13. Excretion in humans

13.1 Excretion in humans

Paper 3 and 4

Marking Scheme

Q1.

(d)(i)	kidney ;	1	**A** skin
(d)(ii)	ions ; urea ; water ;	3	**R** each additional circle

Q2.

(a)	**X** drawn on the bladder ;	1	
(b)(i)	**C** ;	1	
(b)(ii)	**B** ;	1	
(c)	*any three from:* (urine volume depends on) water intake and, temperature / exercise / sweating ; an increase in water intake will increase the (volume of) urine ; an increase in temperature will decrease the (volume of) urine ; exercise will decrease the (volume of) urine ;	3	
(d)(i)	liver ;	1	
(d)(ii)	kidney ;	1	
(e)	carbon dioxide ;	1	

Q3.

(b)	(second sentence) 'increase' circled and then 'decrease' circled ; (third sentence) 'decrease' circled and then 'increase' circled ;	2	

Q4.

(a)	bronchus ; lung ; liver ; ureter ; bladder ;	5
(b)(i)	amino acids ;	1
(b)(ii)	liver ;	1
(c)	95.65(%) ;;;	3

Q5.

(b)	*any three from:* exhalation **or** breathing out / urine **or** excretion through kidney / sweat / vomit / tears **or** crying / blood loss / menstruation / mucus / semen / faeces / egestion / diarrhoea ;;;	3	

Q6.

(a)	carbon dioxide ; urea ;	2	**A** (excess) salts

Q7.

(a)(i)	**A** blood / plasma ; **C** urine ;	2	
(a)(ii)	*any five from:* 1 no / 0 mg, protein in (fluids) **B** or **C** / protein only in (fluid) **A** ; 2 *ref. to* filtration ; 3 *idea that* protein (molecules) too large to enter the nephron ; 4 No / 0mg, glucose in, (fluid) **C** / urine ; 5 (all) glucose is reabsorbed in the nephron ; 6 increased percentage of, water / urea / ions, in (fluid) **C** (compared to fluids **A** and **B**) ; 7 (only) some, water / ions, (re)absorbed in **B or** only excess, water / ions, transferred to (fluid) **C** ; 8 all urea passes to **C** ;	5	

Q8.

(d)	*any four from:* 1 deamination / removal of nitrogen-containing part of amino acids ; 2 removing excess amino acids (from blood regulating concentration of amino acids (in blood)) ; 3 forming urea ; 4 urea, released / diffuses, into blood (to travel to kidney) ; 5 breakdown / respiration / oxidation, of lactic acid ; 6&7 AVP ;	4	e.g. breakdown of, alcohol / hormones / drugs / toxins

Q9.

(a)(i)	glomerulus ;	1	
(a)(ii)	*any one from:* (vessel **Q**) is a (renal) artery / blood has not passed through any capillaries ; blood (in **Q**) comes (straight) from, the heart / an artery / aorta ; (vessel **Q**) is narrow(er than **R**) ; (vessel **Q**) has thick / elastic, walls ; for (ultra)filtration ;	1	**A** it is an arteriole

(b)	*any six from:* 1 no protein in, region 1 / (Bowman's / renal) capsule / protein only in, **P** / blood / plasma ; 2 all glucose / salts / urea, is filtered out, of **P** / blood plasma / into region 1 / (Bowman's / renal) capsule ; 3 (re)absorption of, all glucose, by region 3 / loop of Henle / in tubule / in region 2 / after region 1 ; **ora** 4 (re)absorption of, some salts, by / at, region 3 / by loop of Henle / in tubule / in region 2 / after region 1 ; 5 urea concentration is, increased / higher in, region 3 / loop of Henle ; 6 *idea that* size of the substance determines what is filtered ; 7 glucose / salts / urea, filtered out of blood / plasma OR proteins, stay in blood / plasma / not filtered out, of blood / plasma ; 8 active transport, of glucose / salts (from tubule / back into blood / back into plasma) ; 9 movement of, glucose / salts, against a concentration gradient / through proteins (in membranes) ; 10 (active transport) uses energy from, respiration / mitochondria ; 11 (most) water (re)absorbed by osmosis (in region 3 / loop of Henle) ; 12 urea concentration increases as a result of reabsorption of water ; 13 urea / excess salt, is, an excretory substance / waste product (of metabolism) / toxic ; 14 urine contains salts and urea ;	6	

Q10.

