



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Biology 5416

Specification B

BYB3/W Physiology and Transport

Mark Scheme

2006 examination - January 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.

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.

BYB3/W**Question 1**

- (a) (i) atrioventricular valve/(bi)cuspid valve/mitral valve; 1
- (ii) (valves close) due to high blood pressure / when ventricles contract;
Y prevent valve from being inverted / restricts/stops valve movement;
(allow AV valve, disqualify tricuspid) 2
- (b) (i) **B**; 1
- (ii) $\frac{5}{8} \times 60 = 37.5$ s; correct method 1
correct answer 2

Total 6**Question 2**

- (a) (i) apoplast; 1
- (ii) (pathway from cells) along cell walls / through spaces and out through stoma(ta);
by diffusion (disqualify if osmosis mentioned);
down a WP/diffusion/concentration gradient; 3
- (b) two suitable adaptations plus explanation, e.g.
sunken stomata, reduce air movement/diffusion gradient;
rolled leaves, reduce surface area (for evaporation) / enclose still air around stomata;
waxy cuticle, reduce (cuticular) evaporation / impermeable to water;
(reject waterproof)
few stomata, to reduce SA for diffusion;
small leaves, reduce SA for diffusion; 2

Total 6**Question 3**

- (a) lymph; 1
- (b) arrow drawn from right to left – no mark (if wrong direction disqualify)
correct reference to blood entering capillary having higher hydrostatic pressure; 1
- (c) HP forces water out;
idea that HP is “higher” than WP;
proteins remain in blood (increases WP);
idea that WP is now “higher” than HP;
water returns by osmosis / along WP gradient;
water moves out at arteriole end and back in (at venule end); 4 max

- (c) high respiration rate means high demand for oxygen;
shrew haemoglobin has lower affinity for oxygen / gives up O₂ more readily;
shrew Hb lower saturation rate than human Hb at same partial pressure / more O₂
released at same pp; 3

Total 9

Question 4

- (a) long cells / tubes with no end walls;
continuous water columns;
no cytoplasm / no organelles/named organelle;
to impede/obstruct flow / allows easier water flow;
thickening/lignin;
support / withstand tension / waterproof / keeps water in cells;
pits in walls;
allow lateral movement / get round blocked vessels; 4 max

- (b) (i) increase in transpiration rate/evaporation due to increase in temperature ;
increased (kinetic) energy of water molecules;

OR

increase in light (intensity) increases transpiration rate/evaporation;
greater stomatal aperture / more stomata open;
increase in flow rate due to cohesion/attraction of water molecules; 2 max
- (ii) adhesion/attraction of water molecules to walls of xylem;
results in tension as water pulled up stem;
pulling in walls; 2

Total 8

Question 5

- (a) lactate/lactic acid/pyruvate; ATP; 2
- (b) (i) energy demand is very high/high respiration rate;
unable to supply enough oxygen to muscles/tissues/cells/ insufficient time for
oxygen to reach muscles/tissues/cells / insufficient oxygen in muscles/tissues/cells;2
- (ii) break down with oxygen /oxidise lactate;
convert to pyruvate / glucose / glycogen / CO₂ + water;
by aerobic respiration; 2 max

Total 6

Question 6

- (a) slow then rapid increase rate;
rate becomes more pronounced above a concentration of 5.5%/ at 6.0%; 2
- (b) calculation of total volume of air by multiplication of depth and rate;
(*principle gains 1 mark*)
correct answer 504 % 2
- (c) rise detected by chemoreceptors;
in aortic/carotid body / medulla; (*disqualify sinus*)
nerve impulses sent to medulla /respiratory centre; (*reject messages*)
impulses sent to diaphragm and intercostal muscles;
increase frequency of impulses;
rate and strength/depth of contractions increase; 4 max

Total 8**Question 7**

- (a) 1 sucrose named as the carbohydrate;
2 (loaded) into phloem/sieve tubes;
3 by companion cells/transfer cells
4 sucrose actively pumped /enters by active transport;
5 lowers water potential of sieve tubes/phloem;
6 water diffuses into phloem / enters by osmosis;
7 increases pressure;
8 pressure forces fluid down to roots / moves from higher to lower pressure; 6 max
- (b) flow of carbohydrate into leaf for first 12 days, then out of leaf, (*disqualify 10*)
flow in because leaf using carbohydrate for growth;
(*disqualify if used for photosynthesis*)
flow out because leaf photosynthesising;
flow rate out decreases because rate of photosynthesis decreasing;
leaf aging/dying; 4

Total 10**QWC 1**