



Mark Scheme (Results)

January 2016

Pearson Edexcel International  
Advanced Level  
in Biology (WBI02)  
Paper 01 - Development, Plants and  
the Environment

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## General Marking Guidance

- This mark scheme provides a list of acceptable answers for this paper. Candidates will receive credit for all correct responses but will be penalised if they give more than one answer where only one is required (e.g. putting an additional cross in a set of boxes). If a candidate produces more written answers than the required number (two instead of one, three instead of two etc), only the first answers will be accepted. Free responses are marked for the effective communication of the correct answer rather than for quality of language but it is possible that, on some occasions, the quality of English or poor presentation can impede communication and loose candidate marks. It is sometimes possible for a candidate to produce a written response that does not feature in the mark scheme but which is nevertheless correct. If this were to occur, an examiner would, of course, give full credit to that answer.
- 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.

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(a)(i)</b>	D eukaryotic and prokaryotic cells ;	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(a)(ii)</b>	B - plant cells only ;	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(a)(iii)</b>	B - eukaryotic cells only ;	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(a)(iv)</b>	A - animal cells only ;	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(b)(i)</b>	B - Golgi apparatus ;	(1)

Question Number	Answer	Additional Guidance	Mark
<b>1(b)(ii)</b>	<p>1. modification of { proteins / enzymes } ;</p> <p>2. detail of modification e.g. addition of carbohydrate, production of { glycoprotein / glycolipid } ;</p> <p>3. packaging of { proteins / enzymes } (by the Golgi apparatus) ;</p> <p>4. idea of production of { secretory vesicles / lysosomes } ;</p>	<p><b>2. ALLOW</b> addition of sugars or lipids, or reference to glycosylation</p>	<p>(3)</p>

Question Number	Answer	Additional Guidance	Mark
2(a)	tissues are groups of { one type of cell / similar cells } AND organs are groups of tissues ;	ALLOW 'tissues are made of one type of cell and organs are made of different types of cells	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)	1. increases number of cells / eq ; 2. production of { genetically identical cells / eq } ; 3. specialisation of cells (after cell division) / eq ; 4. replacement of damaged cells in tissues / repair of damaged tissues ;		(3)

Question Number	Answer	Mark
2(c)(i)	C - prophase, metaphase, anaphase, telophase ;	(1)

Question Number	Answer	Mark
2(c)(ii)	B - the nuclear envelope breaks down and the spindle is formed ;	(1)

Question Number	Answer	Additional Guidance	Mark
3(a)	{ $\beta$ - /beta } glucose ; (1,4) glycosidic ; hydrogen ; (cellulose) microfibrils ;	ACCEPT phonetically correct spellings	(4)
Question Number	Answer	Additional Guidance	Mark
3(b)	1. cotton ;  2. { lowest value for lignin / no lignin / 0 lignin } (which provides strength to cell walls) / eq ;		(2)
Question Number	Answer	Additional Guidance	Mark
3(c)(i)	1. calcium needed for { pectin / calcium pectate / eq } ;  2. idea of (pectin) holding { microfibrils / cellulose } in a matrix ;  3. reference to middle lamella ;	2. IGNORE glue	(2)

Question Number	Answer	Additional Guidance	Mark
*3(c)(ii)	<p><b>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> <p>1. description of controlled variable for wheat plants such as { source / parent / size / age /eq } ;</p> <p>2. description of range of at least five different calcium ion concentrations ;</p> <p>3. idea of ( soil / solution ) with same { pH / concentration of other mineral ions } ;</p> <p>4. description of two other environmental variables to be controlled ;</p> <p>5. idea of measuring { mass of grain / yield } ;</p> <p>6. reference to repeats { at each concentration / used to calculate mean values / eq } ;</p>	<p><b>(QWC emphasis on logical sequence)</b></p> <p>1. ACCEPT ref to seeds</p> <p>2. IGNORE units and a concentration of zero</p> <p>3. IGNORE nutrients</p> <p>4. ACCEPT temperature, light, humidity. IGNORE refs to time</p> <p>5. ACCEPT record mass of grain or yield</p>	(5)



