

Topic 7 Biology

Booklet 3 of 3

Revision Questions

**Bones, Muscles &
Joints**

MARK SCHEME

Question Number	Correct Answer	Mark											
5(a)	Mark for each correct row <table border="1"> <thead> <tr> <th rowspan="2">Muscle</th><th colspan="2">Muscle contracted when</th></tr> <tr> <th>Holding steady</th><th>Lifting upwards</th></tr> </thead> <tbody> <tr> <td>Extensor</td><td>X</td><td></td></tr> <tr> <td>Flexor</td><td>X</td><td>X</td></tr> </tbody> </table> ;;	Muscle	Muscle contracted when		Holding steady	Lifting upwards	Extensor	X		Flexor	X	X	(2)
Muscle	Muscle contracted when												
	Holding steady	Lifting upwards											
Extensor	X												
Flexor	X	X											

Question Number	Correct Answer	Mark
5(b)	tendons ;	(1)

Question Number	Correct Answer	Mark
5(c)	1. idea that muscles cannot extend themselves ; 2. need opposing muscle to extend / eq ; 3. antagonistic muscle allows control (of movement) / eq ;	max (2)

Question Number	Correct Answer	Mark
5(d)	1. all fibres same length and width as original ; 2. Z lines closer together ; 3. more overlap of actin and myosin ;	(3)

June 2010

Question Number	Correct Answer	Mark
*5(e) QWC	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. reference to {<i>vesicles</i> / <i>t-tubules</i> / <i>sarcoplasmic reticulum</i>} contain <i>calcium ions</i> ; 2. {binds / eq} to <i>troponin</i> ; 3. <i>tropomyosin</i> moves exposing binding sites / eq ; 4. for <i>myosin</i> /eq ; 5. needs ATP to remove <i>calcium ions</i> / eq ; 6. ATP provides energy for changing shape of <i>myosin</i> / eq ; 7. ATP is required to {break cross bridges / eq} ; 8. ATP for synthesis of <i>neurotransmitter</i> / eq ; 	<p>max (5)</p>

June 2010

Question Number	Answer	Mark
1(a)(i)	D ;	(1)

Question Number	Answer	Mark
1(a)(ii)	B ;	(1)

Question Number	Answer	Mark
1(b)	1. {hold / attaches / eq} bones together / eq ; 2. idea that still allows movement (at the joint) / eq ;	(2)

Question Number	Answer	Mark
1(c)	1. comment on time needed for repair / eq ; 2. reference to difference in composition of {P and Q} e.g. ligament has more elastic fibres , P is inelastic, P is less flexible ; 3. idea of need to (gradually) stretch repaired tissue ;	max (2)

Question Number	Answer	Mark
1(d)	1. less damage (to tissue) / eq ; 2. short time for recovery / eq ; 3. social benefit e.g. more patients can be treated ; 4. idea of economic benefit e.g. cheaper than invasive surgery ; 5. idea of less anaesthetic needed ;	max (3)

Jan 2011

Question Number	Answer	Mark
4(a)	$3.5 \times 10^{-3} \div 1.7 \times 10^{-6} / (3.5 \div 1.7) \times 10^{-3}$; $= 2059 \text{ \{million / } \times 10^6 \text{ \}} / 2058.8 \text{ \{million / } \times 10^6 \text{ \}}$ $/ 2\,058\,823\,530$; <u>Note:</u> 2 marks for correct answer 1 mark for incorrect answer but correct working	(2)

Question Number	Answer	Mark
4(b)(i)	fast twitch (fibre) / type II (fibre) ;	(1)

Question Number	Answer	Mark
4(b)(ii)	1. (ATP from) phosphorylation of ADP / eq ; 2. energy required (for phosphorylation) / eq ; 3. reference to glycolysis / glucose converted to pyruvate / eq ; 4. pyruvate {converted to lactate / reduced / eq} ; 5. idea that makes NAD available ; 6. reference anaerobic respiration ; 7. in (cell) cytoplasm / eq ; 8. ATP from oxidative phosphorylation in mitochondria / eq ; 9. idea that phosphocreatine is involved in production of ATP ;	max (5)

Jan 2011

Question Number	Answer	Mark
4(b)(iii)	<ol style="list-style-type: none">1. ATP supply limited / eq ;2. reference to {anaerobic respiration / lots of lactate / eq} / eq ;3. pH is lower / eq ;4. affects enzymes / prevents muscle contraction / eq ;	max (2)

Jan 2011

Question Number	Answer	Mark
5(a)	<ol style="list-style-type: none"> 1. change for fast twitch = 0.6 ; 2. reading at pH 7 = 0.9 to 1.0, reading at pH 6 = 1.95-2.05, to give answer within the range 0.95 - 1.15 ; 	(2)

Question Number	Answer	Mark
5(b)	<ol style="list-style-type: none"> 1. lower pH, both {less / eq} sensitive to calcium ions / lower pH more calcium ions needed for (50%) contraction / eq ; 2. effect on slow twitch is greater / eq ; 3. lower pH decreases contraction (in both) / eq ; 4. lower pH has no effect at high calcium ion concentration (in both) / eq ; 	(2)

