PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

BIOLOGY



MARK SCHEME

TOPIC 1: KEY CONCEPTS IN BIOLOGY (PAPER 2, PACK 3)

SCORE	PERCENTAGE
/56	%

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Mark Scheme

Q1.

Question Number	Answer	Mark
(i)	D mutualism **The only correct answer is D** ***A*** *is not correct because it is not parasitism* ***B*** *is not correct because it is not indigenous* ***C*** *is not correct because it is not biodiversity*	**(1)** **AO1**

Question Number	Answer	Additional Guidance	Mark
(ii)	7500 (µm)	accept 7.5×10^{3} reject $7.5 \times \mathbf{10^{-3}}$	**(1)** **AO1 1**

Q2.

Question Number	**Answer**	**Mark**
(i)	B substrate **1. The only correct answer is B** ***A*** *is not correct because oxygen and water are the products* ***C*** *is not correct because the active site is part of the catalase enzyme* ***D*** *is not correct because a control would using water and not hydrogen peroxide*	**(1)** AO 2 1

Question Number	Answer	Additional guidance	Mark
(ii)	• mass is a variable/ controlling a variable (1) • so the results could be compared/equal amount of catalase in each reaction (1)	accept the idea that different masses would need more or less oxygen/rise quicker or slower ignore references to fair test or reliable results accept enzyme for catalase	(2) AO 2 2

Question Number	Answer	Additional guidance	Mark
(iii)	Any two from: temperature (1) **volume** of hydrogen peroxide (1) the distance the potato had to rise (1) pH (1) size of test tube (1) age/variety/type of potato (1) surface area of potato (1)	 ignore amount of hydrogen peroxide accept mass for volume accept all discs from the same potato the same stock solution of hydrogen peroxide (1)	(2) AO 3 3b

Q3.

	Answer	Acceptable answers	Mark
(i)	A description including the following points: • increase in concentration of glucose / glucose diffused into water/eq (1) • levels off after 20 mins / at 0.79 g/cm^3(1)	small increase, followed by greater increase / eq	(2)
(ii)	An explanation including **three**of the following points: • starch broken down into		(3)

		glucose (1) • by enzymes / amylase / carbohydrase (1) • glucose passes through visking tubing / eq (1) • by diffusion (1) • down the (glucose) concentration gradient (1) • (net) diffusion stops when {all starch is broken down / concentration of glucose is equal inside and outside the tubing}	reject: references to osmosis or active transport accept: from area of high concentration to area of low concentration	

			Indicative Content	
QWC		***(iii)**	An evaluation including some of the following points: Strengths • thin membrane • permeable membrane • presence of amylase • presence of (large) starch molecules • digestion into glucose • glucose diffuses out • concentration gradient • water represents the blood weaknesses • membrane not one cell thick • not a large surface area • shorter length / not same size • no villi /micro villi • only carbohydrate digestion • no other enzymes present • no peristalsis • no blood movement • other factors e.g. pH	
Level	**0**	No rewardable content		
1	**1 - 2**	• a limited evaluation of the model including **at least one**strength OR weakness of the model • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy		
2	**3 - 4**	• a simple evaluation of the model showing evidence of **at least one**strength AND at least one weakness of the model OR a detailed		

		evaluation of several strengths or several weaknesses of the model • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed evaluation, commenting on **several** of the strengths AND weaknesses of the model and its limitations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q4.

