

Question			Answer	Marks	Guidance
1	(a)	(i)	<p><i>increased blood pressure</i> B1 (small) blood vessels / capillaries, burst / break ;</p> <p>B2 bleeding causes (localised) build up of pressure (leading to cell death) or blood / oxygen , supply , reduced / stopped ;</p> <p>B3 cells cannot <u>respire</u> (leading to cell death) ;</p> <p><i>thrombosis</i> T1 thrombus / clot , interrupts / reduces, blood flow ; T2 (cells) deprived of , oxygen / glucose ; T3 cells cannot <u>respire</u> (leading to cell death) ;</p>	4 max	<p>B1 CREDIT haemorrhage / aneurism / arterioles / arteries B1 IGNORE veins / venules B1 IGNORE destroys / damages blood vessels B2 e.g. bleeding leads to cell compression</p> <p>B2 ACCEPT brain deprived of , oxygen / glucose</p> <p>B3 DO NOT ACCEPT <u>respire</u> less</p> <p>'Clot results in less oxygenated blood to cells' = T1 and T2</p> <p>T2 ACCEPT brain deprived of , oxygen / glucose T3 DO NOT ACCEPT <u>respire</u> less</p>
1	(a)	(ii)	<p><i>idea that</i> (if the stroke has been caused by a bleed) then the drug will, increase the bleeding / be ineffective as a treatment (to prevent bleeding) ;</p>	1	<p>e.g. 'the drug makes the problem worse'</p> <p>DO NOT CREDIT 'not effective in reduction of blood pressure'</p>
1	(a)	(iii)	<p><i>idea of</i> disruption of , oxygen / glucose , supply (to brain cells) for <u>aerobic respiration</u> ;</p> <p><i>lack of oxygen / glucose / blood / damage to</i></p> <p><u>cerebellum</u> resulting in problems with coordination / movement ;</p> <p><u>cerebrum</u> / <u>cerebral hemisphere(s)</u> / <u>cerebral cortex</u> , resulting in loss of , memory / speech ;</p> <p><u>medulla (oblongata)</u> / <u>cerebrum</u> / <u>cerebellum</u>, resulting in paralysis (of body below the neck) ;</p>	4	<p>Can be awarded at any point in the answer.</p> <p>Effect must be correctly linked to the part of the brain responsible.</p> <p>ACCEPT Broca's / Wernicke's, area / hippocampus</p> <p>ACCEPT cerebral hemisphere(s) / cerebral cortex / corpus callosum</p>

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1	(b)		<p><i>producing nicotine is (selectively) advantageous as</i></p> <p>A1 stops , plant being eaten / loss of leaf area ;</p> <p>A2 so plant , survives / does breed / (still) produces seeds;</p> <p>A3 <i>idea that</i> gene must be advantageous to be selected for</p> <p>or gene is linked to another gene that is selected for ;</p> <p><i>producing nicotine is (selectively) disadvantageous</i></p> <p>D1 decreases , reproductive success / number of seeds ;</p> <p>D2 metabolic resources diverted to nicotine production;</p>	3 max	<p>mp must be in correct context (ie advantage/ disadvantage) to be awarded</p> <p>A1 ACCEPT deters / kills, grazers / insects</p>
1	(c)	(i)	postsynaptic membrane(s) (in , neurone / neuromuscular junction) ;	1	<p>ACCEPT sarcolemma</p> <p>DO NOT CREDIT postsynaptic knob</p>

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1	(c)	(ii)	<p><i>Effect</i></p> <p>Nicotine slows down rate of / stops, transmission of, action potentials / nervous impulses;</p> <p>Plus any 2 of the following:</p> <p><i>Explain</i></p> <p>binds to <u>receptor</u>;</p> <p>(nicotine) has the same response / opens Na⁺ channels / causes depolarisation ;</p> <p>nicotine remains in receptor for longer ;</p> <p><i>idea that <u>receptor</u>,</i> remains in refractory stage for longer / unable to return to standby condition / cannot be reactivated ;</p>	3 max	<p>IGNORE 'nervous system slows down' / 'acts as a depressant'</p> <p>ACCEPT competes with acetylcholine for the <u>receptor</u> DO NOT CREDIT active site DO NOT CREDIT 'acts as competitive inhibitor' DO NOT CREDIT binds to receptor permanently</p> <p>ACCEPT causes action potential in next neurone / mimics, action / effects, of acetylcholine IGNORE 'mimics acetyl choline' alone</p> <p>IGNORE delays refractory stage ACCEPT permanently in refractory stage</p>

Question			Answer	Marks	Guidance
1	(d)	(i)	in xylem (by), cohesion-tension / transpiration (stream); in phloem (by), translocation / mass flow ;	2	ALLOW transport in phloem from roots only if clearly in the context of being associated with transport of (stored) assimilates from roots
1	(d)	(ii)	<i>idea that</i> neonicotinoids have , little / no , effect (on humans) ;	1	e.g. they don't harm humans neonicotinoids, do not bind/ not complementary, to receptors neonicotinoids broken down in digestion concentrations used in insecticides , very low / not high enough, to affect humans neonicotinoids not present in part of plant consumed by humans neonicotinoids break down before plant consumed
			Total	19	

