Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4322934603

BIOLOGY **9700/23**

Paper 2 Structured Questions AS **October/November 2014**

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 in the spaces provided at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
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 **14** printed pages and **2** blank pages.

© UCLES 2014

CAMBRIDGE International Examinations

Answer **all** the questions

1 Fig. 1.1 is a photomicrograph of plant root cells near the growing tip. Some of the cells are undergoing mitosis.

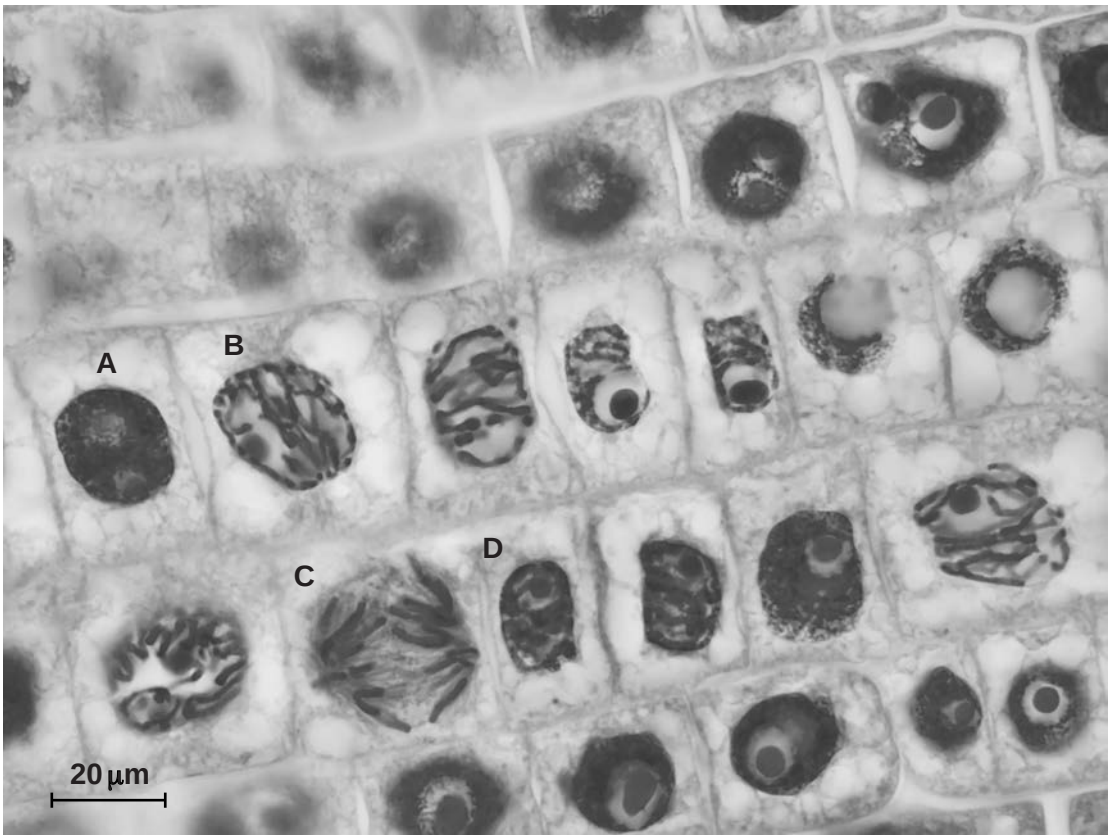


Fig. 1.1

(a) State **one** feature, visible in Fig. 1.1, which indicates that the section is taken from plant tissue and not animal tissue.

.....

.....[1]

(b) State the letter, **A** to **D**, of the cell in Fig. 1.1 which is in:

(i) prophase .....

(ii) anaphase. ..... [2]

(c) Describe two events occurring in cell **B**.

1. .....

.....

2. .....

.....
[2]

© UCLES 2014

(d) (i) Describe the role of mitosis in a growing plant root tip.

.....

.....

.....

.....

..... [2]

(ii) Mutations can sometimes occur in cells which are rapidly dividing.

Outline how a mutation can cause an altered polypeptide to be produced.

.....

.....

.....

.....

.....

.....

..... [2]

(e) Calculate the magnification of Fig. 1.1.

Show your working and give your answer to the nearest whole number.

magnification × .....
[2]

[Total: 11]

2 Fig. 2.1 shows a food chain in a freshwater ecosystem.

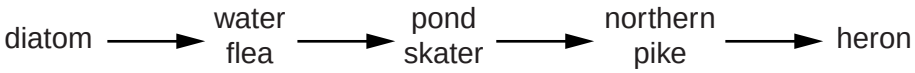


Fig. 2.1

(a) The diatom is an autotroph.

