

# A Level OCR Biology

## 15 Excretion – answers

| Question  | Answers   | Extra information   | Mark               | AO Spec reference  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
|---|---|---|--------------------|--|----|-----------------------------------|-----|---|----|---|----|---|-----|--|----|---|---|-----------------|
| 1(a)  | idea of safe use of scalpel / scissors <b>OR</b><br>wash equipment / hands with detergent ✓   |   | 1 max              | AO1<br>5.1.2(c)(ii)                                      |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| 1(b)(i)   | <b>Y</b> glomerulus ✓<br><b>Z</b> Bowman's capsule ✓  |   | 2                  | AO2<br>5.1.2(c)(iii)                                     |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| 1(b)(ii)  | × 250 ✓ ✓   | 0.03 m / 0.000 120 m = 250<br><b>OR</b> 30 000 μm / 120 μm = 250<br><br>If the final answer is incorrect,<br>award one mark for evidence of<br>'image size / actual size' | 2                  | AO2<br>2.1.1(e)<br>5.1.2(c)(iii)                         |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| 1(c)  | drawing with clear smooth lines and no shading ✓<br>all four parts (ureter, medulla, cortex, and pelvis) labelled ✓ ✓   | Award one mark if two of the four<br>parts are correctly labelled.  | 3                  | AO2<br>5.1.2(c)(ii)                                      |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| 2(a)  | <table border="1"> <thead> <tr> <th>Process</th> <th>Is this excretion?</th> </tr> </thead> <tbody> <tr> <td>the elimination of undigested food from an animal's body</td> <td>no</td> </tr> <tr> <td>an animal exhaling carbon dioxide</td> <td>yes</td> </tr> <tr> <td>excess heavy metals are transferred to cells in the leaves, which are lost from a plant by abscission</td> <td>no</td> </tr> <tr> <td>flowering plants release molecules that attract pollinators</td> <td>no</td> </tr> <tr> <td>stercobilin is formed from the breakdown of haemoglobin and passes through the digestive system</td> <td>yes</td> </tr> <tr> <td>reed species release acid through their roots to destroy competing species</td> <td>no</td> </tr> </tbody> </table> | Process   | Is this excretion? | the elimination of undigested food from an animal's body | no | an animal exhaling carbon dioxide | yes | excess heavy metals are transferred to cells in the leaves, which are lost from a plant by abscission | no | flowering plants release molecules that attract pollinators | no | stercobilin is formed from the breakdown of haemoglobin and passes through the digestive system | yes | reed species release acid through their roots to destroy competing species | no | All 6 correct = 4 marks<br>4 correct = 3 marks<br>3 correct = 2 marks<br>2 correct = 1 mark | 4 | AO2<br>5.1.2(a) |
| Process   | Is this excretion?  |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| the elimination of undigested food from an animal's body  | no  |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| an animal exhaling carbon dioxide   | yes   |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| excess heavy metals are transferred to cells in the leaves, which are lost from a plant by abscission | no  |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| flowering plants release molecules that attract pollinators   | no  |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| stercobilin is formed from the breakdown of haemoglobin and passes through the digestive system       | yes   |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |
| reed species release acid through their roots to destroy competing species                            | no  |   |                    |  |    |                                   |     |   |    |   |    |   |     |  |    |   |   |                 |

