Question Number	Answer	Acceptable answers	Mark
1(a)(i)	(right) lung / lungs		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	An explanation including two of the following: blood flows into (right) atrium (1) (into right) ventricle (1) (ventricle / heart / muscle) contracts (1) (blood) pressure increased (by heart) (1) blood moves into <u>pulmonary</u> artery (1)	 **reject** references to left for either atrium or ventricle. accept blood under high pressure accept reference to valves stopping back flow	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	**D** vena cava aorta		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iv)	A description including two of the following: blood in vessel W / vena cava has: lower pressure (1) deoxygenated / low(er) concentration of oxygen (1) greater concentration of carbon dioxide (1) darker (red) (1)	 accept reverse arguments for blood vessel Y / aorta ignore low pressure accept low pressure in W and high pressure in Y accept low(er) oxygen levels accept carries carbon dioxide ignore W takes blood towards heart / Y takes blood away from heart	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	3 / x3 / three (times thicker) Accept any number between 2.5 and 3 (times thicker).		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	An explanation including two of the following: wall of {left ventricle / chamber B} is {more muscular / stronger / applies more force / more powerful} (1) blood from left ventricle / chamber B is under higher pressure (than blood from right ventricle) (1) (as) blood needs to be {pushed / pumped / forced} through {more capillaries / whole body} (1)	Accept reverse argument for right ventricle / chamber A. ignore left hand side pumps more blood than right hand side / pumps blood faster.	**(2)**

Total for Question 1 = 9 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	A comparison to include three of the following: For the unfit person: • the unfit person's heart rate is higher / faster(1) • idea that both react in the same way eg both peak at ten minutes, both increase when they start exercising (1) • heart rate increases more quickly (to maximum) (1) • heart rate decreases more slowly (back to resting rate) (1) • credit correct manipulated values obtained for heart rates (1)	ORA for fit person	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	• Correct substitution i.e. 0.20 x 110 (1) • 22	Allow 2 marks for correct final bald answer ecf. Allow one mark if final value is correct for the substitution of a different heart rate from the graph, ie between 56 and 140 bpm.	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	An explanation that includes: • the fit person recovers faster/ has a shorter recovery period (1) and two of the following: Fit Person has • greater {vital capacity / blood flow / stroke volume / cardiac output} (1) • correct reference to less / no anaerobic respiration less /no lactic acid build up (1) • lactic acid removed faster EPOC less / lower oxygen debt less oxygen to replace(1)	ORA unfit person Accept Heart pumps more blood / more red blood cells / haemoglobin Accept fit person only respires aerobically / unfit person does anaerobic respiration. Accept unfit person has an oxygen debt /fit person has no oxygen debt	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(b)	**D** pulmonary vein → atrium → ventricle → aorta		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)	plasma (1)		**(1)**

(Total for question 2 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
3(a)	• evaluation (1) 30.4 ÷ 182 • Correct answer (1) 0.167 / 0.17 / 0.2 (dm^3)	give full marks for bald correct answer, no working ecf allow correct answer with full number of decimal points 0.1670329	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)	An explanation linking three of the following points: • muscles working harder / contract faster (1) • need more energy (1) • (aerobic) respiration (1) • more / enough / faster delivery oxygen (1) • more / enough / faster glucose (to muscles / body) (1) • more / faster removal of carbon dioxide (1)	Ignore references to anaerobic respiration	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)	A description including two of the following points: • arteries / aorta transport blood away from heart (1) • veins / vena cava transport blood to the heart (1) • capillaries exchange / pass materials / named substance with tissues / cells (1) • substances carried in plasma / oxygen carried in red blood cells (1) • credit correct description of passage of blood through heart (1)	Ignore references to heart beating faster	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(d)	Any two from the following: • less blood / not enough leaving heart / going round body (1) • less oxygen (to the body) (1) • fatigue/breathlessness/ faint / cannot run as fast (1) • cramps / lactic acid build up / anaerobic respiration (1)	Ignore references to heart beating faster / heart attacks and death Accept less oxygenated blood Accept tired / less energy	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(e)	**C** lactic acid		**(1)**

(Total for question 3 = 10 marks)

Question number	Answer	Mark
4(a)(i)	B	**(1)**

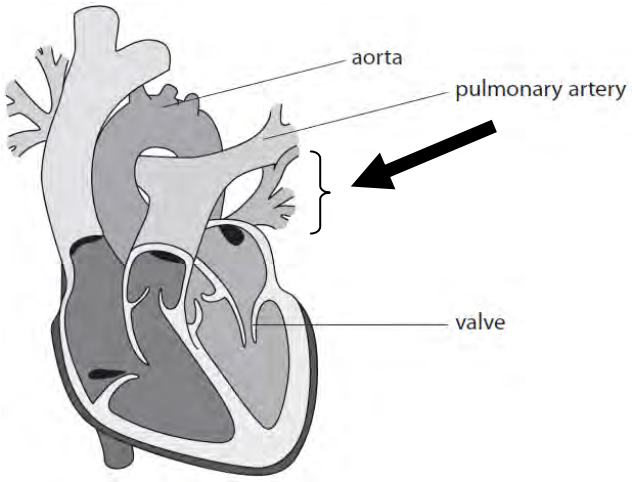
Question number	Answer	Mark
4(a)(ii)	to pump blood around the body under higher pressure	**(1)**

Question number	Answer	Mark
4(a)(iii)	An answer that combines the following points of understanding to provide a logical description: • blood would flow backwards from the ventricle to the atrium/blood will leak through (1) • less (oxygenated) blood would be pumped to the body (1)	**(2)**

Question number	Answer	Mark
4(b)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the blood vessel has thick walls/small lumen (1) • to carry oxygenated blood/to carry blood under higher pressure (1)	**(2)**

Question number	Answer	Mark
4(c)	• the fish heart has two chambers rather than four chambers (1) • the fish heart only has one ventricle and one atrium rather than two ventricles and two atria (1) • only deoxygenated blood flows through the fish heart (1) • the fish heart shows a single circulatory system rather than a double circulatory system (1)	**(4)**

(Total for question 4 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
5(a)(i)		ignore any labels on the arrow allow an arrow coming out of the opening of pulmonary vein into heart	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	Any **two** from the following: • (blood in pulmonary artery) deoxygenated (1) • (blood in pulmonary artery) lower pressure (1)	accept reverse argument for aorta carrying less oxygen / no oxygen less force / slower	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	Any **two** from the following: • prevent backflow (1) • (from ventricle) into atrium (1)	description of backflow ignore references to left atrium and deoxygenated blood	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	D – ventricle every minute		**(1)**

Question Number		Indicative Content	Mark
QWC	***5(b)(ii)**	A description including • there will less blood flow (to the muscles) • because less blood leaving the heart • less oxygen (reaching muscle) • less glucose (reaching muscle) • reduced rate of aerobic respiration • less energy released • less carbon dioxide removed • greater rate of anaerobic respiration • glucose broken down without oxygen • reduced muscle contraction • build up of lactic acid (in muscle cells) • causing cramp / fatigue	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of 2 effects of reduced cardiac output on muscle • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of 4 or more effects of reduced cardiac output on muscle, but some steps maybe missing or out of sequence • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of 6 or more effects of a reduced cardiac output on muscle, with the sequence largely in order and complete • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for question 5 = 12 marks)