www.XtremePapers.com

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0485738209

BIOLOGY **9700/21**

Paper 2 Structured Questions AS **October/November 2009**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Ruler (cm/mm)

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 a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

This document consists of **13** printed pages and **3** blank pages.

© UCLES 2009

Answer **all** the questions.

For Examiner's Use

1 During an immune response, plasma cells secrete antibody molecules. Fig.1.1 is a diagram of an antibody molecule. The diagram is **not** complete.



Fig. 1.1

(a) (i) Draw a circle around a variable region. [1]

(ii) Draw in and label the position of the disulfide bonds in the molecule. [1]

(iii) Explain the importance of disulfide bonds in protein molecules, such as antibodies.

.....

.....

.....

.....

.....

.....[3]

© UCLES 2009

(b) Describe how antibodies provide protection against pathogens.

For Examiner's Use

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) Other proteins are found in cell surface membranes.

Describe three roles of the proteins in cell surface membranes.

1 .....

.....

2 .....

.....

3 .....

.....[3]

[Total: 12]

For Examiner's Use

2 Amylase is an enzyme that catalyses the hydrolysis of starch. A student investigated the effect of pH on the activity of the enzyme.

Eight test-tubes were set up each containing 5 cm^3 of the same concentration of amylase solution but in buffer solutions of different pH values. The test-tubes were left in a water-bath at 30 °C for 10 minutes.

After 10 minutes, 5 cm^3 of a starch suspension at 30 °C was added to each test-tube. Immediately, the student took a sample from each test-tube and tested the reaction mixture for the presence of starch. Samples were then taken every minute for 10 minutes and tested in the same way.

The student's results are shown in Table 2.1.

Table 2.1

pH	time / min										
	0	1	2	3	4	5	6	7	8	9	10
2.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗
4.0	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
5.0	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗
6.0	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
7.0	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗
8.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗
9.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

key
✓ = starch present
✗ = starch absent

(a) Describe how the student would test for the presence of starch.

.....

.....

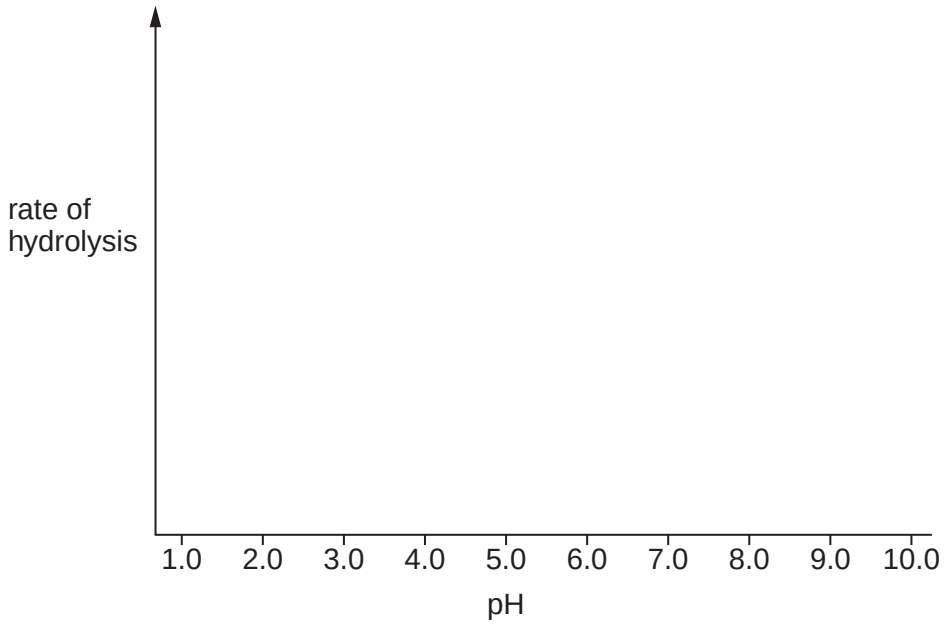
.....

..... [2]

© UCLES 2009

(b) Use the axes below to sketch a graph to show the effect of pH on the **rate of hydrolysis** of starch by amylase.

For Examiner's Use



[2]

(c) With reference to the student's results, describe **and** explain the effect of pH on the rate of hydrolysis of starch by amylase.

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 9]

