Question			Answer	Mark	Guidance
1	(a)		93 (to nearest whole number) / 93.4 (to 3 sig figs) **;** per million (people) / million $^{-1}$ **;**	**2**	**Correct answer with correct units = 2 marks** **Correct answer with no/incorrect units = 1 mark** **If answer incorrect or no numerical answer given then allow 1 mark for using correct units.**
1	(b)	(i)	error bar(s) **;**	**1**	**CREDIT** standard deviation / variance / standard error **DO NOT CREDIT** range bars (as they would not all be equidistant from the mean)

Question			Answer	Mark	Guidance
1	(b)	(ii)	*In the context of starting RRT* **1** more males **ora** **or** higher percentage are males / lower percentage are females **;** **2** the lowest percentage of males is 60% / the highest percentage of females is 40% **;** **3** percentage of males increases with age from age group 35-44 **or** ratio / proportion **,** of male to female increases with age from age group 35-44 **or** percentage of males decreases with age until age group 35-44 **or** ratio / proportion **,** of male to female decreases with age until age group 35-44 **;** **4** *idea that* (as bars overlap) any differences (in proportions of the genders) between age groups are not (statistically) significant **;**	**2 max**	**IGNORE** ref to likelihood of / risk of / more likely to **,** start / have **,** RRT **1** **ACCEPT** 'more than 50% are males' or 'over half are males' or 'less than 50% are females' or 'less than half are females' **IGNORE** refs to data relating to single age groups **2** Needs to emphasise that this is the ***least*** **CREDIT** 55% instead of 60% 45% instead of 40% **3** **IGNORE** ref to number of males **CREDIT ora** for female to male ratio / proportion **IGNORE** ref to number of males **CREDIT ora** for female to male ratio / proportion **4** Illustrates why the conclusions in mp 3 may not be secure

Question			Answer	Mark	Guidance
1	(c)	(i)	*uncertain diagnosis because* *idea that* older people may have more complex medical problems **;**	**1**	e.g. 'older people may have more than one thing wrong with them' 'more likely to have more than one cause of kidney failure'
1	(c)	(ii)	renal vascular disease **and** x 5 increase / (percentage) increase of 400% **;**	**1**	**IGNORE** ref to 9.2%
1	(d)	(i)	it can perform **,** active transport / facilitated diffusion **;**	**1**	**IGNORE** ref to structural features e.g. channel proteins
1	(d)	(ii)	**1** *idea that* (dialysis is replicating function of kidney and) part of kidney's function is to remove (excess) water from blood **;** **2** (dextrose / sugar) reduces **,** water potential / Ψ (of dialysis fluid) **or** (dextrose / sugar **,** solution) has a lower **,** water potential / Ψ (than water) **;** **3** water moves from blood (into dialysis fluid) by osmosis **or** prevents water moving into the blood (from dialysis fluid) by osmosis **;** **4** (if it was water alone) cells would **,** swell / burst **;**	**2 max**	**IGNORE** ref to the use of dextrose rather than glucose **IGNORE** ref to ions

Question			Answer	Mark	Guidance
1	(d)	(iii)	**1** peritoneal dialysis can remove less (named) waste (than haemodialysis) **;** **2** *idea that* in haemodialysis dialysis fluid is constantly **,** refreshed / changed (but not in peritoneal dialysis) **;** **3** haemodialysis uses counter-current flow **;** **4** *idea that* haemodialysis maintains concentration gradient **or** in peritoneal dialysis the concentration gradient **,** reduces / is lower **;** **5** (in peritoneal dialysis) the fluid reaches equilibrium with the blood **;**	**2 max**	**IGNORE** ref to 'cleaning' blood **1** **ora** e.g. haemodialysis is more **,** efficient / effective **,** at removing (named) waste
1	(e)		stem / erythropoietic **,** cell(s) **and** bone marrow **;**	**1**	
			Total	**13**	

Question			Answer	Mark	Guidance
2	(a)	(i)	**Q ;**	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** named region as question requires candidates to identify the relevant regions from the diagram.
2	(a)	(ii)	**Q and J and K and L ;**	1	**All 4 letters required for the mark.** **If additional letters given, = 0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram.
2	(a)	(iii)	**J ;**	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** named region as question requires candidates to identify the relevant regions from the diagram.
2	(b)		**1** more (sodium and chloride) ions pumped **,** out of ascending limb / into medulla **;** **2** builds up greater water potential gradient **;** **3** allows **,** reabsorption / removal **,** of *more* water from **,** collecting duct / M **;**	2	**1** **CREDIT** active transport / AW **,** for 'pumped' **IGNORE** salts / diffusion **2** **ACCEPT** ***even more*** negative water potential in medulla (than other mammals)

