UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5981330009

BIOLOGY **0610/33**

Paper 3 Extended **October/November 2011**

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

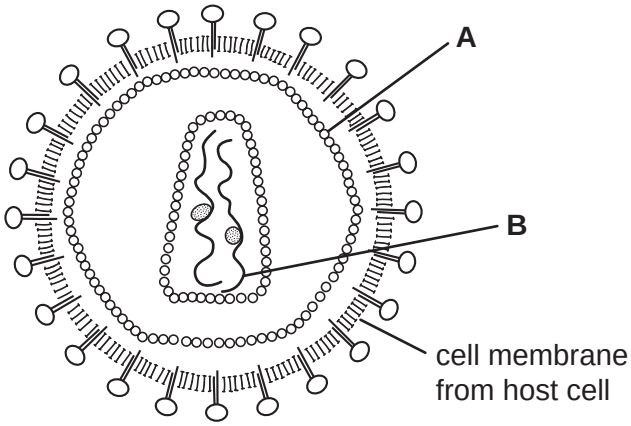
Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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

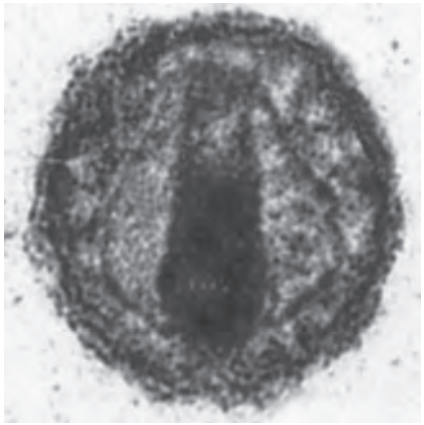
This document consists of **19** printed pages and **1** blank page.

1 Fig. 1.1 shows a diagram and a photograph of the human immunodeficiency virus (HIV) after release from a human cell.

For Examiner's Use



diagram



photograph

Fig. 1.1

(a) Identify **A** and **B**.

A .....

B ..... [2]

(b) HIV infects lymphocytes and may lead to their destruction.

Explain why the destruction of lymphocytes puts people infected with HIV at increased risk of developing many infectious diseases.

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(c) List three methods of transmission of HIV.

1 .....

2 .....

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(d) Describe ways in which the spread of HIV can be reduced.

For Examiner's Use

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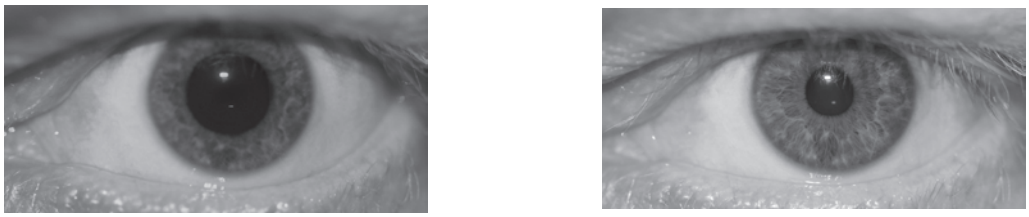
..... [3]

[Total: 11]

2 Fig. 2.1 shows the changes that occur to the iris when a light is switched on.

For Examiner's Use



before light is switched on

after light is switched on

Fig. 2.1

(a) (i) Describe **and** explain the change to the eye as the light is switched on.

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(ii) Explain why the change you described is necessary.

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(iii) Distinguish between the functions of rods and cones in the eye.

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Fig. 2.2 shows the neurones involved in stimulating the muscles in the iris when the changes shown in Fig. 2.1 take place.

