Please check the examination details below before entering your candidate information

Candidate surname   Other names

Centre Number   Candidate Number

Pearson Edexcel International Advanced Level

Friday 19 January 2024

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 ▶

Answer ALL questions.

Write your answers in the spaces provided.

1 Vitamin C is a dietary antioxidant.

Spinach is a plant that produces edible leaves with a high vitamin C content.

(a) Explain the link between dietary antioxidants and the risk of cardiovascular disease (CVD).

(3)

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P 7 5 5 9 1 A 0 2 1 6

(b) The vitamin C content of the leaves from spinach plants was investigated.

Describe how comparative measurements of the vitamin C content of the leaves from two spinach plants could be made.

(5)

(c) The effect of soil type and season on the vitamin C content of spinach plants was investigated.

The table shows some data from spinach grown in the two soil types, in spring and autumn.

	Vitamin C content of leaves / mg g^{-1}			
	Spring		Autumn	
	Soil type 1	Soil type 2	Soil type 1	Soil type 2
Mean	0.49	0.73	0.59	0.95
Standard deviation	± 0.07	± 0.09	± 0.06	

(i) The table shows the data required to calculate the missing standard deviation for the spinach grown in soil type 2 in the autumn.

$(x - \bar{x})^2$
0.031
0.009
0.031
0.004
0.013
0.006
0.001
0.024
0.000
0.024
0.055
0.002

Calculate the standard deviation (s) using this data and the formula:

$$s = \sqrt{\frac{\sum(x - \overline{x})^2}{n - 1}}$$

Give your answer to an appropriate number of decimal places.

(3)

Answer ....

(ii) The graph shows the means from this investigation.

Complete this graph by adding the axes, values and labels, together with the standard deviations.

(3)
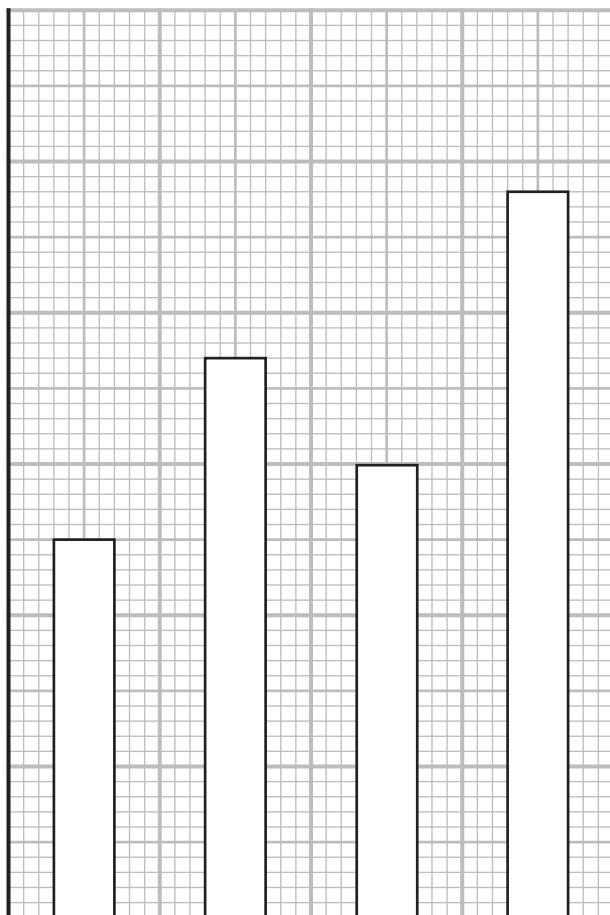
(iii) It was concluded that the vitamin C content of the leaves is affected by the soil type and season in which the plants are grown.

Comment on this conclusion.

