

1.

	<i>excretion</i>	<i>secretion</i>
1 <i>one difference</i>	(metabolic) waste <b>or</b> toxin / harmful <b>or</b> substance is to be removed from body <b>or</b> does not use vesicles	useful product <b>or</b> used in cell communication (e.g. to target tissues) <b>or</b> released from glands (ducts or ductless) <b>or</b> uses vesicles <b>or</b> remain in body
2 <i>one example of a product</i>	urea / carbon dioxide / water / bile pigment / named example	hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example
3 <i>one similarity</i>	requires ATP <b>or</b> (involved in) homeostasis <b>or</b> (compounds) produced by cell(s) / produced by metabolism / need to cross membrane / need to move through membrane / need to leave cell / (may be) transported in blood	

**One mark per row.**

**CREDIT** converse statements on either side or unmatched statements for each

- 1 **IGNORE** name or type of product without qualification  
**DO NOT CREDIT** any ref to egestion in 'excretion'
- 2 **IGNORE** sweat / urine / bile / saliva / salt / (named) digestive juice
- 3 **CREDIT** method of leaving cell e.g. exocytosis  
**IGNORE** going into cells (as some excretory products do)

[3]

2. (i)

**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**

ultrafiltration;

This term required but **ACCEPT** phonetic spelling

(ii) 17.9;;

**Correct answer = 2 marks**

*If answer incorrect, not rounded or incorrectly rounded then allow 1*

*mark for working*

$$125 \div 700$$

**or**

*an unrounded answer e.g. 17.857412*

2

[3]

3. (i)

**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*

(cuboidal) epithelium / epithelial;

**DO NOT CREDIT** 'epithelium cells' / 'ciliated epithelium' / 'squamous epithelium' / endothelium

**ALLOW** columnar epithelium

1

(ii)

**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*

microvilli / microvillus;

**ACCEPT** 'brush border'

**DO NOT CREDIT** cilia

1

(iii) *This is a QWC question*

- 1 selective **reabsorption**;
- 2 of glucose **and** amino acids;  
*DO NOT CREDIT if glucose & amino acids & proteins*
- 3 **co-transport / facilitated diffusion** / uptake described;  
*ACCEPT direct uptake, of glucose / amino acids, by active transport*
- 4 water follows by **osmosis** so concentration of, ions / nitrogenous waste / urea / remaining substances, increases;
- 5 AVP;  
*e.g.*
  - *microvilli provide large surface area for uptake*
  - *many mitochondria provide energy for uptake*
  - *many brush border enzymes (ATPase) for active uptake*
  - *active secretion of nitrogenous waste into lumen*

3 max

QWC - technical terms used appropriately and spelt correctly;

*Use of **three** terms from:  
**reabsorption** (or derived term),  
**co-transport** (or derived term),  
**facilitated diffusion, osmosis***

1

[6]

4. (i) L artery / shunt / vein (at arterial end of shunt)  
**AND**  
M vein;  
*IGNORE names of artery / vein (e.g. renal)*  
*DO NOT CREDIT aorta and vena cava*

1

- (ii) so that clots don't form,  
while in the (dialysis) machine / during dialysis;  
*ALLOW congeal instead of clot*  
*IGNORE prevents clotting in the body*  
*IGNORE clumping*

1

- (iii) *idea of* allowing blood to clot normally after treatment;  
*CREDIT preventing low blood pressure (as low viscosity)*

1

- (iv) **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**

(simple) diffusion;

**IGNORE** dialysis

**DO NOT CREDIT** facilitated diffusion

1

- (v) *idea that it,*

maintains diffusion gradient /

**IGNORE** unqualified ref to countercurrent

maintains concentration gradient /

maximises diffusion gradient /

maximises concentration gradient /

*e.g.*

- *solutions in contact over greater distance*
- *provides maximum contact for exchange*
- *allows exchange over longer distance*

allows maximum removal of waste /

allows maximum rate of diffusion / AW;

**IGNORE** ref to surface area

1

[5]

5. removal of, unwanted / toxic / waste, products;  
of metabolism;

2

[2]

6. (i) *award both marks for correct answer*  
*evidence of  $14.7 - 2.2 = 12.5$  or  $14.7 / 2.2$  gains one calculation mark*

$12.5/2.2 \times 100$ ;

$= 568.2 / 568 / 570$ ;;

2

- (ii) protein converted to amino acids;  
excess amino acids undergo deamination / removal of amino group;  
ammonia formed;  
ammonia converted to urea;

