

Question			Expected Answer	Mark	Additional Guidance
1	(a)	(i)	vein / venule ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE further qualification (e.g. central / hepatic) but DO NOT CREDIT inappropriate name (e.g. renal vein / hepatic portal vein)</p>
1	(a)	(ii)	hepatocyte(s) / hepatic cells ;	1	<p>IGNORE 'liver cells' (as given in Q) and 'sinusoid cells'</p> <p>A list must include 'hepatocytes' or 'hepatic cells' and not include an incorrect cell e.g. hepatocytes and Kupffer cells = 1 hepatocytes and α cells = 0 liver cells and Kupffer cells = 0</p>
1	(b)		<u>deamination</u> ; carbon dioxide / CO_2 ; urea / $\text{CO}(\text{NH}_2)_2$; water / H_2O ;	4	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>If a formula is given for compounds D, E and F then the formula given must be correct in order to be awarded the mark e.g. E 'urea (CONH_2)' = 0 as the formula is incorrect</p>

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1	(c)	(i)	<p><i>This is a QWC question</i></p> <p>1 (testing for) human chorionic gonadotrophin / hCG ;</p> <p>2 hormone small so can pass from blood into filtrate (at Bowman's capsule) ;</p> <p>3 monoclonal / immobilised , antibodies / immunoglobulin , on stick ;</p> <p>4 antibodies attached to , marker / dye ;</p> <p>5 hormone , binds / complementary , to antibody ;</p> <p>6 (triggers) appearance of colour / line becomes visible ;</p> <p>7 AVP ;</p>	3 max	<p>Max 2 (instead of 3) for content if use the term , receptor / antigen / enzyme , throughout instead of antibody</p> <p>1 ACCEPT HCG This mark can be awarded for hCG but the name must be given in full for QWC</p> <p>3 ALLOW 'strip' instead of stick</p> <p>5 IGNORE specificity</p> <p>7 e.g. • reference to the second line to validate test • different antibody for second line • 2 coloured lines = pregnant</p>
			<p>QWC - technical terms used appropriately and spelt correctly ;</p>		1

Question			Expected Answer	Mark	Additional Guidance
1	(c)	(ii)	<p>1 fairness / giving unfair advantage / does not give an 'even playing field' ;</p> <p>2 <i>idea of</i> health risks / dangerous / unhealthy / fatal / side effects ;</p> <p>3 specified health risk ;</p> <p>4 <i>idea of</i> distrust of 'outstanding' performances / does not reflect athlete's natural talent / sport should reflect athlete's natural talent ;</p> <p>5 <i>idea of</i> pressure to keep up with rival competitors ;</p> <p>6 <i>idea that</i> can train for longer (without tiring) / can respire longer (without tiring) / can recover from injury quicker / can build up muscle mass ;</p> <p>7 AVP ;</p>	3 max	<p>IGNORE enhances performance (as given in Q)</p> <p>1 ACCEPT comment about cheating IGNORE idea of should be available to all</p> <p>2 IGNORE 'has an effect on health' as must imply negative effect</p> <p>3 e.g. • depression • aggression • liver , damage / failure • heart attack • masculinisation of female athletes • feminisation of male athletes • infertility</p> <p>7 e.g. • up to the individual to decide • idea that athletes should be role models</p>
			Total	[13]	

Question		Expected Answers		Marks	Additional Guidance				
2	(a)	1	<table border="1"> <thead> <tr> <th><i>excretion</i></th> <th><i>secretion</i></th> </tr> </thead> <tbody> <tr> <td> (metabolic) waste or toxin / harmful or substance is to be removed from body or does not use vesicles </td> <td> useful product or used in cell communication (e.g. to target tissues) or released from glands (ducts or ductless) or uses vesicles or remain in body </td> </tr> </tbody> </table>	<i>excretion</i>	<i>secretion</i>	(metabolic) waste or toxin / harmful or substance is to be removed from body or does not use vesicles	useful product or used in cell communication (e.g. to target tissues) or released from glands (ducts or ductless) or uses vesicles or remain in body	;	<p>One mark per row.</p> <p>CREDIT converse statements on either side or unmatched statements for each</p> <p>IGNORE name or type of product without qualification</p> <p>DO NOT CREDIT any ref to egestion in 'excretion'</p>
			<i>excretion</i>	<i>secretion</i>					
(metabolic) waste or toxin / harmful or substance is to be removed from body or does not use vesicles	useful product or used in cell communication (e.g. to target tissues) or released from glands (ducts or ductless) or uses vesicles or remain in body								
<table border="1"> <tbody> <tr> <td> urea / carbon dioxide / water / bile pigment / named example </td> <td> hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example </td> </tr> </tbody> </table>	urea / carbon dioxide / water / bile pigment / named example	hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example	;	<p>2 IGNORE sweat / urine / bile / saliva / salt / (named) digestive juice</p>					
urea / carbon dioxide / water / bile pigment / named example	hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example								

