Transport in Animals

Mark Scheme 5

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Transport in Animals
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 5

Time Allowed: **78 minutes**

Score: **/65**

Percentage: **/100**

1 (a)	blood passes through heart twice, during one circulation of body / AW ; heart to lungs / pulmonary circulation **AND** heart to rest of body / systemic circulation ; [1 max]	**R** 'goes through heart twice' unqualified **A** 'one cycle' for one circulation of the body **A** a suitable diagram
(b)	*max 1 per blood vessel* *artery* 1 carries blood from the heart / delivers blood to tissues ; 2 withstands / maintains / transports blood at, high pressure ; 3 transports oxygenated blood except pulmonary (artery) ; *capillary* 4 exchange of substances to, tissues / cells ; 5 allows diffusion / described as movement of named gas ; 6 allows, filtration / white cells to escape / forms tissue fluid ; 7 allows (re)absorption ; 8 heat, exchange / loss / gain ; *vein* 9 transports blood, to the heart / from tissues ; 10 transports blood at low pressure ; 11 transports deoxygenated blood except pulmonary (vein) ; [3]	 **A** blood, 'out of the heart' / 'to organs' / 'to body' **A** …'except to the lungs' for except pulmonary (vein) **R** 'carries oxygenated blood to, organs / tissues (unqualified by ref to from the heart) **A** 'from blood' / allows gas exchange **R** plasma leaves capillaries **R** 'connects arteries to veins' **R** 'blood goes close to, tissues / cells' **A** ensures blood flows one way / stops backflow **R** carry blood (to heart) and lungs **A** 'except from the lungs' for except pulmonary (vein)

1 **(c)**	*allow up to 3 structural points, so must have a function for full marks.* *Functional point is most likely to be MP9* 1 small / narrow, lumen / space for blood / opening / hole ; 2 thick / big, wall ; 3 elastic (tissue / fibres) ; 4 stretches / expands ; 5 recoils ; 6 muscle ; 7 flexible to allow expansion / prevents rupture / prevents bursting ; 8 fibrous, tissue / outer layer ; **A** collagen 9 withstands / maintains, pressure ; [4 max]	 **R** 'tube' **R** 'small / narrow' unqualified **R** 'cell wall' **A** ref. to pulsate **R** 'contracts to push blood' as implies peristaltic
(d)	1 blood fills valve / valve closes (in vein) ; 2 to prevent backflow ; 3 blood flows in one direction / towards heart / prevents flowing away from heart ; [2 max]	**A** correct description of valve action (in vein) **R** closing the vein / 'the vein closes' **R** if refer to valves in the heart
	[Total: 10]	

2	(a)	(i)	oxygen ; glucose ; Ⓐ other valid substances	**[2]**
		(ii)	carbon dioxide ;	**[1]**
	(b)		muscle ;	**[1]**
		(ii)	ref. to contraction / shortening ;	**[1]**
		(iii)	ref. to increased pressure ; so blood leaves heart + via aorta ; ref. to volume decreases AW ;	**[max. 2]**
	(c)	(i)	ref. to high + fat diet / cholesterol AW ; ref. to smoking ; ref. to stress ; ref. to lack of exercise ; ref. to genetic influence AW ; ® refs to blood clots	**[max. 2]**
		(ii)	all parts of artery below point B shaded ;	**[1]**
	(d)	(structure)	presence of valves ;	
		(explanation)	prevents backflow of blood AW ;	
		(structure)	ref. to wide lumen ;	
		(explanation)	allows blood to flow with minimum resistance AW ;	
		(structure)	ref. to tough wall / collagen present ;	
		(explanation)	to prevent bursting AW ;	**[max. 4]**
				[max. 14]

3	**(a**	transports, oxygen / gases **;**	[1]	
	(b) (i)	**1** controls activities in the cell / AW **;** **2** contains, chromosomes / genes / alleles / genetic information / DNA **;** **3** controls how cells, develop / divide / reproduce / grow **;**	max [1]	
	(ii)	more space for haemoglobin **;** to enable greater oxygen carrying capacity / AW **;** more flexible shape (to move through capillaries) **;**	max [1]	

Question	Expected Answers	Marks	Additional Guidance
3 (c) (i)	*0.15 mol dm^{-3}* (red blood cells) are normal shape / biconcave ; *0.20 mol dm^{-3}* (red blood cells) have shrunk / crenation / AW ;	max [2]	
(ii)	**1** osmosis ; **2** (diffusion / osmosis) of water molecules into cells ; **3** down a water <u>potential</u> gradient / from high water <u>potential</u> (of solution) to low water potential (in cells) ; **4** across partially permeable membrane ;	max [3]	
(iii)	cell wall (offers resistance) ; water potential (of plant cells) could be equal / higher / less negative (than 0.1 M solution) (so no net osmosis) ;	max [1]	
(d) (i)	0.15 mol dm^{-3} ; no net movement of water / (red blood) cells will remain normal shape / AW ;	[2]	units must be included **A** (red blood) cells won't be damaged / isotonic (with solution)
(ii)	**1** ref to platelets ; **2** fibrinogen converted to fibrin ; **3** soluble to insoluble / fibrin is insoluble ; **4** thrombin / enzyme in context ; **5** mesh / network / web, to trap blood (cells) ; **6** AVP ; e.g. reference to prothrombin or involvement of calcium ions	max [3]	
		[Total: 14]	

