A Level OCR Biology

20 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
1(a)	**D** ✓ **A** ✓ **C** ✓ **B** ✓		4	AO1 AO2 AE 5.2.2(b) 5.2.2(c) 5.2.2(d) 5.2.2(e) 5.2.2(g) 5.2.2(h) 5.2.2(i)(i)
1(b)(i)	**W** Ethanal ✓ **X** Carbon dioxide ✓ **Y** Reduced NAD ✓ **Z** NAD ✓		4	
1(b)(ii)	Pyruvate decarboxylase ✓		1	
1(b)(iii)	Any two pairs from: animal cells produce lactic acid/lactate **AND** plant cells produce ethanol ✓ in animal cells, no carbon dioxide produced / no decarboxylation **AND** in plant cells, carbon dioxide is produced / decarboxylation occurs ✓ animal cells use pyruvate dehydrogenase only **AND** plant cells use pyruvate decarboxylase and ethanol dehydrogenase ✓ pyruvate is the hydrogen acceptor in animal cells **AND** ethanal is the hydrogen acceptor in plant cells ✓ reversible in animal cells **AND** irreversible in plant cells ✓ takes place in one step only in animals **AND** takes place in two steps in plants ✓		4 max	
2(a)	Any two from: (release energy for) skeletal movement / skeletal muscle contractions ✓ active transport / bulk transport ✓ maintain body temperature ✓ moving vesicles and organelles within cells ✓ whole cell movement by flagella ✓ movement of cilia ✓ (named) anabolic reactions (e.g., condensation to produce carbohydrates / lipids / proteins / nucleic acids / transcription / phosphorylation of molecules) ✓		2 max	AO1 AO2 2.1.3(c) 5.2.1(d) 5.2.2(a) 5.2.2(g)

A Level OCR Biology

20 Respiration – answers

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>2(b)(i)</td><td>correct attachment: adenine attached to ribose, which is attached to 3 phosphate groups ✓
adenine attached to C1 of ribose AND 3 phosphate groups attached to C5 of ribose ✓</td><td></td><td>2</td><td></td></tr>
<tr><td>2(b)(ii)</td><td>Any six from:
cristae in mitochondria has ETC ✓
electrons and protons released by reduced NAD / FAD ✓
electrons pass through ETC releasing energy from redox reactions ✓
pump protons from matrix into intermembrane space ✓
increase proton concentration in intermembrane space ✓
chemiosmosis occurs ✓
protons diffuse back into matrix, down electrochemical / proton / H^+ concentration gradient ✓
through ATP synthase (which makes ATP from ADP and Pi) ✓</td><td></td><td>6 max</td><td></td></tr>
<tr><td>2(b)(iii)</td><td>cyclic / non-cyclic photophosphorylation ✓
in thylakoid membrane ✓
substrate-level phosphorylation ✓
in cytoplasm AND matrix ✓</td><td></td><td>4</td><td></td></tr>
<tr><td>3(a)</td><td><table><tr><th>Organelle</th><th>mitochondrion</th><th>cytoplasm</th><th>chloroplast</th></tr><tr><td>ATP synthase is present</td><td>✓</td><td></td><td>✓</td></tr><tr><td>Electrons pass through electron carriers</td><td>✓</td><td></td><td>✓</td></tr><tr><td>Electrons are excited by light</td><td></td><td></td><td>✓</td></tr><tr><td>Coenzymes are present</td><td>✓</td><td>✓</td><td>✓</td></tr></table></td><td>One mark per correct row</td><td>4</td><td>AO2
AE

5.2.1(d)
5.2.1(e)
2.1.5(d)(i)
5.2.2(d)
5.2.2(e)
5.2.2(f)</td></tr>
</table>

A Level OCR Biology

20 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
3(b)	Any four from: NAD and FAD become reduced ✓ in glycolysis, link and Krebs cycle ✓ release hydrogen which splits into protons and electrons in oxidative ✓ phosphorylation to drive ATP production ✓ coenzyme A is present in the matrix ✓ transports acetyl group / acetate ✓ from link reaction to Krebs cycle ✓ it is recycled / reused ✓		4 max	5.2.2(g) 5.2.2(h)
3(c)(i)	**A**: active transport ✓ **B**: chemiosmosis / facilitated diffusion ✓		2	
3(c)(ii)	Any one <u>pair</u> from: *How electrons are excited:* (in photosynthesis) electrons are excited by light in chloroplasts ✓ (in respiration) electrons are excited by energy released through redox reactions of electron carriers ✓ **OR** *The source of electrons/hydrogen ions:* (In photosynthesis) electrons / hydrogen ions came from water in chloroplasts ✓ (In respiration) electrons / hydrogen ions came from reduced coenzymes ✓		2 max	
4(a)	the ratio of carbon dioxide produced to oxygen used ✓ estimates which respiratory substrate is used in the process ✓		2	AO2 AO3 AE UF 5.2.2(j) 5.2.2(k)
4(b)(i)	0.719 ✓ ✓	CO_2 produced / O_2 absorbed $= \frac{110}{153}$ = 0.7189	2	

