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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

* 9 4 5 4 3 4 9 1 3 7 *

BIOLOGY **0610/32**

Paper 3 Extended **October/November 2013**

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.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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 **18** printed pages and **2** blank pages.

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1 Molluscs are important animals in many aquatic and terrestrial ecosystems.

Fig. 1.1 shows four species of mollusc that live in the sea.

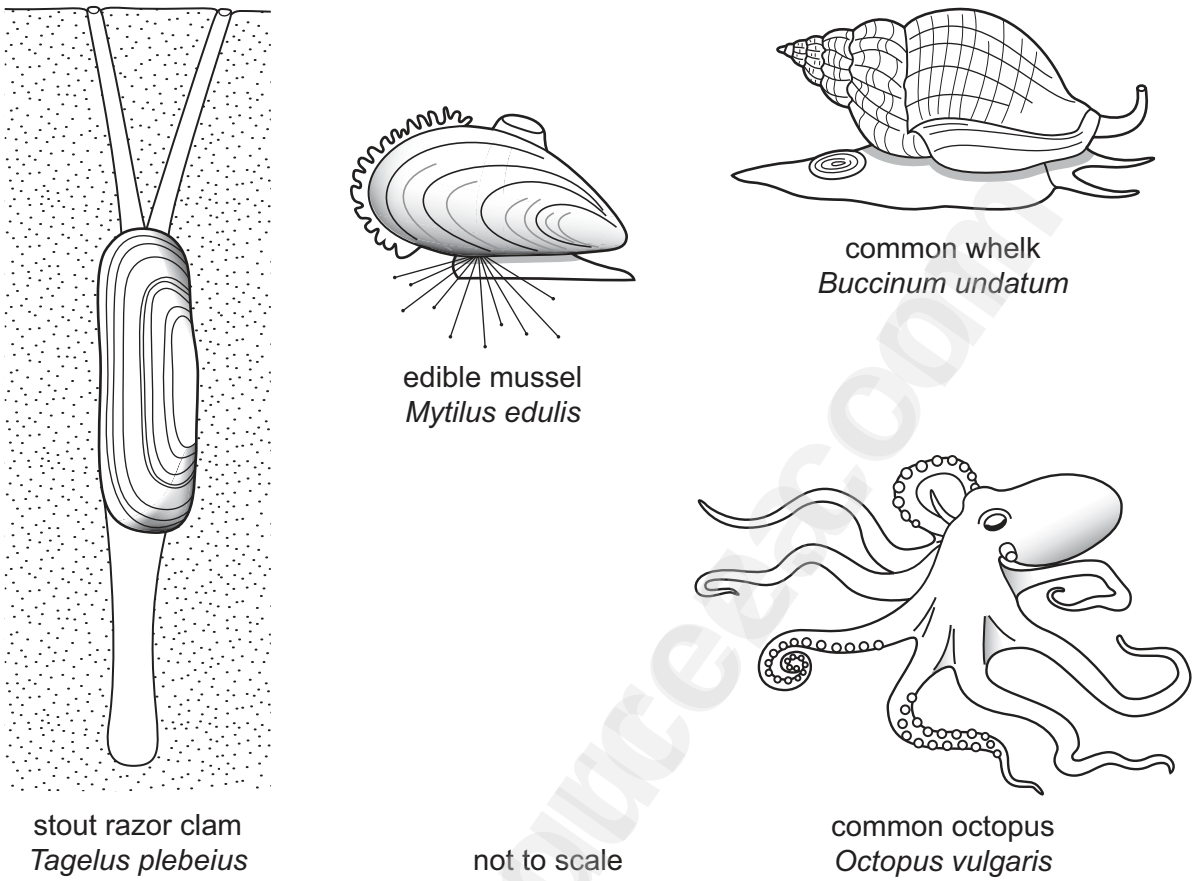

Fig. 1.1

(a) State **two** features shown by all mollusc species.

1 .....

2 ..... [2]

(b) State **two** features, **visible in Fig. 1.1**, in which the octopus differs from the other three molluscs.

1 .....

2 ..... [2]

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(c) The edible mussel, *Mytilus edulis*, is attached to rocks that are exposed to the air at low tide.

