



# **Mark Scheme (Results)**

Summer 2017

Pearson Edexcel GCE Biology (6BI02) Paper 01



### **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 2017

Publications Code 6BI02\_01\_1706\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2017

## General marking guidance

---

- All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the mark scheme – not according to their perception of where the grade boundaries may lie.
- 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/indicative content will not be exhaustive.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, a senior examiner must be consulted before a mark is given.
- Crossed-out work should be marked unless the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1(a)(i)	<p><b>1(a)(i). The only correct answer is D</b></p> <p><i>A is not correct because cellulose is not made up of <math>\alpha</math>-glucose</i></p> <p><i>B is not correct because cellulose is not made up of amylopectin</i></p> <p><i>C is not correct because cellulose is not made up of amylose</i></p>	(1)

Question Number	Answer	Mark
1(a)(ii)	<p><b>1(a)(ii). The only correct answer is B</b></p> <p><i>A is not correct because cellulose is not branched</i></p> <p><i>C is not correct because the monomers are not joined by hydrogen bonds and cellulose is not branched</i></p> <p><i>D is not correct because the monomers are not joined in a chain by hydrogen bonds</i></p>	(1)

Question Number	Answer	Mark
1(a)(iii)	<p><b>1(a)(iii). The only correct answer is B</b></p> <p><i>A is not correct because the matrix does not contain calcium carbonate</i></p> <p><i>C is not correct because as pectin carbonate is not found in the matrix</i></p> <p><i>D is not correct because as pectin nitrate is not found in the matrix</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	<p>1. waterproofing ;</p> <p>2. strength ;</p>	<p>2. ACCEPT stronger / support IGNORE flexibility</p>	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	sclerenchyma;	ACCEPT sclereid (cells) IGNORE vessel elements / tracheids	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	<ol style="list-style-type: none"> <li>1. open ended / no end walls / eq ;</li> <li>2. no cytoplasm / hollow (tubes) / eq ;</li> <li>3. idea of (uninterrupted) transport of water ;</li> <li>4. {lignin / thick walls} for support / eq ;</li> <li>5. idea of { pits / non-lignified areas } ;</li> <li>6. (pits allow lateral) transfer of water ( in / out of xylem) ;</li> </ol>		(4)

**Total for Question 1 = 10 MARKS**

Question Number	Answer	Mark
2 (a)(i)	<p><b>2 (a)(i). The only correct answer is C</b></p> <p><i>A is not correct because cell F is not anaphase</i></p> <p><i>B is not correct because cell F is not metaphase and cell G is not prophase</i></p> <p><i>D is not correct because cell F is not telophase and cell G is not prophase</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	toluidine blue / (acetic) orcein / Schiff's (reagent) / Feulgen (stain) / eq ;		(1)

Question Number	Answer	Mark
2 (b)(i)	<p><b>2 (b)(i). The only correct answer is B</b></p> <p><i>A is not correct because the fewest number of cells are at anaphase</i></p> <p><i>C is not correct because 35 cells at prophase is fewer than 37 at metaphase</i></p> <p><i>D is not correct because there were only 24 cells observed at telophase</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	<ol style="list-style-type: none"> <li>102 (cells undergoing mitosis) divided by 795 (total number of cells) (<math>\times 100</math>) ;</li> <li>12.83 (%) ;</li> </ol>	<p>Correct answer gains all marks</p> <p>ACCEPT CE for mp2 if calculation based on 102 +/- 2</p> <p>ACCEPT 12.8(%) / 13(%)</p>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	<ol style="list-style-type: none"> <li>negative correlation (described) between concentration of Agil and mitosis ;</li> <li>largest decrease between 0.0 and 0.5(ppm) ;</li> </ol>	<p>ACCEPT description</p> <p>ACCEPT decrease of 14.8(%) Credit other correct manipulations E.g. 19.5% decrease overall</p>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	<ol style="list-style-type: none"> <li>chromatids cannot separate ;</li> <li>haploid cells could not form properly / eq ;</li> <li>gametes would be produced with different numbers of chromosomes ;</li> </ol>	<p>IGNORE functions of gametes produced</p> <p>ACCEPT diploid gametes / no gametes formed / fewer gametes formed</p>	<b>(2)</b>

**Total for Question 2 = 9 MARKS**

Formatted: Font: Italic

Question Number	Answer	Additional Guidance	Mark
3(a)	<ol style="list-style-type: none"> <li>idea of {counting the number of different species in a specified area / determining species richness} ;</li> <li>comparisons {made over time / in area with dieback &amp; area without} ;</li> <li>idea of comparing loss of ash trees with loss of biodiversity ;</li> </ol>		(3)

