

APOLLO

Neural signalling

HL

Biology

First assessment 2025

16 questions | mark schemes

Mark-scheme answers

Biology HL | Paper 1A | May 2025 TZ1 | Q17 | 1 marks

17. B

Biology HL | Paper 1A | May 2025 TZ1 | Q18 | 1 marks

18. A

Biology HL | Paper 1A | May 2025 TZ1 | Q26 | 1 marks

26. B

Biology HL | Paper 1A | May 2025 TZ2 | Q17 | 1 marks

17. C

Biology HL | Paper 1A | May 2025 TZ3 | Q17 | 1 marks

17. D

Biology HL | Paper 1A | May 2025 TZ3 | Q18 | 1 marks

18. D

3.	a	a. (voltage-gated) potassium channels are closed when there is a negative membrane potential / when there are (relatively) more negative charges inside / (relatively) more positive charges outside; b. (voltage-gated) potassium channels open after depolarization of the axon / after closing of sodium channels / when a positive membrane potential develops / at +30mV / at +40mV; c. K^+ ions diffuse out of the cell / efflux of K^+; d. (efflux of K^+) causes/results in/happens during repolarization / membrane potential returns to -70mV/ to the resting potential; e. (voltage-gated) potassium channels close again (to terminate the action potential) OR globular protein ball (attached by a flexible chain of amino acids) blocks/closes the channel; f. (following an action potential) hyperpolarization can occur (due to slow closing of potassium channels / continued efflux of K^+ before potassium channels close / nature of potassium channels);		3 max
3.	b	neurotransmitter (gated ion channel) / ligand (gated ion channel) / mechanically (gated ion channel);	<i>Do not accept examples.</i>	1
3.	c	a. <u>hydrophobic</u> regions at the phospholipid tail and <u>hydrophilic</u> regions at the heads; b. (long) carbon chains are <u>hydrophobic</u> (water insoluble) and phosphate head is <u>hydrophilic</u> (water soluble);	<i>Both parts of the answer are needed.</i>	1 max
3.	d	a. modulates/adjusts/controls/regulates membrane fluidity; b. cholesterol stabilizes membranes/prevents membranes becoming too fluid/too porous at <u>higher temperatures</u>; c. cholesterol prevents membranes becoming viscous/inflexible/stiff/stiffening / cholesterol prevents solidification of saturated fatty acids at <u>lower temperature</u>;		1 max
3.	e	a. more unsaturated fatty acids more flexible/fluid; b. more saturated fatty acids less flexible/fluid;	<i>Accept vice versa</i>	1 max

Question	Answers	Notes	Total
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Mark-scheme answers

Biology HL | Paper 1A | Nov 2025 TZ1 | Q15 | 1 marks

15. B

Biology HL | Paper 1A | Nov 2025 TZ1 | Q18 | 1 marks

18. A

Biology HL | Paper 1A | Nov 2025 TZ1 | Q26 | 1 marks

26. A

Biology HL | Paper 1A | Nov 2025 TZ3 | Q18 | 1 marks

18. C

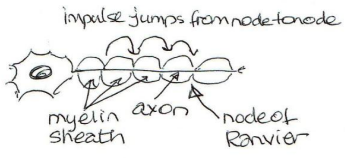
Biology HL | Paper 1A | Nov 2025 TZ3 | Q28 | 1 marks

28. C

3.	a		oscilloscope;		1
3.	b	i	a. SD is variability within a sample while the SE is the variability across samples of a population / OWTTE OR SD is for each sample/earthworm while SE for all the samples/earthworms; b. SD could be calculated from 5 repeats while for SE 30 replicates is (considered) acceptable; c. small SD shows data are clustered around the mean while small SE shows the sample mean is closer to the population mean / vice versa;	<i>Answers must make clear differences between the two.</i> <i>Do not accept references to experimental / human errors for SE.</i>	2 max
3.	b	ii	only one replicate/measurement / OWTTE;		1
3.	c	i	2.56 (faster) OR 256 % (faster);	<i>Significant figures conventions not expected, so 2.5, 2.5555 etc. is acceptable.</i>	1

– 9 –

8825 – 6008M

Question	Answers			Notes	Total
3.	c	ii	a. MGF has larger <u>diameter</u> (of axon than LGF) / vice versa OR MGF is wider (than LGF) / vice versa; b. MGF has (thicker) myelin sheath / vice versa;	<i>Mark only the first answer written</i> <i>Accept answers where MGF is implicit.</i> <i>a. Do not accept "longer".</i> <i>b. Accept "thicker myelin/more myelinated".</i>	1 max
3.	d		a. electric insulation of axon by myelin sheath; b. myelin sheath has nodes (of Ranvier); c. impulses jump/transmitted from node to node; d. ion pumps/channels are clustered at nodes (of Ranvier); e. faster (than in unmyelinated axon) / OWTTE; f. production of all-or-none action potentials by a single node (of Ranvier);	<i>b. Should be for explaining what the nodes are, marking point c. for "jumping", so awarding c. doesn't give marking point b. automatically.</i> <i>Accept correctly annotated diagrams.</i> 	3 max

