

# Mark Scheme (Results) January 2011

GCE

GCE Biology (6BI01/01)

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our website at [www.edexcel.com](http://www.edexcel.com).

If you have any subject specific questions about the content of this Mark Scheme that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

Ask The Expert can be accessed online at the following link:

<http://www.edexcel.com/Aboutus/contact-us/>

Alternatively, you can speak directly to a subject specialist at Edexcel on our dedicated Science telephone line: 0844 576 0037

January 2011

Publications Code US026134

All the material in this publication is copyright  
© Edexcel Ltd 2011

## 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       |
|-----------------|--------|------------|
| <b>1(a)(i)</b>  | A ;    | <b>(1)</b> |

| Question Number | Answer | Mark       |
|-----------------|--------|------------|
| <b>1(a)(ii)</b> | A ;    | <b>(1)</b> |

| Question Number  | Answer | Mark       |
|------------------|--------|------------|
| <b>1(a)(iii)</b> | D ;    | <b>(1)</b> |

| Question Number | Answer | Mark       |
|-----------------|--------|------------|
| <b>1(a)(iv)</b> | B ;    | <b>(1)</b> |

| Question Number | Answer | Mark       |
|-----------------|--------|------------|
| <b>1(a)(v)</b>  | D ;    | <b>(1)</b> |

| Question Number | Answer   | Mark           |
|-----------------|--|----------------|
| <b>1(b)(i)</b>  | <ol style="list-style-type: none"> <li>1. {control / no treatment / placebo} results in (mean) increase in {volume / eq} of plaque / eq ;</li> <li>2. {drug / treatment} causes a decrease in plaque volume / eq ;</li> <li>3. 70 mm<sup>3</sup> difference in means / eq ;</li> <li>4. comment on (the error bars show) plaque increased in some and decreased in others ;</li> <li>5. comment on (length of error bars show) the change in plaque size was more varied in the treatment group e.g treatment group has a greater range of data ;</li> </ol> | <b>max (2)</b> |

| Question Number | Answer   | Mark           |
|-----------------|--|----------------|
| <b>1(b)(ii)</b> | <p>Any <b>two</b> from</p> <ol style="list-style-type: none"> <li>1. reference to small sample size e.g. only 20 in each group, only 40 people tested in total, not enough data ;</li> <li>2. idea that {there is no indication of statistical significance / the error bars overlap} ;</li> <li>3. idea that (2 months) is a very short period of time ;</li> <li>4. idea that there is no evidence that the reduction in volume is permanent ;</li> <li>5. reference to {other variables / appropriate named variable} not taken into account ;</li> </ol> | <b>max (2)</b> |

| Question Number | Answer   | Mark |   |  |  |  |   |   |   |  |   |   |   |     |
|-----------------|--|------|---|--|--|--|---|---|---|--|---|---|---|-----|
| 2(a)            | <table><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td>X</td><td>✓</td><td>✓</td></tr><tr><td></td><td>✓</td><td>X</td><td>✓</td></tr></table> <p>;;;<br/>Any 2 correct for one mark</p> |      |   |  |  |  | X | ✓ | ✓ |  | ✓ | X | ✓ | (3) |
|                 |  |      |   |  |  |  |   |   |   |  |   |   |   |     |
|                 | X  | ✓    | ✓ |  |  |  |   |   |   |  |   |   |   |     |
|                 | ✓  | X    | ✓ |  |  |  |   |   |   |  |   |   |   |     |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>2(b)(i)</b>  | <ol style="list-style-type: none"> <li>1. {base / eq} (of aorta) ;</li> <li>2. prevents backflow (of blood into heart / ventricles) / eq ;</li> <li>3. during { diastole / atrial systole } / eq ;</li> </ol> | <b>(3)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>2(b)(ii)</b> | <ol style="list-style-type: none"> <li>1. {middle layer of wall of vessel / eq } / tunica media / in the muscle layer ;</li> <li>2. reference to allows { stretching / recoil / description} ;</li> <li>3. to prevent damage (of the aorta) / eq / {to maintain the pressure of the blood / eq } ;</li> </ol> | <b>(3)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>3</b>        | <ol style="list-style-type: none"> <li>1. (double) helix ;</li> <li>2. deoxyribose ;</li> <li>3. phosphate / phosphate group;</li> <li>4. phosphodiester / phospho(di)ester / covalent ;</li> <li>5. thymine ;</li> <li>6. guanine ;</li> <li>7. hydrogen ;</li> <li>8. sixteen / 16 ;</li> </ol> | <b>(8)</b> |



| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>4(a)</b>     | idea that {it overcomes limitations of diffusion / it is involved in transport / heat transfer} ; | <b>(1)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>4(b)</b>     | <p>Arrow / arrows in the labelled right side of diagram to indicate the following:</p> <ol style="list-style-type: none"> <li>1. blood (entering) through vena cava ;</li> <li>2. blood flowing from atrium into ventricle ;</li> <li>3. blood (leaving heart) through pulmonary artery ;</li> </ol> | <b>(3)</b> |

| Question Number | Answer  | Mark           |
|-----------------|---|----------------|
| <b>4 (c)</b>    | <ol style="list-style-type: none"> <li>1. idea that it keeps oxygenated and deoxygenated blood separate ;</li> <li>2. idea that this results in as much oxygen as possible being carried to the {tissues / cells} ;</li> <li>3. reference to different pressures in each side / need for different pressures explained ;</li> </ol> | <b>max (2)</b> |

| Question Number  | Answer   | Mark           |
|------------------|--|----------------|
| <b>*5(a) QWC</b> | <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. idea of (<i>mutation</i> / named mutation) causing different base sequence ;</li> <li>2. reference to different {sequence of <i>amino acids</i> / <i>primary</i> structure} / eq ;</li> <li>3. reference to {<math>\beta</math> chain / <i>haemoglobin</i> / <i>protein</i> / <i>polypeptide</i>} being the wrong shape ;</li> <li>4. <i>haemoglobin</i> no longer binds oxygen / binds less <i>oxygen</i> / eq ;</li> <li>5. {less / no } <i>oxygen</i> {supplied / carried / eq} (to the cells) / eq ;</li> <li>6. correct reference to <i>respiration</i> / eq ;</li> <li>7. idea of breathlessness due to body trying to take in more <i>oxygen</i> ;</li> <li>8. idea of tiredness due to lack of energy ;</li> </ol> | <b>max (4)</b> |

| Question Number      | Answer   | Mark    |       |       |                      |                      |         |            |
|----------------------|--|---------|-------|-------|----------------------|----------------------|---------|------------|
| <b>5(b)</b>          | <table border="1"> <tr> <td>25(%)</td><td>25(%)</td><td>50(%)</td></tr> <tr> <td>no chance<br/>/ 0 (%)</td><td>no chance<br/>/ 0 (%)</td><td>100 (%)</td></tr> </table> <p>All 3 in a row = 2 marks<br/>1 or 2 in a row correct = 1 mark</p> | 25(%)   | 25(%) | 50(%) | no chance<br>/ 0 (%) | no chance<br>/ 0 (%) | 100 (%) | <b>(4)</b> |
| 25(%)                | 25(%)  | 50(%)   |       |       |                      |                      |         |            |
| no chance<br>/ 0 (%) | no chance<br>/ 0 (%)   | 100 (%) |       |       |                      |                      |         |            |

| Question Number | Answer  | Mark                      |
|-----------------|---|---------------------------|
| <b>5(c) QWC</b> | <ol style="list-style-type: none"> <li>1. reference to use of {normal / correct} {allele / gene};</li> <li>2. for {haemoglobin / B chain};</li> <li>3. reference to introduction of {gene / allele / DNA} into cells ;</li> <li>4. cells named as (bone) marrow / eq ;</li> <li>5. reference to use of vector (to introduce gene into cells) ;</li> <li>6. (named vector) e.g. virus, liposome ;</li> <li>7. credit reference to appropriate mode of delivery of vector e.g. injection into (bone) marrow ;</li> <li>8. reference to need for repeated treatment ;</li> </ol> | <p><b>max<br/>(4)</b></p> |