Use Fig. 1.1 to suggest how an edible mussel is adapted to attach to rocks and survive when exposed to the air.

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..... [2]

(d) The zebra mussel, *Dreissena polymorpha*, is a freshwater mussel that originates from rivers in southern Russia.

The mussel was introduced into the Great Lakes of North America and has increased in huge numbers with serious effects on the food webs of the lakes.

Explain why an introduced species, such as the zebra mussel, can have serious effects on the populations of the species that are already living in the area.

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..... [3]

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(e) The freshwater mussel, *Pletholophus swinhoei*, was used in a project to monitor water pollution by chemical waste in northern Vietnam.

This was done by regularly counting the number of mussels in the river.

Suggest the advantages of using freshwater mussels to monitor the pollution of water instead of carrying out chemical analysis of the water.

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..... [2]

(f) Non-biodegradable plastics are a serious problem in many aquatic ecosystems.

Explain the harm that non-biodegradable plastics may cause to organisms in aquatic ecosystems.

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..... [3]

[Total: 14]

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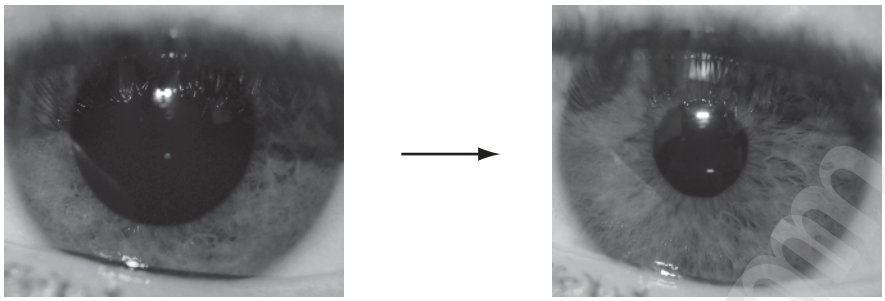
2 **(a)** Fig. 2.1 shows a reflex action that involves the eye.

A shows an eye in dim light. **B** shows the same eye when a bright blue light is shone into it.



A bright blue light **B**

Fig. 2.1

(i) Identify the:

- stimulus to which the eye responds;
- receptor cells that detect the stimulus;
- effector;
- response that the eye makes.

Write your answers in Table 2.1.

Table 2.1

stimulus	
receptor cells	
effector	
response	

[4]

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(ii) Describe how the nervous system coordinates the response shown in Fig. 2.1.

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..... [4]

(b) Adrenaline is secreted by the adrenal glands to prepare the body for dangerous situations.

Extreme sports, such as bungee jumping shown in Fig. 2.2, are an example of such a dangerous situation.

Fig. 2.2

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Explain how adrenaline prepares the body for an extreme sport, such as making a bungee jump.

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..... [5]

(c) The response shown in Fig. 2.1 is involuntary.

Bungee jumping is a voluntary action.

Describe **two** ways in which involuntary actions differ from voluntary actions.

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..... [2]

[Total: 15]

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3 **(a)** The production of yoghurt involves the fermentation of milk by two types of bacteria that use the protein and sugar (lactose) in milk.

Lactobacillus bulgaricus breaks down proteins into short chains of amino acids.

Streptococcus thermophilus uses the chains of amino acids to make formic acid.

L. bulgaricus then uses lactose and formic acid to make lactic acid.

The flow diagram in Fig. 3.1 shows the production process.

