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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 5416
Specification B

BYB3/W Physiology and Transport

Mark Scheme

2006 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.

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 Physiology and Transport

Question 1

(a) (i) Endodermis *(reject pericycle / suberin);* 1
(accept endodermis and / containing Casparian strip)

(ii) S; 1

(iii) R; 1

(b) (i) (waxy so) impermeable to water/waterproof/stops water passing through; 1

(ii) reference to hairs / position of stomata (sunken stomata / stomata in pits) LINKED to reduced air movement / trap layer of air / trap water vapour *(reject water)* / maintains humidity;

reduces diffusion gradient / concentration gradient of water / water potential gradient;

OR

stoma can close;
reduces area for evaporation or transpiration; 2

Total 6

Question 2

(a) (i) 0.4 (s); 1

(ii) $\left\{ \frac{60}{0.8} \right\} = 75$; 1

(iii) 0.26 (between 0.4 - 0.14) x 75 (or from (a)(ii)) = 19.5 (s)
OR
0.25 (between 0.4 - 0.15) x 75 (or from (a)(ii)) = 18.75 (s) 1
(no double penalty)
(allow rounding only if working shown)

(b) (ii) right ventricle;
same pattern / description (as left ventricle) but lower (pressure); 2

(c) increase in volume / size of ventricles (*accept heart*) / hypertrophy of heart / increased strength of heart muscle / increased strength of contraction;
more blood leaves heart in each contraction / increase in stroke volume; 2

Total 7

Question 3

(a) (i) absorption rate stays level (initially) then rises;
transpiration rate rises regularly / transpiration increases at a faster rate than absorption; 2
(principle that both increase 1 max awarded)

(ii) increased stomatal aperture/light/temperature (increases transpiration rate);
decreases water potential in root / increased uptake by osmosis; 2

(b) water evaporates/transpires;
reduces water potential / creates water potential gradient / increases osmotic gradient / moves via apoplast pathway;
water drawn out of xylem;
creates tension/pulling effect / creates negative pressure *(in context)*;
cohesive forces or H bonding between water molecules / water moves as a column*;* 4 max
(accept continuous stream)

Total 8

Question 4

(a) sucrose; 1

(b) (i) more carbohydrate transported to bud (than root);
carbohydrate needed for growth of bud / high growth rate in bud;
carbohydrate needed for respiration / to release energy or ATP;
synthesis of molecules / named molecule; 2 max
(*reject storage*)

(ii) remains in organic molecules (in the leaf) / not enough time for removal; 1

(c) remove / kill phloem;
named technique / method for measuring radioactivity e.g. use of autoradiography / analysis of feeding aphids / Geiger counter;
if no radioactivity passes ring, transport is via phloem; 3

Total 7

Question 5

(a) CO_2, water, ATP, reduced NAD/FAD*;* 1
(accept creatine phosphate)
(any 2 – one tick)

(b) (i) build up/increased concentration of lactate;
lowers pH/increases H^+/increases acidity;
enzymes / named protein inhibited *(not denatured)*; 2 max

(ii) lactate/pyruvate is an energy source;
muscles have increased/immediate energy or ATP supply;
(*accept lactate replenishes glycogen or glucose*)
restores pH levels; 2 max

Total 5

Question 6

(a) slow decrease in speed until reaches arterioles then rapid decrease;
increase in total cross-sectional area of blood vessels / more friction; 2

(b) elastic tissue/fibres/wall;
expands/recoils/springs back (to smooth the pressure surges); 2
(recoil linked to elastic tissues)

(c) walls / endothelium one cell thick / made of flattened cells;
short diffusion pathway

OR

narrow lumen;
reduces rate of flow / more time for diffusion;

OR

gaps / pores between cells *(accept fenestrations between cells);*
increased rate of diffusion / fluid movement out of vessel; 2 max

(d) larger/wider lumen so greater volume carried; 1

Total 7

Question 7

(a) Hb (in **A**) has greater affinity for O_2;
becomes saturated at low(er) ppO_2 / more saturated at same ppO_2 / unsaturated at very low ppO_2;
able to supply enough O_2 to its tissues; 3

(b) fish **B** has a greater rate of respiration *(accept more O_2 needed for respiration);*
Hb dissociates more readily (than **A**);
more O_2 supplied; 2 max

Total 5

Question 8

(a)	1	pressure receptors / baroreceptors / stretch receptors;	
	2	in aorta / carotid arteries / carotid sinus; *(reject carotid body)*	
	3	send impulses; *(reject signals / messages / electronic)*	
	4	to cardiovascular centre / medulla / cardio-inhibitory centre;	
	5	send impulses; *(once only)*	
	6	parasympathetic nerves / vagus; *(accept inhibitory nerve)*	
	7	to SAN;	
	8	release of ACh / inhibits SAN / decreases impulses from SAN;	
	9	decreases impulses to AVN / decreased stimulation of AVN / decreases impulses from AVN; *(any reference to signals / messages / electronic disqualifies points 3 and 5 only)*	6 max
(b)	1	inhibit impulses in sympathetic nerves / from cardio-acceleratory centre;	
	2	SAN not stimulated / noradrenaline not released / *(accept inhibits / blocks synapses)*;	
	3	heart rate lowers / does not increase;	2 max

Total 8

QWC 1