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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 5416

Specification B

BYB3/W Physiology and Transport

Mark Scheme

2008 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.

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Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	(a)		Description; Explanation; E.g. Increase in transpiration/evaporation/diffusion; Higher kinetic energy / faster movement of molecules/ particles/steeper water potential gradient; *OR* Decreases in transpiration/evaporation/diffusion; Due to closing of stomata;	1 1	2 max
1	(b)		Sunken stomata/description; Reduces water potential/diffusion/concentration gradient / traps humidity/water molecules; (*Reject traps water*) Thick cuticle; Impermeable to water (*Accept waterproof*) / increases diffusion pathway/distance;	1 1 1 1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	(a)		Aortic body/aorta; Carotid body/carotid artery; (*Reject carotid sinus*) Medulla;	1 1 1	2 max
2	(b)		1. (Exercise leads to) increased carbon dioxide, lowers blood pH /increase in hydrogen ions/increase in acidity/increase in carbonic acid; 2. Chemoreceptors send (more nerve) impulses; 3. (To) respiratory/inspiratory centre /medulla; 4. Sends impulses to intercostal muscles and diaphragm (to contract); 5. Increased rate/depth/force of contraction;	1 1 1 1 1	4 max

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	(a)	(i)	Root hair (cell);	1	
3	(a)	(ii)	Large/increased surface area;	1	
3	(b)	(i)	Endodermis;	1	
3	(b)	(ii)	Casparian strip/suberin; So water/mineral ions cannot move through apoplast/cell wall / can only move through symplast / have to cross cell membrane; Active transport of (mineral) ions into xylem;	1 1 1	2 max

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	(a)		Glucose; Glycogen; Lipids/fats/triglycerides; ATP; Phosphocreatine/ creatine phosphate; Protein:	1 1 1 1 1 1	2 max
4	(b)		(Lactate) lowers pH/increases hydrogen ions; Decrease enzyme activity / stops muscle proteins/fibres contracting/working (effectively); (*Ignore denaturation*)	1 1	
4	(c)	(i)	Oxygen consumption rises then levels off, lactate starts low/is constant and then rises;	1	
4	(c)	(ii)	Low rate of exercise / initially aerobic respiration; High rate of exercise oxygen is limiting; Anaerobic respiration produces lactic acid;	1 1 1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	(a)		Line to top right hand side (facing) chamber;	1	
5	(b)		Arrow into right atrium; Arrow out of right ventricle (to semi-lunar valves/into pulmonary artery);	1 1	
5	(c)	(i)	Higher pressure in left ventricle/lower pressure in right ventricle (when contracting);	1	
5	(c)	(ii)	All the blood leaving the right side of the heart returns to the left side / (internal) volume of heart (chambers) same on both sides;	1	
5	(d)		Ventricle begins to contract/systole; This increase in pressure closes the atrioventricular valve/bicuspid valve; Pressure rises above that in the aorta; (So) semi-lunar valves open; Blood moves out of the ventricle so volume decreases;	1 1 1 1 1	4 max

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	(a)		Sucrose/sugar actively loaded into phloem (in leaf); By companion cells; *(Accept transfer cells)* (This) lowers the water potential inside phloem (sieve cells); Water enters by osmosis; Increasing (hydrostatic) pressure so forcing sugar in solution down phloem /causing mass flow;	1 1 1 1 1	4 max
6	(b)		(Rapid) photosynthesis, to produce radioactive sugars / sugars containing ^{14}C; *(Accept metabolites)*	1	
6	(c)		Plant **A**; No ^{14}C/radioactivity at the top of the plant (so ringed at **X**); (*Accept quoted figures*) ^{14}C/radioactivity in the roots (so not ringed at **Y**);	1 1 1	
6	(d)		To compare distribution with an unringed plant / plant with phloem present; (*Accept to active as control if qualified)*	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	(a)		1. High(er) hydrostatic/blood pressure at the arterial end of the capillary;	1	6 max
			2. Forces fluid/water out of the capillary/blood (into tissues);	1	
			3. Proteins/large molecules stay in the capillary/plasma;	1	
			4. Water potential of the blood (plasma) falls/becomes more negative (below that in tissues);	1	
			5. Hydrostatic pressure falls;	1	
			6. Due to friction/resistance to flow/narrow capillary/loss of fluid;	1	
			7. Water moves back into blood/plasma in venous end (of the capillary) by osmosis;	1	
			8. Lymph system collects excess tissue fluid;	1	
7	(a)		QWC	1	To be awarded on 7(a) and 7(b) but will only count once.
7	(b)		Anaemia leads to reduced (aerobic) respiration;	1	4 max
			DPG lowers affinity of haemoglobin for oxygen;	1	
			(So) oxygen unloaded more easily / more oxygen unloaded / dissociates more readily;	1	
			At higher PO_2/same PO_2;	1	
			More oxygen to respiring tissues;	1	

7	(b)		QWC	1	To be awarded on 7(a) and 7(b) but will only count once.