

| Question |                              | Expected Answers                                  |                              | Marks | Additional Guidance  |                                 |
|----------|------------------------------|---|------------------------------|-------|--|---------------------------------|
| 1        | (a)                          | <b>Award 1 mark per correct row</b>               |                              | 3     | <p><b>Mark the first answer in each box.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> phonetic spelling <b>except for</b> ethanal and ethanol</p> <p><b>ACCEPT</b> pyruvic acid (instead of pyruvate)<br/> <b>ACCEPT</b> acetaldehyde (instead of ethanal)<br/> <b>IGNORE</b> formulae<br/>                     The spelling of ethanal must be unambiguous</p> <p><b>ACCEPT</b> 2 molecules for yeast<br/>                     (from 1 glucose molecule)</p> <p><b>ACCEPT</b> lactic acid (instead of lactate)<br/> <b>ACCEPT</b> ethyl alcohol (instead of ethanol)<br/> <b>IGNORE</b> alcohol<br/> <b>IGNORE</b> formulae<br/>                     The spelling of ethanol must be unambiguous</p> |                                 |
|          |                              |   | <i>mammal</i>                |       |  | <i>yeast</i>                    |
|          |                              | <i>name of hydrogen acceptor after glycolysis</i> | pyruvate                     |       |  | ethan <u>a</u> l ;              |
|          |                              | <i>is CO<sub>2</sub> produced?</i>                | no / ✘ / none / no molecules |       |  | yes / ✓ / some / one molecule ; |
|          | <i>name of final product</i> | lactate   | ethan <u>o</u> l ;           |       |  |                                 |

| Question     |     | Expected Answers |  | Marks    | Additional Guidance   |
|--------------|-----|------------------|--|----------|---|
| 1            | (b) | 1                | <i>idea that</i> ATP produced / energy released ;                                      | 1 max    | <p><b>IGNORE</b> ref to specific metabolic reactions other than glycolysis (mp 3)</p> <p><b>IGNORE</b> ref to respiration without oxygen</p> <p><b>1</b> <b>DO NOT CREDIT</b> this mark point with any ref to energy , generated / produced / made [eg energy made in the form of ATP = 0 ATP (energy) is produced = 0]</p> <p><b>2</b> <b>ACCEPT</b> 'reoxidises red NAD' (as implies recycling)</p> <p><b>CREDIT</b> NADH / NADH<sup>+</sup> / NADH<sub>2</sub> for red NAD</p> <p><b>DO NOT CREDIT</b> 'oxidises red NAD' without further qualification</p> <p><b>3</b> If glycolysis used as a term, the spelling of 'glyco' must be correct.</p> |
|              |     | 2                | <i>idea that</i> recycles NAD / NAD can be used again ;                                |          |   |
|              |     | 3                | allows , <b>glycolysis</b> / description of glycolysis , to take place / to continue ; |          |   |
| <b>TOTAL</b> |     |                  |  | <b>4</b> |   |

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|----------|-----|-----|---|-------|---|
| 2        | (a) | (i) | <p>1 structure A / Schwann cell / it , produces <b>myelin</b> ;</p> <p>2 (electrical) <u>insulation</u> / <u>insulates</u> ;</p> <p>3 prevents movement of ions , into / out of , neurone / axon<br/><b>or</b><br/>prevents <b>depolarisation</b> ;</p> <p>4 speeds up , <b>conduction</b> / transmission / passage , of ,<br/><b>impulse</b> / action potential ;</p> <p>5 <b>action potentials</b> / <b>local circuits</b> / depolarisation /<br/>only occur at , gaps / <b>nodes</b> (of Ranvier) ;</p> <p>6 <b>saltatory</b> conduction / described ;</p> | 3 max | <p>1 Needs the idea of production rather than simply stating 'it is a myelin sheath'</p> <p>2 <b>CREDIT</b> insulate or derived term.<br/><b>IGNORE</b> impermeable<br/><b>DO NOT CREDIT</b> <i>idea of</i> thermal insulation</p> <p>3 <b>CREDIT</b> 'across membrane' instead of , in / out, of axon<br/><b>IGNORE</b> ion exchange<br/><b>IGNORE</b> impermeable<br/><b>DO NOT CREDIT</b> ions moving , into / out of , membrane<br/><b>DO NOT CREDIT</b> movement of ions without qualification</p> <p>4 Statement must be comparative eg <u>faster</u><br/><b>DO NOT CREDIT</b> message / signal / wave of depolarisation</p> <p>5 <b>ACCEPT</b> longer local circuits<br/><b>ACCEPT</b> 'local currents' instead of local circuits</p> <p>6 eg • impulse jumps from , node to node / gap to gap<br/><b>Note:</b> 'saltatory conduction' = 2 QWC terms</p> |
|          |     |     | <p><b>QWC</b> – technical terms used appropriately with correct spelling ;</p>  |       | 1   |

