GradeMax



Mark Scheme (Results)

Summer 2021

Pearson Edexcel International Advance Level In Biology (WBI12) Paper 01
Cells, Development, Biodiversity and Conservation

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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	Mark
1(a)(i)	The only correct answer is B β-glucose *A is not correct because the molecule is* β-glucose *C is not correct because the molecule is* β-glucose *D is not correct because the molecule is* β-glucose	**(1)**

Question Number	Answer	Mark
1(a)(ii)	The only correct answer is C form microfibrils *A is not correct because cellulose forms microfibrils* *B is not correct because cellulose forms microfibrils* *D is not correct because cellulose forms microfibrils*	**(1)**

Question Number	Answer	Mark
1(a)(iii)	The only correct answer is B chlorophyll *A is not correct because magnesium is not a component of calcium pectate* *C is not correct because magnesium is not a component of DNA* *D is not correct because magnesium is not a component of starch*	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	• xylem		**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	• sclerenchyma	Accept tracheids	**(1)**

Question Number	Answer	Additional guidance	Mark
2(a)(i)	A calculation in which: • conversion of actual length of scale into nm (1) • actual length divided by the given length (answer given to 2 significant figures and in standard form) (1)	<u>Example of calculation:</u> 35mm = 35 000 000 nm 35 000 000 ÷ 1200 = ×2.9 x 10^4 accept +/- 1mm for length of bar	**(2)**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	An explanation that makes reference to two of the following points: • electron microscope (1) • due to high magnification (1)	ecf from 2(a)(i) applies Accept high resolution Accept converse for light microscope Accept 3D image if qualified as scanning electron microscope	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	An answer that makes reference to the following points: • presence of {(peptidoglycan) cell wall / circular chromosome(s) / DNA associated with histones / 70S ribosomes / RNA polymerase} (1) • absence of {nucleus / membrane bound organelles} (1)	Accept ether bonds	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that makes reference to three of the following points: • (analysis of) molecular evidence (1) • to identify similarities and differences in biological molecules / comparison of biological molecules (1) • (analysis of) phenotype (1) • to identify similarities and differences between the two microorganisms (phenotype) (1)	e.g. DNA, mRNA, proteins, enzymes e.g. cell structure / anatomical features, grow in different {habitats/ conditions} e.g. named similarities and differences in cell structure	**(3)**

Question Number	Answer	Mark
3(a)(i)	The only correct answer is C two *A is not correct because there is one maternal and one paternal chromosome with three gene loci* *B is not correct because there is one maternal and one paternal chromosome with three gene loci* *D is not correct because there is one maternal and one paternal chromosome with three gene loci*	**(1)**

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	A description that makes reference to the following points: • uncoiling (of chromosome) (1) • used in protein synthesis / DNA replication (in S phase) (1)	 Accept correct reference to histones / to form chromatin Accept transcription	**(2)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	• prophase I		**(1)**

Question Number	Answer Additional guidance	Mark
3(b)(ii)	The only correct answer is C three *A is not correct because ABe could not be formed by one chiasmata* *B is not correct because ABe could not be formed by one chiasmata* *D is not correct because ABe could not be formed by one chiasmata*	**(1)**

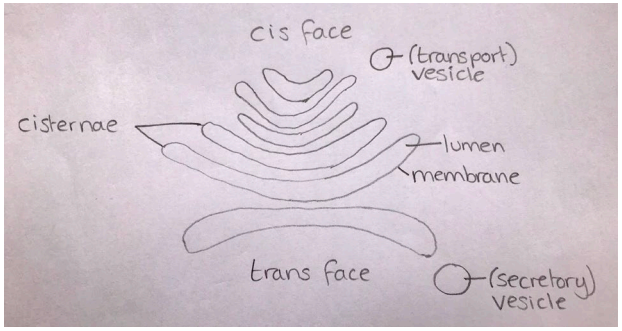
Question Number	Answer	Additional guidance	Mark
3(b)(iii)	An explanation that makes reference to two of the following points: • alleles b and e are closer together (1) • therefore {crossing over / chiasma} is less likely to occur between these alleles (1)	 Accept converse for A and E Accept converse for A and E	**(2)**

