Mark Scheme (Results)

October 2020

Pearson Edexcel International Advanced Subsidiary Level In Biology (WBI12) Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional guidance	Mark
1(a)(i)	The only correct answer is A amyloplast *B is not correct because starch is not stored in the middle lamella* *C is not correct because starch is not stored in the plasmodesmata* *D is not correct because starch is not stored in the tonoplast*		**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	The only correct answer is A one *B is not correct because starch contains 1,4 and 1,6 glycosidic bonds, is a polymer of α-glucose and is a polysaccharide* *C is not correct because starch contains 1,4 and 1,6 glycosidic bonds, is a polymer of α-glucose and is a polysaccharide* *D is not correct because starch contains 1,4 and 1,6 glycosidic bonds, is a polymer of α-glucose and is a polysaccharide*		**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(iii)	The only correct answer is C three *A is not correct because phloem, sclerenchyma and xylem cell walls contain cellulose* *B is not correct because phloem, sclerenchyma and xylem cell walls contain cellulose* *D is not correct because the vacuole does not contain cellulose*		**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)	An explanation that includes the following points: • because there are hydrogen bonds between (adjacent) cellulose molecules (1) • {layers / sheets} of microfibrils (1) • which have microfibrils at different angles (therefore it increases the strength) (1)	ignore {layers / sheets} of cellulose ACCEPT microfibrils arranged in a {criss-cross pattern / mesh}	**(3)**

Question Number	Answer	Additional guidance	Mark
2(a)(i)	The only correct answer is D animal, plant and prokaryotic cells *A is not correct because all three cell types contain a cell membrane* *B is not correct because all three cell types contain a cell membrane* *C is not correct because all three cell types contain a cell membrane*		**(1)**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	The only correct answer is C plant and prokaryotic cells only *A is not correct because prokaryotic cells contain a cell wall* *B is not correct because animal cells do not contain a cell wall* *D is not correct because animal cells do not contain a cell wall*		**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	A calculation in which: • cell diameter measured and converted into micrometres (1) • diameter divided by 25 with no units (1) OR • 25 converted to mm • diameter divided by 0.025 with no units	<u>Example of calculation:</u> 42mm=42000 µm 42000 ÷ 25 = x1680 ecf for ±1mm and incorrect conversions Correct answer with no units and with no working scores full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that includes one of the following points: • (site of) photosynthesis / converts light energy to {chemical energy / ATP} (1)	ACCEPT formation of correct named product of photosynthesis e.g. glucose ignore makes food	**(1)**

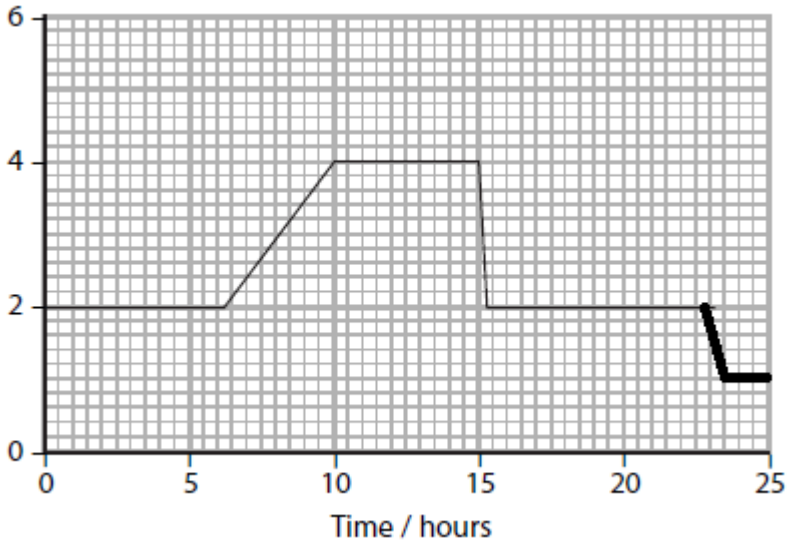
Question Number	Answer	Additional guidance	Mark
2(b)(iii)	An answer that includes the following point: • this organism has a nucleus / prokaryotic cells do not contain a nucleus (1)	DO NOT ACCEPT cell membrane / cytoplasm ignore contains membrane bound organelles	**(1)**

