



Mark Scheme (Results)

Summer 2015

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

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk). Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

## **Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

Summer 2015

Publications Code IA040931\*

All the material in this publication is copyright

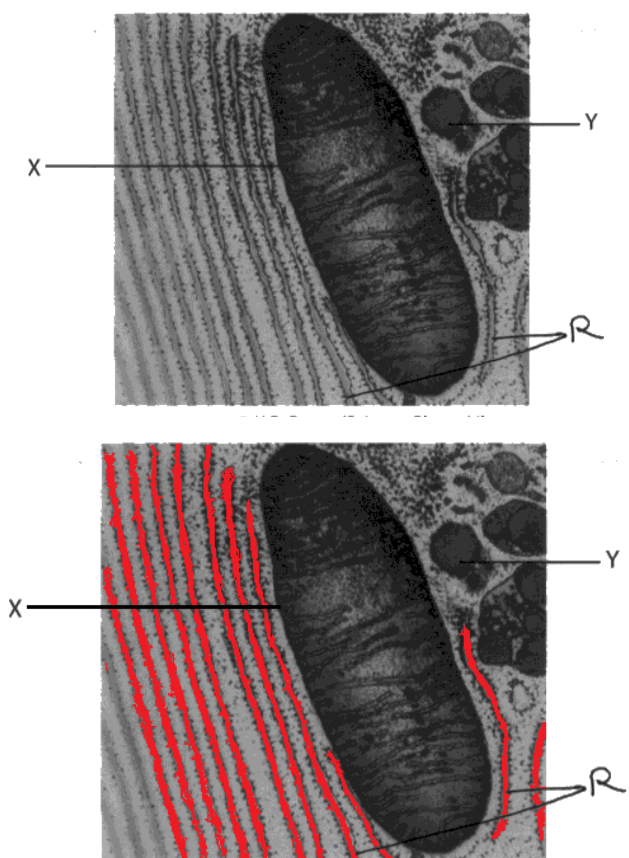
© Pearson Education Ltd 2015



## 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)	C - a mitochondrion ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(a) (ii)	rER correctly labelled ;	<p><u>example of correct response</u></p>  <p>The additional guidance section contains two electron micrographs. The top micrograph shows a mitochondrion (labeled C) and rough endoplasmic reticulum (rER). The rER is represented by a series of parallel lines with small dots (ribosomes) attached. The mitochondrion is a large, bean-shaped structure with internal folds (cristae). Labels X, Y, and R are present. The bottom micrograph is identical to the top one, but with red lines drawn over the rER to highlight it. Labels X, Y, and R are also present in the bottom micrograph.</p>	(1)

Question Number	Answer	Additional Guidance	Mark
1(b) (i)	<ol style="list-style-type: none"> <li>1. idea that ribosomes synthesise the { polypeptide / protein / eq } ;</li> <li>2. proteins { move into / transported through / eq } (the rER) ;</li> <li>3. protein is folded / forms {3-D shape / secondary structure / tertiary structure } ;</li> <li>4. idea that vesicles (containing the protein) are formed by rER ;</li> </ol>	<p><b>ACCEPT</b> reference to enzyme or a hormone instead of protein for MP1 to MP4</p> <ol style="list-style-type: none"> <li>1. <b>ACCEPT</b> ribosome as site of translation</li> <li>2. <b>ACCEPT</b> proteins move through cisternae</li> <li>3. <b>IGNORE</b> quaternary</li> <li>4. <b>IGNORE</b> secretory</li> </ol>	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
1(b) (ii)	<ol style="list-style-type: none"> <li>1. idea that these vesicles move from Golgi (body) to the cell (surface) membrane ;</li> <li>2. idea that the (secretory) vesicle fuses with cell (surface) membrane ;</li> <li>3. by exocytosis ;</li> </ol>	<ol style="list-style-type: none"> <li>3. <b>NOT</b> <u>both</u> exocytosis and endocytosis</li> </ol>	<b>(2)</b>

Question Number	Answer	Mark
2(a) (i)	B - centromeres ;	(1)

Question Number	Answer	Mark
2(a) (ii)	A - anaphase ;	(1)

