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Mark Scheme (Results)
June 2010

GCE

GCE Biology (6BI02/01)

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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.

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.

GENERAL INFORMATION

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[CE] or [TE]	Consecutive error / transferred error

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored

Question Number	Answer	Mark
1 (a) (i)	1. alleles ; 2. loci / locations / positions / eq ;	(2)

Question Number	Answer	Mark
1 (a) (ii)	1. 174 (cm) ; 2. 172 (cm) ;	(2)

Question Number	Answer	Mark
1 (b) (i)	1. {genotype / eq} ; 2. {environment / eq} ;	(2)

Question Number	Answer	Mark
1 (b) (ii)	C ; A ; B ;	(3)

Question Number	Answer	Mark
*2(a) QWC	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. *undifferentiated* cell / eq ; 2. that can give rise to other {types of cell / eq }; 3. idea that no limit to division ; 4. correct reference to {*totipotent* / *pluripotent* /eq} ;	max (2)

Question Number	Answer	Mark
2(b)	1. cord blood /umbilical cord / placenta ; 2. {fertilised egg / zygote / eq} / blastocyst / (early) embryo ; 3. detail of site within blastocyst 4. bone marrow / eq ; 5. {brain / connective / skin / liver} cells / eq ; 6. addition of adult nucleus to enucleated egg cell ;	max (3)

Question Number	Answer	Mark
2(c)(i)	1. decide on max age of embryo allowed for research / eq ; 2. idea of setting or considering {ethical / legal} aspects / judging what is acceptable / follow a code of practice ; 3. example of what {is / is not} acceptable ; 4. checking that source of stem cells is acceptable / eq ; 5. stopping of cloning (of humans) / eq ; 6. appropriate reference to unnecessary repeating of research / eq ;	max (2)

Question Number	Answer	Mark
2 (c)(ii)	people involved in embryo research: 1. idea of being able to (fully) understand the science / recognise what is possible {benefits / risks / eq} / judge in an informed manner ; people not involved in embryo research: 2. idea of giving a {balanced /alternative / wider / named} view ;	(2)

Question Number	Answer	Mark
3 (a)(i)	C ;	(1)

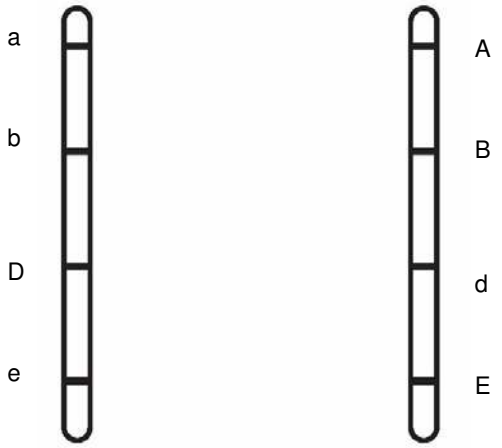
Question Number	Answer	Mark
3 (a)(ii)	B ;	(1)

Question Number	Answer	Mark
3 (a)(iii)	far right-hand box ;	(1)

Question Number	Answer	Mark
3 (a)(iv)	Bacteria / Eubacteria / Archaebacteria / Archaea ;	(1)

Question Number	Answer	Mark
*3(b)(i) QWC	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. cellulose ; 2. as microfibrils ; 3. (cellulose molecules) held together by hydrogen bonds / eq 4. detail of microfibril (e.g. {bundle /correct stated number of}) cellulose molecules) ;; 5. correct reference to arrangement of microfibrils (in primary cell wall) ; 6. reference to {matrix / hemicelluloses / pectins / eq} ; 7. reference to primary and secondary cell walls ; 8. detail of different laying down arrangement (in secondary cell wall) /reference to lignin ;	max (4)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>3 (b)(ii)</td><td>
<table>
<tr><th>Feature described</th><th>Name of feature</th></tr>
<tr><td>site where there was no cell wall and the cytoplasm linked the two adjacent cells</td><td>plasmodesmata / plasmodesma ;</td></tr>
<tr><td>dark line that is the boundary between one cell and the next cell</td><td>middle lamella ;</td></tr>
</table>
</td><td>(2)</td></tr>
</table>

Question Number	Answer	Mark
4 (a)		(1)

Question Number	Answer	Mark
4 (b) (i)	P = crista ; Q = matrix ; R = outer (mitochondrial) membrane / envelope / double membrane ;	(3)

Question Number	Answer	Mark
4 (b)(ii)	1. (they carry out) (aerobic) respiration ; 2. provide {ATP / energy / eq} ; 3. to {move / drive the / eq} {flagellum / tail} ; 4. allows sperm to swim / eq ; 5. towards the {egg / eq} / {towards /along} the oviduct / eq ;	max (3)

Question Number	Answer	Mark
4 (c)(i)	0.065 (%) ;;	(2)

Question Number	Answer	Mark
4 (c)(ii)	16 ;	(1)

Question Number	Answer	Mark
5 (a)(i)	{α/ alpha} glucose ;	(1)

