



# Mark Scheme (Results)

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Pearson Edexcel International  
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in Biology (WBI02) 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	Mark
1(a) (i)	B - a chloroplast ;	(1)

Question Number	Answer	Mark
1(a)(ii)	D - stroma ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)	1. double membrane / envelope / eq ; 2. ribosomes ; 3. idea that some (internal) membranes folded ; 4. plasmid (of DNA) / circular DNA / loop of DNA / eq ;	1. ACCEPT 'double cell membrane' 2. IGNORE reference to size of ribosome 4. NOT just DNA or genetic material – must refer to the type of DNA	(3)

Question Number	Answer	Additional Guidance	Mark
1(c)	eukaryotic cells have membrane bound organelles  OR  prokaryotic cells do not have membrane bound organelles ;		<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	cell OR cells in first box <b>AND</b> organ OR organs in third box ;		(1)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	1. idea that the drug may have an effect on other tissues ; 2. idea of needing to find out effects on { organs / systems / whole organism } ; 3. idea of drug metabolism ; 4. idea of finding out whether drug is { safe / toxic } ;	3. e.g. absorption, breakdown and excretion of the drug 4. NOT side effects	(3)

Question Number	Answer	Mark
2(b)(i)	D – phase 3 tests ;	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	Any <b>TWO</b> from: age / gender / health / family history / lifestyle / level of exercise ; ;	ACCEPT sex as an alternative to gender ACCEPT two correct answers on the same line	(2)

Question Number	Answer	Additional Guidance	Mark
2(c)	<ol style="list-style-type: none"> <li>1. (Withering) less reliable / contemporary protocol more reliable ;</li> <li>2. (because) small(er) number of patients tested / large(r) number of patients tested with contemporary protocol / eq ;</li> <li>3. idea of no {double-blind trial / comparison with placebo } ;</li> </ol>	Ignore references to ways of making the investigation valid.	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
<b>3(a)(i)</b>	1. idea that female plant is the source of the { cuttings / tissue samples / explants } ; 2. idea that all the plants produced would be {genetically identical / clones / produced by mitosis / produced asexually } ;	1. Must refer to female plant	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
<b>3(a)(ii)</b>	1. (male plants) needed for { fertilisation / pollination / sexual reproduction } ; 2. idea of { maintaining / increasing } { genetic variation / genetic diversity } ;		<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
<b>3(b)(i)</b>	1. sterilisation to kill { microbes / microorganisms / bacteria / fungi / moulds / pathogens } ; 2. use of sealed containers to prevent entry of { contaminants / microbes / microorganisms / bacteria / fungi / moulds / pathogens } ;	1. ACCEPT description of method of sterilisation e.g. use of disinfectant to kill bacteria	<b>(2)</b>



Question Number	Answer	Additional Guidance	Mark
<b>3(b)(ii)</b>	<ol style="list-style-type: none"> <li>1. idea that microorganisms could cause disease in explant ;</li> <li>2. idea of competition for { nutrients / minerals } (in growth medium) ;</li> <li>3. idea of { reducing growth of / killing } explant ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT reference to pathogenic unless referring to humans ACCEPT reference to toxins</li> <li>3. ACCEPT reference to adverse effects on development of explant</li> </ol>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark												
3(b)(iii)	<ol style="list-style-type: none"> <li>1. idea of increased percentage of explants developing shoots (from 0.3 or 10.0 to 30.0 (mg dm<sup>-3</sup> ) ;</li> <li>2. little difference from 0.3 to 10.0 (mg dm<sup>-3</sup>) / eq ;</li> <li>3. idea of decrease from 30.0 (mg dm<sup>-3</sup>) ;</li> <li>4. idea of optimum concentration being 30.0 (mg dm<sup>-3</sup>) ;</li> <li>5. correct manipulation of data to support other marking points ;</li> </ol>	<p>2. constant from 1.0 to 10.0</p> <p>5.</p> <table border="1"> <thead> <tr> <th>range / mg dm<sup>-3</sup></th> <th>Difference (%)</th> </tr> </thead> <tbody> <tr> <td>(mp1) 0.3 to 30.0</td> <td>20</td> </tr> <tr> <td>(mp1) 10.0 to 30.0</td> <td>14</td> </tr> <tr> <td>(mp2) 0.3 to 1.0 /3.0 / 10.0</td> <td>6</td> </tr> <tr> <td>(mp3) 30.0 to 300.0</td> <td>61</td> </tr> <tr> <td>(mp3) 30.0 to 100.0</td> <td>54</td> </tr> </tbody> </table>	range / mg dm <sup>-3</sup>	Difference (%)	(mp1) 0.3 to 30.0	20	(mp1) 10.0 to 30.0	14	(mp2) 0.3 to 1.0 /3.0 / 10.0	6	(mp3) 30.0 to 300.0	61	(mp3) 30.0 to 100.0	54	<b>(3)</b>
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Question Number	Answer	Additional Guidance	Mark
3(c)	1. increasing the number of cells / eq ;  2. idea of this being a result of { cell division / mitosis } ;  3. cells increase in size during { G1 / G2 / growth } phases ;	1. ACCEPT reference to production of daughter cells  2. Must be linked to increased cell number (mp1)	(2)

