Write your name here

Surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Biology

International Advanced Subsidiary/Advanced Level
Unit 3: Practical Skills in Biology I

Sample Assessment Materials for first teaching September 2018

Time: 1 hour 20 minutes

Paper Reference **WBI13/01**

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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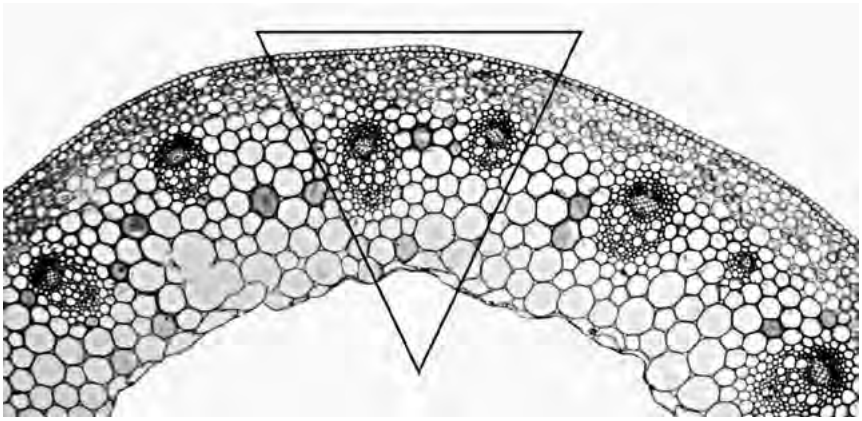
Pearson

Answer ALL questions.

Write your answers in the spaces provided.

1 A student made observations of plant cells and tissues through a microscope.

(a) (i) Photograph A shows part of a transverse section of a stem at a magnification of ×40.



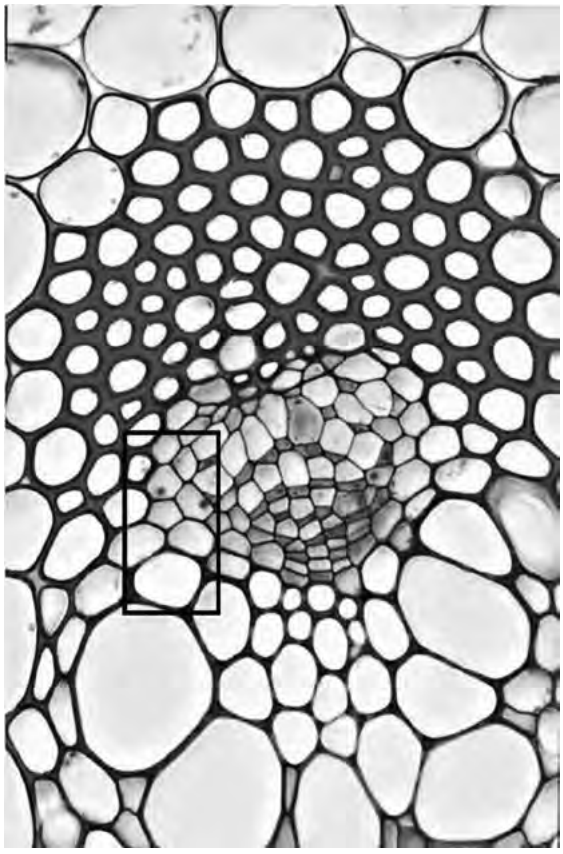
Source: John Adds

Photograph A

Draw a low-power plan of the area within the triangle shown on Photograph A **and** label two tissues on your drawing.

(3)

(ii) Photograph B shows part of a transverse section of the same stem at a magnification of ×400.