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	<p><i>seedlings / coleoptiles have same</i></p> <p>S1 age ; S2 height / length ; S3 mass ; S4 genotype / genome ;</p> <p>S5 species ;</p> <p><i>procedure has same</i></p> <p>P1 same volume of solution applied ;</p> <p>P2 (named) feature of growth medium ;</p> <p>P3 watering regime ;</p> <p>P4 light , intensity / wavelength / duration ;</p> <p>P5 temperature ;</p>	3 max	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>S2 IGNORE size / surface area / width S3 IGNORE size / weight S4 ACCEPT same genetic makeup IGNORE same genes</p> <p>For all P points IGNORE light <i>direction</i> (as this is an independent variable)</p> <p>P1 IGNORE ref to concentration of solution ACCEPT <i>idea of consistency</i> in application of J and K</p> <p>P2 e.g. type / pH / fertiliser (applied) / minerals / ions IGNORE nutrients</p> <p>P3 e.g. volume of water / time of watering</p> <p>P4 e.g. distance from light source</p>

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(ii)	<p><i>idea that shows the response without treatment</i></p> <p>or</p> <p><i>idea that allows the , effect of the treatment / results / groups , to be , compared ;</i></p>	1	<p>IGNORE improves validity / fair test (as an explanation is required) 'to show the effects of J and K' is not enough</p> <p>CREDIT 'observations' for treatments</p>
2	(a)	(iii)	<p>ONLY CREDIT mark points in context of results, and not in context of general roles of auxin and gibberellin</p> <p><i>J is auxin because</i></p> <p>A1 inhibition of development of (lateral) buds (in group 2) ;</p> <p>A2 <u>growth</u> of , coleoptiles / group 5 , towards light ;</p> <p><i>K is gibberellin because</i></p> <p>G1 <u>greater</u> increase in , height / stem length (in group 3) ;</p> <p>G2 causes growth of (lateral) buds (in group 3) ;</p>	3 max	<p>J must be identified correctly for A marks to be awarded</p> <p>K must be identified correctly for G marks to be awarded</p> <p>A1 CREDIT (group2) results show apical dominance</p> <p>A2 CREDIT (group 5) results show positive phototropism</p> <p>IGNORE plant (as all are plants)</p> <p>G1 CREDIT greater elongation</p> <p>G2 CREDIT (group 3) results do not show apical dominance</p>
2	(b)	(i)	protein ;	1	<p>ACCEPT glycoprotein</p> <p>IGNORE polypeptide / channel / carrier / transport</p>
2	(b)	(ii)	(synaptic) <u>cleft</u> ;	1	<p>IGNORE gap</p> <p>IGNORE neuromuscular</p>
2	(b)	(iii)	acetylcholine esterase / ACh esterase ;	1	<p>ACCEPT phonetic spelling and ignore upper/lower case</p> <p>IGNORE AChE</p>

Question		Expected Answer	Mark	Additional Guidance
2	(c)	<p>mitochondria ;</p> <p>oxidative phosphorylation ;</p> <p>lactate ;</p> <p>creatine phosphate / phosphocreatine ;</p> <p>(cross-)bridge / (cross-)link ;</p> <p>myosin (head) ;</p>	6	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT mitochondrion DO NOT CREDIT mitochondrial matrix</p> <p>IGNORE electron transport chain (as not a stage)</p> <p>ACCEPT lactic acid</p> <p>DO NOT CREDIT creatinine</p> <p>DO NOT CREDIT bond ACCEPT phonetic spelling</p>
Total			16	

Question			Answer	Marks	Guidance
3	(a)	(i)	C ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(ii)	D ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(iii)	B / E ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(iv)	E ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
	(b)		<p>1 muscles <u>contract</u>, in antagonistic (pairs) ;</p> <p>2 tendons, pull on bone / connect muscle to bone ;</p> <p>3 ligaments, hold bones together / prevent dislocation ;</p> <p>4 cartilage, reduces, friction / wear ;</p> <p>5 synovial membrane secretes fluid ;</p> <p>6 <u>synovial</u> fluid, is a lubricant / allows smooth movement ;</p>	3	<p>1 CREDIT biceps and triceps or flexor and extensor contract</p> <p>IGNORE context of direction of movement</p> <p>4 ACCEPT 'prevents' for reduces</p> <p>5 ACCEPT makes, produces but not 'releases'</p> <p>6 ACCEPT prevents / reduces, friction</p>

