



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# General Certificate of Education

## Biology 5416/6416 *Specification B*

*Physiology and Transport BYB3/W*

## Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA website:  
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## General Guidance for the Mark Scheme

The following conventions are used in the mark scheme:

- A semicolon (;) separates each mark point
- An oblique stroke (/) separates alternatives within a mark point
- Underlining of a word or phrase means that the term must be used by candidates
- Brackets are used to indicate contexts for which a mark point is valid, but which may just be implied by a candidate's answer
- '*Accept*' and '*reject*' show answers which should be allowed or not allowed.
- Additional instructions may be shown in *italics*

The scheme shows the minimum acceptable answer(s) for each mark point - better, more detailed, or more advanced answers are always accepted, provided that they cover the same key ideas. Occasionally, a candidate will give a biologically correct answer that has not come up at standardising. If it is equivalent in standard to the mark scheme answers, it may be credited.

In some cases a mark may be awarded for understanding of a general principle, even though the detailed mark points on the scheme have not been made. This will be indicated on the mark scheme.

All mark points are awarded independently, unless a link between points is specified in the scheme.

Converse answers are normally acceptable, unless the wording of the question rules this out.

### Disqualifiers

A correct point is disqualified when the candidate contradicts it in the same answer.

### The list rule

When a question asks for a specific number of points, and the candidate gives more, any wrong answer cancels a correct answer. For example, if a question asks for two points and three answers are given, two correct and one clearly wrong, the mark awarded is one, whatever the order of the answers.

Valid points from **diagrams** are credited, if they are not duplicated in the text.

Where a question asks for **differences** between X and Y, the mark may be awarded for a feature of X without the converse for Y, if it is absolutely clear which is being referred to.

## **Guidance on the award of the marks for Quality of Written Communication on Section B of Unit Tests**

Quality of Written Communication assessment requires candidates to:

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

For a candidate to be awarded 1 mark for quality of written communication on Section B in a unit test, the minimum acceptable standard of performance should be:

- the longer parts (worth 4 marks or more) should be structured in a reasonably logical way, appropriate and relevant to the question asked;
- ideas and concepts should be explained sufficiently clearly to be readily understood. Continuous prose should be used and sentences should be generally be complete and constructed grammatically. However, minor errors of punctuation or style should not disqualify;
- appropriate AS/A level terminology should be used. Candidates should not use such phrases as ‘fighting disease’, ‘messages passing along nerves’, ‘enzymes being killed’ etc, but a single lapse would not necessarily disqualify. Technical terms should be spelled correctly, especially where confusion might occur, e.g. mitosis/meiosis, glycogen/glucagon.

The Quality of Written Communication mark is intended as a recognition of competence in written English. Award of the mark should be based on overall impression of performance on Section B. Perfection is not required, and typical slips resulting from exam pressure such as ‘of’ for ‘off’ should not be penalised. Good performance in one area may outweigh poorer performance in another. Care should be taken not to disqualify candidates whose lack of knowledge relating to certain parts of a question hampers their ability to write a clear and coherent answer; in such cases positive achievement on other questions might still be creditworthy. No allowance should be made in the award of this mark for candidates who appear to suffer from dyslexia or for whom English is a second language. Other procedures will be used by the Board for such candidates.

Examiners should record 1 or 0 at the end of Section B in the Quality of Written Communication lozenge. This mark should then be transferred to the designated box on the cover of the script.

**BYB3/W****Question 1**

- (a) (i) stretch receptor; (*allow proprioceptor*)
- (ii) chemoreceptor; 2
- (b) impulses/electrical signals/action potentials/wave of depolarisation (pass along neurones/nerves) *in context*;  
(*reject electronic/signals/messages*)  
correct named muscle (diaphragm/intercostal) causing contraction; 2  
(*ignore stimulus is a decrease in pH / increase in carbon dioxide in blood*)
- (c) increased CO<sub>2</sub> concentration / big decrease in oxygen concentration / decrease in pH / increase in H<sup>+</sup> (is the stimulus for breathing);  
in blood/plasma;  
takes time for the change to occur; 2 max
- Total 6**

**Question 2**

- (a) left ventricle; 1
- (b) (i) (left) ventricle/heart relaxes / diastole / filling / not contracting; 1
- (ii) elastic tissue/wall;  
recoils/springs back (to maintain pressure); 2  
(*“contraction / muscle causing recoil” negates second point*)
- (c) correct answer 666 to 667 *gains 2 marks; allow 1 mark for principle*;  
correct time for 1 heartbeat as 90 (ms) or 630÷7 /  
60 ÷ incorrect time identified from graph; 2
- (d) correct answer, 0.03, *gains 2 marks*; 2  
(*Allow 1 mark for correct working, 16.6 ÷ 550, if answer wrong*)
- Total 8**