Question Number	Answer	Mark
5(c)(i)	Anaerobic {conditions/respiration} / lack of oxygen / process that reduces pH / eq ;	(1)

Question Number	Answer	Mark
5(c)(ii)	<ol style="list-style-type: none"> 1. fast twitch anaerobic / slow twitch aerobic ; 2. fast twitch more likely to experience low pH / eq ; 3. low pH due to lactate / eq ; 4. (fast twitch) is less affected by change in pH / eq ; 5. can continue to respond to stimulus at lower pH / eq ; 	(2)

Question Number	Answer	Mark
5(d)	<ol style="list-style-type: none"> 1. troponin binds calcium ions / eq ; 2. tropomyosin {moved / eq }; 3. (causing) myosin binding sites exposed / eq ; 4. on actin ; 5. calcium binding site sensitive to pH / eq ; 6. idea that troponin is different in each fibre ; 	(3)

Question number	Answer	Mark
6(a)(i)	D	(1)

Question number	Answer	Mark
6(a)(ii)	B	(1)

Question number	Answer	Mark
6(a)(iii)	B	(1)

Question number	Answer	Mark
6(a)(iv)	D	(1)

Question number	Answer	Mark
6(a)(v)	A	(1)

Question number	Answer	Mark
6(a)(vi)	C	(1)

Question Number	Answer	Mark						
5(a)	<table><tr><th>Region of the brain</th><th>One role while she is on the beam</th></tr><tr><td>Cerebellum</td><td>maintaining balance / coordination of movement / muscle control / eq ;</td></tr><tr><td>Medulla oblongata</td><td>regulation of {breathing / heart beat} / eq ;</td></tr></table>	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 ;	(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
5(b)	<ol style="list-style-type: none"> 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
5(c)(i)	<ol style="list-style-type: none"> 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
5(c)(ii)	<ol style="list-style-type: none"> 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)

Question Number	Answer	Additional guidance	Mark
4(a)(i)	<ol style="list-style-type: none"> 1. (protein in thin filament) - actin / G actin ; 2. (protein in thick filament) - myosin ; 		(2)

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	<ol style="list-style-type: none"> 1. {Ca²⁺ / calcium ions} bind to troponin ; 2. troponin {changes shape / moves / eq} ; 3. this displaces tropomyosin (away from myosin) / eq ; 	ACCEPT 3 - pulls/shifts/moves tropomyosin	(2)

Question Number	Answer	Additional guidance	Mark
4(a)(iii)	acetylcholine / {noradrenaline / eq} ;	ACCEPT - ACh, noradrenalin, norepinephrine	(1)

Question Number	Answer	Additional guidance	Mark
4(b)	<ol style="list-style-type: none"> 1. the higher troponin T, the longer the stay / eq ; 2. reliability of prediction decreases as troponin T concentration increases ; 3. because {range / eq} increases ; 4. least reliable for 6.0+ as range is largest ; 5. one range stated e.g. for 6.0+ it is 7 to 11 days ; 6. reference to range overlapping between 4.0-5.9 and 6.0+ ; 7. idea that 6.0+ is too wide a category for conc. of troponin T ; 8. idea that the higher the troponin T, the greater the damage to the heart ; 	<p>ACCEPT 1 - converse</p> <p>ACCEPT 2 - converse, less reliable at high troponin T</p> <p>ACCEPT 3 - range of the length of stay, range of data</p> <p>ACCEPT 4 - converse for 1.0-3.9 / 4.0-5.9</p>	(3)

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

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

Question Number	Answer	Mark
1(a)(iii)	B ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. increased risk of obesity / eq ; 2. (coronary) heart disease / CHD / eq ; 3. diabetes / eq ; 4. high blood pressure / strokes ; 5. osteoporosis ;	1 ACCEPT overweight 2 ACCEPT build-up of cholesterol in {arteries / blood vessels}, CVD, atheroma 5 ACCEPT decrease in bone density	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	1. wear and tear on joints / eq ; 2. suppression of immune system / susceptibility to { respiratory tract infections / eq } / eq ;	1 ACCEPT damage to joints, ligaments, osteoarthritis, arthritis, wearing away of cartilage, stress fractures, named e.g. tennis elbow, RSI must be qualified 2 ACCEPT URT for upper respiratory tract, infections of the airways, reduced numbers of white blood cells IGNORE asthma	(2)

