

Topic 7 Biology

Booklet 1 of 3

Revision Questions

Metabolic Pathways

MARK SCHEME

Question Number	Correct Answer	Mark
6(a)	ATPase / ATP synthetase ;	(1)

Question Number	Correct Answer	Mark
6(b)	<ol style="list-style-type: none"> 1. (H^+ ions) from reduced NAD / eq ; 2. H^+ ions pumped into inter membrane space / eq ; 3. reference to energy needed (for pump) / eq ; 4. reference to movement of electrons along ETC /eq; 5. (ETC on) inner membrane / cristae; 	max (3)

Question Number	Correct Answer	Mark
6(c)	<ol style="list-style-type: none"> 1. H^+ ions follow diffusion gradient / eq ; 2. idea that this causes an energy change or makes energy available ; 3. ATP is formed / eq ; 4. idea that this occurs on stalked particles ; 5. ATP is energy source for (biological processes) / eq ; 	max (2)

June 2010

Question Number	Answer	Mark
5(a)	glycolysis ;	(1)

Question Number	Answer	Mark
5(b)(i)	B ;	(1)

Question Number	Answer	Mark
5(b)(ii)	C ;	(1)

Question Number	Answer	Mark
5(c)(i)	<ol style="list-style-type: none"> 1. oxygen {to oxidise hydrogen / as hydrogen acceptor / as final acceptor of electron transport chain} / eq ; 2. reference to reduced {coenzyme / NAD / FAD / eq} ; 3. (reduced coenzyme) from {glycolysis / Krebs Cycle / eq} ; 4. comparison of two {oxygen uptake / respiration rates} from pyruvate, molecules B and C e.g. respiration rate faster in pyruvate than molecule B ; 5. reference to uptake of substrate compared e.g. uptake of molecule B faster than molecule C ; 6. comparison of diffusion rate / molecular size / eq ; 7. comment on oxidation level of substrate e.g. ratio H:O in molecule / eq ; 8. relative quantity of {reduced coenzyme / eq} produced / eq ; 9. pH effect of pyruvate more favourable for {enzyme / reaction} / eq ; 10. number of carbon atoms of {C lower than B} / eq ; 	max (4)

Jan 2011

Question Number	Answer	Mark
5(c)(ii)	<ol style="list-style-type: none"> 1. lactate can be converted to {pyruvate / eq} ; 2. increases oxygen requirement / reference to oxygen debt / eq ; 3. idea of most potential for oxidation / e.g. can make the most {reduced coenzyme / eq} ; 	max (2)

Jan 2011

Question Number	Correct Answer	Mark
3(a)	1. carbon dioxide produced in respiration / eq ; 2. affects {volume / pressure} of gas / eq ; 3. allows measurement of oxygen used / eq ;	max (2)

Question Number	Correct Answer	Mark
3(b)(i)	Two marks for correct answer 0.8 (mm min ⁻¹) ;; if incorrect allow one mark for correct working 1. 48 ; OR 1. 12 ; 2. ÷ 60 to give answer ; OR 2. ÷ 15 to give answer	(2)

Question Number	Correct Answer	Mark
3(b)(ii)	1. no oxygen available/no oxygen uptake ; 2. reference to anaerobic respiration ; 3. carbon dioxide produced is absorbed / eq ; 4. no (net) change of {volume / pressure} of gas ;	max (2)

June 2010

Question Number	Correct Answer	Mark
3(b)(iii)	<ol style="list-style-type: none"> 1. {mass / eq} of organism may differ ; 2. use same mass / express results per unit mass / eq ; 3. temperature changes / eq ; 4. control temperature using a water bath / eq ; 5. pressure may affect volume of gas / eq ; 6. use of control with no organisms, at the same time / eq ; 	max (4)

