PEARSON EDEXCEL A-LEVEL BIOLOGY A · 9BN0

BIOLOGY



MARK SCHEME

TOPIC 7: RUN FOR YOUR LIFE

SCORE	PERCENTAGE
/161	%

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Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
	An explanation that makes reference to three of the following: • {mutation / change in base sequence} of a gene for {check point protein / cell cycle (control) protein} (1) • no check point (1) • activating oncogenes / deactivating tumour suppressor genes (1) • cell {cycle / division} is no longer inhibited / shortening the cell cycle (1)	IGNORE mitosis ALLOW 'mutation in gene involved in controlling the cell cycle' IGNORE rate of division increases ALLOW shorter S / G stage ALLOW uncontrolled cell division	Expert (3)

Q2.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to three of the following: • acetylcholine was not broken down (as quickly) (1) • therefore {maintaining / increasing} the concentration of acetylcholine in the synaptic gap (1) • so able to compete with the poison (1) • and so able to bind to receptors (on cell surface membrane of cells of the SAN) (1)	ALLOW acetylcholine remains in the synaptic gap	**(3)** **Exp**

Q3.

Question Number	Answer	Mark
	• A 1 only *The answer is not B as these do not summate to the maximum that can be exhaled (the vital capacity)* *The answer is not C as these do not summate to the maximum that can be exhaled* *The answer is not D as these do not summate to the maximum that can be exhaled (the vital capacity)*	**(1)** **Comp**

Q4.

Question number	Answer	Mark
	The only correct answer is C - Myogenic ***A*** *is not correct because autonomic refers to the nervous system* ***B*** *is not correct because cardiac refers to the whole heart* ***D*** *is not correct because systolic describes a stage in the cardiac cycle*	(1)

Q5.

Question Number	Answer	Mark
(a)	molecule R - ATP / adenosine triphosphate ; molecule S - ADP / adenosine diphosphate ;	**(2)**

Question Number	Answer	Mark
(b)(i)	1. carbon dioxide / CO_2 ; 2. idea that the C has been removed from C_6 or C_5 ;	**(2)**

Question Number	Answer	Mark
(b) (ii)	1. cycle would stop / eq ; 2. 4 carbon compound would accumulate / eq ; 3. 6 carbon compound would {run short / not be synthesised} / 5 carbon compound would run short / eq ; 4. idea that {molecule T / H} reduce ;	**(3)**

Question Number	Answer	Mark
(c)	1. idea of electrons being {passed along / eq} the electron transport chain ; 2. idea of {losing / eq} energy ; 3. (used to) add a phosphate to ADP to make ATP / eq ; 4. reference to ATPase ; 5. idea of chemiosmosis ; 6. idea of oxygen as the final acceptor ;	**(3)**

Q6.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	B		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)	D		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(c)	B		**(1)**

Q7.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to two of the following: • pyruvate (1) • oxygen (1) • reduced NAD / ADP (1)		**(2)**

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation that makes reference to four of the following: • to stop H^+ diffusing out (of mitochondrion) / into cytoplasm (1) • (therefore) maintaining a high concentration (of H^+) in the intermembrane space (1) • so {hydrogen ions / protons / H^+} can move down {concentration / electrochemical} gradient (1) • (by) chemiosmosis (1) • to synthesise ATP (1)	ALLOW moves out for diffuses out ALLOW enabling/allowing/establishing formaintaining	(4)

Q8.

Question Number	Answer	Mark
(i)	**The only correct answer is B Q – the Krebs cycle occurs in the matrix** ***A*** *is not correct because the Krebs cycle does not occur in the intermembrane space* ***C*** *is not correct because the Krebs cycle does not occur on the crista* ***D*** *is not correct because the Krebs cycle does not occur at the outer mitochondrial membrane*	**(1)**

Question Number	Answer	Mark
(ii)	**The only correct answer is C – R which labels a crista** ***A*** *is not correct because oxidative phosphorylation does not occur in the intermembrane space* ***B*** *is not correct because oxidative phosphorylation does not occur in the matrix* ***D*** *is not correct because oxidative phosphorylation does not occur at the outer mitochondrialmembrane*	**(1)**

Question Number	Answer	Additional guidance	Mark
(iii)	An answer that makes reference to the following: • length measured and units (converted correctly)(1) • image size divided by actual size to calculate magnification (1)	Example of calculation e.g. 70mm – 70 000 µm e.g. 70 000 ÷ 0.5 = 140 000 x 140 000 Correct answer with no working gains full marks	**(2)**

