

# Mark Scheme (Results)

## January 2010

GCE

GCE Biology (6BI02/01)

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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 Number	Answer	Mark
1(a)(i)	B ;	(1)

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

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

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

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

Question Number	Answer	Mark
1(a)(vi)	C ;	(1)

Question Number	Answer	Mark
1 (b)(i)	{rough endoplasmic reticulum / RER / rER} ;	(1)

Question Number	Answer	Mark
1 (b)(ii)	A = (80S/ large) {ribosomes / ribosome } ; B = membrane / {cisterna / eq } ;	(2)

Question Number	Answer	Mark
2 (a)	<ol style="list-style-type: none"> <li>1. non-identical twins are genetically different / eq ;</li> <li>2. identical twins {are genetically the same / have the same genotype / same genes / same alleles ;</li> <li>3. so difference (in height / mass / phenotype) is due to {environment / named environmental factor / eq} ;</li> <li>4. greater difference in traits for non-identical twins / eq ;</li> <li>5. idea of difference due to genetic effects e.g. genes have a bigger effect ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
2 (b)(i)	<ol style="list-style-type: none"> <li>1. (laboratory) rats of reduced genetic variability / eq ;</li> <li>2. rats have {a similar / well known} metabolism ;</li> <li>3. no harm to human / eq ;</li> <li>4. idea of looking for potential {toxicity / adverse effect / eq } ;</li> <li>5. ref to legal / ethical issues ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
2 (b)(ii)	Phase 1: 1. idea of drug tested on {a small number / healthy} individuals ;  2. ref to low concentration / monitor safety / eq ;  Phase 2: 3. idea that drug tested on small number of patients ;  4. monitor effectiveness of treatment / eq ;	maximum <b>(3)</b>



Question Number	Answer	Mark
3 (a) (i)	xylem (tissue/vessels) / eq ;	(1)

Question Number	Answer	Mark
3 *(a)(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> <p>Allow any pair for each of the following</p> <p>Water transport:</p> <ol style="list-style-type: none"> <li>1. hollow tubes / no living contents / end walls broken down / eq ;</li> <li>2. idea of allow movement of water e.g. columns of water / vertical movement</li> <li>3. ref to waterproof material / eq ;</li> <li>4. idea that keeps water in the vessel e.g. less water lost</li> <li>5. (pores / eq) ;</li> <li>6. to allow sideways movement of water /eq ;</li> </ol> <p>Support:</p> <ol style="list-style-type: none"> <li>7. ref. to {lignin / extra cellulose} ;</li> <li>8. for strength ;</li> <li>9. ref to {rings / spirals / eq} ;</li> <li>10. for strength / flexibility ;</li> </ol>	<p>maximum (4)</p>

Question Number	Answer	Mark
3 (b)	<ol style="list-style-type: none"> <li>1. ref to correct stimulus e.g. chemical ;</li> <li>2. some genes {switched off / switched on / eq} ;</li> <li>3. mRNA from {switched on / eq} genes ;</li> <li>4. mRNA translated / eq ;</li> <li>5. idea of {protein synthesised / different proteins produced} ;</li> <li>6. which (permanently) modify cell (to become specialised) /description of a modification / eq ;</li> </ol>	<p style="text-align: center;"><b>maximum (3)</b></p>

Question Number	Answer	Mark
3 (c)	<ol style="list-style-type: none"> <li>1. ref to {sample / explants} from both (tissues) ;</li> <li>2. ref to aseptic conditions / named example ;</li> <li>3. grow cells into a callus / eq ;</li> <li>4. ref to growth regulators / eq ;</li> <li>5. ref to {cells / tissue} can differentiate / cells can become {whole plants / eq} ;</li> <li>6. ref to details of procedure e.g. agar / leave for a suitable length of time / suitable controlled variable ;</li> </ol>	<p style="text-align: right;"><b>maximum (4)</b></p>

Question Number	Answer	Mark
4 (a)	<ol style="list-style-type: none"> <li>1. organ ;</li> <li>2. (organ) system ;</li> </ol>	(2)