| Question |     |       | Expected Answers  | Marks | Additional Guidance   |
|----------|-----|-------|---|-------|---|
| 2        | (a) | (ii)  | <u>exocytosis</u> ;   | 1     | <b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b><br><br><b>IGNORE</b> bulk transport  |
| 2        | (a) | (iii) | <u>diffusion</u> ;  | 1     | <b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b><br><br><b>DO NOT CREDIT</b> facilitated diffusion  |
| 2        | (a) | (iv)  | <p>1 <i>idea that only</i> the <u>presynaptic</u> neurone ,<br/>produces / releases / contains ,<br/>acetylcholine / ACh / (neuro)transmitter ;</p> <p>2 only the <u>presynaptic</u> membrane has ,<br/>Ca<sup>(2+)</sup> / calcium (ion) , channels ;</p> <p>3 <i>idea that only</i> the <u>postsynaptic</u> , membrane / neurone ,<br/>has (ACh) receptors ;</p> <p>4 ACh broken down at <u>postsynaptic</u> membrane ;</p> | 1 max | <p><b>IGNORE</b> ref to refractory period<br/>(as not a feature of synapse)</p> <p><b>ACCEPT</b> ACH / ach throughout</p> <p>1 <b>CREDIT</b> knob / terminal bouton / bulb<br/>(instead of neurone)</p> <p>2</p> <p>3 <b>DO NOT CREDIT</b> ref to bouton / bulb / etc</p> <p>4 <b>IGNORE</b> ref to (acetyl)cholinesterase without ref<br/>to action at postsynaptic membrane</p> |

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|----------|-----|-----|--|--------------|--|
| 2        | (b) | (i) | <p><b>1</b> <i>idea that</i> atropine , binds to / occupies / competes for , (ACh) <u>receptor</u> on postsynaptic , membrane / neurone ;</p> <p><b>2</b> <i>idea that</i> prevents ACh binding / blocks binding site / blocks receptor ;</p> <p><b>3</b> ion gates / ion channels / sodium channels / protein channels , do not open / remain closed ;</p> <p><b>4</b> Na<sup>+</sup> cannot enter / K<sup>+</sup> cannot leave , neurone / (nerve) cell ;</p> <p><b>5</b> no / insufficient , depolarisation / postsynaptic potential / excitatory postsynaptic potential / epsp / generator potential ;</p> <p><b>6</b> (so) does not reach threshold (value / potential) ;</p> | <b>3 max</b> | <p><b>IGNORE</b> ref to atropine and ACh having similar shapes (as given in Q)</p> <p><b>ACCEPT</b> ACH / ach throughout</p> <p><b>Only credit ORA for the mark points if candidate clearly states that these events do <u>NOT</u> take place with atropine.</b></p> <p><b>1</b> <b>IGNORE</b> ref inhibition<br/><b>DO NOT CREDIT</b> active site<br/><b>DO NOT CREDIT</b> ref to bouton / bulb / etc</p> <p><b>2</b></p> <p><b>3</b> <b>CREDIT</b> fewer ion channels open</p> <p><b>4</b> <b>CREDIT</b> sodium ions / potassium ions<br/><b>DO NOT CREDIT</b> Na / K<br/><b>DO NOT CREDIT</b> ions entering the membrane</p> <p><b>5</b> <b>IGNORE</b> action potential (as given in Q)</p> <p><b>6</b></p> |