3 Fig. 3.1 is an electron micrograph of a lymphocyte in the process of cell division during an immune response.

For Examiner's Use

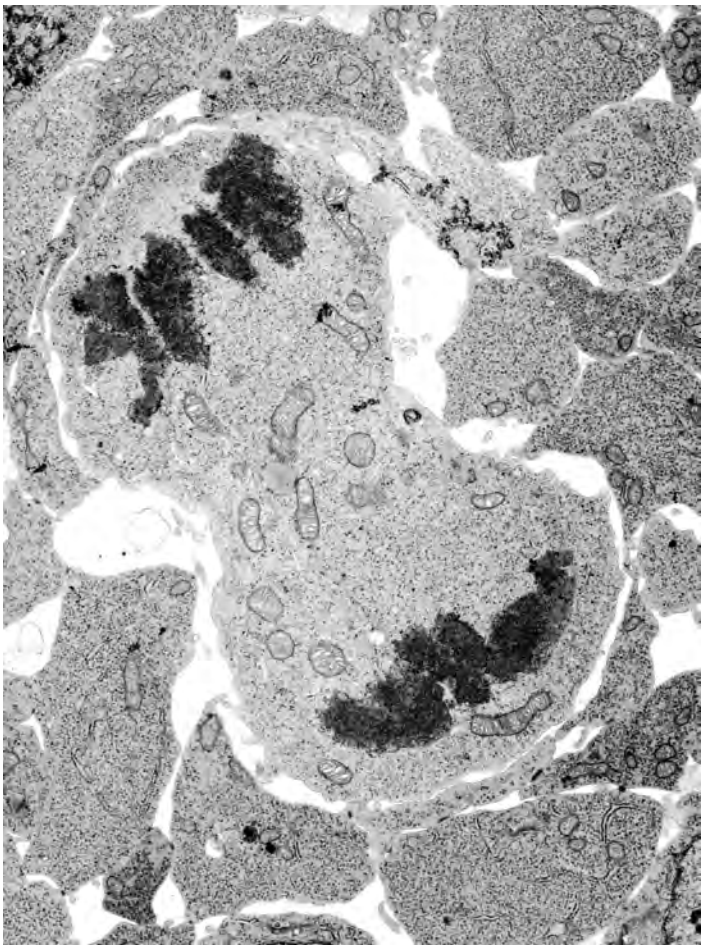


Fig. 3.1

(a) With reference to Fig. 3.1,

(i) name the stage of mitosis shown;

.....[1]

(ii) describe what is happening during this stage of mitosis;

.....

.....

.....

.....

.....[2]

(iii) suggest the **disadvantages** of using an electron microscope to study mitosis.

For Examiner's Use

.....

.....

.....

.....

.....[2]

(b) Tumours may form inside the lungs of long-term smokers.

(i) Describe how a tumour develops in the lungs.

.....

.....

.....

.....

.....

.....

.....[3]

(ii) Describe two signs or symptoms of lung cancer.

1 .....

.....

2 .....

.....[2]

[Total: 10]

For Examiner's Use

4 **(a)** Explain what is meant by the term transpiration.

.....

.....

.....[2]

The rates of transpiration of plants of two species, **A** and **B**, were measured over a period of seven hours. The results are shown in Fig. 4.1.