Question Number	Answer	Mark
4 (b)(i)	<ol style="list-style-type: none"> <li>1. ref to DNA replication ;</li> <li>2. so that it can halve / eq ;</li> <li>3. idea that {new cells will have same amount as original /original (DNA) content restored} ;</li> <li>4. during cytokinesis / eq ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
4 (b)(ii)	3.5 to 3.75 (hours) ;	(1)

Question Number	Answer	Mark
4 (b)(iii)	<ol style="list-style-type: none"> <li>1. <math>(75 \div 270) \times 18</math> ;</li> <li>2. answer correct 5 (hours) ;</li> </ol>	(2)

Question Number	Answer	Mark
4 *(c) 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>chromosomes / chromatids</i> {condense / become visible / eq} ;</li> <li>2. {<i>nuclear</i> envelope / eq } {breaks down / eq} ;</li> <li>3. {<i>nucleolus</i> / eq } {breaks down / eq} ;</li> <li>4. <i>spindle</i> (fibre) begins to form / eq ;</li> <li>5. <i>centrioles</i> migrate to opposite poles / eq ;</li> </ol>	<p>maximum (3)</p>

Question Number	Answer	Mark
5 (a)	Correct ref to: <ol style="list-style-type: none"> <li>1. flagellum / eq ;</li> <li>2. overall shape e.g. streamlined / eq ;</li> <li>3. fewer mitochondria / other organelles / eq ;</li> <li>4. acrosome / eq ;</li> <li>5. zona (pellucida) / jelly layer eq ;</li> <li>6. cortical granules / eq ;</li> <li>7. differences in food store types / eq ;</li> <li>8. sperm cell has less cytoplasm / eq ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
5 (b)	<ol style="list-style-type: none"> <li>1. enzyme {digest / eq}{ zona (pellucida) / eq} ;</li> <li>2. idea that sperm can get through to egg {cell / nucleus / eq} ;</li> <li>3. {contact with / receptor on} {zona pellucida / (glycoprotein) jelly coat / surface of ovum } ;</li> <li>4. (causes) {acrosome / eq to {rupture / open / eq} ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
5 (c)	<ol style="list-style-type: none"> <li>1. meiosis (II) is completed / eq ;</li> <li>2. {male and female / eq } chromosomes come together / (both) nuclei fuse / eq ;</li> <li>3. {cortical granules / enzymes/ chemicals} released (from cell surface membrane) / eq ;</li> <li>4. {bind / eq } with { zona (pellucida) / eq } / {zona (pellucida) / eq } then {thickens /hardens / eq } ;</li> <li>5. to form fertilisation membrane / to make cell impenetrable (to other sperm) / prevents polyspermy / egg cell membrane {changes its charge / becomes positive} / eq ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
5 (d)(i)	<ol style="list-style-type: none"> <li>1. to produce a {zygote / eq} ;</li> <li>2. to produce {original / full} complement of {DNA / chromosomes / genetic material } / diploid / 2n number / eq ;</li> <li>3. to allow mixing of {genes / genetic material } / ref to { genetic variation / eq } ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
5 (d)(ii)	(triploid) endosperm nucleus ;	(1)

Question Number	Answer	Mark
6 (a)(i)	idea that a lower ant diversity indicates a {high copper / poor / eq } environment ;	(1)

Question Number	Answer	Mark
6 (a)(ii)	<ol style="list-style-type: none"> <li>1. idea that amount of vegetation affects the number of ants ;</li> <li>2. idea that the amount of vegetation is affected by copper level ;</li> <li>3. vegetation to copper is direct link / eq ;</li> </ol>	<p>maximum (2)</p>

Question Number	Answer	Mark
6 (b)(i)	<ol style="list-style-type: none"> <li>1. inhibits germination / eq ;</li> <li>2. idea of slowing down {enzymes / biochemical reactions} ;</li> <li>3. slows down rate of { decay / microbial activity / eq } ;</li> <li>4. (therefore) prolongs seed survival / eq ;</li> <li>5. idea that drying reduces freezing effect ;</li> </ol>	<p>maximum (2)</p>

Question Number	Answer	Mark
6 (b)(ii)	<ol style="list-style-type: none"> <li>1. idea that checking {seed viability / germination success / eq } ;</li> <li>2. allows new seeds to be produced / eq ;</li> <li>3. idea that stored seeds may need replacing e.g. due to decay / death ;</li> </ol>	<p>maximum (2)</p>