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|----------|-----|------|---|---------------------|---|
| 2        | (b) | (ii) | <p><b>1</b> <i>idea that</i> will , bind to / occupy / compete for / block ,<br/>(some of ACh) receptors ;</p> <p><b>2</b> so acetylcholine / ACh , cannot bind / less likely to bind<br/>(to receptor / to postsynaptic membrane) ;</p> <p><b>3</b> prevents / reduces ,<br/>constant stimulation / overstimulation /<br/>constant depolarisation ,<br/>of postsynaptic neurone<br/><b>or</b><br/>prevents / reduces ,<br/>constant firing of action potentials /<br/>tetanus / (muscle) spasm ;</p> <p><b>4</b> AVP ;</p> | <p><b>2 max</b></p> | <p><b>ACCEPT</b> ACH / ach throughout</p> <p><b>1</b> <b>DO NOT CREDIT</b> ref to active site</p> <p><b>2</b> <b>ACCEPT</b> <i>idea that</i> ACh remains in synaptic cleft</p> <p><b>3</b></p> <p><b>4</b> eg</p> <ul style="list-style-type: none"> <li>• effective if administered soon after exposure</li> <li>• cannot counteract inhibition of acetylcholinesterase</li> </ul> |
|          |     |      | <b>TOTAL</b>  | <b>12</b>           |   |

| Question |     |      | Expected Answers |   | Marks | Additional Guidance  |
|----------|-----|------|------------------|---|-------|--|
| 3        | (a) | (i)  | W                | glycolysis ;  | 3     | <p><b>Mark the first answer for each letter.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>W</b> : <b>CREDIT</b> glycolytic pathway<br/> <b>ACCEPT</b> phonetic spelling but must have 'glycol'<br/> <b>IGNORE</b> respiration</p> <p><b>X</b> : <b>IGNORE</b> dark reaction / photosynthesis<br/> <b>ACCEPT</b> phonetic spelling</p> <p><b>Y</b> : <b>ACCEPT</b> citric acid cycle / TCA cycle / (tri)carboxylic acid cycle<br/> <b>ACCEPT</b> phonetic spelling<br/> <b>IGNORE</b> respiration / link reaction</p> |
|          |     |      | X                | Calvin cycle / light-independent stage (of photosynthesis) ;  |       |  |
|          |     |      | Y                | Krebs cycle ;   |       |  |
| 3        | (a) | (ii) | 1                | take place in different , parts / organelles , of the cell<br><b>or</b><br>compartmentalisation /<br>reactions separated by membranes ; | 3 max | <p><b>1</b> Must be a clear statement and not implied from others.<br/> <b>DO NOT CREDIT</b> different parts of the leaf<br/> <b>DO NOT CREDIT</b> no interference between pathways (as rephrasing the Q)</p> <p><b>2</b></p> <p><b>3</b> <b>DO NOT CREDIT</b> if thylakoid / membranes stated or implied</p> <p><b>4</b> <b>DO NOT CREDIT</b> if cristae / membranes stated or implied</p> <p><b>5</b> eg</p> <ul style="list-style-type: none"> <li>• different enzymes for each pathway</li> <li>• different conditions for each pathway</li> </ul>   |
|          |     |      | 2                | W / glycolysis , in cytoplasm ;   |       |  |
|          |     |      | 3                | X / Calvin cycle , in , chloroplast / stroma (of chloroplast) ;   |       |  |
|          |     |      | 4                | Y / Krebs cycle , in ,<br>mitochondrion / matrix (of mitochondrion) ;   |       |  |
|          |     |      | 5                | AVP ;   |       |  |

