Question			Answer	Marks	Guidance
1	(a)	(i)	*increased blood pressure* **B1** (small) blood vessels / capillaries**,** burst / break **;** **B2** bleeding causes (localised) build up of pressure (leading to cell death) **or** blood / oxygen **,** supply **,** reduced / stopped **;** **B3** cells cannot <u>respire</u> (leading to cell death) **;** *thrombosis* **T1** thrombus / clot **,** interrupts / reduces, blood flow **;** **T2** (cells) deprived of **,** oxygen / glucose **;** **T3** cells cannot <u>respire</u> (leading to cell death) **;**	**4 max**	**B1 CREDIT** haemorrhage / aneurism / arterioles / arteries **B1 IGNORE** veins / venules **B1 IGNORE** destroys / damages blood vessels **B2** e.g. bleeding leads to cell compression **B2 ACCEPT** brain deprived of **,** oxygen / glucose **B3 DO NOT ACCEPT** <u>respire</u> less 'Clot results in less oxygenated blood to cells' = **T1** and **T 2** **T2 ACCEPT** brain deprived of **,** oxygen / glucose **T3 DO NOT ACCEPT** <u>respire</u> less
1	(a)	(ii)	*idea that* (if the stroke has been caused by a bleed) then the drug will, increase the bleeding / be ineffective as a treatment (to prevent bleeding) **;**	**1**	e.g. 'the drug makes the problem worse' **DO NOT CREDIT** 'not effective in reduction of blood pressure'
1	(a)	(iii)	*idea of* disruption of **,** oxygen / glucose **,** supply (to brain cells) for <u>aerobic</u> <u>respiration</u> **;** *lack of oxygen / glucose / blood / damage to* <u>cerebellum</u> resulting in problems with coordination / movement **;** <u>cerebrum</u> / <u>cerebral</u> <u>hemisphere</u>(s) / <u>cerebral cortex</u> **,** resulting in loss of **,** memory / speech **;** <u>medulla</u> (oblongata)/ <u>cerebrum</u> / <u>cerebellum</u>, resulting in paralysis (of body below the neck) **;**	**4**	**Can be awarded at any point in the answer.** **Effect must be correctly linked to the part of the brain responsible.** **ACCEPT** Broca's / Wernicke's, area / hippocampus **ACCEPT** cerebral hemisphere(s) / cerebral cortex / corpus callosum

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

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

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)	*idea that* 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)	*seedlings / coleoptiles have same* **S1** age **;** **S2** height / length **;** **S3** mass **;** **S4** genotype / genome **;** **S5** species **;** *procedure has same* **P1** same volume of solution applied **;** **P2** (named) feature of growth medium **;** **P3** watering regime **;** **P4** light **,** intensity / wavelength / duration **;** **P5** temperature **;**	**3 max**	**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** **S2 IGNORE** size / surface area / width **S3 IGNORE** size / weight **S4 ACCEPT** same genetic makeup **IGNORE** same genes **For all P points IGNORE** light ***direction*** (as this is an independent variable) **P1 IGNORE** ref to concentration of solution **ACCEPT** *idea of* consistency in application of **J** and **K** **P2** e.g. type / pH / fertiliser (applied) / minerals / ions **IGNORE** nutrients **P3** e.g. volume of water / time of watering **P4** e.g. distance from light source

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

Question			Expected Answer	Mark	Additional Guidance
2	(c)				**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**
			mitochondria ;		**ACCEPT** mitochondrion **DO NOT CREDIT** mitochondrial matrix
			oxidative phosphorylation ;		**IGNORE** electron transport chain (as not a stage)
			lactate ;		**ACCEPT** lactic acid
			creatine phosphate / phosphocreatine ;		**DO NOT CREDIT** creatinine
			(cross-)bridge / (cross-)link ; myosin (head) ;	6	**DO NOT CREDIT** bond **ACCEPT** phonetic spelling
			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)		**1**	muscles <u>contract</u>, in antagonistic (pairs) **;**	3	**1 CREDIT** biceps and triceps **or** flexor and extensor contract **IGNORE** context of direction of movement
			2	tendons, pull on bone / connect muscle to bone **;**		
			3	ligaments, hold bones together / prevent dislocation **;**		
			4	cartilage, reduces**,** friction / wear **;**		**4 ACCEPT** 'prevents' for reduces
			5	synovial membrane secretes fluid **;**		**5 ACCEPT** makes, produces but not 'releases'
			6	<u>synovial</u> fluid, is a lubricant / allows smooth movement **;**		**6 ACCEPT** prevents / reduces, friction