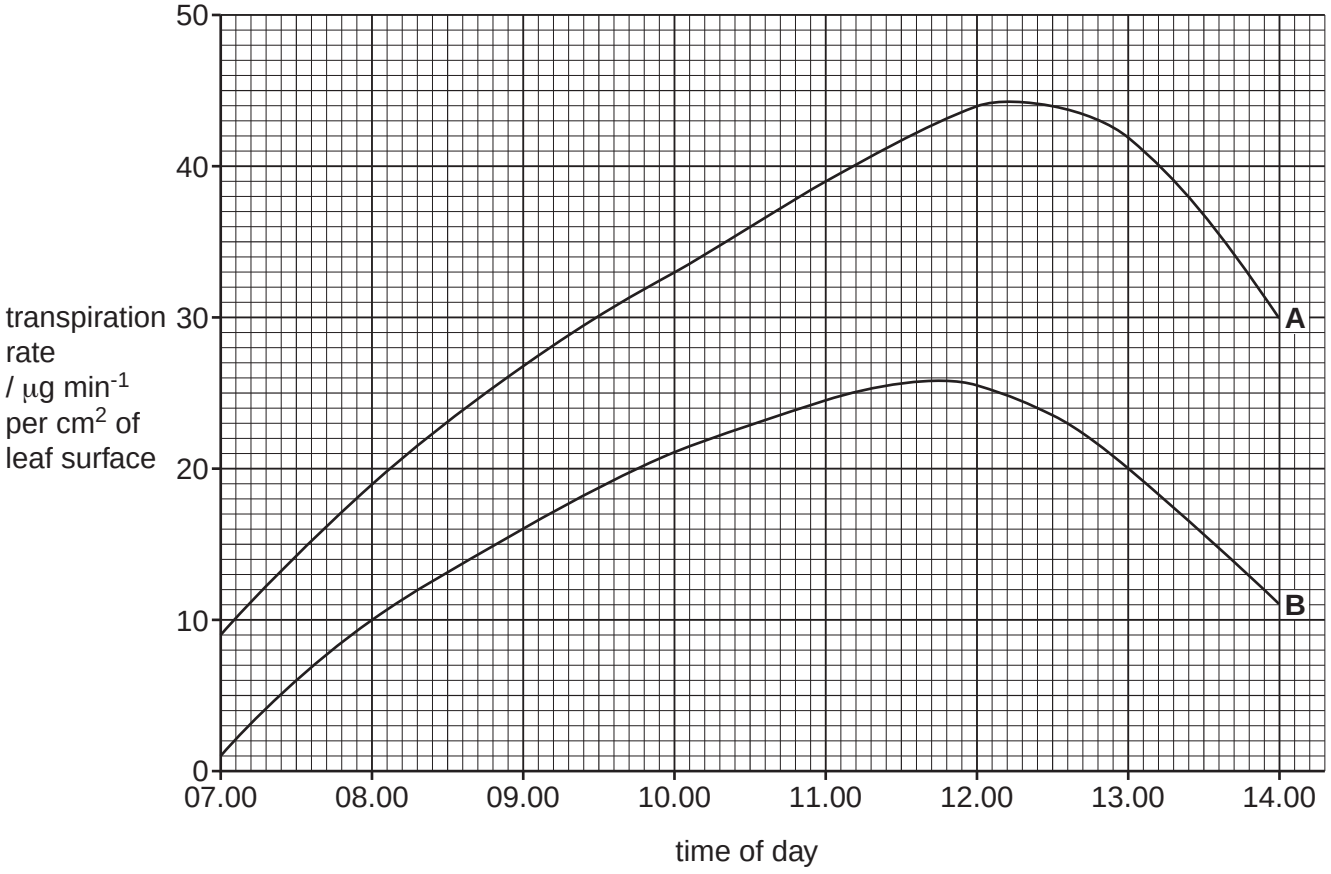


Fig. 4.1

(b) With reference to Fig. 4.1, compare the rates of transpiration of the two species over the seven hour period.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) State two possible features of the **leaves** of species **B** that could explain the different rates of transpiration in comparison with species **A**.

For Examiner's Use

Explain how each feature acts to reduce transpiration.

feature .....

explanation .....

.....

.....

feature .....

explanation .....

.....

.....[4]

[Total: 10]

5 *Pneumocystis jirovecii* is a yeast-like fungus that lives in human lungs. It is the causative agent of one of the opportunistic pneumonia-like infections that may develop during AIDS.

For Examiner's Use

P. jirovecii is eukaryotic. Its life cycle is difficult to observe as it has never been cultured in the laboratory. Fig. 5.1 shows its possible life cycle. The numbers on the diagram represent the number of chromosomes in each stage.

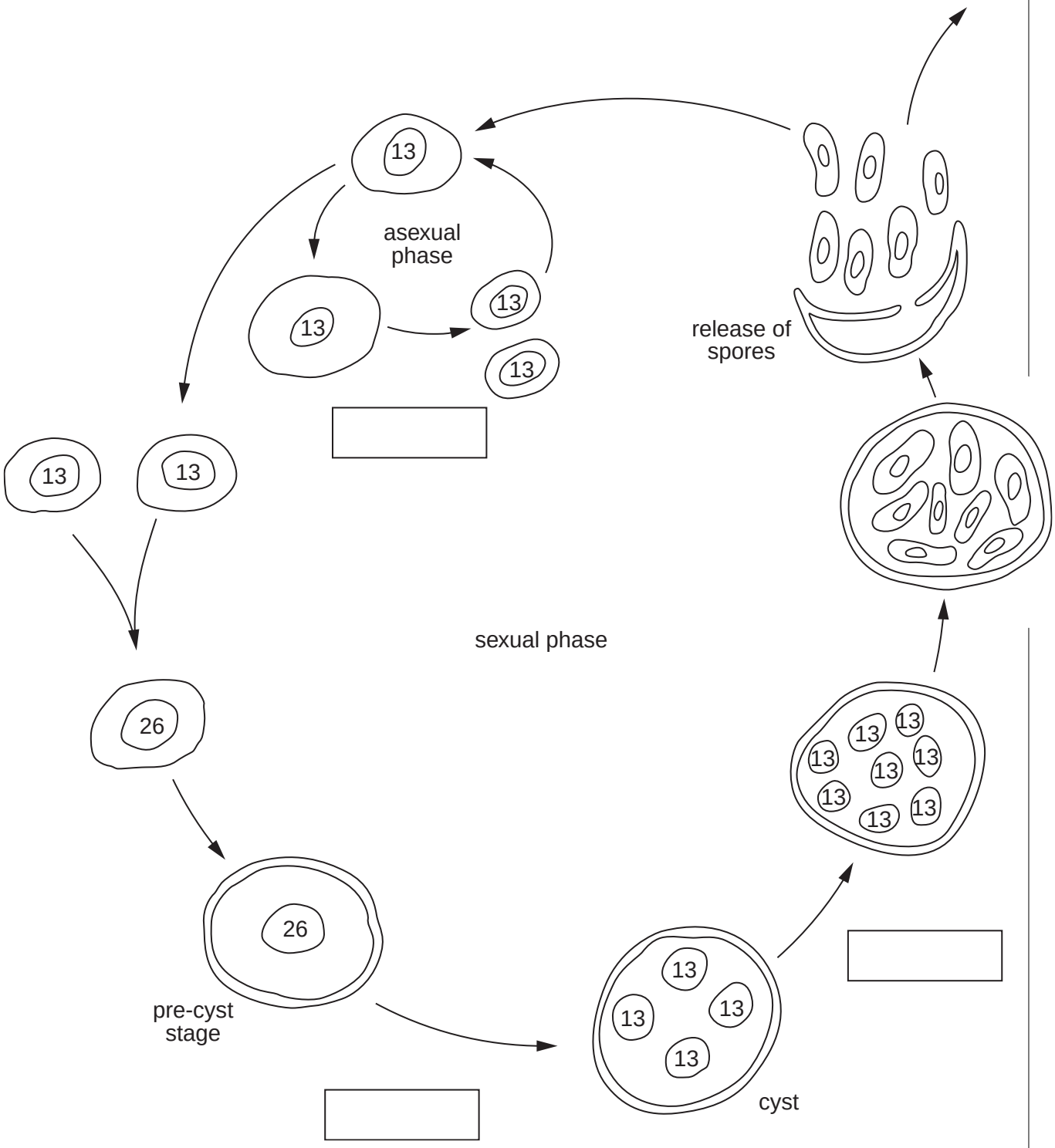


Fig. 5.1

(a) *P. jirovecii* has a haploid number of 13 chromosomes.