Question Number	Answer	Mark
*5(a)(ii)QWC	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. made up of {<u>many / eq</u>} glucose (monomers) ; 2. reference to {energy / eq } storage / glucose is the respiratory substrate / synthesis of organic molecules / eq ; 3. idea that it is {large / eq} ; 4. so is un-reactive / insoluble /no osmotic effect ; 5. molecule coiling / compact / reference to amylose /eq ; 6. more can be stored (in available space) / eq ; 7. reference to branches / reference to (glycosidic) 1-6 bonds / amylopectin ; 8. {rapid / increased / eq } mobilisation of glucose units / eq ;	max (4)

Question Number	Answer	Mark
5 (b)(i)	Allow converse 1. increase in temperature {decreases / eq } (the mean percentage of amylose present)/ negative correlation ; 2. but by differing percentages in all 3 varieties / C, then A & then B ; 3. credit correct manipulation of the data for 1 variety (e.g. by 4.0 % in variety A / 1.5% in variety B / 5% in variety C) eq ;	max (2)

Question Number	Answer	Mark
5 (b)(ii)	1. (variety) B ; 2. idea of smallest difference between (means / amylose content) in B for the two different temp regimes ; 3. idea of {biggest error bars / widest spread} ; 4. idea that error bars for the 2 different temp regimes overlap ; 5. explanation of overlap e.g. some of the data for the lower temp falls within that of the higher temp ;	max (3)

Question Number	Answer	Mark
6(a)	Niche: 1. the {role / function / eq} (of a species / organism) ; 2. {within the community / ecosystem /habitat / environment / eq } ; Species richness: 3. number of (different) species ; 4. in a {habitat / eq } / at any one time ;	max (3)

Question Number	Answer	Mark
*6 (b)(i)QWC	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. (cheetah has) {lowest genetic diversity / least genetic variation } (of the listed cats) ; 2. correct reference to lack of adaptation / example / no selective advantage (when environment changes) ; 3. (therefore) less likely to survive / eq ; 4. (therefore) more at risk of {extinction / eq} ;	max (3)

Question Number	Answer	Mark
6 (b)(ii)	1. {greater / eq} genetic diversity (amongst the litter) / eq ; 2. greater chance that will {survive / eq} ; 3. increased chance of fertilisation / pregnancy / eq ; 4. increase in population size / eq ;	max (2)

Question Number	Answer	Mark
6 (c)	1. increases genetic diversity /eq ; 2. (because it) allows {outbreeding / mating / eq} with (genetically) different individuals / eq ; 3. stop/reduces {inbreeding / mating with parents / siblings} ; 4. (which) reduces genetic diversity / eq ;	max (2)

Question Number	Answer	Mark
6 (d)	cheetahs that are exclusive to one continent ;	(1)

Question Number	Answer	Mark
7 (a)(i)	1. line drawn correctly e.g. from pollen grain, down style to start of ovary ; 2. to micropyle (around the edge) ;	(2)

Question Number	Answer	Mark
7 (a) (ii)	<table><tr><th>Labelled structure</th><th>Tick (✓) if chromosome number increases at fertilisation</th></tr><tr><td>A</td><td></td></tr><tr><td>B</td><td></td></tr><tr><td>C</td><td></td></tr><tr><td>D</td><td>✓</td></tr><tr><td>E</td><td>✓</td></tr></table> Comments given if more than 2 ticks and if use cross or crosses and ticks	(2)

Question Number	Answer	Mark
7 (b)(i)	1. both {increase / positive correlation / eq} ; 2. (pollen tube) length (always) {greater/ eq} when boron present / eq ; 3. idea of rate of growth greater with boron ; 4. linear without boron (for 25 / 30 hours) and not linear with boron / eq ; 5. correct comparative manipulation of the data ;	max (3)

Question Number	Answer	Mark
7 (b)(ii)	idea that pollen tube does grow even in the absence of boron ;	(1)

Question Number	Answer	Mark
7 (b)(iii)	boron {increases / speeds up / eq} rate ;	(1)

Question Number	Answer	Mark
7 (b)(iv)	1. more likely to reach the ovule /eq ; 2. fertilisation more likely to occur /eq ; 3. idea of fertilisation in shorter time period ;	max (2)

Question Number	Answer	Mark
8 (a)(i)	1. (increasing or doubling nitrate ion concentration) decreased mitosis / negative correlation / eq ; 2. manipulation of the data (e.g. by 6 cells (per 500 cells) / reduces by 24%) ;	(2)

Question Number	Answer	Mark
8 (a)(ii)	1. only two concentrations were used / additional nitrate ion concentrations should be used ; 2. no {trend / eq} (as only 2 data sets) ; 3. If one of the two sets of data was {anomalous / eq} ; 4. reference to one with no nitrate ions present ;	max (2)

Question Number	Answer	Mark
8 (a)(iii)	Two appropriate safety risks given ; ; One appropriate precaution, linked to one of the risks above ;	(3)

Question Number	Answer	Mark
8 (b)	1. 3 + / sensible range of nitrate ion concentrations ; 2. reference to repeats (at each concentration) ; 3. reference to uniformity of seedlings (e.g. all from same parent plant, same age, same original root length) ; 4. idea that solution used should contain other mineral ions / named mineral ions ; 5. mention one other variable maintained / kept constant (e.g. temp, all run for same length of time, light intensity, volume of mineral solution) ; 6. reference to mechanism of judging root {growth /eq} (to measure optimum nitrate concentration) ;	max (3)

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