



Mark Scheme (Results)

January 2013

GCE Biology (6BI01) Paper 01
Lifestyle, Transport, Genes and Health

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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 | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1 | 1. diastole ; 2. atrium / atria ; 3. ventricles ; 4. atrioventricular / bicuspid / tricuspid ; 5. semilunar (valves) ; 6. artery ; | 1. ALLOW ventricular diastole or atrial AND ventricular diastole (together) NOT atrial diastole by itself 4. ALLOW AV , mitral 5. ALLOW aortic valves | (6) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 2(a) | <p>1. idea that DNA (molecule) { unwinds / unzips / uncoils / eq } (DNA) strands separate ;</p> <p>2. (RNA mono) nucleotides { line up against / attach to } { one strand / template / antisense strand / eq } / eq ;</p> <p>3. ref to complementary base pairing (between DNA and mononucleotides) ;</p> <p>4. ref to formation of phosphodiester bonds ;</p> <p>5. ref to condensation reaction ;</p> <p>6. correct name of enzyme involved ;</p> <p>7. idea that mRNA detaches from the DNA ;</p> | <p>1. ALLOW description e.g. breaking of hydrogen bonds</p> <p>2. NOT DNA strands, DNA nucleotides</p> <p>3. ALLOW description of complementary base pairing</p> <p>6. (DNA) helicase, RNA polymerase, DNA ligase NOT DNA polymerase, polymerase</p> <p>7. NOT leaves nucleus alone / eq</p> | (4) |

| Question Number | Answer | Mark |
|-----------------|--------|------------|
| 2(b)(i) | B ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--------|------------|
| 2(b)(ii) | B ; | (1) |

| Question Number | Answer | Mark |
|------------------|--------|------------|
| 2(b)(iii) | D ; | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 2(c) | <ol style="list-style-type: none"> 1. tRNA is folded (and mRNA is {straight / unfolded}) / eq ; 2. tRNA has hydrogen bonds (holding the structure together) (but the mRNA does not / eq) ; 3. tRNA is a fixed {size / length} (but mRNA {is not / length depends on size of gene}) / eq ; 4. tRNA has an anticodon (but mRNA has codons) ; 5. tRNA has an amino acid binding site ; | <ol style="list-style-type: none"> 1. IGNORE double stranded / branched ALLOW tRNA clover shaped / looped 2. ALLOW tRNA has complementary base pairing / double stranded sections NOT (all) double stranded 4. NOT is an anticodon | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 3(a) | <ol style="list-style-type: none"> 1. phospholipid (bilayer) ; 2. credit details of phospholipid bilayer ; 3. proteins ; 4. credit details of proteins ; 5. reference to other named membrane components ; | <p>ALLOW a clearly labelled diagram</p> <p>2. e.g orientation because of hydrophobic and/or hydrophilic regions eg phospholipids are fluid</p> <p>4. e.g. description of channel/carrier protein structure or position. (Intrinsic, extrinsic or transmembrane)</p> <p>5.e.g. glycolipid, cholesterol, glycoprotein, carbohydrate <u>chain</u>, glycocalyx</p> | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 3(b)(i) | <p>Solute P:</p> <ol style="list-style-type: none"> 1. (up to 30 minutes) the {concentration / number} of molecules of P increases inside the cell / eq ; 2. ref to {diffusion / facilitated diffusion} (of molecules of P into the cell) ; 3. down the concentration gradient (of P) / eq ; 4. {between 30 and 40 minutes / after 30 minutes } the {concentration / number} of molecules (of P) inside the cell stays the same / eq ; 5. concentration (of P) inside cell equals concentration outside cell / reaches equilibrium / eq ; <p>Solute R:</p> <ol style="list-style-type: none"> 6. solute R does not enter cell / eq ; 7. membrane is impermeable to R ; | <p>IGNORE amount</p> <p>max 4 marks for solute P</p> <ol style="list-style-type: none"> 2. NOT osmosis 3. ALLOW high to low concentration NOT high to low concentration gradient 4. ALLOW no net movement | (5) |

| Question Number | Answer | Additional guidance | Mark |
|------------------|----------------------------------------------------------------------------------|---------------------|------------|
| 3(b) (ii) | six white circles inside and outside the cell and 4 black circles outside cell ; | | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4(a) (i) | <ol style="list-style-type: none"> 1. glucose provides respiratory substrate / eq ; 2. to provide {energy / eq} for heart (muscle) {contraction / eq} ; 3. reference to osmotic effect ; | <ol style="list-style-type: none"> 1. ALLOW needed / used for respiration 3. Can be expressed in a variety of ways eg solution is isotonic. | (2) |