Formatted: Font: Italic

Question Number	Answer	Mark
3 (b)(i)	<p><b>3 (b)(i). The only correct answer is A</b></p> <p><i>B is not correct because genetic diversity is not the number of different genes in a species</i></p> <p><i>C is not correct because genetic diversity is not the number of different species in a gene pool</i></p> <p><i>D is not correct because genetic diversity is not the number of different species in a habitat</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	<ol style="list-style-type: none"> <li>collect (a large number of) seeds from healthy trees /eq ;</li> <li>in (several) locations where ash dieback is present /eq ;</li> </ol>		(2)

Formatted: Emphasis, Font: Frutiger 55 Roman, English (United Kingdom)



Question Number	Answer	Additional Guidance	Mark
3(c)	<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. seeds X-rayed to check for { viability / embryos / eq } ;</li> <li>2. seeds dried (before storage} / eq ;</li> <li>3. seeds stored at very low temperatures / eq ;</li> <li>4. idea of conditions preventing {growth of / decay by} { bacteria / fungi } ;</li> <li>5. idea of storage conditions reducing enzyme activity ;</li> <li>6. idea of germinating seeds at regular intervals to check for viability ;</li> <li>7. seeds stored in low humidity / eq ;</li> </ol>	<p><b>QWC emphasis clarity of expression</b></p> <p>IGNORE sterilisation</p> <p>3. ACCEPT freezing seeds or cold conditions</p> <p>5. ACCEPT slows rate of metabolism</p>	<p>(5)</p>

**Total for Question 3 = 11 MARKS**

Formatted: Font: Not Bold

Formatted Table

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	<ol style="list-style-type: none"> <li>haploid { nucleus / number of chromosomes } / eq ;</li> <li>(haploid state) allows restoration of diploid number at fertilisation / eq ;</li> <li>lipid { droplets / eq } to {provide / store} { energy / food } ;</li> <li>cortical granules / eq ;</li> <li>description of { cortical reaction}eg. {hardening / thickening / eq} of zona pellucida ;</li> <li>mitochondria provide { ATP / energy } (for reactions) eq ;</li> </ol>	<p><b>IGNORE follicle cells</b></p> <ol style="list-style-type: none"> <li>ACCEPT full number of chromosomes at fertilisation / in zygote</li> <li>ACCEPT lysosomes</li> <li>ACCEPT receptors on egg membrane for sperm</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	<ol style="list-style-type: none"> <li>acrosome fuses with the cell membrane of a sperm cell /eq ;</li> <li>{ enzymes / acrosin } released / eq ;</li> <li>digest zona pellucida / creates pathway through follicle cells / eq ;</li> <li>idea that the sperm cell (membrane) is able to fuse with the cell membrane of the egg cell ;</li> </ol>	<p>ACCEPT exocytosis</p> <ol style="list-style-type: none"> <li>ACCEPT break down zona pellucida</li> </ol> <p>IGNORE sperm enters egg</p>	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
4(b)	<ol style="list-style-type: none"><li data-bbox="309 424 1064 481">1. { hormone / kisspeptin } tested on { animals / tissues / models } before humans ;</li><li data-bbox="309 507 1064 564">2. (phase 1) testing on healthy <u>female</u> volunteers to check for side effects / eq ;</li><li data-bbox="309 590 712 622">3. idea of different doses tested ;</li></ol>		(3)

**Total for Question 4 = 10 MARKS**

Question Number	Answer	Additional Guidance	Mark
5(a)	1. idea that plants are resources that can be renewed ; 2. idea that the resource is available for future generations ; 3. idea that oil-based sources { are not renewable / are finite / will run out } ;	1. ACCEPT plants/fibres can be regrown, plants/fibres won't run out 2. ALLOW converse	(3)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. {same / stated} length of fibres used ; 2. description of how { masses / force } applied to fibre ; 3. { force / mass } required to break the fibre is measured ;	2.ACCEPT e.g. add {masses / force} gradually to fixed fibre	(3)

Formatted: Left

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. as cross-sectional area increases the tensile strength decreases / eq ; 2. relationship is not linear / eq ; 3. relevant manipulation of data ;	1. ACCEPT negative correlation 2. ACCEPT a description of non-linear shape / linear between 0.17 & 0.75 3. e.g 450(MPa) overall largest drop 0.03-0.17(mm <sup>2</sup> ) of 245(Mpa)	(2)