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|----------|---|---|-------|--------------------|
| 2(b)(i)  | Any four from:<br><i>idea of high pressure in glomerulus</i> ✓<br>fenestrations / narrow gaps between endothelial cells in capillaries / glomerulus ✓<br>basement membrane filters ✓<br>podocytes ✓<br>large molecules prevented from passing into PCT ✓  | Accept afferent arteriole wider than efferent arteriole<br><br>Accept alternative wording<br><br>Accept only small molecules can pass into PCT  | 4 max | AO1<br>5.1.2(c)(i) |
| 2(b)(ii) | <p><b>Level 3 (5–6 marks)</b><br/>Describes the roles of the PCT and DCT, with no/few errors or omissions.<br/><i>There is a well-developed line of reasoning, which is clear and logically-structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.</i></p> <p><b>Level 2 (3–4 marks)</b><br/>Describes the roles of the PCT and DCT, with some errors and/or omissions.<br/><i>There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.</i></p> <p><b>Level 1 (1–2 marks)</b><br/>Describes aspects of the roles of the PCT or DCT, with major errors and/or omissions.<br/><i>The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.</i></p> <p><b>0 marks</b><br/>No response or no response worthy of credit.</p> | <p><b>Indicative content:</b></p> <p><i>PCT</i></p> <ul style="list-style-type: none"> <li>• Selective reabsorption</li> <li>• Water reabsorbed (65-85% of water is reabsorbed in the PCT)</li> <li>• NaCl reabsorbed (65-85% of Na<sup>+</sup> and Cl<sup>-</sup> ions are reabsorbed in the PCT)</li> <li>• All glucose and amino acids reabsorbed</li> <li>• Vitamins and hormones reabsorbed</li> <li>• Mechanistic details (e.g., co-transport, microvilli, pumps)</li> </ul> <p><i>DCT</i></p> <ul style="list-style-type: none"> <li>• Additional reabsorption of ions (sodium and potassium ions, in particular)</li> <li>• Adjustment of ion concentrations</li> <li>• Adjustment of water potential</li> <li>• pH regulation</li> </ul> | 6     | AO1<br>5.1.2(c)(i) |

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| Question | Answers  | Extra information  | Mark  | AO Spec reference                           |
|----------|--|--|-------|---|
| 3(a)(i)  | M nucleolus ✓<br>N mitochondrion ✓   | Accept mitochondria  | 2     | AO2<br>2.1.1(g)<br>5.1.2(b)(ii)             |
| 3(a)(ii) | Any three from:<br>produce thin section / slice ✓<br>using blade / microtome ✓<br>(differential) staining ✓<br>mount on slide / use wet mount ✓                                    |  | 3 max | AO2<br>2.1.1(b)<br>2.1.1(c)<br>5.1.2(b)(ii) |
| 3(b)     | Any two from:<br>insoluble ✓<br>compact ✓<br><i>idea of easy to break down / hydrolyse when needed</i> ✓<br><i>idea of made of (α) glucose, which is a respiratory substrate</i> ✓ |  | 2 max | AO1<br>2.1.2(g)                             |
| 3(c)     | ammonia / ethanol / hydrogen peroxide conversion or breakdown ✓  |  | 1     | AO1<br>5.1.2(b)(i)                          |
| 3(d)(i)  | 2 ✓ NH <sub>3</sub> ✓  |  | 2     | AO2<br>5.1.2(b)(i)                          |
| 3(d)(ii) | urea ✓   |  | 1     | AO1<br>5.1.2(b)(i)                          |
| 4(a)     | <b>D A E B C F</b> ✓ ✓ ✓   | Award 3 marks for correct final answer<br><br>If the order is incorrect, award: <ul style="list-style-type: none"> <li>• one mark for D being first and F being last</li> <li>• one mark for A before E</li> </ul> | 3     | AO1<br>5.1.2(d)<br>5.1.5(j)                 |

