| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 1 | (a) | | 93 (to nearest whole number) / 93.4 (to 3 sig figs) **;**<br>per million (people) / million $^{-1}$ **;** | 2 | **Correct answer with correct units = 2 marks**<br>**Correct answer with no/incorrect units = 1 mark**<br><br>**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<br>**DO NOT CREDIT** range bars<br>(as they would not all be equidistant from the mean) |

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

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 1 | (c) | (i) | *uncertain diagnosis because*<br>*idea that* older people may have more complex medical problems **;** | **1** | e.g. 'older people may have more than one thing wrong with them'<br>'more likely to have more than one cause of kidney failure' |
| 1 | (c) | (ii) | renal vascular disease<br>**and**<br>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 **;**<br>**2** (dextrose / sugar) reduces **,** <u>water</u> <u>potential</u> / $\underline{\Psi}$ (of dialysis fluid)<br>**or**<br>(dextrose / sugar **,** solution) has a lower **,** <u>water</u> <u>potential</u> / $\underline{\Psi}$ (than water) **;**<br>**3** water moves from blood (into dialysis fluid) by <u>osmosis</u><br>**or**<br>prevents water moving into the blood (from dialysis fluid) by <u>osmosis</u> **;**<br>**4** (if it was water alone) cells would **,** swell / burst **;** | **2 max** | **IGNORE** ref to the use of dextrose rather than glucose<br>**IGNORE** ref to ions |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 1 | (d) | (iii) | **1** peritoneal dialysis can remove<br>less (named) waste<br>(than haemodialysis) **;**<br><br>**2** *idea that*<br>in haemodialysis dialysis fluid is constantly **,**<br>refreshed / changed<br>(but not in peritoneal dialysis) **;**<br><br>**3** haemodialysis uses counter-current flow **;**<br><br>**4** *idea that*<br>haemodialysis maintains concentration gradient<br>**or**<br>in peritoneal dialysis the concentration gradient **,**<br>reduces / is lower **;**<br><br>**5** (in peritoneal dialysis) the fluid reaches equilibrium<br>with the blood **;** | **2 max** | **IGNORE** ref to 'cleaning' blood<br><br>**1** **ora** e.g. haemodialysis is more **,**<br>efficient / effective **,**<br>at removing (named) waste |
| 1 | (e) | | stem / erythropoietic **,** cell(s)<br>**and**<br>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**<br><br>**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.**<br>**If additional letters given, = 0 marks**<br><br>**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**<br><br>**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 **;**<br><br>**2** builds up greater water potential gradient **;**<br><br>**3** allows **,** reabsorption / removal **,** of *more* water from **,** collecting duct / M **;** | 2 | **1** **CREDIT** active transport / AW **,** for 'pumped'<br>**IGNORE** salts / diffusion<br><br>**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**<br><br>**ACCEPT** androgenic steroids<br><br>**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<br>**or**<br>(named) small molecules can **,** leave blood / enter filtrate**;**<br><br>**2** **endotheli**um **/ fenestration**s / **basement membrane ,** prevents **,** large molecules / erythrocytes **,** reaching **,** renal / **Bowmans capsule ;**<br><br>**3** <u>all</u> glucose / glucose completely **,** **reabsor**bed at the **,** **proximal convoluted tubule** / PCT **;**<br><br>**4** <u>all</u> amino acids / amino acids completely **,** reabsorbed at the **,** proximal convoluted tubule / PCT **;**<br><br>**5** (some / not all) ions **,** reabsorbed / move into blood (at any part of **,** nephron / tubule) **;**<br><br>**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<br>**DO NOT CREDIT** through **,** cells / membranes<br>**DO NOT CREDIT** ref to erythrocytes being large molecules or proteins<br>**ACCEPT** capillary / glomerulus **,** for 'blood'<br><br>**2** Needs ref to entering Bowmans capsule to explain data in table<br>**DO NOT CREDIT** basal membrane<br><br>**3** Needs to be a clear statement, not from figs<br>**DO NOT CREDIT** distal convoluted tubule / DCT<br><br>**4** Needs to be a clear statement, not from figs<br>**DO NOT CREDIT** distal convoluted tubule / DCT<br><br>**5** **ACC PT** ref to named ions<br>**IGNORE** salts<br>**DO NOT CREDIT** if stated that **all** ions are reabsorbed<br><br>**6** Must be a clear specific statement and not part of a list<br>Reason must refer **only** to water removal |
| | | | **QWC** – technical terms used appropriately **<u>and</u>** spelled correctly **;** | **1** | Use of **three** terms from:<br>**endothelium / endothelial** **fenestration**(s)<br>**basement membrane** **Bowmans capsule**<br>**reabsorb** (or derived term) **proximal convoluted tubule**<br>**Please insert a QWC symbol next to the pencil icon, followed by**<br>**a tick (✓) if QWC has been awarded**<br>**or a cross (×) if QWC has not been awarded**<br>**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**<br><br>**Answer must include statement about lack of 'working' or 'functioning' of kidney <u>as well as</u> some reference to reduced filtration**<br><br>**IGNORE** ref to creatinine or creatine<br>**ACCEPT** ref to no filtration<br>**DO NOT CREDIT** ref to creatinine ***causing*** kidney damage |