| Question Number | Answer | Additional guidance | Mark |
|------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|------------|
| 4(a) (ii) | {glucose / pH } at same { concentration / volume / value / eq } ; | IGNORE references to caffeine and temperature etc. IGNORE amount | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-------------------|--------------------------------------|------------------------------------------------------------------------------------|------------|
| 4(a) (iii) | reference to replication procedure ; | ALLOW repeats, use more than one heart NOT repeat with different concentrations | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------|
| 4(a)(iv) | <ol style="list-style-type: none"> 1. the heart rate decreases (with increasing caffeine concentrations) above $0.1 \text{ (mg cm}^{-3}\text{)}$ / concentrations of a caffeine above $\{0.30 - 0.34 \text{ (mg cm}^{-3}\text{)}\}$ the heart rate $\{\text{decreases / is lower than base rate}\}$ / eq ; 2. up to a concentration of $\{0.30-0.34 \text{ (mg cm}^{-3}\text{)}\}$ caffeine there is an increase in heart rate (above base rate) / eq ; 3. $0.1 \text{ (mg cm}^{-3}\text{)}$ caffeine causes the fastest heart rate / eq ; 4. credit correct manipulation of figures ; | <p>4. e.g. 20% increase with $0.1 \text{ (mg cm}^{-3}\text{)}$</p> | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4(b)(i) | <ol style="list-style-type: none"> 1. details of method to limit movement of <i>Daphnia</i> ; 2. reference to determining base heart rate (in absence of caffeine) ; 3. reference to use of range of caffeine concentrations ; 4. acclimatisation of <i>Daphnia</i> (in each solution) / eq ; 5. details of method to determine heart rate; 6. repeats / replicates ; 7. Named control variable e.g. {source / size / age / type / eq} of <i>Daphnia</i>, temperature, pH ; | <ol style="list-style-type: none"> 1. e.g. use of cotton wool IGNORE cavity slide 2. ALLOW measure heart rate in 0% caffeine NOT distilled water 5. eg dots on paper in a set time / use video camera IGNORE just counting | (4) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------|---------------------|------------|
| 4(b)(ii) | chicken (embryo) {is a vertebrate / feels pain / will die / cannot give consent/ eq } ; | | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5(a)(i) | <ol style="list-style-type: none"> 1. Idea that there is a {thick wall / lots of collagen / thick layers / thick tunica media / eq} ; 2. Idea that it needs {to avoid rupture / to withstand high pressure / eq} ; 3. {elastic / muscular / eq} {layer / fibres / wall/ eq} ; 4. Control the flow of blood / maintain blood pressure / elastic recoil / eq ; 5. smooth endothelial wall / eq ; 6. to reduce {friction / resistance / eq} ; 7. semi lunar valve present ; 8. to prevent backflow (during diastole) ; 9. large lumen ; 10. idea of accommodating large volumes of blood / eq ; 11. branches ; 12. to supply blood to different parts of the body (including coronary arteries) / eq ; | <p>Max 2 marks for structural features only. Functions need to be in correct context</p> <ol style="list-style-type: none"> 1. ALLOW idea of folded wall 2. IGNORE damage alone ALLOW stretch to accommodate more blood 4. ALLOW to squeeze blood along 5. ALLOW smooth lining 7. IGNORE no valves ALLOW aortic valve 9. IGNORE narrow lumen | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5(a)(ii) | <ol style="list-style-type: none"> 1. capillary walls are one cell thick / eq ; 2. no {elastic tissue / collagen / muscle / multiple layers / eq } in the capillary (walls) ; 3. no valves in capillaries ; 4. capillaries have a very narrow lumen / eq ; 5. capillaries are porous / have pores; | <p>ALLOW converse statements ALLOW statements that only mention capillary or vein – but do not credit same mark point twice 1. and 4. IGNORE capillaries are one cell thick alone</p> | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------|
| 5(b)(i) | <ol style="list-style-type: none"> 1. idea that the area of dead heart muscle will be {downstream of the atheroma / in region normally supplied by the blocked artery / eq} ; 2. idea that each artery supplies (cells) with {oxygen / glucose / oxygenated blood } ; 3. idea that {cells / muscle / tissue / eq} (supplied by the blocked vessel) will die due to lack of {energy / respiration} ; 4. idea that if the atheroma is located {near the end of an artery / in a small artery } then the area of dead muscle will be small ; | <p>4. ALLOW converse</p> | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------|
| 5(b)(ii) | <ol style="list-style-type: none">1. shaded area should not extend above position B ;2. shaded area should be around all the vessels on the right side of the diagram but not overlap with those on the left ; | | (2) |

