UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/31**

Paper 3 Extended **May/June 2011**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

SUITABLE FOR HEARING IMPAIRED CANDIDATES.

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 a pencil for any diagrams or graphs.
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 **18** printed pages and **2** blank pages.

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For Examiner's Use

1 Fig. 1.1 shows a section of a villus at two different magnifications.

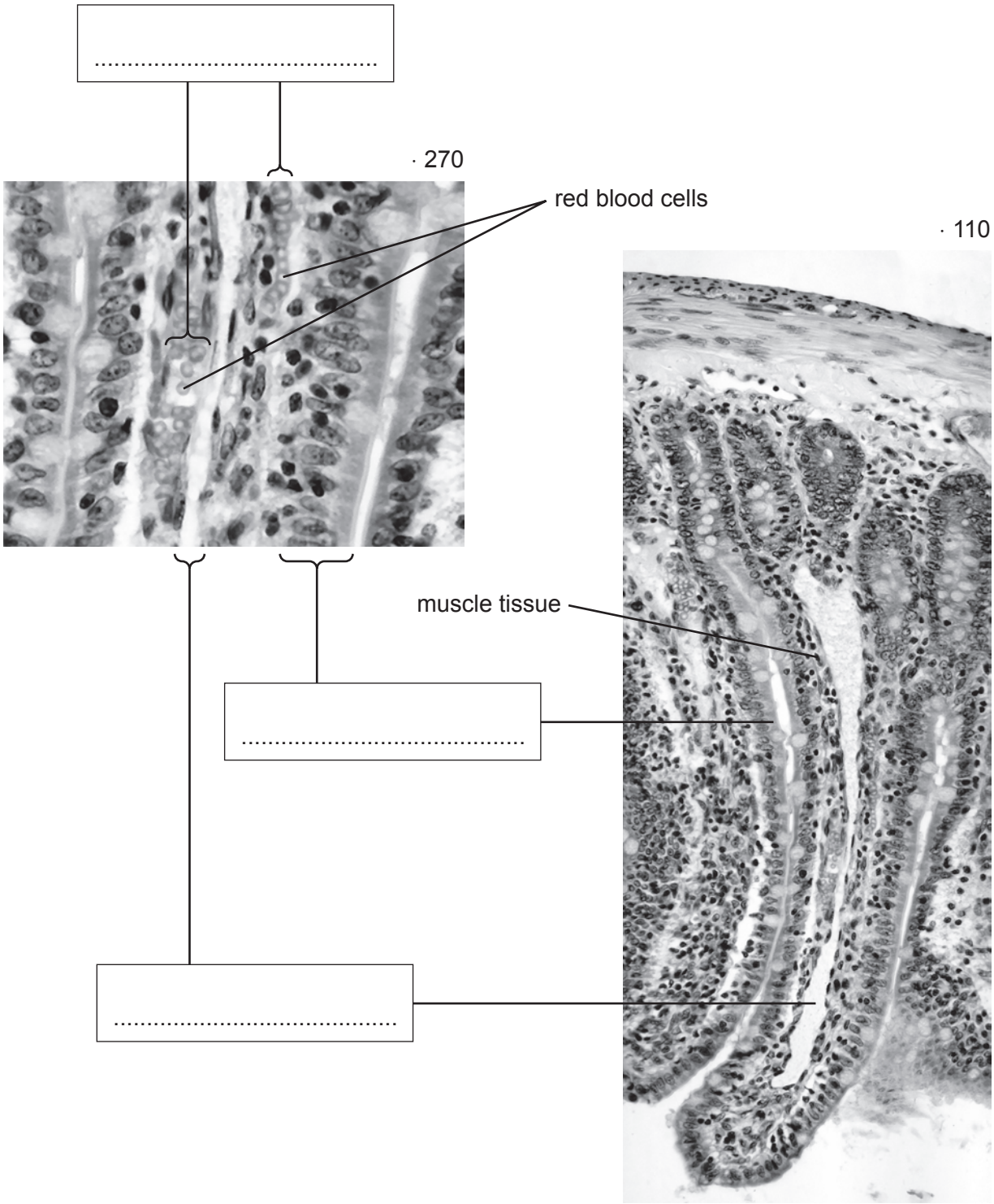

Fig. 1.1

(a) Label the structures shown in Fig. 1.1.

Write the labels in the boxes in Fig. 1.1. [3]

For Examiner's Use

(b) Suggest the role of the muscle tissue shown in the villus in Fig. 1.1.

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..... [2]

Fig. 1.2 shows an experiment to investigate the uptake of glucose by cells of the villi.

- Two leak-proof bags were set up.
- One bag was made from artificial partially permeable membrane (Visking tubing).
- The other bag was made from a piece of small intestine containing living cells, with its inner surface inside the bag.
- The bags were filled with equal volumes of a dilute glucose solution.
- The bags were suspended in the same glucose solution for two hours.
- After two hours, the volumes of the bags were measured and the contents were tested for the concentration of glucose.

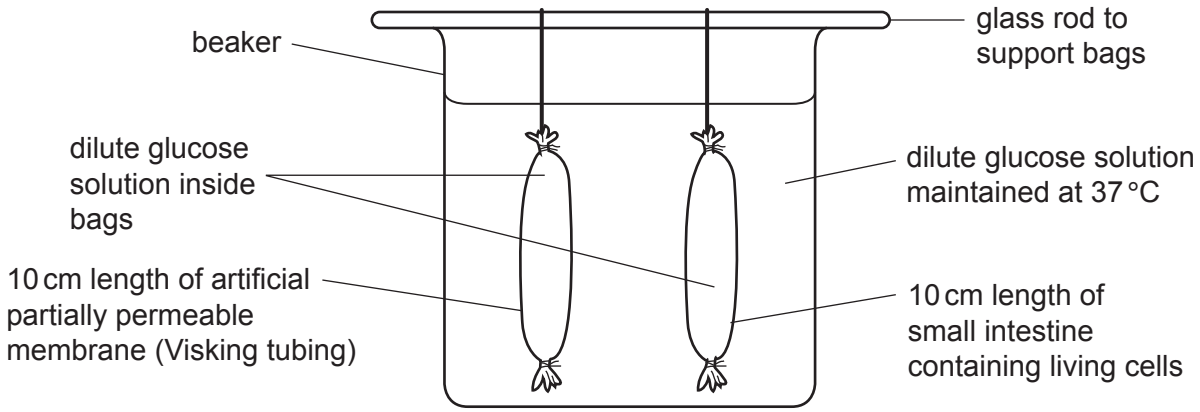

Fig. 1.2

Inside the bag made from small intestine the volume and concentration of the glucose solution decreased. There were no changes to the volume and concentration in the Visking tubing bag.

(c) State **and** explain the process responsible for the **decrease** in the glucose concentration in the bag made from small intestine.

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For Examiner's Use

(d) After two hours there was less water in the bag made from small intestine.

The volume of water in the bag made from small intestine decreased, but the volume in the bag made from Visking tubing did **not** change. Explain why.

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..... [3]

(e) An investigation studied the flow of water into and out of the human alimentary canal. Table 1.1 shows the results.

Table 1.1

water **into** the alimentary canal		water **out of** the alimentary canal	
source of water	volume of water / dm^3 per day	method of water loss	volume of water / dm^3 per day
water from diet	2.5	stomach to the blood	0.00
saliva	1.5	small intestine to the blood	9.00
gastric juice	2.4	large intestine to the blood	0.85
bile	0.8	in the faeces	0.15
pancreatic juice	0.8		
intestinal secretions	2.0		

(i) Name the part of the alimentary canal that secretes most water in a digestive juice.

..... [1]

(ii) Name the part of the alimentary canal that absorbs most water.

..... [1]

For Examiner's Use

(iii) Explain why water is added to food by the secretions shown in Table 1.1.

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(iv) Explain why it is important that water is absorbed in the alimentary canal.

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[Total: 17]

For Examiner's Use

2 Fig. 2.1 shows part of the nitrogen cycle.

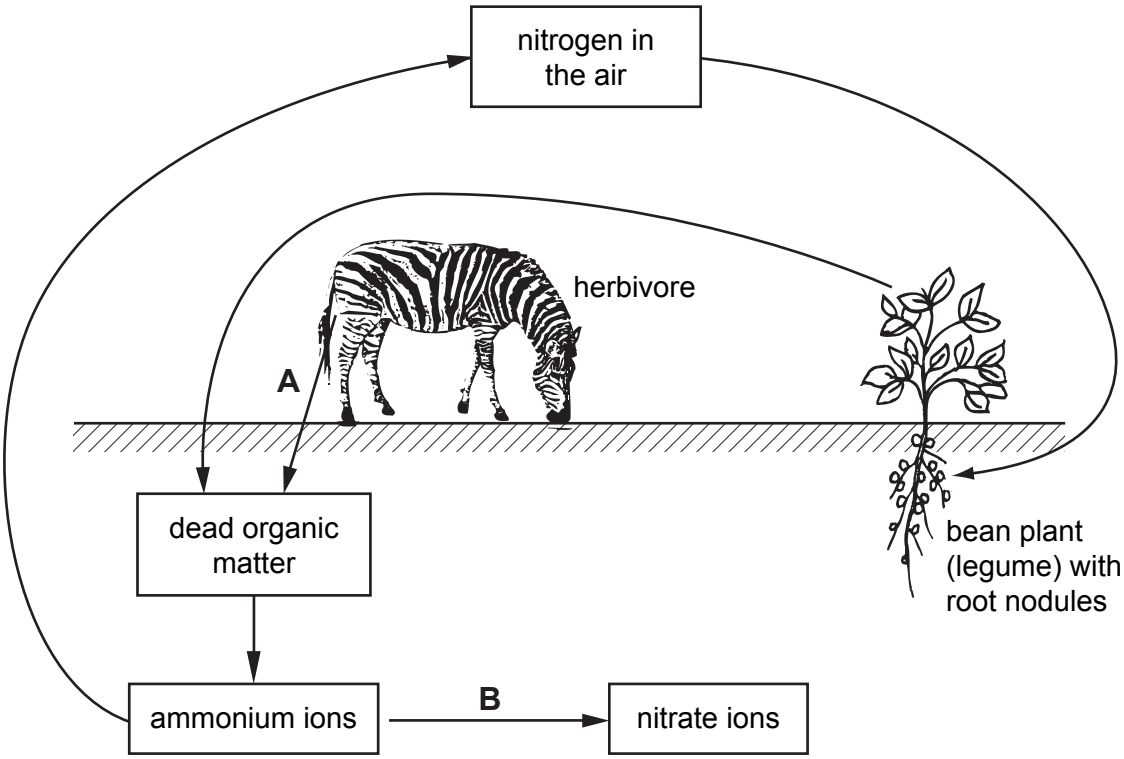

Fig. 2.1

(a) Name the processes **A** and **B** shown in Fig. 2.1.

A .....

B ..... [2]

(b) Fig. 2.1 shows that legumes have root nodules.

Explain why these root nodules are important in the nitrogen cycle.

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..... [4]

For Examiner's Use

(c) Proteins and DNA are important nitrogen-containing compounds in cells.

Describe the roles of proteins and DNA in cells.

proteins .....

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DNA .....

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(d) Many inorganic fertilisers contain compounds of nitrogen. If crop plants do not absorb the fertilisers they can be lost from the soil and pollute freshwater ecosystems, such as lakes and rivers.

Describe how fertilisers may affect freshwater ecosystems.

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[Total: 15]

For Examiner's Use

3 Fig. 3.1 shows a fetus in the uterus immediately before birth.

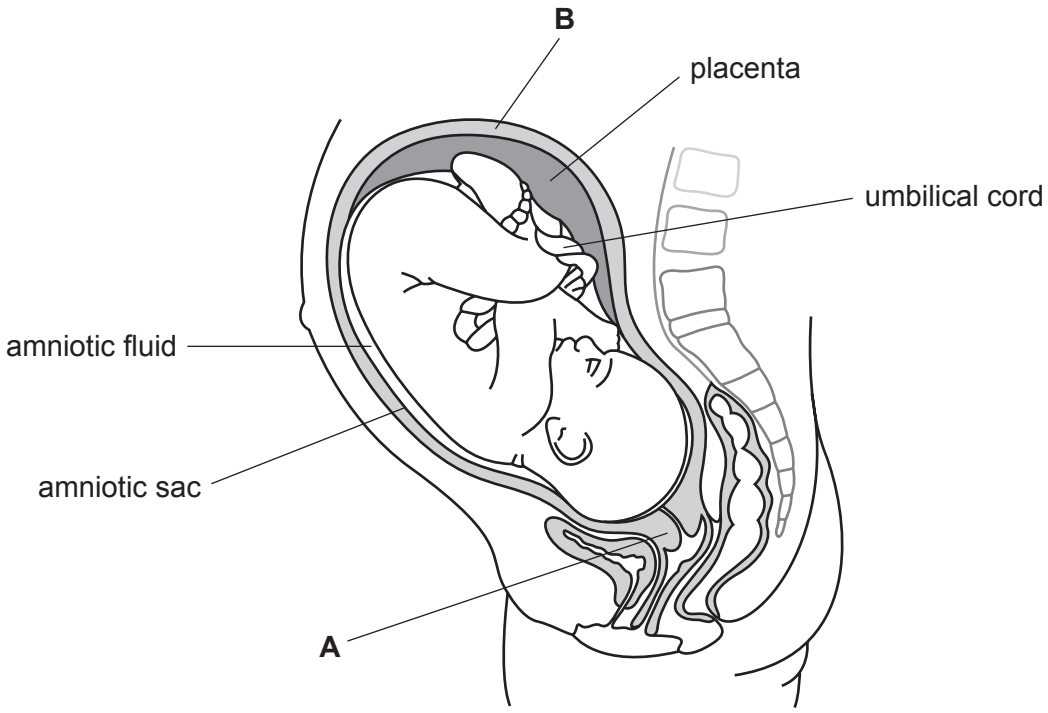

Fig. 3.1

(a) Describe the functions of the amniotic sac and amniotic fluid.

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For Examiner's Use

(b) List three functions of the placenta.

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2. .....

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3. .....

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(c) State what happens to structures **A** and **B** during birth.

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(d) Discuss the advantages **and** possible disadvantages of breast-feeding.

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[Total: 13]

For Examiner's Use

4 A healthy kidney controls the excretion of urea and other waste products of metabolism from the blood.

After kidney failure there are two possible treatments: dialysis or a kidney transplant.

Fig. 4.1 shows how blood and dialysis fluid move through a dialysis machine.

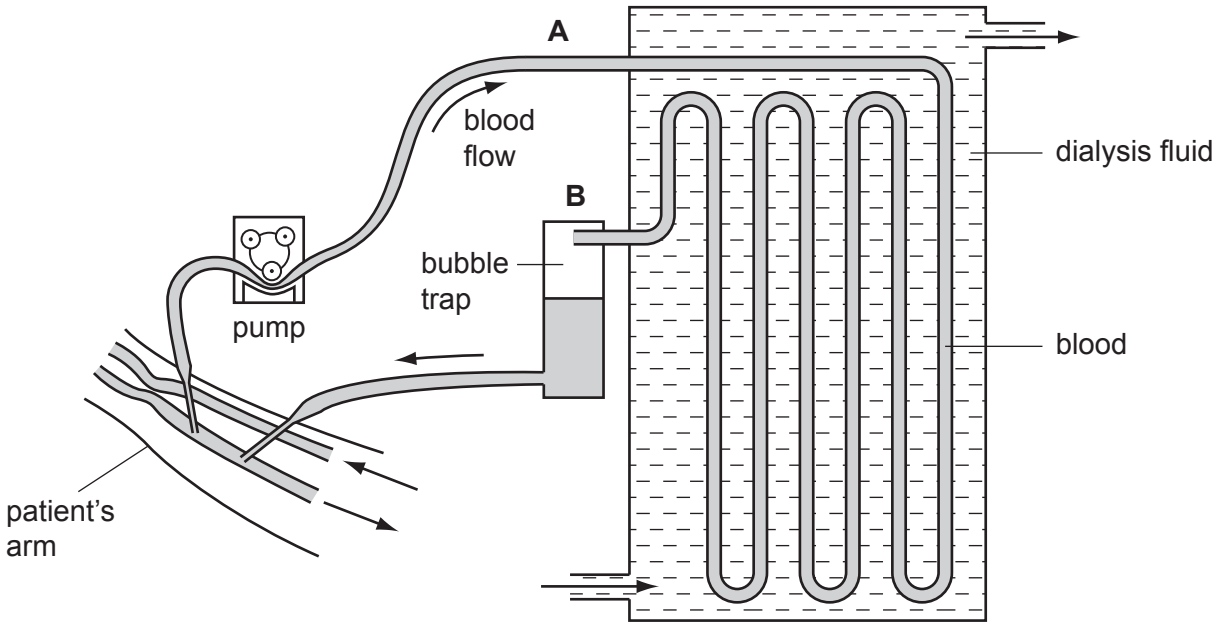

Fig. 4.1

(a) Describe the changes that occur to the blood as it flows through the dialysis machine from **A** to **B**.

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(b) Discuss the advantages of kidney transplants compared with dialysis.

For Examiner's Use

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For Examiner's Use

(c) Two brothers have to make a difficult decision.

One brother, with blood group AB, has kidney failure and is on dialysis.

The healthy brother has agreed to donate one of his kidneys to his brother. He has to have a blood test.

Their father has blood group A and their mother has blood group B.

The brothers have a sister who has blood group O.

(i) Explain how this girl has blood group O when her parents have different blood groups. You **must** use the space below for a genetic diagram to help your answer.

Use the symbols I^A, I^B and I^O to represent the alleles involved in the inheritance of blood groups.

parental phenotypes	blood group A		·	blood group B	
parental genotypes	.....		·	.....	
gametes	.....	.....	+	.....	.....

girl's genotype .....

girl's phenotype .....

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..... [4]

(ii) The healthy brother can only donate the kidney to his brother if they both have the same blood group.

What is the probability that the healthy brother also has blood group AB?

..... [1]

[Total: 10]

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Question 5 begins on page 14

For Examiner's Use

5 **(a)** Write a balanced equation for photosynthesis using symbols.

..... [3]

Plants that live in water are called hydrophytes.

Fig. 5.1 shows a cross-section of a leaf of the hydrophyte, *Nuphar lutea*. The leaves of *N. lutea* float on the surface of water.

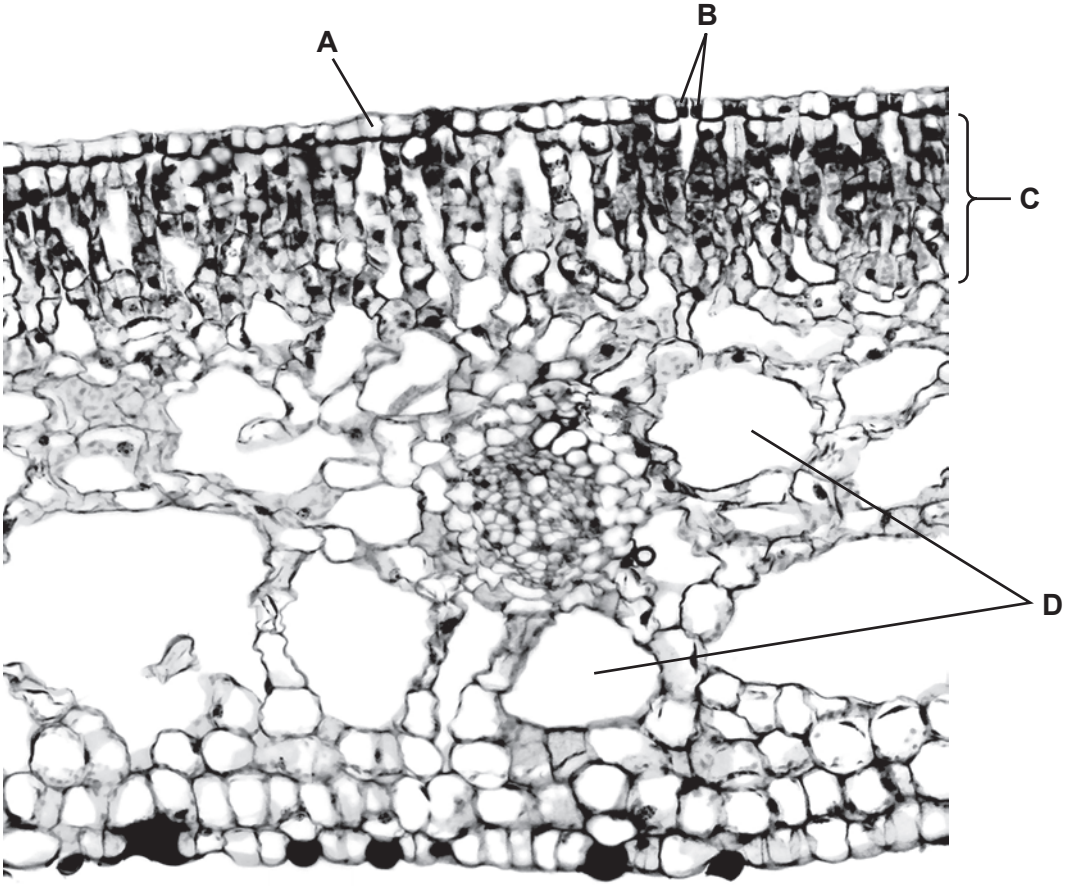

Fig. 5.1

For Examiner's Use

(b) Complete Table 5.1 by describing the function of each feature.
The function for feature **A** has already been completed.

Table 5.1

feature	function
A	transparent to allow light to penetrate into the leaf
B	……
C	……
D	……

[3]

(c) State **and** explain **one** way in which the leaves of *N. lutea* are adapted to their environment.

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…… [2]

For Examiner's Use

(d) A student investigated how magnesium affects the growth of duckweed, *Spirodela polyrhiza*.

He prepared dishes each containing 30 plants of *S. polyrhiza*. Each dish contained a growth medium with different concentrations of a magnesium salt.

Fig. 5.2 shows one of the dishes.

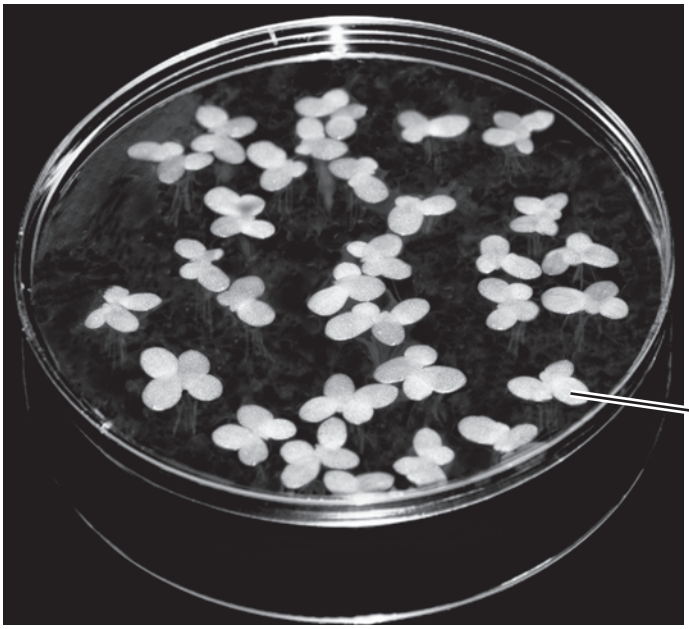

Fig. 5.2

After 33 days, the student counted the number of plants in each dish and recorded their appearance. The results are shown in Table 5.2.

Table 5.2

concentration of magnesium salt / mg per dm^3	number of plants after 33 days	appearance of leaves after 33 days
0.05	27	yellow with some green patches
0.10	64	green with yellow spots
0.15	92	green with yellow spots
0.20	105	green
0.25	109	green

For Examiner's Use

(i) Describe the effects of **decreasing** the concentration of magnesium salt on the growth of *S. polyrhiza*.

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..... [3]

(ii) Explain how magnesium deficiency affects the growth and appearance of this plant.

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..... [3]

[Total: 14]

For Examiner's Use

6 Fig. 6.1 shows three different insects.

Vespula flavopilosa
insect 1

Vespula rufa
insect 2

Callicera rufa
insect 3

Fig. 6.1

(a) Insects 1 and 2 are more closely related to each other than to insect 3.

(i) Explain how the binomial names indicate that insects 1 and 2 are more closely related.

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..... [2]

(ii) Explain how the appearance of the three insects suggests that insects 1 and 2 are more closely related.

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..... [2]

Vespula flavopilosa gives a painful sting. The insect shown in Fig. 6.2 is very similar in appearance to *Vespula flavopilosa* but does not give a sting.

For Examiner's Use

Chrysotoxum cautum

Fig. 6.2

(b) *Chrysotoxum cautum* is very similar in appearance to *Vespula flavopilosa*. Explain how this is an advantage.

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..... [2]

(c) It is thought that *Chrysotoxum cautum* evolved from an insect that did not have any stripes.

Suggest how these insects became striped.

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..... [5]

[Total: 11]

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