For Examiner's Use

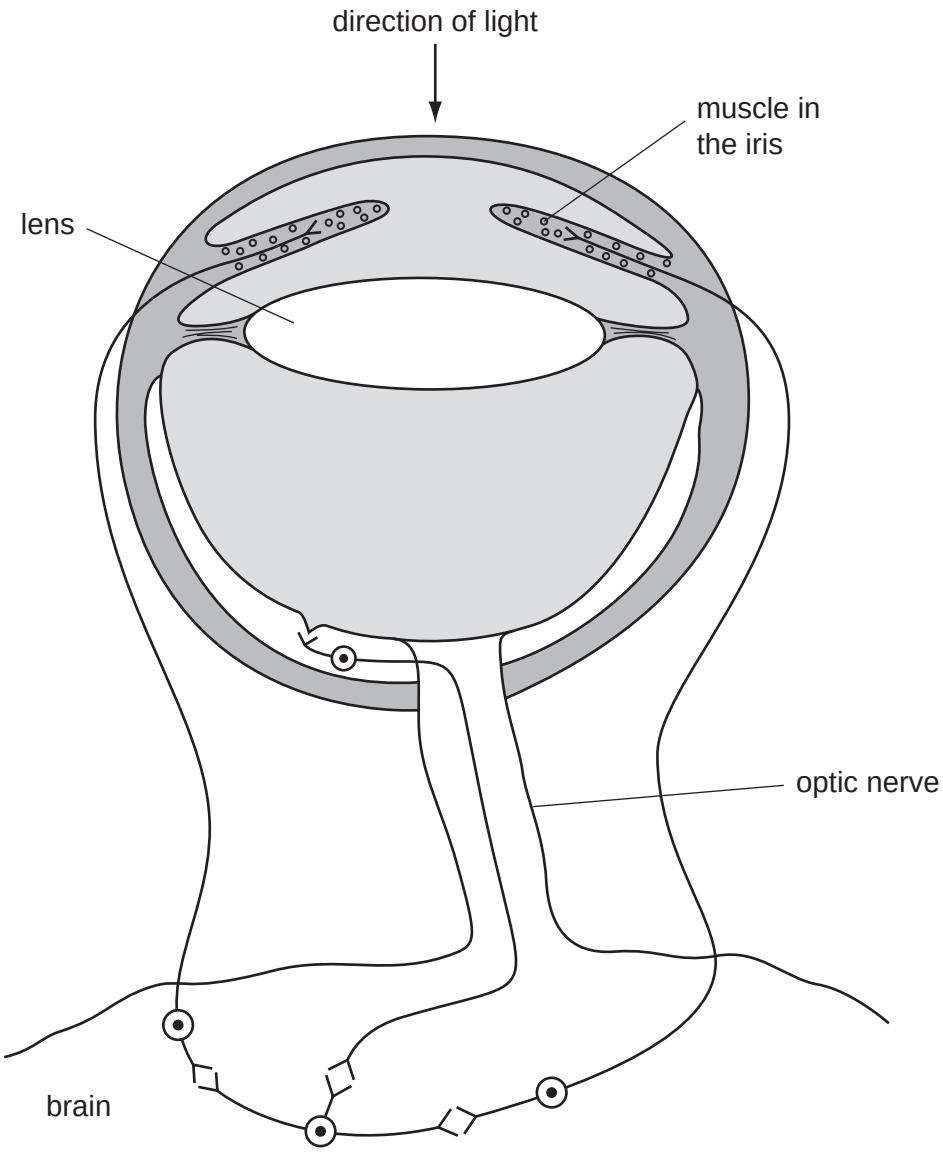

Fig. 2.2

(b) On Fig. 2.2 draw an arrow on each of the **four neurones** to show the direction taken by the impulses when the light is switched on. [1]

For Examiner's Use

(c) Muscles in the iris are described as antagonistic.

Explain the term *antagonistic* using the muscles in the iris as an example.

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(d) Neurones that terminate in the adrenal gland stimulate the release of adrenaline into the blood.

(i) Describe situations when adrenaline would be released from the gland into the blood.

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(ii) State **one** advantage of releasing adrenaline to coordinate the body rather than using nerve impulses.

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..... [1]

[Total: 14]

3 A small quantity of a fungus was put into a fermenter with all the nutrients required for growth and kept at an appropriate temperature.

The fungus was provided with nutrients at a suitable pH at the start.

Fig. 3.1 shows the growth of the fungus over 160 hours.

