Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

2249654089

BIOLOGY **9700/21**

Paper 2 AS Level Structured Questions **October/November 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **12** printed pages.

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Answer **all** the questions.

1 Fig. 1.1 is a transmission electron micrograph of part of an animal cell.

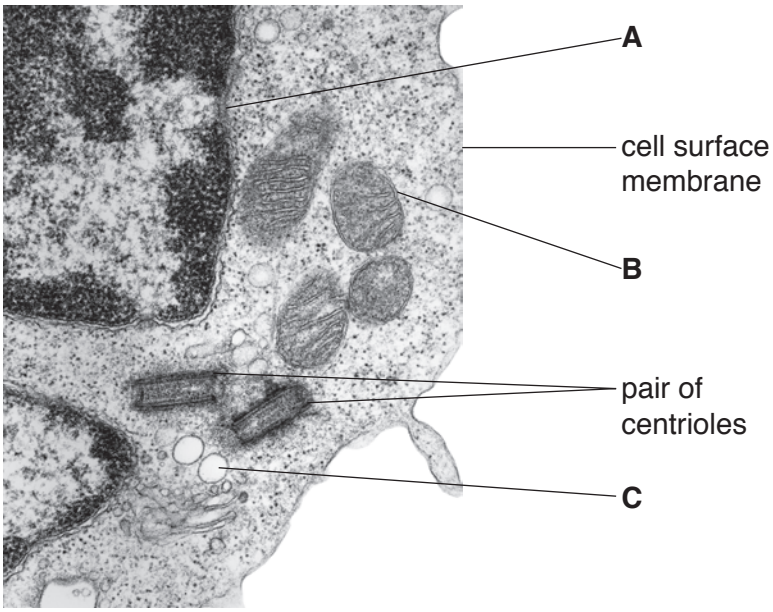


Fig. 1.1

(a) Name the structures **A**, **B** and **C**.

A .....

B .....

C .....[3]

(b) Name **one** structure, visible in Fig. 1.1, that would also be present in a prokaryotic cell.

.....[1]

(c) Cells such as that in Fig. 1.1 can divide by mitosis.

Describe the role of centrioles in mitosis.

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.....[2]

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(d) Sodium ions cross cell surface membranes using facilitated diffusion or active transport.

Explain why sodium ions cross cell surface membranes by these mechanisms and **not** by simple diffusion.

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.....[3]

[Total: 9]

2 **(a)** **(i)** Define *transpiration*.

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.....[1]

(ii) State **two** environmental factors that affect the rate of transpiration.

Explain how each factor affects the rate of transpiration.

factor 1 .....

explanation .....

.....

.....

factor 2 .....

explanation .....

.....

.....[4]

(b) Explain how hydrogen bonding is involved in the movement of water through the xylem.

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.....[3]

[Total: 8]

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3 Fig. 3.1 shows the structure of the enzyme lysozyme.

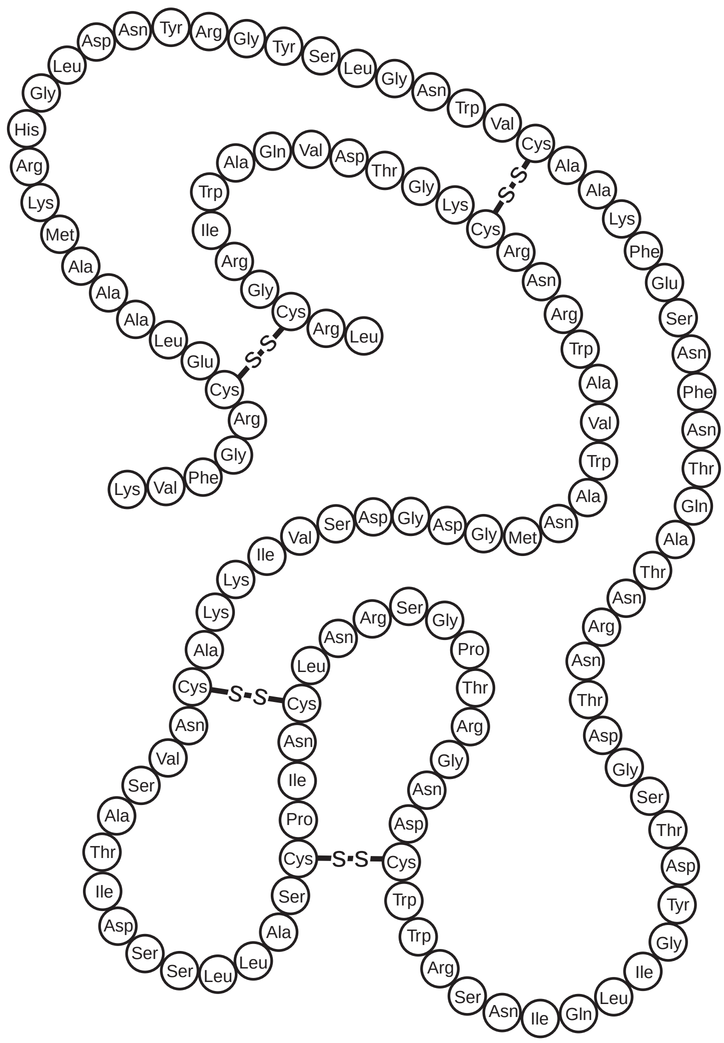


Fig. 3.1

(a) **(i)** Name the **two** types of covalent bond in the structure in Fig. 3.1.

....[1]

(ii) The primary structure of lysozyme is shown in Fig. 3.1.

Explain the meaning of the term *primary structure*.

....

....

....[1]

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(b) Lysozyme hydrolyses the β-1,4 glycosidic bonds present in compounds found in bacterial cell walls.

(i) State what is meant by the term *hydrolysis*.