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| Question | Answers  | Extra information  | Mark | AO Spec reference              |
|----------|--|--|------|--------------------------------|
| 4(b)     | <p><b>Level 3 (5–6 marks)</b><br/>Describes the roles of the PCT, loop of Henle, and collecting duct in water reabsorption, with no/few errors or omissions.</p> <p><i>There is a well-developed line of reasoning, which is clear and logically-structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.</i></p> <p><b>Level 2 (3–4 marks)</b><br/>Describes the roles of the collecting duct <b>and</b> either the PCT <b>or</b> loop of Henle in water reabsorption, with some errors or omissions.</p> <p><i>There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.</i></p> <p><b>Level 1 (1–2 marks)</b><br/>Describes the roles of the PCT <b>or</b> loop of Henle <b>or</b> collecting duct in water reabsorption, with major errors or omissions.</p> <p><i>The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.</i></p> <p><b>0 marks</b><br/>No response or no response worthy of credit.</p> | <p><b>Indicative content:</b></p> <p><i>PCT</i></p> <ul style="list-style-type: none"> <li>• Water reabsorbed (65–85% of water is reabsorbed in the PCT)</li> <li>• Mechanistic details (e.g.. active transport of Na<sup>+</sup> ions; co-transport of Na<sup>+</sup> ions / glucose / amino acids; osmosis of water)</li> </ul> <p><i>Loop of Henle</i></p> <ul style="list-style-type: none"> <li>• Water reabsorption from descending limb</li> <li>• Ascending limb is impermeable to water</li> <li>• Counter-current multiplier</li> <li>• Water potential gradient established by the end of the loop (to enable further water reabsorption from the collecting duct)</li> </ul> <p><i>Collecting duct</i></p> <ul style="list-style-type: none"> <li>• Water reabsorbed by osmosis through aquaporins</li> <li>• Level of reabsorption determined by action of ADH</li> </ul> | 6    | AO1<br>5.1.2(d)                |
| 5(a)     | <p>red blood cells / erythrocytes present ✓<br/><i>idea that</i> red blood cells should not be able to pass out of the glomerulus into a nephron ✓</p>   |  | 2    | AO2<br>5.1.2(c)(i)<br>5.1.2(f) |

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|----------|---|---|-------|-----------------------------|
| 5(b)(i)  | 100% / all reabsorbed in PCT ✓  |   | 1     | AO1<br>5.1.2(c)(i)          |
| 5(b)(ii) | Benedict's test / glucose reagent test strip ✓  |   | 1     | AO1<br>2.1.2(q)<br>5.1.2(f) |
| 5(c)     | Any three from:<br>(monoclonal) antibodies specific to hCG ✓<br>hCG (from urine) binds to antibodies on test strip ✓<br>antibodies are mobile / can be carried by urine ✓<br>immobilised (monoclonal) antibodies (on strip) bind with hCG-antibody complex ✓<br>(two) coloured patterns / lines indicate pregnancy ✓                            |   | 3 max | AO1<br>5.1.2(f)             |
| 5(d)     | Any five from:<br>large sample size / many participants ✓<br>idea of avoiding bias ✓<br>negative control / group of participants tested without diuretic ✓<br>control of participant diet / age / gender / health ✓<br>control of diuretic volume / concentration ✓<br>a third control variable ✓<br>suggestion for measuring kidney function ✓ | e.g., random assignment of participants into experimental groups; double blind trials<br><br>e.g., time of day that the diuretic is given<br>e.g., measure volume of urine produced over 24-hour period;<br>test glucose concentration in urine | 5 max | AO3<br>5.1.2(d)<br>5.1.2(f) |
| 6(a)     | <i>Advantage</i><br>idea of (if successful) removes need for further treatment ✓<br><br><i>Disadvantage</i><br>rejection / use of immunosuppressant drugs / the surgery has a high risk ✓   |   | 2     | AO1<br>5.1.2(e)             |

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|----------|--|-------------------|-------|-------------------|
| 6(b)(i)  | significance of statistical tests ✓<br>sample size ✓<br><i>idea of</i> the control of other variables in the patients ✓<br><i>idea of</i> the extent to which the measures in the table present a risk to a patient's life ✓ |                   | 3 max | AO3<br>5.1.2(e)   |
| 6(b)(ii) | <i>t</i> -test ✓   |                   | 1     | AO3<br>5.1.2(e)   |

### Skills box answers

| Question | Answer                 |
|----------|------------------------|
| 1        | × 400                  |
| 2(a)     | 400 mm                 |
| 2(b)     | 2500 mm                |
| 2(c)     | 0.0006 mm              |
| 2(d)     | 0.0001 mm              |
| 3        | 45 km                  |
| 4        | 2 μl                   |
| 5        | 25 000 mm <sup>3</sup> |