Question			Answer	Mark	Guidance
2	**(c)**		anabolic steroids **;**	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** androgenic steroids **IGNORE** named steroids as *type* of drug asked for
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)		**1** large molecules / proteins / blood cells **,** cannot **,** leave blood / enter the filtrate **or** (named) small molecules can **,** leave blood / enter filtrate**;** **2** **endotheli**um **/ fenestration**s / **basement membrane ,** prevents **,** large molecules / erythrocytes **,** reaching **,** renal / **Bowmans capsule ;** **3** <u>all</u> glucose / glucose completely **,** **reabsor**bed at the **, proximal convoluted tubule** / PCT **;** **4** <u>all</u> amino acids / amino acids completely **,** reabsorbed at the **,** proximal convoluted tubule / PCT **;** **5** (some / not all) ions **,** reabsorbed / move into blood (at any part of **,** nephron / tubule) **;** **6** urea / ion **,** <u>concentration</u> increases (between filtrate and urine) because **,** movement (of urea / ion) into tubule / water removed **;**	**4 max**	**1** Needs more than a figs ref **DO NOT CREDIT** through **,** cells / membranes **DO NOT CREDIT** ref to erythrocytes being large molecules or proteins **ACCEPT** capillary / glomerulus **,** for 'blood' **2** Needs ref to entering Bowmans capsule to explain data in table **DO NOT CREDIT** basal membrane **3** Needs to be a clear statement, not from figs **DO NOT CREDIT** distal convoluted tubule / DCT **4** Needs to be a clear statement, not from figs **DO NOT CREDIT** distal convoluted tubule / DCT **5** **ACC PT** ref to named ions **IGNORE** salts **DO NOT CREDIT** if stated that **all** ions are reabsorbed **6** Must be a clear specific statement and not part of a list Reason must refer **only** to water removal
			QWC – technical terms used appropriately **<u>and</u>** spelled correctly **;**	**1**	Use of **three** terms from: **endothelium / endothelial** **fenestration**(s) **basement membrane** **Bowmans capsule** **reabsorb** (or derived term) **proximal convoluted tubule** **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.**

Question			Answer	Marks	Guidance
3	(b)	(i)	*idea that* (high creatinine concentration indicates) reduced function because **,** less filtration / low GFR **;**	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** **Answer must include statement about lack of 'working' or 'functioning' of kidney <u>as well as</u> some reference to reduced filtration** **IGNORE** ref to creatinine or creatine **ACCEPT** ref to no filtration **DO NOT CREDIT** ref to creatinine ***causing*** kidney damage
3	(b)	(ii)	55 **; ;**	2	**Correct answer = 2 marks** If the answer is incorrect, **award 1 mark** for working: $82 \times \frac{1.73}{2.56}$ If the answer is unrounded, incorrectly rounded or not given to the nearest whole number, **award 1 mark** for seeing an unrounded answer (e.g. 55.4140625)
3	(b)	(iii)	stage 3 **<u>and</u>** moderate reduction (in kidney function) **;**	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** **Needs to quote the effect on the kidney stated in the table.** **If the answer is incorrect, then look at the candidate's answer to Q3(b)(ii) (scroll down – it's situated below this answer) and CREDIT** a stage that correctly follows on from candidate's answer to **(ii)** as **ecf**.

Question			Answer	Marks	Guidance
3	(c)		*general* **1** *idea that* people **should** have a **right** to choose (freely) what to do with their kidney **;** *perceived donor advantages* **2** *idea that* donors / donors' families **,** can benefit from money raised (by selling a kidney) **;** **3** people can donate a kidney to family member **;** **4** *idea that* people can donate without payment **;** *perceived donor disadvantages* **5** *idea of* exploiting people's poverty **;** **6** *idea of* exploitation of **,** children / minors **;** *recipient issues* **7** *idea that* people should receive transplants irrespective of wealth **;** **8** *idea that* it is wrong that recipients are being charged excessively **;** **9** AVP **;**	**3 max**	**IGNORE** 'yes' or 'no' **IGNORE** religious / cultural **,** considerations **IGNORE** ref to kidneys sourced from animals Answers need not be a balanced account. **4** **ACCEPT** choosing to donate for **,** free / the good of it **IGNORE** ref to giving to charity **5** **ora** ethical if not doing it just for money they receive **6** **ACCEPT** ref to illegality of child donors **IGNORE** **'**young' unqualified **ora** ethical as long as (donor) of legal age **9** e.g. family member may feel pressured into donating e.g. can survive with only one healthy kidney e.g. potential for complications if donor has subsequent kidney failure e.g. people should have access to kidneys if needed e.g. danger of operating on **,** healthy person / donor e.g. *idea that* wrong for large profits to be made
			Total	**12**	