	Answer	**Acceptable answers**	**Mark**
(i)	A description including the following points: • increase in concentration of glucose / glucose diffused into water/eq (1) • levels off after 20 mins / at 0.79 g/cm^3(1)	small increase, followed by greater increase / eq	**(2)**
(ii)	An explanation including **three** of the following points: • starch broken down into glucose (1) • by enzymes / amylase / carbohydrase (1) • glucose passes through visking tubing / eq (1) • by diffusion (1) • down the (glucose) concentration gradient (1) • (net) diffusion stops when {all starch is broken down / concentration of glucose is equal inside and outside the tubing}	reject: references to osmosis or active transport accept: from area of high concentration to area of low concentration	**(3)**

		Indicative Content	
QWC	***(iii)**	An evaluation including some of the following points:	

		Strengths • thin membrane • permeable membrane • presence of amylase • presence of (large) starch molecules • digestion into glucose • glucose diffuses out • concentration gradient • water represents the blood weaknesses • membrane not one cell thick • not a large surface area • shorter length / not same size • no villi /micro villi • only carbohydrate digestion • no other enzymes present • no peristalsis • no blood movement • other factors e.g. pH	
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited evaluation of the model including **at least one**strength OR weakness of the model • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple evaluation of the model showing evidence of **at least one**strength AND at least one weakness of the model OR a detailed evaluation of several strengths or several weaknesses of the model • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed evaluation, commenting on **several**of the strengths AND weaknesses of the model and its limitations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q5.

Question number	Answer	Mark
(i)	chloroplast / chloroplasts accept phonetically correct misspellings	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
(ii)	(aerobic) respiration / release energy	ignore make / produce energy accept word equation for respiration accept to produce ATP	(1) AO1 1

Question number	Answer	Additional guidance	Mark
(iii)	Any two from: • no nucleus/ chromosomal DNA (in the cytoplasm) (1) • no membrane-bound organelles (1) • circular/plasmid DNA (1) • no mitochondria (1) • no chloroplasts (1) • no vacuole (1)	accept: presence of flagellum (1) presence of a slime coat (1) presence of pili (1) accept cell wall not made of cellulose (1)	(2) AO1 1

Q6.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** leaf palisade cell		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	An explanation linking two of the following: • by osmosis • from an area of high **water** concentration to an area of low **water** concentration • through (partially permeable) membrane	Ignore references to diffusion reject active transport accept water moves down a concentration gradient	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	• all four bars plotted correctly (+/- 1/2 small square) (1) • X axis correctly labelled for plotted bars , eg North A, North B, South A, South B (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	**D** a quadrat		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(iii)	A suggestion including two of the following: • Species B **is able to** grow on both (North and South) sides (1) • (there are more) on the south side because of a specific difference in a named abiotic factor eg lighter /darker on South side , temperature, pH, water level, (1) • there are fewer on the north side because they are out competed by species A / idea of eaten more on North side (1)	Ignore species B is found / grows on both sides Ignore carbon dioxide concentration Accept less pollution / less sulphur dioxide on South side	**(2)**

Q7.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** leaf palisade cell		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	An explanation linking two of the following: • by osmosis • from an area of high **water** concentration to an area of low **water** concentration • through (partially permeable) membrane	Ignore references to diffusion reject active transport accept water moves down a concentration gradient	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	• all four bars plotted correctly (+/- 1/2 small square) (1) • X axis correctly labelled for plotted bars , eg North A, North B, South A, South B (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	**D** a quadrat		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(iii)	A suggestion including two of the following: • Species B **is able to** grow on both (North and South) sides (1) • (there are more) on the south side because of a specific difference in a named abiotic factor eg lighter /darker on South side , temperature, pH, water level, (1) • there are fewer on the north side because they are out competed by species A / idea of eaten more on North side (1)	Ignore species B is found / grows on both sides Ignore carbon dioxide concentration Accept less pollution / less sulphur dioxide on South side	**(2)**

Q8.

Question number	Answer	Additional guidance	Mark
(i)	Any **one** from: • temperature (1) • the food used (1) • the volume/size of test tube (1)	accept other valid variables	**(1)** **AO2.2**

Question number	Answer	Additional guidance	Mark
(ii)	Any **one** from: • use of a water bath/ description of alternative to water bath (1) • use food from the same source (1) • use test tubes which have the same shape/volume (1)	accept other valid variables to be controlled	**(1)** **AO2.2**

Q9.