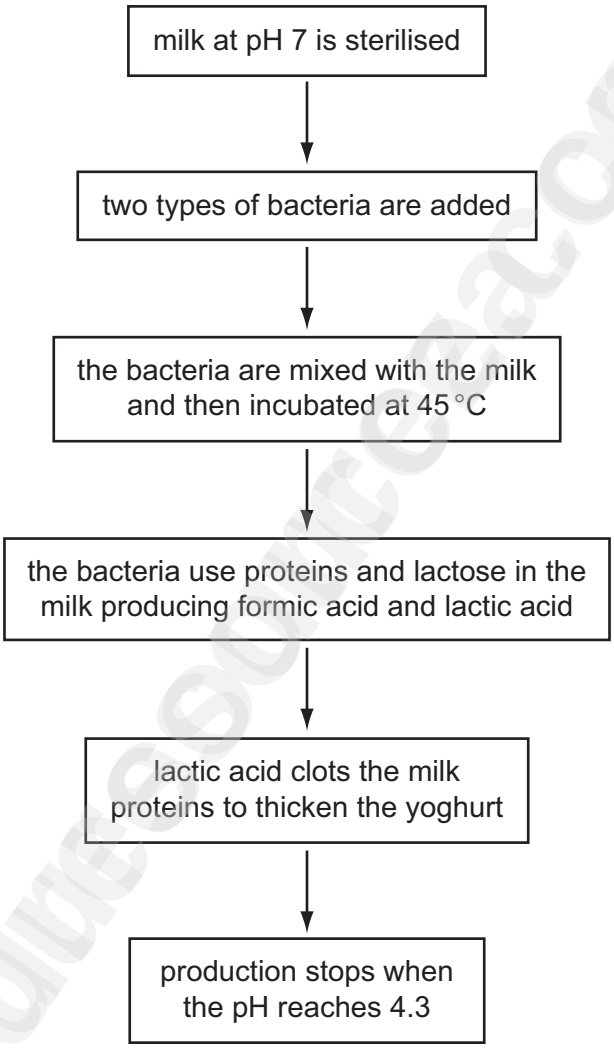

Fig. 3.1

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(i) Explain why the milk is sterilised at the start of the process.

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..... [2]

(ii) Explain why the bacteria are incubated at 45 °C.

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(iii) State **and** explain what happens to the populations of the bacteria during the yoghurt-making process.

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(iv) Explain why yoghurt cannot be made by using only one of the types of bacteria.

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..... [2]

(b) At the end of the fermentation, food additives may be added to the yoghurt.

State **three** types of food additive that may be used in producing yoghurt.

1 .....

2 .....

3 ..... [3]

[Total: 14]

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4 This question is about transport in plants.

(a) Two pea plants, **D** and **E**, were supplied with substances containing the radioactive isotopes, carbon-14 (^{14}C) or phosphorus-32 (^{32}P), as shown in Fig. 4.1.

A leaf of plant **D** was exposed to radioactive carbon dioxide.

Plant **E** was placed into a solution containing radioactive phosphate ions.