Complete the life cycle by writing either mitosis or meiosis in the boxes in Fig. 5.1. [2]

For Examiner's Use

(b) State two structural features that you would expect to find in the cytoplasm of *P. jirovecii* that indicate it is a eukaryote and not a prokaryote.

1 .....

2 .....[2]

(c) Suggest how *P. jirovecii* is transmitted from one person to another.

.....

.....

.....

.....[2]

(d) Discuss the problems in attempting to control the spread of HIV/AIDS.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

6 **(a)** Explain what is meant by the term ecosystem.

For Examiner's Use

.....

.....

.....

.....[2]

Fig. 6.1 shows the energy flow through a river ecosystem.

All the figures are in kJ m^{-2} per year.

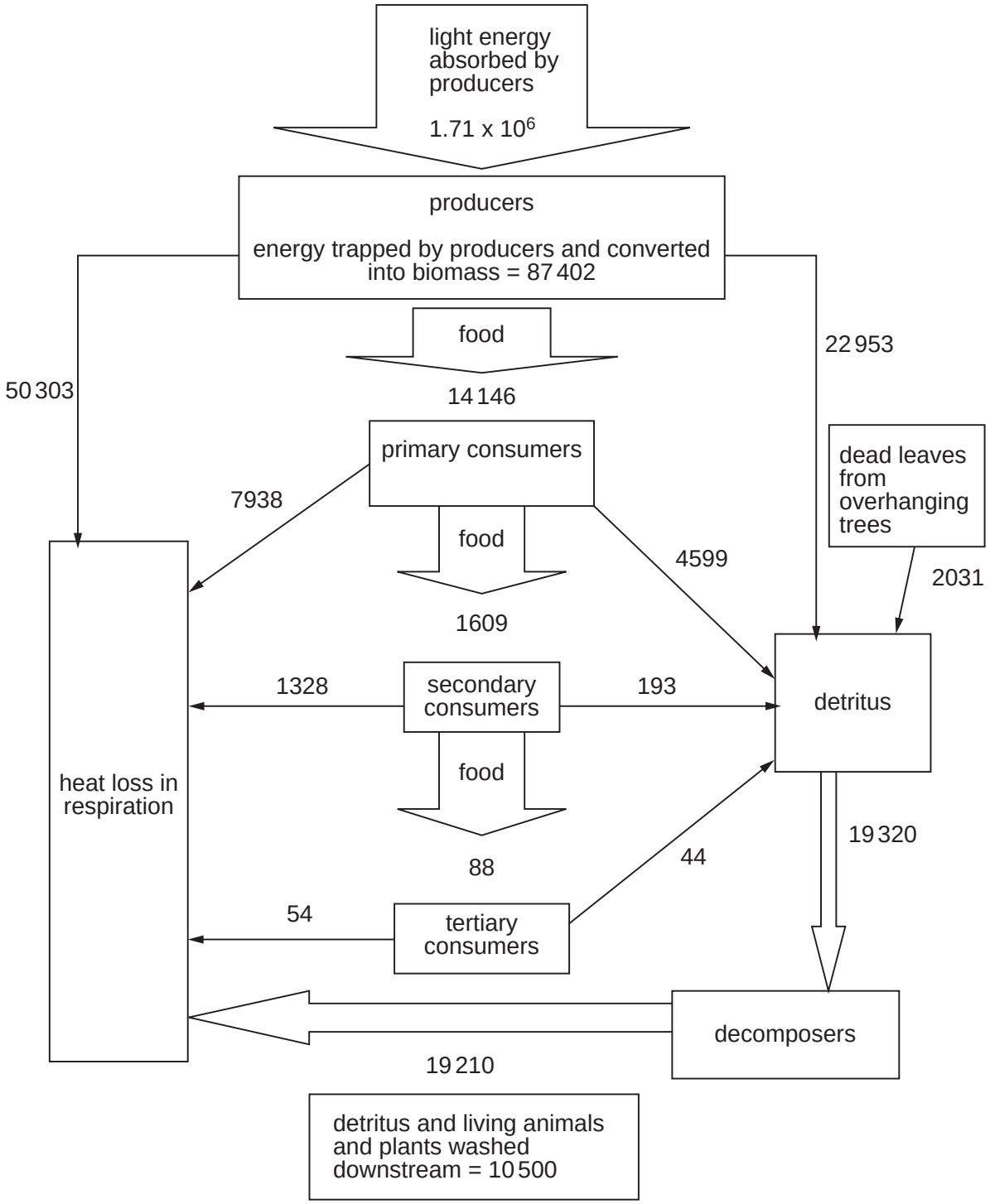


Fig. 6.1

For Examiner's Use

(b) The efficiency of energy transfer between trophic levels is calculated by comparing the energy available to a trophic level with the energy available to the next trophic level. Between secondary and tertiary consumers, this is calculated as follows:

$$\frac{\text{energy available to tertiary consumers}}{\text{energy available to secondary consumers}} \times 100\%$$

Calculate the efficiency of energy transfer between secondary and tertiary consumers in the river ecosystem.

Express your answer to the nearest 0.1%.

Show your working.

Answer .....% [2]

(c) Explain why the energy efficiency between secondary and tertiary consumers is greater than that between producers and primary consumers.

