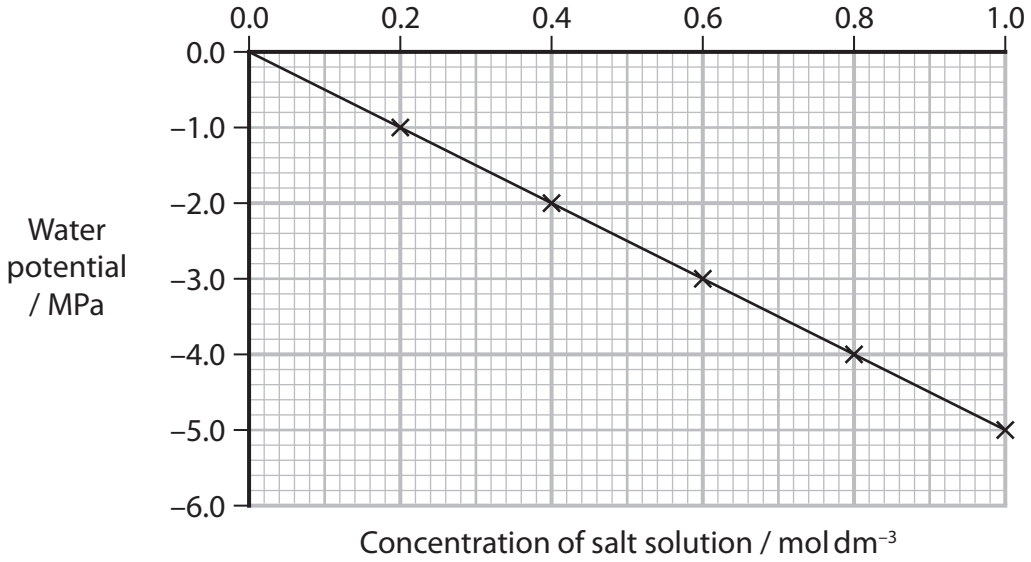
(iii) The graph shows the water potential of different concentrations of salt solution.



Determine the water potential of the potato tissue used in this investigation.

Indicate on each graph how you arrived at your answer.

(2)

Answer ..... MPa

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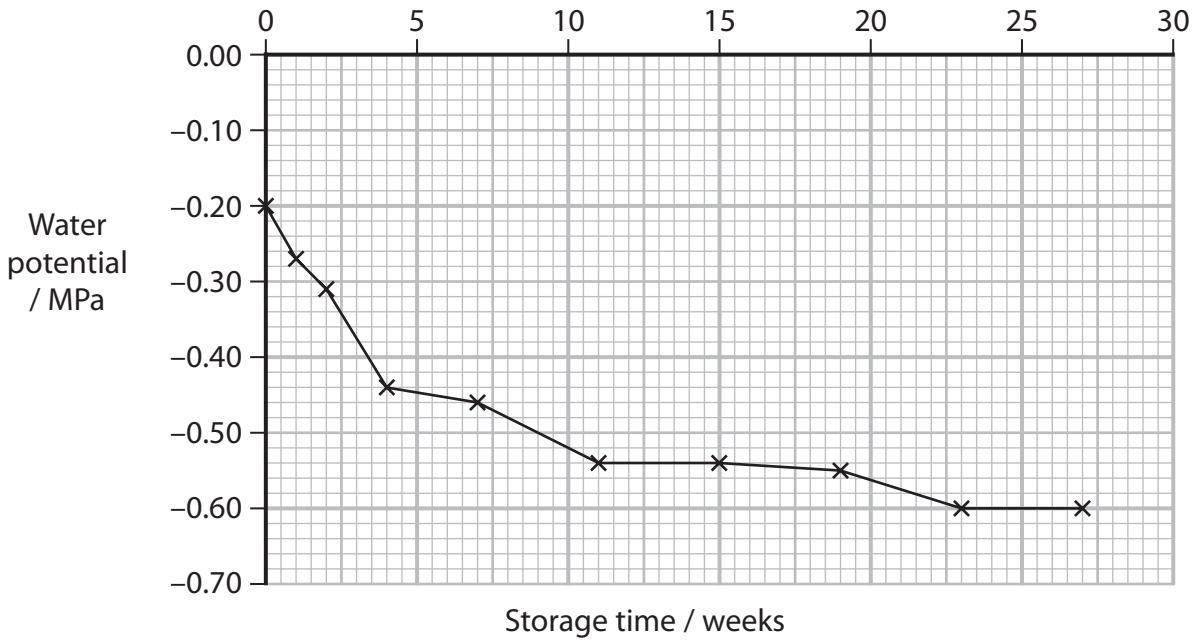
(c) A scientist investigated the effect of storage time on the water potential of potato tubers.