June 2010

Question number	Answer	Mark
2 (a)* 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. idea that energy obtained from ATP ; 2. idea that ATP already in muscle cells e.g. ATP store ; 3. ATP from {<i>glycolysis</i>/ substrate level <i>phosphorylation</i>/ eq} ; 4. idea that <i>glycolysis</i> produces ATP {rapidly / eq} ; 5. idea that some {<i>aerobic respiration</i> / eq} due to some oxygen present ; 6. <i>glycolysis</i> occurs in <i>cytoplasm</i> / eq ; 7. idea of need to recycle NAD^+ ; 8. idea that <i>pyruvate</i> is converted to <i>lactate</i> ; 9. reference to <i>anaerobic respiration</i> ; 10. idea of <i>lactate</i> tolerance ; 11. reference to fast <i>twitch</i> {muscle / fibres} ; 12. reference to {<i>creatine phosphate</i> / eq} ; 	(6)

Question number	Answer	Mark
2 (b)(i)	<ol style="list-style-type: none"> 1. (lactate build up) causes {drop in pH / more acidic / increase H^+ / eq} ; 2. idea of this affects enzyme {activity / shape / eq} ; 3. this slows down {<i>glycolysis</i> / ATP production / anaerobic respiration / eq} ; 4. reference to muscle contractions being affected ; 	(2)

Question number	Answer	Mark
2 (b)(ii)	<ol style="list-style-type: none"> 1. reference to lactate in the blood / eq ; 2. {transported to / broken down in / eq} liver ; 3. lactate is {converted to pyruvate / eq} ; 4. this involves {oxidation / production of reduced NAD / eq} ; 5. pyruvate is then {oxidised / eq} ; 6. reference to Krebs cycle ; 7. {this requires extra oxygen / reference oxygen debt} / eq ; 8. idea that carbon dioxide and water are produced ; 	(4)

Question number	Answer	Mark
3(a)(i)	1. idea that sample size is enough ; 2. comment on the accuracy of measurement / eq ; 3. standard deviations are small / eq ;	(2)

Question number	Answer	Mark
3(a)(ii)	1. $(9.35 \div 10.22)$; 2. $(0.91487) \times 100 = 91.5 (\%)$;	(2)

Question number	Answer	Mark
3(a)(iii)	1. men are faster than women / eq ; Any one from: 2. idea of differences in body structure e.g. men have more muscle, longer legs, more fast twitch fibres ; 3. idea of differences in physiology e.g. testosterone ;	(2)

Question number	Answer	Mark
3(b)	<ol style="list-style-type: none">1. marathon distance greater / eq ;2. Idea that more aerobic respiration is needed ;3. to {reduce / eq} production of lactate ;4. anaerobic respiration not efficient enough / eq ;5. {oxygen debt / lactate levels} cannot be sustained over this distance / eq ;6. idea that marathon runners use slow twitch fibres ;	(3)

Question number	Answer	Mark
5(a) (i)	<p>Any one from:</p> <ol style="list-style-type: none"> 1. reduces {volume / pressure of gas} / eq ; 2. allows {measurement of oxygen used / movement of liquid / eq} ; 	(1)

Question number	Answer	Mark
5(a) (ii)	<ol style="list-style-type: none"> 1. returning the coloured liquid back to zero / eq ; 2. idea of calibration ; 3. repetition / eq ; 	(2)

Question number	Answer	Mark
5(b)* 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 constant temperature ; 2. use of water bath / eq ; 3. reference to {suitable / stated / fixed time / eq} ; 4. Reference to measuring {volume / distance} ; 5. description of how to obtain volume ; 6. calculation of rate described / eq ; 7. reference to replicates ; 8. description of control e.g. no woodlice ; 9. idea of welfare of animals important ; 10. reference to {mass / eq} of woodlice ; 	(6)

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

Question Number	Answer	Mark
2(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
2(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
2(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)