Question Number	Answer	Mark
2(a) (iii)	D - telophase ;	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)	<ol style="list-style-type: none"> <li>1. removal of { last 5-10 mm of root tips / (apical) meristem } ;</li> <li>2. idea of use of (hydrochloric) acid to { separate cells / break down middle lamella / break down pectin / macerate tissue / soften tissue / eq } ;</li> <li>3. addition of appropriate stain, e.g. toluidine (blue), orcein ;</li> <li>4. idea of heating slide to intensify the { colour / stain } ;</li> <li>5. idea of placing the root tip on microscope slide, covering and squashing (to separate the cells) ;</li> </ol>	<ol style="list-style-type: none"> <li>2. <b>ACCEPT</b> HCl</li> <li>3. <b>ACCEPT</b> Feulgens, Schiffs reagent, acetocarmine</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
2(c)	<ol style="list-style-type: none"> <li>1. anaphase ;</li> <li>2. idea that the smallest number of cells are at this stage ;</li> <li>3. number of cells at each stage is proportional to the duration of that stage <b>OR</b> idea that cells spend the shortest length of time at this stage ;</li> </ol>	<ol style="list-style-type: none"> <li>3. <b>ACCEPT</b> anaphase is the fastest / quickest stage</li> </ol>	<b>(3)</b>



Question Number	Answer				Additional Guidance	Mark																									
3(a)(i)	<table border="1"> <thead> <tr> <th data-bbox="398 244 689 352"></th> <th data-bbox="689 244 873 352">Cellulose only</th> <th data-bbox="873 244 1064 352">Starch only</th> <th data-bbox="1064 244 1265 352">Both starch and cellulose</th> <th data-bbox="1265 244 1417 352"></th> </tr> </thead> <tbody> <tr> <td data-bbox="398 352 689 427">Polymer of <math>\alpha</math>-glucose</td> <td data-bbox="689 352 873 427"></td> <td data-bbox="873 352 1064 427" style="text-align: center;"><input checked="" type="checkbox"/></td> <td data-bbox="1064 352 1265 427"></td> <td data-bbox="1265 352 1417 427">;</td> </tr> <tr> <td data-bbox="398 427 689 502">Polymer of <math>\beta</math>-glucose</td> <td data-bbox="689 427 873 502" style="text-align: center;"><input checked="" type="checkbox"/></td> <td data-bbox="873 427 1064 502"></td> <td data-bbox="1064 427 1265 502"></td> <td data-bbox="1265 427 1417 502">;</td> </tr> <tr> <td data-bbox="398 502 689 577">Contains 1,4 - glycosidic bonds</td> <td data-bbox="689 502 873 577"></td> <td data-bbox="873 502 1064 577"></td> <td data-bbox="1064 502 1265 577" style="text-align: center;"><input checked="" type="checkbox"/></td> <td data-bbox="1265 502 1417 577">;</td> </tr> <tr> <td data-bbox="398 577 689 652">Contains 1,6 - glycosidic bonds</td> <td data-bbox="689 577 873 652"></td> <td data-bbox="873 577 1064 652" style="text-align: center;"><input checked="" type="checkbox"/></td> <td data-bbox="1064 577 1265 652"></td> <td data-bbox="1265 577 1417 652">;</td> </tr> </tbody> </table>					Cellulose only	Starch only	Both starch and cellulose		Polymer of $\alpha$ -glucose		<input checked="" type="checkbox"/>		;	Polymer of $\beta$ -glucose	<input checked="" type="checkbox"/>			;	Contains 1,4 - glycosidic bonds			<input checked="" type="checkbox"/>	;	Contains 1,6 - glycosidic bonds		<input checked="" type="checkbox"/>		;		<b>(4)</b>
	Cellulose only	Starch only	Both starch and cellulose																												
Polymer of $\alpha$ -glucose		<input checked="" type="checkbox"/>		;																											
Polymer of $\beta$ -glucose	<input checked="" type="checkbox"/>			;																											
Contains 1,4 - glycosidic bonds			<input checked="" type="checkbox"/>	;																											
Contains 1,6 - glycosidic bonds		<input checked="" type="checkbox"/>		;																											

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	<ol style="list-style-type: none"> <li>made up of { many / eq } (α) glucose (monomers) ;</li> <li>reference to energy storage / glucose is the respiratory substrate / eq ;</li> <li>it is { large / insoluble } so has no osmotic effect / eq ;</li> <li>amylose is coiled <b>AND</b> amylopectin is { branched / has 1,6 glycosidic bonds };</li> <li>compact so that more can be stored { in a small space / eq } ;</li> <li>{ branches / 1,6 glycosidic bonds / eq } for rapid hydrolysis (to release glucose) / eq ;</li> </ol>	<ol style="list-style-type: none"> <li><b>ACCEPT</b> polymer of glucose <b>IGNORE</b> polysaccharide</li> <li><b>ACCEPT</b> breaks down / easily hydrolysed</li> </ol>	(4)

Question Number	Answer	Additional Guidance	Mark
3(b)	<ol style="list-style-type: none"> <li>idea that starch is a { sustainable / renewable } resource / bioplastic comes from a { sustainable / renewable } resource ;</li> <li>more plants can be grown ;</li> <li>plastic comes from a non-renewable resource / oil { is non-renewable / will run out / eq } ;</li> <li>bioplastics are biodegradable / eq ;</li> </ol>	<ol style="list-style-type: none"> <li><b>NOT</b> bioplastics are renewable</li> <li><b>ACCEPT</b> converse statement</li> </ol>	(3)