	Answer	Acceptable answers	Mark
	A ☒ enzymes to help get through the membrane of the egg cell		**(1)**

Q10.

	Answer	Acceptable answers	Mark
	A ☒ enzymes to help get through the membrane of the egg cell		**(1)**

Q11.

	Answer	Acceptable answers	Mark
	• neutralisation (of stomach acid) / raise pH (1) • emulsification / break down of fats (1)	Accept makes stomach / intestine contents more alkaline Accept breaks down large droplets /globules / increases surface area of fats Reject molecules broken down	**(2)**

Q12.

	Answer	Acceptable answers	Mark
	• neutralisation (of stomach acid) / raise pH (1) • emulsification / break down of fats (1)	Accept makes stomach / intestine contents more alkaline Accept breaks down large droplets /globules / increases surface area of fats Reject molecules broken down	**(2)**

Q13.

		Indicative Content	
QWC	*	A description including some of the following points in sequence Names of enzymes: • carbohydrases • named carbohydrase eg amylase • proteases • named protease eg pepsin • lipases • named lipase General points about enzyme action: • breakdown of large / insoluble / named molecu / soluble / named molecules • for absorption • catalysts • speeds up reactions • active sites that bind to substrate • idea of specificity Specific points: • carbohydrates/ starch are broken down • into sugars / glucose • proteins /named protein are broken down • into amino acids • fats / oils / lipids / named lipid are broken dow • into fatty acids /glycerol	

Level	**0**	No rewardable content
1	**1 - 2**	• a limited description of enzyme action that includes at least three points • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple description of enzyme action that includes at least six points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed description of at least nine points • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q14.

		Indicative Content	
QWC	*	A description including some of the following points in sequence Names of enzymes: • carbohydrases • named carbohydrase eg amylase • proteases • named protease eg pepsin • lipases • named lipase General points about enzyme action: • breakdown of large / insoluble / named molecu / soluble / named molecules • for absorption • catalysts • speeds up reactions • active sites that bind to substrate • idea of specificity Specific points: • carbohydrates/ starch are broken down • into sugars / glucose • proteins /named protein are broken down • into amino acids • fats / oils / lipids / named lipid are broken dow • into fatty acids /glycerol	

Level	**0**	No rewardable content
1	**1 - 2**	• a limited description of enzyme action that includes at least three points • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple description of enzyme action that includes at least six points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed description of at least nine points • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q15.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	Correct substitution i.e. (-0.5 ÷ 10.3) x 100 (1) - 4.85 / - 4.9	Accept data correctly put into other acceptable methods. Accept answer with more decimal places eg: - 4.8543 / - 4.854368932 Full marks for correct bald answer award max of one mark if negative is not written eg 4.85 / 4.9	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	better / easier / more valid comparison can be made between values /can make more valid conclusion / because the original / starting masses of potato were not the same / Idea of easier to visualise the size of the change	Ignore makes the results / test reliable / accurate	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description including the following: • Produce two (daughter) cells • which are **genetically** identical • and diploid	Accept DNA for chromosomes throughout Also credit details of the process of mitosis chromosomes replicates (1) spindle fibres form / chromosomes attached to spindle (1) Chromosomes arranged on equator / middle of cell / chromosomes pulled apart /pulled to poles /separation of sets of chromosomes (1) Idea of nucleus reforming / New cell wall formed (to divide cell) / cytokinesis / description of cytokinesis (1)	**(3)**

Question Number		Indicative Content	Mark
QWC	* **(c)**	A explanation to include some of the following points • active transport requires energy • (active transport moves mineral ions) from the soil • into root (hair cells) • reference to pumps (in the cell membranes) • from a low concentration to a high concentration/against their concentration gradient • reference to mineral ions / mineral salts accept named minerals eg nitrates • diffusion is a passive process • gases diffuse from high to low concentration/down their concentration gradient • gas exchange in the leaf occurs by diffusion • carbon dioxide diffuses in • to air spaces in leaves / into cells • for photosynthesis / produces glucose • oxygen diffuses in • for respiration	**(6)**

