

# Mark Scheme (Results)

## January 2010

GCE

GCE Biology (6BI04/01)

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## GENERAL INTRODUCTION

Mark schemes are prepared by the Principal Examiners and revised, together with the relevant questions, by a panel of senior examiners and subject teachers. The schemes are further amended at the Standardisation meetings attended by all examiners. The Standardisation meeting ensures as far as possible that the mark scheme covers the candidates' actual responses to questions and that every examiner understands and applies it in the same way.

The schemes in this document are the final mark schemes used by the examiners in this examination and include the amendments made at the meeting. They do not include any details of the discussions that took place in the meeting, nor do they include all of the possible alternative answers or equivalent statements that were considered to be worthy of credit.

It is emphasised that these mark schemes are working documents that apply to these papers in this examination. Every effort is made to ensure a consistent approach to marking from one examination to another but each marking point has to be judged in the context of the candidates' responses and in relation to the other questions in the paper. It should not be assumed that future mark schemes will adopt exactly the same marking points as this one.

**Edexcel cannot under any circumstances discuss or comment informally on the marking of individual scripts. Any enquiries about the marks awarded to individual candidates can be dealt with only through the official Enquiry about Results procedure.**

## 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	Answer	Mark
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Number		
1(a)(i)	A ;	(1)

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

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

Question Number	Answer	Mark
1(b)	<ol style="list-style-type: none"> <li>1. ref to thylakoids ;</li> <li>2. (made of) membranes ;</li> <li>3. (arranged as) {stacks / grana / eq} ;</li> <li>4. contain {pigment / chlorophyll} / eq ;</li> <li>5. (arranged as) quantasomes / photosystems ;</li> </ol>	<p>maximum (3)</p>

Question Number	Answer	Mark
1(c)(i)	<ol style="list-style-type: none"> <li>1. <math>(62.4 / 162) \times 100</math> ; [accept alternative correct working]</li> <li>2. 38.5(%) ; [must be to 1 dp]</li> </ol>	(2)

Question Number	Answer	Mark
1(c)(ii)	<ol style="list-style-type: none"> <li>1. ref to different lighting has little effect / little variation in percentage grain yields ;</li> <li>2. variation in percentage is less than 3 / eq ;</li> <li>3. which is (probably) {not significant/ insignificant} ;</li> <li>4. yield is {less / eq} for low pressure sodium lamps ;</li> <li>5. the best yield is metal halide / eq ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
1(c)(iii)	<p>Any two from</p> <ol style="list-style-type: none"> <li>1. crops can be grown {out of season / all year round} / eq ;</li> <li>2. plants photosynthesise 24 hours a day / eq ;</li> <li>3. idea of less physical damage from {weather / animals / eq} ;</li> <li>4. pest control easier / eq ;</li> <li>5. ref to control of other named factor, eg CO<sub>2</sub>, temperature, humidity, water supply ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
2(a)(i)	<ol style="list-style-type: none"> <li>1. {carbon dioxide and methane / both / they / eq} are greenhouse gases ;</li> <li>2. {trap / absorb} {heat / infra red / long wave radiation / eq} / eq ;</li> <li>3. idea of reflected from Earth's surface / re-radiation ;</li> <li>4. mean temperature of Earth's surface increases / eq ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
2(a)(ii)	appropriate comment on changes in production of gases e.g. higher estimate assumes no change in production of gases / lower estimate takes into account reduction in carbon emissions ;	(1)

Question Number	Answer	Mark
2(b)(i)	<ol style="list-style-type: none"> <li>1. (in 2000) range of mean temp means that both males and females hatch / eq ;</li> <li>2. as temperature rises {more males / fewer females} (will hatch) / eq ;</li> <li>3. therefore reproduction rate falls ;</li> <li>4. leading to {fall in population / extinction / eq} ;</li> <li>5. if temperature rises above 22°C {only males / no females} will hatch / eq ;</li> <li>6. lower estimate never reaches point where only males hatch / eq ;</li> </ol>	maximum (4)