Question Number	Answer	Additional guidance	Mark
2(c)(i)	• plasmodesma / plasmodesmata (1)		**(1)**

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation that includes the following points: • communication between / connects (connected) cells (1) • therefore signalling substances pass through {symplast / cytoplasm} / cytoplasmic streaming / transport of suitable named molecules e.g. minerals, water, glucose, amino acids, proteins, RNA (1)	allow ECF for pits, cell wall and middle lamella only pits • communication between / connects (connected) cells • therefore transport of suitable named molecules cell wall • (sieve like network made of) cellulose fibres support the cell • therefore helps retain rigid structure / prevent cell lysis middle lamella • joins (adjacent) cell (walls) together • therefore increases {strength / stability} of {plant / cell (wall)}	**(2)**

Question Number	Answer	Additional guidance	Mark
3(a)	C - C D B E A The only correct answer is C *A is not correct because the correct order is C D B E A* *B is not correct because the correct order is C D B E A* *D is not correct because the correct order is C D B E A*		**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	An explanation that includes four of the following points: • DNA content remains constant during {G1 / G2/ mitosis} (1) • the DNA content doubles (1) • due to {DNA / chromosome} replication / S phase / replication (1) • the cell divides / cytokinesis (after 15 hours) (1) • (therefore) it will produce (two) diploid (daughter) cells (1)	ACCEPT DNA content stays at 2 during G1 / DNA content stays at 4 during {G2 / mitosis} ACCEPT DNA content increases {to 4 / by 2} ignore interphase ignore telophase ACCEPT (therefore) it will produce (two) genetically identical (daughter) cells	**(4)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that includes the following points: • similar shape graph as mitosis (1) • with a further division line to reduce DNA content to {haploid / 1 a.u.} (1)	<u>Example of graph</u>  	**(2)**

Question Number	Answer	Additional guidance	Mark
4(a)	A calculation showing the following steps: • mass of bran calculated (1) • mass of fibre calculated (1) • correct answer to two significant figures (1)	<u>Example of calculation</u> (48÷100) x 14 = 6.72 (mg) (6.72÷100) x 43 = 2.889 (mg) 2.9 mg Correct answer with no working scores full marks	**(3)**

Question Number	Answer	Additional guidance	Mark
4(b)	An explanation that includes the following points: • more sustainable (than oil-based plastic) (1) • biodegradable / can be broken down by decomposers (1) • carbon neutral (1)	ACCEPT ORA for oil-based plastic ACCEPT renewable / can be regrown / available for future generations ALLOW can decompose ACCEPT {does not contribute to /reduces} {greenhouse effect / global warming}	**(3)**

Question Number	Answer	Additional guidance	Mark
4(c)	An explanation that includes three of the following points: • pollen tube transports {generative nucleus/male nuclei} to {embryo sac / ovary / micropyle} (1) • (by releasing) digestive enzymes (1) • one of the male nuclei {fertilises / fuses with} the (two) polar nuclei (1) • (causing) the formation of a {<u>3n/ triploid</u>} endosperm (nucleus) (1)	ACCEPT pollen tube transports {generative nucleus/male nuclei} down the style ACCEPT male gamete / sperm nucleus ACCEPT male gamete / {sperm / haploid} nucleus	**(3)**

Question Number	Answer	Additional guidance	Mark
5(a)(i)	An answer that includes the following point: • group of (similar) cells (working together to) perform a (specific) function (1)	ACCEPT cells with similar {structure / function / origin}	**(1)**

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	An answer that includes the following points: • patient P has a mitotic index of 20 (1) • patient R has a mitotic index of 45 (1) • correct order of cancer stage identified (1)	e.g. P has an earlier stage of cancer (than R), R has a more advanced stage of cancer ACCEPT ecf from calculated MI for P and R	**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)	An answer that includes at least one similarity and one difference: similarity: • the survival probability decreases over time (for all three stages) (1) differences: • stage I has the highest survival probability for all years whereas stage IV has the lowest probability for all years (1) • stage IV has the {fastest/steeper} decrease (in survival probability) / stage I has the slowest decrease (in survival probability) (1)	ACCEPT correct order of survival probability for a point on the graph	**(3)**