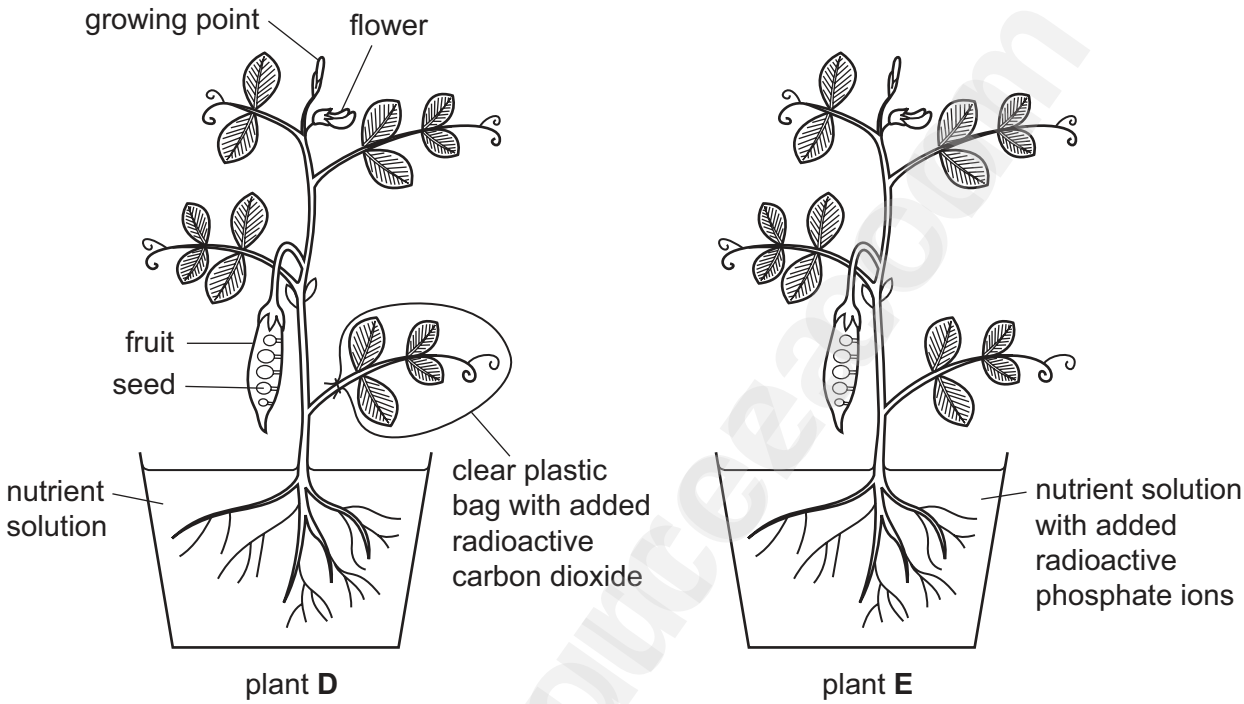

Fig. 4.1

After several hours the plants were analysed for the presence of the radioactive isotopes.

Sucrose containing ^{14}C was found throughout plant **D**.

Compounds containing ^{32}P were found throughout plant **E**.

Complete Table 4.1 to show:

- the tissue in which each substance is transported;
- **one** possible sink for each substance.

Table 4.1

pea plant	**D**	**E**
substance transported	sucrose	phosphate ions
transport tissue		
sink		

[4]

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(b) State **one** substance, **other than sucrose**, that is produced in leaves and translocated to other parts of the plant.

..... [1]

(c) Outline how sucrose is produced from carbon dioxide in pea plants.

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..... [3]

(d) State **two** uses of sucrose within a pea plant.

1 .....

2 ..... [2]

(e) Explain how ions, such as phosphate ions, are absorbed by plant roots.

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..... [3]

[Total: 13]

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5 **(a)** The production of human gametes involves the type of nuclear division known as meiosis.

State **two** reasons why meiosis is suitable for gamete production.

1 .....

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2 .....

..... [2]

(b) The sex of a human fetus is determined by the sex chromosomes, X and Y.

Fig. 5.1 shows the determination of sex in four different examples.

Examples **3** and **4** show sex determination in twins.