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|----------|-----|-------|--|-------|--|
| 3        | (a) | (iii) | X ;<br><br>W and Y ;   | 2     | <p><b>IGNORE</b> names. The question has asked for letters.</p> <p><i>photosynthesis</i><br/> <b>Mark the first answer.</b> If the answer is correct and an additional letter is given then = <b>0 marks</b></p> <p><i>aerobic respiration</i><br/> <b>Mark the first two answers.</b> If these answers are correct and an additional letter (ie 3<sup>rd</sup> etc) is given then = <b>0 marks</b></p> <p><b>Both letters required for this mark, in any order.</b></p> |
| 3        | (a) | (iv)  | ATP / adenosine triphosphate ;<br>water / H <sub>2</sub> O ;<br>(oxidised) NAD / FAD ; | 2     | <p><b>If any answer(s) incorrect then Max 1</b></p> <p><b>IGNORE</b> energy / heat<br/> <b>IGNORE</b> numbers</p> <p>eg oxygen (×) and ATP (✓) and water = max 1<br/> oxygen (×) and energy (<i>ignore</i>) = 0<br/> ATP (✓) and energy (<i>ignore</i>) and H<sub>2</sub>O (✓) = 2<br/> reduced NAD (×) and ATP (✓) and energy (<i>ignore</i>) and H<sub>2</sub>O = max 1</p>  |



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| 3            | (b) | 1                | NAD / FAD / NADP , can ,<br>accept hydrogen / accept H / be reduced ;   | 1                   | <b>DO NOT CREDIT</b> hydrogen ions / protons ,<br>unless there is an electron as well<br><b>DO NOT CREDIT</b> accepts hydrogen molecules /H <sub>2</sub><br><b>CREDIT</b> equation showing the reduction<br><b>ACCEPT</b> eg NAD converted to NADH<br><b>IGNORE</b> 'carries hydrogen' |
|              |     | 2                | reduced , NAD / FAD ,<br>supplies / carries , electrons ,<br>to the electron transport chain /<br>for oxidative phosphorylation ; | 2                   | Must refer to <i>reduced</i> NAD <b>or</b> <i>reduced</i> FAD <b>or</b><br>NADH / NADH <sup>+</sup> / NADH <sub>2</sub> / FADH / FADH <sup>+</sup> / FADH <sub>2</sub>   |
|              |     | 3                | reduced , NAD / FAD ,<br>supplies / carries , hydrogen ions for ,<br>chemiosmosis /<br>oxidative phosphorylation ;                | 3                   | Must refer to <i>reduced</i> NAD <b>or</b> <i>reduced</i> FAD <b>or</b><br>NADH / NADH <sup>+</sup> / NADH <sub>2</sub> / FADH / FADH <sup>+</sup> / FADH <sub>2</sub>   |
|              |     | 4                | reduced NADP , supplies / carries , hydrogen to ,<br>light independent stage / Calvin cycle / X ;                                 | 4                   | Must refer to <i>reduced</i> NADP <b>or</b><br>NADPH / NADPH <sup>+</sup> / NADPH <sub>2</sub>   |
|              |     | 5                | coenzyme A / CoA , carries ,<br><u>acetate</u> / <u>ethanoate</u> / <u>acetyl group</u> ,<br>to , Krebs cycle / Y ;               | 5                   | <b>DO NOT CREDIT</b> acetyl CoA carries acetate  |
|              |     | 6                | AVP ;   | 6                   | eg • co-enzyme(s) / cytochrome(s) ,<br>transfer / accept and release ,<br>electrons along the<br>electron transport chain<br>• can be , recycled / oxidised <b>and</b> reduced   |
| <b>TOTAL</b> |     |                  | <b>3 max</b>  | <b>13</b>           |  |

