<table>
<tr><th>Question</th><th></th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1 (a)</td><td>
<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>
</td><td>[6]</td><td>A ‘AV valve’
R right atrioventricular valve</td></tr>
<tr><td>(b) (i)</td><td>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 ;</td><td>[max 3]</td><td>units must be used
R exponential
increases by 120–126 bpm / by 3.5 to 4 times or approx. 4</td></tr>
</table>

Question		Mark	Guidance
(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 <u>lungs</u> (per unit time) ; more, blood / oxygen / glucose, to <u>muscles</u> ; 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]	

<table>
<tr><th>Question</th><th></th><th>Marks</th><th>Guidance Notes</th></tr>
<tr><td>2 (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>
</table>

Question		Marks	Guidance Notes
2 **(d)**	(blood) enters heart at <u>right</u> atrium / **A** (from the vena cava / **N**) **;** then atrium contracts **;** correct ref to atrioventricular valve **;** then to <u>right</u> ventricle / **D** **;** then ventricle contracts **;** correct ref to semi-lunar valves **;** then pulmonary artery / **J**, <u>to lungs</u> / **O** **;**	[max 4]	**R** contradictions between letters and structures **I** valves unqualified
(e) (i)	(more) exercise / AW **;** stop / less, smoking **;** reduced stress **;**	[max 1]	**I** ref to diet
(ii)	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 **;**	[max 2]	max 1 if no named procedure. **I** open heart surgery / heart transplants
		[Total: 14]	

<table>
<tr><td>3 (a)</td><td>idea that
blood travels through the heart twice during one complete circuit (of the body) ;
or
pulmonary circulation / to the lungs and systemic circulation / described ;</td><td>[1]</td><td>A ‘one cycle / one full circulation’</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><td rowspan="2">organ</td><td colspan="2">blood vessel</td></tr>
<tr><td>delivers blood</td><td>takes blood away</td></tr>
<tr><td>heart</td><td>1 vena cava / coronary artery ;
2 pulmonary vein</td><td>1 aorta
2 pulmonary artery ;</td></tr>
<tr><td>lungs</td><td>pulmonary artery</td><td>pulmonary vein ;</td></tr>
<tr><td>liver</td><td>1 hepatic artery
2 hepatic portal vein ;</td><td>hepatic vein</td></tr>
<tr><td>kidney</td><td>renal artery</td><td>renal vein</td></tr>
</table>
</td><td>[5]</td><td></td></tr>
<tr><td>(c) (i)</td><td>high pressure would, burst / damage, capillaries / AW ;
capillaries / capillary walls, are, thin / fragile / weak / delicate / narrow ;
wall / lining, (of capillary) is one <u>cell</u> thick ;</td><td>[max 2]</td><td>A ‘capillaries cannot withstand pressure’
R thin / thick, ‘cell wall’</td></tr>
<tr><td></td><td>maintains shape / prevents bursting ;</td><td></td><td></td></tr>
<tr><td></td><td></td><td>[Total: 14]</td><td></td></tr>
</table>

4 (a) (i)	urea / hydrogencarbonate (ions) **;**	[1]	Mark first response on each line **A** lactic acid
(ii)	fibrinogen / insulin **;**	[1]	Mark first response on each line
(b) (i)	anaerobic respiration **;** oxygen debt / vigorous exercise with insufficient oxygen supply **;**	[max 1]	
(ii)	(blood) clotting **;** converted into fibrin to form a mesh **;**	[1]	
(iii)	*any two from* dilation of pupils **;** reduced blood flow through, digestive system / skin **;** increase in, blood pressure or heart rate / pulse / stroke volume **;** increase in breathing rate; increase in oxygen concentration in the blood **;** increase in glycogen converted to glucose **;** increase in glucose / sugar concentration in the blood **;** increase in respiration rate **;** increase in blood flow through the muscles **;** increase in awareness / anxiety / alertness **;** broncho-dilation / widen airways **;**	max [2]	

4 **(c)**	**1** (liver cells respond) to insulin if blood glucose is high **;** **2** (enzymes / liver cells) conversion of glucose to glycogen **;** **3** glycogen is stored (in the liver) **;** **4** (liver cells respond) to glucagon if blood glucose is low **;** **5** (enzymes) break down glycogen to glucose **;** **6** ref to, homeostasis / negative feedback **;**	max [3]	**Reject** reference of insulin / glucagon production in liver
(d) (i)	$\frac{3500 \quad 1300}{1300} \times 100$ 169 (%) **;;**	[2]	
(ii)	**1** nonspecific immune response **;** **2** engulf / ingest / A W, bacteria / pathogens / dead cells **; A** phagocytosis **3** into vacuole **;** **4** use enzymes **;** **5** to digest bacteria / pathogens **;** **6** identify antigen / pathogens, for lymphocytes **;**	max [3]	**Reject** destroy disease
(iii)	**1** recognition tissue is foreign / AW **;** **2** ref to antigens **;** **3** lymphocytes release antibodies **;** **4** phagocytes / lymphocytes, cause tissue destruction **;**	max [3]	
		[Total: 17]	