

# Mark Scheme (Results)

Summer 2013

GCE Biology (6BI02)

Paper: 01R

Unit 2: Development, Plants and the Environment

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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.

### Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Additional Comments	Mark
1(a)	animal ; bacterial ; (surface) membrane ; animal ; plant ; bacterial ; ribosomes ;	ACCEPT prokaryote instead of bacterial	(7)

Question Number	Answer	Additional Comments	Mark															
1(b)	<table border="1"> <thead> <tr> <th>A cellulose molecule contains</th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>Beta (<math>\beta</math>) glucose</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>1,4- glycosidic bonds</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>1,6- glycosidic bonds</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Magnesium atoms</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table>	A cellulose molecule contains	True	False	Beta ( $\beta$ ) glucose	<input checked="" type="checkbox"/>		1,4- glycosidic bonds	<input checked="" type="checkbox"/>		1,6- glycosidic bonds		<input checked="" type="checkbox"/>	Magnesium atoms		<input checked="" type="checkbox"/>		(4)
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Question Number	Answer	Additional Comments	Mark
2 (a)	<ol style="list-style-type: none"> <li>1. idea of testing on non-humans e.g. animals, tissue culture ;</li> <li>2. to test for toxicity / eq ;</li> <li>3. idea of testing on healthy volunteers ;</li> <li>4. to test for side effects / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>3. ACCEPT 'people without the disease' NOT 'healthy patients'</li> </ol>	(3)

Question Number	Answer	Additional Comments	Mark
2 (b)	<ol style="list-style-type: none"> <li>1. Idea of tested on two groups of patients (with the condition) ;</li> <li>2. reference to use of placebo ;</li> <li>3. (placebo) used as a {control / comparison} with the actual drug ;</li> <li>4. reference to psychological effect of placebo / eq ;</li> <li>5. idea that neither testers nor patients know if the treatment contains the drug or not ;</li> <li>6. idea that this removes bias ;</li> <li>7. idea of testing to find out if drug is effective ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT some patients given drug and some given placebo</li> <li>3. ACCEPT dummy pill, sugar pill, fake pill</li> </ol>	(4)

Question Number	Answer	Additional Comments	Mark
3 (a)(i)	<input checked="" type="checkbox"/> B metaphase ;		(1)

Question Number	Answer	Additional Comments	Mark
3 (a)(ii)	1. reference to {chromosomes / chromatids} ; 2. at {centre/middle/equator} (of cell) / on the metaphase plate ;		(2)

Question Number	Answer	Additional Comments	Mark
3 (b)	<input checked="" type="checkbox"/> B interphase ;		(1)

Question Number	Answer	Additional Comments	Mark
3 (c)	<p>QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. <i>telophase</i> ;</li> <li>2. <i>chromosomes</i> {<i>decondense</i> / eq } ;</li> <li>3. <i>spindle</i> (fibres) break down / eq ;</li> <li>4. <i>nuclear</i> { <i>membrane</i> / <i>envelope</i> } reforms / eq ;</li> <li>5. two <i>nuclei</i> present /eq ;</li> <li>6. <i>nucleoli</i> reform / eq ;</li> <li>7. each cell will have <i>centrioles</i> ;</li> <li>8. idea of <i>cytokinesis</i> ;</li> </ol>	<p>QWC emphasis is spelling</p> <p>2. NOT chromatids</p> <p>8. NOT '2 new cells' (it is in the stem of the Question) ACCEPT forms cleavage furrow</p>	(4)

Question Number	Answer	Additional Comments	Mark
4(a)(i)	<p>1. Idea that temperature is a controlled variable / idea that temperature could affect {results / length of pollen tube} ;</p> <p>2. idea that (pollen tube) { growth / enzymes / proteins /eq } affected by temperature ;</p> <p>3. idea that the investigation is valid ;</p>	<p>1. NOT as a control</p> <p>3. NOT reliable IGNORE fair test, accurate, precise</p>	(2)