| Question |     | Expected Answers |   | Marks | Additional Guidance  |
|----------|-----|------------------|---|-------|--|
| 4        | (a) | 1                | <u>water potential</u> / $\Psi$ , of plasma / outside cells ,<br>would be higher than that of the (blood) cells ; | 2 max | 1 Must be a clear comparative statement relating to<br>outside and inside cells<br><b>CREDIT</b> ora<br><b>IGNORE</b> water concentration  |
|          |     | 2                | water would enter (blood) <u>cells</u> ;  |       | 2 <b>IGNORE</b> osmosis / down water potential gradient  |
|          |     | 3                | blood cells , swell / (might) burst / lyse ;  |       | 3 <b>CREDIT</b> haemolysis / haemolysed<br><b>DO NOT CREDIT</b> plasmolysis / turgid<br><b>Note:</b> 'cells become turgid and burst' = 0<br>'cells swell and become turgid' = 0  |
| 4        | (b) |                  | <i>type of monomer</i><br>amino acid ;<br><br><i>name of bond</i><br>peptide / amide ;                            | 2     | <b>Mark the first answer on each prompt line.</b> If the<br>answer is correct and an additional answer is given that<br>is incorrect or contradicts the correct answer then = <b>0</b><br><b>marks</b><br><br><b>DO NOT CREDIT</b> amine<br><br><b>IGNORE</b> covalent<br><b>DO NOT CREDIT</b> dipeptide / polypeptide |

| Question |     | Expected Answers |  | Marks | Additional Guidance   |
|----------|-----|------------------|--|-------|---|
| 4        | (c) |                  | <p>1 osmoreceptor / neurosecretory ;</p> <p>2 hypothalamus ;</p> <p>3 axon(s) ;</p> <p>4 posterior pituitary ;</p> <p>5 collecting duct ;</p> <p>6 (plasma / cell) membrane(s) ;</p> <p>7 aquaporins(s) ;</p> <p>8 osmosis ;</p> | 8     | <p><b>Mark the first answer on each prompt line in the passage.</b> If the answer is correct and an additional answer is given for that 'gap' that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> phonetic spelling throughout</p> <p>1 : <b>ACCEPT</b> osmotic receptor</p> <p>2 :</p> <p>3 :</p> <p>4 : <b>DO NOT CREDIT</b> 'pituitary' without correct qualification</p> <p>5 : <b>ACCEPT</b> distal (convoluted) tubule / second convoluted tubule</p> <p>6 :</p> <p>7 : <b>DO NOT CREDIT</b> aqua pores</p> <p>8 :</p> |

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|--------------|-----|------------------|-----------|---------------------|
| 4            | (d) | 1                | 3 max     | 1                   |
|              |     | 2                |           | 2                   |
|              |     | 3                |           | 3                   |
|              |     | 4                |           | 4                   |
|              |     | 5                |           | 5                   |
|              |     | 6                |           | 6                   |
|              |     | 7                |           | 7                   |
|              |     | 8                |           | 8                   |
|              |     | 9                |           | 9                   |
|              |     | 10               |           | 10                  |
| <b>TOTAL</b> |     |                  | <b>15</b> |                     |

| Question |     |      | Expected Answers   | Marks | Additional Guidance  |
|----------|-----|------|--|-------|--|
| 5        | (a) | (i)  | <p><i>2<sup>nd</sup> messenger</i><br/>cAMP / cyclic AMP / cyclic adenosine monophosphate ;</p> <p><i>1<sup>st</sup> messenger</i><br/>adrenaline / adrenalin ;</p>  | 2     | <p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> CAMP / camp<br/><b>DO NOT CREDIT</b> adenine monophosphate</p> <p><b>IGNORE</b> chemicals not named in Fig. 5.1</p> |
| 5        | (a) | (ii) | <p><b>1</b> <u>glycogen</u> → <u>glucose</u> / <u>glycogenolysis</u> ;</p> <p><b>2</b> by <u>hydrolysis</u> ;</p> <p><b>3</b> <i>correct ref to</i><br/>protein kinase / glycogen phosphorylase kinase<br/>(activates glycogen phosphorylase)<br/><b>or</b><br/>glycogen phosphorylase<br/>(stimulates conversion of glycogen)<br/><b>or</b><br/>inhibition of glycogen synthase<br/>(preventing glucose conversion to glycogen) ;</p> | 1 max | <p><b>1</b> <b>DO NOT CREDIT</b> gluconeogenesis / glycogenesis</p> <p><b>2</b> This term must be used, or a derived term.</p> <p><b>3</b></p>   |