| 3 | (b) | (ii) | 55 **; ;** | 2 | **Correct answer = 2 marks**<br><br>If the answer is incorrect, **award 1 mark** for working:<br>$82 \times \frac{1.73}{2.56}$<br><br>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**<br><br>**Needs to quote the effect on the kidney stated in the table.**<br><br>**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*<br>**1** *idea that* people **should** have a **right** to choose (freely) what to do with their kidney **;**<br><br>*perceived donor advantages*<br>**2** *idea that* donors / donors' families **,** can benefit from money raised (by selling a kidney) **;**<br>**3** people can donate a kidney to family member **;**<br>**4** *idea that* people can donate without payment **;**<br><br>*perceived donor disadvantages*<br>**5** *idea of* exploiting people's poverty **;**<br>**6** *idea of* exploitation of **,** children / minors **;**<br><br>*recipient issues*<br>**7** *idea that* people should receive transplants irrespective of wealth **;**<br>**8** *idea that* it is wrong that recipients are being charged excessively **;**<br><br>**9** AVP **;** | **3 max** | **IGNORE** 'yes' or 'no'<br>**IGNORE** religious / cultural **,** considerations<br>**IGNORE** ref to kidneys sourced from animals<br>Answers need not be a balanced account.<br><br>**4** **ACCEPT** choosing to donate for **,** free / the good of it<br>**IGNORE** ref to giving to charity<br><br>**5** **ora** ethical if not doing it just for money they receive<br>**6** **ACCEPT** ref to illegality of child donors<br>**IGNORE** **'**young' unqualified<br>**ora** ethical as long as (donor) of legal age<br><br>**9** e.g. family member may feel pressured into donating<br>e.g. can survive with only one healthy kidney<br>e.g. potential for complications if donor has subsequent kidney failure<br>e.g. people should have access to kidneys if needed<br>e.g. danger of operating on **,** healthy person / donor<br>e.g. *idea that* wrong for large profits to be made |
| | | | **Total** | **12** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 4 | (a) | | hydrostatic ;<br><br>water / urea / amino acids / vitamins / small proteins ;<br><br>ultrafiltration ;<br><br>water ;<br><br>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**<br><br>**IGNORE** blood<br>**DO NOT CREDIT** osmotic / hydrostolic<br><br>**ALLOW** ADH / hCG / LH<br>**DO NOT CREDIT** ions / salts / minerals<br>(because sentence refers to molecules)<br><br>**CREDIT** urea<br>**IGNORE** ref to vitamins<br>**DO NOT CREDIT** amino acids<br>(as these are completely reabsorbed)<br><br>**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**<br><br>**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**<br><br>**ACCEPT** neurosecretory (cell body)<br>**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 ;<br><br>(ADH secretion) will increase ; | 2 | **CREDIT** concentration of $Na^+$ in , plasma / blood , will increase<br>**IGNORE** ref to increased uptake of $Na^+$ into blood<br><br>**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**<br><br>**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 ;<br><br>M Bowman’s / renal , capsule ;<br><br>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<br><br>L ACCEPT ‘capillary knot’<br>IGNORE ‘capillary unqualified’<br><br>N IGNORE ‘first’<br>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></tr>
<tr><td>walls are impermeable to water</td><td>ascending (limb of loop of Henle) ;</td></tr>
<tr><td>glucose is reabsorbed into the blood</td><td>proximal convoluted tubule / N ;</td></tr>
<tr><td>ADH acts on the walls</td><td>collecting duct / distal convoluted tubule ;</td></tr>
<tr><td>contains podocytes</td><td>Bowman’s capsule / renal capsule / M ;</td></tr>
<tr><td>most of the water is reabsorbed into the blood</td><td>proximal convoluted tubule / N ;</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<br><br>ACCEPT rising limb<br><br>ACCEPT pct / first convoluted tubule<br><br>ACCEPT DCT / dct / second convoluted tubule<br><br>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 , **medulla** ;<br>2 (as) in **ascending** limb **active transport** outwards of , solutes / (sodium and chloride) **ions** ;<br>3 (walls of) **descending** limb permeable to water ;<br>4 water removed from descending limb ;<br>5 water potential of tissues surrounding collecting duct is low(er) than fluid inside it ;<br>6 water removed from , filtrate / urine (in collecting duct) ;<br>7 AVP ; | 4 max | *1* **Do not award** for a simple statement that 'there is a lower water potential in the medulla'<br>*2* **ACCEPT** 'pumped' for active transport<br>*3* **IGNORE** ref to permeability to ions<br>*5* **ACCEPT** 'contents of collecting duct'<br>*7* eg • acts as a countercurrent , system / multiplier<br>• the drier the habitat the longer the loop<br>• *idea that* urea contributes to low water potential in medulla<br>• (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:<br>**water potential**, **medulla**,<br>**ascending**, **active transport** (or derived term),<br>**ion**(s), **descending**<br>**Please insert a QWC symbol next to the pencil icon, followed by**<br>**a tick (✓) if QWC has been awarded**<br>**or a cross (×) if QWC has not been awarded**<br>**You should use the green dot to identify the QWC terms that you are crediting.** |
| | | | **Total** | **13** | |