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	<ol style="list-style-type: none"> <li>idea that up to 0.10 (kg per tree) causes an increase in mass of oranges ;</li> <li>idea of { little / eq } change above 0.10 (kg per tree) / no change from 0.10 to 0.20 (kg per tree) ;</li> </ol>		(2)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	<ol style="list-style-type: none"> <li>21 and 44 identified from graph correctly ;</li> <li>23 divided by 21 / 1.09 ;</li> <li>109.52 / 109.5 / 110 ;</li> </ol>	<p>All 3 marks for correct answer</p> <p>2. Allow mp2 only for correct calculation if incorrect figures used from graph</p>	(3)

Question Number	Answer	Additional Guidance	Mark
4(a)(iii)	<ol style="list-style-type: none"> <li>no data between { 0.1 and 0.2 / 0.2 and 0.3 } ;</li> <li>optimum may be anywhere between { 0.1 and 0.2 / 0.2 and 0.3 / 0.1 and 0.3 } ;</li> <li>idea that the mean mass of oranges suggests 0.3 (kg per tree) is optimum ;</li> </ol>		(2)

Question Number	Answer	Additional Guidance	Mark
4(b)	<ol style="list-style-type: none"> <li>1. idea of { magnesium / nitrate } used for production of chlorophyll ;</li> <li>2. chlorophyll used for photosynthesis / eq ;</li> <li>3. idea that an increase in photosynthesis leads to increased yield ;</li> <li>4. idea of nitrate used in production of { amino acids / protein / ATP / DNA / RNA } ;</li> <li>5. idea that more { amino acids / protein / ATP / DNA / RNA } increases growth / eq ;</li> </ol>		<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
4(c)	<ol style="list-style-type: none"> <li>1. photosynthesis ;</li> <li>2. turgor / turgid / support ;</li> <li>3. transport / solvent / medium for chemical reactions ;</li> <li>4. cooling ;</li> <li>5. hydrolysis ;</li> </ol>	ACCEPT two correct marks on the same line	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	1. idea of group of similar cells ; 2. idea of these cells working together for a common function ;	1. ACCEPT one cell type	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	sclerenchyma (tissue /fibre) ;	ACCEPT phonetically recognisable spelling	(1)

Question Number	Answer	Mark
5(a) (iii)	C – middle lamella ;	(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. lignin ; 2. (hemi) cellulose ;	ACCEPT two correct answers on the same line 2. ACCEPT 'cellulose fibres' or 'cellulose microfibrils' IGNORE pectin	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. reference to cellulose microfibrils ; 2. idea of microfibrils parallel to one another in layers (for flexibility) ; 3. idea of mesh of microfibrils in secondary cell wall (for strength) ; 4. idea of cellulose microfibrils embedded in { pectin / pectate } ;	3. ACCEPT 'criss cross' or 'laid at different angles' in the secondary cell wall	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
6(a)	Galapagos penguins <b>only</b> in the Galapagos Islands  OR  Emperor penguins <b>only</b> in Antarctica ;		(1)

Question Number	Answer	Mark
6(b)	B - having a small surface area to volume ratio to reduce heat loss ;	(1)

Question Number	Answer	Mark
6(c)(i)	D ;	(1)

Question Number	Answer	Mark
6(c)(ii)	B ;	(1)



