Plant Cells

Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	Edexcel
Topic	Plant structure and function, Biodiversity and Conservation
Sub-Topic	Plant cells
Booklet	Question paper 2

Time Allowed: **52 minutes**

Score: **/43**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 Almond trees can be grown from shoot tips using a tissue culture technique.

This involves removing explants (small pieces of plant tissue) from the shoot tips of adult plants. The explants are placed on a growth medium, such as agar.
The explants develop roots and shoots as they grow into new plants.

Tissue culture techniques have to be carried out under conditions that prevent contamination of the explants.

(a) (i) Describe how contamination of a tissue culture is avoided.

(2)

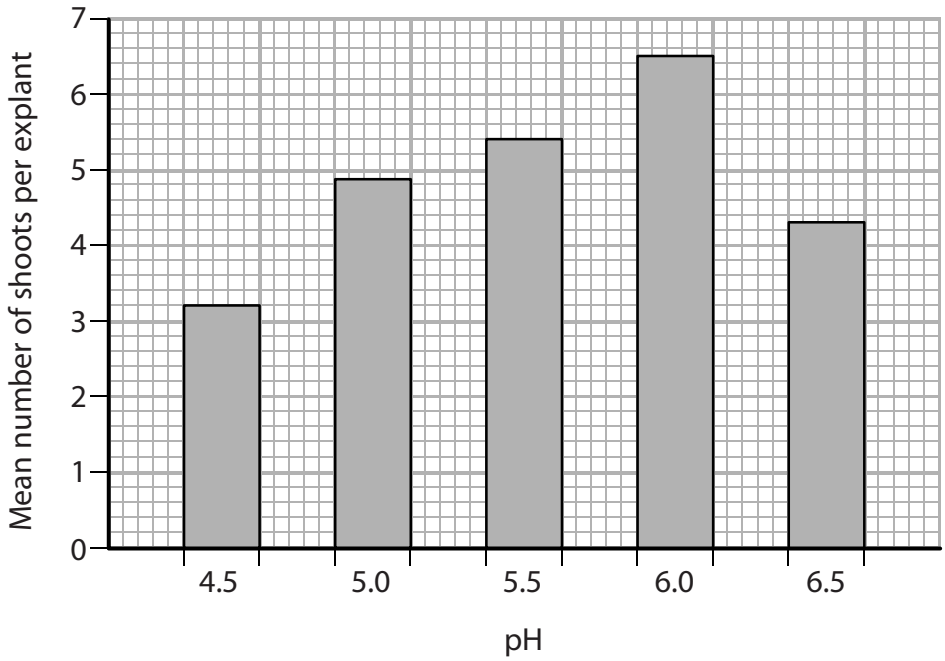
(ii) Explain why contamination of tissue cultures has to be avoided.

(2)

(b) Explants of almond plant shoot tips were grown using tissue culture techniques.

The effect of pH on the development of shoots from the explants was investigated.

The graph below shows the effects of pH on the number of shoots that developed from each explant.



(i) Give **two** environmental factors that would have to be controlled when investigating the effect of pH on the development of shoots from the explants.

(2)

1 .....

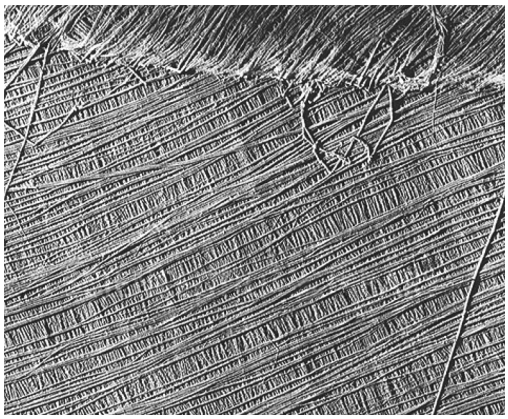
2 .....

(ii) Using the information in the graph, explain the effect of pH on the development of shoots from explants of almond trees.

(3)

(Total for Question 1 = 9 marks)

2 The photograph below shows part of a cellulose cell wall, as seen using an electron microscope.



Magnification ×70 000

(a) Using the information in the photograph and your own knowledge, describe the structure of a cellulose cell wall.

(3)

(b) Cellulose can be used to produce biofuel. The xylem tissue in wood is a good source of cellulose. The cell walls of this tissue are heavily lignified.

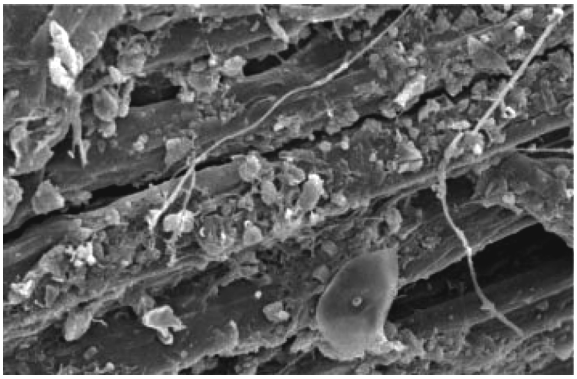
(i) Explain what is meant by the term **tissue**.

(2)

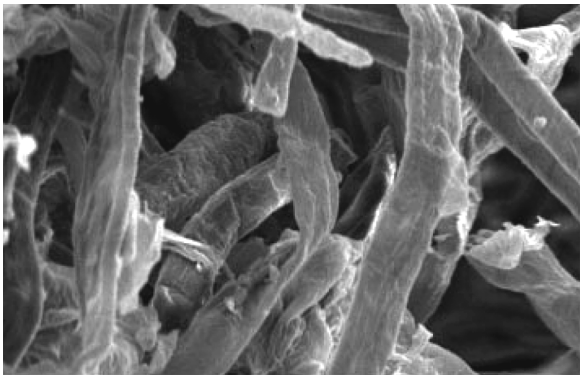
(ii) The cellulose in the xylem tissue of wood has to be broken down by enzymes before it can be used to produce biofuels.