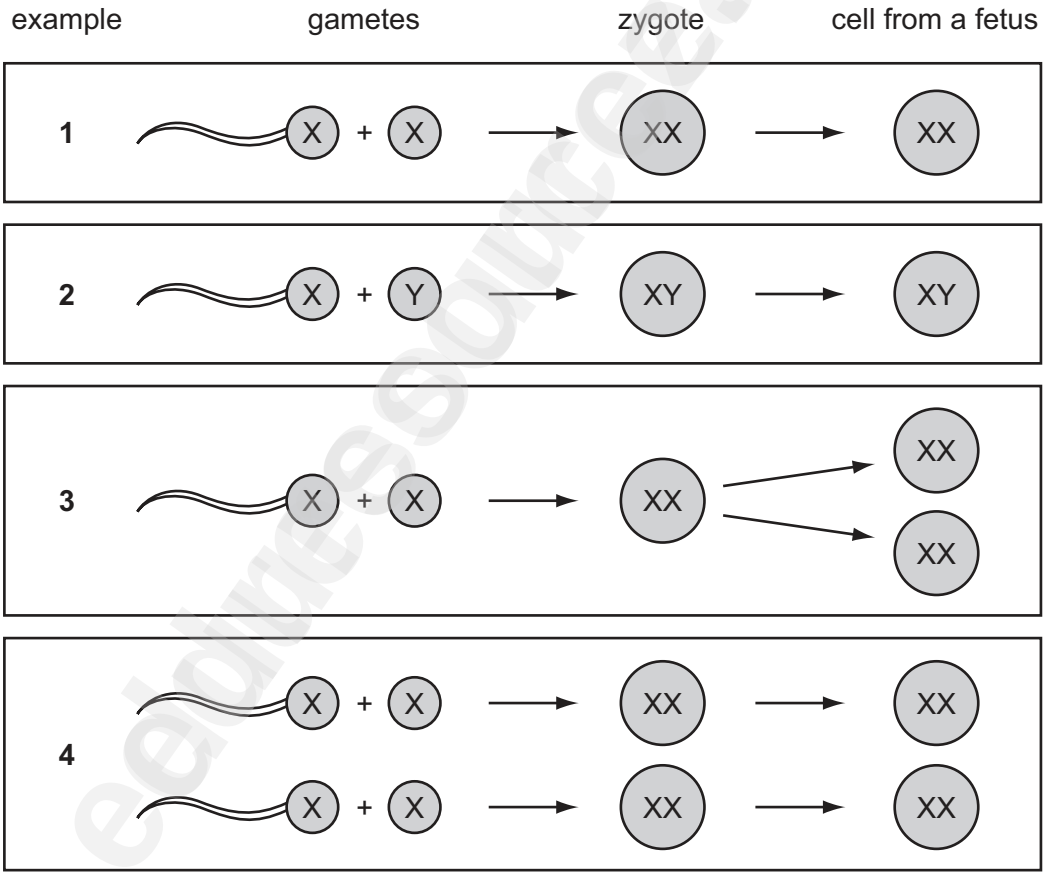

Fig. 5.1

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(i) Use 5.1 to explain how the sex of a fetus is determined.

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..... [2]

(ii) Examples **3** and **4** show two ways in which twins are formed.

The twins in example **3** are identical.

Use Fig. 5.1 to explain why.

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..... [2]

(c) During the development of a fetus, different genes are expressed at different times.

Explain what is meant by the term *development*.

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..... [2]

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(d) One of the genes that controls the ability of blood to clot is found **only** on the X chromosome.

X^H represents an X chromosome with the dominant allele for normal blood clotting.

X^h represents an X chromosome with the recessive allele which causes the blood to clot slowly.

The Y chromosome is small and does not have the gene for blood clotting.

Here is a list of four genotypes.

X^HX^H, X^HX^h, X^HY, X^hY

Choose the genotype from the list that matches each of the following:

- gives a phenotype of long clotting time; .....
- is heterozygous; .....
- is homozygous. ..... [3]

(e) Haemophilia is a rare genetic condition in which the blood clots very slowly.

In the USA, haemophilia affects 1 in 5000 male births each year. In some cases these births occur in families where the condition has not occurred before.

Explain how boys can have haemophilia when the condition has not previously existed in their family.

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..... [2]

[Total: 13]

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6 Fig. 6.1 shows Soay sheep on St. Kilda, a group of small remote islands off the coast of Scotland. These islands experience extreme conditions of cold, wind and rain.

Sheep were introduced to the islands thousands of years ago and the Soay sheep are descended from them.

The islands of St. Kilda have been uninhabited by people since 1930. The sheep are now left unfarmed and in their natural state.

Fig. 6.1

(a) The populations of Soay sheep on St. Kilda show much more variation in their phenotype than modern breeds of sheep.

Explain, by using an example from Fig. 6.1, what is meant by variation in their phenotype.

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..... [2]

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(b) Scientists have recorded the numbers of Soay sheep and lambs on St. Kilda for many years.

Each year between 1985 and 1996, the lambs (young sheep) were caught, marked and weighed. In some years, the total number of sheep on St. Kilda was lower than in other years.

Fig. 6.2 shows the frequency of lambs of different body mass in years when the total number of sheep was low and years when the total number was high.