Question Number	Answer	Additional Guidance	Mark
<b>4(a)</b>	<ol style="list-style-type: none"> <li>1. large group of { patients / people with migraine } ;</li> <li>2. description of a variable to be considered in group of patients selected ;</li> <li>3. divided into groups – one group given the (new) drug, other group not given the drug / eq ;</li> <li>4. neither patient nor { doctor / administrator /scientist / eq } knows who is in which group / eq ;</li> <li>5. description of placebo as inactive substance / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT 100-3000 patients</li> <li>2. e.g. age, gender, health, lifestyle</li> <li>3. ACCEPT other group given placebo/standard or previous treatment</li> </ol>	(4)

Question Number	Answer	Mark
<b>4(b)(i)</b>	A – 37% ;	(1)

Question Number	Answer	Additional Guidance	Mark
<b>4(b)(ii)</b>	<ol style="list-style-type: none"> <li>1. idea of little difference between placebo and sumatriptan in the first 15 minutes ;</li> <li>2. idea that with sumatriptan a larger percentage of patients are free of pain than with the placebo ;</li> <li>3. idea of little difference between 10 mg and 20 mg sumatriptan (at any point in time) ;</li> <li>4. manipulation of data to compare { concentrations of drug / drug and placebo } ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT any time quoted from 0-15 minutes</li> <li>2. ACCEPT sumatriptan has a <b>'better effect than placebo'</b></li> <li>4. e.g. at 120 minutes - 4% difference between 10mg and 20mg, 40% more patients pain free with 10mg than with the placebo, 36% more for 20mg</li> </ol>	(3)
Question Number	Answer	Additional Guidance	Mark
<b>4(b)(iii)</b>	<ol style="list-style-type: none"> <li>1. idea that with { no treatment / placebo } some patients are free of pain ;</li> <li>2. idea that sumatriptan provides more rapid relief than placebo / eq ;</li> <li>3. idea of 20mg being better in the first { 60 / 70 } minutes and 10mg better afterwards ;</li> <li>4. idea that the best dose is 10 mg ;</li> </ol>		(3)

Question Number	Answer	Additional Guidance	Mark
<b>5(a)</b>	1. measure species { richness / diversity index } /count number of species (in the forest); 2. idea of comparing before and after (habitat loss) ;	2. ACCEPT 'count again after a period of time'	(2)
Question Number	Answer	Additional Guidance	Mark
<b>5(b)</b>	1. large number of seeds { collected / stored } / seeds collected from { many /different } plants ; 2. ensures { variety of alleles / large gene pool / eq } (in seed collected) ;	1. ACCEPT 'many seeds' 2. IGNORE references to inbreeding	(2)

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	<ol style="list-style-type: none"> <li>1. after storage negative correlation described / eq ;</li> <li>2. after storage little difference if only dried for 15 minutes ;</li> <li>3. idea that, after storage, drying time of more than 60 minutes results in the largest decrease in germination ;</li> <li>4. idea that more than 60 minutes drying causes decrease in germination whether seeds are stored or not ;</li> <li>5. no germination (without or after storage) if dried for 300 minutes ;</li> <li>6. idea of optimum for germination success being 60 minutes drying without storing ;</li> </ol>	1. IGNORE reference to negative correlation without storage	(3)

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	<ol style="list-style-type: none"> <li>1. lower temperature / store at less than 22°C / eq ;</li> <li>2. lower humidity /store at less than 53% / eq ;</li> <li>3. description of reduced growth of { bacteria / fungi } / eq ;</li> <li>4. description of reduced { enzyme / metabolic } activity / eq ;</li> </ol>	IGNORE low temperature and low humidity	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)	totipotency / pluripotency ;	<b>ACCEPT</b> multipotency /totipotent / pluripotent / multipotent /	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)	<ol style="list-style-type: none"> <li>1. the { egg cell / female gamete } contains the { nucleus / genes } of the brown mouse ;</li> <li>2. alleles for brown fur are in the { egg cell / female gamete } ;</li> <li>3. the alleles for brown fur are dominant / (stem cell) homozygous dominant for brown fur ;</li> <li>4. idea of genetic material from { female parent / sterile mouse } not passed on to offspring ;</li> </ol>		(2)