The lignin has to be removed before the enzymes can be used to break down the cellulose.

The photographs below show fibres containing cellulose before and after the removal of lignin.



Before removal of lignin



After removal of lignin

Source: SciELO

Magnification ×500

Using the information from the photographs, suggest how lignin adds strength to xylem tissue.

(2)

(c) Mineral ions such as calcium, nitrate and magnesium are transported in the xylem vessels. These mineral ions are dissolved in water.

(i) Describe how the structure of xylem vessels allows them to transport water.

(2)

(ii) Explain how calcium, nitrate and magnesium ions are used by plants.

(3)

(Total for Question 2 = 12 marks)

3 Lake Vesijärvi in Finland became polluted a few years ago. This resulted in the lake becoming overpopulated with cyanobacteria.

Large numbers of cyanobacteria make the water very green and cloudy.

(a) Cyanobacteria are photosynthetic, prokaryotic organisms. Cyanobacteria are classified in the domain Bacteria.

(i) Name **one** other domain.

(1)

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(ii) Put a cross ☒ in the box next to the term that completes the following statement.

Organisms can be classified as belonging to these domains using

(1)

☒ **A** dendrochronology

☒ **B** forensic entomology

☒ **C** molecular phylogeny

☒ **D** topography

(iii) Place a cross ☒ in the box next to the structures found in cyanobacteria.

(1)

☒ **A** chloroplasts, large (80S) ribosomes, nucleus

☒ **B** chloroplasts, small (70S) ribosomes, loop of DNA

☒ **C** large (80S) ribosomes, loop of DNA

☒ **D** small (70S) ribosomes, loop of DNA

(iv) Suggest why very green, cloudy water could be a problem for the organisms in Lake Vesijärvi.

(2)

(b) Scientists can alter the abundance of organisms in a habitat by removing or introducing organisms. This is called biomanipulation.

The effect of the pollution in Lake Vesijärvi was reversed by removing 80% of the roach from the lake. Other fish that eat roach were introduced into Lake Vesijärvi.

Roach are fish that eat zooplankton. Zooplankton eat cyanobacteria.

As a result of this biomanipulation, the water in Lake Vesijärvi became clear.

Explain why the water became clear.

(4)

(Total for Question 3 = 9 marks)

4 The photograph below shows seed pods of a Canola plant (*Brassica napus*). Canola is a plant grown as a crop because the seeds are rich in oil. The extracted oil is used in cooking and as a sustainable fuel.

Magnification ×0.1

(a) Suggest why the production of oil from Canola seeds can be described as **sustainable**.

(2)

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(b) Farmers provide the plants with fertiliser containing nitrate ions.

Explain the importance of nitrate ions for the growth of plants.

(2)

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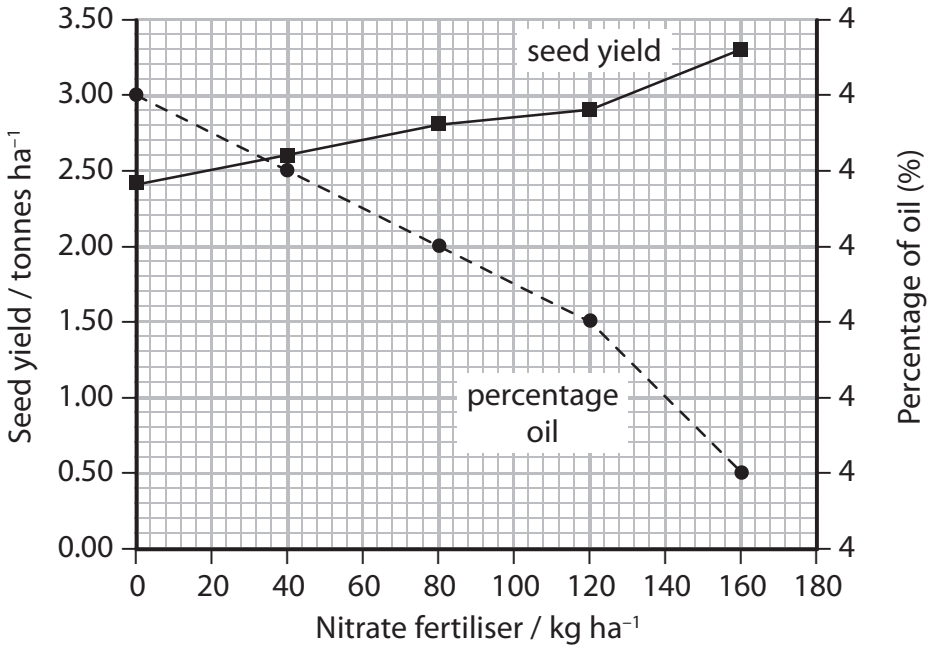
(c) Scientists carried out an investigation into the effect of nitrate fertiliser on the yield.

The graph below shows the results of this investigation.



(i) Place a cross ☒ in the box next to the correct word or words to complete the following statement.

The mass of nitrate fertiliser added and the percentage of oil produced show

(1)

☒ **A** a negative correlation

☒ **B** no relationship

☒ **C** a positive correlation

☒ **D** a proportional relationship

(ii) Using information in the graph, calculate the percentage change in seed yield when the level of nitrate fertiliser is increased from 0 to 160 kg ha^{-1}.

Show your working.

(3)

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(iii) Suggest how the scientist could have ensured that this investigation was valid.

(4)

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(Total for Question 4 = 12 marks)