AVP; e.g. ref. to ornithine cycle

max 3

[5]

7. the longer the loop of Henle the lower the water potential (of urine); ions pass out from ascending limb into, medulla / tissue fluid; creating lower water potential in the medulla / AW; water reabsorbed from collecting duct in medulla; by osmosis; (*linked to previous marking point*)
- AVP; e.g. ref to countercurrent multiplier max 3
- [3]**
- 
8. 1 frequent need to urinate/diuresis;  
2 large volume of urine/very dilute urine;  
3 persistent feeling of thirst/excessive drinking;  
4 electrolyte/mineral, imbalance;  
5 AVP; e.g. dehydration, 3 max
- [3]**
- 
9. 1 blood = transport fluid/AW;  
2 blood has high (hydrostatic) pressure;  
3 tissue fluid created/plasma moves out of capillaries/AW;  
4 named substance; glucose/amino acids/fatty acids/glycerol,  
oxygen, carbon dioxide, urea  
5 from area; gut, alveoli, liver cell, liver cell  
6 moves to; blood/liver cell, blood/liver cell, tissue  
fluid/alveoli, tissue fluid/kidney  
7 method; diffusion/facilitated diffusion/active transport/  
endocytosis, diffusion, diffusion, diffusion  
8 detail of transport in blood; plasma/dissolved, red blood cells/  
haemoglobin,  
HCO<sub>3</sub><sup>-</sup> ions/dissolved/carbamino-  
haemoglobin, plasma/dissolved  
9 ref. respiration;  
10 ref. maintaining diffusion gradients;  
11 osmoregulation by kidney/AW;  
12 pH regulation by kidney/AW;  
13 ref. osmosis;  
14 AVP; e.g. deamination, ornithine cycle, ref. CO<sub>2</sub> acidic  
15 AVP; e.g. ref. glycogen, ref. insulin/glucagon max 7
- QWC – legible text with accurate spelling, punctuation and grammar;** 1
- [8]**

10. (a) (i) wide / large, afferent arteriole;  
narrow / small, efferent arteriole;  
*afferent arteriole, wider / larger, than efferent arteriole – 2 marks*  
ref to ‘bottleneck’ effect / AW; **R** build up pressure on own  
to achieve filtration;  
must be greater than 6.7 kPa for filtration; 2 max
- (ii) *award two marks if correct answer (1.3) is given  
incorrect answer (or no answer) but correct working = 1 mark*  
 $8 - (4 + 2.7)$  **A**  $8 - 6.7$   
1.3;; 2
- (b) (i) (too) large / RMM greater than 69000 or 70000;  
to pass through basement membrane; 2
- (ii) glomerular blood pressure is greater;  
proteins forced through;  
damage to capillaries / AW;  
damage to basement membrane; 2 max
- (c) 1 endothelium of capillaries;  
2 large / many, fenestrations / gaps / holes;  
3 modified epithelial cells of capsule / podocytes;  
4 slit pores / foot-like processes; **A** finger like  
5 basement membrane;  
6 made up of, collagen / glycoproteins / molecular mesh;  
*accept annotated diagrams* 4 max
- (d) 1 volume will increase;  
2 concentration decrease;  
3 (wall of), collecting duct / DCT, (relatively) impermeable to water;  
4 fewer water channels; **A** aquaporins  
5 in membrane of epithelial cells;  
6 less water reabsorbed (from the urine);  
7 by osmosis (linked to marking point 6);  
8 drinking increases liquid intake and therefore liquid loss; 4 max

11. CG acts as antigen;  
 move, attached to, free antibodies;  
 attach to, immobilised antibody;  
 coloured particles, form line;  
 ref to complementary shapes;  
 ref to antigen, antibody complex;  
 AVP; e.g. further detail of antibody structure  
                   monoclonal  
                   CG-antibody complex  
 4 max  
 [4]
12. conversion of one amino acid to another / AW;  
 (free) amino acids in body may not match body's requirements / AW;  
 can only occur with non-essential amino acids;  
 2 max  
 [2]
13. removal of, unwanted / toxic / waste, products ;  
 of metabolism ;  
 [2]
14. proteins / polypeptides ; **R** amino acids **A** enzymes  
 nucleic acids / DNA / RNA / polynucleotides ;  
 [2]
15. (i) *award two marks if correct answer (568.18 / 568.2 / 568 / 570) is given  
 evidence of  $14.7 - 2.2 = 12.5$  or  $14.7/2.2$  gains one calculation mark*  
 $12.5/2.2 \times 100 = 568.18 / 568.2 / 568 / 570 ; ;$  2
- (ii) (more) proteins to amino acids ;  
 ref to deamination / removal of amino group ;  
 (more) ammonia formed ;  
 ref to ornithine cycle ;  
 (more) ammonia converted to urea ;  
 2 max  
 [4]
16. ammonia is, alkaline / highly toxic / *ora* ;  
 ammonia is more soluble / *ora* ;  
 large volumes of water to excrete it ;  
 would cause dehydration ;  
 2 max  
 [2]