(3)

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(Total for Question 1 = 17 marks)

P 7 5 5 9 1 A 0 7 1 6

2 All cells are surrounded by a membrane.

The photograph shows two animal cells where their membranes meet.
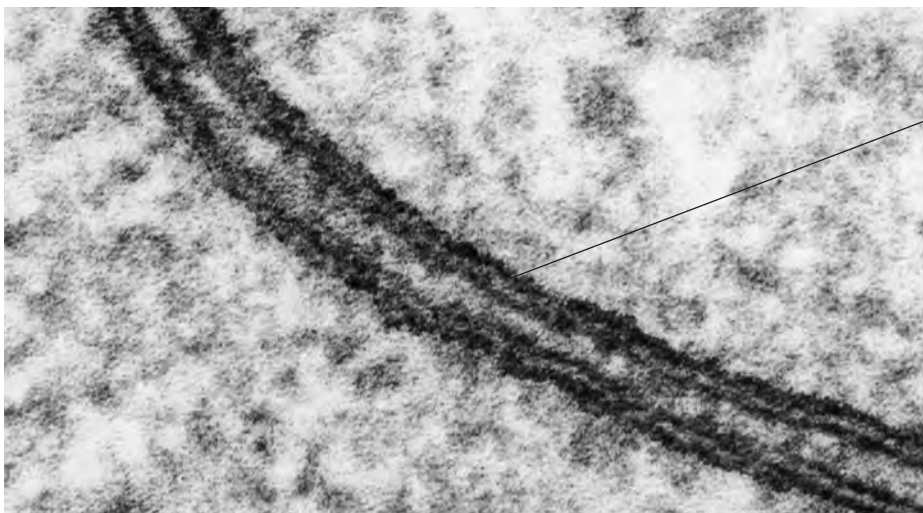
(Source: © Don W. Fawcett / Science Photo Library)

(a) Name **three** types of molecule present in structure **A**.

(2)

1 ....

2 ....

3 ....

(b) Some of the evidence for the structure of cell membranes comes from studies of permeability.

The solubility of substances A to E in olive oil was determined.

The permeability of a cell membrane to these five substances was also measured.

The graph shows the results.
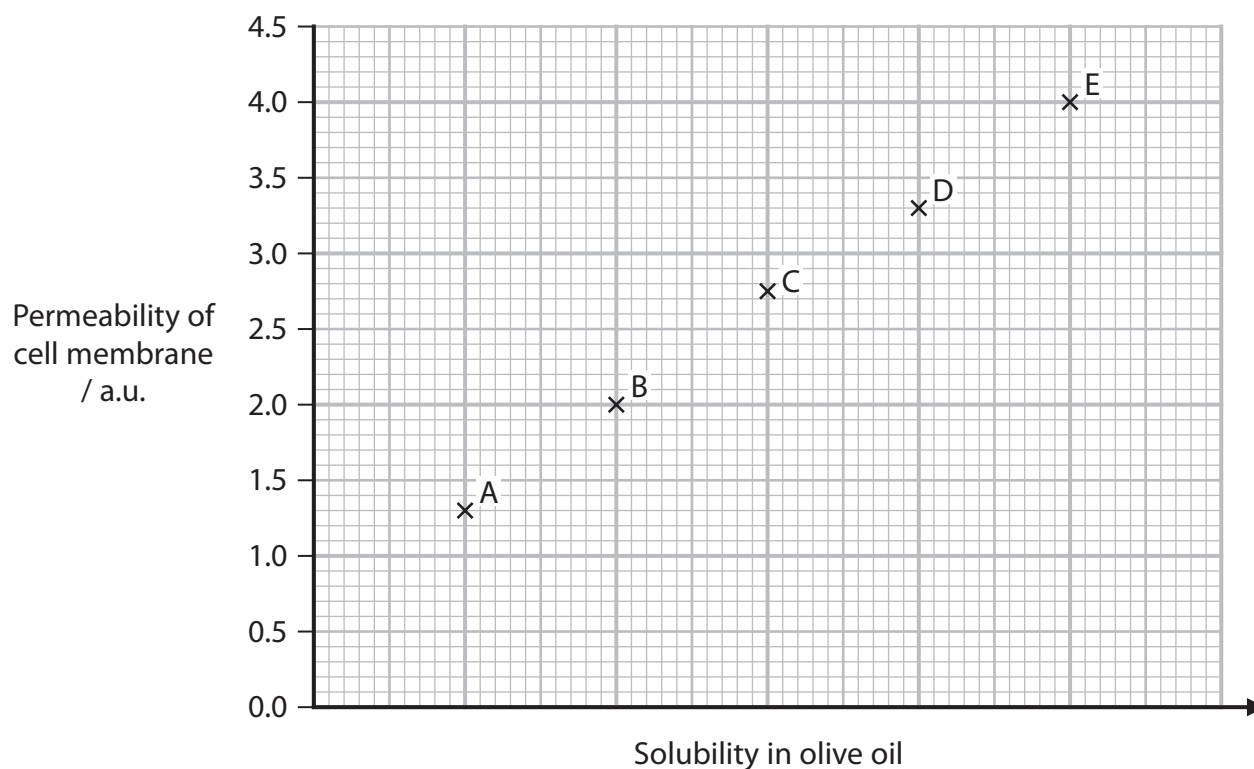
Explain the results shown in this graph.

