Question	Expected Answer	Mark	Additional Guidance

1 (a)

	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 ;

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

* **AC EPT** 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

Question			Expected Answer	Mark	Additional Guidance
1	(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)
	(c)		(cardiac) **D ;** (clapping) **B ;** (bicycle) **C ;**	**3**	
1	(d)		*monkeys rather than rats* **1** *idea that* (humans & monkeys) closely related / share more genes / share a common ancestor **;** **2** (humans & monkeys) both <u>primates</u> **;** **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
1	(e)		**ACCEPT** phonetic spelling throughout		
			appropriate parts of nervous / endocrine systems		
			1 sympathetic (motor neurones) stimulated ;		***1***
			2 noradrenaline / norepinephrine ;		***2***
			3 neurotransmitter released at , neuromuscular junction / organs ;		***3*** May be awarded in the context of acetylcholine
			4 adrenaline (secreted / released into blood) ;		***4***
			5 from adrenal , glands / medulla ;		***5***
			6 *idea of* adrenaline / noradrenaline , binding to receptors (on target tissue) ;		***6***
			7 AVP ;		***7*** eg • correct ref to corticosteroids • correct ref to medulla oblongata
			effect on structures containing 3 types of muscle		**C** = cardiac
			C8 *idea of* heart beats faster ;		***C8***
			C9 *idea of* heart beats more forcefully ;		***C9***
					S = smooth
			S10 alter blood flow / increase blood pressure ;		***S10*** eg • contriction / dilation , of arterioles
			S11 less blood flow to , gut / skin ;		***S11***
			S12 reducing gut secretions / making skin pale ;		***S12***
			S13 smooth muscle in gut relaxes / peristalsis slows down ;		***S13*** **ACCEPT** involuntary for smooth
			S14 smooth muscle in airways relaxes / airways wider ;		***S14*** **ACCEPT** involuntary for smooth
			S15 iris radial muscle contracts / pupil dilates ;		***S15***
					V = voluntary
			V16 *idea of* breathing / intercostals contracting / diaphragm contracting , faster ;		***V16***
			V17 more blood flow to (skeletal) muscles ;		***V17***
			V18 *idea of* (named skeletal) muscles being primed for action ;		***V18*** **ACCEPT** 'leg muscles' as named eg **CREDIT** glycogenolysis in muscle for priming
			19 AVP ;	**8 max**	***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**	

Question			Expected Answer	Mark	Additional Guidance
2	(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
2	(a)	(i)	tropism(s) **;**	**1**	**IGNORE** named tropism eg phototropism
2	(a)	(ii)	(plant) hormone / growth substance / growth regulator / pgr **;**	**1**	
2	(a)	(iii)	deciduous **;**	**1**	
2	(a)	(iv)	conservation **;**	**1**	**DO NOT CREDIT** preservation
2	(a)	(v)	decomposer(s) **;**	**1**	**ACCEPT** saprotroph / saprophyte / saprobiont **IGNORE** fungi / bacteria **DO NOT CREDIT** detritivore
2	(a)	(vi)	nitrogen fixation **;**	**1**	**ACCEPT** nitrogen fixing **DO NOT CREDIT** nitrogen fixing bacteria
2	(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
2	(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
2	(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**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>
<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>
</td><td>4</td><td>One mark per box

difference
NMJ is neuromuscular junction
* AW A CEPT 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</td></tr>
<tr><td>3</td><td>(b)</td><td>(i)
1

2
3

4</td><td>phenelzine ;

no ecf from incorrect drug
idea that does not bind to (dopamine) receptor ; ora
idea that binds to, MAO / enzyme ;