| Question Number | Answer | Comments | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 6(a) | <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. (a) <i>glucose</i> ; 2. <i>glycosidic</i> {bonds / links} ; 3. <i>amylose</i> and <i>amylopectin</i> ; 4. <i>amylose</i> has 1- 4 (<i>glycosidic</i>) {bonds / links} <p>AND <i>amylopectin</i> has 1- 4 and 1- 6 (<i>glycosidic</i>) bonds / eq ;</p> <ol style="list-style-type: none"> 5. <i>amylose</i> is {spiralled / coiled} ; 6. <i>amylopectin</i> is branched / eq ; 7. compact <i>molecule</i> / eq ; | <p>QWC spelling of words in italics should be correct. Penalise just once – ALLOW max score of 5 if 6 mpts met but one lost due to spelling mistake.</p> | (5) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------|
| 6(b)(i) | 1. speeds up the rate of reaction / eq ; 2. without being {changed/used up / eq} ; 3. lowers activation energy / provides an alternative reaction pathway / eq ; 4. does not change {products / position of equilibrium / eq } / eq ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------|---------------------------------------------------------|------------|
| 6(b)(ii) | 1. breaks the (glycosidic) bonds / eq ; 2. reference to use of water ; | 1. IGNORE hydrogen bonds 2. NOT makes water / eq | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------|------------|
| 6(c) | idea that { maltose / disaccharide / glucose / monosaccharide} {is produced / tastes sweet} ; | ALLOW dextrins / sugar NOT any other named sugar eg sucrose | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 7(a) | Idea that (a change in) one variable (directly) results in the change of another variable ; | ALLOW causes, affects, etc and clear examples Eg increase in blood cholesterol causes an increase in the risk of CVD IGNORE correlation, link, relationship, trend, etc alone | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 7(b)(i) | <ol style="list-style-type: none"> 1. reference to peptide bonds (joining amino acids); 2. between amino group (of one amino acid) and carboxyl group (of another) / eq ; 3. the sequence of amino acids is the primary structure of the protein / eq ; 4. reference to folding (of primary structure) held together by bonds / eq ; 5. { disulfide bridges / eq } / { hydrogen / H } bonds / ionic bonds / Van der Waals forces ; 6. between the R groups / eq ; | <ol style="list-style-type: none"> 2. ALLOW from a labelled diagram ALLOW NH₂ and COOH 4. ALLOW ref to alpha helix or beta pleated sheet | (4) |

| Question Number | Answer | Additional guidance | Mark |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------|
| 7 (b) (ii) | <ol style="list-style-type: none"> 1. HDL is smaller ; 2. HDL contains more protein / eq ; 3. HDL contains less cholesterol / eq ; | ALLOW converse for LDL | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 7(c) (i) | <ol style="list-style-type: none"> 1. (risk due to) high blood pressure has fallen overall / eq ; 2. (risk due to) high blood cholesterol has fallen overall / eq ; 3. (risk due to) obesity has risen overall / eq ; 4. obesity was the lowest risk factor but is now the highest / eq ; 5. credit use of manipulated figures ; | <p>Answers should cover total time period and not just 1980-1990</p> <p>5. only credit overall change figures e.g. 17% drop for high blood pressure 16% drop for high blood cholesterol 10.5% increase in obesity</p> | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------|
| 7(c)(ii) | 1. people more aware of the risks / eq ; 2. people consuming foods with lower {cholesterol levels / saturated fats / eq} / eq ; 3. people consuming foods with more fibre in them / eq ; 4. use of statins / eq ; 5. more screening / eq ; 6. more exercise / eq ; | 1. ALLOW more aware of healthy diets 4. Use of sterols/named example 5. ALLOW self testing | (2) |

| Question Number | Answer | Additional guidance | Mark |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------|
| 7(c)(iii) | Any two from: (being) male increase in age lack of exercise / inactivity smoking genetics high alcohol consumption high salt diet high saturated fat intake stress diabetes ; | IGNORE fat, LDL or cholesterol consumption | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------|
| 8(a) | 1. (the disorder results from a) defect in genes / eq ; 2. both (defective) alleles need to be present / homozygous / not expressed in the presence of a dominant allele / eq ; | 1. ALLOW faulty allele | (2) |

| Question Number | Answer | Mark |
|-----------------|--------|------------|
| 8(b) (i) | A ; | (1) |

| Question Number | Answer | Mark |
|------------------|--------|------------|
| 8(b) (ii) | C ; | (1) |

| Question Number | Answer | Mark |
|-------------------|--------|------------|
| 8(b) (iii) | A ; | (1) |

| Question Number | Answer | Mark |
|------------------|--------|------------|
| 8(b) (iv) | D ; | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------|
| 8(c)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. {isolation / identification / eq} of normal gene / eq ; 2. {inserted / eq} into vector / stem cells / eq ; 3. vector named as {liposome / virus} ; 4. injection of {vector / modified stem cells} into {blood / brain / target cells / eq} / eq ; 5. ref to use of control injection ; 6. further detail of control injection e.g. use empty liposome / virus without gene inserted ; 7. progression of disease monitored / eq ; 8. life spans recorded / eq ; 9. reference to appropriate comparison with control eg untreated sheep ; 10.idea that treatment needs to be repeated; 11.idea of replication of investigation; | QWC penalise once if mark point is not in a logical position | (5) |

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