Source: John Adds

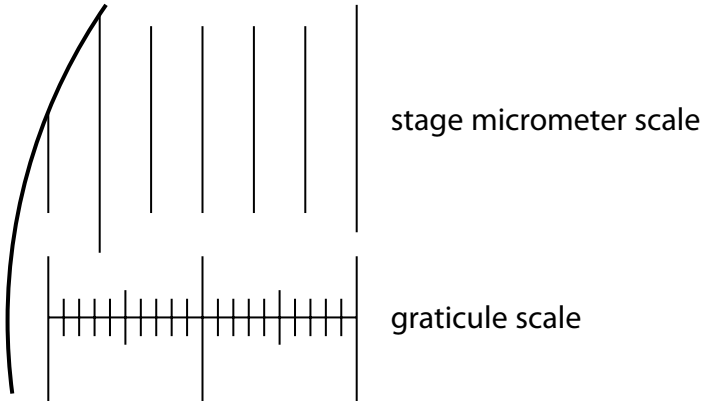
Photograph B

Draw the cells within the box shown on Photograph B.

(3)

(b) The diagram shows part of a stage micrometer scale and part of a graticule scale.

The smallest stage micrometer division is 10 μm.



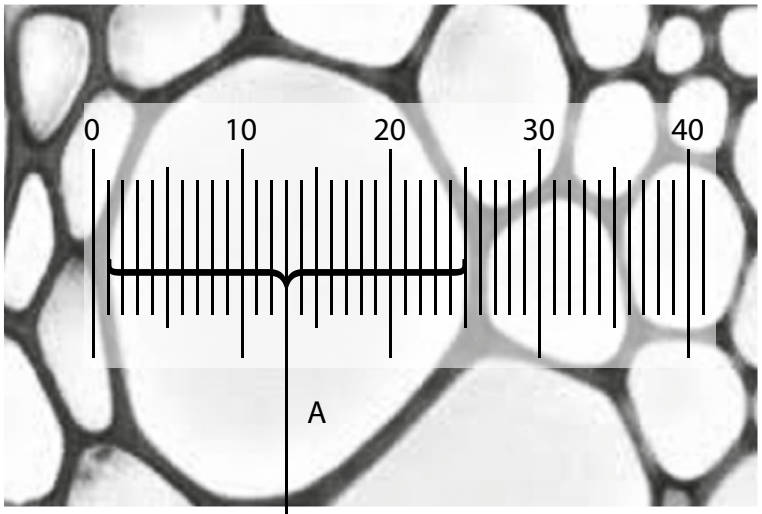
(i) Calculate the size of one small division of the graticule scale.

(2)

Answer..... μm

(ii) Using your answer to (b)(i), determine the internal diameter of the part labelled 'A'.

(2)



graticule scale

Source: John Adds

internal diameter of part A

Answer..... μm

(Total for Question 1 = 10 marks)

2 Mercerisation is a treatment used to increase the tensile strength of natural plant fibres. In this process, fibres are treated with sodium hydroxide solution.

A study was carried out to determine the concentration of sodium hydroxide solution to produce the strongest fibres.

Samples of fibres were obtained from four Nigerian plants: baobab, roselle, okra and kenaf.

All of these fibres were then mercerised by placing them in four different concentrations of sodium hydroxide solution.

The tensile strength of these fibres was then measured.

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

(1)

.....

(ii) State how one named variable could be controlled when mercerising the fibres.

(2)

Variable .....

How the variable could be controlled .....

.....

.....