Question Number	Answer	Additional guidance	Mark
4(a)(i)	A description that makes reference to the following points: • the germination of the seeds remains {high/ constant} for an initial period of time (1) • (after this) the germination of the seeds (rapidly) {decreases / reduces} with increased time in storage (1)		**(2)**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	An explanation that makes reference to four of the following points: • (many different plants result in) increased genetic diversity of the seeds stored (1) • because more (seeds from different) {individuals/ plants} increases the probability of having {more alleles / different genotypes / heterozygotes} (1) • adult plants allow {pollination / sexual reproduction} to occur (1) • to produce new seeds (for storage) (1) • to replace those seeds stored for a long time (1)	Accept reduces chance of seeds from (mainly) {homozygous recessive / diseased} plants Accept to produce seeds which are genetically different (from parent plants) Accept to increase the {viability of stored seeds / percentage of seeds that will germinate}	**(4)**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	A calculation in which: • mass of cutlery per month calculated (1) • mass of cutlery per year calculated to two significant figures with unit (1)	<u>Example of calculation</u> (130000 ÷ 100) × 60 = 78000 (kg) (78 000 × 12) = 940 000 kg / 9.4 x 10^5 kg Correct answer with no working scores full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	An answer that includes the following points: • more (cutlery) can (constantly) be made from avocado seeds (1) • as avocados are {continually being grown / can be grown by future generations} (1)	Accept carbon neutral / lower carbon emissions (than oil-based plastic production) / biodegradable Accept as avocado seeds are waste products	**(2)**

Question Number	Answer	Additional guidance	Mark
5(a)(i)	An answer that includes the following points: • at least two curved cisternae drawn (without ribosomes or interconnections) (1) • vesicle drawn (1) • cisternae labelled (1) • second correct label (1)	<u>Example of diagram</u>  	**(4)**

Question Number	Answer	Mark
5(a)(ii)	The only correct answer is C two *A is not correct because the Golgi apparatus is involved in the formation of extracellular enzymes and modification of proteins* *B is not correct because the Golgi apparatus is involved in the formation of extracellular enzymes and modification of proteins* *D is not correct because the Golgi apparatus does not form peptide bonds*	**(1)**

Question Number	Answer	Mark
5(a)(iii)	The only correct answer is D ribosomes *A is not correct because the ribosomes would become radioactive first* *B is not correct because the ribosomes would become radioactive first* *D is not correct because the ribosomes would become radioactive first*	**(1)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	• 120(%) / 54.5(%) / 54(%) / 55(%)	Example of calculation $\frac{0.5 - 1.1}{0.5} \times 100$	**(1)**

Question Number	Answer	Mark
5(b)(ii)	The only correct answer is B interphase *A is not correct because the Golgi apparatus would increase in size in interphase* *C is not correct because the Golgi apparatus would increase in size in interphase* *D is not correct because the Golgi apparatus would increase in size in interphase*	**(1)**

Question Number	Answer	Additional guidance	Mark
5(b)(iii)	An answer that makes reference to four of the following points: • mitosis / two cells formed from one cell (1) • therefore {number / size} of Golgi (in each cell) has to increase (in interphase / G1) (1) • to provide enough cell {contents / organelles} for two (daughter) cells (after mitosis has occurred) (1) • because increased {protein synthesis / protein modification / gene expression} will occur (in interphase) (1) • because named protein(s) are required (by the cell) (1)	Accept relationship between {number/size} of Golgi and level of protein synthesis e.g. enzymes, hormones, structural proteins	**(4)**

Question Number	Answer	Additional guidance	Mark
6(a)	An explanation that includes four of the following points: • cortical granules are released (from the egg cell) (1) • cortical granules fuse with the {zona pellucida / egg cell membrane} (1) • cortical granules release {chemicals / enzymes / proteins} to cause the hardening of zona pellucida (1) • prevents more than one sperm (cell) entering the egg cell (1) • egg cell and sperm nuclei are haploid and they fuse (during fertilisation) (1)	ACCEPT prevents polyspermy	**(4)**