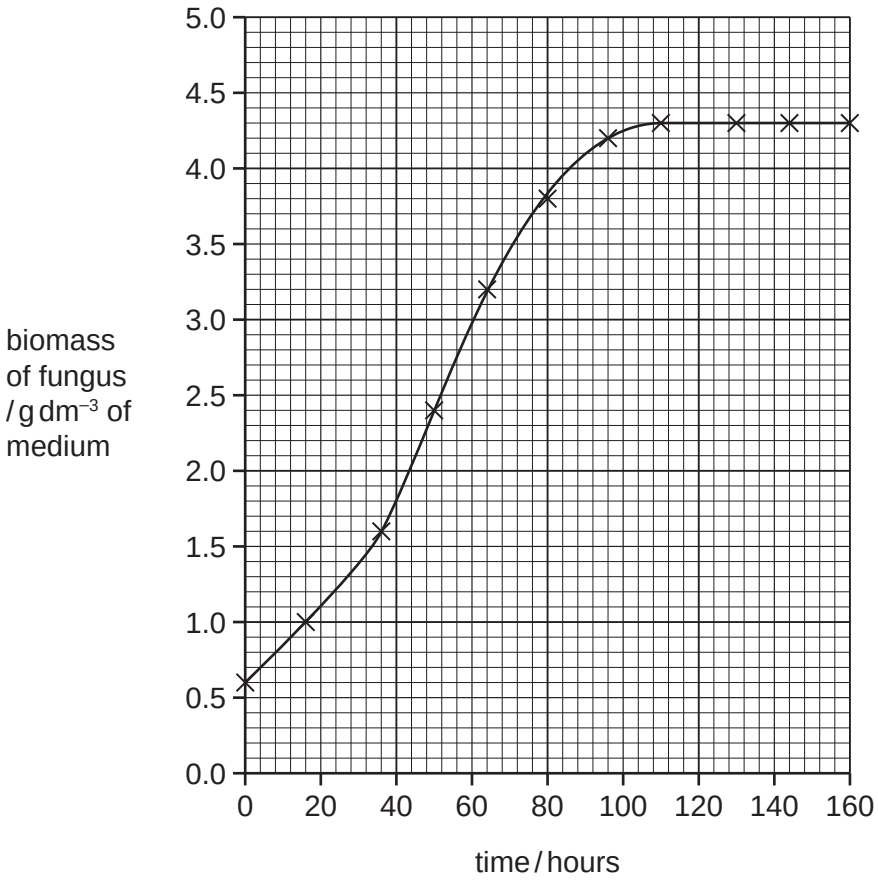

Fig. 3.1

(a) Explain why the biomass of the fungus did **not** increase during the stationary phase after 110 hours.

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Mycoprotein is a food made from the fungus, *Fusarium venenatum*. The production process for mycoprotein is shown in Fig. 3.2.