.....

.....

.....

.....

.....

.....

.....[3]

(d) Describe the roles of decomposers in recycling nitrogen.

.....

.....

.....

.....

.....[2]

[Total: 9]

BLANK PAGE

BLANK PAGE

BLANK PAGE

Copyright Acknowledgements:

Question 3 Fig. 3.1 © P673/063; Cell division, TEM; 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.

University of 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.

www.XtremePapers.com

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

6901396319

BIOLOGY **9700/22**

Paper 2 Structured Questions AS **October/November 2009**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Ruler (cm/mm)

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 a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

This document consists of **13** printed pages and **3** blank pages.

© UCLES 2009

Answer **all** the questions.

For Examiner's Use

1 **(a)** Cell surface membranes are involved with the movement of substances into and out of cells.

Calcium pumps in cell surface membranes maintain a concentration of calcium ions inside the cytoplasm that is a thousand times lower than outside the cell.

Fig. 1.1 shows the movement of calcium ions across a cell surface membrane.

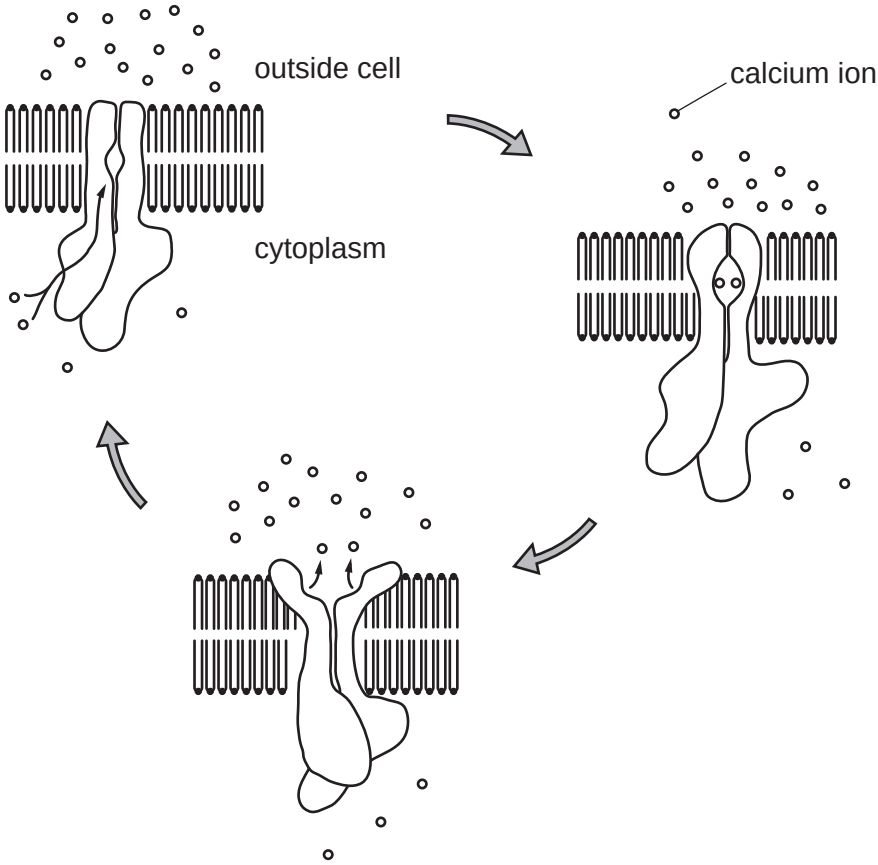


Fig. 1.1

With reference to Fig. 1.1,

(i) explain why calcium ions do not pass through the phospholipid bilayer;

.....

.....

.....

.....[2]

For Examiner's Use

(ii) name and describe the process by which calcium ions are moved across the membrane.

name .....

description .....

.....

.....

.....

.....[3]

(b) Phagocytosis is the process by which bacteria are ingested by cells.

Describe the role of the cell surface membrane during phagocytosis.

.....

.....

.....

.....

.....

.....[3]

(c) Phagocytic cells contain many lysosomes.

Describe the function of lysosomes in destroying ingested bacterial cells.

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 12]

2 Sucrase is the enzyme that catalyses the hydrolysis of sucrose. A student investigated the effect of substrate concentration on the activity of this enzyme.

For Examiner's Use

Six test-tubes were set up each containing $10\,cm^3$ of different concentrations of sucrose solutions. The test-tubes were left in a water bath at 30 °C for ten minutes.

After ten minutes, $5\,cm^3$ of a sucrase solution at 30 °C was added to each test-tube and the reaction mixtures were stirred.

After a further five minutes, the temperature of the water-bath was raised to above 85 °C and the same volume of Benedict's solution added to each test-tube in turn. The student recorded the time when a green colour first became visible in each test-tube.

The concentrations used and the student's results are shown in Table 2.1.

Table 2.1

concentration of sucrose / g dm^{-3}	time taken for green colour to appear / s
5	278
10	145
15	95
20	75
50	47
100	45

(a) Explain why the temperature of the water-bath was raised to above 85 °C.

.....

.....

