Transport in Animals

Mark Scheme 1

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Transport in Animals
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: **70 minutes**

Score: **/58**

Percentage: **/100**

Question		Mark	Guidance
1 (a)		[6]	**A** 'AV valve' **R** right atrioventricular valve

function	letter on Fig. 1.1	name
structure that separates oxygenated and deoxygenated blood	**F**	septum ;
structure that prevents backflow of blood from ventricle to atrium	**D**	bicuspid / mitral / atrioventricular, valve ;
blood vessel that carries oxygenated blood	**A**	aorta
blood vessel that carries deoxygenated blood	**B** **H**	pulmonary artery vena cava ;
structure that prevents backflow of blood from pulmonary artery to right ventricle	**K**	semilunar valve ;
chamber of the heart that contains oxygenated blood	**C** **E**	left atrium left ventricle ;
chamber of the heart that pumps deoxygenated blood	**J** **G**	right atrium right ventricle ;

(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

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>
</table>

Question	Expected Answers	Marks	Additional Guidance
(ii)	contraction of muscles (in the legs) / movement of legs ; pushing / squeezing, blood ; (semi-lunar) valves, ensure blood flows towards heart / prevents backflow ; negative pressure in the, chest / thorax / right atrium / atria / heart ; *idea of* residual pressure from the heart ;	[max 3]	**R** 'muscles in the, veins / wall of veins' **A** 'one way flow'
3 (d)	thick wall ; withstands / AW, (blood) pressure ; muscular (tissue) ; (vaso)constriction / (vaso)dilation / resisting rupture / withstands pressure ; elastic (tissue) ; stretches to allow blood surge / AW *or* recoils to maintain (blood) pressure / smooths out blood flow ; folded / crinkly, endothelium / lining ; allows artery to stretch / allow larger volume of blood to flow / AW ; small lumen ; maintains (blood) pressure ; fibrous (tissue) ;	[max 3]	**R** 'thick cell wall' **A** resist rupture **R** increase
	maintains shape / prevents bursting ;		

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)	$\frac{3500-1300}{1300} \times 100$ 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]	