| Question Number | Answer  | Mark               |
|-----------------|---|--------------------|
| <b>*6(a)QWC</b> | <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. appropriate tissue named e.g. beetroot ;</li> <li>2. reference to {washing / soaking} {beetroot / eq} (thoroughly) ;</li> <li>3. reference to waterbath (to maintain / change temperature) ;</li> <li>4. reference to {range / at least 5] {temperatures / alcohol concentrations} ;</li> <li>5. appropriate controlled variable named e.g. length of time, size of beetroot ;</li> <li>6. indication of what is being used to judge permeability colour of solution, absorbance, transmission ;</li> <li>7. description of how permeability can be assessed e.g. use of colorimeter, standard solutions ;</li> <li>8. reference to repeats / replicates ;</li> </ol> | <b>max<br/>(5)</b> |

| Question Number | Answer                               | Mark       |
|-----------------|--------------------------------------|------------|
| <b>6(b)(i)</b>  | no {relationship / correlation} eq ; | <b>(1)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>6(b)(ii)</b> | permeability of cell membrane increases as the solubility (in oil relative to water) increases / eq ; | <b>(1)</b> |

| Question Number  | Answer   | Mark       |
|------------------|--|------------|
| <b>6(b)(iii)</b> | <ol style="list-style-type: none"> <li>1. circle drawn in top left quarter of graph ;</li> <li>2. {circle/dot} drawn is equal to or smaller than smallest printed circle, e.g. fits within one square ;</li> </ol> | <b>(2)</b> |

| Question Number | Answer  | Mark           |
|-----------------|---|----------------|
| <b>6(b)(iv)</b> | <ol style="list-style-type: none"> <li>1. reference to phospholipid bilayer ;</li> <li>2. reference to hydrophobic nature (of bilayer / tails) ;</li> <li>3. idea that {non-polar molecules / molecules that have high solubility in oil compared with water} will pass through the membrane more readily<br/> <b>OR</b><br/> idea that {polar molecules / molecules with low solubility in oil relative to water} will pass through less readily ;</li> <li>4. idea that permeability linked to readiness to dissolve ;</li> <li>5. reference to {fluidity / movement} of phospholipids ;</li> </ol> | <b>max (3)</b> |

| Question Number | Answer   | Mark           |
|-----------------|--|----------------|
| <b>7(a)(i)</b>  | <ol style="list-style-type: none"> <li>1. reference to {COOH/ carboxylic/ acid} grouping (at one end) ;</li> <li>2. (long hydro)carbon chain / eq ;</li> <li>3. 18 carbons / 17 carbons in hydrocarbon chain / eq ;</li> <li>4. Correct reference to (poly) unsaturated ;</li> <li>5. 3 carbon-carbon double bonds / 4 double bonds ;</li> <li>6. kinked structure / eq ;</li> </ol> | <b>max (2)</b> |

| Question Number | Answer  | Mark           |
|-----------------|---|----------------|
| <b>7(a)(ii)</b> | <p>Any <b>one</b> from</p> <ol style="list-style-type: none"> <li>1. omega 3 has {3 carbon-carbon double bonds / 4 double bonds} , omega 6 has {2 / 3 } / eq ;</li> <li>2. omega 3 has less hydrogens / eq ;</li> <li>3. omega 3 is {kinkier / shorter} / eq ;</li> <li>4. omega 3 less saturated / eq ;</li> </ol> | <b>max (1)</b> |

