# Excretion in Humans

## Mark Scheme 2

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|---|---|
| **Level** | IGCSE |
| **Subject** | Biology |
| **Exam Board** | CIE |
| **Topic** | Excretion in Humans |
| **Paper Type** | (Extended) Theory Paper |
| **Booklet** | Mark Scheme 2 |

**Time Allowed:** **60 minutes**

**Score:** **/50**

**Percentage:** **/100**

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

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

<table>
<tr><th colspan="3">Question</th><th>E Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>E – cortex ;<br>F – medulla ;<br>G – <u>ureter</u> ;</td><td>[3]</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><table><tr><th>process</th><th>letter</th><th></th></tr><tr><td>diffusion of oxygen</td><td>H ;</td><td>idea that (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>idea that (sodium ions) are moved against their concentration gradient/from low to high concentration ;</td></tr></table></td><td>[4]</td><td>mark the columns independently</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>glomerulus ;</td><td>[1]</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>1 (glucose is reabsorbed) by active uptake/active transport (from filtrate) ;<br>2 against concentration gradient/from low to high concentration ;<br>3 using energy ;<br>4 as in L ;</td><td>[max 2]</td><td>ignore diffusion of glucose<br><br>R energy ‘produced’</td></tr>
<tr><td></td><td>(c)</td><td>1<br><br>2<br>3<br>4<br>5<br>6</td><td>active uptake/active transport, of ions against the concentration gradient (into the root) ;<br>energy is needed for, active uptake/active transport ;<br>comes from respiration ;<br>water is absorbed, by osmosis/down water potential gradient ;<br>(osmosis/diffusion is a) passive process/does not need energy ;<br>diffusion of ions will occur until equilibrium ;</td><td>[max 3]</td><td>R energy ‘produced’</td></tr>
<tr><td></td><td colspan="3"></td><td>[Total: 13]</td><td></td></tr>
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|---|---|---|---|---|---|
| 3 | (a) | | removal from the body / organism / cell<br>**R** 'excreted from body' | | **Ig** faeces, egestion, defecation, digestion AW<br>**A** 'substances that cause harm' / 'harmful'<br>*toxic waste products of metabolism / AW = 2 marks*<br>***ignore** routes 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 | | Mpt 3. **A** named examples, e.g. $CO_2$, urea, salt, named ions, amino acids |
| | | **4** | substances in excess (of requirements) / AW | [max 3] | |

**(b)**

| 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** |

[4]

| 3 | | |
|---|---|---|

| component | blood | filtrate | urine | |
|---|---|---|---|---|
| red blood cells | ✓ | × | × | one mark for the filtrate column<br><br>one mark for the urine column |
| white blood cells | ✓ | × | × | |
| plasma proteins | ✓ | × | × | |
| glucose | ✓ | ✓ | × | |
| urea | ✓ | ✓ | ✓ | |
| salts | ✓ | ✓ | ✓ | |
| water | ✓ | ✓ | ✓ | |

[2]

**[Total: 9]**

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