The results of this investigation are shown in the graph.



Explain these results.

(3)

(Total for Question 1 = 17 marks)

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2 The enzyme invertase breaks down sucrose into its two component monosaccharides.

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

(2)

(ii) The effect of pH on the initial rate of the reaction catalysed by invertase was investigated at 25 °C.

State the independent variable in this investigation.

(1)

(iii) Suggest why the temperature was kept at 25 °C.

(2)

(iv) Name **one** non-biological (abiotic) variable, other than temperature, that should be kept constant in this investigation.

(1)

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(v) Describe how you would keep the variable you have named in (a)(iv) at a constant value.

(2)

(vi) Explain why the initial rate of this reaction was determined.

(2)

(vii) Suggest how the initial rate of this reaction could be determined.

(3)

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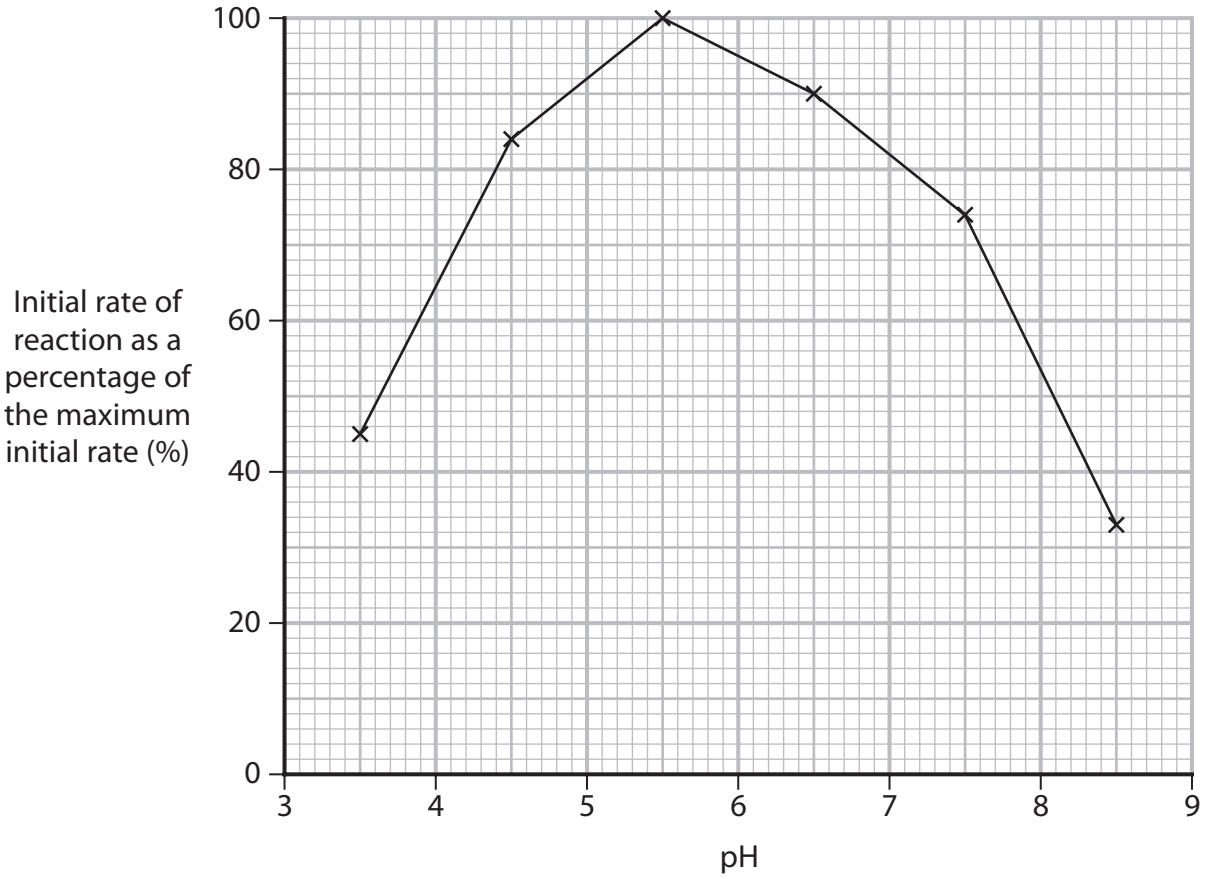
(b) The graph shows the results of this investigation.