Question Number	Answer
***6(b)**	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>length of middle region</u> • increased length of mid region size increases swimming speed (I) • due to more mitochondria supplying more {energy/ ATP} to move the flagella (I) • increased chance of that male's sperm {reaching the egg cell(s) first / fertilising the egg cell(s)} / reproductive success for that male} (R) • selection pressure / males with alleles for longer mid sections will have an advantage over other males (R) • more offspring will {have the same father/ inherit same alleles} (G) • leading to possible reduction in genetic diversity (G) • many males and many egg cells could lead to an increased genetic diversity of offspring (G) <u>spermatophore</u> • spermatophore contains sperm cells for fertilisation of egg (I) • nutrients will be used by female to produce {egg cells with more nutrients / more egg cells} (R) • {chemicals / pheromones} reduce chances of other males mating with the female (R) • increased chance of that male's sperm {reaching the egg cells(s) first / fertilising the egg cell(s)} / reproductive success for that male} (R) • more offspring will {have the same father/ inherit same alleles} (G) • leading to possible reduction in genetic diversity (G) <u>storage of sperm</u> • {fertilised eggs / offspring} can be produced in absence of a mate (I) • increased reproductive success for {that female / males that mated} (R) • increased chance that offspring will {have different father/ inherit different alleles} (G) • leading to possible increase in genetic diversity (G) • not mating with (new) males every year could reduce genetic diversity (G) **(6)**

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	Limited number of the most important or relevant scientific factors from the data/information provided are synthesised. No judgement is made.	1 mark – either R or G for one mating strategy 2 marks – either R+G for one mating strategy OR either R or G for two mating strategies OR 1 mark - basic information (I) given 2 marks - basic information (I) given + 1 or 2 x {R or G}
Level 2	3-4	Some of the most important or relevant scientific factors from the data/information provided are synthesised. A limited accurate judgement is made.	3 marks – 3 x (R or G) considered 4 marks = 4 x (R or G) considered
Level 3	5-6	Most of the important or relevant scientific factors from the data/information provided are synthesised. A detailed and accurate judgement is made.	5 marks = either reproductive success for all strategies considered plus genetic diversity of two strategies considered OR genetic diversity for all strategies considered plus reproductive success of two strategies considered 6 marks genetic diversity and reproductive success considered for all strategies

Question Number	Answer	Additional guidance	Mark
7(a)	A calculation in which: • total population of Santa Cruz in 2020 calculated (1) • total population of Santa Cruz in 2025 calculated (1) • population given to whole number (1)	<u>Example of calculation</u> (17000÷85) × 100 = 20 000 20 000× 1.064^5 =27 273.3 / 27 273.328 / 27 273.33 {27 273 / 27 000} Correct answer with no working scores full marks ecf applies {26400 / 26000} = 2 marks	**(3)**

Question Number	Answer	Additional guidance	Mark
7(b)	• positive correlation between the number of recorded non endemic species and the number of tourists increased	ACCEPT number of recorded non endemic species increased as the number of tourists increased	**(1)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>7(c)(i)</td><td>A calculation in which:

• N(N-1) correctly calculated (1)

• ∑n(n-1) correctly calculated (1)

• correct substitution to obtain D to 1 d.p. (1)</td><td><u>Example of calculation</u>

(147 x 146) = 21462

4684

4.6
(4.58 = 2 marks)

<table>
<tr><th>Species</th><th>Number of individuals (n)</th><th>(n-1)</th><th>n(n-1)</th></tr>
<tr><td>A</td><td>21</td><td>20</td><td>420</td></tr>
<tr><td>B</td><td>2</td><td>1</td><td>2</td></tr>
<tr><td>C</td><td>4</td><td>3</td><td>12</td></tr>
<tr><td>D</td><td>13</td><td>12</td><td>156</td></tr>
<tr><td>E</td><td>54</td><td>53</td><td>2862</td></tr>
<tr><td>F</td><td>15</td><td>14</td><td>210</td></tr>
<tr><td>G</td><td>6</td><td>5</td><td>30</td></tr>
<tr><td>H</td><td>32</td><td>31</td><td>992</td></tr>
<tr><td></td><td>Total (N)=147</td><td></td><td>∑n(n-1)=4684</td></tr>
</table>

Correct answer with no working scores full marks
ECF applied</td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional guidance	Mark
7(c)(ii)	An answer that includes five of the following points: • reduction in biodiversity (1) • as forest is habitat for many species of plants (1) • (because) populations will decrease because loss of forest will result in {reduced habitat for animals / reduced food} / increased competition between (animal) species} (1) • causing reduction in species richness (1) • (because) loss of forest will result in reduction of genetic diversity (1) • (due to) reproduction in {smaller / isolated} populations (1)	Accept possible increase in species that have blackberry as part of food chain Accept reduction in forest habitat (for many species unqualified) / blackberry {outcompetes (the forest) plants / introduces disease} Accept animals not adapted to feed on blackberry / blackberry is poisonous to the animals Accept descriptions of what animals would compete for e.g. nesting sites Accept reduction in gene pool	**(5)**

