1. .

Question			Expected Answer	Mark	Additional Guidance
2	(a)			6	**For each box, mark the first answer that will result in a mark being awarded.** If an additional answer is given that is incorrect or contradictory then **= 0 marks** **IGNORE** information in second or third boxes across row that is identical to 1st or 2nd box – each box should be different (as Q asks for differences between the types) eg striated(✓) unstriated(✓) striated = **2** multinucleate(✓) uninucleate(✓) uninucleate = **2** striated(✓) unstriated(✓) striated multinucleate uninucleate uninucleate(✓) = **3** **CREDIT** drawings if feature such as striated / multinucleate / uninucleate, are clearly shown * **ACCEPT** description of striated / non striated (eg stripey) ** **ACCEPT** control , blood pressure / diameter of blood vessels / diameter of airways ** **CREDIT** vasoconstriction / vasodilation , for controlling diameter of blood vessels

	voluntary (skeletal)	involuntary (smooth)	cardiac
cellular structure	*striated / bands of actin & myosin **or** cylindrical cells **or** multinucleate ;	*unstriated / *non striated **or** spindle-shaped cells **or** uninucleate ;	*striated **or** branched cells **or** uninucleate **or** interlocking / junctions / intercalated discs ;
function	to move , bones / skeleton / joints / (named) limbs ;	*idea of* **controlling diameter of , arteries / arterioles / bronchi / bronchioles **or** peristalsis **or** uterine contraction **or** control pupil size ;	to pump blood / AW ;

Question			Expected Answer	Mark	Additional Guidance
2	(b)		*voluntary* intercostal / diaphragm ; *involuntary* bronchi / bronchioles / arteries / arterioles / aorta / oesophagus ; *cardiac* heart ;	3	**CREDIT** trapezius / deltoid / pectorals / latissimus dorsi / rotator cuff muscles **ACCEPT** 'between the ribs' for intercostal **DO NOT CREDIT** named artery not found in thorax **IGNORE** gut unqualified **ACCEPT** walls of , atria / ventricle(s)
2	(c)		(cardiac) **D** ; (clapping) **B** ; (bicycle) **C** ;	3	
2	(d)		*monkeys rather than rats* 1 *idea that* (humans & monkeys) closely related / share more genes / share a common ancestor ; 2 (humans & monkeys) both primates ; 3 *idea that* brain / body , structure / physiology / behaviour , similar (to humans) ; 4 monkey brain bigger (than rat) ; ***max 2*** *comment* 5 argument in favour ; 6 argument against ; ***max 2***	3 max	**MAXIMUM 2 marks from either section** 1 **DO NOT CREDIT** 'monkeys are closest ancestors to humans' 2 3 **ACCEPT** having a similar response to treatment 4 5 eg • to alleviate human suffering / can save lives 6 eg • causes , pain / distress / stress , to monkeys **DO NOT CREDIT** 'cruel to monkeys' unqualified 'right to life of monkeys' / monkeys killed

Question			Expected Answer	Mark	Additional Guidance
2	(e)		*appropriate parts of nervous / endocrine systems* 1 sympathetic (motor neurones) stimulated ; 2 noradrenaline / norepinephrine ; 3 neurotransmitter released at , neuromuscular junction / organs ; 4 adrenaline (secreted / released into blood) ; 5 from adrenal , glands / medulla ; 6 *idea of* adrenaline / noradrenaline , binding to receptors (on target tissue) ; 7 AVP ; *effect on structures containing 3 types of muscle* C8 *idea of* heart beats faster ; C9 *idea of* heart beats more forcefully ; S10 alter blood flow / increase blood pressure ; S11 less blood flow to , gut / skin ; S12 reducing gut secretions / making skin pale ; S13 smooth muscle in gut relaxes / peristalsis slows down ; S14 smooth muscle in airways relaxes / airways wider ; S15 iris radial muscle contracts / pupil dilates ; V16 *idea of* breathing / intercostals contracting / diaphragm contracting , faster ; V17 more blood flow to (skeletal) muscles ; V18 *idea of* (named skeletal) muscles being primed for action ; 19 AVP ;	8 max	**ACCEPT** phonetic spelling throughout 1 2 3 May be awarded in the context of acetylcholine 4 5 6 7 eg • correct ref to corticosteroids • correct ref to medulla oblongata **C** = cardiac C8 C9 **S** = smooth S10 eg • contriction / dilation , of arterioles S11 S12 S13 **ACCEPT** involuntary for smooth S14 **ACCEPT** involuntary for smooth S15 **V** = voluntary V16 V17 V18 **ACCEPT** 'leg muscles' as named eg **CREDIT** glycogenolysis in muscle for priming 19 eg • erector pili muscles raise hairs
			QWC – linking structure to response ;	1	**Award if** **2** different mps from mps **1 – 7** correctly linked to **2** different mps from mps **C7 – V17**
			Total	**24**	

2. .