(i) Draw a suitable table to show these results.

(3)

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(ii) Criticise the conclusion that 5.5 is the optimum pH for this enzyme.

(3)

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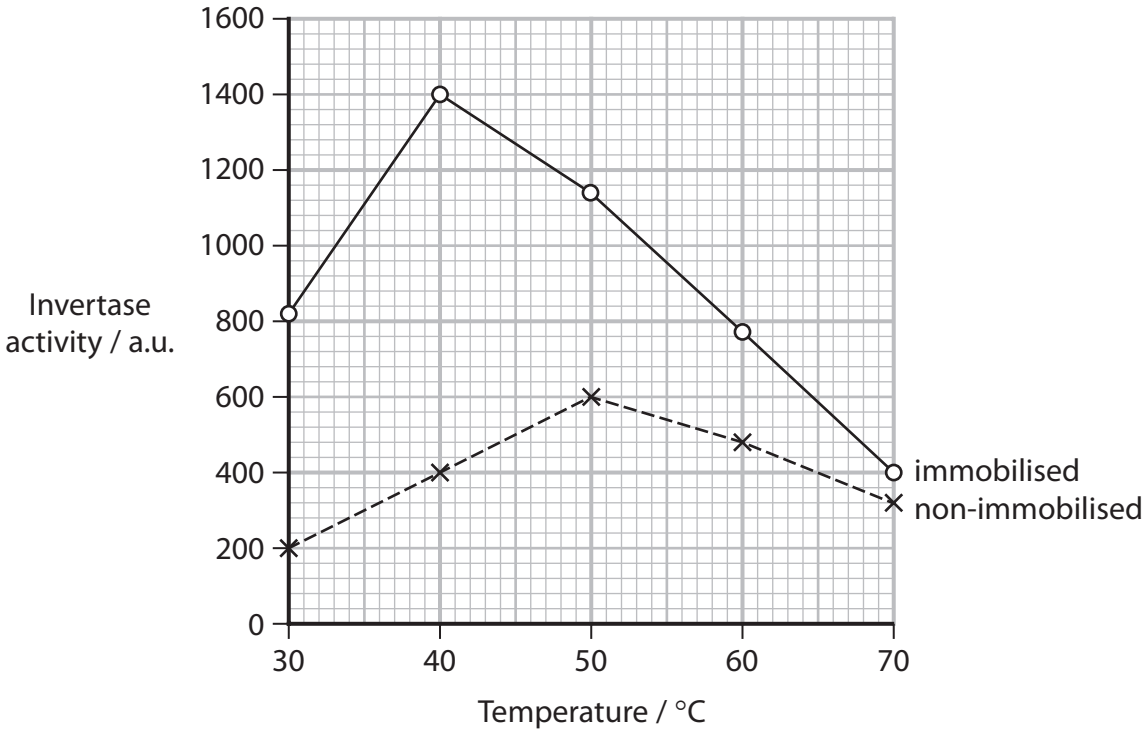
(c) Invertase is used in the food industry. Scientists wanted to increase the efficiency of the enzyme to save time and money.

