

Question			Answer	Marks	Guidance
1	(a)	(i)	<p><i>increased blood pressure</i>  <b>B1</b> (small) blood vessels / capillaries, burst / break ;</p> <p><b>B2</b> bleeding causes (localised) build up of pressure (leading to cell death)  <b>or</b>  blood / oxygen , supply , reduced / stopped ;</p> <p><b>B3</b> cells cannot <u>respire</u> (leading to cell death) ;</p> <p><i>thrombosis</i>  <b>T1</b> thrombus / clot , interrupts / reduces, blood flow ;  <b>T2</b> (cells) deprived of , oxygen / glucose ;  <b>T3</b> cells cannot <u>respire</u> (leading to cell death) ;</p>	4 max	<p><b>B1 CREDIT</b> haemorrhage / aneurism / arterioles / arteries  <b>B1 IGNORE</b> veins / venules  <b>B1 IGNORE</b> destroys / damages blood vessels  <b>B2</b> e.g. bleeding leads to cell compression</p> <p><b>B2 ACCEPT</b> brain deprived of , oxygen / glucose</p> <p><b>B3 DO NOT ACCEPT</b> <u>respire</u> less</p> <p>'Clot results in less oxygenated blood to cells' = <b>T1</b> and <b>T2</b></p> <p><b>T2 ACCEPT</b> brain deprived of , oxygen / glucose  <b>T3 DO NOT ACCEPT</b> <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><b>DO NOT CREDIT</b> '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><b>Can be awarded at any point in the answer.</b></p> <p><b>Effect must be correctly linked to the part of the brain responsible.</b></p> <p><b>ACCEPT</b> Broca's / Wernicke's, area / hippocampus</p> <p><b>ACCEPT</b> 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><b>A1</b> stops , plant being eaten / loss of leaf area ;</p> <p><b>A2</b> so plant , survives / does breed / (still) produces seeds;</p> <p><b>A3</b> <i>idea that</i> gene must be advantageous to be selected for</p> <p><b>or</b> gene is linked to another gene that is selected for ;</p> <p><i>producing nicotine is (selectively) disadvantageous</i></p> <p><b>D1</b> decreases , reproductive success / number of seeds ;</p> <p><b>D2</b> metabolic resources diverted to nicotine production;</p>	3 max	<p><b>mp must be in correct context ( ie advantage/ disadvantage) to be awarded</b></p> <p><b>A1 ACCEPT</b> deters / kills, grazers / insects</p>
1	(c)	(i)	postsynaptic membrane(s) (in , neurone / neuromuscular junction) ;	1	<p><b>ACCEPT</b> sarcolemma <b>DO NOT CREDIT</b> 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><b>Plus any 2 of the following:</b></p> <p><i>Explain</i></p> <p>binds to <u>receptor</u>;</p> <p>(nicotine) has the same response / opens Na<sup>+</sup> 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><b>IGNORE</b> 'nervous system slows down' / 'acts as a depressant'</p> <p><b>ACCEPT</b> competes with acetylcholine for the <u>receptor</u> <b>DO NOT CREDIT</b> active site <b>DO NOT CREDIT</b> 'acts as competitive inhibitor' <b>DO NOT CREDIT</b> binds to receptor permanently</p> <p><b>ACCEPT</b> causes action potential in next neurone / mimics, action / effects, of acetylcholine <b>IGNORE</b> 'mimics acetyl choline' alone</p> <p><b>IGNORE</b> delays refractory stage <b>ACCEPT</b> permanently in refractory stage</p>

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1	(d)	(i)	in xylem (by), cohesion-tension / transpiration (stream);  in phloem (by), translocation / mass flow ;	2	<b>ALLOW</b> transport in phloem from roots <b>only if</b> 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
			<b>Total</b>	<b>19</b>	