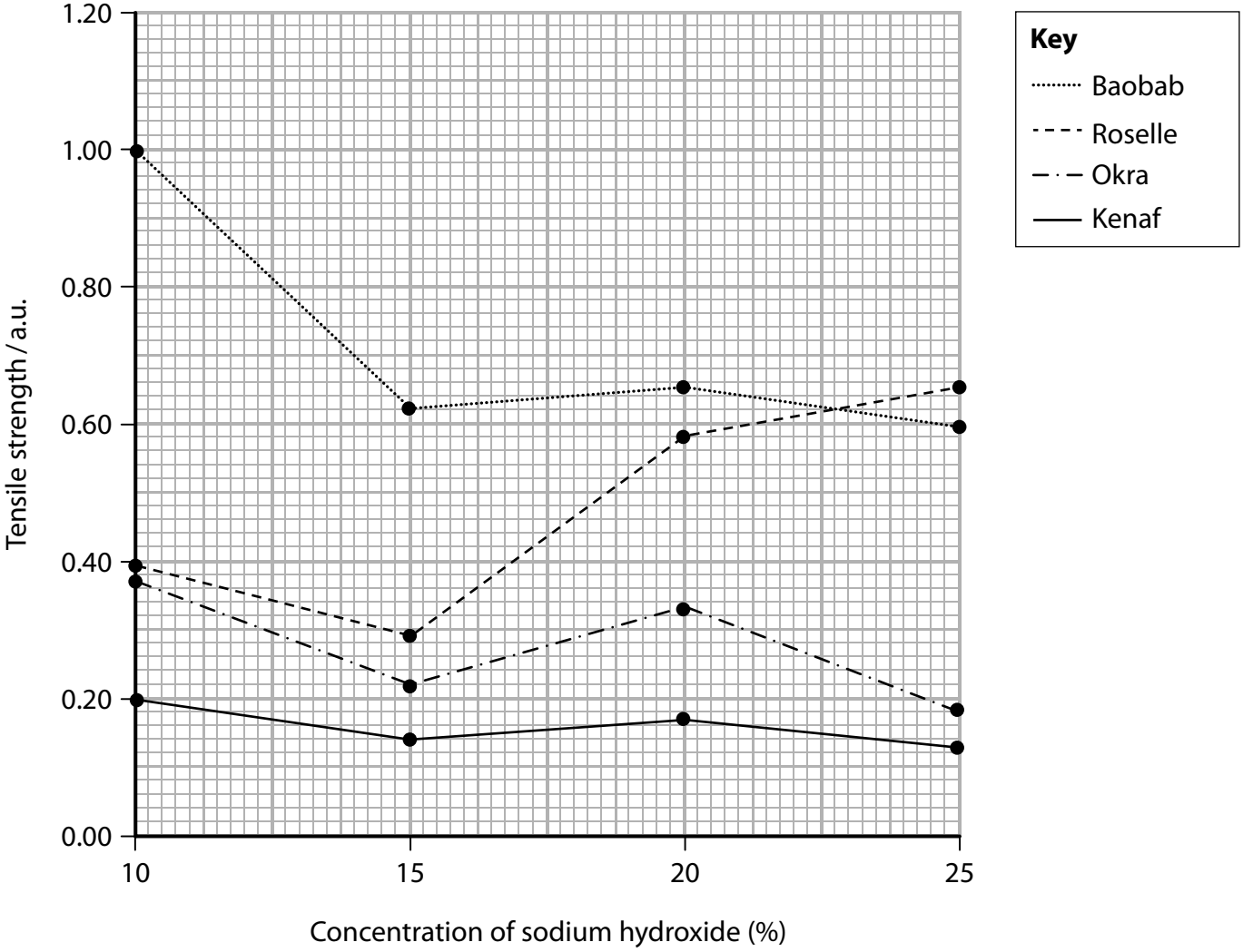
.....

.....

(iii) Devise a method that can be used to make a valid comparison of the tensile strength of fibres from the same plant, treated with different concentrations of sodium hydroxide solution.

(5)

(b) The graph shows the tensile strength of fibres from these four plants, treated with sodium hydroxide solutions.



(i) Using the graph, determine the concentration of sodium hydroxide solution that should be used for mercerisation of fibres from each of these four plants.

(2)