Explain what is meant by the term *autotroph*.

.....

.....

..... [2]

(b) Describe the role of the water flea in the food chain shown in Fig. 2.1.

.....

.....

..... [2]

(c) Suggest why the heron population is much smaller than the population of the water flea.

.....

.....

.....

.....

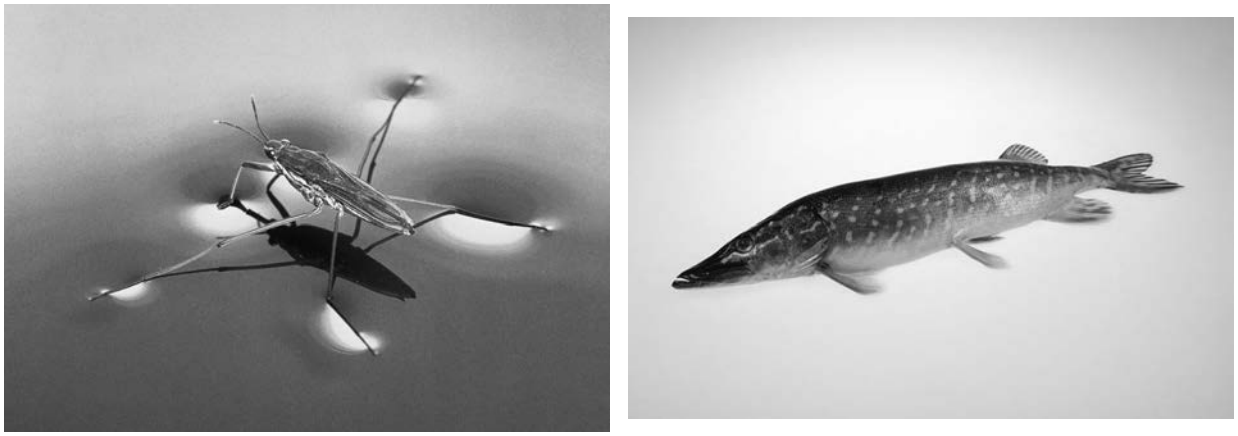
..... [2]

© UCLES 2014

Fig. 2.2a shows a pond skater walking on the surface of the water.

Fig. 2.2b shows a northern pike.

These are not shown to the same scale.



a **b**

Fig. 2.2

Both animals live in northern countries of the world, where temperatures often drop below 0 °C.

(d) Describe the importance of water as an environment for the pond skater **and** the northern pike.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(e) The mud at the bottom of the freshwater ecosystem contains dead organic material and also supports the growth of water plants.

Outline how nitrogen from the dead organic material is made available to the growing plants.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 14]

3 Measles is an infectious disease for which vaccines have been developed.

The commonly used vaccine consists of an attenuated (weakened) form of the virus.

The measles vaccine is normally given to children when they are about one year old, followed by a booster dose when they are about four years old.

(a) Explain how this vaccine can provide long-term immunity against measles.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

Fig. 3.1 shows the number of reported cases of measles and the percentage of the population vaccinated worldwide between 1980 and 2002.

