

## Paper 2 (4BI1/2B)

| Question number | Answer  | Mark |
|-----------------|---|------|
| 1(a)            | An explanation that makes reference to the following two points: <ul style="list-style-type: none"> <li>ice caps melt/flooding/rise of sea levels/climate change/ extreme weather (1)</li> <li>therefore loss of habitat/extinction/effect on food webs/ effect on crop growth (1)</li> </ul> | 2    |

| Question number | Answer                                | Mark |
|-----------------|---------------------------------------|------|
| 1(b)            | Transfers virus (from sheep to sheep) | 1    |

| Question number | Answer  | Mark |
|-----------------|---|------|
| 1(c)            | An explanation that makes reference to the following points: <ul style="list-style-type: none"> <li>evaporation of water (1)</li> <li>therefore reduces body temperature/heat loss/equivalent (1)</li> <li>enzymes not denatured (1)</li> </ul> | 2    |

| Question number | Answer  | Mark |
|-----------------|---|------|
| 1(d)            | Too cold for midge to move/survive/reproduce/equivalent | 1    |

| Question number | Answer   | Additional guidance   | Mark |
|-----------------|--|---|------|
| 1(e)            | <ul style="list-style-type: none"> <li><math>(100 \times 20) \div 995</math> (1)</li> <li>2.01% (1)</li> </ul> | award full marks for correct numerical answer without working | 2    |

| Question number | Answer  | Mark |
|-----------------|---|------|
| 1(f)            | An explanation that makes reference to two of the following points: <ul style="list-style-type: none"> <li>less blood/(oxy) haemoglobin/oxygen (1)</li> <li>narrowing of blood vessels (1)</li> <li>vasoconstriction (1)</li> </ul> | 2    |

| Question number | Answer  | Mark     |
|-----------------|---|----------|
| <b>1(g)</b>     | <p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• sheep injected with dead/attenuated/harmless virus/antigens (1)</li> <li>• (sheep produces) memory cells (1)</li> <li>• (sheep produces) antibodies (1)</li> <li>• faster/greater/quicker response (1)</li> </ul> | <b>3</b> |

| Question number | Answer  | Mark     |
|-----------------|---|----------|
| <b>1(h)</b>     | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• midges cannot bite/feed (1)</li> <li>• reduce spread of virus (1)</li> </ul> | <b>2</b> |

**Total for Question 1 = 15 marks**

| Question number | Answer  | Mark |
|-----------------|---|------|
| 2               | A description that makes reference to four of the following points: <ul style="list-style-type: none"><li>• mammoth cell nucleus put into enucleated (elephant) egg cell (1)</li><li>• electric shock/equivalent (1)</li><li>• cell division/mitosis (1)</li><li>• embryo (1)</li><li>• uterus/womb (1)</li><li>• surrogate mother (elephant) (1)</li></ul> | 4    |

**Total for Question 2 = 4 marks**

| Question number | Answer | Mark |
|-----------------|--------|------|
| 3(a)(i)         | B      | 1    |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 3(a)(ii)        | A      | 1    |

| Question number | Answer  | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 3(b)(i)         | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>less dry mass (with herbicide) so less growth (1)</li> <li>less carbon dioxide absorbed (1)</li> <li>less photosynthesis (1)</li> <li>less carbohydrate synthesised/equivalent (1)</li> <li>less water loss/transpiration (1)</li> <li>stomata close (1)</li> <li>less supply of mineral ions/named mineral ion (1)</li> <li>nitrate needed for amino acids/protein; phosphate needed for ATP/DNA; magnesium needed for chlorophyll/ chloroplasts (1)</li> </ul> | ignore nutrients    | 6    |

| Question number | Answer  | Additional guidance  | Mark |
|-----------------|---|--|------|
| 3(b)(ii)        | <p>Subtraction</p> <ul style="list-style-type: none"> <li><math>0.97 - 0.85 = 0.12</math> (1)</li> </ul> <p>Multiplication</p> <ul style="list-style-type: none"> <li><math>60 \times 24 \times 7 =</math></li> <li><math>10080 \times 1209.6 = 1200</math> to two sig fig (1)</li> </ul> | <p>award full marks for correct numerical answer without working</p> <p>allow 1209.6</p> | 2    |

| Question number  | Answer   | Additional guidance  | Mark     |
|------------------|--|--|----------|
| <b>3(b)(iii)</b> | Subtraction<br>• $33.3 - 19.5 = 13.8$ (1)<br><br>Percentage<br>• $(13.8 \div 33.3) \times 100 = 41.4\%$ to three significant figures (1) | award full marks for correct numerical answer without working<br><br>allow 41% | <b>2</b> |

| Question number | Answer  | Additional guidance                                      | Mark     |
|-----------------|---|--|----------|
| <b>3(c)</b>     | A description that makes reference to five of the following points: <ul style="list-style-type: none"> <li>• potometer (1)</li> <li>• stopwatch/reference to time (1)</li> <li>• measure distance moved by bubble/measure mass loss/equivalent (1)</li> <li>• repeat readings/find mean (1)</li> <li>• control of named environmental factor (1)</li> <li>• same size plant/divide by leaf surface area/equivalent (1)</li> </ul> | allow credit for description of weight or mass potometer | <b>5</b> |