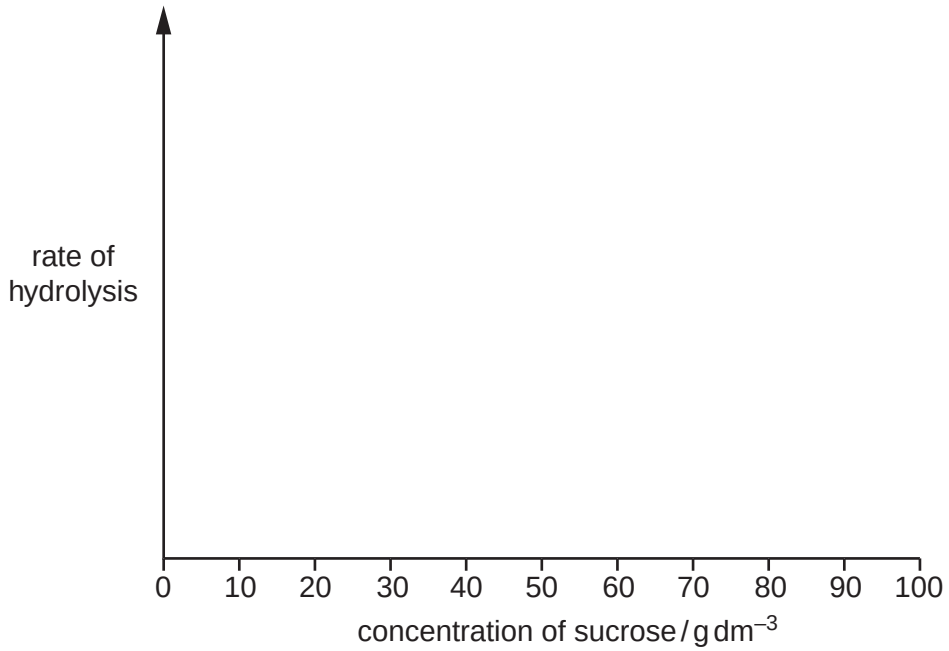
.....

..... [2]

© UCLES 2009

(b) Use the axes below to sketch a graph to show the effect of substrate concentration on the **rate of hydrolysis** of sucrose by sucrase.

For Examiner's Use



[2]

(c) With reference to the student's results, describe **and** explain the effect of increasing substrate concentration on the rate of hydrolysis of sucrose by sucrase.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 9]

For Examiner's Use

3 **(a)** Explain why it is important that the daughter cells produced during a mitotic cell cycle in humans are genetically identical.

.....

.....

.....

.....[2]

(b) Name two factors that increase the chance that a cancer cell will develop.

1 .....

2 .....[2]

(c) Fig. 3.1 shows a cancer cell in the process of cell division.

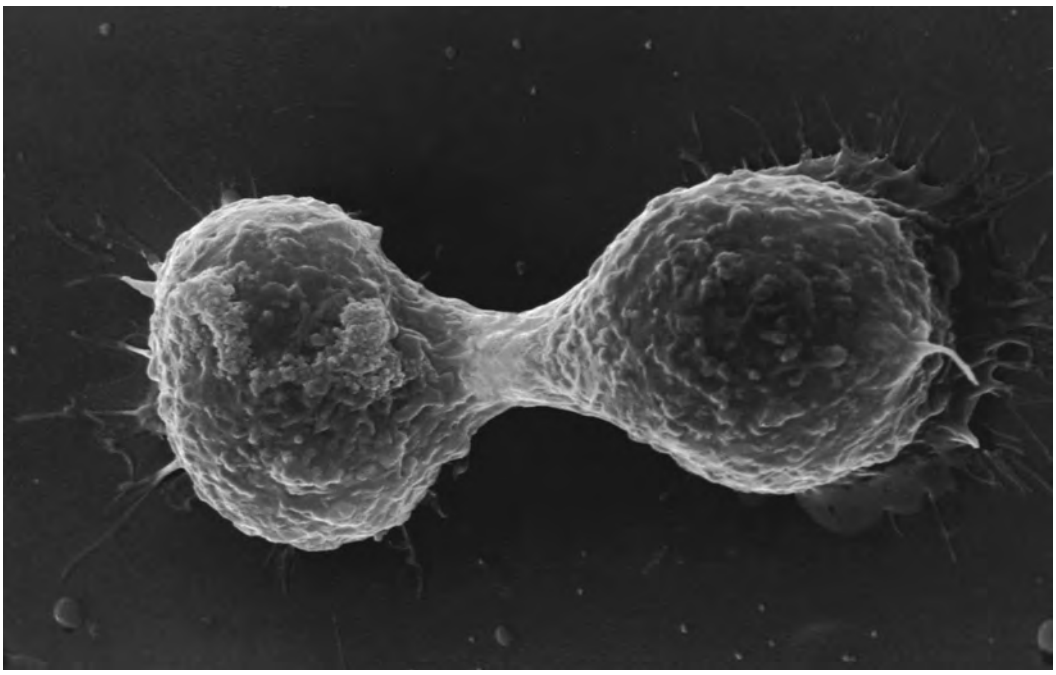


Fig. 3.1

With reference to Fig. 3.1,

(i) state the stage of cell division;

.....[1]

(ii) describe what is happening to the cell during this stage of cell division;

For Examiner's Use

.....

.....

.....

.....

.....

.....

.....[3]

(iii) describe how these cells develop into a tumour.

.....

.....

.....

.....

