



CHEMISTRY ONLINE
— **TUITION** —

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BIOLOGY

THE CONTROL OF GENE EXPRESSION

Level & Board	AQA (A-LEVEL)
TOPIC:	ENERGY
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	5
TOTAL MARKS	20

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Energy - 1

1.

(a) Describe how the molecules that make up an ATP molecule are assembled. (4)



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2.

(b) ATP is hydrolyzed using water.

Identify the two ATP hydrolysis byproducts. (1)

1

2

The enzyme ATP hydrolase catalyzes the hydrolysis of ATP.

A student looked into how the amount of ATP affected the activity of the enzyme ATP hydrolase. She cited the lengthening of muscular tissue strips brought on by contraction as proof that ATP was being hydrolyzed.

- She put identically sized strips of muscle tissue to each of the four slides (A, B, C, and D).
- Then, she poured the same volume of ATP solutions in each of the four slides, varying their concentrations, and left each slide alone for five minutes.
- She then noted the total length of each muscle strip.

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The table contains her findings.

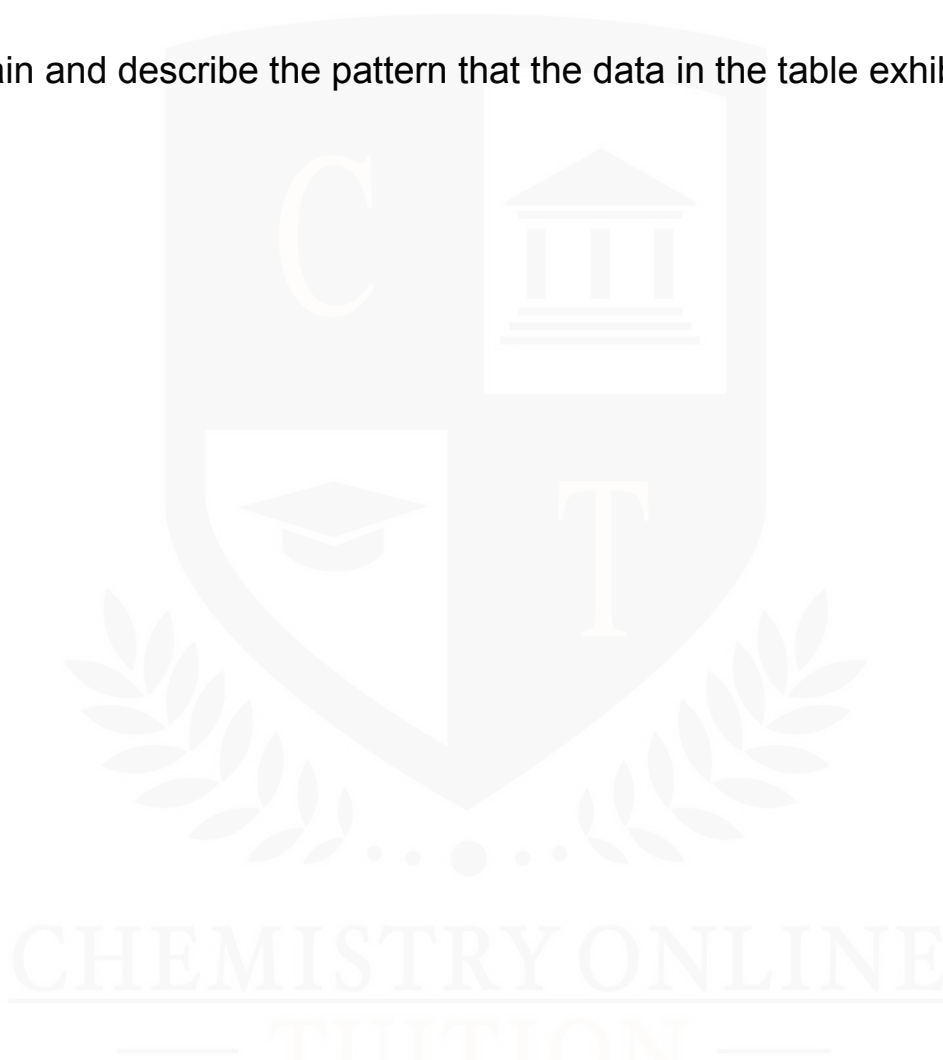
Slide	Concentration of ATP solution added to slide / $\times 10^{-6}$ mol dm ⁻³	Final length of muscle tissue after 5 minutes / mm
A	2	36
B	4	31
C	6	29
D	8	26

