Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

2999926299

BIOLOGY **9700/21**

Paper 2 AS Level Structured Questions **October/November 2017**

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 **15** printed pages and **1** blank page.

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Answer **all** questions.

1 Fig. 1.1 is a photomicrograph of plant cells showing stages in cell division.

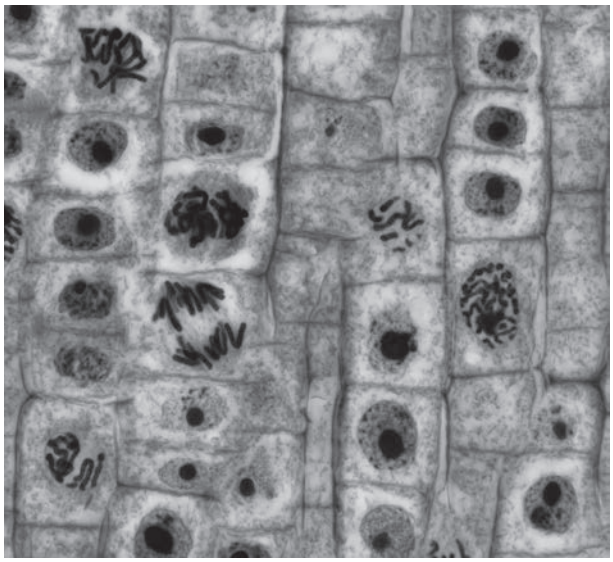


Fig. 1.1

(a) On Fig. 1.1, draw a circle around a cell in anaphase. [1]

(b) Suggest the advantages of using a light microscope, rather than an electron microscope, to study cell division.

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..... [2]

(c) Mitosis is important in producing more cells for plant growth.

Describe **three other** ways in which mitosis is important in plants.

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..... [3]

[Total: 6]

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2 Fig. 2.1 is a transmission electron micrograph of a section through a blood vessel.

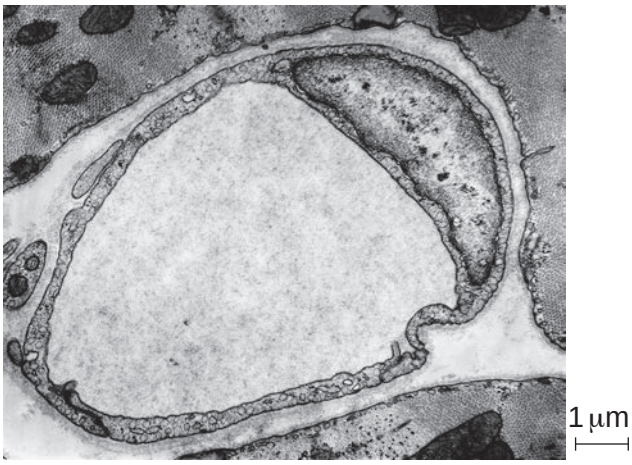


Fig. 2.1

(a) State the type of blood vessel shown in Fig. 2.1 **and** give **two** reasons for your choice.

type of blood vessel .....

reason 1 .....

.....

reason 2 .....

.....[3]

Fig. 2.2 is a graph showing how the blood pressure in the pulmonary artery and in the right ventricle changes during one cardiac cycle.