allosteric site / non-competitive inhibitor ;</td><td>1

max 1</td><td>Award mp1 and, if correct, any 1 from the remaining points

2 CREDIT other two do bind to dopamine receptor
3 IGNORE inhibits, MAO / enzyme (as given in the question)
4 ACCEPT “not a competitive inhibitor”</td></tr>
<tr><td>3</td><td>(b)</td><td>(ii)</td><td>(drug) occupies / blocks / binds to, (dopamine) receptors ;
without causing, action potential / response ;
reduces effect of dopamine / is a dopamine antagonist ;</td><td>2</td><td>CREDIT “without causing depolarisation” / AW
DO NOT CREDIT “inhibits dopamine” or “reduces dopamine levels</td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
3	(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
	(c)	(ii)	(gel) <u>electrophoresis</u> **;**	**1**	
	(d)	**1**	13 b-p deletion (has most serious consequences) **;**	**3 max**	***6*** **CREDIT** could be a silent mutation / 1 b-p substitution may not have an effect
		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 **;**		
	(e)	**1**	<u>natural selection</u> **;**	**4 max**	
		2	<u>selective advantage</u> **;**		
		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	<u>allele</u> passed on (to next generation) **;**		
		6	(allele / behaviour) increased in frequency over, generations / time **;**		***6*** **MUST HAVE** time element
			Total	**18**	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	1	to cope with changing conditions / AW **;**		***1*** Looking for a general statement **DO NOT CREDIT** "adapt to change"
		2	avoid <u>abiotic</u> stress **;**		
		3	to maximise photosynthesis **or** to obtain more, light / water / minerals **; ora**		***3*** **CREDIT** named elements / ions **IGNORE** nutrients
		4	avoid, herbivory / grazing **;**		***4*** methods of preventing grazing could include producing more toxins / more spines / encouraging stinging ants **IGNORE** predation
		5	to ensure, germination in suitable conditions / pollination / seed set / seed dispersal **;**	**max 2**	***5*** **DO NOT CREDIT** 'maximise reproduction' without further qualification
4	(b)	(i)			
		1	in water / in **A** / with no abscisic acid, germination increases as conc. GA increases **;**		
		2	when abscisic acid present / in **B**, no germination **;**		***2*** **DO NOT CREDIT** 'inhibits germination' (as this is a conclusion not a description)
		3	maximum germination 90% with 5 mol dm^{-3} GA, in water / without abscisic acid **;**		***3*** **ACCEPT** 91% (± 2%) for 90%
		4	2 comparative figures (x and y refs. plus units) **;**		***4*** EITHER compare **A** and **B** at the same GA conc OR two points on same line **with units for both**
		5	GA concentration increases, logarithmically / by a factor of 10, on x axis **;**		
		6	10 times more GA gives, 3 (conc 0.05 to 0.5) / 0.5 (conc 0.5 to 5), times more germination **;**	**4 max**	

GA conc (mol dm^3)	A (%)	B (%)
0	10 ± 2	0
0.05	22 ± 2	0
0.5	66 ± 2	0
5	91 ± 2	0

Question			Expected Answers	Marks	Additional Guidance
4	(b)	(ii)			
		1	so temperature doesn't affect results / so only desired variable(s) changed / to show just the effect of plant hormones ;		*1* **ACCEPT** fair test **IGNORE** to control temperature / temperature is a limiting factor / temperature is a controlled variable
		2	since temperature affects enzyme activity ;		*2* **CREDIT** "optimum temperature for enzyme activity" or "this is the temperature when enzymes work best"
		3	suitable / optimum, temperature for (lettuce) germination ;		*3* **ACCEPT** 'these' seeds
				2 max	
4	(b)	(iii)			**Mark the FIRST suggestion on each numbered line** **DO NOT CREDIT** conc, GA / giberrellin (as this is the independent variable) **IGNORE** number of seeds (as given in the question)
		1	<u>volumes</u> of liquid(s) ;		*1* **DO NOT CREDIT** amounts / levels **CREDIT** volume of, water / GA / ABA
		2	ABA concentration ;		
		3	oxygen availability ;		*3* **IGNORE** carbon dioxide
		4	age of seeds ;		
		5	previous storage of seeds / viability idea ;		
		6	genotype / variety, of seeds ;		*6* **CREDIT "**from same batch of seeds" or "seeds from same plant"
		7	size / type of, petri dish / filter paper ;		
		8	length of time experiment left for (before recording results) ;		
		9	space between seeds ;		
		10	AVP ;		*10* e.g. ● light qualified (duration / intensity / wavelength) ● use of distilled water ● all lids, off / on
				3 max	

Question			Expected Answers	Marks	Additional Guidance
4	(c)				**Mark the FIRST TWO suggestions** **IGNORE** the names of plant growth regulators
		1	seedless, fruits / grapes **;**		
		2	weedkillers **;**		
		3	rooting powder / to grow cuttings / used in tissue culture **;**		
		4	control fruit ripening **;**		***4*** could be used to speed up or slow down
		5	controls fruit drop **;**		
		6	restrict hedge growth **;**		
		7	preserve, cut flowers / green vegetables **;**		
		8	specific example of improved fruit quality **;**		***8*** e.g. ● longer stalks on grapes ● longer apples
		9	producing malt / in brewing **;**		
		10	AVP **;**		***10 & 11*** e.g. ● promoting sexual maturity in conifers ● promoting latex flow in rubber plants ● promoting sexual maturity in female cucumber plants ● longer nodes in sugar cane ● restricting growth in, chrysanthemums / other e.g.
		11	AVP **;**		
				2 max	
			Total	**13**	