One way is to immobilise the enzyme by binding it to a surface. This stops the enzyme molecules from moving.

The effect of temperature on immobilised invertase and non-immobilised invertase was investigated. The results are shown in the graph.



Compare and contrast the effect of temperature on these two forms of invertase.

(3)

(Total for Question 2 = 22 marks)

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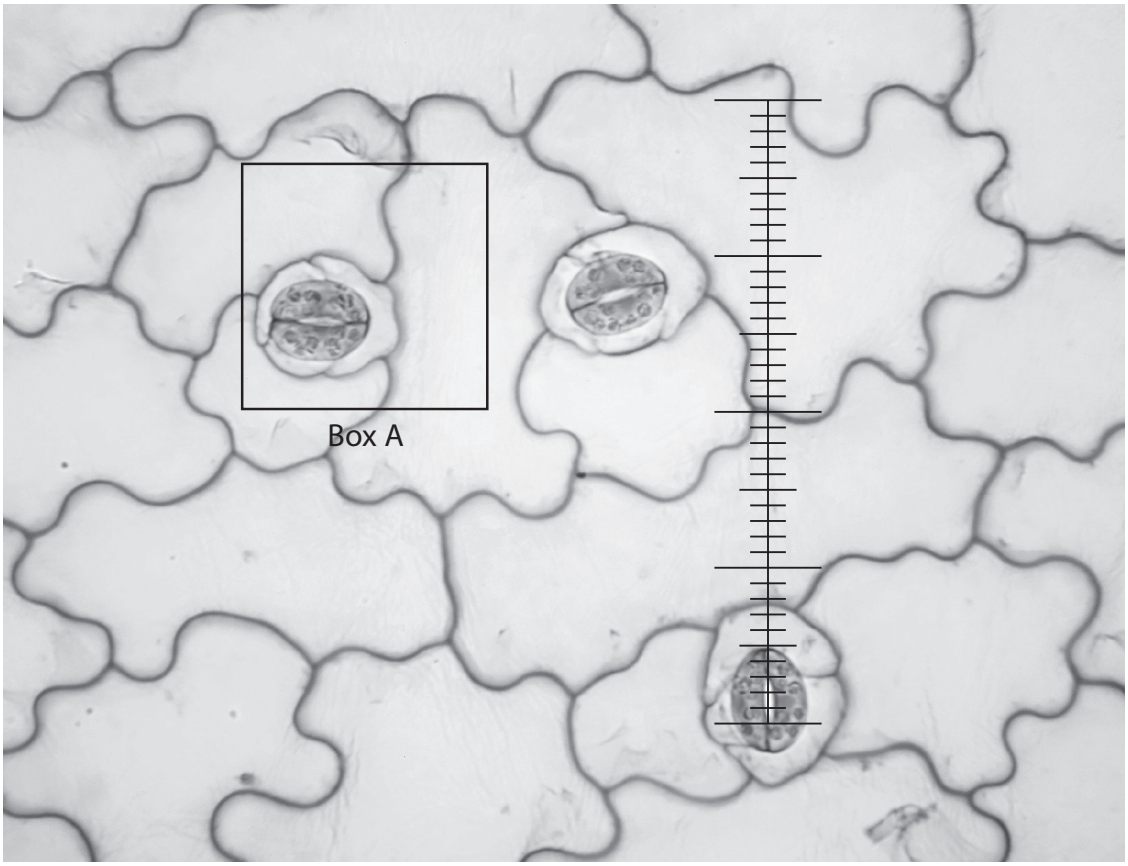
3 This photograph, taken through a light microscope, shows three of the stomata on the underside of a leaf.



(Source: John Adds)

(a) (i) Draw the cells within Box A on the photograph.

(3)

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(ii) An eyepiece graticule is shown over one of the pores.