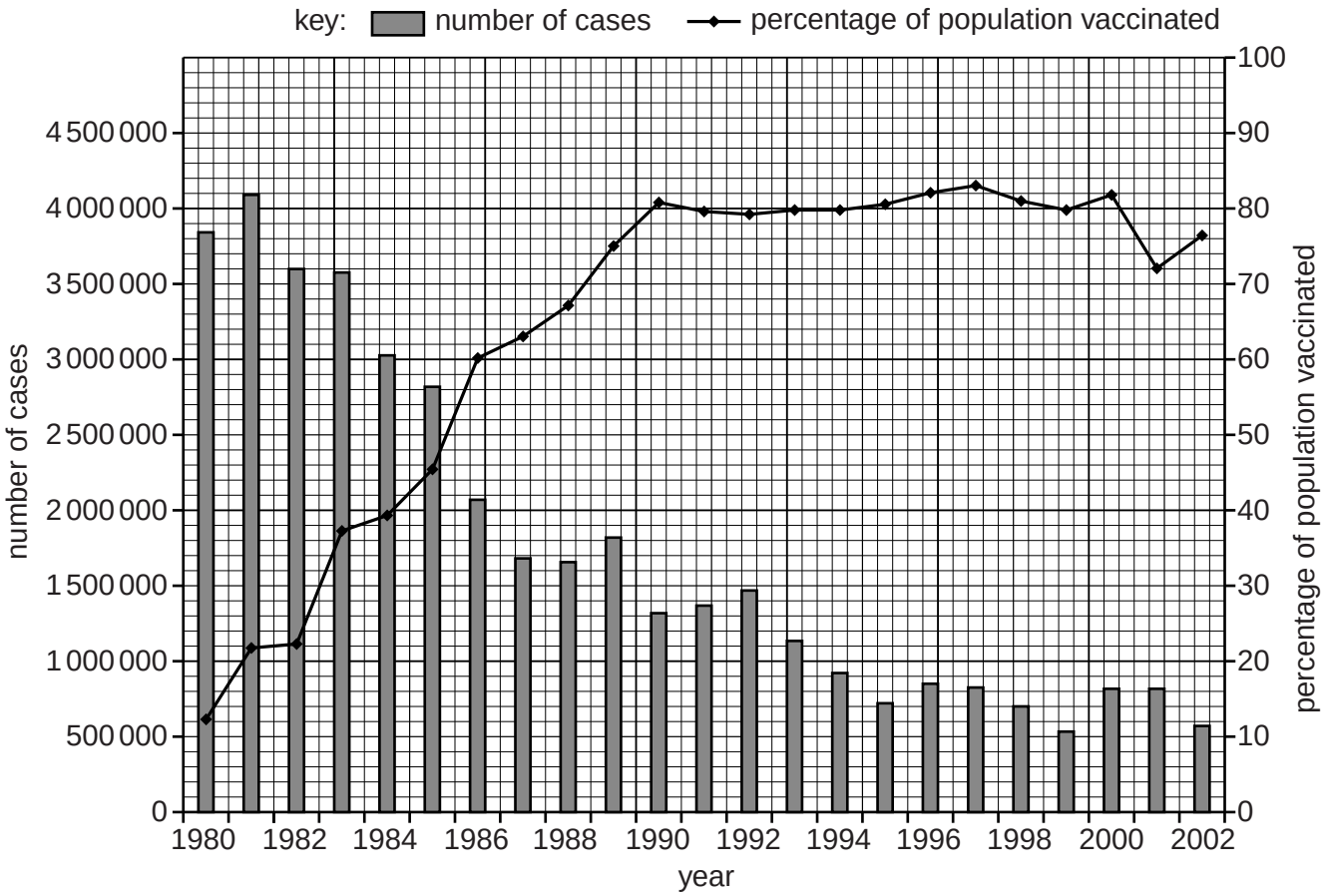


Fig. 3.1

(b) Describe the trends shown in Fig. 3.1:

between 1980 and 1990

.....

.....

.....

.....

.....

between 1990 and 2002.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) The measles virus has a unique protein on its surface called MV-H which can bind to a protein called CD-46 on the surface of human cells. This allows the measles virus to infect these cells.

Suggest how the two proteins, MV-H and CD-46, can bind to each other.

.....

.....

.....

.....[2]

[Total: 11]

4 Fig. 4.1 is a computer-generated image of the enzyme hexokinase binding with its substrate, glucose. The product of the enzyme-catalysed reaction is glucose-6-phosphate.

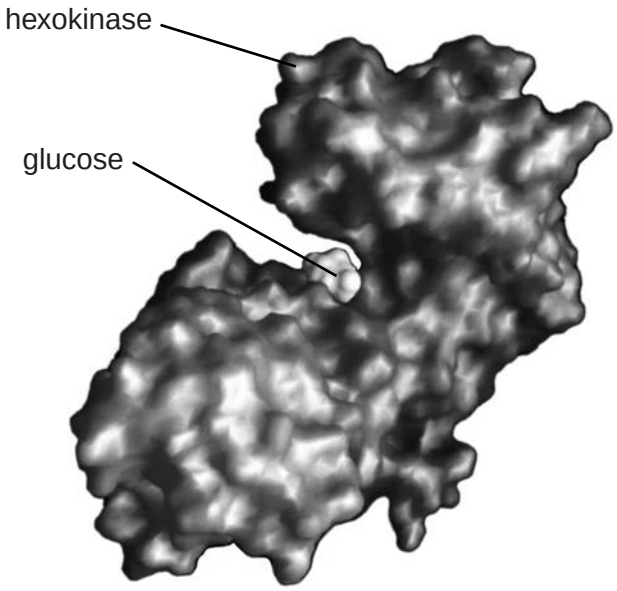


Fig. 4.1

(a) Hexokinase binds with glucose using the induced fit mechanism.
Describe how an enzyme-substrate complex forms by this mechanism.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(b) Suggest how enzymes which use the induced fit mechanism can be less affected by competitive inhibitors than those which use the lock and key mechanism.

.....

.....

.....

.....

..... [2]

© UCLES 2014

(c) When a solution of the enzyme hexokinase is heated to 45 °C for 10 minutes, the quantity of product formed decreases by 50% compared to a sample kept between 30 °C and 40 °C.