For Examiner's Use

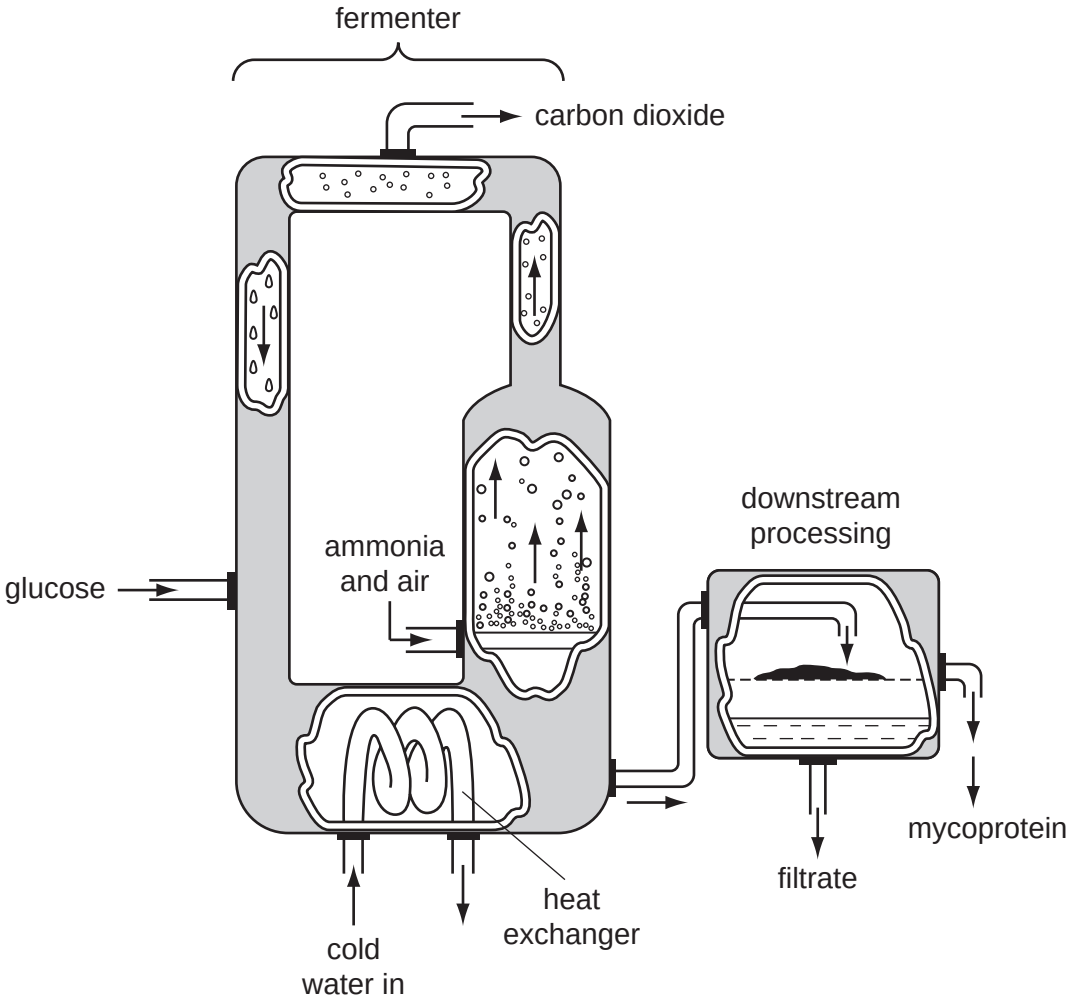

Fig. 3.2

(b) Explain why ammonia and air are pumped into the fermenter.

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(c) The growth depends on the activity of enzymes in the fungus.

Explain why the temperature in the fermenter is kept constant.

For Examiner's Use

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(d) Efficient production of mycoprotein depends on keeping the fungus in the exponential phase of growth.

Explain how the production process, **shown in Fig. 3.2**, keeps the fungus in the exponential phase.

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(e) The fungus extracted from the fermenter contains nutrients and is converted into foods, such as burgers and sausages, that are suitable for vegetarians.

For Examiner's Use

During processing, food additives are mixed with the fungus.

State **two** reasons for mixing food additives with the fungus that is made into foods.

1 .....

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2 .....

..... [2]

[Total: 14]

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For Examiner's Use

4 **(a)** Explain how water is absorbed by plant roots.

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(b) Young plants were grown in pots of sand for four weeks.

Some plants were watered with distilled water at pH 7.0 (no salts).

Most pots were watered with solutions containing different concentrations of salt (sodium chloride) at pH 7.0.

The plants were kept at 20 °C.

The growth of the plants was measured after four weeks.

The growth of the plants is shown in Fig. 4.1 as percentages of the growth of the plants watered with distilled water.

