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)

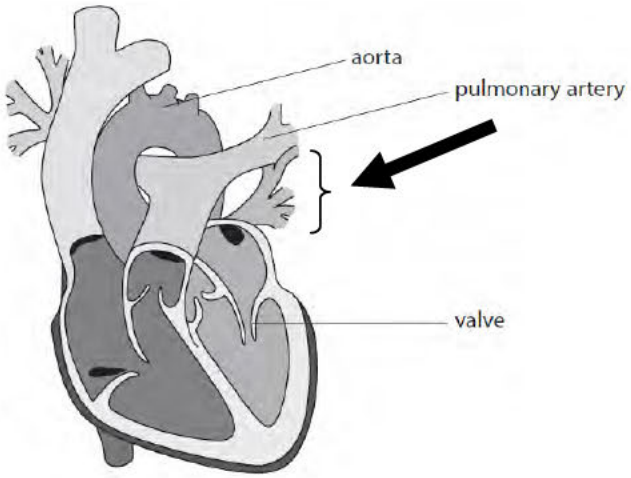
Question number	Answer	Mark
4(a)(ii)	to pump blood around the body under higher pressure	(1)

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)