(c) Name two more factors the student should have controlled besides the ones mentioned. (2)

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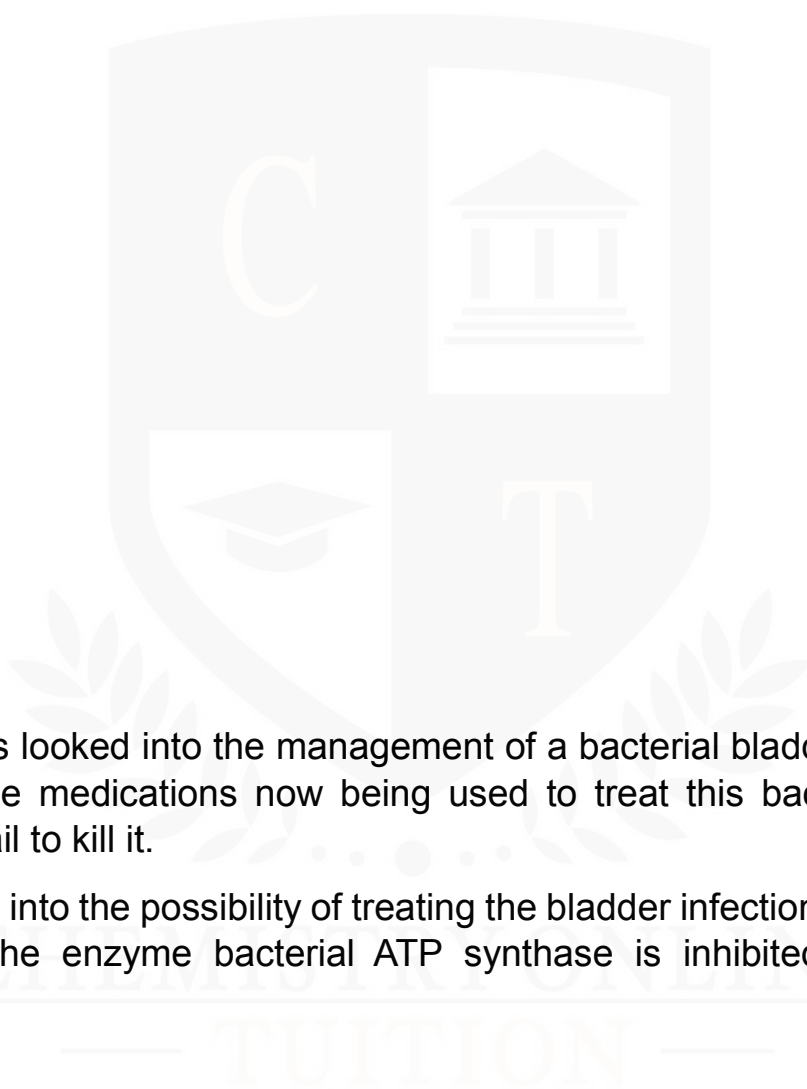
(d) Explain and describe the pattern that the data in the table exhibit. **(2)**



(e) A 1 mol/dm^{-3} solution of ATP is hydrolyzed to produce 30 500 J of energy. The hydrolysis of 1 mol dm^{-3} of ATP releases 60% of its energy as heat, with the remaining 40% being used to contract muscles.

The student filled slide D with 0.05 cm^3 of ATP solution.

Calculate the amount of ATP energy required to cause the muscle to contract on this slide. **(3)**



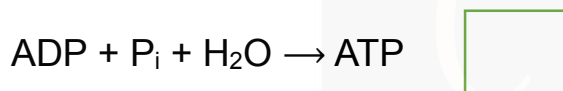
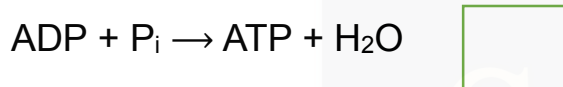
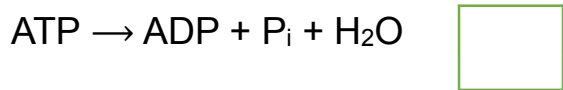
3.

Researchers looked into the management of a bacterial bladder infection in humans. The medications now being used to treat this bacterial species frequently fail to kill it.

They looked into the possibility of treating the bladder infection using a novel antibiotic. The enzyme bacterial ATP synthase is inhibited by the new antibiotic.