A Level OCR Biology

20 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
		If the final answer is correct, but no working is shown, award 2 marks. If the final answer is incorrect, but working is shown, or the answer was not rounded to 3 significant figures, award 1 mark.		
4(b)(ii)	Lipid ✓ As the RQ value for lipid is 0.7 ✓		2	
4(b)(iii)	Some CO_2 produced is used up in photosynthesis ✓		1	
4(c)(i)	proteins are broken down into amino acids ✓ amino acids undergo deamination (to remove amine group) ✓ the remaining part of the deaminated amino acid then enters cellular respiration / is converted into lipids for storage / becomes pyruvate ✓		3	
4(c)(ii)	Any two from: many proteins have essential structural / biochemical functions in our body ✓ breakdown of essential proteins can cause health problems and death ✓ examples – breaking down plasma proteins can cause oedema and death ✓ deamination uses ATP ✓ less net ATP gained / overall ATP production decreases ✓		2 max	
5(a)(i)	**P AND Q** ✓	Extra answers given negates the mark	1	AO1 AO2 AO3 AE UF 5.2.2(e) 5.2.2(j)
5(a)(ii)	carbon dioxide (CO_2) ✓		1	
5(a)(iii)	link reaction ✓ ethanol fermentation ✓		2	
5(b)(i)	substrate-level phosphorylation ✓		1	

A Level OCR Biology

20 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
5(b)(ii)	1 ✓		1	
5(c)(i)	3 reduced NAD ✓ 1 reduced FAD ✓		2	
5(c)(ii)	Any three from: travel to cristae ✓ release protons and electrons to electron transport chain ✓ coenzymes become oxidised ✓ electrons travel through ETC, releasing energy ✓ energy is used to pump protons from matrix into intermembrane space ✓		3 max	
5(d)	Any three from: in anaerobic respiration, ethanol dehydrogenase converts ethanal to ethanol by using reduced NAD ✓ ethanol can be processed into ethanal by using NAD instead ✓ this means less NAD is available in β-oxidation of fatty acids ✓ less fatty acids are broken down (into acetyl groups, leading to build up of fats) ✓		3 max	
6(a)(i)	the three ester bonds (between glycerol and 3 fatty acids) are broken ✓ with the use of water ✓		2	AO2 AO3 UF AE 2.1.2(h) 2.1.2(i) 2.1.5(d)(i) 5.2.2(g) 5.2.2(h)

A Level OCR Biology

20 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
6(b)	**Indicative content** • More H^+ diffuse from intermembrane space back into matrix • By facilitated diffusion (through the extra hydrogen channels) • Less H^+ go through ATP synthase • By chemiosmosis • Down the electrochemical gradient • Less ADP phosphorylated / ATP production • Energy stores broken down by hydrolysis • (Named) energy stores / respiratory substrates – e.g., fats, proteins • Become pyruvate for respiration • Most food eaten are broken down and used up more quickly than usual • Less food converted into fat storage • To fulfil the energy demand of the body	**Level 3** A detailed explanation to the effects of having more hydrogen ion channels is given, linked to the different mechanisms of movement across the membrane. A link is formed between the low ATP production to the loss of weight and to the increased appetite. All of the information is relevant. **Level 2** A brief explanation to the effects of having more hydrogen channels is given, mentioning some mechanisms of movement across the membrane. There is an attempt to explain the loss of weight and/or increased appetite. Most of the information is relevant. **Level 1** There is a description of the effects of having more hydrogen channels, leading to lower ATP production. There is very little link to explain the loss of weight or increased appetite. **Level 0** No relevant content	6	

A Level OCR Biology

20 Respiration – answers

Skills box answers

Question	Answer
1(a)	$\frac{1.2}{3.3} = 0.36$
1(b)	$\frac{1.7}{3.3} = 0.52$
1(c)	$\frac{3.2}{3.3} = 0.97$
2	pigment **A** – chlorophyll *b* pigment **B** – chlorophyll *a* pigment **C** – phaeophytin pigment **D** – carotenes
3	it is difficult to measure the exact distance any pigment has travelled from the origin, and some colour zones may be a mixture of pigments (e.g., xanthophylls)