# Mark Scheme (Final)

# Summer 2014

## GCE Biology (6BI01)
## Paper 01R

## Unit 1: Lifestyle, Transport, Genes and Health

## Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk for our BTEC qualifications.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

If you have any subject specific questions about this specification that require the help of a subject specialist, you can speak directly to the subject team at Pearson.

Their contact details can be found on this link:
www.edexcel.com/teachingservices.

You can also use our online Ask the Expert service at www.edexcel.com/ask. You will need an Edexcel username and password to access this service.

**Pearson: helping people progress, everywhere**
Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2014
Publications Code

## 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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
iii) organise information clearly and coherently, using specialist vocabulary when appropriate

## Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

## 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.

| Question Number | Answer | Mark |
|---|---|---|
| 1(a)(i) | B ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 1(a)(ii) | A ; | (1) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 1(b) | 1. (right) atrium has less muscle / eq ;<br><br>2. idea that thickness is related to blood pressure required ;<br><br>3. right atrium pumps blood to (right) ventricle / eq ;<br><br>4. right ventricle pumps blood to lungs / eq ; | <br><br>2. ACCEPT reference to distance blood is pumped or strength of contraction required.<br><br>4. ACCEPT into pulmonary artery | (3) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 1(c) | <table><tr><th>Stage of cardiac cycle</th><th>Valves X</th><th>Valves Y</th></tr><tr><td>Atrial systole</td><td>✓</td><td>× ;</td></tr><tr><td>Diastole</td><td>✓</td><td>× ;</td></tr></table> | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 1(d)(i) | $0.95^2$ / 0.90 ;<br><br>X 3.14 = 2.83 ; | Correct answer = 2 marks<br><br>ACCEPT 2.8 / 2.834 | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 1(d)(ii) | 1. reference to elastic fibres;<br>2. allow stretching to accommodate higher pressure / allow recoil to maintain pressure / eq ;<br><br>3. reference to folded endothelium ;<br>4. allow stretching to accommodate higher pressure / eq ;<br><br>5. reference to (smooth) muscle ;<br>6. idea that muscle can {contract / exert pressure / eq} ;<br><br>7. reference to smooth {lining / endothelium / eq} ;<br>8. reduce {friction / resistance to blood flow / eq} ;<br><br>9. reference to narrow lumen ;<br>10. to maintain (high) blood pressure ;<br><br>11. reference to collagen ;<br>12. idea that it avoids {rupture / damage / eq} ; | Linked points – Maximum of 2 marks for structures. Function must be linked to relevant structure. | (3) |

| Question Number | Answer | Mark |
|---|---|---|
| 2(a)(i) | D ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 2(a)(ii) | A ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 2(a)(iii) | B ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 2(a)(iv) | D ; | (1) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 2(b)(i) | 1. idea that only one factor has changed ;<br><br>2. if intake went up, increase risk / obesity a risk factor / if intake went down could decrease CHD risk / eq ; | 1. ACCEPT Less valid investigation / method , to allow comparison, variables need to be controlled<br>IGNORE reliability, fair test | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 2(b)(ii) | 1. both diets decrease the risk / eq ;<br><br>2. both diets have less saturated fats / eq ;<br><br>3. saturated fat associated with heart disease / eq ;<br><br>4. idea that changing to unsaturated lipids has the greater effect ;<br><br>5. idea that excess carbohydrates may be stored as saturated lipids ;<br><br>6. idea that unsaturated lipids change HDL/LDL ratio ; | 4. 30% more decrease | (3) |