Question Number	Answer	Additional Guidance	Mark
<b>6(c)</b>	1. haploid { nucleus / number of chromosomes } / eq ; 2. (haploid state) allows restoration of diploid number at fertilisation / eq ; 3. lipid { droplets / eq } to provides { energy / food } ; 4. cortical granules / eq ; 5. description of { cortical reaction / hardening of zona pellucida / eq } ;		(4)

Question Number	Answer	Additional Guidance	Mark
<b>6(d)</b>	1. meiosis produced { haploid nuclei / genetic variation } ; 2. independent assortment of chromosomes / { crossing over of chromatids / chiasmata } ; 3. resulting in recombination of alleles ; 4. { transcription / mRNA produced } at active genes / eq ; 5. translation of mRNA produced { protein / polypeptide } ; 6. production of { protein / enzyme } which determine { cell structure / function } ;	3. ACCEPT production of recombinants. IGNORE reference to mutations  5. ACCEPT enzyme  6. ACCEPT 'proteins modify the cells'	(4)

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	<ol style="list-style-type: none"> <li>1. idea of more than one gene for a single characteristic ;</li> <li>2. at { many / different } loci / eq ;</li> <li>3. cumulative effect on the phenotype / interaction of many genes ;</li> </ol>		(2)
Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	continuous ;		(1)
Question Number	Answer	Additional Guidance	Mark
7(a)(iii)	diet / temperature / competition / disease / day length ;	ACCEPT food or named nutrient such as protein, also ACCEPT malnutrition	(1)
Question Number	Answer	Additional Guidance	Mark
7(b)(i)	<ol style="list-style-type: none"> <li>1. correct figures selected – 42.57 and 51.61 ;</li> <li>2. difference between 42.57 and 51.61 correctly calculated as 9.04 ;</li> <li>3. difference divided by original mass multiplied by 100 / correct answer of 21.24% ;</li> </ol>	<p>Maximum of 2 marks if incorrect breed selected. Correct answer only gains 3</p> <p>3. ACCEPT 21.236 and 21.2 but not 21.3</p>	(3)

Question Number	Answer	Additional Guidance	Mark
<b>7(b)(ii)</b>	1. idea that at each time interval the mass of eggs is greater for Aseel hens;  2. idea that the { ranges / standard deviation figures } do not overlap ;	1. IGNORE larger eggs	(2)

Question Number	Answer	Additional Guidance	Mark
<b>7(b)(iii)</b>	1. idea of no eggs laid until at least 22 weeks ;  2. both increase (from 22 weeks) to 31 weeks / same at 30 weeks ;  3. idea that a higher percentage of Aseel hens lay eggs up to 31 weeks ;  4. idea that a higher percentage of Kadaknath hens lay eggs from 32 weeks ;  5. highest for Aseel at 31 weeks and for Kadaknath at 35 weeks ;  6. highest value is for Kadaknath hens (at 35 weeks);		(3)



Question Number	Answer	Additional Guidance	Mark
8(a)(i)	1. anatomical ; 2. physiological ; 3. behavioural ;		(2)

Question Number	Answer	Additional Guidance	Mark
*8(a)(ii)	<p><b>*(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> 1. idea of genetic variation within the species ; 2. mutations ; 3. reference to selection pressures / description of relevant selection pressure such as predation ; 4. reproductive or geographical isolation ; 5. the idea of alleles for beneficial { phenotypes / features } ; 6. idea of those with beneficial { alleles /features } surviving ; 7. idea of those individuals (breeding and) passing on beneficial alleles to next generation ; 8. idea of change in allele frequency over time ;	<p><b>QWC emphasis is clarity of expression</b></p> 5. IGNORE genes 6. e.g. number/size of eyespots. 8. ACCEPT 'frequency of beneficial alleles increases'	(5)

Question Number	Answer	Additional Guidance	Mark
8(b)	<ol style="list-style-type: none"><li data-bbox="383 304 1301 376">1. phenotype determined by genotype and the environment / eq ;</li><li data-bbox="383 411 1272 483">2. idea that the genotype may not be known e.g. may have different genotypes ;</li></ol>		(2)