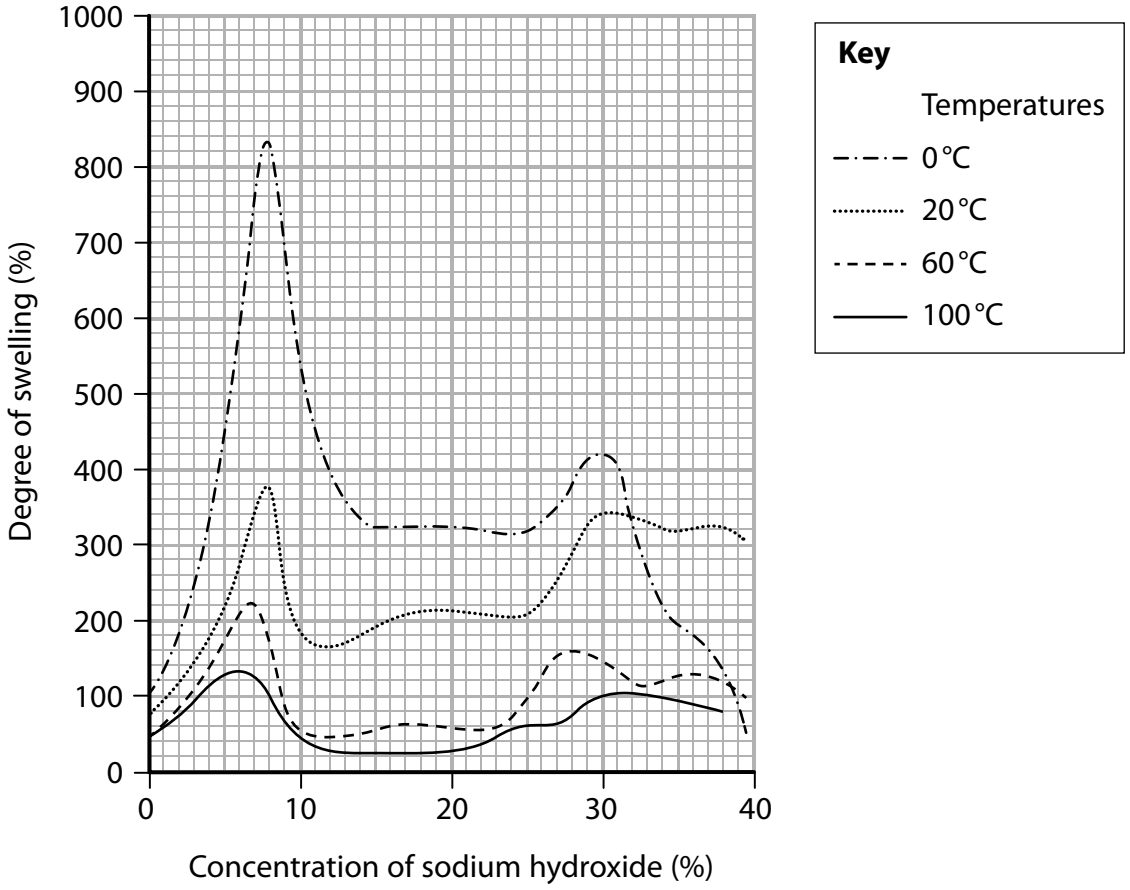
(ii) Draw a suitable table to include the results for roselle and baobab only.

(3)

(c) Mercerisation causes plant fibres to swell.

A study was carried out on the effect of temperature and the concentration of sodium hydroxide on the degree of swelling of cotton fibres.

The graph shows the results of this study.



(i) Compare and contrast the trends shown by the results at 20 °C with those at 0 °C.

(2)

(ii) Describe the effect of temperature on the degree of swelling of cotton fibres at a sodium hydroxide concentration of 5%.

(2)

.....

.....

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.....

.....

(Total for Question 2 = 17 marks)

3 A student studied the water potential of carrot tissue.

Pieces of weighed carrot tissue were placed in a range of sucrose solutions.

After two hours, the tissue was blotted and weighed again. The results are shown in the table.

Concentration of sucrose solution /mol dm^{-3}	Original mass of carrot tissue /g	Final mass of carrot tissue /g	Percentage change in mass of carrot tissue (%)
0.0	2.40	3.10	29.17
0.2	2.48	2.68	8.06
0.4	2.48	2.42	–2.42
0.6	2.31	1.96	–15.15
0.8	2.41	1.78	–26.14
1.0	2.75	1.92	