**Question 3**

- (a) Osmosis/diffusion of water;  
by/into root hairs;  
down a water potential gradient / from high (less negative) to low (more negative) water potential / towards a more negative water potential / from a dilute to concentrated solution;  
through symplast/vacuoles/plasmodesmata/cytoplasm;  
through apoplast/along cell walls; 3 max

- (b) (i) (graph shows) greater uptake (of ions) in aerobic (conditions);  
aerobic respiration / conditions releases more energy/ATP (for active transport); 2  
(*reject produces / makes energy*)
- (ii) ATP/energy limiting;  
active transport stops;  
diffusion gradient lost / equal concentrations of ions / no net movement of ions; 1 max  
(*do not allow store of ATP runs out*)
- Total 6**

**Question 4**

- (a) (i) unrestricted/free/quick/easy water flow/continuous column / maintains transpiration stream; 1
- (ii) resists tension in water (column) / provides support/strength / maintains column of water/adhesion / prevents water loss  
(*allow waterproofing in correct context i.e. not absorbing*); 1
- (b) (i) as total area of stomata decreases the rate of water flow decreases / decrease is proportional; 1  
(*reject proportional, 'as one goes up the other goes up' and 'same shape'*)
- (ii) increasing/higher temperature causes increasing/higher rate of evaporation/transpiration; 1  
(*not water loss*)
- (iii) lower plateau (start and finish at same point); 1  
(*allow if curve sketched on original graph, reject 'curve is lower'*)
- (c) conserves water / reduces water loss / reduces transpiration / reduces evaporation; 2  
high humidity (in pit) / reduced water potential gradient / less water blown away / increased diffusion pathway;
- Total 7**

**Question 5**

- (a) used in (aerobic) respiration / to provide energy / ATP (and not replaced by breathing) / used up by muscle and not replaced; 1  
(*reject used up and used up and not replaced*)
- (b) 36; 1

- (c) (transported to) the liver / muscles;  
 converted back to pyruvate/glycogen/glucose/CO<sub>2</sub> and H<sub>2</sub>O;  
reacted with oxygen / oxidised; 2 max  
*(reject “breaking down” with respect to glycogen and glucose)*
- (d) (i) vasoconstriction / contraction of muscles in arteries/arterioles /  
 arteries/arterioles close; 1  
*(reject contraction of arteries/arterioles/capillaries)*
- (ii) supplies oxygen / glucose or removal of carbon dioxide / lactate;  
 so cells can respire when not contracting / breathing; 2
- (e) increased CO<sub>2</sub>/H<sup>+</sup> / decreased pH;  
 chemoreceptors/medulla/cardiovascular centre (stimulated);  
 stimulates sino-atrial node/pacemaker; 2 max  
*(accept adrenaline released / stimulating receptors / sino-atrial node)*
- Total 9**

**Question 6**

- (a) (i) CO<sub>2</sub> is produced (in respiration);  
 forms carbonic acid / hydrogen ions released;  
*(lactic acid produced negates both points)* 2
- (ii) low pH because high rate of respiration;  
 cells need more O<sub>2</sub>;  
 more O<sub>2</sub> released / O<sub>2</sub> released faster; 2 max
- (b) (i) high altitudes have a low partial pressure of O<sub>2</sub>;  
 high saturation/affinity of Hb with O<sub>2</sub> (at low partial pressure O<sub>2</sub>);  
 sufficient/enough O<sub>2</sub> supplied to cells / tissues; 2 max
- (ii) difficult to unload/dissociate O<sub>2</sub> (at tissues); 1
- Total 7**

**Question 7**

- (a)
1. movement/secretion of ions into xylem / vascular bundle;
  2. involves active transport;
  3. from endodermal cells;
  4. water movement down water potential gradient;
  5. by osmosis;
  6. Casparian strip prevents return of water;
- P (principle: if no points from 1-6 awarded, then max 1 for idea that ions enter roots by active transport and osmosis is involved (to generate pressure))
- 3 max

- (b)
1. photosynthesis;
  2. production of sugar / glucose / sucrose;
  3. sugar radioactive / contains  $^{14}\text{C}$ ;
- (details of translocation to a maximum of 5 marks)
4. loading (sugar) into phloem;
  5. by companion / transfer cells;
  6. by active transport;
  7. reduces water potential (of phloem solution);
  8. water enters phloem by osmosis;
  9. increases (hydrostatic) pressure;
  10. movement to (named) sink regions / meristems;
- 7 max
- (if reference to  $^{14}\text{CO}_2$  transport, then only points 5 – 10 can be awarded to a maximum of 5 marks)

**Total 10**

**QWC 1**