Question Number	Answer	Mark
6 (c)	<ol style="list-style-type: none"> <li>1. maintaining the endangered species e.g. protection from poachers/ predation ;</li> <li>2. (captive) breeding programmes /eq ;</li> <li>3. reintroduction into the wild / eq ;</li> <li>4. scientific research / example given / eq ;</li> <li>5. education / example given / eq ;</li> </ol>	<p>maximum (2)</p>

Question Number	Answer	Mark
7 (a) (i)	<ol style="list-style-type: none"> <li>1. both increase / eq ;</li> <li>2. qualification of increase e.g. both increase most rapidly between 0 and 100 mg dm<sup>-3</sup> / converse / gradient decreases with increase in calcium / eq ;</li> <li>3. dry mass {equal / 10.6 g} in both at 150 mg dm<sup>-3</sup> ;</li> <li>4. increase in mass very similar in both after 150 mg dm<sup>-3</sup> / increase higher in pods after 150 mg dm<sup>-3</sup> / eq ;</li> <li>5. change in pod mass greater (than shoot) / eq ;</li> <li>6. correct comparative manipulation of the data e.g. shoot increased by {8.1 g to 8.3 g} whilst pod has increased by 11 g ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
7 (a)(ii)	{more / larger} cells / more {cell walls / calcium pectate / middle lamella} / helps uptake of other ions / eq ;	(1)

Question Number	Answer	Mark
7 (b)(i)	<ol style="list-style-type: none"> <li>1. positive (relationship / correlation) / as calcium ion concentration increases so does total nitrogen uptake by pods [not other way round] / eq ;</li> <li>2. {non-regular /greatest increase in total nitrogen uptake occurs between 0 and 75 mg dm<sup>-3</sup> of calcium / eq ;</li> </ol>	(2)

Question Number	Answer	Mark
7 (b)(ii)	nitrate / ammonium / ammonia ;	(1)

Question Number	Answer	Mark
7* (b)(iii) 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. {greater / eq} (protein content) ;</li> <li>2. greater nitrogen uptake / eq ;</li> <li>3. nitrogen is {part / used in synthesis} of {amino acids / protein} / eq ;</li> <li>4. (amino acids) used to synthesise protein / eq ;</li> </ol>	<p>maximum (3)</p>

Question Number	Answer	Mark
8 (a)	<ol style="list-style-type: none"> <li>1. ref. to agar / eq ;</li> <li>2. idea that bacteria need to be distributed ;</li> <li>3. idea of {single / named} bacterial strain / eq ;</li> <li>4. appropriate microbiological technique employed e.g. aseptic / sterile plates ;</li> </ol>	maximum (2)

Question Number	Answer	Mark
8 (b)(i)	to allow a comparison with the other discs / to show that any difference between the discs is due to the treatment given to those discs / eq ;	(1)

Question Number	Answer	Mark
8 (b)(ii)	<ol style="list-style-type: none"> <li>1. (tea tree oil) { diffused / eq } (out of disc) ;</li> <li>2. killed the bacteria / inhibits bacterial growth / eq ;</li> </ol>	(2)

Question Number	Answer	Mark
8 (b)(iii)	<ol style="list-style-type: none"> <li>1. record several measurements / eq ;</li> <li>2. divide by number of measurements (to obtain mean) ;</li> </ol>	(2)

Question Number	Answer	Mark
8 (c)	<ol style="list-style-type: none"> <li>1. 3 (or more) dilutions of tea tree oil / eq ;</li> <li>2. from 50% downwards / eq ;</li> <li>3. looking for minimum strength when diameter is same as original strength / eq ;</li> <li>4. one other named variable kept constant ;</li> </ol>	<p>maximum (3)</p>

Question Number	Answer	Mark
8 (d)	<ol style="list-style-type: none"> <li>1. 37°C is (human) body temperature ;</li> <li>2. (this temp) allows growth of {pathogenic / eq} bacteria / encourages more rapid {growth /reproduction/ eq} ;</li> </ol>	<p>(2)</p>

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