Level	**0**	No rewardable content
1	**1 - 2**	• a limited explanation that gives information about active transport **OR** diffusion in the correct context e.g. minerals ions are transported into root (hair cells) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple explanation that gives details of active transport or diffusion transporting materials e.g. carbon dioxide diffuses into leaves down their concentration gradient OR a limited explanation of both active transport and diffusion • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed explanation that describes **both** processes e.g. active transport requires energy to transport mineral ions into the root hair cell AND carbon dioxide diffuses into the leaf for photosynthesis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q16.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	Correct substitution i.e. (-0.5 ÷ 10.3) x 100 (1) - 4.85 / - 4.9	Accept data correctly put into other acceptable methods. Accept answer with more decimal places eg: - 4.8543 / - 4.854368932 Full marks for correct bald answer award max of one mark if negative is not written eg 4.85 / 4.9	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	better / easier / more valid comparison can be made between values /can make more valid conclusion / because the original / starting masses of potato were not the same / Idea of easier to visualise the size of the change	Ignore makes the results / test reliable / accurate	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description including the following: • Produce two (daughter) cells • which are **genetically** identical • and diploid	Accept DNA for chromosomes throughout Also credit details of the process of mitosis chromosomes replicates (1) spindle fibres form / chromosomes attached to spindle (1) Chromosomes arranged on equator / middle of cell / chromosomes pulled apart /pulled to poles /separation of sets of chromosomes (1) Idea of nucleus reforming / New cell wall formed (to divide cell) / cytokinesis / description of cytokinesis (1)	**(3)**

Question Number		Indicative Content	Mark
QWC	* **(c)**	A explanation to include some of the following points • active transport requires energy • (active transport moves mineral ions) from the soil • into root (hair cells) • reference to pumps (in the cell membranes) • from a low concentration to a high concentration/against their concentration gradient • reference to mineral ions / mineral salts accept named minerals eg nitrates • diffusion is a passive process • gases diffuse from high to low concentration/down their concentration gradient • gas exchange in the leaf occurs by diffusion • carbon dioxide diffuses in • to air spaces in leaves / into cells • for photosynthesis / produces glucose • oxygen diffuses in • for respiration	**(6)**

Level		
0	**0**	No rewardable content
1	**1 - 2**	• a limited explanation that gives information about active transport **OR** diffusion in the correct context e.g. minerals ions are transported into root (hair cells) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	**3 - 4**	• a simple explanation that gives details of active transport or diffusion transporting materials e.g. carbon dioxide diffuses into leaves down their concentration gradient OR a limited explanation of both active transport and diffusion • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed explanation that describes **both** processes e.g. active transport requires energy to transport mineral ions into the root hair cell AND carbon dioxide diffuses into the leaf for photosynthesis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q17.

	Answer	**Acceptable answers**	**Mark**
(a)(i)	A description including the following points: • increase in concentration of glucose / glucose diffused into water/eq (1) • levels off after 20 mins /	small increase, followed by greater increase / eq	**(2)**

	at 0.79 g/cm^3(1)		
(a)(ii)	An explanation including **three** of the following points: • starch broken down into glucose (1) • by enzymes / amylase / carbohydrase (1) • glucose passes through visking tubing / eq (1) • by diffusion (1) • down the (glucose) concentration gradient (1) • (net) diffusion stops when {all starch is broken down / concentration of glucose is equal inside and outside the tubing}	reject: references to osmosis or active transport accept: from area of high concentration to area of low concentration	**(3)**