Q9.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to four of the following: • select people with different thorax sizes (1) • select people who are similar in other respects (1) • one relevant variable controlled (1) • measurement of tidal volume from spirometer trace (1) • measure breathing rate as number of {peaks / troughs} in a set time (1)	ALLOW with or without the adaptation, who lived at high altitude and low altitude e.g. same age, same fitness level, same sex e.g. temperature, same level of previous activity, data collected when subjects were at rest ALLOW difference in peak to trough volume gives tidal volume ALLOW – measure breathing rate by counting number of breaths in a set time	**(4)** **Exp**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to four of the following: • (by) differentiation (1) • (due to) certain stimuli (1)		(4) Exp
	• (which causes) {some genes/ gene for haemoglobin} to be activated / some genes to be deactivated (1) • {mRNA / haemoglobin} produced from activated genes (1) • removal of nucleus / produce a biconcave shape (1)	ALLOW some genes switched on / switched off IGNORE genes being turned on / off	

Q10.

Question Number	Answer	Additional Guidance	Mark
(i)	• calculation of heart rate per minute (1) • percentage above 100 beats per minute (1)	Example of calculation 60 ÷ 0.5 = 120 20% Full marks for correct answer without working	(2) Grad

Question Number	Answer	Mark
(ii)	• C that the atrioventricular node (AVN) delays depolarisation *The answer is not A because Z is not the time of atrial contraction* *The answer is not B because Z is not the time it takes for the A-V valves to open* *The answer is not D because Z is not the time that the ventricles are contracting*	(1) Comp

Q11.

Question Number	Answer	Mark
(i)	**The only correct answer is A - ligaments only** ***B*** *is not correct because the tendons do not join bones to bones in the elbow joint* ***C*** *is not correct because the tendons do not join bones to bones in the elbow joint* ***D*** *is not correct because the ligaments do join bones to bones in the elbow joint*	**(1)**

Question Number	Answer	Mark
(ii)	**The only correct answer is D rows 3 and 4** ***A*** *is not correct because the tendons showing a change is not a change in genotype* ***B*** *is not correct because the tendons also show a physiological adaptation* ***C*** *is not correct because the tendons showing a change is not a change in genotype*	**(1)**

Question Number	Answer	
* **(iii)**	Answers will be credited according to candidates' deployment of knowledge and understanding of materialin relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the materialwhich is relevant. Additional content included in the response must be scientific and relevant. **Indicative content Valid because:** • {sufficient replicates / 12 individuals} used and a mean calculated • All same gender • Means of both heart rate and blood lactate agree with conclusion • Spread of data (standard deviation / error bars) between cycling and running does not overlap **Not valid because:** • Insufficient / only 12 individuals involved • Insufficient detail relating to the athletes e.g. they maybe athletes that focus on different sports/have done more than one previous triathlon / more experienced • The three disciplines are always done in the same order / different distances covered • Spread of cycling data (standard deviation / error bars) for blood lactate overlaps with swimming • As no time allowed to recover between sports, some of blood lactate shown for cycling could havebeen produced during swimming • Agree or not agree with conclusion	**(6)**

			Additional Guidance
Level 0	Marks	No awardable content	
Level 1	1-2	Limited scientific judgement made with a focus on mainlyjust one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolatedelements of biological knowledge and understanding butwith limited evidence to support the judgement being made.	Considers one area only e.g. comparingmean data or spread of data only Conclusion based on only one set of data or only one sport considered e.g. cycling ismost demanding
Level 2	3-4	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasionalevidence to support the judgement being made.	Considers both a valid and an invalid aspect e.g. relevance of spread of data forlactate concentrations overlap in some cases or elements of the study Conclusion given that takes both valid andinvalid aspects into account
Level 3	5-6	A scientific judgement is made which is supported throughout by sustained application of relevant evidencefrom the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages tobiological knowledge and understanding with evidence to support the judgement being made.	Considers both a range of valid and invalidaspects A conclusion based on a range of considered evidence

Q12.

Question number	Answer	Additional guidance	Mark
	An answer that makes reference to the following points: • (athlete) P should exercise at an intensity of 300 watts (1) • (athlete) Q should exercise at an intensity of 330 watts (1) • (athlete) R should exercise at an intensity of 360 watts (1) • as there would be an increase in lactate at the next level of intensity of exercise (1)		(4)

Q13.