(a)	*any two from:* water / fluid / liquid, intake ; exercise / activity level ; sweating ; temperature ; salt / salty food, intake ; quantity of urea produced / concentration of urea in blood ; (named) drug ; (named) medical condition ; AVP ; e.g. water potential of blood / AW	2	

Q11.

<table>
<tr><td>(b)</td><td>any three from:
breakdown of (excess) amino acids ;
(by) deamination ;
removal of nitrogen containing part (of amino acid) ;
in the liver ;</td><td>3</td><td></td></tr>
<tr><td>(c)(i)</td><td>X marked on either kidney in the outer / edge region ;</td><td>1</td><td></td></tr>
<tr><td>(c)(ii)</td><td><table>
<tr><th>function</th><th>name of structure</th><th>letter from Fig. 3.2</th></tr>
<tr><td>organ that stores urine</td><td>bladder</td><td>G ;</td></tr>
<tr><td>tube that carries urine out of the kidney</td><td>ureter</td><td>F ;</td></tr>
<tr><td>blood vessel with the lowest concentration of urea</td><td>renal vein</td><td>D ;</td></tr>
<tr><td>blood vessel with the lowest concentration of carbon dioxide</td><td>renal artery</td><td>E ;</td></tr>
<tr><td>tube that carries urine out of the body</td><td>urethra</td><td>H ;</td></tr>
</table></td><td>5</td><td>one mark per correct row</td></tr>
<tr><td>(d)(i)</td><td>any two from:
sweat more / lost more water (while running) ;
do not drink as much / reduced intake of water (while running) ;
ref. to homeostasis / negative feedback ;
AVP ;</td><td>2</td><td></td></tr>
</table>

<table>
<tr><td>(d)(ii)</td><td>9(%) ;;;</td><td>3</td><td>MP1 correct values selected i.e. 78.2 and 85.6
MP2 correct calculation
MP3 correct rounding to one significant figure
ecf for MP2 and MP3 for incorrect MP1</td></tr>
<tr><td>(d)(iii)</td><td>any three from:
salts are in the blood / move from the blood into the tubule / AW ;
ref. to glomerulus ;
(ultra)filters / allows through ;
pores / gaps, in capillary wall / narrow capillaries ;
small molecules are filtered / large are not filtered / AW ;
(some salt) reabsorption ;
ref. to active transport / diffusion ;
excess (salt) remains in the, urine / filtrate ;
AVP ;</td><td>3</td><td></td></tr>
<tr><td>(e)</td><td>any one from:
fibrinogen / fibrin ;
(named) hormone ;
antibodies ;</td><td>1</td><td></td></tr>
</table>

Q12.

(a)	remove from the, body / organism / cell ; waste / poisons / toxins / harmful substances ; (waste products) of metabolism / respiration ; (named) substances in excess ;	**2**	
(b)	the outline shape of a kidney, with one tube attached, drawn ; tube labelled ureter, outer portion of kidney labelled as cortex, medulla labelled inside the kidney ;	**2**	
(c)(i)	ref. to capillaries ; (capillaries are) one cell thick / thin / AW ; *idea of* fenestrations / pores ; network (of capillaries) / tangled / knotted / tightly packed tubes ; description of shape e.g. round / ball-shaped ;	**2**	
(c)(ii)	provides blood at high pressure ; provides a large surface area ; (ultra)filtration ; *ref. to* small *or* soluble molecules / water / glucose / urea / salts, (are filtered) out ; *ref.* to (named*)* large OR insoluble (molecules) / blood cells, stay in the glomerulus ; AVP ;	**2**	
(d)(i)	(by) active transport ; from a low to a high concentration / AW ; (through cell) membrane ; ref. to proteins (pumps / channels / AW) ; uses energy ; from respiration ;	**4**	

(d)(ii)	*human* 575 √ 320 =1.797 or 1.8 *mouse* 0.551 √ 0.31 ; =1.778 or 1.8 ; g (salt) per day per g (kidney) ; similar or the same, results / rates / ratios, so hypothesis is supported ;	**4**	
(d)(iii)	osmosis ;	**1**	
(d)(iv)	glucose / AVP ;	**1**	