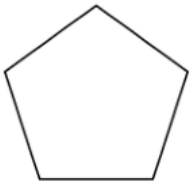
ATP: AQA A Level Biology Exam Questions by Topic

16 questions · 36 marks · about 47 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · AS Paper 1 · June 2025 · Q02.1 · 2 marks

0 2 . 1 **Figure 4** shows one component of an ATP molecule.

Figure 4



Complete **Figure 4** to show the structure of an ATP molecule.

Label all of its components.

[2 marks]

Question 2 · AS Paper 1 · June 2017 · Q01.4 · 2 marks

0 1 . 4 Adenosine triphosphate (ATP) is a nucleotide derivative.

Contrast the structures of ATP and a nucleotide found in DNA to give **two** differences.

[2 marks]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

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Question 3 · A level Paper 1 · June 2024 · Q10.3 · 4 marks

1 0 . 3 Describe the structure of ATP.

Outline how named enzymes break down and resynthesise ATP.

[4 marks]

Question 4 · AS Paper 1 · June 2018 · Q08.2 · 1 mark

0 8 . 2 Water is used to hydrolyse ATP.

Name the **two** products of ATP hydrolysis.

[1 mark]

1 _____

2 _____

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Question 5 · AS Paper 1 · June 2025 · Q02.2 · 3 marks

0 2 . 2 Describe how phosphate is released from ATP within cells.

Explain **one** way in which this phosphate can be used by cells.

[3 marks]

How phosphate is released from ATP

Question 6 · AS Paper 1 · June 2016 · Q03.1 · 2 marks

0 3 Cells constantly hydrolyse ATP to provide energy.

0 3 . 1 Describe how ATP is resynthesised in cells.

[2 marks]

Question 7 · AS Paper 2 · November 2021 · Q07.1 · 4 marks

0 7 . 1 Describe how an ATP molecule is formed from its component molecules.

[4 marks]

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Question 8 · AS Paper 1 · June 2016 · Q03.2 · 2 marks

0 3 . 2 Give **two** ways in which the hydrolysis of ATP is used in cells.

[2 marks]

1 _____

_____

2 _____

_____

Question 9 · AS Paper 2 · June 2022 · Q01.4 · 2 marks

0 1 . 4 Describe the role of ATP in the process of translation in protein synthesis.

[2 marks]

_____

_____

_____

_____

_____

_____

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Question 10 · A level Paper 2 · June 2022 · Q03.3 · 2 marks

0 3 . 3 Nitrogenase catalyses the reduction of nitrogen during nitrogen fixation. The reaction requires 16 molecules of ATP for each molecule of nitrogen that is reduced.
When ammonia inhibits nitrogenase activity, nitrogen-fixing bacteria may benefit.
Explain how.

[2 marks]

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Question 11 · A level Paper 3 · June 2018 · Q03.5 · 2 marks

0 3 . 5 If most of the mitochondria in a cell are faulty, this prevents many important enzyme-catalysed reactions taking place or slows them down.

Suggest and explain **one** reason why.

[2 marks]

There are no questions on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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Question 12 · information from earlier in the question

0 5 . 2 Sometimes, damage occurs during DNA replication. One enzyme involved in repairing damage to DNA is called ATR.

ATR works as follows.

- ATR phosphorylates other enzymes involved in repairing DNA.
- ATR **also** phosphorylates substrates required to repair DNA.

When ATR phosphorylates other enzymes, these enzymes become able to bind to their substrates.

Use your knowledge of enzyme structure to suggest why.

[2 marks]

Question 12 · A level Paper 3 · June 2017 · Q05.3 · 1 mark

0 5 . 3 The enzyme-catalysed reactions activated by ATR only occur if the substrates have been phosphorylated.

Use your knowledge of energy changes in enzyme-catalysed reactions to suggest why.

[1 mark]

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Question 13 · A level Paper 1 · November 2020 · Q05.3 · 2 marks

0 5 . 3 Cyclin D stimulates the phosphorylation of DNA polymerase, which activates the DNA polymerase.

Describe how an enzyme can be phosphorylated.

[2 marks]

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Hydrolysis of ATP is catalysed by the enzyme ATP hydrolase.

A student investigated the effect of ATP concentration on the activity of ATP hydrolase. She used shortening of strips of muscle tissue caused by contraction as evidence that ATP was being hydrolysed.

- She took four slides **A**, **B**, **C** and **D**, and added strips of muscle tissue of the same length to each slide.
- She then added the same volume of ATP solutions of different concentrations to the four slides and left each slide for five minutes.
- She then recorded the final length of each strip of muscle tissue.