**Total for Question 5 = 8 MARKS**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	1. idea of presence of membrane bound organelles ; 2. idea of { larger / 80S } ribosomes ; 3. DNA not circular / no plasmids ; 4. { chromosomes / DNA } in a (membrane bound) nucleus ;	1. ACCEPT a named membrane bound organelle  3. ACCEPT DNA is linear	(4)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	anatomical ;		(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	1. <i>T. avium</i> AND <i>T. cruzi</i> ; 2. idea that they have most recently evolved from a common ancestor ;	3. ACCEPT share a {recent / later} common ancestor OR they diverged more recently.	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	natural selection / evolution ;	ACCEPT speciation	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	1. idea of analysing { DNA / protein } ; 2. idea that more similarities in sequences of {bases / amino acids } indicates { closer relationship / a more recent shared common ancestor } ;		(2)

**Total for Question 6 = 10 MARKS**

Question Number	Answer	Additional Guidance	Mark
7(a)	<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. idea that mesenchymal stem cells are undifferentiated ;</li> <li>2. produce cells by mitosis / eq ;</li> <li>3. certain genes are { activated /eq} ;</li> <li>4. (by) a stimulus / eq ;</li> <li>5. { transcription / mRNA produced } at active genes / eq ;</li> <li>6. translation of mRNA to produce { protein / polypeptide} ;</li> <li>7. production of { protein / enzyme } which determines cell { structure / function } ;</li> </ol>	QWC emphasis – logical sequence	(5)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	<ol style="list-style-type: none"> <li>1. 10 (per million) in 14 year old and 2.5 (per million) in 50 year old / <math>0.001 \div 0.00025</math> ;</li> <li>2. 4 (times as many) ;</li> </ol>	Correct answer with no working achieves 2 marks	(2)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	1. time taken for bones to mend will increase / eq ; 2. idea of fewer (mesenchymal) stem cells with age ; 3. idea that these stem cells are needed to {replace damaged bone cells / repair damaged bone tissue } ;		(3)

Question Number	Answer	Additional Guidance	Mark
7(c)	1. (autologous stem) cells will not be rejected / eq ; 2. idea of reduced risk of transmission of diseases / eq ; 3. No need to wait for a donor / eq ;	1. ACCEPT converse IGNORE less rejection	(2)

Question Number	Answer	Additional Guidance	Mark
7(d)	idea that the use of embryonic stem cells involves destruction of embryos ;	ACCEPT embryo {cannot give consent / has right to life }	(1)

**Total for Question 7 = 13 MARKS**



Question Number	Answer	Additional Guidance	Mark
8(a)	<ol style="list-style-type: none"> <li>1. Idea that percentage would be higher if only genetic ;</li> <li>2. idea that if only genetic then an identical twin would have 100% probability of having Crohn's if their twin had it ;</li> <li>3. 85% of people with Crohn's do not have a relative with the disease / in 30% of cases of an identical twin having Crohn's, their twin does not ;</li> <li>4. idea that environmental factors influence the development of the disease ;</li> </ol>		(3)

Question Number	Answer	Mark
8(b)(i)	<p><b>8(b)(i). The only correct answer is C</b></p> <p><i>A is not correct because monogenic is the wrong description</i></p> <p><i>B is not correct because monohybrid refers to the pattern of inheritance for one gene</i></p> <p><i>D is not correct because polyhybrid is the wrong description</i></p>	(1)

Question Number	Answer	Mark
8(b)(i)	<p><b>8(b)(i). The only correct answer is D</b></p> <p><i>A is not correct because an allele is a version of a gene, not its location on a chromosome</i></p> <p><i>B is not correct because centrioles are not part of a chromosome</i></p> <p><i>C is not correct because the centromere is the structure that holds together sister chromatids</i></p>	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
8(c)	<ol style="list-style-type: none"> <li>1. {smoking / diet } is an environmental factor ;</li> <li>2. idea of it being a polygenic disease e.g. cumulative effect of more genes ;</li> <li>3. idea that probability of it developing increases if there are more { genes for the disease / environmental risk factors } ;</li> <li>4. idea that severity of symptoms increases if there are more { genes for the disease / environmental risk factors } ;</li> </ol>	<ol style="list-style-type: none"> <li>2. ACCEPT some people may have more genes that affect the disease</li> </ol>	<b>(4)</b>

**Total for Question 8 = 9 MARKS**

**TOTAL FOR PAPER = 80 MARKS**



Llywodraeth Cymru  
Welsh Assembly Government



Further copies of this publication are available from  
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467  
Fax 01623 450481  
Email [publication.orders@edexcel.com](mailto:publication.orders@edexcel.com)

Order Code

For more information on Edexcel qualifications, please visit our website  
[www.edexcel.com](http://www.edexcel.com)

Pearson Education Limited. Registered company number 872828  
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom