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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	
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4	
5	
6	
Total	

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

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Answer **all** the questions.

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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.

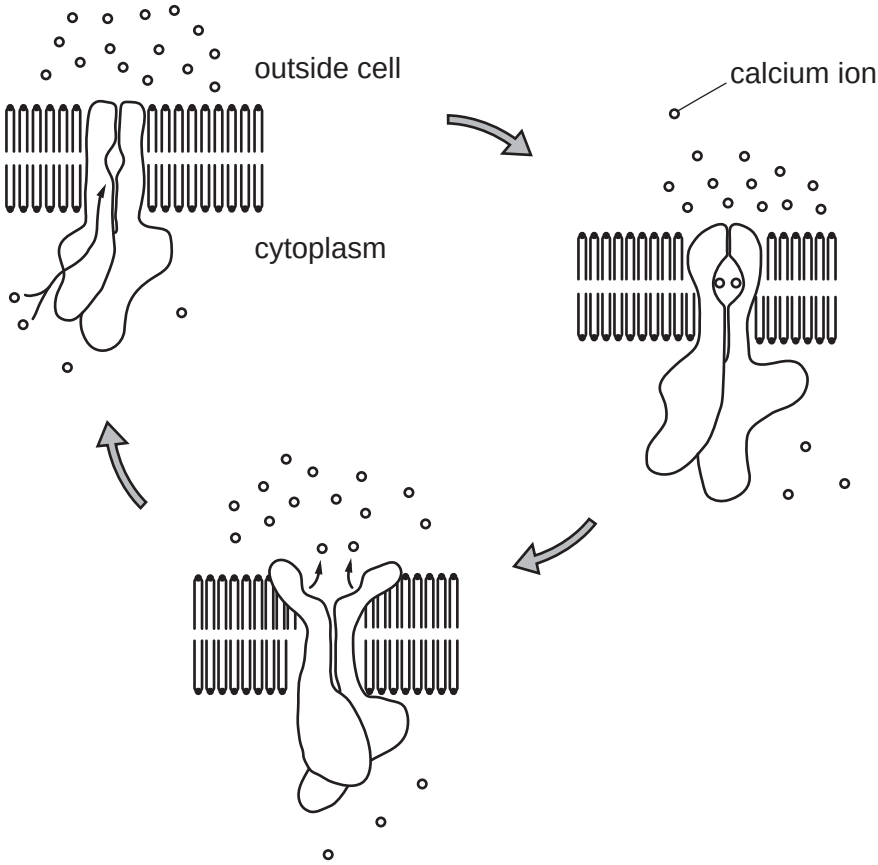


Fig. 1.1

With reference to Fig. 1.1,

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

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

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name .....

description .....

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

Describe the role of the cell surface membrane during phagocytosis.

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(c) Phagocytic cells contain many lysosomes.

Describe the function of lysosomes in destroying ingested bacterial cells.

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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.

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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.

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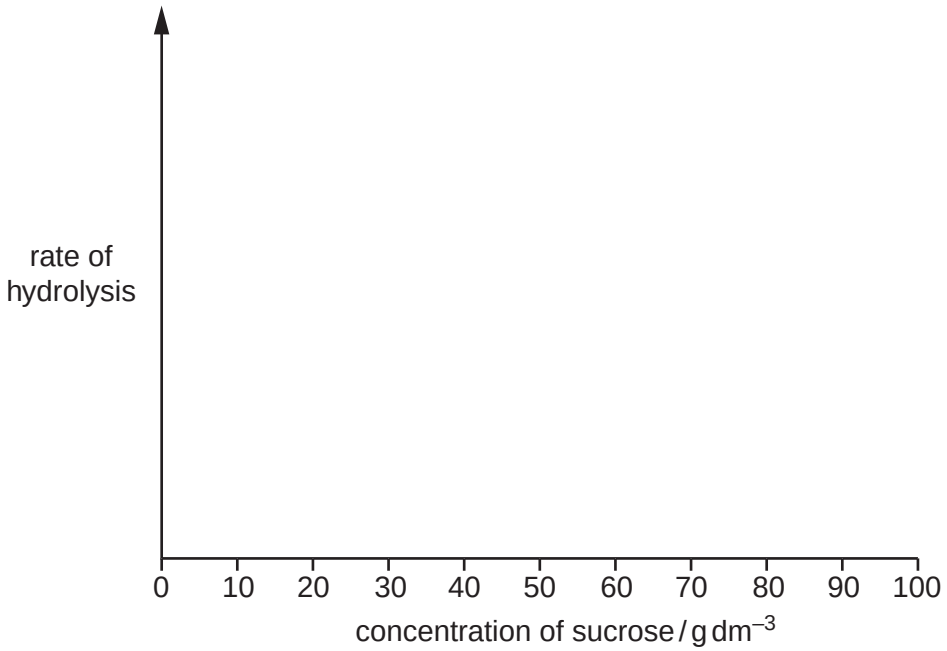
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(b) Use the axes below to sketch a graph to show the effect of substrate concentration on the **rate of hydrolysis** of sucrose by sucrase.

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(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.

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[Total: 9]

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

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

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

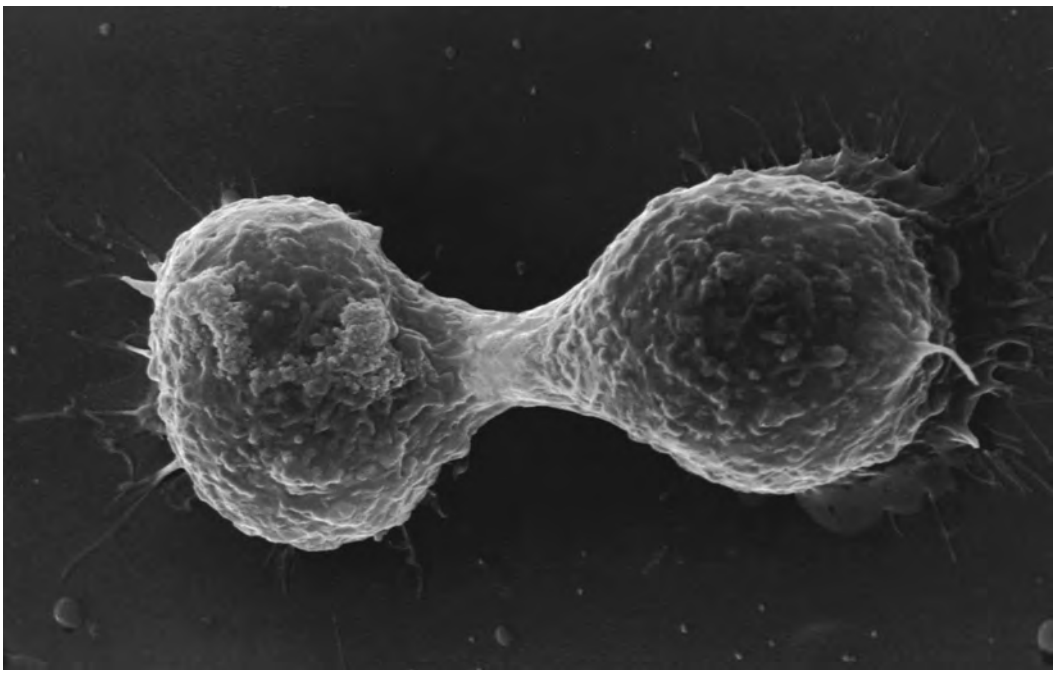


Fig. 3.1

With reference to Fig. 3.1,

(i) state the stage of cell division;

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

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

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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.

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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.

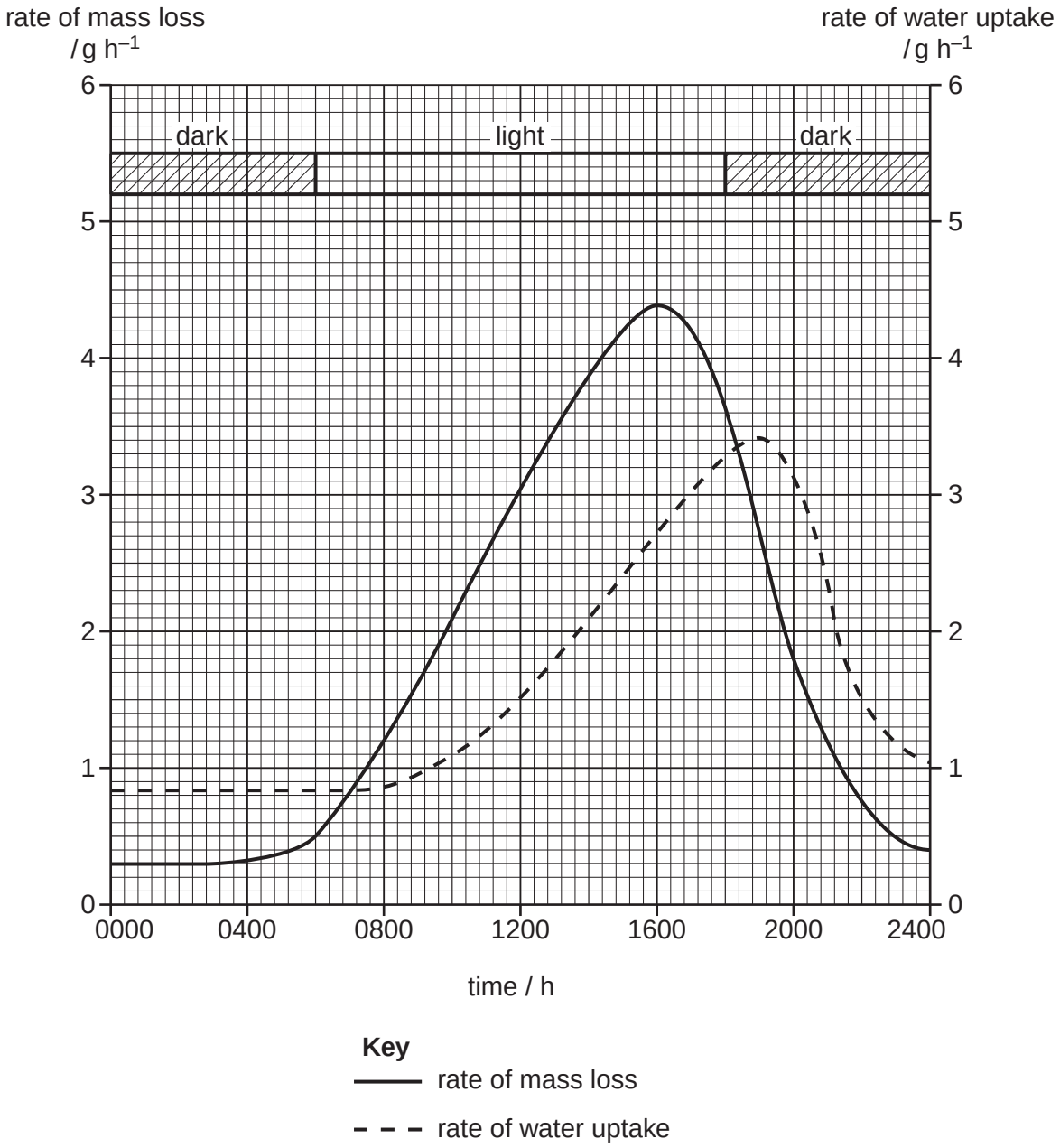


Fig. 4.1

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

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

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

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[Total: 10]

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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.

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

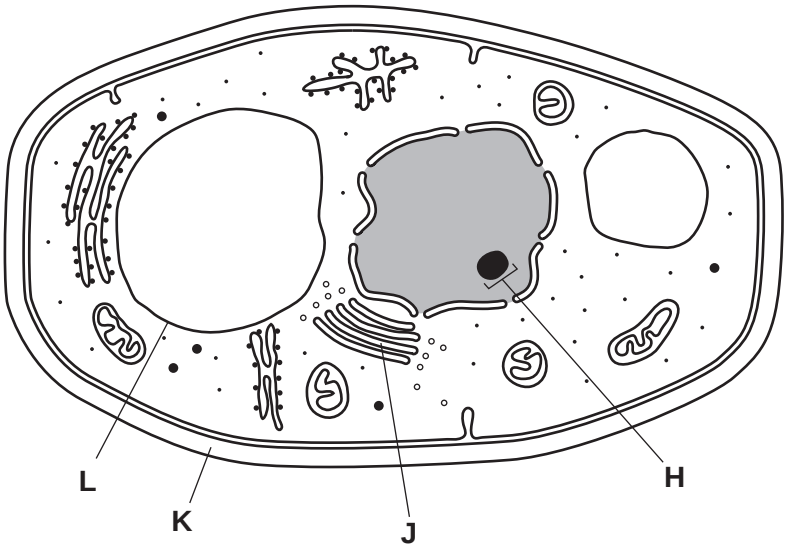


Fig. 5.1

(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.

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(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.

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

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[Total: 10]

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

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

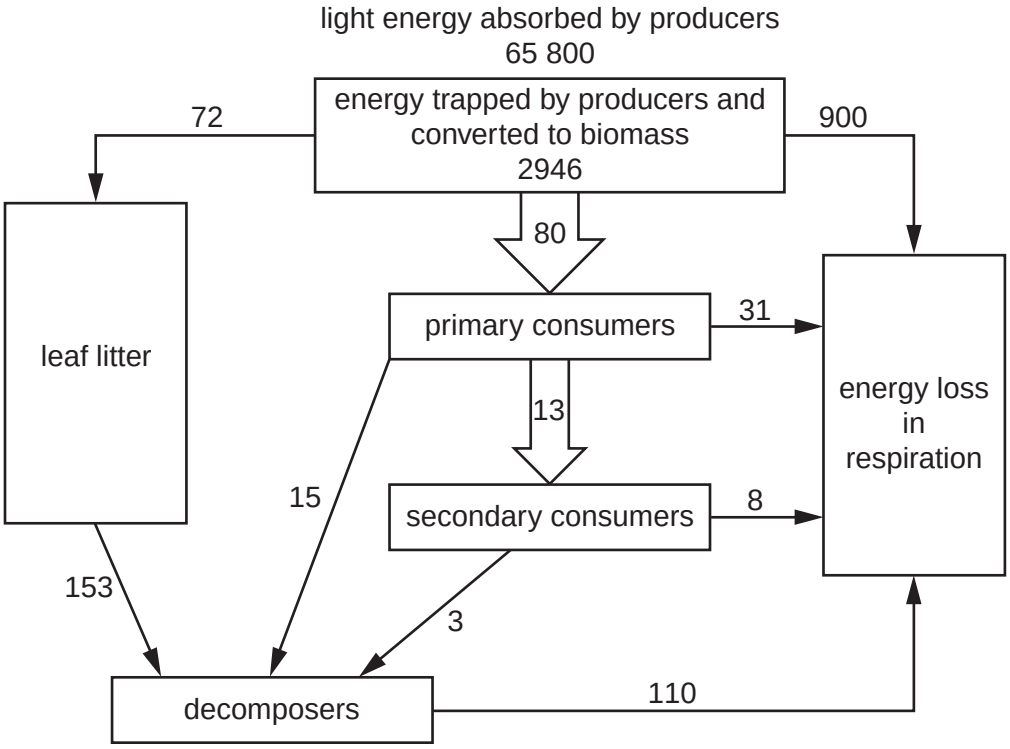


Fig. 6.1

(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]

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

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(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.

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

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