**Total for Question 3 = 17 marks**

| Question number | Answer  | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 4(a)            | One mark for each of the following :<br><ul style="list-style-type: none"> <li>osmoregulation (1)</li> <li>excretion (1)</li> </ul> | any order           | 2    |

| Question number | Answer                   | Mark |
|-----------------|--------------------------|------|
| 4(b)(i)         | $0.17 / (0.200 - 0.030)$ | 1    |

| Question number | Answer   | Mark |
|-----------------|--|------|
| 4(b)(ii)        | An explanation that makes reference to four of the following points:<br><ul style="list-style-type: none"> <li>protein stays in plasma/not in filtrate or in urine (1)</li> <li>protein molecules too large to pass out of glomerulus/into Bowman's capsule (1)</li> <li>glucose in plasma and filtrate/none in urine (1)</li> <li>small enough to pass out of glomerulus/into Bowman's capsule (1)</li> <li>all glucose reabsorbed by active transport in proximal convoluted tubule (1)</li> </ul> | 4    |

| Question number | Answer   | Mark |
|-----------------|--|------|
| 4(b)(iii)       | A description that makes reference to four of the following points:<br><ul style="list-style-type: none"> <li>Benedict's/equivalent (1)</li> <li>heat (1)</li> <li>red in high concentration of glucose (1)</li> <li>orange/yellow-green in low concentration of glucose (1)</li> <li>control volume of sample/time heated/temperature/ volume of Benedict's/equivalent (1)</li> </ul> | 4    |

| Question number | Answer  | Mark |
|-----------------|---|------|
| 4(c)            | An explanation that makes reference to three of the following points:<br><ul style="list-style-type: none"> <li>less volume (1)</li> <li>more concentrated (1)</li> <li>as more water lost in sweat (1)</li> <li>more ADH released (1)</li> </ul> | 3    |

**Total for Question 4 = 14 marks**

| Question number | Answer   | Mark |
|-----------------|--|------|
| 5(a)            | A description that makes reference to three of the following points: <ul style="list-style-type: none"> <li>• helix (1)</li> <li>• double stranded (1)</li> <li>• paired bases (1)</li> <li>• A with T and C with G (1)</li> </ul> | 3    |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 5(b)(i)         | A      | 1    |

| Question number | Answer     | Mark |
|-----------------|------------|------|
| 5(b)(ii)        | $4^3 = 64$ | 1    |

| Question number | Answer  | Mark |
|-----------------|---|------|
| 5(c)(i)         | A description that makes reference to three of the following points: <ul style="list-style-type: none"> <li>• change in the order of bases/equivalent (1)</li> <li>• leads to different codon (1)</li> <li>• different amino acid in protein (1)</li> <li>• different-shaped enzyme/change to active site/enzyme not made/equivalent (1)</li> </ul> | 3    |

| Question number | Answer   | Mark |
|-----------------|--|------|
| 5(c)(ii)        | An explanation that makes reference to two of the following points: <ul style="list-style-type: none"> <li>• change in base may code for same amino acid (1)</li> <li>• amino acid may not be involved in active site (1)</li> <li>• enzyme still made/still functions/equivalent (1)</li> <li>• could be recessive allele (1)</li> <li>• so not expressed in phenotype (1)</li> </ul> | 2    |

| Question number | Answer   | Mark |
|-----------------|--|------|
| 5(c)(iii)       | An answer that makes reference to x-rays/ultraviolet radiation/gamma radiation/tar/ carcinogens/equivalent | 1    |

**Total for Question 5 = 11 marks**

| Question number | Answer  | Mark     |
|-----------------|---|----------|
| <b>6(a)</b>     | One mark for each of the following:<br><br><b>A</b> nitrogen fixation (1)<br><br><b>B</b> decomposition (1)<br><br><b>C</b> nitrification (1) | <b>3</b> |

| Question number | Answer   | Mark     |
|-----------------|--|----------|
| <b>6(b)(i)</b>  | A description that makes reference to two of the following points: <ul style="list-style-type: none"> <li>• nitrate values and BOD decrease (1)</li> <li>• BOD decreases at a faster rate (1)</li> <li>• nitrate rises in some years/fluctuates (1)</li> </ul> | <b>2</b> |

| Question number | Answer  | Mark     |
|-----------------|---|----------|
| <b>6(b)(ii)</b> | An explanation that makes reference to four of the following points: <ul style="list-style-type: none"> <li>• lower nitrate levels means less plant growth/equivalent (1)</li> <li>• less eutrophication (1)</li> <li>• less plant death (1)</li> <li>• less decomposition/fewer decomposers/fewer bacteria/equivalent (1)</li> <li>• less respiration (1)</li> <li>• named other factor that could affect BOD (1)</li> </ul> | <b>4</b> |

**Total for Question 6 = 9 marks**

**TOTAL FOR PAPER = 70 MARKS**