| Question Number | Answer | Mark |
|---|---|---|
| 3(a)(i) | A ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 3(a)(ii) | 8 ; | (1) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 3(b) | Transcription ; | | (1) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 3(c) | 1. idea that there is a change in the {DNA sequence / base sequence of a gene / eq } ;<br><br>2. change in amino acid / change in primary structure of { protein / enzyme } ;<br><br>3. reference to different R groups ;<br><br>4. leading to different {type / position / eq} bonding ;<br><br>5. idea of change in {shape / properties} of the active site ;<br><br>6. idea of {phenylalanine / substrate / eq} does not fit in the enzyme's active site ; | 1. IGNORE mRNA<br><br>4. ACCEPT named bond e.g. hydrogen, ionic, disulphide<br>NOT peptide<br>5. ACCEPT enzyme is not made<br><br>6. ACCEPT no enzyme-substrate complex made | (4) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 3(d) | 1. loss causes whole amino acid sequence (beyond mutation) to change / causes frame shift / eq ;<br><br>2. replacement only changes one {codon / amino acid / may not change the amino acid if third base / eq } eq ;<br><br>3. idea that the number of amino acids remains the same with replacement ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 4(a) | 1. phospholipid bilayer – correct orientation ;<br><br>2. glycosidic protein – in outer layer only ;<br><br>3. intrinsic protein – spanning both layers ; | IGNORE labels<br>1. NOT if gap between layers bigger than one phospholipid<br>2. NOT if floating above layer<br><br>3 ACCEPT in one layer only | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 4(b) | | | **(3)** |