Question			Answer	Marks	Guidance
	(c)		**1** (two parts are) sympathetic **and** parasympathetic **;** **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 **;** **3** **S** uses noradrenaline **but P** uses acetylcholine (at organ) **;** **4** **S,** fight / flight / stress, **but P**, rest / relaxation / calm **;** **5** **S** increases, heart rate / cardiac output / blood pressure, **but P** reduces this **;** **6** **S** increases , speed / rate / depth, of breathing, **but P** reduces this **;** **7** **S** increases airway diameter **but P** reduces it **;** **8** **S** increases blood flow to skeletal muscle **but P** increases blood flow to gut (smooth muscle) **;** **9** **S** for orgasm **but P** for sexual arousal **;** **10** **S** dilates pupils **but P** constricts pupils **;** **11** **S** makes liver release glucose, **but P** makes liver**,** store / take up, glucose **;** **12** **P** allows**,** <u>peristalsis</u> / digestion, **but S** reduces it **;**	7	**1** If BOTH names are wrong but begin with **S and P, DO NOT CREDIT** mp1 but allow ECF for mps 2-12 **2** **ACCEPT** tissue for organ **3** **CREDIT** norepinephrine for noradrenaline but **IGNORE** noradrenaline from adrenal gland and **IGNORE** references to ganglion here **6** **CREDIT** **S** increases ventilation rate and **P** slows it **8** **CREDIT** voluntary or striated for skeletal **IGNORE** ORA **11** **ACCEPT** correct reverse reasoning for glycogen **IGNORE** sugar 'liver' must be mentioned at least once **12** **IGNORE** **'**stops' for **S** but allow **S** inhibits
			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)	(both) to, avoid / counter, (abiotic) stress **;**	2	**Mark the first 2 reasons** **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
			(both) to avoid, being eaten / predation **;**		**only CREDIT** descriptions relevant to both animals (being consumed, being preyed upon) **and** to plants (being grazed, herbivory).
			(both) to access resources **;**		**only CREDIT** descriptions relevant to both animals (get food) **and** plants (obtain light, minerals, water)
		(ii)	*all points must show a clear comparison between mammals (M) and plants (P)* **1** (M) made in endocrine glands **versus** (P) made in many plant tissues **;**	3	
			2 (M) move in blood **versus** (P) move, in xylem / in phloem / from cell to cell **;**		**2(P) ACCEPT** diffusion / through plasmodesmata, for 'from cell to cell'. **ACCEPT** by translocation / in transpiration stream **IGNORE** mass flow
			3 (M) act on**,** a few / specific / target, tissues **versus** (P) act on most tissues / can act in cells where produced **;**		
			4 (M) act more rapidly **; ORA**		**4** must be comparative e.g. respond fast**er** in mammals
	(b)	**(i)**	inherited / passed to offspring / passed (down) from parents **;**	2	**ACCEPT** in context of condition or gene
			(caused by) mutation / allele **;**		

Question			Answer	Marks	Guidance
		(ii)	gene / allele ; (DNA) ligase ; transgenic / transformed ; antibiotic(s) ; (gene / DNA / fluorescent / radioactive) probe ;	5	**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** **ACCEPT** recombinant / GE / GM **CREDIT** named antibiotic e.g. ampicillin, tetracycline
	(c)		fat soluble / non-polar / uncharged / hydrophobic ; (so can move directly through) phospholipid bilayer ;	2	**ACCEPT** through phospholipids / through phospholipid membrane **DO NOT CREDIT** through pores

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