Question Number	Answer	Mark
2(b)(ii)	<ol style="list-style-type: none"><li>1. fewer {prey / eq} eaten (by tuataras) / eq ;</li><li>2. {prey /eq} increase (in number) ;</li><li>3. other {carnivores / eq} may increase / eq ;</li><li>4. because less competition for food (from tuataras) / eq ;</li><li>5. predator of tuatara might {decrease / eat other prey / migrate} / eq ;</li></ol>	<b>maximum (2)</b>

Question Number	Answer	Mark
3(a)	ref to biotic factors involve {organisms / living} abiotic are {physical / chemical / non-living} (factors) / eq ;	(1)

Question Number	Answer	Mark
3(b)(i)	B ;	(1)

Question Number	Answer	Mark
3* (b)(ii) QWC	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. ref to {several / many / more than 2} readings ;</li> <li>2. ref to use of random quadrat positions ;</li> <li>3. description of suitable process to give random positions / eq ;</li> <li>4. ref to {known / stated} area of quadrat ;</li> <li>5. number of individuals in each quadrat {counted/ recorded} / eq ;</li> <li>6. description of how mean density calculated using total count e.g. total number (of each species) divided by total area sampled ;</li> </ol>	<p>maximum (3)</p>

Question Number	Answer	Mark
3(b)(iii)	<p><b>(Abiotic)</b> light intensity / light duration / availability of oxygen(in rock pools) / length of exposure (to air) / length of submersion / temperature / presence of toxic chemicals / height above sea level / slope/ aspect / wave action / pH / any other suitable e.g. ;</p> <p><b>(Biotic)</b> predators / availability of food organisms / disease / parasites / competition for a named resource / any other suitable e.g. ;</p>	(2)

Question Number	Answer	Mark
3(b)(iv)	B ;	(1)

Question Number	Answer	Mark
3(b)(v)	<p><b>Statement A</b> 1. data on two species only / eq ;</p> <p><b>Statement B</b> Accept any 3 of the following</p> <p>2. idea of density of both species changes as height changes ;</p> <p>3. as height increases <i>L. littorea</i> tends to increase, <i>L. obtusata</i> tends to decrease / eq ;</p> <p>4. no <i>L. obtusata</i> above 2 m, {very few / almost no} <i>L. littorea</i> below 0.5 m ;</p> <p>5. competition not a (significant) factor as both species can be found at same height ;</p> <p>6. ref to both are {plentiful / high density} between 0.5 and 1.5 m ;</p> <p><b>Statement C</b> 7. idea of density of species changes as height changes ;</p> <p>8. ref to no {information / data} for other factors ;</p>	<p>sub-max (3)</p> <p>maximum (4)</p>

Question Number	Answer	Mark												
4(a)(i)	<table border="1"> <thead> <tr> <th>Statement</th> <th>TRUE</th> <th>FALSE</th> </tr> </thead> <tbody> <tr> <td>This sequence of bases could be used as a template during translation</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>A strand of mRNA could be synthesised using this sequence</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>This sequence codes for 7 amino acids during protein synthesis</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> </tbody> </table> <p>1 mark each correct box ;;; [crosses in both boxes for a statement = 0]</p>	Statement	TRUE	FALSE	This sequence of bases could be used as a template during translation		<input checked="" type="checkbox"/>	A strand of mRNA could be synthesised using this sequence	<input checked="" type="checkbox"/>		This sequence codes for 7 amino acids during protein synthesis	<input checked="" type="checkbox"/>		(3)
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Question Number	Answer	Mark
4(a)(ii)	<ol style="list-style-type: none"> <li>1. ribosomes / RER / rough endoplasmic reticulum / poly(ribo)some ;</li> <li>2. descriptive feature e.g. (for ribosome or polysome) {ribosomal RNA / rRNA} / protein component / {two sub-units / large and small sub-unit} (for RER) ribosome attached to membrane ;</li> </ol>	(2)