Question			Answer	Marks	Guidance
4	(a)		hydrostatic ; water / urea / amino acids / vitamins / small proteins ; ultrafiltration ; water ; capillaries / vessels ;	5	**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** **IGNORE** blood **DO NOT CREDIT** osmotic / hydrostolic **ALLOW** ADH / hCG / LH **DO NOT CREDIT** ions / salts / minerals (because sentence refers to molecules) **CREDIT** urea **IGNORE** ref to vitamins **DO NOT CREDIT** amino acids (as these are completely reabsorbed) **DO NOT CREDIT** plasma / arteries / arterioles / tissue fluid
4	(b)	(i)	((walls of) blood vessels in) hypothalamus ;	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** brain
4	(b)	(ii)	osmoreceptor(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** **ACCEPT** neurosecretory (cell body) **DO NOT CREDIT** osmoregulatory

Question			Answer	Marks	Guidance
4	(c)	(i)	cortex **;**	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**
4	(c)	(ii)	water potential of **,** plasma / blood **,** will **,** decrease / become more negative **;** (ADH secretion) will increase **;**	2	**CREDIT** concentration of Na^+ in , plasma / blood **,** will increase **IGNORE** ref to increased uptake of Na^+ into blood **DO NOT CREDIT** ADH starts to be released / produced
4	(c)	(iii)	negative feedback **;**	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** cell signaling

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>L glomerulus ;

M Bowman’s / renal , capsule ;

N proximal convoluted tubule ;</td><td>3</td><td>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

L ACCEPT ‘capillary knot’
IGNORE ‘capillary unqualified’

N IGNORE ‘first’
IGNORE PCT / pct (as Q asks for ‘name’)</td></tr>
<tr><td>5</td><td>(b)</td><td></td><td>
<table>
<tr><th>statement</th><th>part(s) of the nephron</th><th></th></tr>
<tr><td>walls are impermeable to water</td><td>ascending (limb of loop of Henle)</td><td>;</td></tr>
<tr><td>glucose is reabsorbed into the blood</td><td>proximal convoluted tubule / N</td><td>;</td></tr>
<tr><td>ADH acts on the walls</td><td>collecting duct / distal convoluted tubule</td><td>;</td></tr>
<tr><td>contains podocytes</td><td>Bowman’s capsule / renal capsule / M</td><td>;</td></tr>
<tr><td>most of the water is reabsorbed into the blood</td><td>proximal convoluted tubule / N</td><td>;</td></tr>
</table>
</td><td>5</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

ACCEPT rising limb

ACCEPT pct / first convoluted tubule

ACCEPT DCT / dct / second convoluted tubule

ACCEPT pct / first convoluted tubule</td></tr>
</table>

Question			Answer	Marks	Guidance
5	(c)		**1** *role of loop of Henle is to* cause a decrease in **water potential** in / establish water potential gradient going down **,** **<u>medulla</u>** **;** **2** (as) in **ascending** limb **active transport** outwards of **,** solutes / (sodium and chloride) **ions** **;** **3** (walls of) **descending** limb permeable to water **;** **4** water removed from descending limb **;** **5** water potential of tissues surrounding collecting duct is low(er) than fluid inside it **;** **6** water removed from **,** filtrate / urine (in collecting duct) **;** **7** AVP **;**	4 max	***1*** **Do not award** for a simple statement that 'there is a lower water potential in the medulla' ***2*** **ACCEPT** 'pumped' for active transport ***3*** **IGNORE** ref to permeability to ions ***5*** **ACCEPT** 'contents of collecting duct' ***7*** eg • acts as a countercurrent **,** system / multiplier • the drier the habitat the longer the loop • *idea that* urea contributes to low water potential in medulla • (facilitated) diffusion of ions out of the loop at the bottom
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **water potential**, **medulla**, **ascending**, **active transport** (or derived term), **ion**(s), **descending** **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.**
			Total	**13**	