1 **(a) (i)**	**1** **2** **3** **4**	removal from the, body / organism / cell **;** (of) poisons / toxins / harmful substances **;** named example (or) waste products of, metabolism / respiration / deamination / chemical reactions in cells **;** substances in excess (of requirements) / AW **;**	[max 3]	
(ii)	carbon dioxide / water (vapour) **;**		[1]	
(iii)	**1** **2** **3** **4** **5** **6** **7**	deamination (of amino acids) **;** removal of nitrogen-containing part of amino acids **;** to produce urea **;** urea / AW, passes into blood **;** breakdown of, hormones / toxins / drugs / excess vitamins **;** breakdown of, worn out red blood cells **;** excretory products put in bile **;** e.g. cholesterol	[max 3]	

<table>
<tr><th>Question</th><th>E</th><th>Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1 (b)</td><td colspan="2"><table>
<tr><td>Function</td><td>Name</td><td>letter from Fig.4.1</td></tr>
<tr><td>blood is filtered</td><td>cortex</td><td>K ;</td></tr>
<tr><td>concentration of urine is determined</td><td>medulla</td><td>L</td></tr>
<tr><td>urine flows to the bladder</td><td>ureter</td><td>N ;</td></tr>
<tr><td>blood is carried into the kidney</td><td>renal artery</td><td>P ;</td></tr>
<tr><td>blood flows out of the kidney</td><td>renal vein</td><td>O ;</td></tr>
</table></td><td>[4]</td><td>one mark for each correct name and matching letter</td></tr>
<tr><td>(c) (i)</td><td colspan="2">urea ;
ammonia ;
uric acid ;
creatinine ;
(named) salt / ions ; e.g. Na^+, Cl , Mg^{2+}, Ca^{2+}, HCO_3
water ;
(named) toxins ;
hormones ;</td><td>[max 2]</td><td>ignore glucose / sugar / urine / amino acids</td></tr>
<tr><td>(ii)</td><td colspan="2">advantage
1 patients do not need to return to clinic for dialysis / AW ;
2 can eat normally / do not need to eat a restricted diet / AW ;
3 periods of feeling unwell reduced / absent ;

disadvantage
4 need, immunosuppressant / AW, drugs ;
5 risk of death / infection, during / after, the operation ;
6 rejection of kidney ;
7 finding a compatible donor ;
8 AVP ; e.g. water retention</td><td>[max 2]</td><td>one mark for an advantage and one mark for a disadvantage</td></tr>
<tr><td></td><td></td><td>Total:</td><td>[15]</td><td></td></tr>
</table>

2 **(a)**	**E** – cortex **;** **F** – medulla **;** **G** – ureter **;**		**[3**	
(b)	**1** **2** **3** **4** **5** **6**	(ultra)filtration **;** high blood pressure assists filtrate to pass through glomerulus / capsule **;** proteins / blood cells, too big to move out of capsule / glomerulus **;** filtrate / named example, small enough to move through **;** filtrate consists of water and dissolved salts / ions / named ion / glucose / urea **;** ref to capillaries **;**	**[ma 3]**	
(c)	movement of (ions / large molecules) through the cell membrane **;** (ions/large molecules) against a concentration gradient **;** using energy (from respiration) **;** use of protein / carrier in membranes **;**		**[ma 2]**	**R** along the concentration gradient
(d)	water **;** salt(s) / ions / minerals / named ion **;**		**[ma 1]**	

2 (e) (i)

Substance	before dialysis	Concentration in **used** dialysis fluid	Concentration in fresh dialysis fluid
glucose	normal		same ;
salt	high		low ;
urea	high		none ;
toxins	high	high	low

[max 3]

(ii)

1 dialysis membrane is partially permeable ;
2 minerals / salts / ions / urea, move by diffusion ;
3 from high concentration to low concentration / down a concentration gradient ;
4 water, moves by osmosis ;
5 (osmosis is the movement of water) from high water potential to low water potential across membrane ;
6 proteins / blood cells too large to move across membrane ;
7 glucose is not removed by dialysate (same concentration) ;
8 fresh dialysate maintains a concentration gradient ;

[ma 4]

(f)

fewer diet / fluid intake restrictions ;
no need for regular visits to hospital ;
less unwell / tired / nausea / headaches / less pain (after surgery) ;
no needles / no fistula, permanently in arm ;

[max 3]

(g)

avoid rejection ;
stop immune system attacking new kidney ;

[max 1]

[Total: 20]

Question		Marks	Additional Guidance
3 **(a)**	removal from the, body / organism / cell; poisons / toxins / harmful substances; waste product(s), of metabolism / respiration / deamination / chemical reactions; substances in excess (of requirements) / AW;	**max 3**	**A** 'substances that cause harm' / 'harmful' **A** named example e.g. CO_2, urea, salt, named ions, amino acids toxic waste products of metabolism / AW = 2 marks
(b) (i)	protein;	**1**	
(ii)	glucose**;**		
(iii)	urea **and** salts**;**	**1**	**A** sodium / ions
(c)	any three from: pelvis; ureter; bladder; urethra;	**max 3**	
(d)	homeostasis;	**1**	
		[Total: 10]	