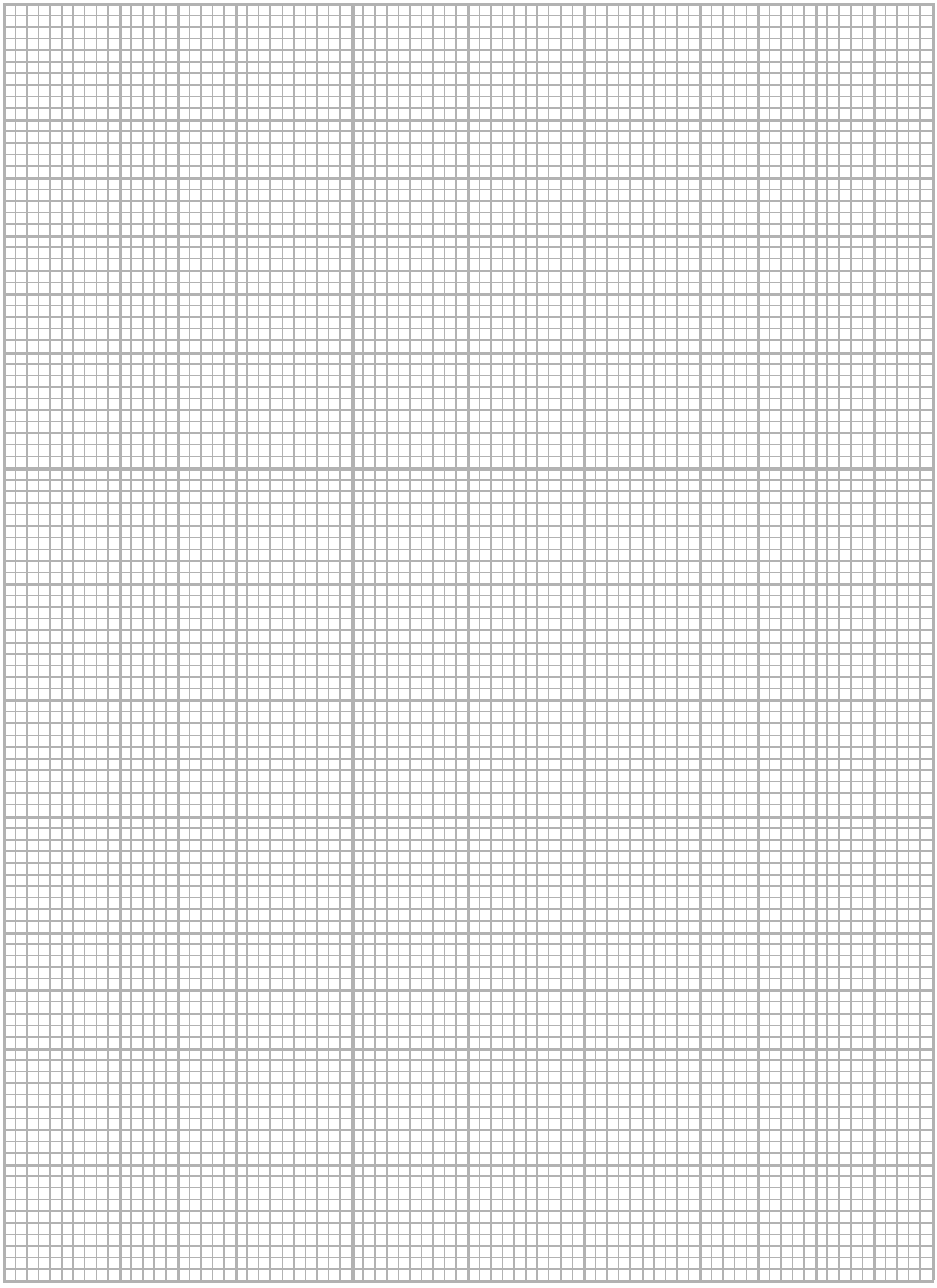
(a) (i) Calculate the percentage change in mass when the carrot tissue was in a sucrose solution of 1.0 mol dm^{-3}.

(2)

Answer..... %

(ii) Plot a suitable graph to show the relationship between sucrose concentration and percentage change in mass. Join the points with straight lines.

(4)



(iii) Using your graph, determine the concentration of sucrose solution which caused no change in mass of the carrot tissue.

(2)

(iv) Explain why there is no change in mass of the carrot at this concentration.

(2)

(b) Five students investigated the effect of temperature on the movement of materials through the membranes of cells in a plant tissue. Beetroot was chosen for this investigation because the cells contain a red pigment called betalain.

