

Question	Answer	Mark	Guidance										
4(a)(i)	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Important role</th> <th>Ion</th> </tr> </thead> <tbody> <tr> <td>Production of nitrate ions by bacteria</td> <td><math>\text{NH}_4^+</math></td> </tr> <tr> <td>Loading of phloem</td> <td><math>\text{H}^+</math></td> </tr> <tr> <td>DNA structure</td> <td><math>\text{PO}_4^{3-}</math></td> </tr> <tr> <td>Cofactor for amylase</td> <td><math>\text{Cl}^-</math></td> </tr> </tbody> </table> <p style="text-align: right;">✓ ✓</p>	Important role	Ion	Production of nitrate ions by bacteria	$\text{NH}_4^+$	Loading of phloem	$\text{H}^+$	DNA structure	$\text{PO}_4^{3-}$	Cofactor for amylase	$\text{Cl}^-$	2	<p><b>Additional incorrect answer in a cell = 0 marks</b></p> <p>Symbols must be fully correct</p> <p>all three correct = 2 marks</p> <p>one or two correct = 1 mark</p> <p>none correct = 0 marks</p>
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4(a)(ii)	<p>at arterial end  <b>AND</b>            hydrostatic / 4.6, is <b>greater</b> than, oncotic / –3  <b>AND</b>            (fluid / plasma) moves, <b>out</b> / from, (capillary) ✓</p> <p>at venous end  <b>AND</b>            hydrostatic / 2.3, is <b>lower</b> than, oncotic / –3  <b>AND</b>            (tissue fluid) moves <b>into</b> (capillary) ✓</p>	2	<p>Statements must:</p> <ul style="list-style-type: none"> <li>• <b>name the end</b> of the capillary</li> <li>• make a <b>comparative</b> statement about the two pressures in the capillary (using name or number)</li> <li>• state the <b>direction of movement</b> of fluid.</li> </ul> <p><b>ALLOW</b> bigger / higher / more, for ‘greater’  <b>ALLOW</b> ORA oncotic / –3, less than hydrostatic / 4.6</p> <p><b>ALLOW</b> ORA fluid moves into tissues  <b>IGNORE</b> osmosis</p> <p><b>ALLOW</b> smaller / less, for ‘lower’  <b>ALLOW</b> ORA oncotic / –3, more than hydrostatic / 2.3</p> <p><b>ALLOW</b> ORA fluid moves, out of / from, tissues  <b>IGNORE</b> osmosis</p>										

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4(b)(i)	<p>1 inhibitor binds to, allosteric site / enzyme away from active site ✓</p> <p>2 changes, tertiary / 3D, structure of, enzyme / active site / protein  <b>OR</b>  <u>active site</u> no longer <u>complementary</u> to substrate  <b>OR</b>  substrate and, enzyme / active site, cannot, bind / fit (together)  <b>OR</b>  E-S complex cannot form ✓</p>	2	<p><b>ALLOW</b> catalase for 'enzyme' throughout  <b>ALLOW</b> hydrogen peroxide / H<sub>2</sub>O<sub>2</sub>, for 'substrate' throughout</p> <p><b>ALLOW</b> joins / fits into, for 'binds'  <b>ALLOW</b> shown on diagram</p> <p><b>ALLOW</b> conformation / shape for 'structure'  <b>IGNORE</b> denatures</p>
4(b)(ii)	<p>1 downward-sweeping curve showing negative correlation drawn ✓</p> <p>2 x axis label = conc(entration) of copper sulfate in moles dm<sup>-3</sup></p> <p><b>AND</b></p> <p>y axis label = <u>vol(ume)</u> of oxygen (gas produced) in cm<sup>3</sup> ✓</p>	2	<p><b>DO NOT ALLOW</b> straight line or plotted points that are not joined. Curve may level off at end. Allow 'dot-to-dot' curve.</p> <p><b>ALLOW</b> CuSO<sub>4</sub> / copper sulphate, for 'copper sulfate'  <b>ALLOW</b> slash before unit / slash or 'per' in the unit / brackets round unit  <b>ALLOW</b> variant symbols: M <b>OR</b> moles L<sup>-1</sup> <b>OR</b> moles / L  <b>OR</b> mol dm<sup>-3</sup></p> <p><b>ALLOW</b> O<sub>2</sub> for 'oxygen'</p>

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4(b)(iii)	<p><i>(trend described)</i>  <b>1</b> as (concentration of) copper, sulphate / ions, <b>increases</b>,            (volume of) oxygen / H<sub>2</sub>O<sub>2</sub> breakdown, <b>decreases</b> ✓</p> <p><i>(conclusion / inference, about activity of enzyme)</i>  <b>2</b> copper, sulphate / ions, inhibit(s) / decrease(s), <u>catalase</u> activity ✓</p> <p><i>(detail)</i>  <b>3</b> at high concentrations / 0.15 / 0.20  <b>EITHER</b>            most enzymes, (irreversibly / already) damaged / inhibited  <b>OR</b>            adding more copper (sulphate / ions) has little effect ✓</p>	2 max	<p><b>ALLOW</b> AW for 'decrease' e.g. reduce / decline / drop / fall  <b>ALLOW</b> AW for 'increase' e.g. go up / rise / climb</p> <p><b>ALLOW</b> AW so long as inverse trend is still made clear by use of comparative terms such as: increases / decreases, higher / lower, more / less</p> <p>E.g. <i>'when there is more CuSO<sub>4</sub>, less oxygen is produced'</i></p> <p><b>ALLOW</b> ORA, e.g. <i>'the lower the concentration of Cu<sup>2+</sup> the higher the volume of oxygen produced'</i></p> <p><b>IGNORE</b> <i>'disturbs the action of catalase'</i></p>

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4(b)(iv)	<p>1 compare / measure / test, catalase activity / oxygen produced ✓</p> <p>2 experimental detail ✓</p> <p>3 further experimental detail ✓</p> <p>4 less, oxygen / catalase (activity), means more, copper / pollution ✓</p> <p>5 use, Table 4 / graph, to estimate copper (ion) concentration ✓</p>	3 max	<p><b>IGNORE</b> how much oxygen is in each fish <b>IGNORE</b> how much catalase is in each fish</p> <p><i>experimental detail points:</i> <b>ALLOW</b> AW throughout <b>IGNORE</b> amount throughout</p> <p><b>i</b> prepare a , catalase / fish / tissue, extract / sample (e.g. ref. pestle and mortar / chopping / liquidiser)</p> <p><b>ii</b> equal / known / controlled, volume / sized samples (of fish / tissue / extract)</p> <p><b>iii</b> equal / known / controlled, concentration / volume, of hydrogen peroxide</p> <p><b>iv</b> measure, volume of, oxygen / gas, in a given time</p> <p><b>v</b> use gas syringe / collect gas under water</p> <p><b>ALLOW</b> correct statement of relationship between copper or pollution <b>and</b> oxygen <b>or</b> amount of catalase present <b>or</b> catalase activity <b>even if wrong experiment is done</b> (e.g. adding catalase or copper sulphate to fish) or measuring 'how much oxygen is in fish'</p>