Question Number	Answer	Additional guidance	Mark
(i)	An answer the makes reference to the following: • (use of anabolic steroids) reduces {ventricular fraction / ejection fraction /stroke volume / cardiac output } (1) • {83 % / 10 out of 12} of users have ventricular fraction below {55% / the healthy value} (1)	ALLOW less blood leaving the ventricle when it contracts ALLOW more users of anabolic steroids have a ventricular fraction below 55% than non-users ALLOW other valid quantitative values e.g. comparing mean values for each group 51.25 and 60.6%	**(2)**

Question Number	Answer	Additional guidance	Mark
(ii)	An answer the makes reference to the following: • test the drug on { healthy individuals / animals / cell cultures } (1) • (then) test on group of individuals with cancer (1) • (gradually increasing the dose) to determine dose that does not reduce ventricular ejection fraction (1)	ALLOW test on a group of patients ALLOW to determine the dose that does not cause side effects	**(3)**

Q14.

Question Number	Answer
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Indicative content Investigation 1 • comparison of data for no exercise/exercise without nandrolone: maximum recoil of {aorta / artery} is {higher / 23% greater} • discuss outcome of this difference as an advantage: so (oxygen-rich) blood can flow more rapidly (at the correct pressure) {from the heart / to the muscles} • less likely to get atherosclerosis / CVD / strokes Investigation 2 • comparison of data for P and R for both protein complexes: more present due to exercise • discuss advantageous outcome: so more {oxidative phosphorylation / ATP synthesis / chemiosmosis} so more ATP for muscle contraction / breaking of the bond between actin and myosin (in aorta wall) Investigation 3 • compare P and Q for mRNA coding for Tfam: more Tfam per cell so more mitochondria produced so more {respiration / ATP formed }

Level	Marks	Descriptor	Additional Guidance
0	0	No awardable content	
1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Results of one investigation described e.g. comparing P and R groups General comments about production of ATP or respiration
2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts/concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	Results of at least two investigations considered Discussion of results of one of these investigations in terms of consequences

3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts. Consequences are discussed which are supported throughout by sustained linkage to a range of scientific ideas, processes, techniques or procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Results of all three investigations discussed Discussion of the consequences of the data from the investigations in terms of respiration / ATP synthesis Links the consequences to muscle contraction

Q15.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	antagonistic (muscles)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)(i)	contraction (of F) {flexes / bends } the arm		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)(ii)	A description that makes reference to the following: • G (tendon) attaches E to the bone (1) • as G does not stretch, the contraction of E moves the bone (1)		**(2)**

Q16.

Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	D		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)	An explanation that makes reference to: • muscles can only work in one direction (1) Plus one from: • therefore a need to create opposite forces (1) • so must have extensors and flexors (1)		**(2)**

Q17.

Question Number	Indicative content
*	Answers will be credited according to candidates' deployment of knowledge and understanding of material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is relevant. Additional content included in the response must be scientific and relevant. Give examples of relevant biological knowledge and understanding: Evidence of isolated elements of biological knowledge: • glucose for respiration in both • starch for energy storage in plants /glycogen for energy storage in animals • cellulose for cell walls in plants Evidence of adequate biological knowledge with linkages made • starch composed of amylose and amylopectin in plants • sucrose as a transport sugar in phloem in plants, glucose in animals • lactose in milk for energy • a judgement on the importance of carbohydrates in plants and animals is made e.g. cellulose as a structural carbohydrate in plants therefore a greater proportion of carbohydrate in plants than animals or animals require more energy, therefore need more carbohydrate Evidence for comprehensive biological knowledge and understanding with sustained linkages • pentose sugars ribose and deoxyribose { in nucleic acids / DNA/ RNA / ATP} in both • ribulose as part of the Calvin cycle in plants • glycoprotein in { mucus / receptors on cell surface membranes /antibodies} • glycolipids in cell membranes • a supported judgement on the relative importance of carbohydrates in plants and animals is given e.g. animals store more energy in lipids than carbohydrate, therefore carbohydrate more important as a storage molecule in plants **or** the idea of carbohydrates as part of complex molecules **or** the proportion of carbohydrates present is not the same as importance

Level	Mark	Descriptor	Additional guidance
0	0	No awardable content	
1	1-3	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made.	Glucose for respiration Polysaccharides for energy storage Cellulose for plant cell walls Simple conclusion made
2	4-6	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts/concepts. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made.	Branched storage molecules for rapid energy release in starch Roles of sucrose, lactose A judgement on the importance of carbohydrates in plants and animals is made
3	7-9	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made.	All of the above plus discussion of carbohydrates as part of complex molecules A supported judgement on the relative importance of carbohydrates in plants and animals

Q18.