4 (a)	hepatic portal vein ;	[1]	
(b)	(semi lunar) valves ; prevent backflow ; large, lumen ; low, pressure / resistance to blood flow ; thin / less elastic / less muscular, walls (than arteries) ; low blood pressure ; allows vein to be squeezed by (surrounding skeletal) muscles ;	2 + 2 max [4]	in each case the explanation must be linked to a correct feature
(c)	= (181 – 135) ÷ 135 (× 100) ; = 34 (%) ;;	max [2]	
(d) (i)	(liver) responds to insulin (from pancreas) ; increased, uptake / respiration, of glucose ; glucose converted to glycogen ; by enzymes ; glycogen is, insoluble / stored ; negative feedback ;	max [2]	**A** glycogenesis **R** hormones carrying out conversions directly **ignore** homeostasis
(ii)	temperature ; water ; AVP ; e.g. pH / ions / urea / carbon dioxide	max [1]	

4 **(e)**	deamination ; (part of excess) amino acids converted to urea ; (part of) amino acid converted to ammonia ; ammonia converted to urea ; ammonia is harmful ; (rest of) amino acid molecule, releases energy / converted to glucose / glycogen / respired ; (some amino acids) used to make proteins e.g. fibrinogen ; AVP ; e.g. transamination	max [3]	**A** description of amino group removal **ignore** protein converted to urea
(f)	bile production / AW ; breakdown / remove, hormones / red blood cells / toxins / alcohol / drugs ; storage of, iron / vitamin A / vitamin D ; AVP ; e.g. cholesterol, synthesis / AW	m [1]	**R** homeostasis, deamination, protein synthesis, transamination
		[Total: 14]	

Question				Answers	Marks	Additional Guidance
5	(a)	(i)		lymphocyte ;	[1]	***ignore*** leucocyte **A** phonetic spellings
		(ii)	1	attach to, bacteria / viruses / pathogens ;		**A** antigens
			2	cause them to, aggregate / stick together / AW ;		
			3	stop them spreading ;		**R** 'fight' against *anywhere in the answer*
			4	help phagocytes engulf them ;		**A** opsonisation / described **A** 'makes bacteria more detectable by phagocytes'
			5	cause bacteria to burst / kill bacteria / destroy bacteria ;		***ignore*** 'dissolve bacteria
			6	stop bacteria moving / immobilise bacteria ;		
			7	neutralise, toxins / poisons / harmful substances ;		**A** 'detoxify'
			8	stop, viruses / bacteria, entering cells ;	[max 2]	
	(b)	(i)	1	when blood clots / following a cut / when wounded / AW ;		**A** injury
			2	when blood vessels are damaged ;		
			3	on exposure of, blood / fibrinogen, to air ;		
			4	flows over rough surfaces / AW ;	[max 1]	
		(ii)	1	(fibrinogen is converted into) insoluble (fibrin) ;		*assume answer is about fibrin*
			2	forms, mesh / net / network / strands ;		
			3	traps, (red) blood cells / platelets ;		**A** 'gauze' / threads / fibres / web
			4	(dries) to form a scab ;		
			5	prevents, loss of blood / more bleeding ;		
			6	prevents infection / AW ;		
					[max 3]	**A** prevents entry of (named) pathogens **R** foreign bodies

Question			Answers	Marks	Additional Guidance
5	(c)	(i)	5°C – low (kinetic) energy / slow movement of molecules ; low frequency of / few, collisions ; 70°C – enzyme <u>denatured</u> ; ref. to active site / shape of enzyme ;	[max 3]	*accept that 'it' refers to the enzyme* denatures active site = 2 marks, **A** thrombin for enzyme **R** if 'die' / 'die and denature'**A** 'deformed' / AW, active site / enzyme
		(ii)	time taken for fibrin to form / liquid to become sticky / AW ; time taken for fibrinogen / substrate to disappear ; how much fibrin produced in, unit time / stated time ; how much fibrinogen converted, in unit time / stated time ;	[max 1]	**A** rate of fibrin production / how long it takes blood to clot / form a mesh / to reach same viscosity **R** 'how long it took a scab to form' **A** product for fibrin **A** substrate for fibrinogen
		(iii)	pH ; volume of, enzyme / thrombin (solution) ; concentration of, enzyme / thrombin (solution) ; volume of, substrate / fibrinogen (solution) / blood ; concentration of, substrate / fibrinogen (solution) ; calcium ions ; AVP ; e.g. equilibration time	[max 2]	**R** temperature **A** 'amount' for concentration **A** 'amount' for concentration **R** blood **R** size of fibrinogen / substrate
			[Total: 13]		