PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



EXAM QUESTION PACK

TOPIC 1: BIOLOGICAL MOLECULES

INORGANIC IONS

SCORE	PERCENTAGE
/35	%

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Q1.

Chemical control in plants is brought about by plant growth substances such as auxins.

Auxins cause elongation of cells.

Auxins weaken the bonds between molecules found in cell walls. Molecules found in cell walls include cellulose and hemicellulose.

(i) Which of the following statements about cellulose molecules is correct?

(1)

☒ **A** they are branched polymers

☒ **B** they contain α-glucose

☒ **C** they are bonded to each other by hydrogen bonds

☒ **D** they contain 1,6 glycosidic bonds

(ii) The following statements relate to calcium pectate:

1. found in the middle lamella

2. cell walls together

3. prevents the movement of water

Which of the following is correct for calcium pectate?

(1)

☒ **A** statement 1 and statement 2

☒ **B** statement 1 and statement 3

☒ **C** statement 2 only

☒ **D** statement 3 only

(Total for question = 2 marks)

Q2.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer

with a cross ☒.

Transpiration moves water and mineral ions from the roots to the leaves of plants.

Which box in the table shows the mineral ions needed to make an amino acid and which box shows those needed to make DNA?

(2)

Molecule	Mineral ions needed to make the molecule			
	nitrate ions only	phosphate ions only	both nitrate and phosphate ions	neither nitrate nor phosphate ions
amino acid	☐	☐	☐	☐
DNA	☐	☐	☐	☐

(Total for question = 2 marks)

Q3.

White clover plants provide a rich source of nitrogen for cattle when grown with grass plants in fields.

The photograph shows a clover plant growing in a field of grass.



Clover plants have bacteria living in root nodules.

These bacteria convert atmospheric nitrogen (N_2) to ammonia (NH_3) using the enzyme nitrogenase.

(i) State one organic molecule containing nitrogen atoms which is found in plant cells.

(1)

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(ii) Nitrogen is a relatively unreactive gas that forms 80% of the atmosphere.

The enzyme nitrogenase catalyses the reaction shown:

$$N_2 + 8H^+ + 16\ ATP \rightarrow 2NH_3 + H_2 + 16\ ADP + 16\ Pi$$

The activation energy for this reaction is very high.

Analyse the information to explain how the enzyme nitrogenase is involved in the energy changes required for this reaction.

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(Total for question = 5 marks)

Q4.

The photograph shows a glacier that is melting. As the glacier gradually melts, it leaves behind bare rock.



(Source: © CHARLES D. WINTERS/SCIENCE PHOTO LIBRARY)

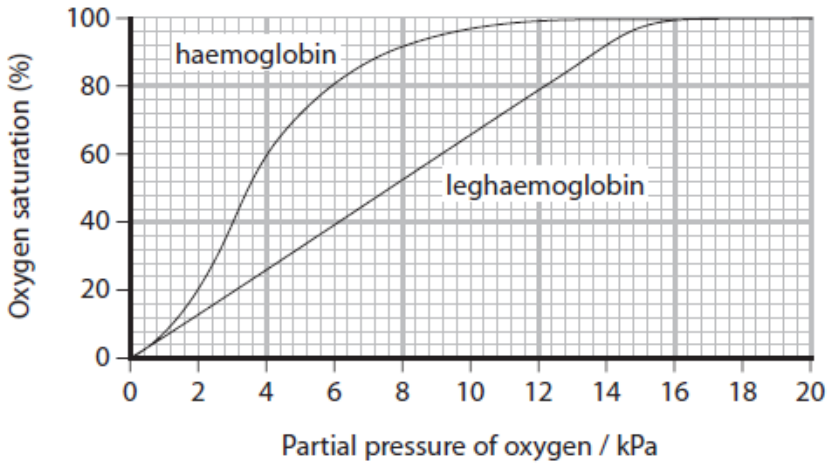
Scientists sampled the soil from areas that had been uncovered for different lengths of time after the glacier ice had melted.

The table shows the results from the samples.

Length of time since glacier melted / years	Soil depth / cm	Mass of nitrate in soil / mg m^{-2}	Mass of leaf litter that falls to ground each year / g m^{-2} yr^{-1}
5	5.2	3.8	1.5
15	6.4	4.1	1.7
40	7.0	5.3	12.8
100	9.2	21.8	277.0
150	10.8	35.4	335.0
200	15.1	53.3	277.0
250	16.2	61.4	261.0

The roots of some of the plants growing around the glacier were found to contain an oxygen binding protein called leghaemoglobin.

The graph shows the oxygen dissociation curve for leghaemoglobin and the oxygen dissociation for haemoglobin.



(i) Leghaemoglobin is a protein that is similar in structure to myoglobin. Both of these proteins have one subunit.

Explain how the oxygen dissociation curve shows that the structure of leghaemoglobin is more similar to myoglobin than to haemoglobin.

(3)

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(ii) Explain how leghaemoglobin enables these plants to grow in waterlogged and compact soils.

(3)

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(Total for question = 6 marks)

Q5.

Plants require mineral ions from the soil for healthy growth.

(i) Describe how mineral (inorganic) ions are taken up by active transport.

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(ii) Describe the function of a named mineral ion that is vital for the growth of plants.

(2)

Mineral ions

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Function

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(Total for question = 5 marks)

Q6.

Soya beans are an important crop for the production of food and oil.

A study of the nutritional content of soya beans from non-transgenic soya bean plants and from transgenic soya beans plants was carried out in two regions of Brazil.

The regions were Ponta Grossa and Londrina.

Tables 1 and 2 show the results of this study.

Table 1

Type of plant	Region	Mean mineral content / mg per 100 g dried soya beans		
		Iron	Copper	Manganese
Non-transgenic	Ponta Grossa	3.34	0.76	1.38
Transgenic	Ponta Grossa	3.44	0.86	1.40
Non-transgenic	Londrina	4.59	1.35	2.20
Transgenic	Londrina	4.15	1.25	2.02

Table 2

Type of plant	Region	Mean organic content / mg per 100 g dried soya beans		
		Protein	Lipid	Carbohydrate
Non-transgenic	Ponta Grossa	38.61	21.09	23.88
Transgenic	Ponta Grossa	38.80	21.19	23.41
Non-transgenic	Londrina	41.68	18.56	25.74
Transgenic	Londrina	40.62	19.87	25.26

* (i) Analyse the data to assess the nutritional content of soya beans from transgenic and from non-transgenic soya bean plants grown in these two regions.

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(ii) The soil in Londrina is more fertile than the soil in Ponta Grossa. Londrina has higher temperatures and rainfall during the growing season.

Explain the differences in the nutritional content of soya beans grown in these two regions.

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(iii) Explain why this study also analysed the types of fatty acid found in soya beans from transgenic plants and from non-transgenic plants.

(2)

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(Total for question = 13 marks)

Q7.

Water is needed for the transport of mineral ions through a plant.

Farmyard manure contains many mineral ions.

(i) Calcium ions in manure promote the growth of plants by increasing

(1)

☒ **A** amino acid synthesis

☒ **B** the production of chlorophyll

☒ **C** the strength of the middle lamella between cells

☒ **D** water loss by the leaves

(ii) Which of the following is the mechanism by which these calcium ions are transported from soil water into plants?

(1)

☒ **A** active transport

☒ **B** exocytosis

☒ **C** osmosis

☒ **D** transpiration