Question Number	Answer	Additional Comments	Mark																		
4(a)(ii)	<p>1. idea of increase from { 0/1 } to 10 (<math>\mu\text{g dm}^{-3}</math>) ;</p> <p>2. greatest length at 10 (<math>\mu\text{g dm}^{-3}</math>)/ greatest increase between 1 and 10 (<math>\mu\text{g dm}^{-3}</math>) ;</p> <p>3. idea of decrease between { 10/50 } and 200 (<math>\mu\text{g dm}^{-3}</math>) ;</p> <p>4. shorter at 200 (<math>\mu\text{g dm}^{-3}</math>) compared with 0 / eq ;</p> <p>5. idea of greatest {change / drop} between 100 and 200 (<math>\mu\text{g dm}^{-3}</math>) ;</p> <p>6. credit correct manipulation of the data (e.g. change in length in <math>\mu\text{m}</math> calculated by subtraction), e.g. decreases by 76 <math>\mu\text{m}</math> between 100 and 200 <math>\mu\text{g dm}^{-3}</math> ;</p>	<p>IGNORE UNITS</p> <p>2. 'Greatest increase between 1 and 10' scores mp1 as well as mp2</p> <p>6. Other examples:</p> <table border="1"> <thead> <tr> <th>Conc. change</th> <th>Difference (<math>\mu\text{m}</math>)</th> </tr> </thead> <tbody> <tr> <td>0-1</td> <td>22</td> </tr> <tr> <td>0-10</td> <td>75</td> </tr> <tr> <td>1-10</td> <td>53</td> </tr> <tr> <td>10-50</td> <td>-39</td> </tr> <tr> <td>10-200</td> <td>-135</td> </tr> <tr> <td>50-100</td> <td>-20</td> </tr> <tr> <td>100-200</td> <td>-76</td> </tr> <tr> <td>0-200</td> <td>-60</td> </tr> </tbody> </table>	Conc. change	Difference ( $\mu\text{m}$ )	0-1	22	0-10	75	1-10	53	10-50	-39	10-200	-135	50-100	-20	100-200	-76	0-200	-60	(3)
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Question Number	Answer	Additional Comments	Mark
4(a)(iii)	mitosis / nuclear division / DNA synthesis ;		(1)



Question Number	Answer	Additional Comments	Mark
4 * (b)	<p>QWC- Spelling of technical terms must be correct and the answer must be organised in a logical sequence</p> <ol style="list-style-type: none"> <li>1. idea that generative nucleus divides to form two male gametes ;</li> <li>2. by mitosis ;</li> <li>3. pollen tube fuses with embryo sac / eq ;</li> <li>4. reference to double fertilisation ;</li> <li>5. (one) male { gamete / nucleus } fuses with egg (cell) <u>nucleus</u> ;</li> <li>6. to produce diploid zygote;</li> <li>7. other male nucleus fuses with two polar nuclei ;</li> <li>8. to produce triploid endosperm ;</li> </ol>	<p>QWC emphasis on logical sequence</p> <ol style="list-style-type: none"> <li>1. ACCEPT 'haploid' for 'male' and 'nuclei' for 'gametes'</li> <li>5. NOT ovule</li> <li>7. ACCEPT fusion nucleus, NOT polar bodies</li> </ol>	(4)

Question Number	Answer	Additional Comments	Mark
4 (c)	<ol style="list-style-type: none"> <li>1. reference to both { independent / random } assortment and { crossing-over/chiasma(ta) } ;</li> <li>2. independent assortment gives rise to {new / different / eq} combinations of (paternal and maternal) chromosomes ;</li> <li>3. crossing over involves swapping of {sections / eq} of {chromatids / chromosomes} ;</li> </ol>	<ol style="list-style-type: none"> <li>3. NOT swapping genes ACCEPT new combinations of alleles (on a chromosome) / correct reference to recombinants</li> </ol>	(2)

Question Number	Answer	Additional Comments	Mark
5(a)	1. prevent { contamination by / entry of } bacteria / eq ; 2. idea of maintaining humid conditions ; 3. consequence of either on growth of cotton plants, e.g. competition or infection by bacteria, pathogenic bacteria, less water available for growth of plant ;	1. ACCEPT microorganisms, fungi  3. ACCEPT harmful to humans or plant	(2)

Question Number	Answer	Additional Comments	Mark
5(b)	1. { one parent / same plant / eq } used ; 2. no { fertilisation / gametes / meiosis } involved ; 3. reference to mitosis / asexual reproduction ;	2. ACCEPT no sexual reproduction  3. ACCEPT clones. IGNORE somatic and stem cells	(2)

Question Number	Answer	Additional Comments	Mark
5(c) (i)	1. as BAP increases, the percentage of explants with new shoots decreases / eq ; 2. idea of little change from 0.5 to 1.0 (mg dm <sup>-3</sup> ) ; 3. credit correct manipulation of the data ;	1. IGNORE descriptions of gradient. ACCEPT negative correlation  3. ACCEPT 73% decrease from <u>0- 1.5</u>	(3)

Question Number	Answer	Additional Comments	Mark
5(c) (ii)	<ol style="list-style-type: none"> <li>1. idea of both lines follow the same trend, e.g. little difference in effect between the two concentrations (of NAA) ;</li> <li>2. idea that at some BAP concentrations 1mg of NAA results in a { higher / lower } percentage, (therefore conclusion is valid) ;</li> <li>3. idea of differences being quantified, e.g. greatest difference is 12% or lowest is 3% ;</li> <li>4. comment on no evidence provided for variability in data /eq ;</li> </ol>	<p>IGNORE comments on method used for investigation</p> <p>4. no errors bars / no standard deviation / no mean</p>	(3)

Question Number	Answer	Additional Comments	Mark
5(d)	Totipotency ;		(1)

