PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 4: EXCHANGE AND TRANSPORT

SURFACE AREA TO VOLUME RATIO

SCORE	PERCENTAGE
/20	%

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Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
(i)	• divide oxygen consumption by body mass (1) • express answer in standard form (1)	Example of calculation 50 ÷ 4 000 = 0.0125 1.25×10^{-2} Correct answer gains full marks, with no working shown **ACCEPT** one mark in working for 0.0125	(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to four of the following: • {small(er) mammals / small(er) body mass} consume more oxygen (per kg) (1) • mammals are endotherms / maintain body temperature / regulate body temperature (1) • small mammals have larger surface area to volume ratio (1) • therefore lose more heat (1) • heat by respiration (1)	**ACCEPT** large(r) mammals consume more oxygen in $dm^3\ h^{-1}$ **ACCEPT** converse for Mps 1, 3 and 4 and 5	(4)

Q2.

Question Number	Answer	Additional guidance	Mark
	An explanation that makes reference to the following: • large surface area (to volume ratio) for diffusion (1) • thin for shorter diffusion distance (1) • {blood flow / countercurrent} to maintain {diffusion gradient / concentration gradient} (1)	**DO NOT ACCEPT** thin membranes	**(3)**

Q3.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • they have a large surface area to volume ratio (1) • therefore diffusion is sufficient (1)	**Accept** short diffusion distance	**(2)**

Q4.

Question Number	Correct Answer	Additional guidance	Mark
(a)	56 - 36 = 20 (1)		**(1)**

Question Number	Indicative content	
(b)*	Answers will be credited according to the candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The Indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • Dissociation curve for mouse haemoglobin is to the right of the curve for elephant haemoglobin • Mouse haemoglobin has a lower affinity for oxygen • Mouse haemoglobin allows more dissociation • Mouse has bigger surface area to volume ratio • Mouse loses more heat / needs to regenerate more heat • Maintenance of body temperature • Mouse has higher metabolic rate • Mouse needs more oxygen • Accept converse answers for elephant	
Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts/concepts to provide the explanation being presented. Lines of argument occasionally supported through the application of relevant evidence (scientific ideas, processes, techniques and procedures). The explanation shows some linkages and lines of reasoning with some structure.
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts to provide the explanation being presented. Line(s) of argument supported throughout by sustained application of relevant evidence (scientific ideas, processes, techniques and procedures). The explanation shows a well-developed and sustained line of reasoning which is clear, coherent and logically structured.

Q5.

Question Number	Answer	Additional guidance	Mark
(i)	C (the strength of the middle lamella between cells)		**(1)**

Question Number	Answer	Additional guidance	Mark
(ii)	A (active transport)		**(1)**