01. 0610_s17_MS_41 Q: 4

	Answer	Mark	Partial Marks
(a)	blood travels through the heart once in a, circuit / cycle (of the body) / AW ;	1	
(b)	**D** ;	1	
(c)	**1** large surface area ; **2** thin (surface) / one cell thick ; **3** short diffusion distance ; **4** good blood supply / many capillaries ; **5** good ventilation / good movement of air *or* water / good oxygen supply ; **6** permeable ; **7** moist ;	2	

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02. 0610_m17_MS_42 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	**L** – atrioventricular valve ; **M** – septum ; **O** – semi-lunar valve ;	3	
(a)(ii)	**N / P** ; **J / K** ; **J** ;	3	
(b)(i)	**1** blood from pulmonary vein / K, enters left atrium ; **2** atria contract ; **3** atrioventricular valve / L, opens due to pressure from blood ; **4** blood forced into left ventricle ; **5** ventricle contract ; **6** atrioventricular valves / L, shut to prevent blood entering atrium ; **7** semi-lunar valves / O, open ; **8** blood forced into, aorta / J ; **9** AVP;	5	
(b)(ii)	left ventricle wall contains more muscle ; left ventricle pumps blood further ; left ventricle has to overcome more resistance ; left ventricle pumps blood at higher pressure ;	2	

	Answer	Mark	Partial Marks
(a)	**1** (for) energy / energy source / respiration ; **2** storage / stored ; (fat or vitamins or energy) **3** insulation / reduce heat loss / maintains temperature / ref to myelin ; **4** protection (against mechanical damage) / cushions organs / shock absorber ; **5** AVP ; **6** AVP ;	**3**	**R** 'produce energy' **I** homeostasis e.g. buoyancy making (some) hormones making (cell) membranes provide heat absorption of vitamins waterproofing
(b)(i)	lipase ;	**1**	
(b)(ii)	fatty acids and glycerol ;	**1**	
(b)(iii)	bile ;	**1**	
(b)(iv)	gall bladder ;	**1**	
(c)	(bile) emulsifies fats ; breaks down into / changed into smaller, globules / AW ; increases surface area (to volume ratio) ; for, enzyme(s) / lipase ;	**2**	**R** molecules
(d)	*fatty acids / glycerol / fats, enter / AW* **1** (micro)villi ; **2** capillaries / blood vessels / blood / circulatory system ; **3** lacteals / lymphatic capillary ; **4** (travel via) lymph / in lymph vessels / in lymph(atic) system ; **5** lymph empties into blood ;	**3**	**MP5 A** tissue fluid / 'body fluid' for lymph **A** lymphatic vessels empty into blood
(e)	**1** fat is deposited in (walls of) arteries ; **2** coronary arteries ; **3** arteries are blocked / blood flow is restricted in arteries ; **4** less / no, blood flow to, heart muscle / cardiac muscle / wall of heart ; **5** less / no, nutrients / glucose / oxygen, reaches heart, muscle / walls / cells ; **6** AVP ;	**3**	**I** veins / blood vessels **A** narrows (lumen of) arteries e.g. to form, plaques / atheroma / atherosclerosis roughens the lining of arteries increases blood pressure promotes, blood clotting / thrombus / thrombosis heart muscle, cannot respire (aerobically) / respires anaerobically heart muscle, fatigues / tires / AW ref. to cholesterol heart muscle produces lactic acid
(f)	**1** drug treatment ; **2** aspirin ; **3** to, reduce risk of / prevent, blood clotting ; **4** surgery / operation ; **5** (coronary) by-pass ; **6** described / a piece of blood vessel attached to carry blood around the blocked artery ; **7** angioplasty ; **8** described / tube *or* balloon inserted into artery and inflated to widen artery ; **9** stent(s) ; **10** tube / AW, to, hold arteries open / stop arteries collapsing ; **11** to restore blood supply (to heart muscle) ; **12** AVP ;	**6**	**A** antiplatelets / warfarin **I** 'thins the blood'

