

Mark Scheme (Results) January 2011

GCE

GCE Biology (6BI04/ 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)	B ;	(1)

Question Number	Answer	Mark
1(a)(ii)	D ;	(1)

Question Number	Answer	Mark
1(a)(iii)	D ;	(1)

Question Number	Answer	Mark
1(b)(i)	<ol style="list-style-type: none"> 1. idea of carbon fixation produces {GP / eq} ; 2. (product) is converted to {starch / sugar / eq} ; 3. {faster / eq} C-fixation means faster {sugar / starch / eq} production / eq ; 4. reference to rate of {growth / development} depends on rate of carbon fixation ; 5. reference to increased GPP (of crop) ; 	max (3)

Question Number	Answer	Mark
1(b)(ii)	<ol style="list-style-type: none"> 1. reference to effect of temperature change on {kinetic energy / movement} of {molecules / particles / eq} / eq ; 2. therefore this effects number of {collisions / enzyme-substrate complex} ; 	(2)

Question Number	Answer	Mark
1(b)(iii)	<ol style="list-style-type: none"> 1. A ; [award if written in text instead] <p>Any four from:</p> <ol style="list-style-type: none"> 2. idea that (in Central Europe) {temperatures never reach 25°C / data for 25°C is irrelevant} / 14°C is {within the range / close to the average temperature} ; 3. {mean / eq} temperatures (in Central Europe) {15.25 / 15.3}°C ; 4. A has highest rates of CO₂ fixation at 14°C / eq ; 5. (therefore) A {will grow well / eq} in temperature (range) of Central Europe / eq ; 6. {B / C / D / E / F / others} would have relatively low {growth / yield / eq} at 14°C / eq ; 	max (5)

Question Number	Answer	Mark																
2(a)	<table border="1"> <thead> <tr> <th>Feature</th> <th>Bacteria only</th> <th>Viruses only</th> <th>Both bacteria and viruses</th> </tr> </thead> <tbody> <tr> <td>Glycogen granules</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Nucleic acids</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Protein coat (capsid)</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table> <p style="text-align: center;">1 mark per row ;;;</p>	Feature	Bacteria only	Viruses only	Both bacteria and viruses	Glycogen granules	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Nucleic acids	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Protein coat (capsid)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(3)
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Question Number	Answer	Mark
2(b)(i)	<ol style="list-style-type: none"> 1. viruses (and bacteria) involved ; 2. (usually) antibiotics {are only effective against bacteria / do not affect viruses / eq} ; 3. {other medication / eq} needed to deal with viruses / eq ; 	max (2)

Question Number	Answer	Mark
2(b)(ii)	<ol style="list-style-type: none"> 1. both enrofloxacin and florfenicol named ; 2. idea of {(high) effectiveness / eq} against all three bacteria / eq ; 3. above {80% / 83% / eq / average above 90% / eq} ; 	(3)

Question Number	Answer	Mark
2(b)(iii)	<ol style="list-style-type: none"> 1. idea that antibiotic used is {most effective / eq} (against the known bacterium) ; 2. idea that none of the antibiotics is 100% effective / some bacteria {survive / eq} ; 3. some bacteria {are resistant / eq} ; 4. idea of resistant strain {develops / prevented} ; 	<p>max (3)</p>

Question Number	Answer	Mark
3(a)	<ol style="list-style-type: none"> 1. polysaccharide ; 2. unbranched / straight chain ; 3. {beta / β} glucose ; 4. (1-4) glycosidic bonds (between glucose molecules) ; 5. reference to intermolecular hydrogen bonds/ eq ; 	max (3)

Question Number	Answer	Mark
3(b)	xylem / sclerenchyma ;	(1)

Question Number	Answer	Mark
3(c)	<ol style="list-style-type: none"> 1. reference to {decomposition / decay / putrefaction } (by microorganisms) ; 2. reference to respiration ; 3. releases carbon dioxide for photosynthesis / eq ; 4. methane released in anaerobic (conditions); 5. (methane) available as fuel / eq ; 	max (3)

Question Number	Answer	Mark
3(d)(i)	<p>Any one from:</p> <ol style="list-style-type: none"> 1. reference to {increased / eq} income / 2. in order to export fuel / 3. reference to more {jobs/ eq} / 4. reduce imports of (fossil / bio) fuels / 5. reference to biofuels {renewable / sustainable} / 6. fossil fuels finite / eq / 7. {reduce use of / as alternative to} {fossil fuels / named e.g.} / reference to meeting carbon targets/ eq / 8. reference to no loss of {farmland / eq} ; 	max (1)