Question Number	Answer	Additional guidance	Mark
8(a)	An answer that includes at least one similarity and one difference: similarities: • both contain membrane bound organelles (1) • both contain a {cell membrane / cell wall} (1) max 2 differences: • plant cell wall is composed of cellulose whereas a fungal cell wall is composed of chitin (1) • fungal cells contain glycogen granules whereas plant cells contain {starch grains / amyloplasts} (1) • plant cells contain {chloroplasts / plasmodesmata / tonoplast} whereas fungal cells do not (1)	ACCEPT named organelle(s) e.g. nucleus, mitochondria, 80S ribosomes etc ACCEPT both contain DNA associated with histones (1) ACCEPT fungal cells contain lysosomes whereas plant cells do not / plant vacuole may be larger than fungal vacuole	**(3)**

Question Number	Answer	Additional guidance	Mark
8(b)(i)	An explanation that makes reference to four of the following points: • reduction in growth (1) and any three from: • due to reduced {cell division / mitosis} (1) • reduced gene expression will cause reduction in {enzyme/ protein} production (1) • reduced phospholipids which are needed for (growth of) {cell / organelle} membranes (in daughter cells) (1) • reduced transport of sucrose (around the plant) in the phloem / reduced sucrose available for other plant cells (1)	ACCEPT reduced DNA synthesis results in fewer cells in S phase / not enough DNA produced for mitosis to occur ACCEPT named enzyme e.g. DNA polymerase ACCEPT correct examples of sucrose use by plant e.g. reduced {respiration / ATP production}	**(4)**

Question Number	Answer
***8(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</u> • infection with fungus results in increased {tannin/ flavonoid} production • increasing the concentration of tannin reduces the leaf damage from herbivores • negative correlation / linear decrease • increasing the concentration of flavonoids increases the diameter of inhibition zone • doubling the concentration of flavonoids increases the diameter of inhibition zone by 28.6% <u>Plant</u> • explanation of how tannins reduce leaf damage e.g. herbivores don't like the taste / toxic / poisonous therefore less likely to eat the plant (A) • more leaves for photosynthesis and therefore increased growth (A) • explanation of what the diameter of inhibition zone shows = link to bactericidal/ bacteriostatic effect of flavonoids (A) • reduced plant infections (A) • link to why reduced herbivory and reduced plant infection benefits the infected plant e.g. fewer resources goes into growing new leaves and more can go into sexual reproduction (A) • disadvantage for plant – increased fungal growth (D) • more resources required {to produce tannins / for gene expression} instead of being used for {growth / sexual reproduction} (D) <u>Fungus</u> • link to why reduced herbivory benefits the fungus e.g. reduced competition for plant resources from herbivores, more plant resources available to fungus (A) • link to why reduced plant infection benefits the fungus e.g. reduced competition for plant resources from {bacteria / other fungi} (A) • reduced resources for fungus from plant as more used to synthesise tannins / flavonoids (D)

	• the fungus might only be able to {influence / live in / complete life cycle in} darnel plants (D) **(6)**		
			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Information from one section
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts/concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	level one content plus consideration of advantage(s) and / or disadvantage(s) 3 marks = L1+ one from {FA / FD / PA / PD} 4 marks = L1+ two from {FA / FD / PA / PD} FA = fungal advantage FD = fungal disadvantage PA = plant advantage PD = plant disadvantage
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts. Consequences are discussed which are supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Information from three sections applied to the given context showing a good understanding of the advantages and disadvantages to the infected plant and to the fungus 5 marks = L2 + three from {FA / FD / PA / PD} 6 marks – all four of {FA / FD / PA / PD} discussed

Question Number	Answer	Additional guidance	Mark
8(b)(iii)	A description that includes reference to the following points: • (flavonoid drug) tested on small numbers of patients with {*P. aeruginosa* / lung infection} (1) • use of double-blind trial (1)	ACCEPT tested on {100 to 500} of patients with {*P. aeruginosa* / lung infection} ACCEPT placebo / established drug treatment	**(2)**

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