

Question Number	Answer	Mark
<b>1(a)(i)</b>	13.1 ;	<b>(1)</b>

Question Number	Answer	Mark
<b>1(a)(ii)</b>	16.0 / 16 (%) ;	<b>(1)</b>

Question Number	Answer	Mark
<b>1(a)(iii)</b>	mitochondria / mitochondrion ;	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
<b>1(a)(iv)</b>	<ol style="list-style-type: none"> <li>1. idea of more sperm (cells) with defective flagella ;</li> <li>2. idea that flagella needed to move sperm (cells) ;</li> <li>3. idea of more sperm (cells) with defective mid-piece ;</li> <li>4. idea that if mitochondria are affected there is no { respiration / energy / ATP } ( for movement of flagella ) ;</li> </ol>	<ol style="list-style-type: none"> <li>1. needs to be comparative ACCEPT only 4% in control</li> <li>2. ACCEPT swim</li>   <li>4.ACCEPT damaged or fewer mitochondria ACCEPT less energy, less respiration or less ATP</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
<b>1(b)</b>	<ol style="list-style-type: none"> <li>1. ( acrosome contains) { acrosin / enzyme / eq } ;</li> <li>2. Reference to acrosome reaction ;</li> <li>3. idea that { zona pellucida / jelly layer } needs to be digested ;</li> <li>4. sperm (cell) needs to { reach / fuse with } cell (surface) membrane of egg / eq ;</li> </ol>	3. ACCEPT broken down	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
<b>1(c)</b>	<ol style="list-style-type: none"> <li>1. idea that smoking causes { damage to sperm / infertility } ;</li> <li>2. idea of smoking as a variable to be controlled ;</li> <li>3. idea of making sure that any effects were due to globozoospermia OR idea of difficulty in distinguishing between genetic and environmental factors ;</li> </ol>	3. e.g. difficult to tell if it was due to smoking or disease	<b>(3)</b>

Question Number	Answer	Mark
2(a)(i)	B (between 12 and 15 hours) ;	(1)

Question Number	Answer	Mark
2(a)(ii)	D (phytochrome) ;	(1)

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	any two of the following standardised: water / eq mineral ion concentrations / eq light intensity / eq wavelength of light CO <sub>2</sub> concentration, temperature pH soil type ;	IGNORE seed  ACCEPT named mineral ion	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(iv)	idea of using shorter time intervals e.g. 1 hour intervals ;	ACCEPT a description e.g. repeat with 12 hours of light, 13 hours, etc Ignore ref to more data collected unqualified	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)	any one from: temperature water availability the {wavelength / quality} of light intensity of light {edaphic / named edaphic} factor ;	IGNORE ref to pollinators	(1)

Question Number	Answer	Additional Guidance	Mark
2(c) (i)	outer segment / internal membranes / inner membranes / vesicles ;	IGNORE ref to top, end, outer layer	(1)

Question Number	Answer	Additional Guidance	Mark															
2(c) (ii)	<table border="1"> <thead> <tr> <th rowspan="2">Description</th> <th colspan="3">Statement</th> </tr> <tr> <th>Opsin binds to the rod cell membrane</th> <th>Rhodopsin bleaches</th> <th>ATP used</th> </tr> </thead> <tbody> <tr> <td>Rhodopsin responding to light</td> <td>✓</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>Rhodopsin being reset</td> <td>✗</td> <td>✗</td> <td>✓</td> </tr> </tbody> </table> <p>Any two correct for 1 mark ;</p>	Description	Statement			Opsin binds to the rod cell membrane	Rhodopsin bleaches	ATP used	Rhodopsin responding to light	✓	✓	✗	Rhodopsin being reset	✗	✗	✓	IGNORE blank boxes IGNORE hybrid tick/crosses (✓)	(3)
Description	Statement																	
	Opsin binds to the rod cell membrane	Rhodopsin bleaches	ATP used															
Rhodopsin responding to light	✓	✓	✗															
Rhodopsin being reset	✗	✗	✓															

Question Number	Answer	Mark
<b>3* (a) QWC</b>	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. idea that there is a cascade of events (leading to blood clotting) ;</li> <li>2. ref to <i>thromboplastin</i> (starting the cascade) ;</li> <li>3. ref to conversion of <i>prothrombin</i> into <i>thrombin</i> ;</li> <li>4. idea that {<i>thromboplastin / thrombin</i>} is {an enzyme / a catalyst} ;</li> <li>5. ref to conversion of <i>fibrinogen</i> into <i>fibrin</i> ;</li> <li>6. ref to formation of mesh of {fibres / <i>fibrin</i>} ;</li> <li>7. ref to requirement of {calcium ions/ <math>\text{Ca}^{2+}</math> / vitamin K} ;</li> <li>8. ref to {<i>platelets</i> / blood cells} getting trapped (in the mesh) ;</li> </ol>	<b>maximum (4)</b>

Question Number	Answer	Mark
<b>3(b)(i)</b>	<ol style="list-style-type: none"> <li>1. snake venom decreases the clotting time /eq ;</li> <li>2. (overall) as mass of snake venom increases the clotting time decreases /eq ;</li> <li>3. idea that only a very small increase (0.004) in mass causes very sharp drop in clotting time ;</li> <li>4. concentrations above {0.004 /0.02} cause little change in clotting time / eq ;</li> <li>5. credit correct use of manipulated figures ;</li> </ol>	<b>maximum (3)</b>

Question Number	Answer	Mark
3(b) (ii)	<p>idea of one of the following:</p> <p>if the snake venom has similar effects as a known clotting factor an idea of its mode of action can be worked out /</p> <p>how deadly the snake is /</p> <p>compare to normal (clotting) process /</p> <p>possible use as medication /</p> <p>for research into antidotes / eq ;</p>	(1)

Question Number	Answer	Mark
3(c) (i)	<ol style="list-style-type: none"> <li>1. ref to an enzyme as a protein ;</li> <li>2. ref to {3D / tertiary / globular} structure ;</li> <li>3. ref. to named bonds (holding structure in place) ;</li> <li>4. between the R groups ;</li> <li>5. ref to active site ;</li> <li>6. idea of specificity of active site ;</li> </ol>	maximum (3)

Question Number	Answer	Mark
3(c)(ii)	<ol style="list-style-type: none"> <li>1. it is one of the enzymes /similar to one of the enzymes, in the clotting process / eq ;</li> <li>2. idea that has active site complementary to one of the substrates ;</li> <li>3. ref to it activating other enzymes ;</li> <li>4. ref to effect on platelets ;</li> <li>5. idea that it triggers the clotting process ;</li> </ol>	maximum (2)