Question	Expected Answers	Marks	Additional Guidance
<p>3</p> <p><i>one similarity</i></p>	<p>requires ATP or (involved in) homeostasis or (compounds) produced by cell(s) / produced by metabolism / need to cross membrane / need to move through membrane / need to leave cell / (may be) transported in blood</p>	<p>3</p>	<p>3</p> <p>CREDIT method of leaving cell e.g. exocytosis IGNORE going into cells (as some excretory products do)</p>

Question		Expected Answers	Marks	Additional Guidance
2	(b)	<p>S1 glucose is not the only substrate / there are other substrates ; E1 named alternative substrate ; or</p> <p>S2 ATP is produced / energy is released ; E2 (by) substrate level / oxidative, phosphorylation ; or</p> <p>S3 ATP / energy, required ; E3 (for) phosphorylation / glycolysis ; or</p> <p>S4 is not a single step reaction / other steps involved / other products / other intermediates ; E4 named stage(s) / named intermediate compound(s) ; or</p> <p>S5 enzymes are involved ; E5 dehydrogenation / decarboxylation / oxidative phosphorylation / named (respiratory) enzyme ; or</p> <p>S6 coenzymes / NAD, involved ; E6 oxidative phosphorylation / link reaction / Krebs cycle / glycolysis ; or</p> <p>S7 glucose does not, combine / react , (directly) with oxygen ; E7 (oxygen) used in oxidative phosphorylation / is final electron acceptor / is final hydrogen acceptor ;</p>	S & C	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>CREDIT one statement and a suitable explanation related to that (first) given statement (e.g. S3 + E3 but not S4 + E1)</p> <p>DO NOT AWARD 2 marks for 2 statements or 2 explanations</p> <p>1 'fats can (also) be respired' = E1 'fats can be respired as well as glucose' = S1 + E1</p> <p>S2 DO NOT CREDIT energy produced / made / created</p> <p>4 Krebs cycle / ETC , happens = E4 'other stages such as link reaction are involved' = S4 + E4 E4 e.g. pyruvate / acetyl CoA / acetate IGNORE NAD(H) / FAD(H) / ATP</p> <p>S6 DO NOT CREDIT NADP</p>
			2	

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2	(c)	(i)	1	unable to produce (enough) insulin / do not secrete insulin / produces ineffective insulin ;	2 max	Max 1 if referring to insulin receptors
			2	insulin-producing cells / beta cells / islets of Langerhans, not functioning (correctly) / damaged / destroyed / attacked ;		1 DO NOT CREDIT 'excrete' as incorrect
			3	by (body's own) immune system / by (body's own) antibodies / auto-immune disease ;		2 ALLOW lack of beta cells / ref to b cells DO NOT CREDIT alpha cells / B cells (if lymphocytes implied)
			4	(idea of) family history / genetic / hereditary ;		3 CREDIT description
			5	(condition can be) triggered by , virus / environmental factor ;		5 e.g. <ul style="list-style-type: none"> • shock • drugs side effect • (pancreatic) cancer • infection / disease
2	(c)	(ii)	1	increasing age / older / ageing / more prevalent over 40 ;	3 max	Mark the first 3 responses only
			2	(idea of) family history / genetic / hereditary ;		1 DO NOT CREDIT age without 'older' implication
			3	(more common in) males ;		
			4	(more common in) some ethnic groups / African / Afro-Caribbean / Asian / Hispanic / Oceanic ;		
			5	obese / overweight / fat around abdomen ;		5 CREDIT 'apple shaped'
			6	high / frequent, intake of , sugar / highly processed food / high GI food ;		6 IGNORE 'poor diet' / 'bad diet' / 'unhealthy diet' IGNORE fat / carbohydrate , in diet
			7	lack of physical activity / sedentary lifestyle ;		
			8	high blood pressure ;		8 CREDIT history of , heart attack / stroke
			9	excessive alcohol intake ;		9 idea of <i>too much</i> is needed
Total					10	

Question			Expected Answers	Marks	Additional Guidance
3	(a)		<u>ultrafiltration</u> ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>This term required but ACCEPT phonetic spelling</p>
3	(a)		17.9 ; ;	2	<p>Correct answer = 2 marks</p> <p>If answer incorrect, not rounded or incorrectly rounded then allow 1 mark for working</p> <p style="padding-left: 40px;">$125 \div 700$</p> <p style="padding-left: 40px;">or</p> <p style="padding-left: 40px;">an unrounded answer e.g. 17.857412</p>
3	(b)	(i)	(cuboidal) epithelium / epithelial ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>DO NOT CREDIT 'epithelium cells' / 'ciliated epithelium' / 'squamous epithelium' / endothelium</p> <p>ALLOW columnar epithelium</p>
3	(b)	(ii)	<u>microvilli</u> / <u>microvillus</u> ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT 'brush border'</p> <p>DO NOT CREDIT cilia</p>