.....

.....[1]

(ii) Suggest the type of biological molecule which is the substrate for lysozyme.

.....[1]

(iii) Lysozyme uses the induced fit mechanism.

Explain the mode of action of an enzyme that uses the induced fit mechanism.

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.....[4]

(c) In human tears and saliva, lysozyme acts as an extracellular enzyme.

State what is meant by the term *extracellular*.

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.....[1]

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(d) Fig. 3.2 shows the results of an investigation into the effect of substrate concentration on the rate of reaction catalysed by lysozyme.

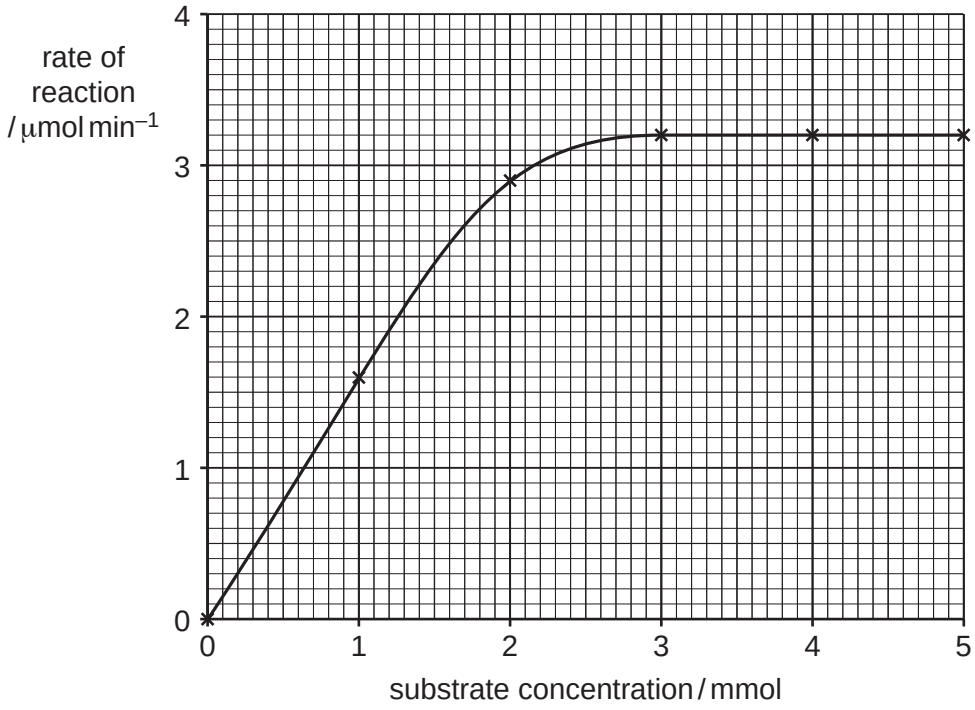


Fig. 3.2

Use Fig. 3.2 to:

(i) state the lowest substrate concentration to give the maximum rate of reaction, V_{max}

.....[1]

(ii) determine the Michaelis-Menten constant, K_m.

K_m = ...[1]

(e) The investigation was repeated in the presence of a competitive inhibitor of lysozyme.

Draw a curve **on Fig. 3.2** to show the expected results. [2]

[Total: 13]

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[Turn over

4 **(a)** **(i)** Name the bacterium that causes cholera.

.....[1]

(ii) Describe how cholera is transmitted from an infected person to an uninfected person.

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.....[2]

(iii) Suggest **and** explain why cholera outbreaks are common after natural disasters.

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.....[2]

(b) The bacteria that cause cholera can become resistant to antibiotics by a substitution mutation.

A substitution mutation occurs when one nucleotide in the DNA sequence is replaced by a different nucleotide.

(i) Explain how a substitution mutation could result in a change in the amino acid sequence of a polypeptide.

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.....[2]

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(ii) The antibiotic nalidixic acid acts as an inhibitor of an enzyme involved in DNA replication in the bacteria that cause cholera.

The gene *gyrA* codes for this enzyme. A substitution mutation in this gene results in resistance to the antibiotic nalidixic acid.

Suggest how a change in the amino acid sequence of the enzyme results in antibiotic resistance.

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.....[2]

(c) Some of the strains of bacteria that cause cholera are resistant to more than one antibiotic (multiple resistance).

Discuss the consequences of multiple resistance for health authorities.

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.....[4]

[Total: 13]

5 **(a)** Monoclonal antibodies (MAbs) have been used in the treatment of some non-infectious diseases.

MAbs can be designed to bind to a protein on diseased cells, so causing their destruction by cells of the person's immune system.

(i) Name the part of an antibody molecule that will bind to a protein on diseased cells.

.....[1]

(ii) Suggest how the binding of monoclonal antibody to the diseased cells causes their destruction by cells of the person's immune system.

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.....[4]

(b) Myasthenia gravis is an auto-immune disease.

Explain the term *auto-immune disease*.

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.....[1]

[Total: 6]

6 **(a)** Complete Table 6.1 to show the features of the human gas exchange system.

Place a tick (✓) where a feature is present and a cross (✗) if a feature is absent.

Table 6.1

	cartilage	cilia	elastic fibres
trachea			
bronchioles			
alveoli			

[3]

(b) Smoking causes changes to the structure of the lining of the bronchi that make smokers more likely to be infected by bacteria.

Describe these changes and explain how this leads to an increased risk of bacterial infection.

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.....[3]

(c) Haemoglobin binds oxygen in the lungs to form oxyhaemoglobin.

Describe what causes oxygen to be released from the oxyhaemoglobin as blood flows through respiring tissues.

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.....[4]

(d) Explain why red blood cells are in blood but not in tissue fluid.

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.....[1]

[Total: 11]

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