(3)

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(c) Beetroot cells contain a water-soluble pigment. The effect of increasing temperature on the release of this pigment was investigated.

The quantity of pigment released was measured using a colorimeter, an instrument that can measure the transmission of light through a coloured solution.

The transmission of light through the solution decreases as the intensity of the colour increases.

The results are shown in the graph.
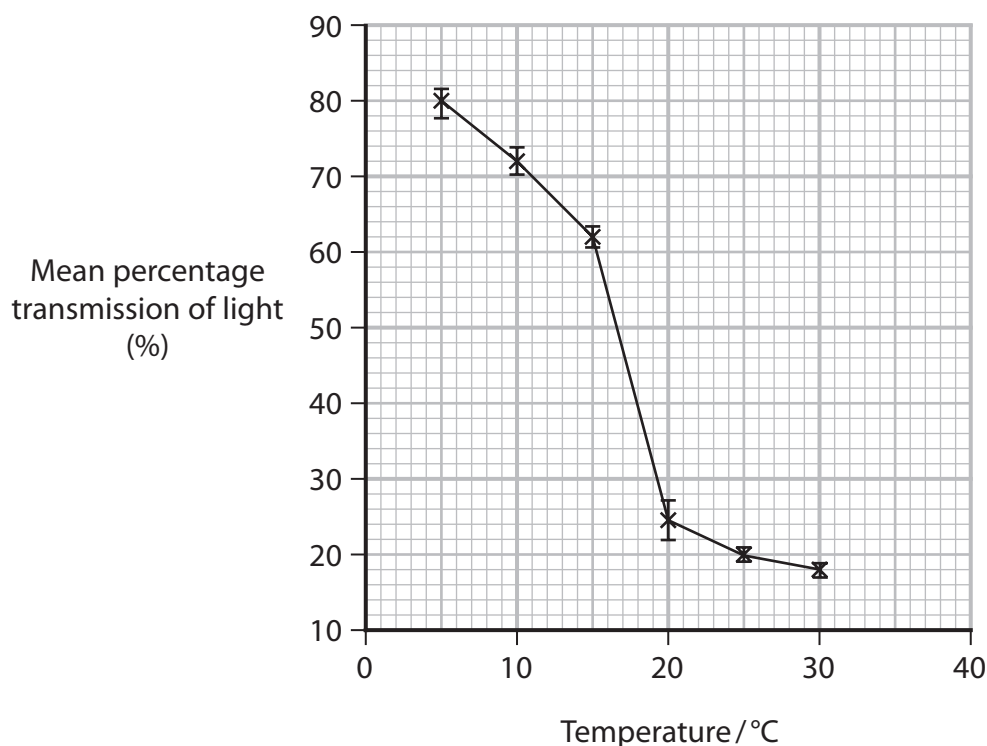
(i) Explain the results of this investigation.

(3)

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(ii) Describe a procedure that could have been used to obtain the results shown in this graph.

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(Total for Question 2 = 13 marks)

P 7 5 5 9 1 A 0 1 1 1 6

3 The protein content of food can be estimated using a semi-quantitative test.

(a) (i) Name a reagent that can produce a semi-quantitative test for protein.

(1)

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(ii) State the colour change that occurs when this reagent is added to a protein solution.