Question Number	Answer	Additional guidance	Mark
5(c)	A description that includes the following points: • correct description of a placebo being given to one group (and the other group receiving (anticancer) drug) (1) • neither the patient nor the doctor knows whether the patient is receiving (the drug or) the placebo (1)	ACCEPT description of a placebo e.g. has no active ingredient / already known drug / sugar pill / dummy drug ACCEPT scientist / researcher for doctor	**(2)**

Question Number	Answer	Additional guidance	Mark
6(a)	An explanation that includes four of the following points: • water for {hydrolysis reactions / form cytoplasm / solvent / hydration} (1) • (some bacteria require) oxygen for (aerobic) respiration (1) • (suitable/optimum) temperature for {enzyme-controlled / metabolic} reactions to occur (at suitable rate) (1) • (suitable/optimum) pH for {enzyme-controlled / metabolic} reactions to occur (at suitable rate) (1) • named organic molecule and an explanation of why that organic molecule is needed (1)	ACCEPT (some anaerobic bacteria require) no oxygen for anaerobic respiration ACCEPT (suitable) temperature so enzymes do not denature ACCEPT (suitable) pH so enzymes do not denature e.g. glucose for respiration / lipids to provide fatty acid chains for new cell membrane / proteins to provide amino acids for {protein synthesis / growth}	**(4)**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	A calculation showing the following steps: • calculation of difference in mean area of ulcer (1) • calculation of percentage decrease (1)	<u>Example of calculation</u> (802.71-95.71) =707 $\frac{(802.71-95.71)}{802.71} \times 100$ = 88 / 88.077 / 88.08 / 88.1 (%) Correct answer with no working shown scores full marks	**(2)**

Question Number	Answer	
6 (b)(ii)	Answers will be credited according to candidate's 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 indicated as relevant. Additional content included in the response must be scientific and relevant. <u>Description of data in table</u> • mass of mucus • ulcer area <u>Conclusions and Explanations</u> • omeprazole was most effective treatment /none of the extracts were as effective as omeprazole at reducing ulcer area / all treatments resulted in {reduction of ulcer area / increased mass of mucus} • correlation between mucus mass and ulcer area (apart from omeprazole) • bacteria damage stomach lining causing ulcers • suggestion that {omeprazole / extract} increases mucus production • high mucus content prevents bacteria {reaching / damaging} stomach lining • explanation of how mucus production links to ulcer area • high mucus content prevents acid contents damaging stomach lining <u>Sustained</u> • link to biological process resulting in increased mucus production • {omeprazole / extract} causes the {stomach lining / goblet cells} increases mucus production • suggestion that {omeprazole / extract} reduces acidity of stomach making it less suitable for *H. pylori* • antimicrobial properties of {omeprazole / extract} reducing {number / reproduction} of bacteria • therefore {slow population growth / reduced population of bacteria} results in {reduced damage to stomach lining / smaller ulcer area} **(6)**	

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and 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.	Either Description of: mass of mucus data and/or ulcer area data OR description of one and/or conclusion / explanation of one data set
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.	description of both data plus: explanation of mass of mucus / ulcer area and/or simple conclusion of most effective treatment
Level 3	5-6	An explanation is made that 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.	all level 2 plus: a detailed explanation using sustained application. The detail of sustained application determines the mark in this level.

Question Number	Answer	Additional guidance	Mark
7(a)(i)	A - Metaphase I The only correct answer is A *B is not correct because independent assortment does not occur in metaphase II* *C is not correct because independent assortment does not occur in telophase I* *D is not correct because independent assortment does not occur in telophase II*		**(1)**

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	C - Prophase I The only correct answer is C *A is not correct because crossing over does not occur in metaphase I* *B is not correct because crossing over does not occur in metaphase II* *D is not correct because crossing over does not occur in prophase II*		**(1)**

Question Number	Answer	Additional guidance	Mark
7(b)	An explanation that includes three of the following points: • (due to) linkage (1) • A and B are on same chromosome (1) • {genes/ alleles / AB / ab / 48%} are not separated due to crossing over / {AB / ab} are inherited together (1) • {Ab / aB / 2%} formed by crossing over (1)	 ACCEPT 25% due to A and B on separate chromosomes ACCEPT the closer together two loci are the smaller the chance of separation (by recombination) / ORA ACCEPT {Ab / aB} are recombinants	**(3)**