17. 1 both filtered / AW ;  
 2 both small molecules / AW ; A RMM close to 69 000  
 3 (all filtered) glucose reabsorbed ;  
 4 active uptake, carrier / cotransporter, proteins ;  
 5 (some) glucose used in, respiration / active processes, in kidney ;  
 6 some urea reabsorbed ;  
 7 by diffusion ;  
 8 ref to reabsorption in PCT ; *apply once to either glucose or urea* 5 max [5]
18. ADH / anti diuretic hormone ;  
 reduces blood sugar levels / correct mechanism to achieve this ;  
 increases blood sugar levels / correct mechanism to achieve this ;  
 ABA / abscisic acid ;  
 auxin / IAA ; [5]
19. A – sinusoid ;  
 B – (branch of) bile duct ;  
 C – (branch of hepatic) portal vein / HPV ;  
 D – (branch of) hepatic artery ; [4]
20. bile pigments build up in blood ;  
 (pigments) do not enter gut / AW ;  
 AVP ; e.g. bile, canaliculi / duct, blocked / gall stones 2 max [2]
21. (i) directly proportional / AW ; 1  
 (ii) 2.6 ; 1  
 (iii) 1 high levels of glucose in glomerular filtrate ;  
 2 unable to reabsorb all glucose (in, PCT / kidney tubule) ;  
     A no more glucose can be reabsorbed  
 3 ref to glucose carriers / AW ;  
 4 at threshold value carriers, all saturated / limiting factor ;  
 5 AVP ; e.g. ref to renal threshold 3 max [5]



22. (i) long loop of Henlé or/ deep / wide, medulla ;  
 very low water potential in medulla / AW ; **A** higher concentration of salts  
 collecting duct more permeable to water ;  
 large number of, water permeable channels / aquaporins, in collecting duct ;  
 more sensitive to ADH / more ADH produced ;  
 AVP ; e.g. other correct ref to kidney histology  
     all loops of Henlé are long  
     CD more permeable to urea  
     more capillary loops in medulla 3 max
- (ii) seeds contain, storage molecules / AW ; **A** named example of storage  
 molecule  
 aerobic ;  
 respiration ;  
 water is produced ; *linked to respiration*  
**R** reference to condensation reactions  
  
*accurate equation for aerobic respiration can gain 3 marks*  
*metabolic water = 2 marks* 3 max
23. (a) (i) noradrenaline / adrenaline / thyroxine / growth hormone  
 / glucocorticosteroid; **R** steroid 1
- (ii) insoluble;  
 unreactive / stable / inert;  
 cannot diffuse out of cell / AW;  
 no effect on water potential;  
 compact / branched;  
 lots of glucose in small space / AW; **R** lots of energy in  
 small space  
 easy to, convert to glucose / hydrolyse;  
 lots of 'ends' for enzyme action; max 3
- (b) 1 increases activity of glycogen synthetase;  
 2 slow initial effect / AW;  
 3 ref to figures to show an increase;  
 4 (overall effect) increases, production of glycogen  
 / glycogenesis; **R** storage of  
 5 glycogen  
 6 lowers activity of glycogen phosphorylase;  
 7 rapid effect;  
 8 ref to figures to show a decrease;  
 9 prevents / reduces, breakdown of glycogen / glycogenolysis;  
 10 (glucose binds to) allosteric site / AW;  
 (glucose acts as) inhibitor / activator; **R** competitive inhibitor max 5

[6]

- (c) *either*  
deamination of amino acids / removal of  $\text{NH}_2$  from amino acids;  
pyruvate / carbon skeleton / AW;  
triose phosphate / TP;  
condensation / increasing number of carbon atoms;  
*or*  
breakdown of, lipid / triglyceride;  
glycerol;  
triose phosphate / TP;  
condensation / increasing number of carbon atoms;

max 3

**[12]**