Question			Answer	Marks	Guidance
1	(a)	(	liver ;	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**
1	(a)	(i	**1** (high intake of protein) leads to a large amount of amino acids ; **2** (excess) amino acids cannot be stored ; **3** amino acids deaminated **or** amine group / NH_2 , removed / converted to ammonia ; **4** (large amount of) ammonia enters ornithine cycle (for conversion to urea) ; **5** increased , blood / plasma , concentration of urea (leads to more urea in , filtrate / urine) ; **6** high concentration of , amino acids / urea , in blood increases water absorption from urine ;	3 max	**1** Must emphasise the idea of *leading to* , more / too many / lots of , amino acids **3 DO NOT CREDIT** deamination of protein **IGNORE** amino group **4 ACCEPT** ref to urea cycle instead of ornithine cycle correct diagram of the cycle
1	(b)		diabetes (mellitus) ;	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** **ACCEPT** kidney disease / nephritis / kidney failure / pregnancy **IGNORE** type 1 or 2

Question			Answer	Marks	Guidance
1	(c)	(	(human) chorionic gonadotrop(h)in / hCG**;**	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** **ACCEPT** phonetic spelling (a vowel between the ch and r) **DO NOT CREDIT** chronic **ACCEPT** combinations of lower and upper case letters **DO NOT CREDIT** letters in the incorrect order (eg hGC)

Question			Answer	Marks	Guidance
1	(c)	(i	**1** LH binds to **,** anti-LH / its complementary (free / mobile / with dye) **,** antibodies **;** **2** this (LH-anti-LH) antibody complex moves along (test stick together with urine) **;** **3** this (LH-anti-LH) antibody complex binds (only) with **,** immobilised antibodies specific to them / lower band of immobilised antibodies **;** **4** (only) control antibodies bind with **,** immobilised antibodies specific to them / upper band of immobilised antibodies **;** **5** *idea that* binding of antibody (with dye to its immobilised anti-antibody) produces coloured line **;** **6** 2 lines indicates **,** positive result / presence of LH **or** darker line = more LH **or** 'control' / top **,** line indicates the strip is working (correctly) **or** 'control' / top **,** line alone indicates no LH **;**	**3 max**	**ACCEPT** joins / attaches **,** for 'bind' throughout **IGNORE** **'**reacts with' **DO NOT CREDIT** active site / enzyme references instead of antibodies **If a candidate's <u>whole</u> answer is in terms of pregnancy testing, DO NOT CREDIT mps 1, 2 & 3** **1** **ACCEPT** hormone for LH 'specific' for 'complementary' **2** **IGNORE** urine moving along the stick on its own **5** **Award** in context of either LH or control line **6** **DO NOT CREDIT** this alternative in context of positive pregnancy result
			Total	**9**	

Question			Answer	Marks	Guidance
2	(a)		**E** (proximal / first / distal / second) convoluted tubule / PCT / DCT **;** **F** (lumen of) Bowman's / renal **,** capsule **;**	**2**	**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** **E ACCEPT** collecting duct **DO NOT CREDIT** loop of Henle (as not in cortex) **DO NOT CREDIT** 'cells of …' / tube **IGNORE** 'nephron tubule' / nephron

Question			Answer	Marks	Guidance
2	(b)	(	1 **afferent** arteriole , has diameter greater than that of / is wider than , **efferent arteriole** ; 2 build up of / high , **hydrostatic** / blood , pressure ; 3 **endothelium** / wall , of , capillary / glomerulus , has , (small) pores / **fenestrations** ; 4 (these allow) **ultrafiltration** ;	2 max	1 **IGNORE** different / larger / smaller, without suitable qualification **IGNORE** thicker / thinner 3 **ACCEPT** holes / gaps instead of pores **IGNORE** epithelium **DO NOT CREDIT** cell wall **DO NOT CREDIT** podocytes / basement membrane if linked to capillary structure **IGNORE** podocytes / basement membrane if linked to the Bowmans capsule
			QWC – technical terms used appropriately and spelt correctly ;	1	Use of **three** terms from: **afferent**, **efferent**, **arteriole**, **hydrostatic**, **endothelium**, **fenestrations**, **ultrafiltration** (or derived term) **Please insert a QWC symbol next to the pencil icon, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded** **You should use the green dot to identify the QWC terms that you are crediting.**
2	(b)	(i	podocyte(s) ;	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**