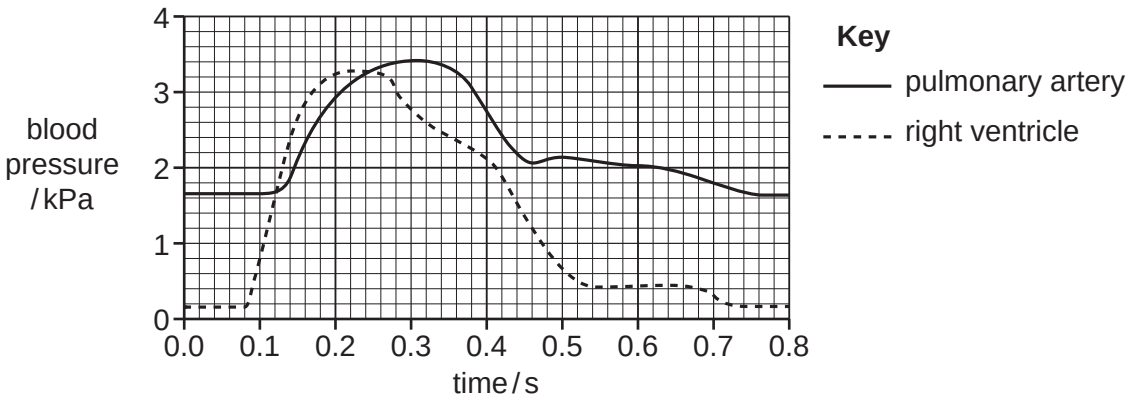


Fig. 2.2

(b) Use Fig. 2.2 to state the time at which:

(i) the valve between the right ventricle and the pulmonary artery closes

.....[1]

(ii) the ventricle begins to contract.

.....[1]

(iii) State **and** explain the similarities and differences between Fig. 2.2 and a graph showing how the blood pressure for the **left** ventricle changes during the same cardiac cycle.

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.....[4]

[Total: 9]

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3 Cells of the immune system function to protect the body against infectious diseases.

(a) (i) Name the type of cell that produces antibodies.

.....[1]

(ii) The virus that causes the infectious disease influenza has two antigens, **H** and **N**. Antibodies are produced in response to an infection by this virus. The antibodies are specific for either antigen **H** or for antigen **N**.

Describe how the structure of an antibody molecule allows it to be specific for **one** antigen, such as **H** or **N**.

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.....[3]

(b) Cholera is a disease caused by a bacterial pathogen.

(i) Name the pathogen that causes cholera.

.....[1]

(ii) Describe how the pathogen that causes cholera is transmitted.

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.....

.....

.....[2]

(c) Viruses that infect bacteria are called bacteriophages. Some bacteriophages that infect the cholera pathogen cause lysis of the bacterium.

(i) Suggest what happens to the structure of a bacterial cell to cause lysis.

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.....[2]

(ii) Some scientists believe that bacteriophages could be used to treat people who are infected with cholera.

Suggest the properties of the bacteriophages that would make this possible.

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.....[2]

(iii) Antibiotics can be used to treat people with cholera.

State why antibiotics are **not** effective against measles.

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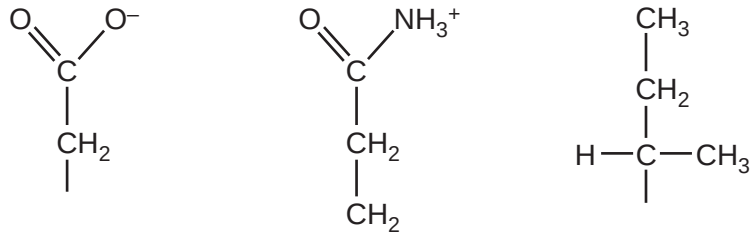
.....

.....[1]

[Total: 12]

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4 Fig. 4.1 shows the structure of the R groups of three amino acids, aspartate (Asp), glutamine (Gln) and isoleucine (Ile).



Asp R group **Gln R group** **Ile R group**

Fig. 4.1

(a) One of the mRNA codons for the amino acid Gln is CAA.
A mutation could change this codon from CAA to UAA.

UAA is a STOP codon.

State what is meant by a STOP codon.

.....

.....

.....[1]

(b) Many proteins that contain the amino acids shown in Fig. 4.1 are globular.

Describe how the three R groups in Fig. 4.1 can contribute to the globular structure of a protein.

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.....[4]

(c) An example of a globular protein is the enzyme starch phosphorylase. This enzyme catalyses the conversion of starch to glucose-1-phosphate.

Name the type of bond that is broken when starch is converted to glucose-1-phosphate.

.....[1]

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An investigation was carried out to find out how the activity of starch phosphorylase varied with temperature, when free in solution and when immobilised in alginate.

The results are shown in Fig. 4.2.

