Question Number	Answer	Mark
1(a)(i)	A ; cerebrum	(1)

Question Number	Answer	Mark
1(a)(ii)	C ; hypothalamus	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	<table><tr><th>Stage</th><th>Voltage-gated K^+ channel open</th><th>Voltage-gated K^+ channel closed</th><th>Voltage-gated Na^+ channel closed</th></tr><tr><td>Depolarisation</td><td></td><td>✓</td><td></td></tr><tr><td>Repolarisation</td><td>✓</td><td></td><td>✓</td></tr></table>	**3 columns correct = 2 marks** **2 columns correct = 1 mark**	(2)

Question Number	Answer	Mark
1(b)(ii)	A ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	In sensory neurone: 1. dendron longer; 2. dendron myelinated ; 3. axon shorter ; 4. {cell body / eq} {not at the end / towards the middle / to the side / eq } ; 5. reference to no {motor end plate / eq} ;	ALLOW converse for motor neurone 4. **ACCEPT** centron / nucleus for cell body	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)	1. idea that there was no bias ; 2. idea of contributes to validity ; 3. idea of hot object desensitises ; OR idea of thermoreceptors not harmed /overstimulated / habituated due to high temp ;	**1. ACCEPT** sequence of procedure has no effect/to see if positive then negative gives a different outcome to negative then positive	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. conclusion is valid / eq ; 2. (because mean feelings) scores similar for both / eq ; 3. idea that difference between positive and negative (mean feelings) scores are similar ; 4. comment on SD as a measure of variation from the mean / eq ; 5. SD similar for physical and emotional when experience is positive / eq ; 6. Idea of overlap for {positive / negative} ; 7. figures used to support Mp6 e.g. for positive minimum is 4.0 for physical and maximum is 4.6 for emotional ;	**1 ACCEPT** conclusion is supported NB for negative the positive minimum for physical is 1.3 and maximum is 2.1 for emotional	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	1. fMRI ; and any two from: 2. (fMRI) operates in real time / eq ; 3. as experience will be short lived / eq ; 4. Active areas will {light up / be coloured / eq} (on the image) / eq ; 5. high resolution (as areas involved may be small) / eq ; 6. Safer / eq ;	 **2 ACCEPT** live images, 4 images per second **4. ACCEPT** idea of active areas require more oxygen/oxygenated blood 5 **ACCEPT** more pixels, image is more detailed **6. ACCEPT** ref. to not using X rays, etc	**(3)**

Question Number	Answer	Mark
2(c)(ii)	D ;	**(1)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(a)</td><td>
<table>
<tr><th>Labelled structure</th><th>Name of structure</th><th>One function</th></tr>
<tr><td>A</td><td>Medulla (oblongata) ;</td><td>Controls {breathing / heart / eq} ;</td></tr>
<tr><td>C ;</td><td>Cerebral hemisphere/ cerebrum / frontal cortex ;</td><td>Feel emotions</td></tr>
</table>
</td><td>For A ACCEPT involuntary muscles or named e.g. swallowing, vomiting, sneezing
IGNORE brain stem

For cerebrum, reject cerebellum
For cerebrum, accept frontal lobe/prefrontal / cerebral cortex</td><td>(4)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	1. idea that cuts at a specific sequence of bases ; 2. idea of (generates) sticky ends ; 3. so easier to join together / eq ;	1. ACCEPT DNA sequence 3. ACCEPT to produce {same / complementary / eq} sticky ends (in plasmid and (human) gene)	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	1. the chemical could be a {transcription factor / hormone} ; 2. idea of interaction at (bacterial) cell (surface) membrane ; 3. idea of transcription factor being activated ; (e.g. transcription initiation complex formed, binds to transcription factor) or counters inhibitor ; 4. ref to promoter region ; 5. idea of transcription occurs e.g. RNA polymerase binds, mRNA produced ;	 2. ACCEPT binds to cell surface membrane/passes through 3. ACCEPT triggers secondary messenger to be released {into cytoplasm/from (inner side of) membrane} 5. OT DNA polymerase	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	(ribosome has) larger and smaller subunit / (ribosomal) protein and rRNA ;	ACCEPT ref to 2 subunits ACCEPT 30S and 50S subunits	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iv)	1. larger lumen so easier to put into blood / eq ; 2. (less muscle / thinner wall) so easier to penetrate / eq ; 3. (blood) pressure less so less damage to vein / eq ; 4. idea that vein is easier to find;	ACCEPT converse when appropriate IGNORE ref to 'going to the heart' 3. ACCEPT (blood) pressure less so less blood loss 4. CCEPT nearer the skin surface/easier to access	**(2)**

Question Number	Answer	Additional guidance	Mark
4 (a)	<table><tr><th>Labelled structure</th><th>Name of structure</th><th>One function of labelled structure</th></tr><tr><td>A</td><td>cerebellum ;</td><td>Coordinates movement / balance / posture / fine motor control ;</td></tr><tr><td>D ;</td><td>Hypothalamus ;</td><td>thermoregulation</td></tr></table>		(4)

Question Number	Answer	Additional guidance	Mark
4(b)	1. Heat (energy) from blood in capillaries / eq ; 2. Absorbed by sweat ; 3. Used to break H bonds in water ; 4. Ref to latent heat ; 5. (So) water evaporates ; 6. Taking heat from the body / eq ;		(3)

Question Number	Answer	Additional guidance	Mark
4(c)(i)	1. Ref to arrival of { impulse / action potential / eq } ; 2. Calcium ion {channels / eq } open in { pre-synaptic membrane / brain cell membrane / eq } ; 3. Calcium ions enter (brain cell) through {diffusion / down concentration gradient } ; 4. Causes (glutamate-rich) vesicles to {move towards / fuse with} pre-synaptic membrane / eq ; 5. {Neurotransmitter / glutamate} release through exocytosis ;		(4)

Question Number	Answer	Additional guidance	Mark
4 (c)(ii)	1. Idea that the damaged areas can be identified on MRI scan ; 2. Idea that these damaged areas are known to be areas associated with the release of glutamate ; 3. Comparison with and without domoic acid ;	3. ACCEPT in terms of brain regions or sea lions	**(2)**