Question Number	Answer	Mark
4(b)(i)	<ol style="list-style-type: none"> <li>1. {change / eq} in DNA ;</li> <li>2. ref to {change / deletion / addition / duplication / substitution / eq} of {bases / nucleotides} ;</li> </ol>	(2)

Question Number	Answer	Mark
4(b)(ii)	<ol style="list-style-type: none"> <li>1. correct reference to change in frequency of either allele e.g. mutant increases / normal decreases ;</li> <li>2. idea of reproductive success of the {mutant / non-photosynthetic} individuals ;</li> <li>3. (as trees develop) pond will be (more) shaded / eq ;</li> <li>4. (less light means) less photosynthesis possible / eq ;</li> <li>5. ref to photosynthetic individuals die / {non-photosynthetic / mutant} individuals survive ;</li> <li>6. ref to pass on the {mutation / allele} (for using organic compounds) / eq ;</li> <li>7. ref to more organic nutrients in pond ;</li> </ol>	<p>maximum (4)</p>

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

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

Question Number	Answer	Mark
5(a)(iii)	<ol style="list-style-type: none"> <li>1. (S/ suspect) 3 ;</li> <li>2. (S3) matches {all / 9 / eq} of the bands in the sample ;</li> <li>3. DNA profiling assumes every individual's DNA is {unique / different} / eq ;</li> <li>4. apart from identical twins / eq ;</li> <li>5. ref to DNA profiling analyses the {introns / non-coding blocks / STR / short tandem repeats / eq} ;</li> <li>6. non-coding DNA {very variable / hypervariable / eq} ;</li> <li>7. large number of {introns / non-coding blocks / eq} ;</li> <li>8. idea of many {combinations / eq} (at each locus) ;</li> </ol>	<p>maximum (5)</p>

Question Number	Answer	Mark
5(b)	<ol style="list-style-type: none"> <li>1. ref to DNA profiling has several stages ;</li> <li>2. ref to {artefacts / contamination / eq} can arise at any stage ;</li> <li>3. only {a few sequences / small portion } of DNA analysed / eq ;</li> <li>4. ref to possibility of two identical profiles from unrelated individuals ;</li> <li>5. {identical twins / closely-related individuals / eq} may show same profile / eq ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
5(c)	<ol style="list-style-type: none"> <li>1. comparisons made between DNA from fossils and other organisms ;</li> <li>2. to find genetic relationships / how closely related / eq ;</li> <li>3. ref to used in {taxonomy / classification / eq} ;</li> <li>4. to understand evolutionary lines / to determine common ancestor / eq ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
6(a)	<ol style="list-style-type: none"> <li>1. RNA in HIV and DNA in {bacterium / eq} ;</li> <li>2. comparative description of nucleic acid e.g. circular in bacterium and linear in HIV / eq ;</li> <li>3. plasmids in {bacterium / eq} and no plasmids in HIV ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
6(b)	<ol style="list-style-type: none"> <li>1. {keratin / protein} in skin {surface / epidermis} ;</li> <li>2. idea of forms a {hard / impenetrable / physical / eq} barrier ;</li> </ol>	(2)

Question Number	Answer	Mark
6(c)(i)	<ol style="list-style-type: none"> <li>1. numbers decrease / eq ;</li> <li>2. small decrease in {first week / between weeks {4 / 5} and 6} / eq ;</li> <li>3. large decrease between weeks {1 / 2} to 3 / eq ;</li> <li>4. credit use of manipulated figures ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
6* (c)(ii) QWC	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. {<i>glycoprotein</i> / gp120} on virus / eq ;</li> <li>2. binds with {receptors / CD4} / eq ;</li> <li>3. on (surface) membrane of <i>lymphocytes</i> / eq ;</li> <li>4. viral RNA enters the <i>lymphocyte</i> / eq ;</li> <li>5. viral RNA used to produce viral DNA (in <i>lymphocyte</i>) / eq ;</li> <li>6. by action of <i>reverse transcriptase</i> ;</li> <li>7. ref to formation of new viruses ;</li> <li>8. <i>lymphocyte</i> destroyed when new viruses {bud out of / leave} the cell / eq ;</li> <li>9. T killer {cells / <i>lymphocytes</i>} destroy T helper {cells / <i>lymphocytes</i>} / eq ;</li> </ol>	maximum (5)