Question Number	Answer	Additional Guidance	Mark
4(a)	1. mice of different mass / eq ; 2. idea of concentration is a controlled variable ; 3. idea of increases validity of investigation or conclusions ; 4. maybe harmful in high doses / eq ;	ACCEPT converse statement where appropriate 1. IGNORE ref to diff sizes unqualified 2. to overcome effect of {lighter mice receiving proportionately a higher dose / heavier mice receiving proportionately a lower dose} / to keep concentration per kg of mouse constant ; 3. ACCEPT so comparisons can be made 4. ACCEPT concentration for dose	(3)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. increases the ratio; 2. by { 0.3 / 17.6% } ; 3. inner membrane is larger / eq ;	1. ACCEPT ratio is higher 2. ACCEPT 18% 3. ACCEPT increases the surface area of inner membrane ACCEPT converse IGNORE it is smaller	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	<ol style="list-style-type: none"> 1. idea that fatigue may be due to less ATP ; 2. inner membrane is the site of {electron transport chain / oxidative phosphorylation / eq} ; 3. {more inner membrane / greater inner surface area} then more electron transport chain / eq ; 4. more ATP made / eq ; 5. detail of ATP synthesis e.g. ref to chemiosmosis, H^+ down electrochemical gradient through ATP synthase ; 6. (so) delays onset of fatigue / eq ; 7. by 34 seconds in {group A / those fed epicatechin} ; 	<p>ACCEPT converse where appropriate</p> <ol style="list-style-type: none"> 1. ACCEPT running out, running short 2+3 ACCEPT crista for inner membrane 3. ACCEPT more aerobic respiration 4. ACCEPT idea that more ATP present/available 5. This mp is independent of quantity 6. ACCEPT ref to muscles can contract for longer 7. gains Mp6 as well if states comparison e.g. 34s longer to fatigue 	(5)

Question Number	Answer	Additional Guidance	Mark
6(a)	<ol style="list-style-type: none"> 1. RBC will {carry/supply oxygen} ; 2. idea that low number of mitochondria present in fast twitch ; 3. so additional oxygen may have limited additional effect / eq ; 4. poor {blood supply / capillary network} in fast twitch muscle so little additional {oxygen / RBC / eq} received / eq ; 5. (in fast twitch) respiration is (primarily) anaerobic / eq ; 6. short {time duration of race/distance travelled} means minimal additional blood supplied to muscles in timeframe ; 	<p>ACCEPT converse for slow twitch muscle</p> <p>4. ACCEPT low numbers of RBC in fast twitch so extra will have minimal additional effect</p> <p>6. ACCEPT no need for oxygen because of short {time duration of race/distance travelled}</p>	(3)

Question Number	Answer	Additional Guidance	Mark
6(b)	<ol style="list-style-type: none"> 1. idea of not being fair ; 2. idea of being a poor role model for youngsters ; 3. health risk to athletes / eq ; 4. cost to {NHS / medical services / eq} of health implications / eq ; 	<p>3. ACCEPT raised blood clotting risk, harmful side effects</p>	(2)

Question Number	Answer	Mark
1(a)	D - stays the same;	(1)

Question Number	Answer	Mark
1(b)(i)	D ;	(1)

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

Question Number	Answer	Mark
1(b)(iii)	B - myosin binding sites to be exposed ;	(1)

Question Number	Answer	Mark
1(b)(iv)	B - myosin ;	(1)

Question Number	Answer	Mark
1(b)(v)	A - more mitochondria than fast twitch fibres ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(c)	1. {extensor muscles / eq} {contract / shorten / eq} ; 2. leg is straightened / eq ; 3. flexor muscle relaxes / eq ; 4. description of antagonistic action e.g. these muscles working in opposition, when one contracts the other relaxes ; 5. flexor is stretched / eq ; 6. tendons attach muscles to bones / eq ;	1 ACCEPT correctly named muscle e.g. quads/quadriceps 3 ACCEPT correctly named muscle e.g. hamstrings 4 IGNORE work together, in pairs	(4)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	1. generate heat (energy) / maintain core temperature / eq 2. moving about looking for food / eq 3. the birds are heavier so they will need more energy to move / eq ;	IGNORE to keep warm 1. ACCEPT to store (excess energy as) fat / insulation	(1)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	1. less active / less food available / already have insulating fat layer/ eq ;	IGNORE hibernate	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	1. energy consumption per bird will be affected by mass of the bird / eq ; 2. (need to adjust values to per kg) to make a valid comparison / eq ;	1. ACCEPT 'birds might have different masses' 2. ACCEPT to remove body mass as a variable	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. winter energy consumption is lower than in summer / eq ; 2. consumption increases with running speed (for both seasons) / eq ; 3. same { difference between seasons / eq } at each speed ; 4. calculated difference supporting MP1, MP2 or MP3 ;	1. ACCEPT converse 2. ACCEPT positive correlation 4. ACCEPT $3.5 \text{ (Jkg}^{-1}\text{s}^{-1})$ greater in summer / correct calculated % increase for a specified running speed	(3)

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	1. ptarmigan can run for longer distances / increased endurance / eq ; 2. reduced running speeds / eq ;	1. ACCEPT tires slowly	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(iv)	ligaments ;	ACCEPT tendons, cartilage	(1)

Question Number	Answer	Additional Guidance	Mark
2(c)	1. lactate { moves into / transported in } the blood / eq ; 2. carried to the liver / eq ; 3. lactate is converted to { pyruvate / glucose } ; 4. glucose is { respired / stored / eq } / pyruvate is respired / eq ;	1. ACCEPT lactic acid { moves into / transported in } the blood 4. ACCEPT pyruvate enters link reaction / pyruvate reacts with CoA DO NOT-ACCEPT-ACCEPT pyruvate enters Krebs cycle	(3)

Total for Question 2 = 13 MARKS