Explain this result.

.....

.....

.....

.....

.....

..... [3]

Glucose can enter cells by active transport or facilitated diffusion.

Glucose-6-phosphate is a charged, polar molecule and cannot move out of cells.

(d) (i) State two **differences** between active transport and facilitated diffusion.

1. .....

.....

2. .....

.....

[2]

(ii) Suggest why glucose-6-phosphate cannot move out of cells.

.....

.....

.....

.....

.....

..... [2]

[Total: 12]

5 Fig. 5.1 shows a section of lung tissue from a smoker. The image magnification is ×10.

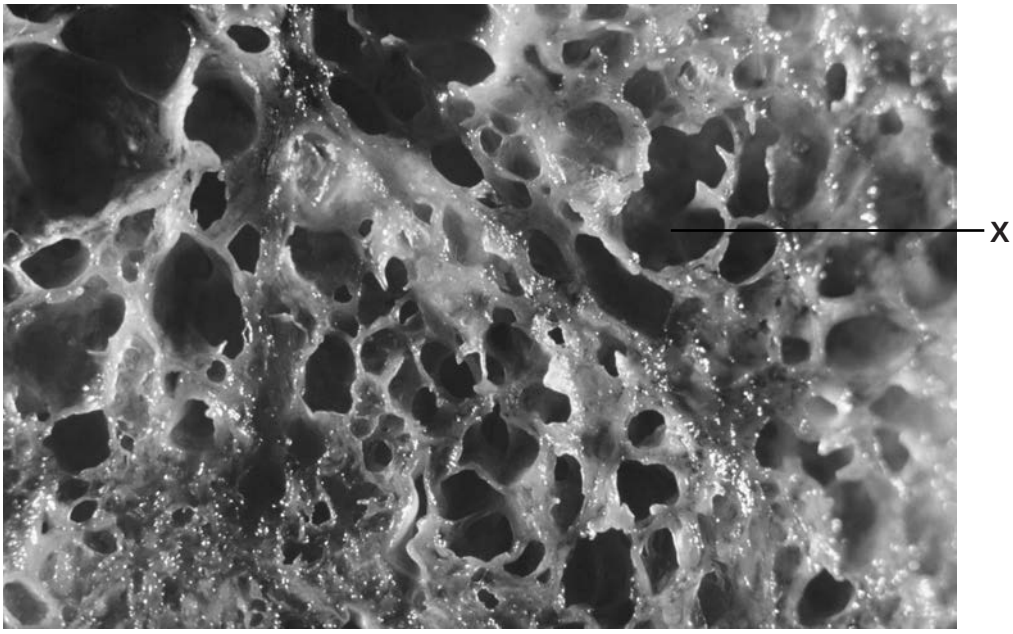


Fig. 5.1

In a smoker, the walls between the gas exchange structures in the lungs can break down, resulting in the damaged features visible in Fig. 5.1. One of these damaged features is labelled **X**.

(a) (i) Name the gas exchange structures which are damaged in Fig. 5.1.

.....[1]

(ii) Name the smoking-related disease resulting in the damaged feature labelled **X** in Fig. 5.1.

.....[1]

(b) Smoking-related diseases may increase the risk of infectious diseases of the gas exchange system.

Describe **and** explain how smoking can increase the risk of these infections.

.....

.....

.....

.....

.....

.....

.....[3]

© UCLES 2014

(c) From one cigarette, a smoker will inhale between 14 and 20 mg of carbon monoxide.

Describe the effects of carbon monoxide on haemoglobin.

.....

.....

.....

.....

.....

.....[2]

[Total: 7]

6 Table 6.1 contains some information about xylem vessels and phloem sieve tube elements in plants.

Table 6.1

features	**xylem vessels**	**phloem sieve tube elements**
living cells		yes
substances transported		dissolved sugars and amino acids
direction of flow of substances	one direction, roots to leaves	
permeability of cell walls to water	not permeable	
cell wall material		

(a) Complete Table 6.1. [4]

(b) State **one** use for magnesium ions in plants.

.....[1]

[Total: 5]

© UCLES 2014

BLANK PAGE

© UCLES 2014

BLANK PAGE

Copyright Acknowledgements:

Fig. 1.1 © GERD GUENTHER/SCIENCE PHOTO LIBRARY.
Fig. 2.1 a © HERMANN EISENBEISS/SCIENCE PHOTO LIBRARY.
Fig. 2.1 b © Francisco Martinez / Alamy.
Fig. 4.1 © KENNETH EWARD/BIOGRAFX/SCIENCE PHOTO LIBRARY.
Fig. 5.1 © CNRI/SCIENCE PHOTO LIBRARY.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2014