Question Number	Answer	Mark
*3(d)(ii) QWC	<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"> 1. reference to (combustion of) biofuels releases carbon dioxide {recently / eq} removed from atmosphere / eq ; 2. (therefore) there is no (net) increase in carbon dioxide (in atmosphere) / eq ; 3. carbon dioxide is a greenhouse gas / eq ; 4. that {absorbs/ traps/ eq} {infra-red / heat / long-wave} (radiation reflected from Earth's surface) ; 5. reference to prevents {infra-red / heat / long-wave} {escaping / eq} into space ; 6. reference to (therefore) mean temperature of Earth's surface increases ; 7. idea that carbon in peat (land) was {trapped / eq} {a long time ago / eq} ; 8. idea of peatland clearance releases carbon dioxide ; 9. idea that there is a (net) gain of carbon dioxide (in the atmosphere) ; 10. idea that removal of plants (during clearance) reduces photosynthesis ; 11. reference to carbon dioxide released from (clearance) machinery ; 	max (5)

Question Number	Answer	Mark
4(a)(i)	Any characteristic symptom of TB e.g. tubercles, bloody sputum, (general) body tissue wastage ;	(1)

Question Number	Answer	Mark
4(a)(ii)	D ;	(1)

Question Number	Answer	Mark
4(a)(iii)	<ol style="list-style-type: none"> 1. idea of {bacterium / eq} recognised as {non-self / eq} ; 2. reference to labelling of bacteria by B {lymphocytes / cells} ; 3. phagocytosis / phagocytic / phagocyte ; 4. descriptive detail of phagocytosis (involving {bacterium / eq}) ; 5. reference to formation of vacuole ; 	max (3)

Question Number	Answer	Mark
4(a)(iv)	<ol style="list-style-type: none"> 1. {kills / eq} {bacteria / eq} in {stomach / mouth / saliva / gastric juice} ; 2. (by) {(hydrochloric) acid / lysozyme} ; 	(2)

Question Number	Answer	Mark
*4(b)QWC	<p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <p>Supporting the hypothesis:</p> <ol style="list-style-type: none"> 1. both HIV and TB infection rates rise and then fall / eq ; 2. both HIV infection and TB infection increase {from 1990 to 2000 / for the first 10 years} / eq ; <p>Not supporting the hypothesis:</p> <ol style="list-style-type: none"> 3. TB infection falls from 2000 onwards but HIV continues to rise (until 2004) / eq ; 4. different {parameters / measures / variables / eq} for the two infections / eq ; <p>General points:</p> <ol style="list-style-type: none"> 5. idea of {more {data / information / eq} is needed / other factors (may be) involved} ; 6. reference to need for statistical {analysis / test} ; 7. such as correlation {data / test / named example} ; 8. there is no data that {links HIV infection with TB infection / shows that people with HIV also have TB / shows causal relationship / eq} ; 	<p>max (4)</p>

Question Number	Answer	Mark
5(a)(i)	(abiotic factors) are non-living / eq ;	(1)

Question Number	Answer	Mark
5(a)(ii)	C ;	(1)

Question Number	Answer	Mark
5(b)(i)	C ;	(1)

Question Number	Answer	Mark
5(b)(ii)	<ol style="list-style-type: none"> 1. make it {easier / easy} to {estimate / measure / calculate / count} / eq ; 2. reference to more precise ; 3. idea of each section would be 4% ; 	max (2)

Question Number	Answer	Mark			
5(b)(iii)	<table border="1" style="margin-left: 20px;"> <tr> <td>(water) mint</td> </tr> <tr> <td>(common) duckweed</td> </tr> <tr> <td>(soft) rush</td> </tr> </table> <p>one correct 1 mark ; three correct 2 marks ;;</p>	(water) mint	(common) duckweed	(soft) rush	(2)
(water) mint					
(common) duckweed					
(soft) rush					

Question Number	Answer	Mark
5(b)(iv)	<ol style="list-style-type: none"> 1. {saturation / eq} not measured / depth of water does not give saturation data / eq ; 2. no data on other {factors / variables / conditions} ; 3. other {factors / variables / conditions} may be {affecting distribution / not controlled / confounding} ; 4. named example / eq ; 5. idea of only one set of data taken ; 	max (3)

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

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

Question Number	Answer	Mark
6(a) (iii)	A ;	(1)

Question Number	Answer	Mark
6(b)	<ol style="list-style-type: none"> 1. idea of sequence of {bases / nucleotides} on DNA determines sequence on (pre-) mRNA ; 2. reference to complementary base pairing / stated example e.g. AU / CG / GC / TA (DNA: mRNA) ; 3. reference to formation of bonds by condensation reaction ; 4. phosphodiester {bonds / links} ; 5. reference to RNA-polymerase ; 	max (3)

