

A Level AQA Biology

4 ATP, water, and inorganic ions – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	(A=) adenine; (B=) ribose; (C=) (inorganic) phosphates;	Accept triphosphate	3	AO1 3.1.6
01.2	similarities pentose sugar; (one) nitrogenous base; differences ATP has 3 phosphates AND DNA nucleotide has 1 phosphate; ATP has ribose AND DNA has deoxyribose; ATP always has adenine AND DNA nucleotides can have different (named) bases;		4 max	AO2 3.1.6
01.3	hydrolysis;		1	AO1 3.1.6
01.4	condensation (reaction); light-dependent stage of photosynthesis (in chloroplasts of plant cells); in mitochondria; substrate-level phosphorylation; oxidative phosphorylation / by ATP synthase;	Accept photophosphorylation Accept in glycolysis / in Krebs cycle	4 max	AO1 3.1.6 3.5.1 3.5.2
02.1	water has a high latent heat of vaporisation; energy used to evaporate sweat from skin surface; heat loss from blood (near skin surface);		2 max	AO1 3.1.7
02.2	blood plasma is (predominantly) water; water is a solvent (for polar molecules); glucose and amino acids are polar / hydrogen bonds form between molecules and water;		3	AO1 3.1.2 3.1.4.1 3.1.7 3.3.4.1

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Question	Answers	Extra information	Mark	AO Spec reference						
02.3	stomata; transpiration; cohesion; solvent;		4	AO1 3.1.7 3.3.4.2						
03.1	ATP hydrolase;		1	AO1 3.1.6						
03.2	(ATP hydrolysis) releases energy (that can be used in energy-requiring reactions); (the released phosphate) phosphorylates other compounds; (phosphorylation) makes other compounds more reactive;		2 max	AO1 3.1.6						
03.3	similarities ribose sugar; (one) nitrogenous base; differences ATP has 3 phosphates AND cGMP has 1 phosphate; phosphate, is cyclic / has 2 bonds to ribose, in cGMP AND phosphate, is non-cyclic / has 1 bond to ribose, in ATP; cGMP has guanine AND ATP has adenine;		4 max	AO2 3.1.6						
03.4	(m/t/r) RNA;		1	AO2 3.1.5.1						
04.1	<table border="1"> <thead> <tr> <th>Inorganic ion</th> <th>Role</th> </tr> </thead> <tbody> <tr> <td>H⁺ / hydrogen ions</td> <td>produces an acidic environment within particular cells and organelles</td> </tr> <tr> <td>phosphate</td> <td>Structure of DNA / RNA / ATP</td> </tr> </tbody> </table>	Inorganic ion	Role	H ⁺ / hydrogen ions	produces an acidic environment within particular cells and organelles	phosphate	Structure of DNA / RNA / ATP	One mark per correct box Accept structure of phospholipid (bilayer)	2	AO1 3.1.8
Inorganic ion	Role									
H ⁺ / hydrogen ions	produces an acidic environment within particular cells and organelles									
phosphate	Structure of DNA / RNA / ATP									

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04.2	(Fe ²⁺ is found in) haem prosthetic group; (in) haemoglobin protein; (for) oxygen transport;		2 max	AO1 3.1.8
04.3	rate of water transport correlated with rate of co-transport; water may be able to pass through the co-transport protein;		2	AO3 3.1.8
04.4	(named) amino acid(s)		1	AO1 3.1.8
05.1	(heat capacity =) heat / energy required to raise temperature (of a substance by a unit of temperature); (latent heat of vaporisation =) energy needed to change (a given quantity of) liquid into gas;		2	AO1 3.1.7
05.2	<i>high heat capacity</i> (in aquatic environments there are) small temperature changes (compared to air temperature); stable (aquatic) habitats; reduces effect of environmental temperature change on organism; stable conditions in cells; <i>large latent heat of vaporisation</i> sweating / panting , in animals; allows , cooling / temperature loss / temperature regulation;		4 max	AO1 3.1.7
05.3	710 600 (joules) / 85 (kg) = 8360; 8360 / 2 (K) = 4180; 4180 / 1000 = 4.18 (J g ⁻¹ K ⁻¹);	Final answer of 4.18 (J g ⁻¹ K ⁻¹) should be awarded 3 marks. ECF for marking points 2 and 3	3	AO2 3.1.7

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06.1	photosynthesis AND respiration;	Accept 'light-dependent reactions' or 'photophosphorylation' for 'photosynthesis' and 'oxidative phosphorylation' for 'respiration'.	1	AO1 3.1.6
06.2	ADP AND inorganic phosphate;	Accept 'Pi' for 'inorganic phosphate'	1	AO1 3.1.6
06.3	<i>intermembrane space</i> (pH =) 7.0; <i>matrix</i> (pH =) 7.9;	Accept any correct rounding or calculator value of 6.9586073 Accept any correct rounding or calculator value of 7.92081875	2	AO2 3.1.8
07	The following are suitable topic areas from the specification that could be used to describe the importance of water as a solvent and a reactant in a range of biochemical reactions. In order to fully address the question and reach the highest mark bands students must also include at least five topics in their answer, to demonstrate a synoptic approach to the essay.		25	AO1 3.1.1 3.1.2 3.1.4 3.1.5.1 3.1.6 3.1.7 3.3.3 3.5.1 3.5.2 3.5.4

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Question	Answers		Extra information	Mark	AO Spec reference
	Specification reference	Topic area			
	3.1.1	Monomers and polymers			
	3.1.2	Carbohydrates			
	3.1.4	Proteins			
	3.1.5.1	Structure of DNA and RNA			
	3.1.6	ATP			
	3.1.7	Water			
	3.3.3	Digestion and absorption			
	3.5.1	Photosynthesis			
	3.5.2	Respiration			
	3.5.4	Nutrient cycles			
	<p>Students may be able to show the relevance of other topics from the specification.</p> <p>Note: other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.</p>				

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Skills box answers

Question	Answer
1	pH = 1
2	pH = 0.3
3	pH = 2.6
4	$6.31 \times 10^{-3} \text{ mol dm}^3$
5	$1.95 \times 10^{-9} \text{ mol dm}^3$
6	$1.58 \times 10^{-6} \text{ mol dm}^3$