| Question |     |       | Expected Answers   | Marks               | Additional Guidance   |
|----------|-----|-------|--|---------------------|---|
| 5        | (a) | (iii) | <p>1 different tissues have different (types of adrenaline) receptors ;</p> <p>2 (causing) cAMP concentration to increase or decrease ;</p> <p>3 second messenger (may be) different ;</p> <p>4 cAMP / second messenger , activates , different / other , enzymes / enzyme reactions (in different target cells) ;</p> | <p><b>2 max</b></p> | <p><b>IGNORE</b> reasons not related to adrenaline (as Q specifies 'how the adrenaline molecule can cause ...')</p> <p><b>IGNORE</b> descriptions of stated effects in different tissues as Q asks <i>how</i> adrenaline causes these different effects</p> <p>1</p> <p>2 <b>ACCEPT</b> adenylyl cyclase / cAMP , inhibited</p> <p>3</p> <p>4</p> |

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| 5            | (b) | <p>1 <b>adrenalin(e)</b> increases ,<br/>heart rate / stroke volume / cardiac output ;</p> <p>2 <b>cardiovascular centre</b> in <b>medulla oblongata</b> ;</p> <p>3 <i>idea of</i> nervous connection to , SAN / <b>sino-atrial node</b> ;</p> <p>4 (which) controls frequency of waves of ,<br/>excitation / depolarisation ;</p> <p>5 <b>vagus / parasympathetic</b> , nerve decreases heart rate ;</p> <p>6 <b>accelerator / sympathetic</b> , nerve increases heart rate ;</p> <p>7 high blood pressure detected by ,<br/>stretch receptors / baroreceptors ;</p> <p>8 low blood pH / increased levels of blood CO<sub>2</sub> ,<br/>detected by <b>chemoreceptors</b> ;</p> <p>9 (receptors) in , aorta / <b>carotid</b> sinus / carotid arteries ;</p> | 4 max     | <p>1</p> <p>2 <b>ACCEPT</b> 'cardiac' instead of cardiovascular<br/>but not for QWC</p> <p>3 <b>ACCEPT</b> SAN for mp 3 but not for QWC</p> <p>4 <b>CREDIT</b> in relation to mp 2 or mp 3</p> <p>5 <b>ONLY CREDIT</b> vagus <b>or</b> parasympathetic for QWC</p> <p>6 <b>ONLY CREDIT</b> accelerator <b>or</b> sympathetic for QWC<br/><b>ACCEPT</b> phrenic nerve</p> <p>7 <b>DO NOT CREDIT</b> proprioceptor</p> <p>8</p> <p>9</p>   |
|              |     | <p><b>QWC</b> – technical terms used appropriately with correct spelling ;</p>   |           | <p>1</p> <p>Correct use of <b>adrenalin(e)</b> (<b>Identify using the tick 1 <input checked="" type="checkbox"/> 1</b> AND MUST BE INCLUDED FOR QWC TO BE AWARDED)</p> <p><b>plus</b> use of 2 terms from:<br/> <b>cardiovascular centre,</b>                    <b>medulla oblongata,</b><br/> <b>sino-atrial node,</b>                         <b>vagus or parasympathetic,</b><br/> <b>carotid,</b>                                         <b>accelerator or sympathetic,</b><br/> <b>chemoreceptor</b></p> <p><b>You should use the GREEN DOT to identify the remaining QWC terms that you are crediting.</b></p> <p><b>Please insert a QWC symbol next to the PENCIL ICON, followed by a tick (✓) if QWC has been awarded or a cross (x) if QWC has not been awarded</b></p> |
| <b>TOTAL</b> |     |  | <b>10</b> |  |