Her results can be seen in **Table 1**.

Table 1

Slide	Concentration of ATP solution added to slide / $\times 10^{-6}$ mol dm^{-3}	Final length of muscle tissue after 5 minutes / mm
A	2	36
B	4	31
C	6	29
D	8	26

0 8 . 3 Other than those given, name **two** variables the student should have controlled.

[2 marks]

1 _____

_____

2 _____

_____

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Question 15 · AS Paper 1 · June 2018 · Q08.4 · 2 marks

0 8 . 4 Describe **and** explain the pattern shown by the data in **Table 1**.

[2 marks]

Description _____

Explanation _____

Question 16 · AS Paper 1 · June 2018 · Q08.5 · 3 marks

0 8 . 5 The hydrolysis of 1 dm^3 of a 1 mol dm^{-3} solution of ATP releases 30 500 J of energy.

60% of the energy released during the hydrolysis of 1 mol dm^{-3} of ATP is released as heat; the rest is used for muscle contraction.

The student added 0.05 cm^3 of ATP solution to slide **D**.

Calculate the energy available from ATP for contraction of the muscle on this slide.

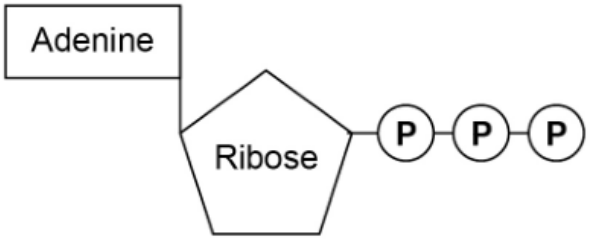
[3 marks]

Answer = _____ J

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Mark schemes

Question 1 · AS Paper 1 · June 2025 · Q02.1 · 2 marks

02.1	1. Adenine, ribose and 3 x phosphate correctly labelled; 2. Bonds (between ribose and adenine **and** between ribose and phosphates) in correct positions;  	2 (2 x AO1)	1. Accept P in a circle/P_i/PO_4^{-3} for phosphate. Reject phosphorus 1. Ignore pentose, reject deoxyribose 1. Ignore labelling of bonds 1. Ignore shapes of adenine and phosphates

Question 2 · AS Paper 1 · June 2017 · Q01.4 · 2 marks

01.4	1. ATP has ribose **and** DNA nucleotide has deoxyribose; 2. ATP has 3 phosphate (groups) **and** DNA nucleotide has 1 phosphate (group); 3. ATP- base always <u>adenine</u> **and** in DNA nucleotide base can be different / varies;	2 max

Both parts of each MP needed

3.Reject Uracil / U

3. Accept C, T or G for different bases

Accept annotated diagram for any of the three marks

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10.3	1. Ribose, Adenine **and** 3 phosphates; 2. ATP to ADP + Pi by ATP hydrol**ase** in hydrolysis (reaction); 3. ADP + Pi to ATP by ATP synth**ase**; 4. (In) condensation (reaction);	4 (4 x AO1)

1. Accept a labelled diagram showing ribose, adenine and 3 phosphates

1. Accept adenosine **and** 3 phosphates

1. Reject Adenosine and 3 phosphates if ribose/pentose is also mentioned

1. Ignore pentose sugar

2. Accept ATPase for ATP hydrolase

2. Accept hydrolayse

3. Accept synthayse

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08.2	Adenosine diphosphate **and** (inorganic) phosphate;	1	Accept ADP for adenosine diphosphate Accept Pi / PO_4^{3-} / P in a circle for inorganic phosphate Reject adenine diphosphate Reject phosphorus / P for phosphate

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Question 5 · AS Paper 1 · June 2025 · Q02.2 · 3 marks

02.2	1. Hydrolysis; 2. ATP hydrolase; 3. Phosphorylate other substances **to** make them more reactive/change their shape **OR** To form DNA/RNA/phospholipids;	3 (3 x AO1)

1. Reject hydrolysis of hydrogen bond 1. Ignore other named bonds 2. Accept ATPase 3. Accept description of phosphorylation 3. Accept any named biological molecule containing phosphate e.g. triose phosphate 3. Ignore to form ATP

Question 6 · AS Paper 1 · June 2016 · Q03.1 · 2 marks

03.1	1. From ADP and phosphate; 2. By ATP synthase; 3. During respiration/photosynthesis;	2 max	1. Accept Pi/PO_4^{3-} / (P) 1. Reject P/Phosphorus 1. Reject use of water in the reaction