Question Number	Answer	Mark
(a)	1. idea that less {food /eq} required to deliver energy requirement ; 2. (so) more likely to have extra food not respired / {extra/surplus} energy ; 3. which could be laid down in body as fat / eq ;	**(2)**

Question Number	Answer	Mark
(b)	Any two from: 1. ADP 2. Pi / inorganic phosphate 3. pyruvate / pyruvic acid / lactate 4. fatty acids 5. NAD / eq 6. acetyl CoA / eq 7. water ; ;	**(2)**

Question Number	Answer	Mark
(c)	1. many {alpha / eq} glucose monomers ; 2. joined by glycosidic bonds ; 3. detail of glycosidic bonds e.g. 1-4 ; 4. reference to side branches present / 1-6 glycosidic bonds ;	**(3)**

Question Number	Answer	Mark
(d)	1. more gonadotropins ; 2. {use / muscle uptake} of (excess) fatty acids ; 3. respired to release (much) energy / increased fat metabolism ; 4. idea of reduced requirement to replenish glycogen stores ;	**(3)**

Question Number	Answer	Mark
(e)	1. (slow twitch muscles) carry out aerobic respiration / full oxidation / eq ; 2. which produces more ATP (than anaerobic) / eq ; 3. 'energy' not locked up in lactate / eq ; 4. idea that it takes longer for lactate levels to build up ;	**(2)**

Question Number	Answer	Mark
***(f)**	QWC – Spelling of technical terms (*shown in italics*) must be correct and the answer must be organised in a logical sequence) 1. Ca^{2+} leaks out of {cell / *cytoplasm* / *sarcoplasmic reticulum*} ; 2. idea of change in Ca^{2+} binding to *troponin* ; 3. causes displacement of *tropomyosin* / eq ; 4. idea of change in number of *myosin* binding sites exposed ; 5. comment on *myosin* binding to *actin* ; 6. (loss of Ca^{2+} from cell / cytoplasm) therefore force exerted by muscle is lower than expected OR (more Ca^{2+} in cytoplasm) results in less ATP so less muscle contraction ;	**(4)**

Question Number	Answer	Mark
(g)	**Process** / **Two nucleic acids involved in the process** Transcription of the ACE gene / DNA & mRNA ; Production of ACE at a ribosome / Any **two** from: mRNA, tRNA, rRNA ;	**(2)**

Question Number	Answer	Mark
(h)	1. obtain a sample of cells / extract DNA (from cells) ; 2. reference to named enzyme ; 3. idea of how to increase amount of DNA ; 4. reference to electrophoresis ; 5. details of electrophoresis ; 6. use a {DNA / gene} probe ; 7. with a base sequence complementary to that on the {variant / eq} ; 8. idea of matching with known variant profile ;	**(4)**

Question Number	Answer	Mark
(i)	B ;	**(1)**

Question Number	Answer	Mark
(j)	1. (higher metabolic rate) means more chemical reactions / eq ; 2. more {energy released / ATP used} / eq ; 3. (which) releases heat / eq ; 4. keeps divers warmer / warm for longer / able to swim without a wetsuit / eq ;	**(3)**

Question Number	Answer	Mark
(k)	1. carbon dioxide due to {deforestation / land cleaning / burning fossil fuels / correct ref to respiration / eq} ; 2. methane from {rice fields / anaerobic bacterial action / ruminant fermentation / named ruminant} ;	**(2)**

Question Number	Answer	Mark
(l)	1. 1.4 ÷ 37 = ; 2. 3.8 (%) ; Correct answer gains both 2 marks	**(2)**

Q19.

Question number	Answer	Additional guidance	Mark
(i)	A description that makes reference to the following points: • tropomyosin is moved (by troponin) (1) • myosin binding sites (on actin) are exposed (1)	ALLOW tropomyosin moves ALLOW actin-myosin binding site	(2)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that makes reference to four of the following points: • myosin heads can bind to binding sites (1) • (bound) myosin changes shape (1) • actin filaments { slide / pulled } over the myosin (1) • (therefore) { muscle fibres / myofibril / sarcomeres } shorten (1) • ATP hydrolysed / ADP and { inorganic phosphate / Pi } released (1)	ALLOW actin – myosin bridges form ALLOW description of head 'nodding' or 'dipping' forward ALLOW actin moves towards the M line ALLOW Ca^{2+} activates ATPase	(4)

Q20.