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(a) Put a checkmark (✓) in the box that corresponds to the equation that reflects the ATP synthase-catalyzed reaction. **(1)**



(b) The new antibiotic is safe for human consumption because it does not prevent human cells from producing ATP synthase.

Explain why bacterial synthase is inhibited but human ATP synthase is not. **(1)**

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4.

(a) A lot of cell activities require ATP as an energy source. Give two examples of how ATP can be a useful energy source for cells. **(2)**

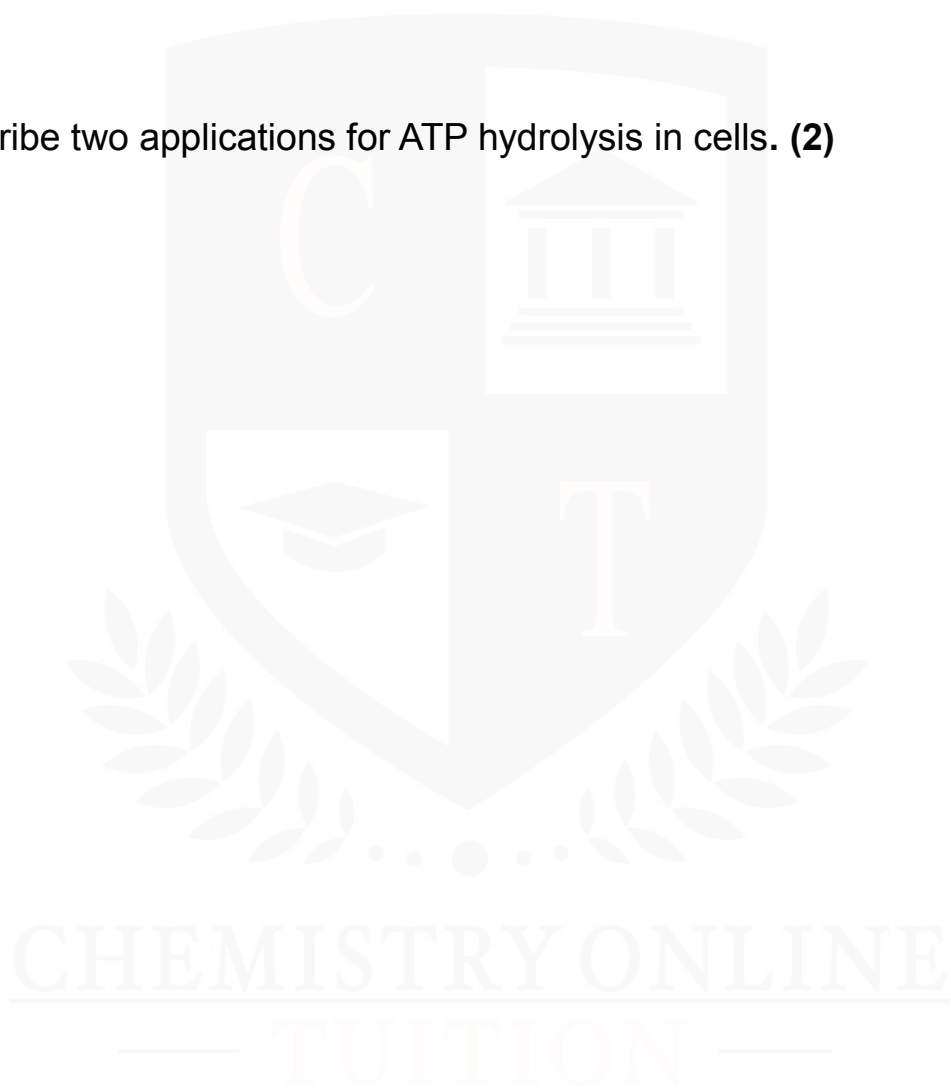
5.

To provide energy, cells hydrolyze ATP continuously.

(a) Describe the process by which cells resynthesize ATP. **(2)**

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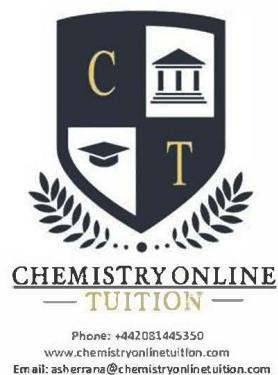
(b) Describe two applications for ATP hydrolysis in cells. (2)



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- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, and Math's Tutor

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