One piece of beetroot was placed into a tube containing 15 cm^3 of water at 0 °C and left for 15 minutes. The procedure was repeated for seven further temperatures between 10 °C and 70 °C.

Each piece of beetroot was removed and a sample of the fluid was placed in a colorimeter. The colorimeter was used to determine the intensity of the red colour of the fluid.

(i) Name **two** variables, other than those mentioned above, which should be kept constant during this experiment.

(2)

(ii) State the dependent variable in this investigation.

(1)

.....

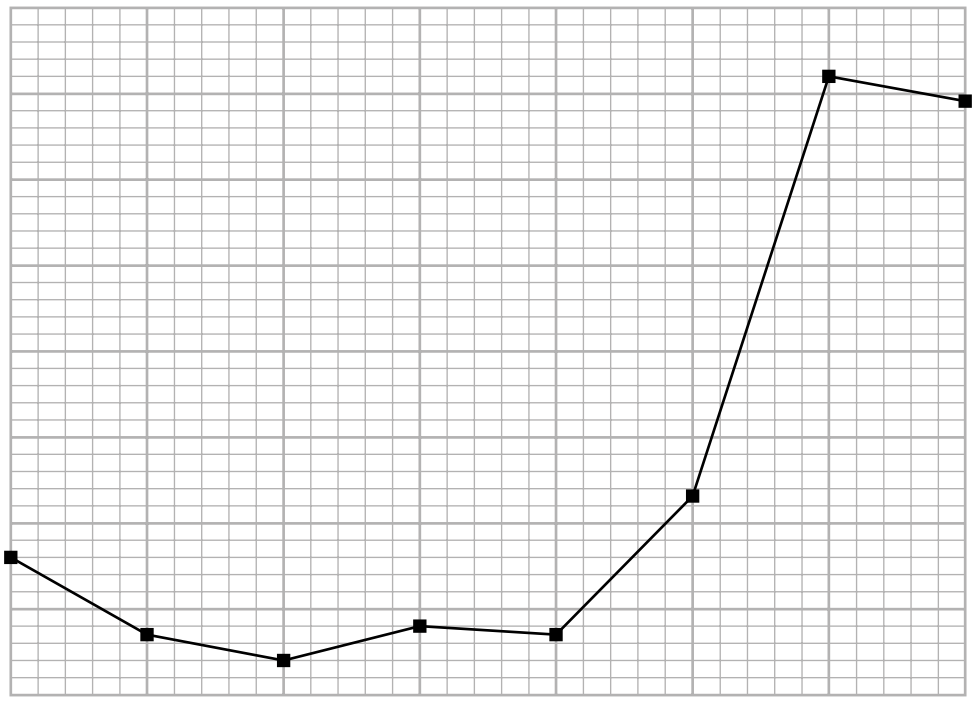
(iii) The table shows the results of this investigation.

Temperature /°C	Intensity of the red colour / a.u.						
	Student 1	Student 2	Student 3	Student 4	Student 5	Mean	Standard deviation
0	0.20	0.15	0.30	0.00	0.13	0.16	0.11
10	0.00	0.14	0.06	0.03	0.12	0.07	0.06
20	0.03	0.08	0.04	0.04	0.02	0.04	0.02
30	0.20	0.04	0.04	0.04	0.06	0.08	0.07
40	0.18	0.04	0.04	0.04	0.07	0.07	0.06
50	0.10	0.26	0.00	0.60	0.18	0.23	0.23
60	0.60	0.89	0.80	0.80	0.55	0.72	0.15
70	0.75	0.50	0.75	0.75	0.70	0.69	0.11

The graph showing the relationship between temperature and the mean intensity of red colour is incomplete.

Complete the graph.

(3)



(iv) Suggest why four of the readings were above zero a.u. at 0 °C.

(2)

(v) The students concluded that as temperature increases, membrane permeability increases.

Using the information in the table and graph, criticise this conclusion.

(5)

(Total for Question 3 = 23 marks)

TOTAL FOR PAPER = 50 MARKS