Question Number	Answer	Additional Guidance	Mark
4* (a) (i)	<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 of standardisation of extraction method ;</li> <li>2. same { volume of extract / diameter of wells in agar / size paper discs } ;</li> <li>3. idea of different agar plates for the { 14 / all / eq } microorganisms ;</li> <li>4. description of aseptic technique, e.g. use of sterile equipment ;</li> <li>5. incubated at the same temperature <b>AND</b> for the same length of time <b>OR</b> in range 20 to 30°C <b>AND</b> stated time in range 1 to 7 days ;</li> <li>6. measure zone of inhibition ;</li> <li>7. replication qualified e.g. repeats { for each extract / for each microorganism / to calculate mean } ;</li> </ol>	<p>QWC emphasis is logical sequence</p> <ol style="list-style-type: none"> <li>1. e.g. made from same mass of cloves and herbs, extracts have same concentration, extracts made using same volume of solvent <b>NOT</b> 'amount'</li> <li>6. <b>IGNORE</b> observe</li> <li>7. <b>NOT</b> repeat the experiment</li> </ol>	(5)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	<ol style="list-style-type: none"> <li>1. clove is { most effective / effective against more species of microorganism / eq } ;</li> <li>2. basil is the least effective (extract) / eq ;</li> <li>3. manipulation of data, e.g. the difference in percentage effectiveness between cloves and another named extract ;</li> </ol>	<ol style="list-style-type: none"> <li>3. e.g. 58% difference between clove and basil, 43% between clove and lemon balm, 50% between clove and rosemary or 36% between clove and thyme</li> </ol>	(2)
4(b)	<ol style="list-style-type: none"> <li>1. both possess cell surface membrane ;</li> <li>2. both contain ribosomes / bacterial cells have smaller ribosomes / eq ;</li> <li>3. bacterial cells contain { circular DNA / nucleoid / plasmid } <b>AND</b> yeast have DNA that is { linear / contained in a membrane / in a nucleus } ;</li> <li>4. bacterial cells do not contain membrane bound organelles ;</li> <li>5. both have a cell wall ;</li> </ol>	<p><b>ACCEPT</b> reference to eukaryotic cell instead of yeast</p> <p>4. <b>ACCEPT</b> named membrane bound organelle</p> <p>5. <b>IGNORE</b> description of difference in cell wall composition</p>	(4)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	<p><b>Independent:</b> (incubation) temperature ;</p> <p><b>Dependent:</b> length of pollen tube ;</p>	<b>IGNORE</b> mean, growth	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	<ol style="list-style-type: none"> <li>figures from graph 0.2 and 0.9 ;</li> <li>calculation { 0.9 minus 0.2 / 0.7 } divided by 0.2 ;</li> <li>350 (%) ;</li> </ol>	$\frac{(0.9-0.2)}{0.2} \text{ or } \frac{0.7}{0.2}$ <p>correct answer gains 3 marks</p>	(3)

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	<ol style="list-style-type: none"> <li>{ no significant / little difference } at { 15 °C / 35 °C } ;</li> <li>idea of a positive correlation between temperature and pollen tube length in A and B up to 30 °C ;</li> <li>idea of greater effect (of temperature) on A than on B / pollen tubes of A grew longer than B at all temperatures ;</li> <li>idea of 30 °C as optimum temperature for both A and B ;</li> </ol>	<p>4. <b>ACCEPT</b> pollen tubes the longest at 30 °C</p>	(3)

Question Number	Answer	Additional Guidance	Mark
5(b)	<ol style="list-style-type: none"> <li>reference to { nuclei / (generative) nucleus / gametes } ;</li> <li>idea of { creating / digesting / eq } a pathway through the style ;</li> <li>(from stigma) to { micropyle / embryo sac / ovule / egg cell } ;</li> </ol>	3. <b>IGNORE</b> ovum / ovary	(2)

Question Number	Answer	Additional Guidance	Mark
5(c)	<ol style="list-style-type: none"> <li>idea of producing haploid { nuclei / cells } ;</li> <li>genetic variation through { crossing over / independent assortment } / eq ;</li> <li>independent assortment gives rise to { new / different / eq } combinations of (paternal and maternal) chromosomes ;</li> <li>crossing over involves swapping of { sections / eq } of chromatids ;</li> <li>new combinations of alleles produced ;</li> </ol>	<ol style="list-style-type: none"> <li><b>ACCEPT</b> halving the chromosome number</li> <li>&amp; 3. <b>ACCEPT</b> random assortment</li> <li>4. <b>NOT</b> chromosome</li> </ol>	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	1. (counting) { number / range / variety } of species ;  2. in a { known / given / stated } area of land ;  3. genetic diversity within a species / number of different alleles in a {species / gene pool} ;	2. references to quadrats must be qualified with measuring an area	<b>(2)</b>