(1)

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(iii) A semi-quantitative test was used to estimate the protein concentration in a solution.

A set of standards was produced using dilutions of egg white containing protein of known concentrations.

The test was carried out on each standard and on the sample with an unknown protein concentration (test tube 6).

The photograph shows the results.

Test tube	1	2	3	4	5	6
Egg white protein concentration / mg dm^{-3}	0	0.1	0.4	2.0	10.0	unknown

(Source: © Martyn F. Chillmaid / Science Photo Library)

Estimate the protein concentration in the solution in test tube 6.

Express your answer as a range.

(1)

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(iv) Suggest how this investigation could be adapted to increase the accuracy of the estimate.

(2)

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P7 5 5 9 1 A 0 1 3 1 6

(b) Some herring are processed to make animal feed.
The photograph shows a catch of herring.

(Source: © John Greim / Science Photo Library)

This process adds acid to the fish followed by heating them for a period of time.
The effect of temperature and heating time on the protein content of the animal
feed was investigated.

The graph shows the protein content after heating for 5 or 7 days at
each temperature.
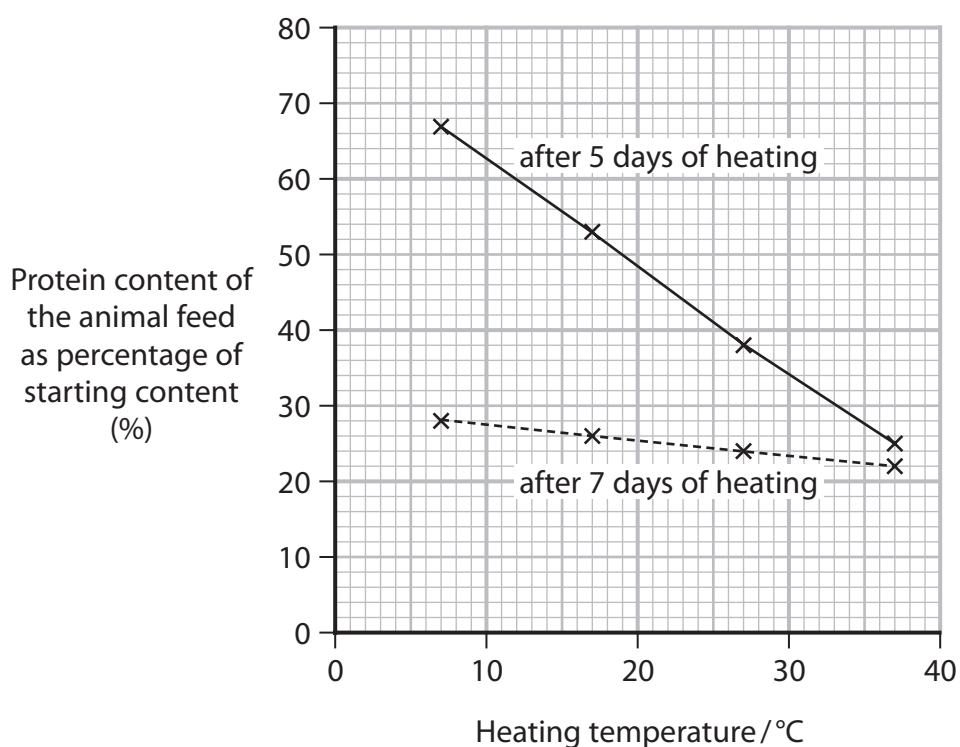
(i) Draw a table to display all the results shown in this graph.

(3)

(ii) Calculate the gradient of the line at 7 days.

Include units in your answer.

(3)

Answer ....

(iii) Comment on the effects of both heating temperature and the length of time heated on the protein content of the animal feed.

Use the graph and your calculation in (b)(ii) to support your answer.

(3)

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P 7 5 5 9 1 A 0 1 5 1 6

(iv) This process preserves the animal feed because it kills bacteria.
The process involves heating for a period of time, the heating temperature and the addition of acid.

Devise a procedure to safely compare the effect of acid on bacteria.

(6)

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(Total for Question 3 = 20 marks)

TOTAL FOR PAPER = 50 MARKS