04. 0610_w17_MS_43 Q: 2

	Answer	Mark	Partial Marks
(a)(i)	**1** exercise will increase heart rate (from resting rate) ; **2** after exercise heart rate will, remain high / start decreasing ; **OR** **3** there is no effect of exercise on heart rate ; is the null hypothesis ;	**2**	**A** before exercise heart rate will be lower
(a)(ii)	**1** fingers on, wrist / neck / artery ; **2** number beats over a period of time / bpm ; **3** use a heart rate monitor / AW ; **4** contact of sensor with skin ;	**2**	
(b)	**1** lack of, blood supply / oxygen / glucose to heart, wall / muscle / tissues / cells ; **2** less / no, (aerobic) respiration / described ; **3** (heart) tissue / cells, die ; **4** heart (muscle) cannot contract ;	**2**	**A** more anaerobic
(c)	*description* **1** no difference between groups at 0 months ; **2** HRR in **A** increases and **B** increases and then decreases ; **3** (at) 3 months, little difference between groups / group **B** higher ; **4** (at) 6 months / at end, group **A** higher HRR (than group **B**) ; **5** comparative data quote with units ; *explanation* **6** (regular) exercise improves, HRR / fitness ; **7** exercise, strengthens heart muscle / increases, stroke volume / cardiac output ; **8** *idea that* anaerobic respiration / oxygen debt reduces HRR ; **ora** **9** given plan has better long term effect / without given plan better short term effect ; **10** patients may stick to given plan better (than their plan) ; **ora** **11** without a given plan patients probably started with a higher intensity plan ; **ora** **12** given plan may be better designed (to improve HRR long term) ; **ora**	**6**	**A** fitness or HR for HRR throughout **A** both groups increase HRR overall
(d)	**1** reduced, salt / (saturated) fats / cholesterol ; **2** stop smoking ; **3** reduce stress ; **4** AVP ; e.g. / medication qualified / control diabetes / reduced alcohol / reduce blood pressure	**1**	

	Answer	Mark	Partial Marks
(a)	<table><tr><th>function</th><th>letter on Fig. 1.1</th><th>name</th></tr><tr><td>structure that separates oxygenated and deoxygenated blood</td><td>F</td><td>septum ;</td></tr><tr><td>structure that prevents backflow of blood from ventricle to atrium</td><td>D</td><td>bicuspid / mitral / atrioventricular, valve ;</td></tr><tr><td>blood vessel that carries oxygenated blood</td><td>A</td><td>aorta</td></tr><tr><td>blood vessel that carries deoxygenated blood</td><td>B H</td><td>pulmonary artery vena cava ;</td></tr><tr><td>structure that prevents backflow of blood from pulmonary artery to right ventricle</td><td>K</td><td>semilunar valve ;</td></tr><tr><td>chamber of the heart that contains oxygenated blood</td><td>C E</td><td>left atrium left ventricle ;</td></tr><tr><td>chamber of the heart that pumps deoxygenated blood</td><td>J G</td><td>right atrium right ventricle ;</td></tr></table>	[6]	**A** 'AV valve' **R** right atrioventricular valve
(b) (i)	pulse rate increases and remains constant ; immediate / sudden / steep / rapid / AW, increase in pulse rate ; increases from 44–48 bpm to 164–170 bpm ; maximum / 164–170 bpm, at, 4 min(utes) / 2 min(utes) after race starts ;	[max 3]	*units must be used* **R** exponential increases by 120–126 bpm / by 3.5 to 4 times *or* approx. 4
(ii)	adrenaline stimulates increase in, heart / pulse, rate ; increase in blood, carbon dioxide (concentration) / acidity, detected ; nerves stimulate heart to beat faster ; ref to muscle contraction / AW ; muscles require more energy / muscles are doing more work ; (rate of aerobic) respiration increases ; increase demand for, oxygen / glucose ; ref to removal of, carbon dioxide / lactic acid / heat ; more, blood / carbon dioxide, to lungs (per unit time) ; more, blood / oxygen / glucose, to muscles ; AVP ; e.g. ref to ATP / vasodilation in muscles	[max 4]	**A** decrease in pH 'more' / 'increases', is only needed once **R** 'produce energy' once only
		[Total: 13]	