Question Number	Answer	Mark
6(c)(iii)	B {cells / lymphocytes} { not activated / not stimulated / are inhibited / eq} / fewer antibodies / T killer cells {increase / multiply / eq} ;	(1)

Question Number	Answer	Mark
7(a)(i)	<ol style="list-style-type: none"> <li>1. hydrogen ;</li> <li>2. glycosidic ;</li> </ol>	(2)

Question Number	Answer	Mark
7(a)(ii)	<p>sclerenchyma (fibres) ;</p> <p>xylem (vessels) ;</p> <p>cellulose (fibre) ;</p>	maximum (2)

Question Number	Answer	Mark
7(b)	<ol style="list-style-type: none"> <li>1. ref to {microorganisms / microbes / bacteria / fungi / eq} ;</li> <li>2. ref to respiration of (microorganisms / bacteria / fungi / eq) ;</li> <li>3. ref to aerobic / anaerobic (respiration) ;</li> <li>4. converts {organic compounds / eq} to carbon dioxide / eq ;</li> <li>5. converts {nitrogen compounds / proteins / amino acids/ urea} to ammonia / eq ;</li> </ol>	maximum (4)

Question Number	Answer	Mark
7(c)	<ol style="list-style-type: none"><li>1. correct ref to temperature effect ;</li><li>2. correct ref to water availability ;</li><li>3. correct ref to waterlogging reduces oxygen availability ;</li><li>4. correct ref to frozen water ;</li><li>5. ref to more {insects / decomposers / eq} in summer ;</li><li>6. correct ref to rate of growth of {microorganisms / eq} ;</li><li>7. ref to rate of {metabolism / enzyme reactions} ;</li><li>8. use of manipulated figures to support above points e.g. {50 / 60} days faster in late summer ;</li></ol>	<b>maximum (3)</b>

Question Number	Answer	Mark
8(a)	<ol style="list-style-type: none"> <li>1. idea of antibiotic is used to {control / kill / prevent reproduction of / eq} bacteria ;</li> <li>2. bacteriostatic prevent {reproduction / division / multiplication / growth / eq} of bacteria;</li> <li>3. bactericidal {destroy / kill / eq} bacteria ;</li> </ol>	(3)

Question Number	Answer	Mark
8(b)	<ol style="list-style-type: none"> <li>1. idea that both more or less the same at {start / end} ;</li> <li>2. idea that B is higher than A most of the time ;</li> <li>3. B rises and then falls and A falls and then rises / eq ;</li> <li>4. ref to both falling after April 04 / eq ;</li> <li>5. comparative use of figures ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
8(c)(i)	D {has the lowest rate of MRSA infection (throughout) / is consistent / has less fluctuation} / eq ;	(1)

Question Number	Answer	Mark
8(c)(ii)	<ol style="list-style-type: none"> <li>1. D has {stricter / eq} hygiene practices / eq ;</li> <li>2. ref to hand washing regimes for {doctors / nurses / medical staff / visitors} ;</li> <li>3. particularly when dealing with open {wounds / eq} / eq ;</li> <li>4. ref to wearing suitable clothing ;</li> <li>5. ref to antiseptic (solutions) readily available ;</li> <li>6. named antiseptic e.g. gels, pastes, alcohol rubs ;</li> <li>7. ref to {isolation of suspected cases / screening of admissions} / eq ;</li> <li>8. D {controls / monitors} use of antibiotics / eq ;</li> <li>9. fewer {patients / visitors} passing in and out ;</li> </ol>	<p style="text-align: right;"><b>maximum (3)</b></p>

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