Question Number	Answer	Additional Guidance	Mark
6(c)(iii)	<p>1. idea that the more (sequences) in common the { closer the relationship / more closely related } ;</p> <p>With evidence from any <b>TWO</b> of the following</p> <p>2. DNA profiling / eq ;</p> <p>3. sequences of bases (in RNA or DNA) ;</p> <p>4. proteomics / amino acid sequences / eq ;</p>	1. ACCEPT converse statement.	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
6(d)	<p><b>(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> <ol style="list-style-type: none"> <li>1. geographical isolation ;</li> <li>2. idea of variation within penguin population ;</li> <li>3. idea of mutations producing new alleles ;</li> <li>4. description of relevant selection pressure e.g. very cold temperature ;</li> <li>5. allele for a described beneficial feature e.g. body shape ;</li> <li>6. idea of those with beneficial { phenotypes / features / alleles } survive to breed ;</li> <li>7. idea of those individuals passing on beneficial alleles to next generation ;</li> <li>8. idea of increased frequency of advantageous allele over time ;</li> </ol>	<p><b>QWC emphasis clarity of expression</b></p> <p>5. Do not accept genes</p>	<p><b>(5)</b></p>

Question Number	Answer	Additional Guidance	Mark
<b>7(a)</b>	1. use of { stud books / DNA profiles / eq } (to select mates) ; 2. exchange of animals between zoos / eq ; 3. idea of { reducing inbreeding / encouraging outbreeding } ; 4. prevention of genetic drift / eq ; 5. introduction of alleles from other populations / eq ;	1. ACCEPT 'breeding records'  2. ACCEPT reference to exchange of eggs or sperm between zoos	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
<b>7(b)(i)</b>	1. idea that mitochondria provide { energy / ATP } ; 2. reference to (aerobic) respiration ; 3. (therefore) flagellum unable to move / sperm unable to swim / chances of fertilisation reduced / eq ;	ACCEPT converse points for mp1 and mp2 e.g. damaged mitochondria do not provide ATP  3. ACCEPT tail for flagellum	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	<p><b>(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> <ol style="list-style-type: none"> <li>1. <i>acrosome</i> contains { <i>acrosin</i> / <i>digestive enzyme</i> / <i>eq</i> } ;</li> <li>2. <i>acrosome</i> cannot fuse with cell surface <i>membrane</i> of sperm ;</li> <li>3. (<i>acrosin</i> / <i>enzyme</i>) cannot be released ;</li> <li>4. by <i>exocytosis</i> ;</li> <li>5. idea that the sperm cell cannot penetrate the <i>zona pellucida</i> / <i>zona pellucida</i> not { <i>digested</i> / <i>broken down</i> } ;</li> </ol>	<p><b>QWC emphasis on spelling</b></p> <ol style="list-style-type: none"> <li>1. ACCEPT <i>hydrolytic enzyme</i> or <i>hydrolase</i></li> <li>2. ACCEPT plasma membrane</li> <li>5. ACCEPT “jelly layer”</li> </ol>	<p><b>(4)</b></p>

Question Number	Answer	Additional Guidance	Mark
8(a)	<ol style="list-style-type: none"> <li>1. idea that risk increases as number of cigarettes smoked (per day) increases ;</li> <li>2. idea that risk increases as the number of years of smoking increases ;</li> <li>3. identification of a point that does not fit the pattern ;</li> </ol>	<p>ACCEPT converse arguments for 1 and 2</p> <p>3. e.g. 10-19 OR 20+ cigarettes per day at less than 20 years OR 40-49 years of smoking ;</p>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
8(b)	lung cancer caused by a genetic factor ;	<p>e.g. risk of lung cancer can be inherited or increased by genes or genotype</p> <p>Do not award mark if environment is also given as a factor</p>	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
8(c)(i)	<ol style="list-style-type: none"> <li>1. idea that identical twins have the same genotype ;</li> <li>2. idea that any differences between identical twins would be due to environmental factors ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT same alleles, NOT 'same genes' or 'same genetic material' or 'same genetic make up' or 'same DNA'</li> </ol>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
8(c)(ii)	<ol style="list-style-type: none"> <li>1. both genotype and environment contribute ;</li> <li>2. (evidence for genetic contribution) a higher concordance for identical than non-identical (twins) ;</li> <li>3. evidence to support environmental contribution e.g. identical twins do not show 100% concordance ;</li> <li>4. idea that environmental contribution is greater than genetic contribution ;</li> <li>5. evidence for greater environmental contribution such as low concordance values :</li> </ol>		<b>(4)</b>

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