Question number	Answer	Mark
1 (a)	1. Idea that animals are being mistreated e.g. caused stress, pain ; 2. idea that it is not ethical ; 3. research topic might not be regarded as essential / eq ;	(2)

Question number	Answer	Mark
1 (b)(i)	1. effect on heart described e.g. increase heart rate / increased cardiac output ; 2. idea of acts as neurotransmitter/ effect on sites of control e.g. increased SAN activity, excitatory centre, sympathetic nerves ; 3. idea of vasodilation ; 4. increase in blood pressure / eq ;	(2)

Question number	Answer	Mark
1 (b)(ii)	1. (increased blood flow) provides more {glucose / oxygen} / enables more {respiration/ energy release} ; 2. for muscle used in "food hunt"/ eq ;	(2)

Question Number	Answer	Additional guidance	Mark
2(a) (i)	(cut shoot) without IAA present / without agar blocks ;	ACCEPT - agar block with no IAA, empty agar block, agar block with water ACCEPT - auxin(s) as alternative to IAA	**(1)**

Question Number	Answer	Additional guidance	Mark
2(a) (ii)	1. (both sides of) shoot taller / eq ; 2. than the control / eq ; 3. both IAA's diffuse {down / out of agar / to zone of elongation} / eq ; 4. reference to cell elongation / eq ; 5. details of cell elongation / eq ; 6. shoot bends to the right / eq ; 7. (due to) more growth on {left side of shoot / side with artificial IAA} / eq ;	ACCEPT - auxin as alternative to IAA throughout ACCEPT 1 – grow {taller/higher/up/ towards the light} ACCEPT 3 – away from the light/agar block ACCEPT 6 - bends away from side with artificial IAA	**(5)**

Question Number	Answer	Additional guidance	Mark
2(b)	1. idea that IAA enters the cell ; 2. reference to movement within cell / IAA in cytoplasm to nucleus ; 3. effect when binds to transcription factor e.g. forms a transcription initiation complex or countering an inhibitor ; 4. reference to switching on gene ; 5. activity at promoter region / eq ; 6. allows formation of (m)RNA / eq ; 7. idea of translation produces protein ;	ACCEPT - auxin as alternative to IAA throughout ACCEPT 3 - joins to promoter region or activates transcription factor ACCEPT 5 – ref to RNA polymerase activity	**(4)**

Question Number	Correct Answer	Mark
3(a)	1. depolarisation of adjacent {membrane / eq} / eq ; 2. changes PD across membrane / eq ; 3. opens sodium {gates / eq} ; 4. sodium ions move into (the neurone) ;	**max (2)**

Question Number	Correct Answer	Mark
3(b)	**Position on diagram** / **Permeable to sodium ions** / **Permeable to potassium ions** A ☒ ; D ☒ ;	**(2)**

Question Number	Correct Answer	Mark
3(c)	1. correct {reference to / description of} diffusion gradient (of potassium ions) ; 2. correct {reference to / description of} electrochemical gradient ; 3. increased permeability (of membrane) to potassium ions / eq ; 4. reference to potassium {gates / eq} open / eq ; 5. reference to sodium {gates / eq} closed / eq ;	**max (3)**

Question Number	Correct Answer	Mark
3(d)	1. PD less negative / eq 2. idea that the membrane remains permeable to potassium ions ; 3. potassium ions {move because of charge difference / eq} ; 4. into {nerve cell / neurone / axon / eq} ; 5. idea that potassium ion is removing a positive charge (from the outside) ; 6. idea that equilibrium is established e.g. diffusion gradient balanced by potential difference ;	**max (3)**