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	<p><i>seedlings / coleoptiles have same</i></p> <p><b>S1</b> age ;  <b>S2</b> height / length ;  <b>S3</b> mass ;  <b>S4</b> genotype / genome ;</p> <p><b>S5</b> species ;</p> <p><i>procedure has same</i></p> <p><b>P1</b> same volume of solution applied ;</p> <p><b>P2</b> (named) feature of growth medium ;</p> <p><b>P3</b> watering regime ;</p> <p><b>P4</b> light , intensity / wavelength / duration ;</p> <p><b>P5</b> temperature ;</p>	<b>3 max</b>	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>S2 IGNORE</b> size / surface area / width  <b>S3 IGNORE</b> size / weight  <b>S4 ACCEPT</b> same genetic makeup  <b>IGNORE</b> same genes</p> <p><b>For all P points IGNORE</b> light <i>direction</i>  (as this is an independent variable)</p> <p><b>P1 IGNORE</b> ref to concentration of solution  <b>ACCEPT</b> <i>idea of consistency</i> in application  of <b>J</b> and <b>K</b></p> <p><b>P2</b> e.g. type / pH / fertiliser (applied) / minerals / ions  <b>IGNORE</b> nutrients</p> <p><b>P3</b> e.g. volume of water / time of watering</p> <p><b>P4</b> 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><b>or</b></p> <p><i>idea that allows the , effect of the treatment / results / groups , to be , compared ;</i></p>	1	<p><b>IGNORE</b> improves validity / fair test (as an explanation is required) 'to show the effects of J and K' is not enough</p> <p><b>CREDIT</b> 'observations' for treatments</p>
2	(a)	(iii)	<p><b>ONLY CREDIT mark points in context of results, and not in context of general roles of auxin and gibberellin</b></p> <p><i>J is auxin because</i></p> <p><b>A1</b> inhibition of development of (lateral) buds (in group 2) ;</p> <p><b>A2</b> <u>growth</u> of , coleoptiles / group 5 , towards light ;</p> <p><i>K is gibberellin because</i></p> <p><b>G1</b> <u>greater</u> increase in , height / stem length (in group 3) ;</p> <p><b>G2</b> causes growth of (lateral) buds (in group 3) ;</p>	3 max	<p><b>J must be identified correctly for A marks to be awarded</b></p> <p><b>K must be identified correctly for G marks to be awarded</b></p> <p><b>A1 CREDIT</b> ( group2) results show apical dominance</p> <p><b>A2 CREDIT</b> ( group 5) results show positive phototropism</p> <p><b>IGNORE</b> plant (as all are plants)</p> <p><b>G1 CREDIT</b> greater elongation</p> <p><b>G2 CREDIT</b> (group 3) results do not show apical dominance</p>
2	(b)	(i)	protein ;	1	<p><b>ACCEPT</b> glycoprotein</p> <p><b>IGNORE</b> polypeptide / channel / carrier / transport</p>
2	(b)	(ii)	(synaptic) <u>cleft</u> ;	1	<p><b>IGNORE</b> gap</p> <p><b>IGNORE</b> neuromuscular</p>
2	(b)	(iii)	acetylcholine esterase / ACh esterase ;	1	<p><b>ACCEPT</b> phonetic spelling and ignore upper/lower case</p> <p><b>IGNORE</b> 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><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> mitochondrion <b>DO NOT CREDIT</b> mitochondrial matrix</p> <p><b>IGNORE</b> electron transport chain (as not a stage)</p> <p><b>ACCEPT</b> lactic acid</p> <p><b>DO NOT CREDIT</b> creatinine</p> <p><b>DO NOT CREDIT</b> bond <b>ACCEPT</b> phonetic spelling</p>
<b>Total</b>			<b>16</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	C ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
		(ii)	D ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
		(iii)	B / E ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
		(iv)	E ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
	(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><b>1 CREDIT</b> biceps and triceps <b>or</b> flexor and extensor contract</p> <p><b>IGNORE</b> context of direction of movement</p> <p><b>4 ACCEPT</b> 'prevents' for reduces</p> <p><b>5 ACCEPT</b> makes, produces but not 'releases'</p> <p><b>6 ACCEPT</b> prevents / reduces, friction</p>



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

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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><b>Mark the first 2 reasons</b></p> <p><b>CREDIT</b> to avoid named stressors e.g. cold, heat, dryness, humidity or unfavourable conditions  <b>only CREDIT</b> descriptions relevant to both animals (avoiding a stressor) <b>and</b> to plants (closing stomata, wintering underground, etc).  <b>IGNORE</b> survival and dangers unqualified</p> <p><b>only CREDIT</b> descriptions relevant to both animals (being consumed, being preyed upon) <b>and</b> to plants (being grazed, herbivory).</p> <p><b>only CREDIT</b> descriptions relevant to both animals (get food) <b>and</b> 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><b>1</b> (M) made in <u>endocrine</u> glands <b>versus</b>  (P) made in many plant tissues ;</p> <p><b>2</b> (M) move in blood <b>versus</b>  (P) move, in xylem / in phloem / from cell to cell ;</p> <p><b>3</b> (M) act on, a few / specific / target, tissues <b>versus</b>  (P) act on most tissues / can act in cells where produced ;</p> <p><b>4</b> (M) act <u>more</u> rapidly ; <b>ORA</b></p>	3	<p><b>2(P) ACCEPT</b> diffusion / through plasmodesmata, for 'from cell to cell'.  <b>ACCEPT</b> by translocation / in transpiration stream  <b>IGNORE</b> mass flow</p> <p><b>4</b> must be comparative e.g. respond <b>faster</b> 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><b>ACCEPT</b> 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><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> recombinant / GE / GM</p> <p><b>CREDIT</b> 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><b>ACCEPT</b> through phospholipids / through phospholipid membrane</p> <p><b>DO NOT CREDIT</b> through pores</p>

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