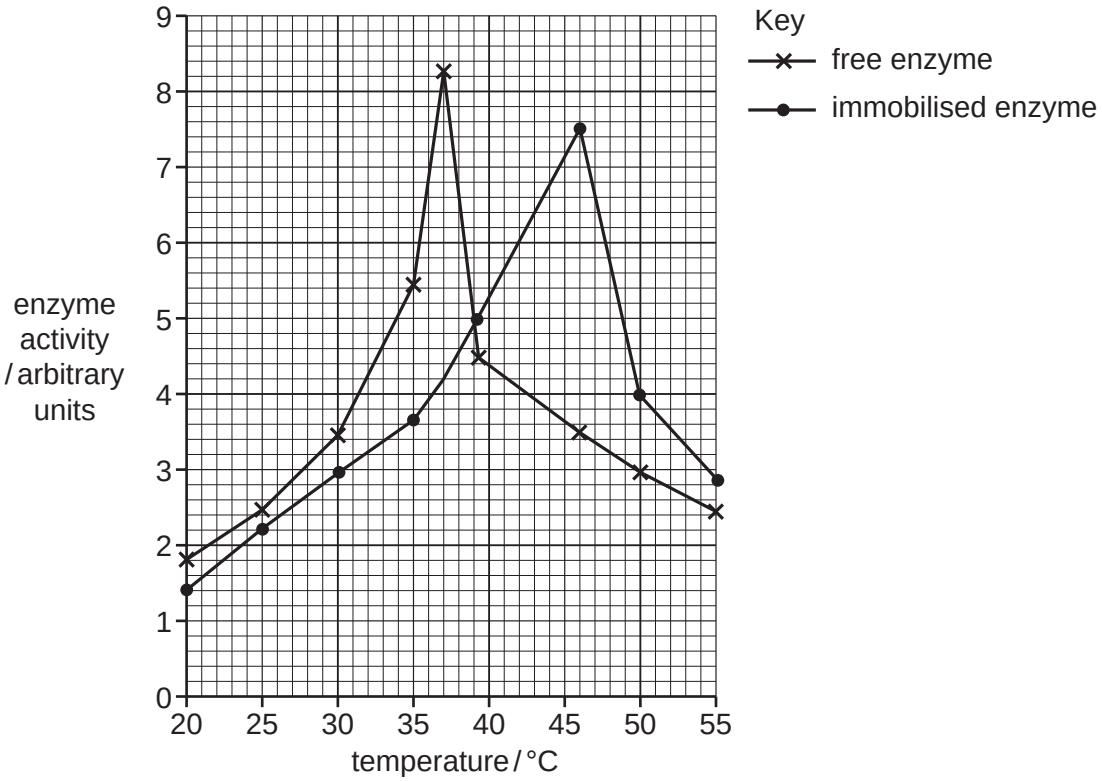


Fig. 4.2

(d) With reference to Fig. 4.2, compare the results for the enzyme activity when free in solution and when immobilised.

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.....[4]

(e) State how the Michaelis–Menten constant (K_m) is derived from V_{max} for an enzyme.

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.....[1]

(f) The K_m values for starch phosphorylase were determined when free in solution and when immobilised.

The K_m values were:

- free in solution, $K_m = 0.34\,mmol\,dm^{-3}$
- immobilised, $K_m = 0.84\,mmol\,dm^{-3}$.

Suggest an explanation for the difference between the two values.

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.....[2]

[Total: 13]