Question Number	Answer	Additional guidance	Mark
3(a)	<ol style="list-style-type: none"> 1. Idea an enzyme converts a named substrate into named product e.g. enzyme 1 converts P to Q ; 2. idea that this product becomes the substrate of next step ; 3. idea of specificity ; 4. {controls / eq} the conversion / eq ; 5. speeds up the conversion / eq ; 6. by reducing activation energy / eq ; 7. credit reference to control of whole process ; 	<p>ACCEPT answers in context of respiration</p> <p>ACCEPT 1 - ref to an enzyme converting one named intermediate to the next e.g. {enzyme/ named enzyme} used to convert hexose to phosphorylated hexose</p> <p>ACCEPT 3 - description of specificity e.g. active site of enzyme 1 only accepts substance P or in context of named respiratory intermediate</p> <p>ACCEPT 4 - regulates</p> <p>ACCEPT 5 - catalysis / enzyme acts as a catalyst</p> <p>ACCEPT 7 - end product inhibition or description</p>	(4)

Question Number	Answer	Additional guidance	Mark
3(b)(i)	<p>1. $W = \{NAD / NAD^+ / NAD_{ox} / eq\}$;</p> <p>Any two of the following:</p> <p>2. (due to) reduced NAD {releasing/eq} {electrons / eq} ;</p> <p>3. Idea of electrons go to {carrier A / ETC / eq} ;</p> <p>4. Idea of H^+ moved into inter-membranal space ;</p>	<p>ACCEPT 2 – being oxidized Releasing hydrogen (atoms), H^+/protons</p> <p>ACCEPT 3 – 1st electron carrier/correctly named carrier</p>	(3)

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	<p>1. substance X is ATP ;</p> <p>Any two of the following :</p> <p>2. due to H^+ pass through {stalked particle / ATP synthase} ;</p> <p>3. (H^+ passes) down an electrochemical gradient ;</p> <p>4. (sufficient) energy is {released / eq} ;</p> <p>5. to join ADP and {Pi / eq} ;</p> <p>6. reference to chemiosmosis ;</p>	<p>ACCEPT 2 –ATPase</p> <p>ACCEPT 3 - description of electrochemical gradient</p> <p>ACCEPT 5 – phosphorylation of ADP</p>	(3)

Question Number	Answer	Additional guidance	Mark																			
3(c)	<table border="1"> <thead> <tr> <th rowspan="2">Situation</th><th colspan="3">Movement of coloured liquid</th></tr> <tr> <th>towards A</th><th>towards B</th><th>does not move</th></tr> </thead> <tbody> <tr> <td>Screw clip is open</td><td></td><td></td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>Screw clip is closed</td><td><input checked="" type="checkbox"/></td><td></td><td></td></tr> <tr> <td>Potassium hydroxide is replaced with water and screw clip is closed</td><td></td><td></td><td><input checked="" type="checkbox"/></td></tr> </tbody> </table>	Situation	Movement of coloured liquid			towards A	towards B	does not move	Screw clip is open			<input checked="" type="checkbox"/>	Screw clip is closed	<input checked="" type="checkbox"/>			Potassium hydroxide is replaced with water and screw clip is closed			<input checked="" type="checkbox"/>		(3)
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Question Number	Answer					Additional Guidance	Mark
5(a) (i)	Investigation	Type of respiration	Potassium hydroxide solution absent or present	Coloured liquid moved to the left	Coloured liquid moved to the right	Coloured liquid did not move	
	1	Anaerobic	Absent	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2	Aerobic	Absent	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> ;	
	3	Aerobic	Present	<input checked="" type="checkbox"/> ;	<input type="checkbox"/>	<input type="checkbox"/>	
							(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	1. (as anaerobic) no O_2 absorbed / eq ; 2. no CO_2 produced / eq ; 3. so no change in {volume/pressure} (so liquid does not move) ; 4. since for each 6C glucose respired, 2x3C lactate formed / eq ;	1. ACCEPT No oxygen used	(3)

