PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 1: BIOLOGICAL MOLECULES

INORGANIC IONS

SCORE	PERCENTAGE
/35	%

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Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
(i)	The only correct answer is **C** (they are bonded to each other by hydrogen bonds) **A** is not correct because cellulose molecules are not branched polymers **B** is not correct because cellulose molecules do not contain α - glucose, they contain β - glucose **D** is not correct because cellulose molecules do not contain 1,6 glycosidic bonds, they contain 1,4 glycosidic bonds		**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	The only correct answer is **A** (statement 1 and statement 2) **B** is not correct because calcium pectate does not prevent the movement of water **C** is not correct because calcium pectate is also found in the middle lamella **D** is not correct because calcium pectate does not prevent the movement of water		**(1)**

Q2.

Question Number	Answer	Additional Guidance	Mark
			(2)

Molecule	Mineral ions used			
	nitrate ions only	phosphate ions only	both nitrate and phosphate ions	neither nitrate nor phosphate ions
amino acid	X	☐	☐	☐
DNA	☐	☐	X	☐

Q3.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to the following: • (the nitrogen can be incorporated into) protein (1)	Allow {DNA / RNA / organic base / amino acid / named protein / ATP /chlorophyll}	(1)
(ii)	An explanation that makes reference to the following: • enzyme lowers the activation energy (for the reaction) (1) • a large number of ATP molecules is used (1) • because the reaction needs a lot of energy (1) • to compensate for nitrogen being unreactive (1)		(4)

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to three of the following points: • (leghaemoglobin / myoglobin) is not S shaped / is linear / is a straight line (1) • because (leghaemoglobin / myoglobin) affinity for oxygen does not alter (1) • because (with leghaemoglobin) there is no cooperative binding (1) • (leghaemoglobin) binds to one molecule (of oxygen) (1)	**Accept** converse for haemoglobin **Accept** converse for haemoglobin **Accept** converse for haemoglobin **Accept** shape change to subunits / conformation change **Accept** (leghaemoglobin / myoglobin) has only one oxygen binding site **Accept** haemoglobin has four binding sites / binds to four molecules of oxygen	3 exp

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to three of the following points: • (waterlogged soil has) little / low / less / no oxygen (1) • (leghaemoglobin) provides oxygen for **respiration** (1) • which enables active uptake of mineral ions / named mineral ion (1) • such as (calcium) to make calcium pectate / (nitrate) to make amino acids / (magnesium) to make chlorophyll (1)	**Accept** binds to / stores oxygen for respiration **Accept** other correct active processes e.g. synthesis of amino acids / protein synthesis / mitosis **Accept** other correct examples of minerals with functions	3 exp

Q5.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that includes three of the following: • moved {across membrane / into cell / into root} by carrier proteins (1) • against a concentration gradient (1) • using ATP (1)	Accept protein pumps Ignore channel proteins Accept from a low to a high concentration	Exp (3)

Question Number	Answer	Additional Guidance	Mark
(ii)	• suitable mineral ion named (1) • appropriate function given (1)	Mp2 can be given if suitable mineral not named eg nitrogen for nitrate eg **nitrate / (ammonium)** – formation of amino acids / proteins / enzymes / nucleic acids / nucleotides / DNA / RNA / chlorophyll **phosphate** – formation of nucleotides / nucleic acids / DNA / RNA / ATP / ADP / amino acids **calcium** – formation of middle lamella / calcium pectate **magnesium** – formation of chlorophyll Accept other correct mineral ions with correct functions potassium, sodium, iron etc	**Exp (2)**

Q6.

Question Number	Indicative content
* (i)	Answers will be credited according to candidates' deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Indicative content **Table 1** • Ponta Grossa: transgenic plants have higher mineral content than non-transgenic plants • Londrina: transgenic plants have lower mineral content that non-transgenic plants • Transgenic plants: plants grown in Ponta Grossa have lower mineral content than plants grown in Londrina • Non-transgenic plants: plants grown in Ponta Grossa have lower mineral content than plants grown in Londrina • Londrina:both types of soybean have more mineral content than both types in Ponta Grossa

	Table 2 • Ponta Grossa: transgenic plants have higher protein and lipid but lower carbohydrate content than non-transgenic plants • Londrina: transgenic plants have higher lipid but lower protein and carbohydrate content than non-transgenic plants • Transgenic plants: plants grown in Ponta Grossa have higher lipid but lower protein and carbohydrate content than plants grown in Londrina • Non-transgenic plants: plants grown in Ponta Grossa have higher lipid but lower protein and carbohydrate content than plants grown in Londrina • Londrina: both types of soybean have more protein and carbohydrate but lower lipid than both types in Ponta Grossa **Examples of Conclusions** • Londrina soybeans are (generally) the most nutritious • In Londrina, non-transgenic soybeans are more nutritious

	• In Ponta Grossa, transgenic soybeans are more nutritious • Very little difference in nutritional content overall	
Level 0	Marks	No awardable content
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just one piece of scientific information. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context. 2 / 3 comparisons / conclusions
Level 2	3-4	An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure. 4 / 5 comparisons / conclusions
Level 3	5-6	An explanation is made which is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear and logically structured. 6 / more comparisons and conclusions

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to five of the following: • Londrina (has a more fertile soil therefore the) soya beans will have a higher {mineral / mineral ion / ion / named mineral ion} content (1) • Londrina (has a more fertile soil therefore the) soya beans will have a higher protein content as there will be more nitrates (1) • Londrina has a higher temperature so {photosynthesis / Calvin cycle / carbon fixation} will be faster (1) • as {enzymes / RUBISCO} will {increase rate of reactions / have more kinetic energy} (1) • therefore making more {organic molecules / carbohydrate / named carbohydrate / protein} (1) • Londrina has a higher rainfall therefore more water for {photolysis / transport of minerals} (1)	**ACCEPT** {photosynthesise faster as more magnesium ions for chlorophyll / be stronger as more calcium ions for cell walls / more phosphate for ATP or nucleic acid synthesis} **ACCEPT** greater activity / work faster **ACCEPT** light-dependent reactions	**(5)**

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference to the following: • to compare the fatty acids in the two types of soya bean (1) • so that {the (transgenic) soybeans will be less likely to increase the risk of heart disease / oxidation is less likely} (1)	**ACCEPT** to see if there were less saturated fatty acids / less linoleic acid / more oleic acid **ACCEPT** converse less likely to go rancid oleic acid less likely to oxidise than linoleic acid	**(2)**

Q7.

Question Number	Answer	Additional guidance	Mark
(i)	C (the strength of the middle lamella between cells)		**(1)**

Question Number	Answer	Additional guidance	Mark
(ii)	A (active transport)		**(1)**