Question Number	Answer	Additional guidance	Mark
7(c)	A description that includes the following points: • reference to post transcriptional changes / (pre-)RNA splicing (1) • {introns / P, R, T, V and X} removed by enzymes (1) • rearrangement of {exons / Q, S, U and W} / removal of some exons (1) • credit two different permutations of exon order given (1) • (therefore) a different {primary sequence / sequence of amino acids / polypeptide} (1)	ACCEPT spliceosomes ACCEPT not all exons used ACCEPT different sequence of amino acids can result in differences in {folding / bonding} giving a different protein (3D) shape	**(5)**

Question Number	Answer	Additional guidance	Mark
7(d)	An answer that includes the following points: • (activity of) gene T decreases (during development) and gene U increases (1) • (because) gene T is switched off (1) • {product of gene T not needed / (gene T) protein not produced} once blastocyst stage reached (1) • product of gene U is needed at higher levels after the {8-cell / morula} stage (1)	ACCEPT pieced together ACCEPT description ACCEPT product of gene T not needed after 8-cell stage reached ACCEPT gene U is involved in specialisation of the cells / correct description of role of gene U protein	**(3)**

Question Number	Answer	Additional guidance	Mark
8(a)(i)	A description that includes two of the following points: • long wings to allow it to {fly long distances / glide / use updraft} (1) • webbed feet to allow it to paddle through water (1) • long beak {to allow it to catch its prey / to feed / for defence} (1)	 ACCEPT webbed feet to allow increased air resistance ACCEPT large eyes to see prey in the water	**(2)**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	A calculation showing the following steps: • calculation of decrease in number (1) • calculation of population remaining, rounded to a whole number (1)	<u>Example of calculation:</u> 5.3% of 4500 = 238.5 4261 / 4262 Correct answer with no working shown scores full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
8(b)	An answer that includes the following point: • similar phenotype (1)	ACCEPT they have similar {physical features / anatomy / morphology} ACCEPT could interbreed to produce fertile offspring	**(1)**

Question Number	Answer	Additional guidance	Mark
8(c)	An answer that makes reference to four of the following: • (genetic) mutation(s) occurred (1) • resulting in (new) **allele** coding for {larger size / ability to digest meat / eat chicks} (1) • (which then) conferred a selective advantage / (mutated mice) more likely to {survive and reproduce / pass alleles to offspring} (1) • (therefore) increasing **allele** frequency (1) • mutated mice on this island becoming reproductively isolated (resulting in two different species) (1)	Ignore genes max 3 if they do not refer to {larger size / ability to digest meat / eat chicks / defence from chicks} ACCEPT those without the {mutation / ability to eat chicks / advantageous allele} were less likely to survive and reproduce ACCEPT mice on this island were geographically isolated (from non-mutated mice) / allopatric speciation occurred	**(4)**

Question Number	Answer	
8 (d)	Answers will be credited according to candidate's 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 indicated as relevant. Additional content included in the response must be scientific and relevant. <u>On the island</u> • introducing laws to protect the albatross (D) • removal of predators (D) • through trapping / poisoning of mice / introducing a predator of mice (D) • so more chicks will survive to breeding age (E) • fishing exclusion zone (D) • supplying more food to albatross (E) • more food available for parents to give to chicks (E) • therefore increase population size / conserve the albatross (E) • reintroduction program (D) • strategies to ensure increased survival chances of reintroduced birds e.g. removal of mice, behavioural conditioning (E) <u>In zoos</u> • Tristan albatross breeding pairs taken to zoos (D) • captive breeding programmes (D) • reference to studbooks (D) • collecting eggs and taking them elsewhere to hatch (D) • therefore offspring are not eaten by mice / protected from predators (E) • offspring reintroduced to the island (D) • to increase population size (E) • reintroduce Tristan albatross currently held in zoos (D) • therefore increase population size (E) • (captive breeding/studbooks/breeding zoo albatrosses used) to {maintain / increase} genetic diversity (E) • Hardy Weinberg equation used to see change in allele frequency over time (E) **(6)**	

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and 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.	Either on island or zoo involvement explained 1 mark = description of one method 2 marks = description of both methods or description of one with some explanation
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.	Both island and zoo involvement explained in relation to the question 3 marks = description of both methods with some explanation for one 4 marks = description of both methods with explanation
Level 3	5-6	An explanation is made that 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.	All level 2 content plus: consideration of {maintaining / increasing genetic diversity} (Zoo) and / or reintroduction strategies to increase survival (Island)

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