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	<ol style="list-style-type: none"> 1. (reduced NAD from glycolysis) enters mitochondria/ moves through outer mitochondrial membrane / eq ; 2. moves to inner membrane of mitochondrion / eq ; 3. becomes {oxidised / NAD / NAD⁺} ; 4. as {electrons / eq} transferred to {electron transport chain / eq} / eq ; 5. fate of hydrogen ions described e.g. pumped into membrane space ; 6. (NAD) returns to {Krebs cycle/ matrix / eq} ; 	<p>2. ACCEPT crista for inner mitochondrial membrane</p> <p>6. ACCEPT cytoplasm, glycolysis</p>	(4)

Question Number	Answer	Additional Guidance	Mark
5(b)	<ol style="list-style-type: none"> 1. same mass of each tissue / eq ; 2. idea of time being recorded for {a set distance travelled by coloured liquid OR distance coloured liquid travelled in a set time} ; 	1. IGNORE amount	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	Two from: 1. idea of size of cube ; 2. same {species / eq} of carrot ; 3. same {age / source / eq} of carrot ;	1 ACCEPT surface area / volume IGNORE mass	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	1. (oxygen is) electron acceptor / eq ; 2. (also oxygen) binds with protons / H^+ / hydrogens ; 3. Idea of electrons from {electron transport chain / ETC} ; 4. to form (metabolic) water ;	3 ACCEPT from cytochromes	(3)

Question	Answer	Additional Guidance	Mark
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Number	Answer	Additional Guidance	Mark
2(b)	1. aerobic respiration ; 2. ref. to decarboxylation ; 3. (when) pyruvate broken down / eq ; 4. (decarboxylation occurs) in Krebs cycle ; 5. details of where in Krebs cycle e.g. removed from { C6 / C5 / eq } compound ;	4 ACCEPT link reaction 5 ACCEPT C3 to C2 if refer to link reaction	(4)

Question Number	Answer	Additional Guidance	Mark
2(c)	1. as temperature increases, percentage of CO ₂ in bag {increases / eq} ; 2. (as temperature increase) {reactants / named / eq} {gain more kinetic energy / collide more often} ; 3. increased enzyme activity / more E-S complexes form / eq ; 4. smaller increase between 5 and 10 because {more active sites occupied / some other factor is limiting / eq} ;	1 ACCEPT rises IGNORE change unqualified 4 ACCEPT e.g. O ₂ concentration could be limiting, high CO ₂ levels inhibit enzymes	(3)

Question Number	Answer	Additional Guidance	Mark
2(d)	anaerobic respiration ;	ACCEPT fermentation but not lactic acid fermentation IGNORE: respiration unqualified	(1)

Question Number	Answer	Mark
1(a)	1(a). The only correct answer is A <i>B is not correct because the spikes on the graph do not become further apart with time</i> <i>C is not correct because the spikes on the graph do not become smaller with time</i> <i>D is not correct because the spikes on the graph do not become smaller and further apart with time</i>	(1)

Question Number	Answer	Mark
1(b)	1(b). The only correct answer is B <i>A is not correct because the value is too small</i> <i>C is not correct because the value is too large</i> <i>D is not correct because the value is too large</i>	(1)

Question Number	Answer	Mark
1(c)	1(c). The only correct answer is B <i>A is not correct because the value is too small</i> <i>C is not correct because the value is too large</i> <i>D is not correct because the value is too large</i>	(1)

Question Number	Answer	Mark
1(d)	<p>1(d). The only correct answer is A</p> <p><i>B is not correct because the value is too large</i></p> <p><i>C is not correct because the value is too large</i></p> <p><i>D is not correct because the value is too large</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
1(e)	<ol style="list-style-type: none"> 1. oxygen is {H⁺ / electron} acceptor / eq ; 2. (at end of) electron transport chain ; 3. oxygen is used to form water / eq ; 4. reference to oxidative phosphorylation ; 5. production of ATP ; 	<ol style="list-style-type: none"> 1. ACCEPT final electron acceptor 	(4)

Total for Question 1 = 8 MARKS