Question		Answer	Marks	Guidance
(c)		<p>1 (two parts are) sympathetic and parasympathetic ;</p> <p>2 S has, short preganglionic neurone / long postganglionic neurone / ganglia near(er) spinal cord, but P has, long preganglionic neurone / short postganglionic neurone / ganglia near(er) organ ;</p> <p>3 S uses noradrenaline but P uses acetylcholine (at organ) ;</p> <p>4 S, fight / flight / stress, but P, rest / relaxation / calm ;</p> <p>5 S increases, heart rate / cardiac output / blood pressure, but P reduces this ;</p> <p>6 S increases , speed / rate / depth, of breathing, but P reduces this ;</p> <p>7 S increases airway diameter but P reduces it ;</p> <p>8 S increases blood flow to skeletal muscle but P increases blood flow to gut (smooth muscle) ;</p> <p>9 S for orgasm but P for sexual arousal ;</p> <p>10 S dilates pupils but P constricts pupils ;</p> <p>11 S makes liver release glucose, but P makes liver, store / take up, glucose ;</p> <p>12 P allows, <u>peristalsis</u> / digestion, but S reduces it ;</p>	7	<p>1 If BOTH names are wrong but begin with S and P, DO NOT CREDIT mp1 but allow ECF for mps 2-12</p> <p>2 ACCEPT tissue for organ</p> <p>3 CREDIT norepinephrine for noradrenaline but IGNORE noradrenaline from adrenal gland and IGNORE references to ganglion here</p> <p>6 CREDIT S increases ventilation rate and P slows it</p> <p>8 CREDIT voluntary or striated for skeletal IGNORE ORA</p> <p>11 ACCEPT correct reverse reasoning for glycogen IGNORE sugar 'liver' must be mentioned at least once</p> <p>12 IGNORE 'stops' for S but allow S inhibits</p>
		QWC ;	1	Award QWC if 1 mark awarded for organisation mps 1-3 and 2 marks awarded for functions mps 4-11
		Total	15	

Question			Answer	Marks	Guidance
4	(a)	(i)	<p>(both) to, avoid / counter, (abiotic) stress ;</p> <p>(both) to avoid, being eaten / predation ;</p> <p>(both) to access resources ;</p>	2	<p>Mark the first 2 reasons</p> <p>CREDIT to avoid named stressors e.g. cold, heat, dryness, humidity or unfavourable conditions only CREDIT descriptions relevant to both animals (avoiding a stressor) and to plants (closing stomata, wintering underground, etc). IGNORE survival and dangers unqualified</p> <p>only CREDIT descriptions relevant to both animals (being consumed, being preyed upon) and to plants (being grazed, herbivory).</p> <p>only CREDIT descriptions relevant to both animals (get food) and plants (obtain light, minerals, water)</p>
		(ii)	<p><i>all points must show a clear comparison between mammals (M) and plants (P)</i></p> <p>1 (M) made in <u>endocrine</u> glands versus (P) made in many plant tissues ;</p> <p>2 (M) move in blood versus (P) move, in xylem / in phloem / from cell to cell ;</p> <p>3 (M) act on, a few / specific / target, tissues versus (P) act on most tissues / can act in cells where produced ;</p> <p>4 (M) act <u>more</u> rapidly ; ORA</p>	3	<p>2(P) ACCEPT diffusion / through plasmodesmata, for 'from cell to cell'. ACCEPT by translocation / in transpiration stream IGNORE mass flow</p> <p>4 must be comparative e.g. respond faster in mammals</p>
	(b)	(i)	<p>inherited / passed to offspring / passed (down) from parents ;</p> <p>(caused by) <u>mutation</u> / <u>allele</u> ;</p>	2	<p>ACCEPT in context of condition or gene</p>

Question		Answer	Marks	Guidance
	(ii)	<p><u>gene</u> / <u>allele</u> ;</p> <p>(DNA) <u>ligase</u> ;</p> <p>transgenic / transformed ;</p> <p>antibiotic(s) ;</p> <p>(gene / DNA / fluorescent / radioactive) <u>probe</u> ;</p>	5	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT recombinant / GE / GM</p> <p>CREDIT named antibiotic e.g. ampicillin, tetracycline</p>
	(c)	<p>fat soluble / non-polar / uncharged / hydrophobic ;</p> <p>(so can move directly through) phospholipid bilayer ;</p>	2	<p>ACCEPT through phospholipids / through phospholipid membrane</p> <p>DO NOT CREDIT through pores</p>

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(d)	<p>EITHER</p> <p>1 (<i>lac</i>) <u>repressor protein</u> ;</p> <p>2 (repressor protein) changes shape when bound to lactose ;</p> <p>3 (with lactose) lifts off <u>operator</u> allowing, transcription / gene expression / binding of RNA polymerase to promoter ; ORA</p> <p>4 β-galactosidase / enzyme(s) / structural gene(s) ;</p> <p>OR</p> <p>5 homeotic / homeobox / hox (genes) ;</p> <p>6 gene product / protein / transcription factor, binds to DNA ;</p> <p>7 gene product / protein, starts transcription / is a transcription factor ;</p> <p>8 many genes affected / controls body plan ;</p>	4	<p>Mark the first example.</p> <p>3 ORA without lactose the protein binds to the <u>operator</u> stopping, transcription / gene expression / binding of RNA polymerase to promoter DO NOT CREDIT mp 3 if ref. made to DNA polymerase or DNA replication</p> <p>4 CREDIT lactose permease</p> <p>6 CREDIT homeobox domain / homeodomain, binds to DNA</p> <p>7 ACCEPT controls / regulates / stops, transcription</p> <p>8 CREDIT controls, development / segmentation</p>
	Total	18	