Question			Answer	Marks	Guidance
2	(c)	(	*if kidney cannot filter so substances remain in blood* **1** increase / high **,** in urea **;** **2** increase / high **,** in **,** (named) ions / (named) salts **;** **3** increase / high **,** in water **;** **4** AVP **;** **OR** *if problems cause substances to be lost indiscriminately* **5** decrease / low **,** in **,** protein / blood cells **;** **6** decrease / low **,** in **,** (named) ions / (named) salts **;** **7** decrease / low **,** in **,** glucose / amino acids / vitamins **;** **8** decrease / low **,** in water **;**	**2 max**	**Candidate's answer can only come from one section of the mark scheme if type of failure not specified. However, all marks are available if clearly linked to the type of failure.** **3 IGNORE** ref to water potential **4** e.g. • high(er) levels of **,** creatinine / (named) hormone • high(er) levels of **,** metabolite / toxin **,** breakdown **for mps 5-8 DO NOT CREDIT** 'no' / 'none' / 'zero' **7 IGNORE** sugar **8 IGNORE** ref to water potential ***Note*** 'increase in urea' = 1 (mp 1) 'increase in salt and water' = 2 (mps 2 & 3) 'low in protein but high in urea' = 1 (mp 5, but not mp 1 as different type of failure and has not been specified)

Question			Answer	Marks	Guidance
2	(c)	(i	*if not closely matched* **1** donated kidney will be recognised as **,** foreign / non-self **;** **2** antigens / glycoproteins **,** (on donated kidney) will be different **;** **3** causing rejection **;** **4** (response) by immune system **;** **5** use of immuno-suppressant drugs **;** **6** ref to need for suitable size in specific case (e.g. if recipient is a small child) **;**	**3 max**	**CREDIT** ora **for all mark points** **1** Needs the idea of the body *recognising* the foreign nature **4** **CREDIT** a description of immune response **DO NOT CREDIT** ref to <u>auto</u>immunity
			Total	**11**	

Question			Expected Answer	Mark	Additional Guidance
3	(a)		**P** cortex ; **Q** ureter ;		**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** ***Q*** **Correct spelling only** **DO NOT CREDIT** incorrect spelling of ureter

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(i)	**1** **ultrafiltration** ; **2** **afferent** arteriole is wider than **efferent** arteriole ; **3** high **blood pressure** in glomerulus / high(er) **hydrostatic pressure** in glomerulus (than in Bowman's capsule) ; **4** *idea that* **endothelium** / wall of capillary , has gaps to , allow / prevent , passage (of substances / cells) ; **5** *idea that* **basement membrane** stops removal of , large molecules / cells ; **6** **podocytes** / **epithelial** cells of Bowman's capsule , have (finger-like) projections / processes ; **7** (projections) ensure gaps to allow passage (of substances) ;	**3 max**	***4*** e.g. fenestrations in capillary wall don't allow red blood cells to leave **DO NOT CREDIT** cell walls of capillaries ***5*** e.g. basement membrane (only) allows small molecules to pass through
			QWC – technical terms used appropriately and spelt correctly ;	**1**	Use of **3** terms in the correct context from: **afferent**, **efferent**, **blood pressure / hydrostatic pressure**, **endothelium / endothelial**, **basement membrane**, **podocyte(s)**, **epithelial / epithelium**, **ultrafiltration** **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(ii)	**1** (large) protein / amino acids , present ; **2** blood (cells) present ; **3** glucose present ; **4** more water present / more dilute ; **5** more , ions / salts / electrolytes , present ; **6** (more) vitamins present ;	**2 max**	**Mark as prose - award marks wherever they occur** ***1*** **ACCEPT** more , protein / amino acids **ACCEPT** appropriately named protein e.g. albumin / antibodies / immunoglobulins ***3*** **DO NOT CREDIT** more glucose
3	(c)	(i)	protein / polypeptide ;	**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** alpha helix / intrinsic / transmembrane **DO NOT CREDIT** glycoprotein
3	(c)	(ii)	**1** the ions (in solution) are too large to pass through the channel **or** the channel is too narrow for the ions (in solution) to pass through ; **2** shapes not compatible ; **3** *idea that* positive charge (in the channel) repels the (positively charged) ions ;	**2 max**	**Mark the first <u>two</u> suggestions** ***1*** **ACCEPT** gap / hole for channel ***3*** **DO NOT CREDIT** repels and/or attracts
			Total	**11**	

