

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(a)(i)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>(small pieces) provides large surface area to volume ratio (1)</li> <li>(use of ethanol for a long time means) the antibacterial substance is soluble in ethanol and more will be extracted (1)</li> </ul>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(a)(ii)</b>	<p><math>\pi \times 2.15^2</math> (1)</p> <p>14.5 cm<sup>2</sup> (1)</p>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(b)(i)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>the <i>t</i>-test assess the significance of the difference between the means of the two treatments (1)</li> <li>Chi squared not appropriate because there are no expected values (1)</li> <li>correlation coefficient not appropriate because the independent variable is discontinuous / not continuous (1)</li> </ul>		<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(b)(ii)</b>	$2.37^2 \div 9 = 0.62$ and $3.60^2 \div 9 = 1.44$ (1)  $\sqrt{(0.62 + 1.44)} = 1.44$ (1)  $(27 - 25) \div 1.44 = t = 1.39$ (1)	Correct answer gains full marks	<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(b)(iii)</b>	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• there is no significant difference between the clear area caused by garlic compared with that caused by chloramphenicol (1)</li> <li>• <math>p &gt; 0.05</math> (1)</li> <li>• difference due to chance (1)</li> <li>• therefore accept null hypothesis (1)</li> </ul>	Allow marking points for the calculated value of $t$ from the candidate	<b>(4)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(c)(i)</b>	An explanation that makes reference to the following: <ul style="list-style-type: none"> <li>suggests cedar wood oil has no anti-microbial effect on <i>E. coli</i> and all other oils do (1)</li> <li>quoting at least two values from: rosemary 2%, geranium 0.5%, garlic 0.125% / manipulation of data to show relative effects (1)</li> </ul>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(c)(ii)</b>	An answer that makes reference to the following: <ul style="list-style-type: none"> <li>for cedar wood oil try concentrations above 4% (1)</li> <li>for all the others, try concentrations below 0.0625% (1)</li> </ul>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>12(c)(iii)</b>	A description that makes reference to the following: <ul style="list-style-type: none"> <li>only one tray per species – need repeated measurements (1)</li> <li>species – only used one species of bacteria / only used extracts from four plant species (1)</li> </ul>		<b>(2)</b>

(Total for Question 12 = 20 marks)