A Level OCR Biology

8 Gas Exchange – answers

Question	Answers	Extra information	Mark	AO Spec reference
1(a)	large surface area to volume ratio (ignore flat) ✓ thin / short diffusion pathway / faster (rate of) diffusion ✓		2	AO2 2.1.5(c) 2.1.5(d) 3.1.1(b)
1(b)	solubility of oxygen in the blood decreases as the temperature increases/inverse proportion ✓ correct manipulation of figures, such as 50% decrease in solubility from 10 °C to 40 °C ✓	Allow reverse argument	2	AO2 3.1.2(h)
1(c)	2.0×10^{-2} dm^3 ✓ ✓	(100 – 98.5 = 1.5) $\left(\frac{1.3}{100}\right) \times 1.5$	2	AO2 3.1.2(h)
1(d)	vena cava ✓		1	AO1 3.1.2(c
1(e)	**Level 3 (5–6 marks)** Full and detailed explanation of the impact of a reduced blood supply on the circulatory system. *There is a well-developed explanation and. The information presented is relevant and clearly explained.* **Level 2 (3–4 marks)** The response includes at least two impacts of how the circulatory system may be affected by a reduced blood supply. The response is explained. *There is a reasonable explanation and sequence. The information presented is in the most-part relevant and well-explained.*	**Indicative content:** • decreased oxygen to the heart • decreased stroke volume • decreased cardiac output • higher / increased risk of heart attack • reduced aerobic respiration in cardiac muscle cells • reduced oxygen delivered to all cells ✓ • reduced carbon dioxide removed from all cells ✓ • faster heart rate ✓ • increase in blood pressure ✓	6	AO3 3.1.2(a) 3.1.2(c) 3.1.2(f) 5.2.2(a)

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	Level 1 (1–2 marks) Response gives brief detail about at least one impact of how the circulatory system may be affected by a reduced blood supply. The response may not be fully explained. *The information is basic and communicated in an unstructured way. The information is supported by limited method which may be unclear.* **0 marks** No response worthy of credit.			
1(f)	= 2.60 mm^3 ✓ ✓ ✓	volume = width × length × height = 1 × 20 × h = 20 × h surface area = 2wl + 2wh + 2lh = (2 × 1 × 20) + (2 × 1 × h) = (2 × 20 × h) = 40 + 42h surface area = 17.48 × v = 17.48 × 20 × h = 349.69h 40 + 42h = 349.69h 349.69h – 42h = 40 307.69h = 40 $h = \frac{307.69}{42}$ h = 0.13 volume = w × l × h = 1 × 20 × 0.13 3 marks for correct final answer without working One mark for correct use surface area equation One mark for correct use of volume equation	3	AO2 3.1.1(a)

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Question	Answers	Extra information	Mark	AO Spec reference
2(a)	Any four from: (large number of alveoli so) large total surface area ✓ walls only one cell thick to reduce diffusion distance ✓ squamous epithelial cells are flattened to reduce diffusion distance ✓ (excellent) capillary blood supply to maintain concentration gradient/difference ✓ elastic fibres improve ventilation (to maintain concentration gradient/difference) ✓ surfactant prevents alveoli collapsing / maintains large surface area ✓		4 max	AO1 3.1.1(b) 3.1.1(c)
2(b)	28% (2.s.f) ✓ ✓	(23 – 18 = 5) $\left(\frac{5}{18}\right) \times 100$	2	AO2 3.1.1(e)
2(c)	Any three from: difficulty inhaling / (ignore breathing) ✓ the diaphragm might not be able to contract / lower the pressure inside the thoracic cavity ✓ this means less air inhaled ✓ less oxygen into blood (from alveoli) ✓ less carbon dioxide into alveoli (from blood) ✓		3 max	AO2 3.1.1(e)
3(a)	*Puntigrus* ✓		1	AO2 4.2.2(a)
3(b)	Any two from: thin diffusion distance / (gill lamellae are) one cell thick ✓ the concentration of oxygen in the capillaries is always lower than in the gill lamella ✓ a concentration gradient for oxygen is maintained the whole length of the lamellae ✓	Allow gill plates for lamellae	2 max	AO1 AO2 3.1.1(f)