Question Number	Answer	Mark
6(c)(i)	<ol style="list-style-type: none"> 1. reference to {start / stop / nonsense} (codon) ; 2. start (codon) needed to begin {polypeptide synthesis / eq} / {stop / nonsense} (codon) needed to end {polypeptide synthesis / eq} / eq ; 	(2)

Question Number	Answer	Mark
6(c)(ii)	<ol style="list-style-type: none"> 1. reference to {difference / variations / eq } of {exons / mRNA} ; 2. reference to different {primary structure / sequence of amino acids} ; 3. reference to {secondary / tertiary } structure of proteins depends on primary {structure / sequence} / eq ; 4. due to {change in / different} bonds ; 5. {hydrogen / ionic / disulphide} bonds ; 6. reference to different 3D shape / eq ; 	max (3)

Question Number	Answer	Mark
7(a)(i)	(the total of) all the alleles in a {population / eq} ;	(1)

Question Number	Answer	Mark
7(a)(ii)	the {proportion of / number of times occurring / eq} for one allele within a {gene pool / population / eq} ;	(1)

Question Number	Answer	Mark
7(b)(i)	<ol style="list-style-type: none"> 1. if allowed to interbreed / eq ; 2. sub-species could (probably) produce fertile offspring / eq ; 	(2)

Question Number	Answer	Mark
7(b)(ii)	<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"> 1. reference to a few (<i>ancestral</i>) boar reaching the island ; 2. reference to (two populations) {<i>geographical separation / separated by the sea / volcanic eruptions / eq</i>} ; 3. populations {cannot <i>interbreed</i> / eq} ; 4. idea of gene flow between populations {prevented / restricted} ; 5. only a small number (on island) of other boar for breeding / reference to <i>founder effect</i> / eq ; 6. reference to {restricted / limited / eq} variety of <i>alleles</i> / eq ; 7. reference to <i>mutations</i> ; 8. different {<i>environmental conditions / selection pressures</i> / eq} on island different from mainland ; 9. reference to changes in <i>allele frequencies</i> ; 10. (leads to) {<i>phenotypic / physiological / physical / behavioural</i>} changes ; 11. reference to possibility of (<i>allopatric speciation</i>) ; 	max (5)

Question Number	Answer	Mark
7(b)(iii)	<ol style="list-style-type: none"> 1. reference to {bands / eq} produced ; 2. reference to {bands/ eq} at certain {positions/ eq} ; 3. common {bands/ eq} contain similar {DNA fragments/ eq} ; 4. idea that the more similar the patterns the {closer the relationship / more likely to have {recent / eq} common ancestor} ; 5. idea that very few differences if still a sub-species ; 	max (3)

Question Number	Answer	Mark										
8(a)	<table border="1"> <thead> <tr> <th>Source of antibodies</th> <th>Form of immunity</th> </tr> </thead> <tbody> <tr> <td></td> <td>D</td> </tr> <tr> <td></td> <td>B</td> </tr> <tr> <td></td> <td>C</td> </tr> <tr> <td></td> <td>A</td> </tr> </tbody> </table> <p>Note: [accept descriptions instead of letters]</p> <p>4 correct = 2 marks 2 or 3 correct = 1 mark 0 or 1 correct = 0 marks ;;</p>	Source of antibodies	Form of immunity		D		B		C		A	(2)
Source of antibodies	Form of immunity											
	D											
	B											
	C											
	A											

Question Number	Answer	Mark
8(b)	<ol style="list-style-type: none"> 1. (bacterium) is made of many different {polymers/ chemicals/ eq} / eq ; 2. which can act as antigens / eq ; 3. reference to B {lymphocytes / cells} ; 4. reference to (individual B-lymphocytes) recognise specific antigens / antibodies are specific / eq ; 5. reference to {activation/ eq} of B-lymphocytes by T {lymphocytes / cells} ; 6. reference to mitosis (in B-lymphocytes or cells) ; 7. to {form / eq} genetically identical plasma cells ; 	max (4)

Question Number	Answer	Mark
8(c)	<ol style="list-style-type: none"> 1. specific {antigen / virus / pathogen / bacterium / eq} can be {identified / eq} ; 2. idea of {specific / monoclonal} antibody binds to {specific / only one} antigen ; 3. specific treatment can be given / eq ; 4. avoids unnecessary use of {drugs / treatment} / eq ; 5. more likely to be effective / eq ; 	max (3)

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