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Question 7 · AS Paper 2 · November 2021 · Q07.1 · 4 marks

07.1	1. and 2. Accept for 2 marks correct names of three components adenine, ribose/pentose, <u>three</u> phosphates;; 3. Condensation (reaction); 4. ATP synthase;

4	1. and 2. Accept for 1 mark, correct name of two components 1. and 2. Accept for 1 mark, ADP **and** phosphate/Pi 1. and 2. Ignore adenosine 1. and 2. Accept suitably labelled diagram 3. Ignore phosphodiester 4. Reject ATPase

Question 8 · AS Paper 1 · June 2016 · Q03.2 · 2 marks

03.2	1. To provide energy for other reactions/named process; 2. To add phosphate to other substances **and** make them more reactive/change their shape;	2	Reject 'produce' energy

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Question 9 · AS Paper 2 · June 2022 · Q01.4 · 2 marks

01.4	1. Releases/provides energy; 2. (So) peptide bonds form between amino acids **OR** (So) amino acid joins to tRNA;	2 (2 x AO1)	1. Reject 'produce energy'

Question 10 · A level Paper 2 · June 2022 · Q03.3 · 2 marks

03.3	1. Less/no ATP/energy required/used **OR** More ATP/energy available; 2. ATP/energy can be used for growth/synthesis/replication **OR** Lower (rate of) respiration required **OR** ATP for phosphorylation;	2 (2 x AO2)	2. Accept ATP can be used for 'other reactions', 'movement', 'active transport' or correctly named reaction. 2. Ignore 'aerobic', 'anaerobic' in context of respiration. 2. Reject ATP/energy used for/in respiration. 2.Reject mitosis.

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Question 11 · A level Paper 3 · June 2018 · Q03.5 · 2 marks

03.5	1. Not enough / little ATP produced; 2. ATP provides **energy** for (enzyme) reactions **OR** ATP phosphorylates substrates / enzymes, **so** making them (more) reactive;

2 max	**One** reason asked for, so list rule applies 1. Ignore ref. to no ATP produced 2. Accept (leads to) lower activation energy for reaction 2. Reject if mention energy produced

Question 12 · A level Paper 3 · June 2017 · Q05.3 · 1 mark

05.3	(Phosphorylation/phosphate) makes substrates more reactive/raises their energy level(s)/lowers activation energy for the reaction;	1	Ignore provides energy unqualified Ignore refs to kinetic energy unqualified

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Question 13 · A level Paper 1 · November 2020 · Q05.3 · 2 marks

05.3	1. Attachment/association of (inorganic) phosphate (to the enzyme); 2 2. (Released from) hydrolysis of ATP OR (Released from) ATP to ADP + Pi;	1 and 2. For 'phosphate/Pi' accept PO_4^{3-} and P in a circle. 1. Accept 'phosphate goes to the enzyme'. 1. Ignore named bonding or position of phosphate attaching to enzyme but reject formation of E-S complex. 2. For ATP accept adenosine triphosphate. 2. For ADP accept adenosine diphosphate.

Question 14 · AS Paper 1 · June 2018 · Q08.3 · 2 marks

08.3	1. Species / organism the muscle tissue came from; 2 max **OR** Thickness / type / source of the muscle tissue; 2. Temperature of the muscle tissue / ATP solution / slides; 3. pH of the ATP solution;	1. Ignore surface area of muscle tissue 2. and 3. Need to be qualified Reject concentration / volume of ATP hydrolase

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Question 15 · AS Paper 1 · June 2018 · Q08.4 · 2 marks

08.4	Description 1. As concentration of ATP increases, length of muscle decreases; Explanation 2. More ATP (hydrolysed by ATP hydrolase), **so** more energy released, **so** more muscle contraction / shortening of muscle;	2	1. Accept negative correlation 2. Accept more ATP available for correct/named aspect of muscle contraction 2. Idea of more is required once. 2. Reject energy produced

Question 16 · AS Paper 1 · June 2018 · Q08.5 · 3 marks

08.5	4.88×10^{-6} ;;; If answer incorrect **EITHER** Allow 1 mark for 0.244 Allow 1 mark for 1.22×10^{-5} **OR** Allow 1mark for 12200 / 1.525 Allow 1 mark for 0.61	3	Accept 5×10^{-6} Accept correct answer however expressed Max 2 for incorrect final answer

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