.....[2]

[Total: 10]

4 A leafy twig was cut from a tree and the cut end immediately placed into water. The twig was then put into a potometer to measure the uptake of water. The potometer was placed on a balance to record changes in mass.

For Examiner's Use

Fig. 4.1 shows the rate of water uptake and the rate of mass loss over a period of 24 hours. The graph also shows when it was light and when it was dark.

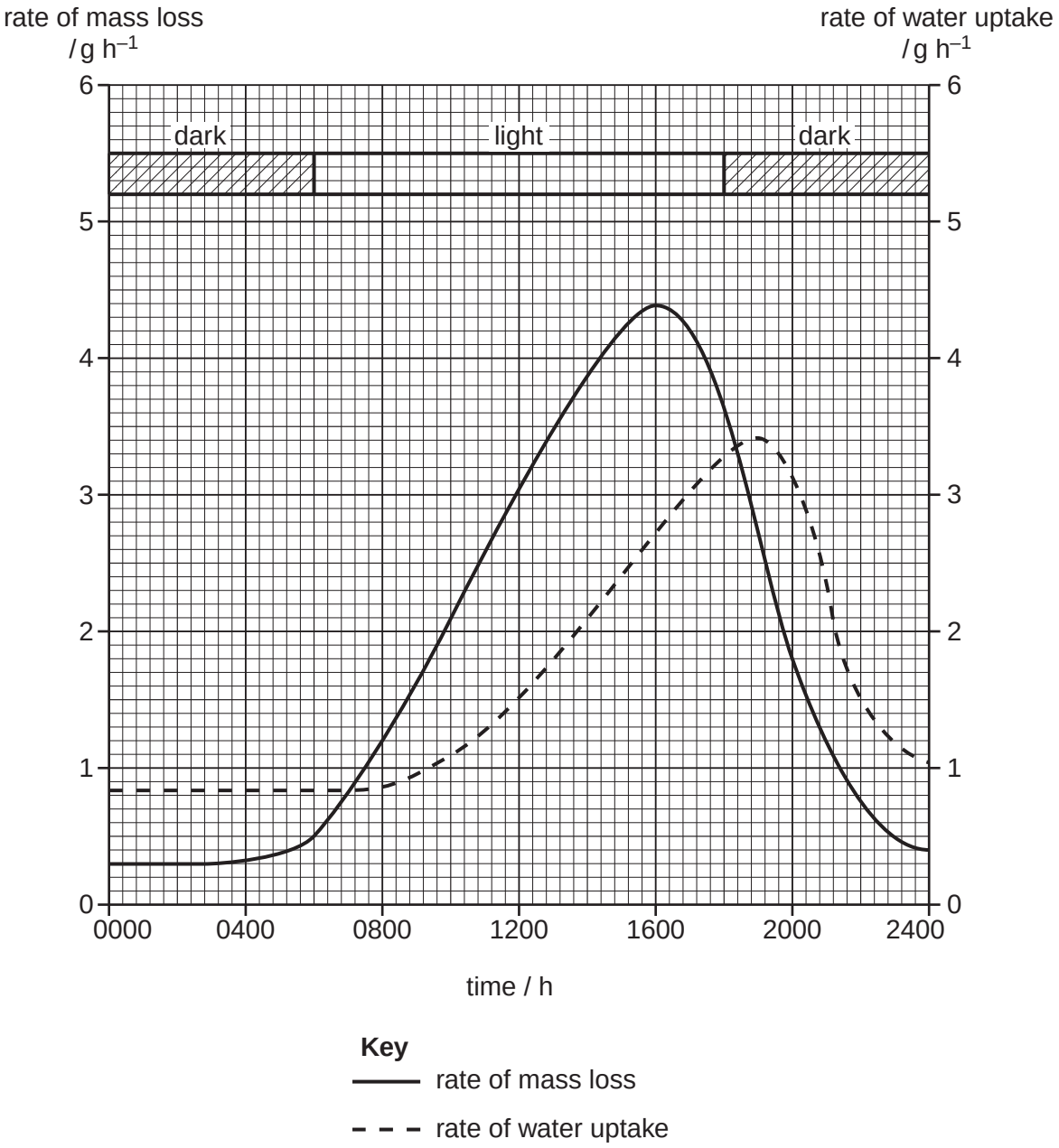


Fig. 4.1

(a) (i) Explain how water was lost from the leaves of the leafy twig.

For Examiner's Use

.....

.....

.....

.....

.....

.....[3]

(ii) With reference to Fig. 4.1, describe how the rates of water uptake and water loss change during the 24 hour period.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

(b) Explain the mechanism by which water is transported in the xylem of the leafy twig while in the potometer.

.....

.....

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

For Examiner's Use

5 *Candida albicans* is a yeast-like fungus that lives in human lungs. It is the causative agent of one of the opportunistic infections that may develop during AIDS.