Question			Expected Answers	Marks	Additional Guidance
3	(b)	(iii)	<i>This is a QWC question</i>		
		<p>1 selective reabsorption ;</p> <p>2 of glucose <u>and</u> amino acids ;</p> <p>3 co-transport / facilitated diffusion / uptake described ;</p> <p>4 water follows by osmosis so concentration of, ions / nitrogenous waste / urea / remaining substances , increases ;</p> <p>5 AVP ;</p>	<p>S & C</p> <p>2 DO NOT CREDIT if glucose & amino acids & proteins</p> <p>3 ACCEPT direct uptake , of glucose / amino acids, by active transport</p> <p>5 e.g. • microvilli provide large surface area for uptake • many mitochondria provide energy for uptake • many brush border enzymes (ATPase) for active uptake • active secretion of nitrogenous waste into lumen</p>		
			QWC - technical terms used appropriately and spelt correctly ;	1	Use of three terms from: reabsorption (or derived term), co-transport (or derived term), facilitated diffusion, osmosis

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3	(c)	(i)	L artery / shunt / vein (at arterial end of shunt) AND M vein ;	1	IGNORE names of artery / vein (e.g. renal) DO NOT CREDIT aorta and vena cava
3	(c)	(ii)	so that clots don't form, while in the (dialysis) machine / during dialysis ;	1	ALLOW congeal instead of clot IGNORE prevents clotting in the body IGNORE clumping
3	(c)	(iii)	<i>idea of</i> allowing blood to clot normally after treatment ;	1	CREDIT preventing low blood pressure (as low viscosity)
3	(c)	(iv)	(simple) <u>diffusion</u> ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE dialysis DO NOT CREDIT facilitated diffusion
3	(c)	(v)	<i>idea that</i> it, maintains diffusion gradient / maintains concentration gradient / maximises diffusion gradient / maximises concentration gradient / allows maximum removal of waste / allows maximum rate of diffusion / AW ;	1	IGNORE unqualified ref to countercurrent e.g. <ul style="list-style-type: none"> • solutions in contact over greater distance • provides maximum contact for exchange • allows exchange over longer distance IGNORE ref to surface area
Total				14	

Question			Answer	Mark	Guidance
4	(a)	(i)	acetylcholine ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>CREDIT other correct examples e.g. dopamine / noradrenaline / norepinephrine</p> <p>ACCEPT ACh</p>
4	(a)	(ii)	<p>either</p> <p>post-synaptic membrane ; (TRPA1) prevents attachment of (named) neurotransmitter to its receptor ;</p> <p>or</p> <p>pre-synaptic membrane / (pre)synaptic knob / axon terminal / bouton / synaptic bulb ; (TRPA1) prevents , release of (named) neurotransmitter / influx of calcium ions ;</p>	2	<p>Explanation must match correct location for 2 marks. If no location stated then explanation can be awarded independently for 1 mark. Incorrect location = 0 marks.</p> <p>IGNORE 'interferes' (as in Q)</p> <p>IGNORE ref to dendrites / cell bodies /neurone(s) / synapse(s)</p> <p>CREDIT causes hyperpolarisation</p> <p>DO NOT CREDIT idea that TRPA1 is a free protein that will enter the ACh receptor and block it (rather like a competitive inhibitor occupying the active site of an enzyme)</p> <p>ACCEPT Ca²⁺</p>

Question			Answer	Mark	Guidance
4	(b)	(i)	<p>A sinusoid ;</p> <p>B (branch of) bile duct ;</p> <p>C (branch of) hepatic portal <u>vein</u> ;</p> <p>D (branch of) hepatic artery / arteriole ;</p> <p>E (branch of) hepatic / central , <u>vein</u> ;</p>	5	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>B DO NOT CREDIT canaliculus</p> <p>C IGNORE inter lobular but DO NOT CREDIT intra lobular</p> <p>D IGNORE inter lobular but DO NOT CREDIT intra lobular</p> <p>E IGNORE intra lobular but DO NOT CREDIT inter lobular</p>
4	(b)	(ii)	<p>1 because there is not enough <u>glutathione</u> / <u>glutathione</u> has run out ;</p> <p>2 enzyme catalysing glutathione reaction is , working at V_{max} / inhibited / in short supply ;</p> <p>3 the NAPQI cannot , cross the cell (surface) membrane / leave the cell / leave (named) organelle ;</p>	1 max	<p>2 DO NOT CREDIT in context of P450 system</p> <p>3 IGNORE ref to excretion</p>
4	(b)	(iii)	<p>hepatocytes</p> <p>and</p> <p><u>mitosis</u> / <u>mitotic</u> (division) ;</p>	1	<p>CREDIT (liver) stem cells / hepatic cells</p> <p>IGNORE liver cells unqualified</p> <p>DO NOT CREDIT Kupffer cells</p> <p>ONLY CREDIT correct spelling for mitosis / mitotic</p>
Total				10	