5 Fig. 5.1 is a transmission electron micrograph of part of a cell.

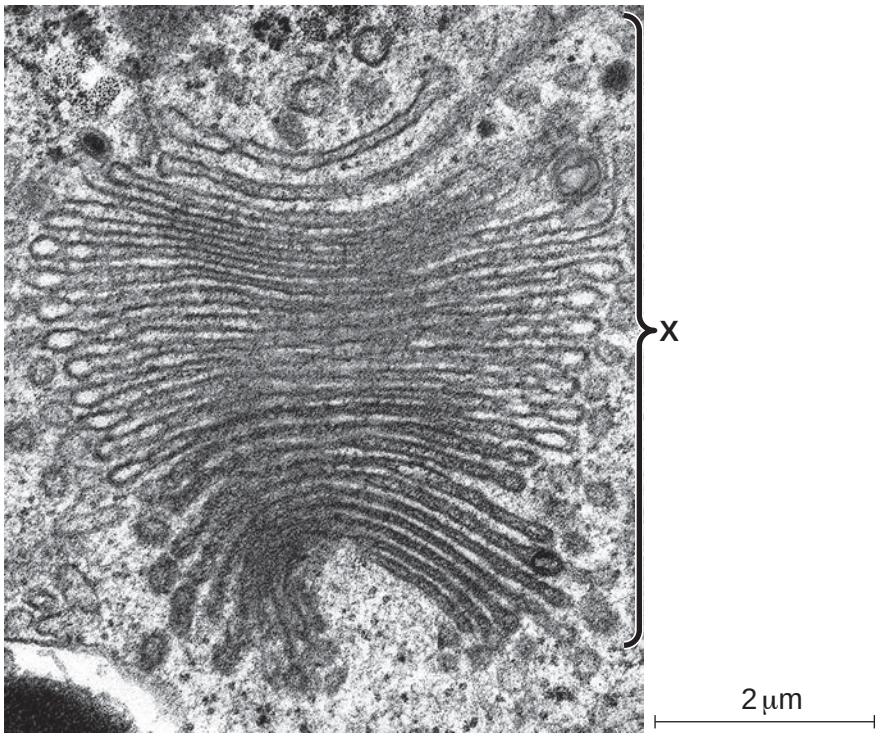


Fig. 5.1

(a) (i) Name the organelle labelled **X**.

.....[1]

(ii) Put a tick (✓) in the box beside the type, or types, of cell that contain this organelle.

animal cell	
plant cell	
bacterial cell	

[1]

(b) Use the scale bar to calculate the magnification of Fig. 5.1.

Write down the formula and use it to make your calculation. Show your working.

formula

magnification × .....[3]

(c) The organelle in Fig. 5.1 is made from structures surrounded by a single membrane.

Name **two** organelles that are surrounded by double membranes.

.....[2]

(d) **(i)** The structure of the cell surface membrane is described as a fluid mosaic.

Explain what is meant by the term *fluid mosaic*.

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.....[2]

(ii) Outline the roles of the cell surface membrane.

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.....[4]

[Total: 13]

6 Plants have two transport tissues, xylem and phloem.

(a) Describe **and** explain **two** ways in which the structure of xylem vessels is adapted to their function.

description 1 .....

.....

explanation 1 .....

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description 2 .....

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explanation 2 .....

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.....[2]

(b) Describe **two** differences between the vessels that transport phloem sap in flowering plants and the vessels that transport blood in mammals.

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.....[2]

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Fig. 6.1 shows root hair cells.

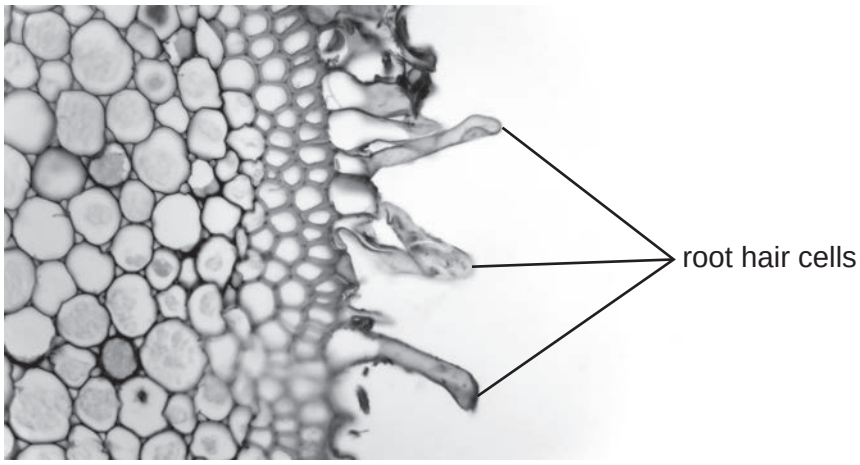


Fig. 6.1

(c) Explain why the root hair cells in Fig. 6.1 have more mitochondria than the other root cells shown.

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.....[3]

[Total: 7]

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