

Question	E Answer	Marks	Additional Guidance
1 (a) (i)	plasma ;	[1]	
(ii)	excretion ;	[1]	
(b) 1 2 3 4 5 6	<p>A (ultra)filtration ; small molecules, from blood or glomerulus/into (Bowman's/renal) capsule ; are forced/pushed (out)/under (high) pressure ;</p> <p>B (selective) <u>re</u>absorption ; back into the blood/capillaries ; e.g. of any substance that is filtered or reabsorbed ;</p>	[max 4]	A small particles/examples of relevant small molecules instead of 'small molecules'
(c) (i)	protein ;	[1]	
(ii)	glucose ;	[1]	
(iii)	urea ;	[1]	
(d)	water has been reabsorbed ; by osmosis ; (in/by) collecting duct/nephron/(proximal convoluted) tubule ; <i>idea that</i> by Z there is no change in, sodium ions/urea/solutes, but volume of water is less ;	[max 2]	A loop of Henle

<p>1 (e) (i)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p>	<p><i>either</i></p> <p>0.35 (g per 100 cm³) ;</p> <p>same concentration as the blood/to be in equilibrium with the blood/to prevent loss or gain, of sodium ions ;</p> <p>prevents/reduces, osmosis ;</p> <p><i>or</i></p> <p>any figure greater than 0 and less than 0.35 (g per 100 cm³) ;</p> <p>excess, sodium/salt, in the blood ;</p> <p>diffusion, from blood/into dialysis fluid ;</p>	<p>[max 2]</p>	<p>Note: Mpts 2 or 3 linked to correct answer for Mpt 1</p> <p>Note: Mpts 5 or 6 linked to correct answer for Mpt 4</p>
<p>(e) (ii)</p>	<p>red blood cells/erythrocytes ;</p> <p>white blood cells/lymphocytes/phagocytes ;</p> <p>platelets/thrombocytes ;</p> <p>(named) plasma protein(s) e.g. fibrinogen, antibodies ;;</p> <p>(named) hormones ;;</p> <p>urea/uric acid ;</p> <p>amino acids/(named) vitamins/cholesterol/fats/fatty acids/glycerol/bacteria/virus ;;</p>	<p>[max 2]</p>	<p>Ignore protein, cells, plasma, (named) gases, iron, (named) toxins, (named) drugs</p> <p>R glucose, (mineral) salt, minerals, sodium, (named) ions, water, carbohydrate, starch, blood, ammonia</p>
<p>(f)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p>	<p>ref to platelets (in correct context of clotting) ;</p> <p>fibrinogen converted to <u>fibrin</u> ;</p> <p>soluble to insoluble/ fibrin is insoluble ;</p> <p>thrombin/enzyme, in context ;</p> <p>mesh/network/web, to trap blood (cells) ;</p> <p>AVP ; e.g. ref to prothrombin or involvement of, calcium ions/clotting factors</p>	<p>[max 3]</p>	<p>A ref to thrombocytes</p>
		<p>[Total:18]</p>	

Question		E Answers		Marks	Additional Guidance									
2	(a)	E – cortex ; F – medulla ; G – <u>ureter</u> ;		[3]										
	(b)	(i)	<table border="1"> <thead> <tr> <th>process</th> <th>letter</th> <th></th> </tr> </thead> <tbody> <tr> <td>diffusion of oxygen</td> <td>H ;</td> <td><i>idea that</i> (oxygen) diffuses, from high concentration/to low concentration/down concentration gradient (into the cell) ;</td> </tr> <tr> <td>active uptake of sodium ions</td> <td>L ;</td> <td><i>idea that</i> (sodium ions) are moved against their concentration gradient/from low to high concentration ;</td> </tr> </tbody> </table>	process	letter		diffusion of oxygen	H ;	<i>idea that</i> (oxygen) diffuses, from high concentration/to low concentration/down concentration gradient (into the cell) ;	active uptake of sodium ions	L ;	<i>idea that</i> (sodium ions) are moved against their concentration gradient/from low to high concentration ;	[4]	<i>mark the columns independently</i>
process	letter													
diffusion of oxygen	H ;	<i>idea that</i> (oxygen) diffuses, from high concentration/to low concentration/down concentration gradient (into the cell) ;												
active uptake of sodium ions	L ;	<i>idea that</i> (sodium ions) are moved against their concentration gradient/from low to high concentration ;												
		(ii)	glomerulus ;	[1]										
		(iii)	<table border="1"> <tbody> <tr> <td>1</td> <td>(glucose is reabsorbed) by active uptake/active transport (from filtrate) ;</td> </tr> <tr> <td>2</td> <td>against concentration gradient/from low to high concentration ;</td> </tr> <tr> <td>3</td> <td>using energy ;</td> </tr> <tr> <td>4</td> <td>as in L ;</td> </tr> </tbody> </table>	1	(glucose is reabsorbed) by active uptake/active transport (from filtrate) ;	2	against concentration gradient/from low to high concentration ;	3	using energy ;	4	as in L ;	[max 2]	ignore diffusion of glucose R energy 'produced'	
1	(glucose is reabsorbed) by active uptake/active transport (from filtrate) ;													
2	against concentration gradient/from low to high concentration ;													
3	using energy ;													
4	as in L ;													
	(c)	1 active uptake/active transport, of ions against the concentration gradient (into the root) ; 2 energy is needed for, active uptake/active transport ; 3 comes from respiration ; 4 water is absorbed, by osmosis/down water potential gradient ; 5 (osmosis/diffusion is a) passive process/does not need energy ; 6 diffusion of ions will occur until equilibrium ;	[max 3]	R energy 'produced'										
				[Total: 13]										