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

Calculate the length of this pore in micrometres (μm).

(2)

Answer ..... μm

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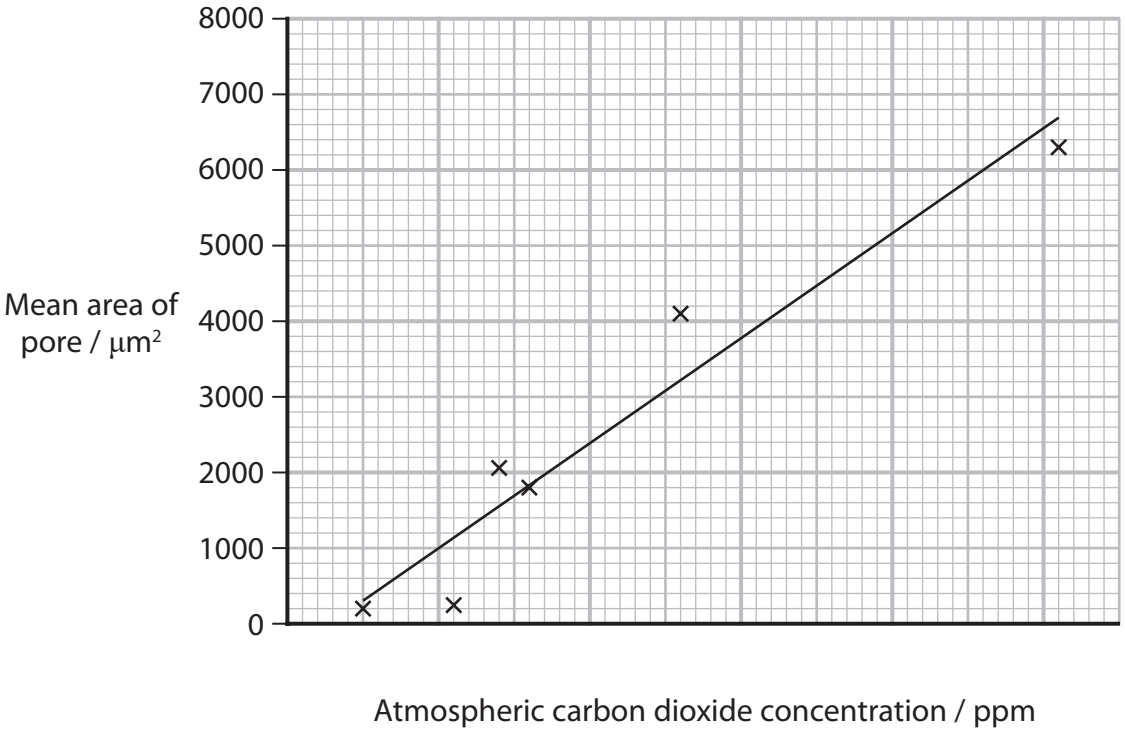
(b) The area of a sample of pores in fossil leaves was investigated and the means calculated.

These means were correlated with estimates of atmospheric carbon dioxide concentration at the time the fossil was formed.

The results are shown in the table.

Atmospheric carbon dioxide concentration / ppm	Mean area of pore / μm^2	Standard deviation
250	200	1
550	240	2
700	2050	150
800	1800	70
1300	4100	160
2550	6300	1600

The data in the table were plotted on a graph.



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(i) Add the scale for carbon dioxide concentration to the graph.

(1)

(ii) Draw the standard deviation for the mean area of the pores 4100 μm^2 and 6300 μm^2 on the graph.

(1)

(iii) It was concluded that the mean areas of these pores were significantly different.

Justify this conclusion.

(2)

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.....

(iv) Predict the mean area of pores at a time in the Earth's history when the carbon dioxide concentration was 6500 ppm.

Use the equation $y = mx + c$, where $m = 2.8$ and $c = -397.5$

(2)

Answer ..... μm^2

(Total for Question 3 = 11 marks)

TOTAL FOR PAPER = 50 MARKS

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