Question			Expected Answer	Mark	Additional Guidance
6	(a)				**Mark the first answer on each prompt line for all parts of (a).** If an additional answer is given that is incorrect or contradicts the correct answer, then **= 0** **ACCEPT** phonetic spelling
6	(a)	(i)	tropism(s) ;	1	**IGNORE** named tropism eg phototropism
6	(a)	(ii)	(plant) hormone / growth substance / growth regulator / pgr ;	1	
6	(a)	(iii)	deciduous ;	1	
6	(a)	(iv)	conservation ;	1	**DO NOT CREDIT** preservation
6	(a)	(v)	decomposer(s) ;	1	**ACCEPT** saprotroph / saprophyte / saprobiont **IGNORE** fungi / bacteria **DO NOT CREDIT** detritivore
6	(a)	(vi)	nitrogen fixation ;	1	**ACCEPT** nitrogen fixing **DO NOT CREDIT** nitrogen fixing bacteria
6	(b)	(i)	stimulus identified ; organism named **and** normal response described ; response , stops / lessens , after repeated stimulation / over time ;	3	eg • touch eg • sea anemone withdrawing tentacles 'learning to ignore' is not quite enough
6	(b)	(ii)	organism named **and** voluntary behaviour described ; reinforcer / reward / punishment , identified ; behaviour , increases (for reward) / decreases (for punishment) , in frequency ;	3	eg • dog begging eg • food reward / treat

Question			Expected Answer	Mark	Additional Guidance
6	(b)	(iii)			Marks can be awarded in general context of social interaction instead of a specific piece of behaviour described.
			primate species identified ;		**CREDIT** English names eg chimpanzee, gorilla, orang-utan, (named) monkey, lemur or ape **IGNORE** humans
			behaviour described ;		eg • include dominance hierarchy interactions (play, aggressive, affiliative) • allogrooming • communication behaviours (vocal, facial, postural) • passing on of , cultural / tool-using, knowledge • *idea of* prolonged / frequent , mother-infant interactions
			purpose / importance , stated ;	3	**CREDIT** answers relating to benefit to group or to individual eg • with respect to access to food, resources or mates eg • reducing , disease / parasites
			Total	**15**	

3. .

Question			Expected Answers	Marks	Additional Guidance
4	(a)		<table><tr><th></th><th>similarity</th><th>difference</th></tr><tr><td>structure</td><td>mitochondria **or** vesicles **or** postsynaptic receptors ;</td><td>NMJ membrane(s), wavy / AW * **ora** **or** receptors different (shape) **or** enzymes in different places ;</td></tr><tr><td>function</td><td>(neuro)transmitter, released **/** crosses gap **or** changes potential difference / AW ** **or** enzymes break down (neuro)transmitter ;</td><td>different neurotransmitters / ACh vs. dopamine **or** muscle contraction vs. nerve impulse **or** different enzymes ;</td></tr></table>	4	**One mark per box** *difference* **NMJ** is neuromuscular junction * **AW ACCEPT** wiggly / bumpy / not smooth / rough / larger SA / any suitable description **but IGNORE** microvilli *difference* **ACh** is acetylcholine *similarity* ** **AW CREDIT** depolarises / -70 mV → +40 mV **but IGNORE** pass on action potential
4	(b)	(i)			
		1	phenelzine ;	1	**Award mp1 and, if correct, any 1 from the remaining points**
			no ecf from incorrect drug		
		2	*idea that* does not bind to (dopamine) receptor ; **ora**		*2* **CREDIT** other two do bind to dopamine receptor
		3	*idea that* binds to, MAO / enzyme ;		*3* **IGNORE** inhibits, MAO / enzyme (as given in the question)
		4	allosteric site / non-competitive inhibitor ;	max 1	*4* **ACCEPT** "not a competitive inhibitor"
4	(b)	(ii)	(drug) occupies / blocks / binds to, (dopamine) receptors ; without causing, action potential / response ; reduces **effect of** dopamine / is a dopamine antagonist ;	2	**CREDIT** "without causing depolarisation" / AW **DO NOT CREDIT** "inhibits dopamine" or "reduces dopamine levels