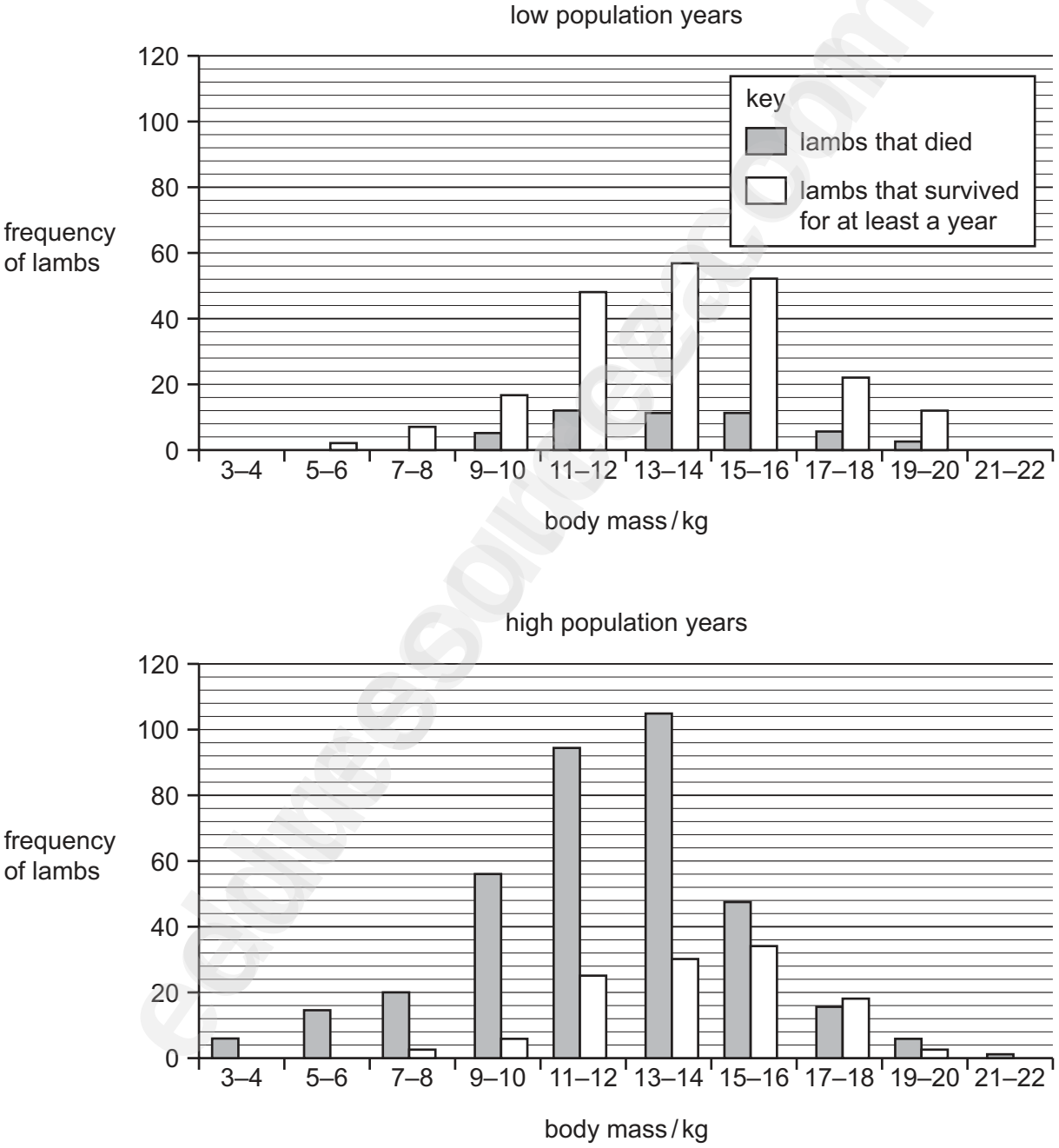

Fig. 6.2

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(i) Population size has a great effect on the survival of lambs on St. Kilda.

Describe the evidence from Fig. 6.2 that supports this statement.

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..... [2]

(ii) Suggest an explanation for the effect that you have described.

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..... [3]

(c) Soay sheep are adapted to the extreme conditions experienced on St. Kilda.

Explain how natural selection could account for the adaptive features of Soay sheep.

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..... [4]

[Total: 11]

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Figure 1.1	© *Buccinum undatum*; http://www.glaucus.org.uk/Buckie.htm. *Octopus vulgaris;* http://animaldiversity.ummz.umich.edu/site/resources/Grzimek_inverts/Cephalopoda/Octopus_vulgaris.jpg/view.html. *Tagelus plebeius;* R D Barnes; *Invertebrate Zoology*; Saunders; 1968.
Figure 2.2	© *Bungee jumping*; matejmm IStock 1935273, mayo5 iStock 10138655.
Figure 4.1	© R Fosbery et al; *Revise AS Biology for OCR*; Heinemann; 2001.
Figure 6.1	© *Soay sheep on St Kilda, Scotland*; Gannet77 iStock 2094245.
Figure 6.2	© J M Milner et al; *Journal of Animal Ecology*; 1999; http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2656.1999.00299.x/full.

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