C. albicans is eukaryotic. Fig. 5.1 shows its structure.

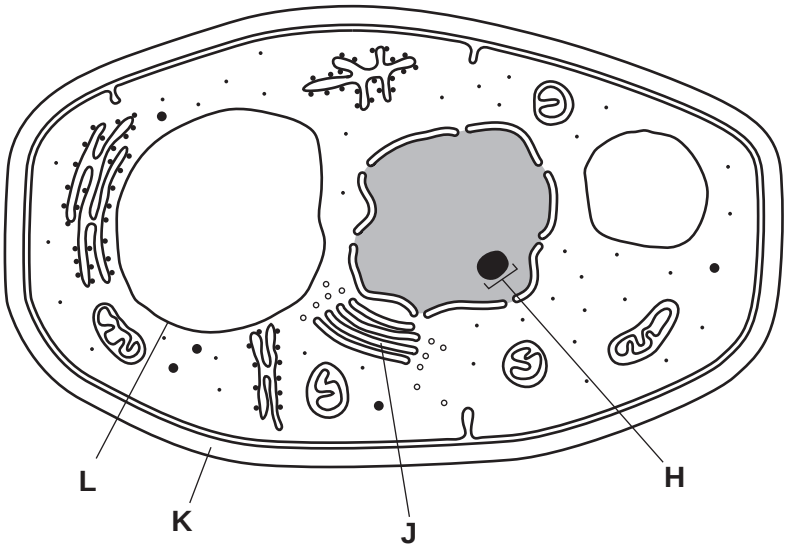


Fig. 5.1

(a) (i) Name **H** to **L**.

H .....

J .....

K .....

L ..... [4]

(ii) State two ways in which the **structure** of a prokaryotic cell differs from that shown in Fig. 5.1.

1 .....

.....

2 .....

..... [2]

© UCLES 2009

(b) *C. albicans* uses a transport protein, TMP1, to absorb sugar molecules from the inside of the mouth. TMP1 is encoded by a gene within the nucleus and is produced when sugars are present in the surroundings.

For Examiner's Use

Explain how the structures within the cell shown in Fig. 5.1, are involved with the production of functioning TMP1.

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

6 **(a)** Explain what is meant by the term *community*.

For Examiner's Use

.....

.....

.....

.....[2]

Fig. 6.1 shows the flow of energy through a woodland. All figures are in kJ m^{-2} per week.

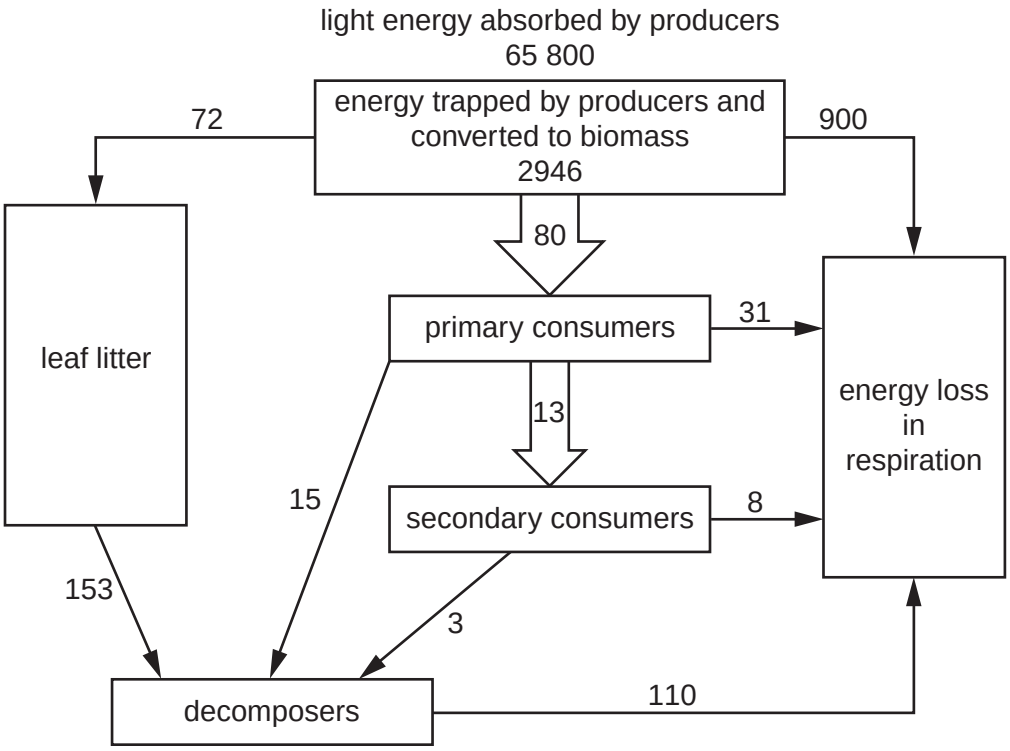


Fig. 6.1

(b) **(i)** Calculate the energy trapped by the producers and converted to biomass as a percentage of the light energy absorbed.

Express your answer to the nearest 0.1%.

Show your working.

Answer .....% [2]

For Examiner's Use

(ii) Suggest, in terms of energy flow, why there are no tertiary consumers in the woodland.

.....

.....

.....

.....[2]

(iii) Leaf litter is composed of dead leaves and twigs. The total energy in the leaf litter was 15 899 kJ m^{-2} but only 153 kJ m^{-2} per week is transferred to decomposers. When animal wastes rich in nitrogen were mixed with the leaf litter the energy flow to decomposers increased significantly.

Suggest why the addition of animal wastes rich in nitrogen increased the energy flow to decomposers.

.....

.....

.....

.....

.....

.....[3]

[Total: 9]

© UCLES 2009

BLANK PAGE

BLANK PAGE

BLANK PAGE

Copyright Acknowledgements:

Question 3 Fig. 3.1 © M122/283; Breast cancer cells, SEM; 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.

University of 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.