06. 0610_s16_MS_42 Q: 1

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>septum ;</td><td>[1]</td><td></td></tr>
<tr><td>(b) (i)</td><td>blood flows through heart twice, for one (complete) circuit / to get backto the same point ;
one loop to lungs, and one loop to rest of the body ;</td><td>[max 1]</td><td></td></tr>
<tr><td>(ii)</td><td>high(er), blood pressure / flow rate (than single circulation) ;
allows different blood pressure in each loop ;
prevent mixing of oxygenated and deoxygenated blood ;
allows animals to have high metabolic rates ;
allows animals to be, large / tall ;</td><td>[max 1]</td><td>A more efficient / faster, delivery / removal, of a named blood component e.g. oxygen
I maintain blood pressure</td></tr>
<tr><td>(c)</td><td><table><tr><th>description</th><th>name of structure</th><th>letter on Fig 1.1</th></tr><tr><td>heart chamber with the thickest muscular wall</td><td>left ventricle</td><td>C ;</td></tr><tr><td>the blood vessel carrying oxygenated blood to the heart</td><td>pulmonary vein</td><td>K ;</td></tr><tr><td>the blood vessel that carries oxygenated blood away from the heart</td><td>aorta</td><td>P ;</td></tr><tr><td>a blood vessel that carries blood away from the kidneys</td><td>renal vein</td><td>M ;</td></tr><tr><td>the blood vessel with the largest lumen</td><td>vena cava</td><td>N</td></tr></table></td><td>[4]</td><td>one mark for each correct row</td></tr>
<tr><td>(d)</td><td>(blood) enters heart at right atrium / A (from the vena cava / N) ;
then atrium contracts ;
correct ref to atrioventricular valve ;
then to right ventricle / D ;
then ventricle contracts ;
correct ref to semi-lunar valves ;
then pulmonary artery / J, to lungs / O ;</td><td>[max 4]</td><td>R contradictions between letters and structures
I valves unqualified</td></tr>
<tr><td>(e) (i)</td><td>(more) exercise / AW ;
stop / less, smoking ;
reduced stress ;</td><td>[max 1]</td><td>I ref to diet</td></tr>
<tr><td>(ii)</td><td>stent ;
small mesh tube inserted in artery ;
opens / supports, (narrow / weak) artery ;
(balloon) angioplasty / dilatation ;
(tube / catheter with) balloon inserted into artery ;
inflate balloon to widen artery ;
by-pass ;
(another / shunt) blood vessel joined / grafted / replace, artery ;</td><td>[max 2]</td><td>max 1 if no named procedure.
I open heart surgery / heart transplants</td></tr>
<tr><td></td><td></td><td>[Total: 14]</td><td></td></tr>
</table>

07. 0610_s17_MS_43 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	arrow / (s) from a vena cava through atria and into right ventricle ;	1	
(a)(ii)	**C**, aorta ;	1	
(b)(i)	ventricles relax ; increased volume of ventricles ; higher blood pressure in, the arteries / **C**, **D** and **E** / aorta and pulmonary artery (than in the ventricles) ; **ora**	1	
(b)(ii)	stop back-flow (of blood) / ensure (blood) flows one way ;	1	**I** pressure changes
(c)	1 (right) ventricle contracts ; 2 blood pressure increases (in heart) ; 3 higher blood pressure in ventricles than in arteries ; 4 semilunar valve / valve **1**, opens ; 5 blood flows into, **D** / **E** / pulmonary artery ; 6 semilunar valve closes (when blood in pulmonary artery) ; 7 **D** / **E**, is a pulmonary artery ; 8 valve **1** is a semilunar valve ;	4	sequence of events must be in the correct order
(d)	1 septum ; *either* 2 separates oxygenated and deoxygenated blood ; *or* 3 to allow a double circulation ;	2	

08. 0610_s19_MS_43 Q: 4

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>one loop to lungs / pulmonary circulation, and one loop to rest of the body / systemic circulation ;
blood flows through heart twice, for one (complete) circuit / to get back to the same point ;</td><td>1</td><td></td></tr>
<tr><td>(b)</td><td>lymphocyte / AW ;
engulf/ digest / kill / destroy, bacteria / pathogens ;
platelet ;
red blood cell ;</td><td>4</td><td></td></tr>
<tr><td>(c)</td><td>wall of artery thicker than wall of vein ;
lumen labelled in both drawings ;</td><td>2</td><td></td></tr>
<tr><td>(d)(i)</td><td>arrow(s) start in right-hand side of heart in correct direction ;
arrow(s) point upwards inside pulmonary artery ;</td><td>2</td><td></td></tr>
<tr><td>(d)(ii)</td><td><table><tr><th>statement</th><th>name of structure</th><th>letter from Fig. 4.1</th></tr><tr><td>chamber that creates the highest blood pressure</td><td>left ventricle</td><td>F ;</td></tr><tr><td>blood vessel containing blood with the highest concentration of oxygen</td><td>pulmonary vein / aorta</td><td>C / A ;</td></tr><tr><td>structure that prevents blood going from ventricle to atrium</td><td>atrioventricular valve</td><td>E ;</td></tr><tr><td>structure that prevents backflow of blood from artery to ventricle</td><td>semilunar valve</td><td>K ;</td></tr><tr><td>chamber that receives blood from vena cava</td><td>right atrium</td><td>J ;</td></tr></table></td><td>5</td><td>one mark per row</td></tr>
<tr><td>(e)</td><td>tissue fluid drains (into lymphatic vessels) ;
transports tissue fluid ;
back into the blood / circulatory system ;
contains, lymphocytes / antibodies (in lymph nodes) ;
defence against infection / provide (active) immunity / AW ;
(lacteals) absorbs /transports, fats / fatty acids ;
from small intestine / duodenum / ileum ;
AVP ;</td><td>3</td><td></td></tr>
</table>