Question Number	Answer	Additional Comments	Mark
6(a)	<ol style="list-style-type: none"> <li>1. increasing mass increased the distance up to 150g ;</li> <li>2. { 150 to 200 g / after 150 g } the distance did not change ;</li> <li>3. idea that relationship is linear to 100(g) ;</li> <li>4. greatest change in 0 to 100 g range ;</li> </ol>	2. not 'line levels off on graph'	(3)

Question Number	Answer	Additional Comments	Mark
6(b)	<ol style="list-style-type: none"> <li>1. second fibre had { less tensile strength / greater elasticity } /eq ;</li> <li>2. different fibre { size /content / source }</li> </ol> <p>OR</p> <p>different environmental conditions e.g. temperature or humidity ;</p>	<ol style="list-style-type: none"> <li>1. IGNORE 'different' unqualified</li> <li>2. ACCEPT reference to width / length / mass / lignin content / age / part of plant fibres extracted from</li> </ol>	(2)

Question Number	Answer	Additional Comments	Mark
6(c)	<ol style="list-style-type: none"> <li>1. named fibre variable controlled e.g. length, width, mass ;</li> <li>2. environmental variable controlled, e.g. temperature, humidity ;</li> <li>3. named procedural variable controlled, e.g. size of masses used ;</li> <li>4. idea of adding masses until fibre breaks / eq ;</li> <li>5. repeat and find the { mean / average } ;</li> <li>6. reference to action taken in case of { anomalous result / outlier } ;</li> <li>7. reference to safety procedure ;</li> </ol>	4. ACCEPT 'measure the mass' that either 'breaks the fibre' or that 'the fibre can hold before breaking'	(5)

Question Number	Answer	Additional Comments	Mark
7(a)	<input checked="" type="checkbox"/> C Archaea, Bacteria and Eukarya ;		(1)

Question Number	Answer	Additional Comments	Mark
7(b) (i)	<ol style="list-style-type: none"> <li>published in { scientific paper / journal } / eq ;</li> <li>at a conference / presentation / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>IGNORE online, internet ACCEPT scientific magazine</li> </ol>	(2)

Question Number	Answer	Additional Comments	Mark
7(b) (ii)	<ol style="list-style-type: none"> <li>idea of peer review ;</li> <li>idea of repeating experiments to confirm or validate findings ;</li> </ol>	<ol style="list-style-type: none"> <li>must be an indication of further testing being carried out</li> </ol>	(2)

Question Number	Answer	Additional Comments	Mark
7 (c)	<ol style="list-style-type: none"> <li>idea that organisms with { specific / particular / shared / common / similar / eq } { characteristics / features / traits / eq } are placed in a group ;</li> <li>idea that taxonomic groups have specific differences ;</li> <li>idea that phylogeny describes {evolutionary / genetic} relationship ;</li> <li>idea that molecular phylogeny based on similarities in { DNA / DNA sequence / proteins / eq } ;</li> </ol>	<ol style="list-style-type: none"> <li>IGNORE gene sequence</li> </ol>	(4)

Question Number	Answer	Additional Comments	Mark
8 (a)	<input checked="" type="checkbox"/> C a species found in one geographical location ;		(1)

Question Number	Answer	Additional Comments	Mark
8 (b)	<ol style="list-style-type: none"> <li>1. idea that it is a small population, e.g. only two females ;</li> <li>2. with a small gene pool / eq ;</li> <li>3. and low genetic diversity / eq ;</li> <li>4. reference to inbreeding problems ;</li> <li>5. idea of difficulties in breeding, e.g. some may have been too old / ill / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>2. Must refer to original population. IGNORE reference to allele frequency.</li> <li>3. Must refer to original population. ACCEPT low genetic variation.</li> <li>4. NOT interbreeding</li> <li>5. IGNORE reference to lack of attraction between individual squirrels</li> </ol>	(3)

Question Number	Answer	Additional Comments	Mark
8 (c) (i)	<ol style="list-style-type: none"> <li>1. Highest value as 550 and lowest value as 200 ;</li> <li>2. Difference divided by 550, e.g. <math>350 \div 550</math> ;</li> <li>3. - 63.6(4)% or 63.6(4)% decrease ;</li> </ol>	<p>ACCEPT 63.6% or 64% for 2 marks</p> <p>ACCEPT correct final answer for 3 marks – must refer to decrease</p>	(3)

Question Number	Answer	Additional Comments	Mark
8 (c)(ii)	<ol style="list-style-type: none"> <li>1. number of middens fell / eq ;</li> <li>2. (therefore) population of squirrels fell ;</li> <li>3. reference to slight increase in population in 2004 ;</li> </ol>		(2)

Question Number	Answer	Additional Comments	Mark
8 (d)	<ol style="list-style-type: none"> <li>1. population (in the wild) falling ;</li> <li>2. loss of habitat as a results of fire ;</li> <li>3. breeding programme will increase numbers /eq ;</li> <li>4. idea that it would enable reintroduction to the wild ;</li> <li>5. idea of endemic to one specific area, e.g. endangered, not found elsewhere;</li> <li>6. idea of conserving species e.g. may face extinction ;</li> </ol>		(3)

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