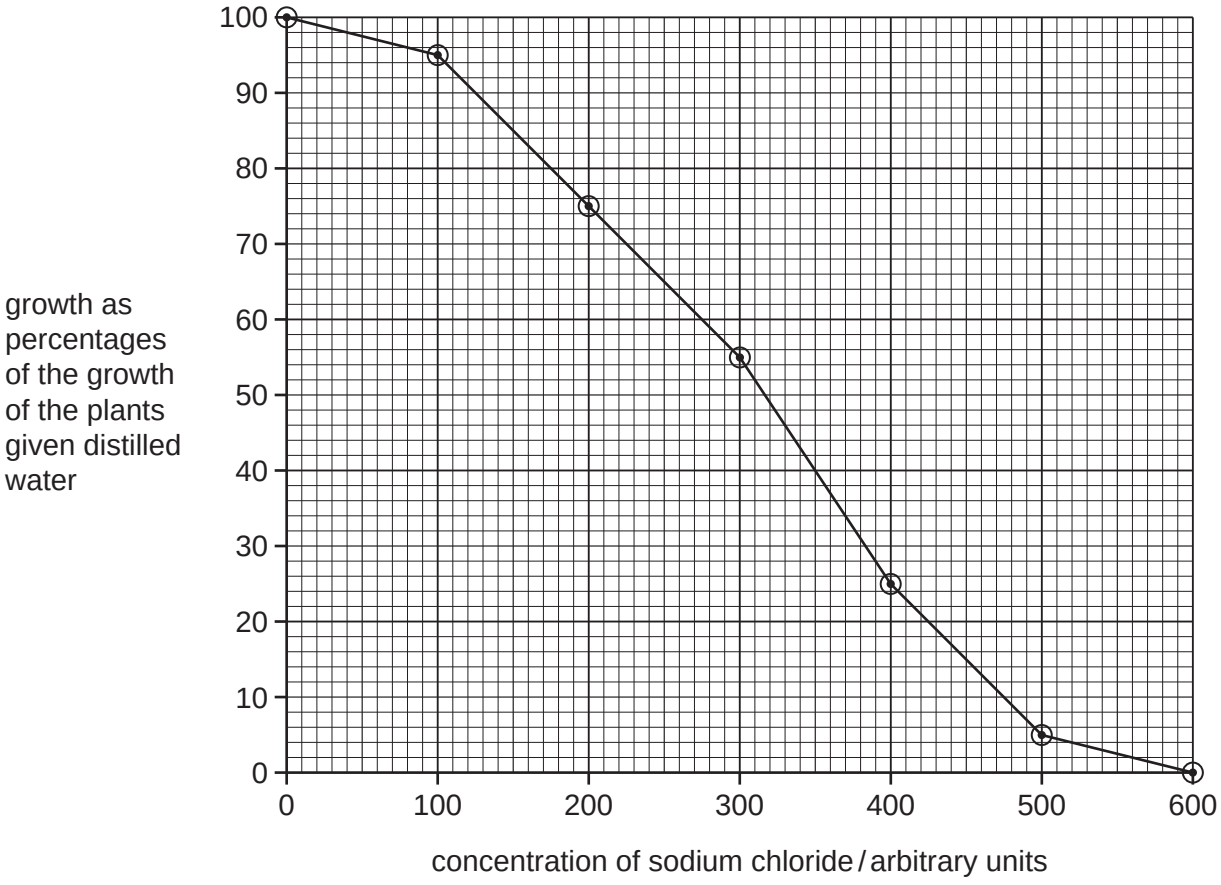

Fig. 4.1

(i) Describe the results shown in Fig. 4.1.

You will gain credit for using the figures in the graph to support your answer.

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For Examiner's Use

(ii) Explain the difference in growth between the plants watered with low concentrations and those watered with high concentrations of salt solution.

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The pH of soils influences the availability of ions to plants.

Fig. 4.2 shows the availability of ions in soils of different pH.

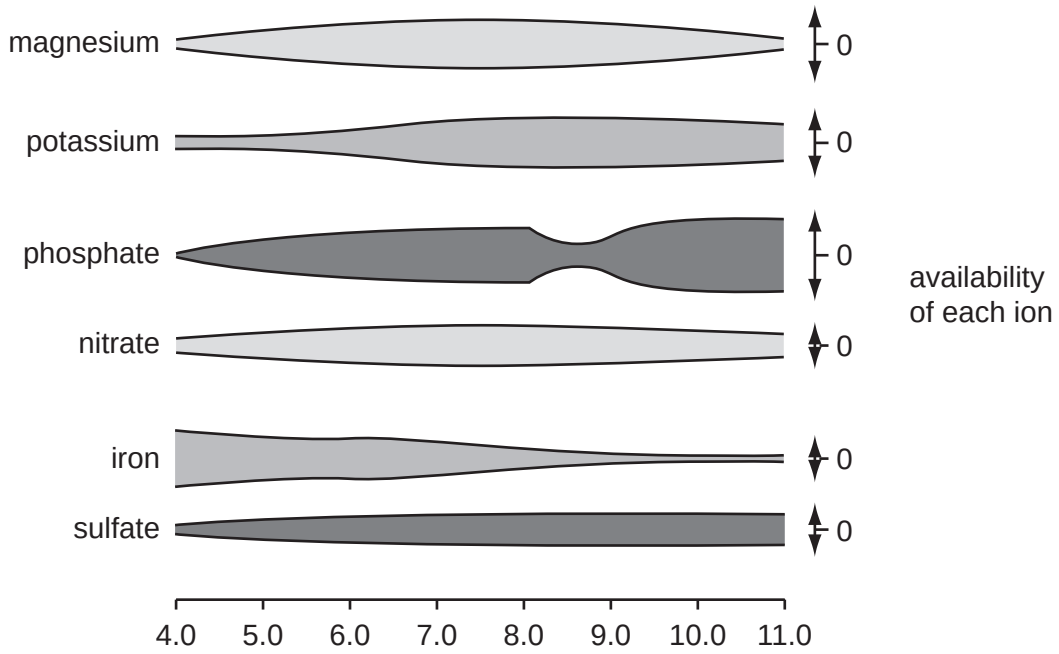

Fig. 4.2

(c) Name the ion that is **least** available in soils of pH 4.0 and in soils of pH 11.0.

pH 4.0 .....

pH 11.0 ..... [2]

(d) Plants grown in soils of pH 10 may show symptoms of deficiency. They are stunted and their leaves are yellow.