Question Number	Answer	Mark
6(a)(ii)	endemic / endemism / endemic species ;	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
6(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. increase { numbers / population size / eq } ;</li> <li>2. { maintain / increase } genetic diversity / reduce genetic drift / eq ;</li> <li>3. exchange of { macaques / gametes } between zoos ;</li> <li>4. using { stud books / DNA profiling / eq } (for selection of mates) ;</li> <li>5. preparation for reintroduction to the wild described ;</li> <li>6. idea of selection of safe area for reintroduction e.g. national park or reserve ;</li> <li>7. idea of protecting from { predators / poachers / eq } (once released) ;</li> </ol>	<p>QWC – Emphasis on clarity of expression</p> <ol style="list-style-type: none"> <li>2. <b>IGNORE</b> genetic variation</li> <li>3. <b>ACCEPT</b> animals</li> <li>5. e.g. idea of reinforcing wild behaviour or reduce food intake or encourage hunting</li> </ol>	(5)



Question Number	Answer	Additional Guidance	Mark
7(a)	Sclerenchyma / xylem ;	<b>IGNORE</b> reference to fibres, vessels or tissue	(1)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	the { force / weight / strain / stress / tension } a fibre can take without breaking <b>OR</b> the { force / weight / strain / stress } required to make a fibre break ;	<b>ACCEPT</b> failing instead of breaking  <b>ACCEPT</b> reference to load /mass instead of force	(1)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	1. reference to { pectin / (calcium) pectate } ; 2. reference to middle lamella ; 3. idea of holding together microfibrils in cell walls ; 4. idea that the fibres are stronger if cellulose microfibrils held together more strongly ;		(2)

Question Number	Answer	Additional Guidance	Mark
7(c)(i)	<ol style="list-style-type: none"> <li>diameter of fibres highest { in group 1 / with no mineral ions } ;</li> <li>idea of no significant difference between { high mineral ion / group 2 } and control for fibre diameter ;</li> <li>thickness of cell wall highest { in group 2 / with high mineral ion concentration } ;</li> <li>idea of no significant difference between control and { group 1 / with no mineral ions } on cell wall thickness ;</li> </ol>	<ol style="list-style-type: none"> <li><b>ACCEPT</b> higher than both the control and group 2 <b>OR</b> higher than the groups with mineral ions</li> <li><b>ACCEPT</b> little difference</li> <li><b>ACCEPT</b> higher than both the control and group 1</li> <li><b>ACCEPT</b> little difference</li> </ol>	(3)

Question Number	Answer	Additional Guidance	Mark
7(c)(ii)	<ol style="list-style-type: none"> <li>group 2 has more magnesium / control has less magnesium ;</li> <li>magnesium required for chlorophyll (production) ;</li> </ol>	<ol style="list-style-type: none"> <li><b>IGNORE</b> other mineral ions such as nitrate</li> </ol>	(2)

Question Number	Answer	Mark
8(a)(i)	totipotency / totipotent ;	(1)

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	<ol style="list-style-type: none"> <li>1. idea of { stimulus / chemical / hormone } ;</li> <li>2. idea that some genes are { active / switched on / expressed } ;</li> <li>3. idea of { transcription / mRNA produced } at active genes ;</li> <li>4. mRNA is { translated / used } to produce { protein / polypeptide } ;</li> <li>5. idea that this protein (permanently) modifies cell <b>OR</b> idea that this protein determines { cell structure / function } ;</li> </ol>	2. <b>IGNORE</b> genes being 'turned on'	(3)

Question Number	Answer	Additional Guidance	Mark
8(a)(iii)	<ol style="list-style-type: none"> <li>1. idea of genes being { switched off / deactivated } ;</li> <li>2. idea that (cell) { permanently modified / irreversibly changed } ;</li> </ol>		(2)

Question Number	Answer	Additional Guidance	Mark
8(b)	1. reference to peer review ; 2. idea of (other scientists) repeating the experiment ; 3. idea that same results were not achieved ;		(3)

Question Number	Answer	Additional Guidance	Mark
8(c)	1. produce transplant organs / building new organs / 3-D printing of organs / eq ; 2. repair or replace damaged tissues e.g. heart or spinal cord / replace damaged cells ;	<b>IGNORE</b> named condition that could be treated with stem cell therapy	(2)

