A Level AQA Biology

16 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	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 3.5.23.1.6
01.2	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;		2	AO2 3.1.6
01.3	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);		6 max	AO1 3.5.2
01.4	substrate-level phosphorylation in cytoplasm **AND** matrix; photophosphorylation in the grana / thylakoid membranes;		2	AO1 3.5.1

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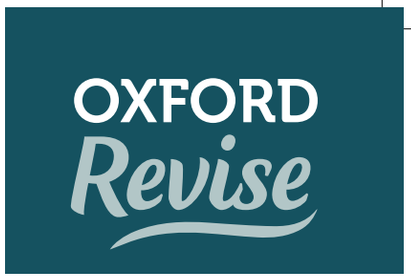

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>02.1</td><td>
<table>
<tr><th>Organelle</th><td>mitochondrion</td><td>cytoplasm</td><td>chloroplast</td></tr>
<tr><th>ATP synthase is present</th><td>✓</td><td></td><td>✓</td></tr>
<tr><th>Electrons pass through electron carriers</th><td>✓</td><td></td><td>✓</td></tr>
<tr><th>Electrons are excited by light</th><td></td><td></td><td>✓</td></tr>
<tr><th>Coenzymes are present</th><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td><td>One mark per correct row</td><td>4</td><td>AO1/AO2</td></tr>
<tr><td>02.2</td><td>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;</td><td></td><td>4 max</td><td>AO1
3.5.2</td></tr>
<tr><td>02.3</td><td>A active transport;
B facilitated diffusion;</td><td></td><td>2</td><td>AO1/AO2
3.5.2</td></tr>
</table>

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Question	Answers	Extra information	Mark	AO Spec reference
02.4	*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:* (in photosynthesis) electrons come from water (in chloroplasts); (in respiration) electrons come from reduced coenzymes;		2 max	AO1 3.5.1 3.5.2
03.1	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$	Do not accept incorrect chemical formula with numbers not in subscript	1	AO2 3.5.2
03.2	6 oxygen used and 6 carbon dioxide released $\frac{6}{6} = 1.0$		1	AO2 3.5.2
03.3	$\frac{110}{153}$; = 0.7189 = 0.719;	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. Allow errors carried forward	2	AO2 3.5.2
03.4	lipid;		1	AO2
03.5	some CO_2 produced is used up in photosynthesis;		1	AO2 3.5.1

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Question	Answers	Extra information	Mark	AO Spec reference
03.6	proteins are broken down into amino acids (which can then be processed to enter cellular respiration);		1	AO1 3.5.2
03.7	many proteins have essential structural / biochemical functions in our body; breakdown of essential proteins can cause health problems and death;	Accept any named essential function	2	AO1/AO3 5.4.2 3.1.4.1
04.1	**P AND Q**;		1	AO2 3.5.2
04.2	ethanol fermentation;		1	AO1 3.5.2
04.3	substrate-level phosphorylation;		1	AO1 3.5.2
04.4	1;		1	AO2 3.5.2
04.5	oxidative phosphorylation; **AND** Any two from: travel to cristae; release hydrogen (atoms) and electrons so coenzymes become oxidised; electrons travel through ETC, releasing energy; energy is used to pump protons from matrix into intermembrane space;		3 max	AO1 3.5.2
04.6	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 (reverse reaction); this means less NAD is available in β-oxidation/breakdown of fatty acids; less fatty acids are broken down (into acetyl groups, leading to build up of fats);		3 max	AO2/AO3 3.5.2

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Question	Answers	Extra information	Mark	AO Spec reference
05.2	(lactate) lowers pH; denature enzymes / affect enzyme activity;		2	AO1/AO2 3.5.23.1.4.2
05.2	liver; glycogenesis;		2	AO1 3.6.4.2
05.3	$\frac{2.45 - 2.30}{60 - 40}$;; $0.0075\ dm^3s^{-1}$;	Max 2 marks if answer not in 2 significant figures Max 2 marks if answer is correct but with no unit	3	AO2 3.3.2
05.4	the three ester bonds (between glycerol and 3 fatty acids) are broken; with the use of water;		2	AO1 3.1.1 3.1.3
05.5	glycerol used to make pyruvate; enters into link reaction; fatty acids enters the Krebs cycle;		3	AO1 3.5.2

