

A Level AQA Biology

19 Nervous co-ordination – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	sodium ion channels are stretch-mediated / open when (receptor) membrane is stretched; sodium ions diffuse into receptor / neurone; (receptor membrane is) depolarised; generator potential; action potential passes along sensory neurone;	Accept 'Na ⁺ ' for 'sodium' throughout	3 max	AO1 3.6.1.2 3.6.2.1
01.2	molecule binds to (olfactory) receptor; receptor molecule changes shape; sodium ion channel opens; sodium ions diffuse into receptor / neurone;	Accept 'Na ⁺ ' for 'sodium' throughout	3 max	AO2 3.6.1.2 3.6.2.1
01.3	receptors have different binding sites / shapes / conformations / structures; <i>idea of each binding site is , specific / complementary , to a particular molecule;</i>		2	AO2 3.6.1.2
01.4	depolarisation of receptor membrane / generator potential; action potential passes along sensory neurone; <i>idea of brain interprets nerve impulses as pain;</i>		3	AO2 3.6.1.2 3.6.2.1
02.1	cell body not at the end of axon; cell body not surrounded by dendrites; dendron present;	Accept all other suitable answers Accept all other suitable answers	2 max	AO1 3.6.2.1
02.2	myelination increases conduction speed; <i>idea that conduction speed is positively correlated with axon diameter;</i> (increase in) axon diameter has greater effect in myelinated neurones; <i>idea that relationship between axon diameter and conduction speed is (almost/ approximately) directly proportional in myelinated neurones;</i>	Or reverse argument	3 max	AO3 3.6.2.1
02.3	'conduction speed (m/s)' on <i>y</i> -axis AND 'diameter of axon (μm)' on <i>x</i> -axis; appropriate scale; all data points accurate to within half a grid unit AND suitable line of best fit;		3	AO2 3.6.2.1

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02.4	(myelin provides) electrical insulation; saltatory conduction; <i>idea that</i> depolarisation only occurs at nodes of Ranvier;		2 max	AO1 3.6.2.1
02.5	increased kinetic energy of ions;	Accept all other suitable answers	1	AO1 3.6.2.1
03.1	sodium-potassium pump; 3 Na ⁺ ions pumped out (of neurone) for every 2 K ⁺ ions pumped in; (some) K ⁺ ion channels remain open / (some) K ⁺ ions leak back out of the neurone; potential difference of -70 mv;	Accept 60–75 mv	3 max	AO1 3.6.2.1
03.2	<i>idea of</i> different concentrations or activity of sodium-potassium pumps; <i>idea of</i> different concentrations of K ⁺ ion channels;		1 max	AO2 3.6.2.1
03.3	<i>Purkyne neurone has</i> lower / less positive , action potential peak; shorter duration of action potential / faster repolarisation; more frequent action potentials; <i>Purkyne neurone has a refractory period AND CA1 has no clear refractory period;</i>	Accept reverse arguments for the CA1 neurone throughout	3 max	AO2 3.6.2.1
03.4	<i>idea that</i> stimulus must be above threshold value to produce action potential; action potential always the same , magnitude / shape (in a particular type of neurone);		2	AO1 3.6.2.1
04.1	<i>idea of</i> ensuring impulses travel in one direction; <i>idea of</i> (multiple postsynaptic neurones allows) signals to be passed to many effectors; spatial summation / described; temporal summation / described; <i>idea of</i> (summation) allows indication of stimulus strength;		3 max	AO1 3.6.2.2

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04.2	3 marks for correct order of: 1 3 6 4 2 5	If 3 marks are not awarded, allow one mark for 1 and 2 being in the correct boxes and one mark for 5 and 6 being in the correct boxes.	3	AO1 3.6.2.2
04.3	acetylcholinesterase; hydrolyses / breaks down , acetylcholine; (forming) choline and ethanoic acid; (which) diffuse back into presynaptic neurone;		3 max	AO1 3.6.2.2
05.1	no / fewer , nerve impulses; stops , sodium ions diffusing into neurones / depolarisation of neurones; no action potentials;		2 max	AO2 3.6.2.1
05.2	more exocytosis of dopamine into synaptic clefts; more dopamine binds to receptors on postsynaptic membranes; more action potentials in postsynaptic neurones;		2 max	AO2 3.6.2.2
05.3	(more) dopamine remains in synaptic clefts; (dopamine) (re)binds to postsynaptic receptors; more action potentials in postsynaptic neurones;		2 max	AO2 3.6.2.2
05.4	fewer acetylcholine molecules can to postsynaptic receptors; fewer action potentials in postsynaptic neurones;		2	AO2 3.6.2.2
06.1	sinoatrial; atrioventricular; Purkyne;	Accept Purkinje	3	AO1 3.6.1.3

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06.2	<p>similarities neurotransmitter is acetylcholine; (acetylcholine) receptors on postsynaptic membrane; causes (postsynaptic) depolarisation;</p> <p>differences synapse is between two neurones AND NMJ is between neurone and muscle; presynaptic neurone varies in synapse AND presynaptic neurone is motor neurone in NMJ; synapse produces (postsynaptic neurone) action potential AND NMJ produces muscular contraction / depolarisation of sarcolemma;</p>		5 max	AO1 3.6.2.2														
07	<p>The following are suitable topic areas from the specification that could be used to describe the role of the nervous system in homeostasis.</p> <p>In order to fully address the question and reach the highest mark bands students must also include at least five topics in their answer, to demonstrate a synoptic approach to the essay.</p> <table border="1"> <thead> <tr> <th>Specification reference</th> <th>Topic area</th> </tr> </thead> <tbody> <tr> <td>3.3.2</td> <td>Gas exchange</td> </tr> <tr> <td>3.3.4.1</td> <td>Mass transport in animals</td> </tr> <tr> <td>3.6.1.2</td> <td>Receptors</td> </tr> <tr> <td>3.6.1.3</td> <td>Control of heart rate</td> </tr> <tr> <td>3.6.2.1</td> <td>Nerve impulses</td> </tr> <tr> <td>3.6.2.2</td> <td>Synaptic transmission</td> </tr> </tbody> </table>	Specification reference	Topic area	3.3.2	Gas exchange	3.3.4.1	Mass transport in animals	3.6.1.2	Receptors	3.6.1.3	Control of heart rate	3.6.2.1	Nerve impulses	3.6.2.2	Synaptic transmission		25	AO1 AO2 3.3.2 3.3.4.1 3.6.1.2 3.6.1.3 3.6.2.1 3.6.2.2 3.6.4.1 3.6.4.3
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	<table border="1"> <tr> <td>3.6.4.1</td> <td>Principles of homeostasis</td> </tr> <tr> <td>3.6.4.3</td> <td>Control of blood water potential</td> </tr> </table> <p>Students may be able to show the relevance of other topics from the specification.</p> <p>Note: other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.</p>	3.6.4.1	Principles of homeostasis	3.6.4.3	Control of blood water potential			
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3.6.4.3	Control of blood water potential							

Skills box answers

Question	Answer
1	x400
2a	400 mm
2b	2500 mm
2c	0.0006 mm
2d	0.0001 mm
3	45 km
4	2 μ l
5	25 000 mm ³