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Question	Answers	Extra information	Mark	AO Spec reference
3(c)	lamellae have less oxygenated water flow ✓ less gas exchange of oxygen and carbon dioxide ✓ concentration gradient not maintained ✓		3	AO3 3.1.1(b) 3.1.1(f)
3(d)	Any two from: protects the gills ✓ stays closed for breathing in and open for breathing out ✓ involved in pressure changes ✓		2 max	AO1 3.1.1(f)
4(a)	**mouse** 96.9 : 1 ✓ **elephant** 0.15 : 1 ✓	mouse: $\left(\frac{1279}{13.2}\right)$ elephant: $\left(\frac{3.7 \times 10^5}{2.4 \times 10^6}\right)$	2	AO2 3.1.1(a)
4(b)	Description: high metabolic rate correlates with high SA:V ✓ **AND** Explanation: High SA:V requires high metabolic rate to compensate for rapid heat loss ✓ **OR** High SA:V enables more rapid gas exchange (per unit mass) to enable higher metabolic rate ✓	1 mark for description 1 mark for explanation Allow reverse arguments	2 max	AO2 3.1.1(a)
4(c)	**Level 3 (5–6 marks)** Full and detailed explanation of how heart activity is transmitted and the meaning of myogenic in the context of the heart. There is a well-developed explanation and. The information presented is relevant and clearly explained.	**Indicative content:** • SAN spreads wave of excitation across (the walls of) the atria to cause contraction • non-conductive tissue present • SAN acts as the pacemaker • delay at the AVN • wave of excitation passes onto • purkyne fibres / bundle of His to pass to the apex	6	AO2 3.1.2(g)

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	Level 2 (3–4 marks) Response is aware of the meaning of myogenic in the context of the heart and at least two stages of how heart activity is controlled are explained. There is a reasonable explanation and sequence. The information presented is in the most-part relevant and well-explained. **Level 1 (1–2 marks)** Response is aware of the meaning of myogenic in the context of the heart or brief detail about one part of how heart activity is controlled. The information is basic and communicated in an unstructured way. The information is supported by limited method which may be unclear. **0 marks** No response worthy of credit			
5(a)	oxygen diffuses down a concentration gradient ✓ oxygen used in aerobic respiration ✓ bubble becomes smaller ✓ oxygen availability reduces ✓		4	AO2 2.1.5(d) 3.1.1(f)
5(b)	Any three from: *Yes, because:* there is an overall trend that increased temperature (generally) leads to increased metabolic rate (in giant green water beetles) ✓	Allow a comparison (quoting correct figures) between an increase in temperature leading to an increased metabolic rate	3 max	AO3 3.1.1(f) 3.1.2(a)

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	No, because: at 23.5 °C, the metabolic rate was lower compared to 23 °C ✓ no evidence of the investigation being repeated/reproduced ✓ no error bars ✓ no statistical test carried out ✓ correlation does not (necessarily) mean causation ✓	Allow correct alternative data patterns		
5(c)	Any two from: surface area to volume ratio ✓ type / design of gaseous exchange system ✓ number of spiracles ✓ availability of glucose ✓		2 max	AO2 3.1.1(a) 3.1.1(f)
6(a)	the 45 year old male regular smoker is likely to already have a FEV1 that is subnormal/below 80% ✓ by stopping smoking the 45 year old male regular smoker will slow the future rate of decline of FEV1 possibly avoiding serious health effects / respiratory symptoms ✓	Allow increased life expectancy if qualified	2	AO3 3.1.1(e)
6(b)	less oxygen diffused into the blood from the alveoli and less carbon dioxide diffused into the alveoli from the blood ✓ damage to alveoli reduces effective surface area / increases diffusion distance ✓ breathlessness / ventilation rate reduced because elasticity of alveoli reduced (making expiration less efficient) ✓		3	AO2 AO3 3.1.1(d) 3.1.1(e)

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6(c)	Any three from: (smoking cigarettes leads to) no clonal selection / expansion ✓ killer T cells not being stimulated ✓ T helper cells not being stimulated ✓ cytokines/interleukins are not released ✓ B cells not being stimulated ✓ no antigen–antibody complex is formed ✓ unable to form memory cells ✓		3 max	AO2 4.1.1(f)

Skills box answers

Question	Answer
1	Organism **A** = 6.3 m^{-1} (an elephant) Organism **B** = 400 m^{-1} (a mouse) Organism **C** = 6000 m^{-1} (an amoeba)
2	$\frac{6\,000}{6.3} = 9.52$
3	Alveoli, ventilation, blood supply