For Examiner's Use

Explain how deficiencies of magnesium ions and nitrate ions lead to the symptoms described.

magnesium ions .....

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nitrate ions .....

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[Total: 16]

For Examiner's Use

5 Two species of beetle, *Tribolium castaneum* and *T. confusum*, can infest and eat stored flour.

In an investigation these two species were kept together in containers of flour under different environmental conditions.

Many identical containers were set up, each with the same mass of flour.

Equal numbers of male and female flour beetles of the two species were put into each container at the start.

The numbers of beetles were counted regularly.

The containers were left until only one species survived.

Table 5.1 shows the percentage of containers in which *T. castaneum* or *T. confusum* were the only survivors.

Table 5.1

environmental conditions	percentage of containers in which only *T. castaneum* survived / %	percentage of containers in which only *T. confusum* survived / %
A hot and wet	100	0
B hot and dry	10	90
C warm and wet	86	14
D warm and dry	13	87
E cold and wet	29	71
F cold and dry	0	100

(a) Compare the survival of the two species of flour beetle in different temperatures and humidities.

Use data from Table 5.1 to illustrate your answer.

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(b) Suggest why only one species survived in each container.

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There is a gene in *T. confusum* which controls body colour.

A represents the dominant allele for red-brown body colour.

a represents the recessive allele for black body colour.

(c) Complete the genetic diagram below to show the colour of beetles produced when heterozygous beetles are crossed with beetles that are homozygous recessive for this gene.

parental phenotypes ..... × .....

parental genotypes ..... × .....

gametes  +

offspring genotypes .....

offspring phenotypes .....

ratio of phenotypes .....

[4]

The eyes of *Tribolium* species are usually black. A very small number of flour beetles have white eyes.

For Examiner's Use

(d) Explain how this happens and why they are so rare.

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(e) Insect pests, such as flour beetles, eat the flour and deposit nitrogenous waste in urine and faeces into the flour. This leads to the growth of bacteria and fungi in the flour.

Suggest **and** explain what happens to the nitrogenous waste and the faeces released by the flour beetles.

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[Total: 16]

6 Fig. 6.1 shows the Calayan rail, *Gallirallus calayanensis*, a flightless bird that inhabits Calayan Island in the Philippines. This species of bird was discovered in 2004.

For Examiner's Use

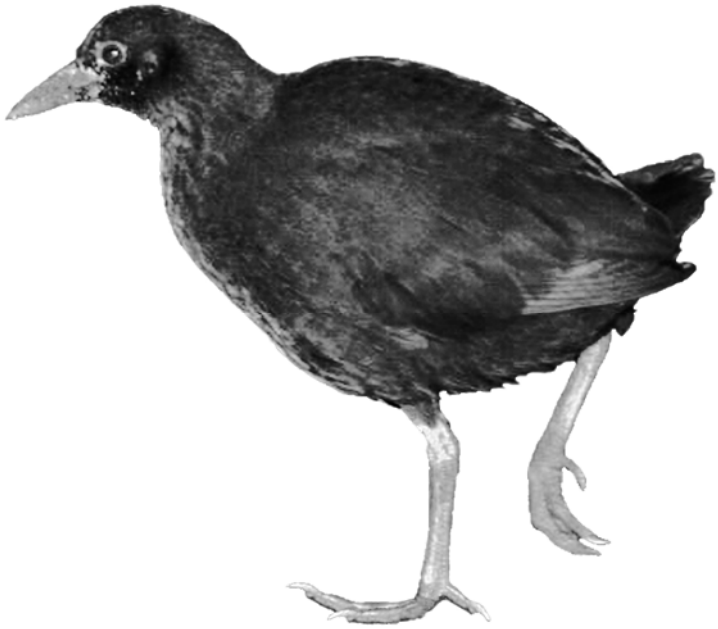

Fig. 6.1

(a) State the name of the genus of the Calayan rail.

.....[1]

Many bird species are threatened by deforestation.

(b) Suggest three reasons why deforestation occurs.

1 .....

2 .....

3 .....[3]

(c) Suggest the likely effects of deforestation on populations of bird species.

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(d) Some species of birds, such as the Calayan rail, are endangered.

Outline the reasons why it is important to conserve species.

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[Total: 9]

For Examiner's Use