



A-Level Biology

ATP, Water and Inorganic Ions

Question Paper

Time available: 87 minutes

Marks available: 70 marks

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1.

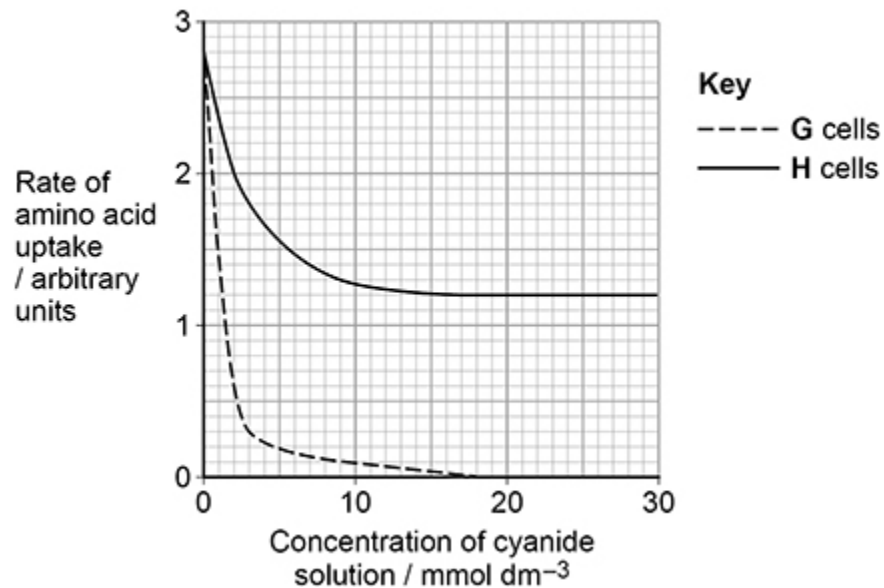
(a) Describe how an ATP molecule is formed from its component molecules.

(4)

A scientist investigated the effect of cyanide on the rate of amino acid uptake in two types of *Escherichia coli*, **G** and **H**.

- **G** cells produce enzymes involved in ATP production **only** on their cell-surface membrane.
- **H** cells produce enzymes involved in ATP production on their cell-surface membrane **and** in their cytoplasm.

The graph below shows her results.



- (b) Use the graph above to calculate the percentage decrease in the rate of amino acid absorption by **H** cells in 30 mmol dm^{-3} cyanide solution.

Answer _____ %

(1)

- (c) Using the graph above and the information provided, what can you conclude about amino acid uptake by **G** cells and by **H** cells?

(3)

(Total 8 marks)

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) Other than those given, name two variables the student should have controlled.

1. _____

2. _____

(2)

(d) Describe and explain the pattern shown by the data in the table.

Description _____

Explanation _____

(2)

(e) The hydrolysis of 1 dm³ 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 cm³ of ATP solution to slide **D**.

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

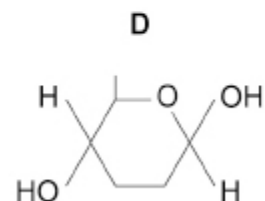
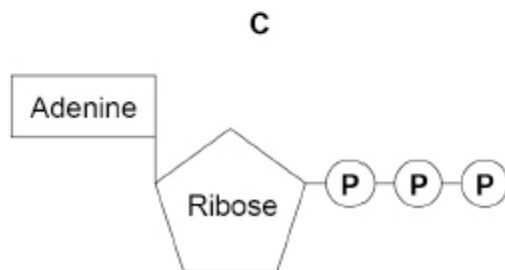
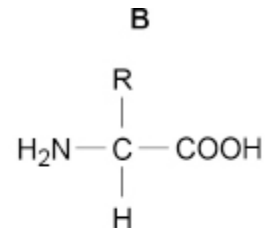
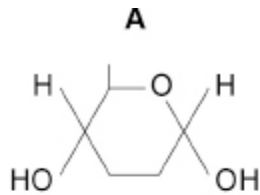
Answer = _____ J

(3)

(Total 10 marks)

3.

The diagram below shows the structure of molecules found in organisms.



- (a) Complete the table below by putting the correct letter, **A**, **B**, **C** or **D**, in the box next to each statement. Each letter may be used once, more than once, or not at all.

Letter	Statement
	is a monomer in an enzyme's active site
	is a monomer in cellulose
	is produced during photosynthesis and respiration
	forms a polymer that gives a positive result with a biuret test

(4)

- (b) Raffinose is a trisaccharide of three monosaccharides: galactose, glucose and fructose. The chemical formulae of these monosaccharides are:

- galactose = $C_6H_{12}O_6$
- glucose = $C_6H_{12}O_6$
- fructose = $C_6H_{12}O_6$

Give the number of carbon atoms, hydrogen atoms and oxygen atoms in a molecule of raffinose.

Number of carbon atoms _____

Number of hydrogen atoms _____

Number of oxygen atoms _____

(1)

7.

Water and inorganic ions have important biological functions within cells.

- (a) Give **two** properties of water that are important in the cytoplasm of cells. For each property of water, explain its importance in the cytoplasm.

Property 1 _____

Biological importance within cells _____

Property 2 _____

Biological importance within cells _____

(4)

- (b) Other than sodium, name **one** inorganic ion and give **one** example of its biological importance in a cell.

Name of inorganic ion _____

Biological importance _____

(2)

- (c) Compare and contrast the processes by which water and inorganic ions enter cells.

(3)

(Total 9 marks)