Question number	Answer	Additional guidance	Mark
	An explanation that makes reference to the following points: • (muscles cells release lactate into blood) due to anaerobic respiration (1) • insufficient oxygen for aerobic respiration / aerobic respiration cannot meet the demand for energy (1)		(2)

Q21.

Question number	Answer	Additional guidance	Mark
	A description that makes reference to three of the following points: • { increased / sufficient } oxygen supply (1) • for aerobic respiration (1) • because { heart rate / breathing rate } increases (1) • lactate is broken down by the liver / rate of lactate production is balanced by rate of lactate breakdown (1)	ALLOW lactic acid for lactate	(3)

Q22.

Question Number	Answer	Additional Guidance	Mark
(i)	• calculate a difference in the number of neutrophils (1) • calculation of difference in number of neutrophils per athlete either in blood or per kilogram (1) • calculation of number of fewer neutrophils in the blood per kilogram (1)	Example of calculation: $0.15 \times 10^6 = 150\,000$ OR $(3.57 \div 70) - (3.42 \div 70) = 0.002142$ In blood - $150\,000 \times 5000 = 750\,000\,000$ OR per kg - $150\,000 \div 70 = 2142.86$ $750\,000\,000 \div 70 = 10\,714\,286$ OR $2142 \times 5000 = 10\,710\,000$ ALLOW 11×10^6 or 1.1×10^7 or 0.11×10^8 ALLOW ECF - 2 marks for 10.7 or 10.71 Correct answer with no working gains full marks.	**(3)** **Exp**

Question Number	Answer	Additional Guidance	Mark
(ii)	• there are fewer neutrophils and the activity is reduced		**(1)** **Exp**

Q23.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>(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>ACCEPT for function of A: involuntary muscles or named e.g. swallowing, vomiting, sneezing

ACCEPT for cerebrum: frontal lobe / prefrontal / cerebral cortex</td><td>(4)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
(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 ;	3. ACCEPT to produce {same / complementary / eq} sticky ends (in plasmid and (human) gene)	(2)

Question Number	Answer	Additional Guidance	Mark
(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. reference 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)

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

Question Number	Answer	Additional Guidance	Mark
(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 3. ACCEPT (blood) pressure less so less blood loss 4. ACCEPT vein nearer the skin surface	(2)

Q24.

Question Number	Answer	Mark
(a)		**(2)**

Region of the brain	**One role while she is on the beam**
Cerebellum	maintaining balance / coordination of movement / muscle control / eq ;
Medulla oblongata	regulation of {breathing / heart beat} / eq ;

Question Number	Answer	Mark
(b)	1. idea more blood flows near the skin surface / eq ; 2. due to {vasodilation / dilation of arterioles / eq} ; 3. {vasoconstriction / eq} of shunt vessels / eq ; 4. more blood to capillaries / eq ; 5. idea of more heat lost ; 6. via radiation ;	**(4)**

Question Number	Answer	Mark
(c)(i)	1. {in the knee / behind the knee cap} /{cross- shaped / two ligaments} ; 2. (connective tissue that) connects bone to bone / eq ;	**(2)**

Question Number	Answer	Mark
(c)(ii)	1. idea of smaller incision reduces chance of infection / eq ; 2. idea of smaller incision reduces recovery time ; 3. idea of smaller incision reduces likelihood of osteoarthritis / knee joint replacement later / eq ; 4. idea of smaller incision so less scar tissue / eq ; 5. idea of smaller incision so less blood loss / eq ; 6. idea of smaller incision so less pain / eq ; 7. use of local anaesthetic means less (associated) risk / eq ; 8. idea of cheaper related to fewer staff needed ;	**(2)**

Q25.

Question Number	Answer	Mark
(a)		**(4)**

Labelled structure	Name of structure	One function
A	cerebellum ;	coordinates movement / balance / posture / fine motor control ;
D ;	hypothalamus ;	Thermoregulation

Question Number	Answer	Additional guidance	Mark
(b)	1. heat (energy) from blood in capillaries / eq ; 2. absorbed by sweat ; 3. used to break H bonds in water ; 4. reference to latent heat ; 5. (so) water evaporates ; 6. taking heat from the body / eq ;		(3)

Question Number	Answer	Additional guidance	Mark
(c)(i)	1. reference 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**
(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 comparison of brain regions or sea lions	**(2)**