| Question Number  | Answer   | Mark       |
|------------------|--|------------|
| <b>7(a)(iii)</b> | <ol style="list-style-type: none"> <li>1. indication that fatty acid forms a bond with the OH group of the glycerol molecule ;</li> <li>2. indication that water is formed ;</li> <li>3. ester bond correctly drawn ;</li> </ol> | <b>(3)</b> |

| Question Number | Answer   | Mark           |
|-----------------|--|----------------|
| <b>7(b)</b>     | <ol style="list-style-type: none"> <li>1. less grass less omega 3 / eq ;</li> <li>2. less grass more omega 6 / eq ;</li> <li>3. more grass reduces the omega 6 to omega 3 ratio / eq ;</li> <li>4. credit correct manipulation of figures ;</li> </ol> | <b>max (3)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>7(c)(i)</b>  | <p>Any <b>two</b> from:</p> <ol style="list-style-type: none"> <li>1) high {salt / sodium}</li> <li>2) high cholesterol</li> <li>3) high saturated fat / high trans-fat</li> <li>4) high calories</li> <li>5) high alcohol</li> <li>6) low fibre / low NSP</li> <li>7) low antioxidants / low vitamin C / low vitamin E ;</li> </ol> | <b>(1)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>7(c)(ii)</b> | <p>blood pressure falls too low / coughs / swelling of ankles / impotence / tiredness / constipation / headache / confusion / depression / excessively low heart rate / allergy / stroke / provoked type II diabetes / frequent urination / fainting / dizziness / vomiting / dry mouth / breathing difficulties / irregular heart rate / chest pain / hives / rash / dehydration / reduced circulation effects / low potassium / blurred vision / eq ;</p> | <b>(1)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>8(a)(i)</b>  | 1. {sequence / order} of amino acids ;<br>2. joined by peptide bonds ; | <b>(2)</b> |

| Question Number | Answer   | Mark           |
|-----------------|--|----------------|
| <b>8(a)(ii)</b> | 1. idea that primary structure determines (three-dimensional) folding / eq ;<br>2. reference to types of amino acids determine {types of bonds / (other than peptide bonds) / named bond};<br>3. reference to position of amino acids determines position of {bonds / correctly named bond} ;<br>4. correct reference to two cys (amino acids) form bonds ;<br>5. idea that {shape / position / eq} of active site is determined by position of amino acids ;<br>6. reference to shape of active site being correct to bind to substrate ;<br>7. reference to {amino acids / R groups} involved in {chemical reaction / eq} ;<br>8. reference to {globular/ soluble / enzyme} molecules being {relatively short / small / made up of relatively few amino acids} ;<br>9. reference to {globular / soluble proteins/ enzyme} having relatively high number of {polar / small{ { amino acids / R groups} ;<br>10. reference to {polar R groups / eq} facing outwards ; | <b>max (5)</b> |



| Question Number | Answer  | Mark               |
|-----------------|---|--------------------|
| <b>8(b)(i)</b>  | <ol style="list-style-type: none"> <li>1. reference to mRNA as a copy of the {genetic code / DNA} ;</li> <li>2. of the protein (being synthesized) / eq ;</li> <li>3. moves {out of the nucleus / to ribosomes } / eq ;</li> <li>4. idea that it {acts as a template / has the instructions} for translation ;</li> </ol> | <b>max<br/>(3)</b> |

| Question Number | Answer   | Mark               |
|-----------------|--|--------------------|
| <b>8(b)(ii)</b> | <ol style="list-style-type: none"> <li>1. correct reference to translation ;</li> <li>2. binds to an amino acid / takes the amino acid to the {ribosome / mRNA} ;</li> <li>3. reference to tRNA being specific to amino acid ;</li> <li>4. holds the amino acid in place / eq ;</li> </ol> | <b>max<br/>(3)</b> |

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

Telephone 01623 467467  
Fax 01623 450481

Email [publications@linneydirect.com](mailto:publications@linneydirect.com)

Order Code US026134 January 2011

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

Edexcel Limited. Registered in England and Wales no.4496750  
Registered Office: One90 High Holborn, London, WC1V 7BH