Question			Expected Answers		Marks	Additional Guidance
4	(a)		1	water potential / Ψ , of plasma / outside cells , would be higher than that of the (blood) cells ;	2 max	*1* Must be a clear comparative statement relating to outside and inside cells **CREDIT** ora **IGNORE** water concentration *2* **IGNORE** osmosis / down water potential gradient *3* **CREDIT** haemolysis / haemolysed **DO NOT CREDIT** plasmolysis / turgid ***Note:*** 'cells become turgid and burst' = 0 'cells swell and become turgid' = 0
			2	water would enter (blood) cells ;		
			3	blood cells , swell / (might) burst / lyse ;		
4	(b)		*type of monomer* amino acid ; *name of bond* peptide / amide ;		2	**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** **DO NOT CREDIT** amine **IGNORE** covalent **DO NOT CREDIT** dipeptide / polypeptide

Question			Expected Answers		Marks	Additional Guidance
4	(c)					**Mark the first answer on each prompt line in the passage.** If the answer is correct and an additional answer is given for that 'gap' that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** phonetic spelling throughout
			1	osmoreceptor / neurosecretory ;		***1*** **ACCEPT** osmotic receptor
			2	hypothalamus ;		***2***
			3	axon(s) ;		***3***
			4	posterior pituitary ;		***4*** **DO NOT CREDIT** 'pituitary' without correct qualification
			5	collecting duct ;		***5*** **ACCEPT** distal (convoluted) tubule / second convoluted tubule
			6	(plasma / cell) membrane(s) ;		***6***
			7	aquaporins(s) ;		***7*** **DO NOT CREDIT** aqua pores
			8	osmosis ;		***8***
					8	

Question			Expected Answers		Marks	Additional Guidance	
4	(d)			*how ADH is dealt with as a protein*			
			1	in , liver / hepatocytes ;		*1*	**DO NOT CREDIT** if linked directly to excretion eg 'excreted by the liver'
			2	hydrolysis / acted on by protease ;		*2*	'broken down' is not quite enough
			3	deamination / amine group removed / formation of ammonia / formation of NH_3 ;		*3*	**DO NOT CREDIT** 'amine group deaminated'
			4	ornithine cycle / formation of urea / formation of $CO(NH_2)_2$;		*4*	**DO NOT CREDIT** 'amino acid enters ornithine cycle'
			5	amino acids / keto acids , used in (named) metabolic pathway ;		*5*	eg • amino acids used for protein synthesis • keto acids used in , Krebs cycle / respiration • used in gluconeogenesis
				how ADH or urea is dealt with as a small molecule			
			6	in kidney ;		*6*	
			7	(ultra)filtered from blood / moves from blood into nephron ;		*7*	
			8	(because) small molecule ;		*8*	
			9	urea not (all) reabsorbed / ADH not reabsorbed / (ADH or urea) present in urine ;		*9*	**DO NOT CREDIT** 'removed **as** urine'
			10	excreted ;		*10*	**DO NOT CREDIT** if linked directly to the liver eg 'excreted by the liver'
					3 max		
				TOTAL	**15**		