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Question	Answers	Extra information	Mark	AO Spec reference
05.6	**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 • description of how respiratory substrates enter respiration • most food eaten are immediately broken down and used up • less food converted into 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 max	AO1/AO2 3.5.2 3.2.3

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Question	Answers	Extra information	Mark	AO Spec reference
06.1	Any two from: (Space **C** has:) more oxygen (than space **D**); less carbon dioxide (than space **D**); similar percentage of nitrogen and other gases;	Allow reverse argument	2 max	AO2 3.5.2
06.2	Any two from: concentration / volume of glucose used; volume of yeast; volume of air in space **C**; pH of yeast-glucose mixture / solution;	Reject 'amount'	2 max	AO2
06.3	NAD; FAD;		2	AO1 3.5.2
06.4	*At 10 °C – Any two from:* enzymes are inactive; low on kinetic energy / little movement of substrates, enzymes and coenzymes; fewer electrons released (to reduce methylene blue); *At 50 °C:* enzymes are denatured; less/No electrons can be released (to reduce methylene blue);	2 max 2 max	4 max	AO1 3.1.4.2

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16 Respiration – answers

Question	Answers	Extra information	Mark	AO Spec reference
06.5	Any Four from: it took the least amount of time for the methylene blue to turn colourless; suggesting rate of respiration highest at 30 °C (more electrons released to reduce methylene blue); **BUT** large intervals of temperatures used; colour could have changed between 5–10min; actual optimal temperature may be before 10 min; yeast (at the bottom of the tube) can also carry out anaerobic respiration, which also releases electrons, so impossible to tell if result is solely due to aerobic respiration; temperature may drop during the experiment without insulation;		4 max	AO3 3.5.2 3.1.4.2
06.6	*Experiment A, Any two from:* low accuracy as water level may change due to pressure changes / error in practical set up; some carbon dioxide released may be dissolved in water (instead of displacing water); results are qualitative **SO** use a graduated tube (or other valid equipment) to get quantitative results; **AND** *Experiment B:* low accuracy as results are qualitative / subjective (different people have different perception of colours) **SO** use colorimeter; change could have occurred in between the temperature intervals **SO** use smaller temperature intervals;	2 max For both experiments, accept any valid and supported judgement of accuracy, and any valid change/ equipment to increase accuracy 2 max	4 max	AO2/AO3

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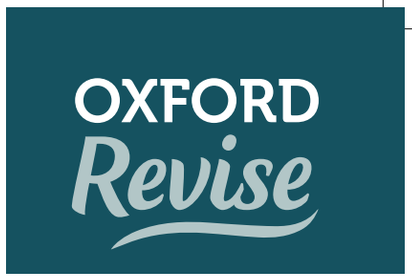

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>07</td><td>Compare the processes and importance of photosynthesis, aerobic respiration, and anaerobic respiration:
<table><tr><th>Specification reference</th><th>Topic area</th></tr><tr><td>3.1.4.2</td><td>Enzyme-catalysed reactions</td></tr><tr><td>3.1.6</td><td>ATP</td></tr><tr><td>3.1.7</td><td>Water</td></tr><tr><td>3.1.8</td><td>Inorganic ions</td></tr><tr><td>3.2.2</td><td>Cell division</td></tr><tr><td>3.2.3</td><td>Transport across membranes</td></tr><tr><td>3.3.2</td><td>Gas exchange</td></tr><tr><td>3.3.3</td><td>Digestion and absorption</td></tr><tr><td>3.3.4.1–2</td><td>Mass transport in animals and plants</td></tr><tr><td>3.4.2</td><td>DNA and protein synthesis</td></tr><tr><td>3.5.1</td><td>Photosynthesis</td></tr><tr><td>3.5.2</td><td>Respiration</td></tr></table></td><td>The answer should include similarities and differences between the different reactions. This includes the location of the reactions, the substrates and products in common, the coenzymes that are involved, specific movements across membranes.</td><td>25</td><td>Synoptic</td></tr>
</table>

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Skills box answers

Question	Answer
1a	1.74%
1b	0.159%
1c	2.45%
2	0.1
3	0.5