09. 0610_w19_MS_41 Q: 5

	Answer	Mark	Partial Marks
(a)(i)	coronary artery ;	1	
(a)(ii)	ref. to platelets ; fibrinogen converted to fibrin ; soluble to insoluble ; forms a mesh ; traps, (red blood) cells ;	3	
(a)(iii)	aspirin / AVP ;	1	
(b)(i)	98 (%) ;;;	3	one mark for correct readings from graph one mark for correct calculation one mark for correctly rounding to a whole number
(b)(ii)	*argument for:* as exercise increased CHD deaths decreased ; **ora** comparative data quote with units ; the same group of people were studied ; regular measurements were taken ; large benefit for doing only a small amount of exercise (therefore easy to do) ; even if there are some doubts about the benefits no harm will be done / AW ; *argument against:* only women in the study ; **ora** none younger than 35 (at the start of the study) ; **ora** actual number of deaths per 10 000 is very small even for those that do not exercise ; other risk factors not considered ; named examples of other risk factors ;; e.g. diet / smoking / alcohol / genetics some women may have forgotten / not answered correctly about how much exercise they did / AW ; some women may have been successfully treated for CHD / not died from the condition / AW ; other variables not considered ; e.g. pre-existing conditions / medication / type of exercise / length of exercise	5	
(c)	more blood, to muscles ; to deliver more, oxygen / glucose ; for muscle contraction ; for (aerobic) respiration ; more energy required ; ref. to adrenaline ;	3	

10. 0610_w18_MS_43 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	diffusion ;	1	
(a)(ii)	blood (in capillaries / **A**) is under (high) pressure ; (liquid) forced out (of capillaries / **A**) ; *ref. to* thin walls / pores / holes, in capillary (walls / bed) ; *ref. to* osmosis (through capillary walls / membranes) ; to form tissue fluid (in **B** / outside of cells) ;	2	
(a)(iii)	red blood cells ; (large / named) proteins ; platelets ; AVP ;	1	
(b)(i)	(semi-lunar) valves ; large, lumen / AW ; thin(ner) walls (than arteries) ; (thin) elastic, tissue / layer / wall ; (thin) muscle, tissue / layer / wall ; AVP ;	2	
(b)(ii)	transports lymph ; transports, named component of lymph ; (lymphatic vessel) absorbs excess (tissue) fluid (from **B**) ; returns fluid to, blood / circulatory system ; AVP ;	2	
(c)	*location*: in villi / small intestine ; *function:* absorbs / transports, fats / fatty acids ;	2	
(d)(i)	lymph node ;	1	
(d)(ii)	(lymphocytes) provide (active) immunity ; produce antibodies ; (antibodies) lock-on to antigens ; (antibodies mark) pathogen / antigen, for destruction / AW ; (lymphocytes) produce memory cells ;	2	**A** protect against, infection / pathogen **A** *ref. to* specificity **A** kill pathogen **A** ref. to long-term immunity

11. 0610_s16_MS_43 Q: 4

	Answer	Mark	Partial Marks
(a) (i)	iodine solution diffused, into the bag / through the (Visking) tubing ; iodine molecules small (enough to pass through the membrane) ; iodine solution stains starch **ora** ; no starch diffused, out of the bag / through the (Visking) tubing ; starch molecules too large (to pass through the membrane) ; ref to pore / AW, size ;	[max 4]	**I** osmosis
(ii)	temperature ; (surface) area ; concentration (gradient) / water potential ; size / type, of molecule ; thickness / distance, across membrane / permeability (of membrane) ; pressure ; (number of) protein, channels / pumps / AW ; energy / number of mitochondria ;	[max 3]	**I** distance / thickness unqualified
(b) (i)	*from muscle cell* (produced in) mitochondrion ; diffused ; (diffused) in cytoplasm / tissue fluid / (blood) plasma ; through membrane ; through capillary wall ; *from blood:* vein / vena cava / pulmonary artery / heart ; travels to lungs ; into alveoli ; exhaled / breathed out / excreted ;	[3]	**A** red blood cell **I** exit the body unqualified
(ii)	thin, wall / epithelium ; for efficient, diffusion / gas exchange ; small, diameter / lumen ; idea that many capillaries can fit into tissues / capillaries reach (every cell) throughout the body / relative size to red blood cell ; extensive network ; large surface for diffusion ; capillary cells have pores ; to allow substances to pass in and out of the blood easily ;	[max 3]	adaptations must be linked to correct feature max 2 for features only **A** one cell thick **R** 'thin cell wall'
(c)	diffusion ; down concentration gradient ; (diffuses) through stoma / stomata ; (through) (intercellular) air space / (between) spongy mesophyll ; into / reached, palisade, mesophyll / cell ; chloroplast ; AVP ; e.g. dissolve / diffuse, through cell wall / cell membrane / cytoplasm	[max 4]	**A** lower concentration of carbon dioxide inside leaf / **ora** ; **A** into guard cell / spongy, mesophyll / cell **I** chlorophyll
		[Total: 17]	