		Indicative Content	
QWC	***(a)(iii)**	An evaluation including some of the following points: Strengths • thin membrane • permeable membrane • presence of amylase • presence of (large) starch molecules • digestion into glucose • glucose diffuses out • concentration gradient • water represents the blood weaknesses • membrane not one cell thick • not a large surface area • shorter length / not same size • no villi /micro villi • only carbohydrate digestion • no other enzymes present • no peristalsis • no blood movement • other factors e.g. pH	
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited evaluation of the model including **at least one** strength OR weakness of the model	

		• the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple evaluation of the model showing evidence of **at least one**strength AND at least one weakness of the model OR a detailed evaluation of several strengths or several weaknesses of the model • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed evaluation, commenting on **several**of the strengths AND weaknesses of the model and its limitations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

	Answer	Acceptable answers	Mark
(b)	**C** store bile		**(1)**

Q18.

	Answer	Acceptable answers	Mark
(a)(i)	A description including the following points: • increase in concentration of glucose / glucose diffused into water/eq (1) • levels off after 20 mins / at 0.79 g/cm^3(1)	small increase, followed by greater increase / eq	**(2)**
(a)(ii)	An explanation including **three**of the following points: • starch broken down into glucose (1) • by enzymes / amylase / carbohydrase (1) • glucose passes through visking tubing / eq (1) • by diffusion (1) • down the (glucose) concentration gradient (1) • (net) diffusion stops when	reject: references to osmosis or active transport accept: from area of high concentration to area of low concentration	**(3)**

	{all starch is broken down / concentration of glucose is equal inside and outside the tubing}		

		Indicative Content	
QWC	***(a)(iii)**	An evaluation including some of the following points: Strengths • thin membrane • permeable membrane • presence of amylase • presence of (large) starch molecules • digestion into glucose • glucose diffuses out • concentration gradient • water represents the blood weaknesses • membrane not one cell thick • not a large surface area • shorter length / not same size • no villi /micro villi • only carbohydrate digestion • no other enzymes present • no peristalsis • no blood movement • other factors e.g. pH	

Level	**0**	No rewardable content	
1	**1 - 2**	• a limited evaluation of the model including **at least one**strength OR weakness of the model • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple evaluation of the model showing evidence of **at least one**strength AND at least one weakness of the model OR a detailed evaluation of several strengths or several weaknesses of the model • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed evaluation, commenting on **several**of the strengths AND weaknesses of the model and its limitations • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

	Answer	**Acceptable answers**	**Mark**
(b)	**C** store bile		**(1)**

Q19.

Question Number	Answer	Mark
(i)	**B mitochondria** **The only correct answer is B** ***A*** *is not correct because vacuoles do not release energy* ***C*** *is not correct because nuclei do not release energy* ***D*** *is not correct because ribosomes do not release energy*	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer including: • thick walls (1) • continuous / hollow tubes / no end walls (1)	 accept no cytoplasm accept made of lignin / made of dead cells (1)	**(2)** **AO2 1**

Q20.

	Answer	Acceptable answers	Mark
(i)	Any **two** of the following points: (yeast cell) • has a nucleus (1) • does not have a flagellum (1) • does not have a plasmid (1) (bacterial cell)	 Accept: has a vacuole	**(2)**

	• has chromosomal DNA / circular DNA (1) • has a capsule (1) • has a slime coat (1) • does not have mitochondria (1)	accept: named bacterial feature e.g pilli, small ribosome, if not labelled in yeast cell	
(ii)	does not have chloroplasts/chlorophyll	cannot photosynthesise	**(1)**

Q21.

	Answer	**Acceptable answers**	**Mark**
(i)	Any **two** of the following points: (yeast cell) • has a nucleus (1) • does not have a flagellum (1) • does not have a plasmid (1) (bacterial cell) • has chromosomal DNA / circular DNA (1) • has a capsule (1) • has a slime coat (1) • does not have mitochondria (1)	Accept: has a vacuole accept: named bacterial feature e.g pilli, small ribosome, if not labelled in yeast cell	**(2)**
(ii)	does not have chloroplasts/chlorophyll	cannot photosynthesise	**(1)**