– 10 –

8825 – 6008M

Question	Answers			Notes	Total
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8.	a	a. binds to the active site / inhibitor is complementary to the active site; b. prevent binding of substrate (so reducing enzyme activity/rate of reaction) OR fewer enzyme-substrate complexes form; c. inhibitor chemically similar/similar in shape/similar in structure to substrate d. statins are competitive inhibitors of HMG-CoA reductase/enzyme needed to make cholesterol; e. statins prevent conversion of HMG-CoA to mevalonate;	<i>Accept other examples for mark point d and mark point e such as:</i> <i>Oxygen binds to rubisco (d.) and preventing production of glycerate 3-phosphate (e.)</i> <i>Malonate binds to succinic dehydrogenase (d.), preventing production of fumarate (e.).</i> <i>Allow penicillin as a competitive inhibitor of transpeptidase/for bacterial cell wall production for mark point d, but not mark point e.</i>	4 max
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Question		Answers	Notes	Total
8.	b	a. depolarization/action potential in pre-synaptic membrane/pre-synaptic neuron causes release of neurotransmitter; b. by exocytosis/by fusion of vesicle with pre-synaptic membrane; c. neurotransmitter diffuses/travels across the synaptic cleft; d. neurotransmitter binds to receptors in postsynaptic membrane; e. (binding causes) ion/sodium/ligand-gated channels to open; f. post-synaptic membrane reaches threshold potential/depolarizes/action potential generated; g. neurotransmitter broken down / reabsorbed by presynaptic neuron OR exogenous chemicals/example of exogenous chemical not released from receptor/not broken down; h. exogenous chemicals can block/increase synaptic transmission; i. neonicotinoids bind to acetylcholine/neurotransmitter/post-synaptic <u>receptors</u>; j. excessive of Na⁺ enters post-synaptic neuron / Na⁺ channels remain open; k. cocaine binds to (dopamine) reuptake transporters; l. <u>dopamine</u> in the synaptic cleft continues to stimulate (post-synaptic neuron);	<i>Allow 'acetylcholine' instead of neurotransmitter in mark points a, c and d.</i> <i>Accept 'cause constant depolarization' instead of 'increase synaptic transmission' in mark point h.</i> <i>Mark point h. can be awarded for a specific example of blocking/increasing synaptic transmission.</i>	7 max

Question		Answers	Notes	Total
8.	c	a. HIV can be passed on/spread (by someone who is HIV positive); b. HIV invades/infests/destroys <u>helper</u> T-lymphocytes / <u>CD4 cells</u> ; c. all (helper/CD4) T-lymphocytes gradually/eventually destroyed; d. B-lymphocytes not (sufficiently) activated without T-lymphocytes; e. antibodies not produced (in sufficient quantity); f. immunity to new infections/pathogens cannot develop / antibodies not produced in response to new pathogens/antigens g. opportunistic infections cannot be controlled/eliminated / valid example of an opportunistic infection; h. AIDS/acquired immune deficiency syndrome (develops); i. rapid mutation rate in HIV so evades immune system/resists (anti-retroviral) drugs;	<i>Allow T-cells instead of T-lymphocytes and B-cells instead of B-lymphocytes.</i> <i>Mark point a is awarded for spread of HIV from an infected person, not for spread to an uninfected person, because the question asks about the consequences of infection.</i> <i>Do not award mark point f or mark point g for understatements such as 'reduced immunity'.</i>	4 max

Question	Answers	Notes	Total
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3.	a	a. saltatory conduction / nerve/electric impulse/action potential "jumps" from node (of Ranvier) to node (of Ranvier); b. myelin is an insulating material / does not allow ion exchange OR ion exchange / action potential only occurs at the nodes of Ranvier OR ion pumps/channels/Na⁺ and K⁺ channels clustered/more abundant/higher in numbers at nodes of Ranvier;		2
3.	b	a. both involve transport of particles down/along a concentration gradient OR both are passive / do not require energy/ATP; b. facilitated diffusion requires membrane proteins/channel proteins whereas simple diffusion does not OR facilitated diffusion moves hydrophilic/polar particles/ions/large molecules, whereas simple diffusion moves hydrophobic/non-polar particles/small molecules;	OWTTE For b. allow correct reference to gated ion channels.	2

– 10 –

8825 – 6021M

Question		Answers	Notes	Total
3.	c	a. prevent synaptic transmission; b. neonicotinoids act like / have similar structure to acetylcholine; c. neonicotinoids bind to <u>acetylcholine</u> receptors (in the post-synaptic membrane / in cholinergic synapses / between motor neuron and muscles); d. neonicotinoids are not broken down by acetylcholinesterase/enzymes; e. binding is irreversible OR receptors are blocked; f. the receptors are overstimulated OR acetylcholine cannot bind; g. paralyses/kills the insect;	<i>For c. accept ACh abbreviation.</i>	3 max

– 11 –

8825 – 6021M

Question	Answers	Notes	Total
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Mark-scheme answers

Biology HL | Paper 1A | Specimen 2025 | Q28 | 1 marks

28. D