| Question |     | Expected Answers        | Marks | Additional Guidance   |
|----------|-----|-------------------------|-------|---|
| 6        | (a) | 124 (%) / 123.7 (%) ; ; | 2     | <ul style="list-style-type: none"> <li>• Correct answer = 2 marks<br/><math>(208 - 93) \div 93 \times 100</math></li> <li>• <b>ACCEPT</b> 55 (%) / 55.3 (%) for 2 marks<br/><math>(208 - 93) \div 208 \times 100</math></li> <li>• Correct numerical answer but inappropriate units<br/>(eg 124 <math>\mu\text{m}</math>) = 1 mark</li> <li>• If answer not rounded correctly (to nearest whole number or to 1 dp) or if answer incorrect, then allow 1 mark for seeing<br/><b>either</b><br/>115 <b>or</b> (208 - 93)</li> </ul> |



| Question |     | Expected Answers  | Marks    | Additional Guidance  |
|----------|-----|---|----------|--|
| 6        | (b) | <p><b>1a</b> <i>benefit</i><br/>allows entry of <b>more</b> CO<sub>2</sub> ;</p> <p><b>2a</b> <i>explanation</i><br/>(CO<sub>2</sub>) for , light-independent reaction / Calvin cycle<br/><b>or</b><br/><b>2b</b> light-dependent reaction is taking place quickly /<br/>reduced NADP building up / ATP building up<br/><b>or</b><br/><b>2c</b> CO<sub>2</sub> not as limiting (than when there are fewer stomata)<br/><b>or</b><br/><b>2d</b> <i>idea that</i> increases access to air spaces<br/>for distribution of CO<sub>2</sub> ;</p> <p><b>OR</b></p> <p><b>1b</b> <i>benefit</i><br/>reduces transpiration ;</p> <p><b>2e</b> <i>explanation</i><br/><i>idea of</i> stomata sheltered from , air currents / heat<br/>(when on lower surface)<br/><b>or</b><br/><b>2f</b> <i>idea that</i> diffusion shells maintained ;</p> | <b>2</b> | <p>Read through complete answer.<br/>Award 2 marks if a benefit and explanation <u>are</u> correctly linked.</p> <p>If benefit and explanation <u>are not</u> correctly linked:<br/>Award Max 1 for <u>either</u> a benefit <u>or</u> an explanation.</p> <p><b>1a</b> Must indicate the idea of <i>more and imply going in</i><br/>eg 'allows more gas exchange so that there is more CO<sub>2</sub> for photosynthesis'<br/>the mention of gas exchange implies that the CO<sub>2</sub> must be going in</p> <p><b>2a</b> <b>DO NOT CREDIT</b> 'CO<sub>2</sub> fixed' without further qualification (eg ref to Rubisco / GP formation)</p> <p><b>2b</b></p> <p><b>2c</b> <b>CREDIT</b> with fewer stomata CO<sub>2</sub> is limiting</p> <p><b>2d</b></p> <p><b>1b</b> <b>DO NOT CREDIT</b> description of transpiration<br/><b>ACCEPT</b> 'plant less likely to wilt'</p> <p><b>2e</b></p> <p><b>2f</b></p> |

| Question     |     | Expected Answers | Marks   | Additional Guidance  |
|--------------|-----|------------------|---|--|
| 6            | (c) |                  |   | <b>DO NOT CREDIT</b> refs to controlling temperature<br>or light or wind or time |
|              |     | 1                | equal sample size for sun and shade leaves /<br>increase sample size of shade leaves /<br>greater numbers of sun and shade leaves ; | 1  |
|              |     | 2                | measure thickness of cuticle /<br>make cuticle observations quantitative ;  | 2  |
|              |     | 3                | record range / calculate SD / calculate SE /<br>(named) statistical analysis ;  | 3  |
|              |     | 4                | record data on leaf,<br>length / width / area / colour / chlorophyll content ;  | 4  |
|              |     | 5                | record data on ,<br>size of stomata / stomatal count on upper surface ;   | 5  |
|              |     | 6                | define what is a sun or shade leaf /<br>measure light levels to classify type of leaf ;   | 6  |
|              |     | 7                | repeat / replicate , the (whole) experiment /<br>using other plants of the same species ;   | 7  |
| <b>TOTAL</b> |     |                  | <b>2 max</b>  |  |
|              |     |                  | <b>6</b>  |  |