Question			Expected Answers	Marks	Additional Guidance
4	(c)	(i)	humans are, diploid / 2n ; chromosomes, are in pairs / homologous ; one, (copy / gene / allele), from each parent / on each chromosome of pair ;	2 max	**DO NOT CREDIT** ref to bivalents
4	(c)	(ii)	(gel) electrophoresis ;	1	
4	(d)	1	13 b-p deletion (has most serious consequences) ;	3 max	
		2	frameshift / alter reading frame ;		
		3	genetic code is triplet / read in groups of 3 bases ;		
		4	alters all amino acids (coded for) after the mutation ;		
		5	21 b-p deletion causes 7 amino acids to be lost ;		
		6	substitution changes, one / no, amino acids ;		*6* **CREDIT** could be a silent mutation / 1 b-p substitution may not have an effect
4	(e)	1	natural selection ;	4 max	
		2	selective advantage ;		
		3	(allele / behaviour) increases, survival / breeding / AW ;		*3* **CREDIT** increases reproductive success / AW
		4	(because) helped, find food / find new resources / make new tools / get mates ;		*4* **ACCEPT** more promiscuous / AW
		5	allele passed on (to next generation) ;		
		6	(allele / behaviour) increased in frequency over, generations / time ;		*6* **MUST HAVE** time element
			Total	**18**	

4. .

Question			Expected Answers	Marks	Additional Guidance
5	(b)	(ii)	species richness & evenness decrease ; **ora**	max 2	**ACCEPT** they both, decrease / decline / fall **or** they were higher at start
			(richness) 29 → 26 (species) ;		**ACCEPT** 6 → 4 **or** 2 fewer (from table) **or** 3 fewer (from text)
			(evenness) large numbers of, 2 / some, species, but, low numbers / none, of other species ;		**CREDIT** suitable named e.g.s from table
5	(c)	(i)	rare initially / AW ;	max 1	**ACCEPT** that there weren't very many at start
			prey, numbers have reduced / have become extinct / have left the area ;		**DO NOT CREDIT** 'lack of food' unless has indicated that food is an animal
			idea of slower reproductive rate / AW ;		**ACCEPT** don't breed as fast / don't have as many offspring
5	(c)	(ii)		max 3	**Mark the FIRST suggestion on each numbered line**
		1	aesthetic / amenity / recreational, value ;		*1* **ACCEPT** description, e.g. beautiful / so people will visit / so people will use it for leisure
		2	(eco)tourism ;		*2* **ACCEPT** description, e.g. raise money from visitors
		3	to, preserve biodiversity / preserve genetic diversity / stop extinction ;		*3* **ACCEPT** description, e.g. keep more species
		4	ref. interactions between species / need to preserve whole habitat ;		*4* **ACCEPT** description, e.g. if habitat destroyed there will be a knock-on effect on many species
		5	(rainforest species / preserve gene pool as) could be useful, in future / as potential, for, medicine / genetic engineering / AW ;		*5* **ACCEPT** for drugs, pharmaceuticals, GM or GM e.g. (like crop improvement)
		6	to support indigenous peoples / AW ;		*6* **ACCEPT** let native people continue to live in forest income for indigenous people
		7	to stop effect of deforestation on, atmosphere / climate / soil ;		*7* **ACCEPT** to stop, CO_2 % rising / global warming / erosion **or** forest acts as C, sink / store
		8	AVP ;		*8* e.g. • habitat for pollinators • habitat for predators of pests **DO NOT CREDIT** 'right to life'

Question			Expected Answers	Marks	Additional Guidance
5	(d)				**LOOK FOR** key ideas expressed in different ways
			management practices		
		M1	coppicing / pollarding / description ;		***M1*** **CREDIT** coppicing with standards / rotational coppicing
		M2	selective felling / description ;		***M2*** **ACCEPT** only some trees cut down
		M3	rotational felling / description ;		***M3*** **ACCEPT** cycle of felling different areas
		M4	strip felling ;		
		M5	replant after felling ; **(max 2)**		
			explanation of benefits re. sustainability		
		B1	preserves / prevents disruption to, habitat / ecosystems / nesting sites ;		
		B2	maintains / increases, species diversity / biodiversity ;		
		B3	prevents, soil erosion / leaching ;		
		B4	less disturbance by machinery ;		
		B5	AVP ; **(max 2)**		***B5*** **CREDIT** specific benefits linked to a practice e.g. • faster recovery due to seeding from untouched areas nearby (M3) • pollarding so deer can't eat shoots (M1)
				max 4	
			Total	**20**	