| | Process | | |
|---|---|---|---|
| Description | Simple diffusion | Facilitated diffusion | Active Transport |
| ATP required | × | × | ✓ |
| Membrane protein molecules involved | × | ✓ | ✓ |
| Direction of transport is always down a concentration gradient | ✓; | ✓; | ×; |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 4(c) | 1. idea that the rate increases when the concentration increases / eq ;<br><br>2. this increases the concentration gradient / eq ;<br><br>3. idea that {plateau / levelling off} of curve due to channel proteins being saturated with molecules (of the substance) / eq ;<br><br>4. idea that no more can be carried (per unit time) / max rate of entry reached /eq ; | | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(a) | 1. lower blood cholesterol / eq ;<br>2. idea of inhibition of cholesterol synthesis in liver ;<br>3. reduce risk of CVD / eq ; | 3. ACCEPT atherosclerosis, fatty plaques, atheroma | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(b)(i) | 1. idea that statins seen as more effective / more aware of the benefits / eq ;<br><br>2. may be prescribed (more frequently) as a preventative measure to reduce risk of further CVD / eq ;<br><br>3. specific reference to cheaper / off-patent statins available / eq ;<br><br>4. perception of lower risks / more awareness of the risks / eq ; | | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(b)(ii) | 1. use of both increased over three years / eq ;<br><br>2. greater increase in use of antihypertensives than in platelet inhibitory drugs / eq ;<br><br>3. the use of platelet inhibitory drugs is (always) greater than antihypertensives / eq ;<br><br>4. comparative manipulation of data ; | | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(c)(i) | 1. prevents platelets becoming {activated / sticky} / eq ;<br><br>2. prevent the formation of a {blood clot / thrombus / embolism / eq} / eq ;<br><br>3. specific example e.g. stroke ; | 1. ACCEPT effectiveness of platelets reduced / idea that clotting factors {not synthesised / inhibited / eq}<br><br>2. IGNORE 'thin the blood'<br>ACCEPT prevents blood clotting<br><br>3. IGNORE CVD<br>ACCEPT idea that (risk of) blood vessels becoming blocked is reduced | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(c)(ii) | 1. reduce blood pressure / eq ;<br><br>2. reduces heart rate / eq ;<br><br>3. prevent muscles in vessel walls contracting / eq ;<br><br>4. by acting on (sympathetic) nervous system / eq ; | | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 6(a)(i) | 1. an increase in temperature increases the permeability / eq ;<br><br>2. idea that increase in permeability is non-linear e.g. greatest increase between 40 and 60 °C, less change up to 40°C ;<br><br>3. credit correct manipulation of figures e.g. 4.9 increase between 40 and 60 °C ; | 2. NOT faster, slower, etc | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 6(a)(ii) | 1. idea that increased kinetic energy increases movement of molecules ;<br><br>2. reference to phospholipids moving / eq ;<br><br>3. idea that (membrane) proteins denatured ;<br><br>4. idea that there is more {denaturation / disruption / eq} at {higher temperatures / above 40 °C } ;<br><br>5. idea that {betalain / pigment} can escape from the {cell / vacuole /eq } when the membrane is disrupted ;<br><br>6. comment on the disruption of the vacuole membrane / eq ; | | (3) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| ***6(b)** | (QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)<br><br>1. appropriate standardisation of source of beetroot tissue ;<br><br>2. standardisation of size of beetroot pieces / eq ;<br><br>3. need for {washing / rinsing / eq} {beetroot / eq} (thoroughly) ;<br><br>4. use of waterbath (to maintain / change temperature) ;<br><br>5. reference to repeats at each temperature / replicates / eq ;<br><br>6. use of temperatures {below 20 / above 90 $^{0}$C / smaller intervals / eq };<br><br>7. reference to one other suitable variable e.g. time beetroot pieces left between cutting and use ;<br><br>8. reference to {calibration / zeroing / eq} of colorimeter ; | QWC emphasis clarity of expression | **(5)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 7(a)(i) | to (help) standardise health of sample group / eq<br>OR<br>to (help) standardise risk of {CVD / stroke / heart attack / eq} in sample group / eq<br>OR<br>idea that it increases confidence that any CVD developed during the period of the investigation ; | ACCEPT to keep variables constant | (1) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 7(a)(ii) | 1. (to allow researchers to) select people with similar levels of {activity / lifestyle / risk factors /eq} ;<br><br>2. (to allow researchers to) select people with similar medical history ;<br><br>3. (to allow researchers to) [idea of] collecting information about television viewing without singling that out ; | 1. ACCEPT take into account / eliminate other factors that cause CVD | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 7(b)(i) | 1. idea that some are indicators of obesity e.g. BMI ;<br><br>2. (most are) risk factors for CVD / eq ;<br><br>3. HDL cholesterol lowers (CVD) risk / eq ;<br><br>4. reference to ratio of LDL:HDL ;<br><br>5. idea that this is data that can be measured during the investigation to show increased risk of CVD ; | | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 7(b)(ii) | 1. data is quantitative ;<br><br>2. health professionals trained ;<br><br>3. health professionals less biased ;<br><br>4. (idea that) participants may over or underestimate ;<br><br>5. questionnaire data relies on remembering events / medical history etc accurately ; | 5. ACCEPT idea of inaccurate untruthful answers to questionnaire | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 7(c) | 1. reference to bias ;<br><br>2. drug company may have an interest in showing a strong link ;<br><br>3. TV manufacturer may have an interest in showing a weak link ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 7(d) | [No]<br><br>1. correlation does not show causation / eq ;<br><br>2. some other (risk) factor may be involved / eq ;<br><br>3. example of risk factor e.g. diet, smoking ;<br><br>4. idea that sitting watching television is lack of exercise / sitting reading a book would be similar risk ; | 1. ACCEPT not a causal relationship | (3) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| ***8(a)** | (QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)<br><br>1. reference to CFTR {protein / channel} / eq ;<br><br>2. idea of a different {amino acid / sequence of amino acids / primary structure / eq} ;<br><br>3. {shape / function} of {CFTR / protein/ channel / eq} changed / eq ;<br><br>4. role of protein in transporting chloride ions / eq ;<br><br>5. (chloride) ions not {moving out of cells / going into mucus} / eq ;<br><br>6. water does not move out (of cells) / water moves in (to cells) / eq ;<br><br>7. reference to osmosis ;<br><br>8. mucus (on cell surface) {is not diluted / becomes thicker / becomes stickier} / eq ;<br><br>9. (thickened mucus) cannot be moved by {cilia / coughing} ; | QWC –answer must be organised in a logical sequence) | **(5)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 8(b) | 1. reference to using {alleles / genes / eq} coding for the CFTR {protein / channel} ;<br><br>2. reference to introducing the {alleles / genes / eq} into the cells of the {lungs / pancreas / reproductive tracts / that produce mucus / eq} ;<br><br>3. using a {vector / named vector} ;<br><br>4. credit suitable delivery mechanism e.g. nebuliser, injection ;<br><br>5. idea that treatment needs to be repeated (due to cell replacement) ;<br><br>6. idea that {transcription / translation} of the gene produces the {normal/ functioning / CFTR / eq} protein ; | 2. NOT replaces/ repairs | **(3)** |



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

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com

Order Code

For more information on Edexcel qualifications, please visit our website
www.edexcel.com

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE