

Question Number	Answer	Mark
1(a)(i)	A ; cerebrum	(1)

Question Number	Answer	Mark
1(a)(ii)	C ; hypothalamus	(1)

Question Number	Answer	Additional Guidance	Mark												
1(b)(i)	<table border="1"> <thead> <tr> <th>Stage</th> <th>Voltage-gated K<sup>+</sup> channel open</th> <th>Voltage-gated K<sup>+</sup> channel closed</th> <th>Voltage-gated Na<sup>+</sup> channel closed</th> </tr> </thead> <tbody> <tr> <td>Depolarisation</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Repolarisation</td> <td>✓</td> <td></td> <td>✓</td> </tr> </tbody> </table>	Stage	Voltage-gated K <sup>+</sup> channel open	Voltage-gated K <sup>+</sup> channel closed	Voltage-gated Na <sup>+</sup> channel closed	Depolarisation		✓		Repolarisation	✓		✓	3 columns correct = 2 marks 2 columns correct = 1 mark	(2)
Stage	Voltage-gated K <sup>+</sup> channel open	Voltage-gated K <sup>+</sup> channel closed	Voltage-gated Na <sup>+</sup> channel closed												
Depolarisation		✓													
Repolarisation	✓		✓												

Question Number	Answer	Mark
1(b)(ii)	A ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	In sensory neurone: 1. dendron longer;  2. dendron myelinated ;  3. axon shorter ;  4. { cell body / eq } { not at the end / towards the middle / to the side / eq } ;  5. reference to no { motor end plate / eq } ;	ALLOW converse for motor neurone  4. <b>ACCEPT</b> centron / nucleus for cell body	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)	<ol style="list-style-type: none"> <li>1. idea that opsin uncouples from the (rod cell) cell surface membrane ;</li> <li>2. trans retinal {converts / eq} to cis retinal ;</li> <li>3. rhodopsin is (re)formed / eq ;</li> <li>4. from opsin and retinal ;</li> <li>5. idea that this results in dark adaptation ;</li> <li>6. permeability of the cell surface membrane to <math>\text{Na}^+</math> increases / eq ;</li> <li>7. hyperpolarisation of cell decreases / eq ;</li> <li>8. (more) neurotransmitter is released / eq ;</li> </ol>	<p><b>NB IGNORE</b> <i>references to bipolar neurone responses</i>  <b>IGNORE</b> reference to retinol</p> <p><b>6. ACCEPT</b> <math>\text{Na}^+</math> {enters /channels unblocked / channels open}  <b>7. ACCEPT</b> (partial) depolarisation / reduced potential difference  <b>8. ACCEPT</b> glutamate for neurotransmitter</p>	<b>(5)</b>

Question Number	Answer	Additional Guidance	Mark
2 (b) (i)	<ol style="list-style-type: none"> <li>1. mean peak voltage increases as light intensity increases up to 9 AU / eq ;</li> <li>2. idea of {non linear increase / increase decreases} ;</li> <li>3. no further increase in change in mean peak voltage as light intensity increases from 9AU / eq ;</li> </ol>	<p><b>IGNORE</b> speed references</p> <p><b>2. ACCEPT</b> greatest change is mean peak voltage is when light intensity increases from 1 to 3</p>	<b>(2)</b>

Question Number	Answer		Mark
2 (b) (ii)	<p><i>As light intensity increases up to 9AU</i></p> <ol style="list-style-type: none"> <li>idea that the greater the light intensity, the less {neurotransmitter/eq} there is binding to the neurone present ;</li> <li>idea that inhibition removed e.g. (more) Na<sup>+</sup> channels open, (more) Na<sup>+</sup> diffuses into neurone ;</li> <li>so peak voltage of depolarisation becomes more positive / eq ;</li> </ol> <p><i>At high light intensities (from 9AU) :</i></p> <ol style="list-style-type: none"> <li>idea of no {neurotransmitter/eq} binding ;</li> <li>sufficient Na<sup>+</sup> enters / eq ;</li> <li>so action potential achieved ;</li> </ol>	<p><b>NB ACCEPT</b> glutamate for neurotransmitter <b>ACCEPT</b> converse for decreasing light intensity</p> <p><b>3 ACCEPT</b> increasing depolarisation</p> <p><b>5 ACCEPT</b> threshold potential achieved</p>	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
2(c)	<ol style="list-style-type: none"> <li>idea of rats have rights ;</li> <li>rats made {blind/ eq } ;</li> <li>15 samples may not be sufficient for a reliable investigation / eq ;</li> <li>idea that rat retina may not behave like human retina (so investigation has no (potential) medical application) ;</li> </ol>	<ol style="list-style-type: none"> <li><b>ACCEPT</b> lack of consent given</li> <li><b>ACCEPT</b> harmed, causes pain, requires killing rats</li> <li><b>ACCEPT</b> tissue culture available</li> </ol>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark									
3 (a)	<table border="1"> <thead> <tr> <th>Labelled structure</th> <th>Name of structure</th> <th>One function of labelled structure</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>cerebellum ;</td> <td>Coordinates movement / balance / posture / fine motor control ;</td> </tr> <tr> <td>D ;</td> <td>Hypothalamus ;</td> <td>thermoregulation</td> </tr> </tbody> </table>	Labelled structure	Name of structure	One function of labelled structure	A	cerebellum ;	Coordinates movement / balance / posture / fine motor control ;	D ;	Hypothalamus ;	thermoregulation		(4)
Labelled structure	Name of structure	One function of labelled structure										
A	cerebellum ;	Coordinates movement / balance / posture / fine motor control ;										
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Question Number	Answer	Additional guidance	Mark
3(b)	<ol style="list-style-type: none"> <li>1. Heat (energy) from blood in capillaries / eq ;</li> <li>2. Absorbed by sweat ;</li> <li>3. Used to break H bonds in water ;</li> <li>4. Ref to latent heat ;</li> <li>5. (So) water evaporates ;</li> <li>6. Taking heat from the body / eq ;</li> </ol>		(3)

Question Number	Answer	Additional guidance	Mark
3(c) (i)	<ol style="list-style-type: none"> <li>1. Ref to arrival of { impulse / action potential / eq } ;</li> <li>2. Calcium ion { channels / eq } open in { pre-synaptic membrane / brain cell membrane / eq } ;</li> <li>3. Calcium ions enter (brain cell) through { diffusion / down concentration gradient } ;</li> <li>4. Causes (glutamate-rich) vesicles to { move towards / fuse with} pre-synaptic membrane / eq ;</li> <li>5. {Neurotransmitter / glutamate} release through exocytosis ;</li> </ol>		(4)

Question Number	Answer	Additional guidance	Mark
3 (c) (ii)	<ol style="list-style-type: none"> <li>1. Idea that the damaged areas can be identified on MRI scan ;</li> <li>2. Idea that these damaged areas are known to be areas associated with the release of glutamate ;</li> <li>3. Comparison with and without domoic acid ;</li> </ol>	3. ACCEPT in terms of brain regions or sea lions	(2)

Question Number	Answer	Mark
<b>4(a)(i)</b>	B ;	<b>(1)</b>

Question Number	Answer	Mark
<b>4(a)(ii)</b>	C ;	<b>(1)</b>

Question Number	Answer	Mark
<b>4(b)</b>	D ;	<b>(1)</b>

Question Number	Answer	Mark
<b>4(c)</b>	A ;	<b>(1)</b>

Question Number	Answer	Mark
<b>4(d)</b>	C ;	<b>(1)</b>

Question Number	Answer	Mark
<b>4(e)</b>	D ;	<b>(1)</b>