3	(a)	<p>removal from the body / organism / cell R 'excreted from body' 2 poisons / toxins / harmful substances 3 named example OR waste products / of metabolism / respiration / deamination / chemical reactions in cells or in the body 4 substances in excess (of requirements) / AW</p>	[max 3]	<p>lg faeces, egestion, defecation, digestion AW A 'substances that cause harm' / 'harmful' <i>toxic waste products of metabolism / AW = 2 marks</i> ignore routes from body Mpt 3. A named examples, e.g. CO₂, urea, salt, named ions, amino acids</p>										
(b)		<table border="1" data-bbox="338 500 1350 858"> <tr> <td data-bbox="338 500 1066 565">process that occurs in the kidney tubule</td> <td data-bbox="1066 500 1350 565">letter from Fig. 2.1</td> </tr> <tr> <td data-bbox="338 565 1066 630">filtration of blood</td> <td data-bbox="1066 565 1350 630">H</td> </tr> <tr> <td data-bbox="338 630 1066 695">reabsorption of most of the solutes in the filtrate</td> <td data-bbox="1066 630 1350 695">C</td> </tr> <tr> <td data-bbox="338 695 1066 795">water is absorbed by osmosis to determine the concentration of urine</td> <td data-bbox="1066 695 1350 795">G</td> </tr> <tr> <td data-bbox="338 795 1066 858">unfiltered blood returns to the renal vein</td> <td data-bbox="1066 795 1350 858">D / E</td> </tr> </table> <p data-bbox="1167 863 1205 896">[4]</p>			process that occurs in the kidney tubule	letter from Fig. 2.1	filtration of blood	H	reabsorption of most of the solutes in the filtrate	C	water is absorbed by osmosis to determine the concentration of urine	G	unfiltered blood returns to the renal vein	D / E
process that occurs in the kidney tubule	letter from Fig. 2.1													
filtration of blood	H													
reabsorption of most of the solutes in the filtrate	C													
water is absorbed by osmosis to determine the concentration of urine	G													
unfiltered blood returns to the renal vein	D / E													

3	<table border="1"> <thead> <tr> <th>component</th> <th>blood</th> <th>filtrate</th> <th>urine</th> </tr> </thead> <tbody> <tr> <td>red blood cells</td> <td>✓</td> <td>✗</td> <td>✗</td> </tr> <tr> <td>white blood cells</td> <td>✓</td> <td>✗</td> <td>✗</td> </tr> <tr> <td>plasma proteins</td> <td>✓</td> <td>✗</td> <td>✗</td> </tr> <tr> <td>glucose</td> <td>✓</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>urea</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>salts</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>water</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	component	blood	filtrate	urine	red blood cells	✓	✗	✗	white blood cells	✓	✗	✗	plasma proteins	✓	✗	✗	glucose	✓	✓	✗	urea	✓	✓	✓	salts	✓	✓	✓	water	✓	✓	✓	<p>one mark for the filtrate column</p> <p>one mark for the urine column</p>
	component	blood	filtrate	urine																														
	red blood cells	✓	✗	✗																														
	white blood cells	✓	✗	✗																														
	plasma proteins	✓	✗	✗																														
	glucose	✓	✓	✗																														
	urea	✓	✓	✓																														
	salts	✓	✓	✓																														
	water	✓	✓	✓																														
[2]																																		
[Total: 9]																																		

Question	Answers	Mark	Additional Guidance
4 (a)	A – B 1 urea (concentration) decreases ; 2 water (content) increases / decreases ; 3 salt (concentration), decreases ; 4 ref to, glucose / sugar ; <i>could be increase, decrease or stays the same</i>	[max 2]	A 'passes out of blood' / 'passes into blood' / removed / taken out / diffuses in / diffuses out A minerals / any named salt or ion
(b)	<i>advantages of transplants</i> 1 long term solution / person no longer needs (regular) dialysis ; 2 an example of a disadvantage of dialysis ; A pain / tiring / discomfort / takes a long time / fails eventually 3 increased freedom / better quality of life / ora ; 4 better / more efficient, control of composition of blood ; 5 can have wider diet / ora ; 6 ref. to cost or economic benefit – to health service or to individual ;	[max 3]	A 'doesn't need to go to clinic / hospital' MP2 is medical issue A any appropriate blood borne disorder MP3 is social issue MP6 R cost unqualified A 'dialysis machine available for others'
(c) (i)	$I^A I^O \times I^B I^O$; $I^A , I^O + I^B , I^O$; $I^O I^O$, (blood group) O ; (allele) I^O recessive to I^A <u>and</u> I^B ; parents must both, have I^O / O / be heterozygous ;	<i>accept:</i> $AO \times BO$; $A , O + B , O$; OO , (blood group) O ; (allele) O recessive to A <u>and</u> B ;	R one I for the genotypes, e.g. I^{AO} gametes must be derived correctly from the parental genotypes written explanation may be written in terms of parents pass on the allele I^O ignore gene for allele
(ii)	25% / 0.25 / ¼ / 1 in 4 ;	[1]	R a ratio e.g. 1:3
		[Total: 10]	