UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	CANDIDATE NUMBER

6943348601

BIOLOGY **0610/33**

Paper 3 Extended **October/November 2012**

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.

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

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

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Question 1 begins on page 3.

For Examiner's Use

1 Cicadas are insects that make a lot of noise.

Fig. 1.1 shows an adult chorus cicada, *Amphipsalta zelandica*, that is only found in New Zealand.



Fig. 1.1

(a) State three features, **visible in Fig. 1.1**, that show that the chorus cicada is an insect.

1 .....

2 .....

3 ..... [3]

(b) Insects are classified in the same group as crustaceans, arachnids and myriapods.

Name the group that contains all these animals.

..... [1]

Evolutionary relationships between different species are investigated by examining DNA.

(c) State precisely where DNA is found in a cell.

.....

..... [2]

For Examiner's Use

Small sections of DNA in 14 species of cicada found in Australia, New Caledonia and New Zealand (**1** to **14**) were examined for similarities and differences.

The results of the DNA examination of these species were used to make a diagram showing how these cicada species may have evolved. Species that are closely related are grouped together on the right of Fig. 1.2.

The brackets show that the cicada species in New Zealand are in two separate groups.

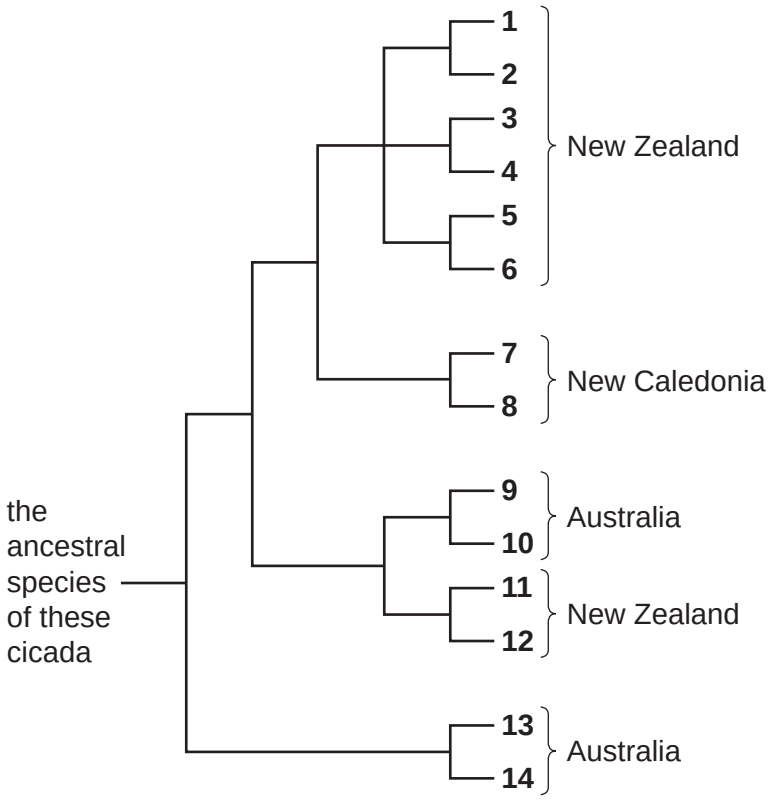


Fig. 1.2

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(d) It is suggested that the eight cicada species in New Zealand originated from two migrations, **A** and **B**, from Australia as shown in Fig.1.3.

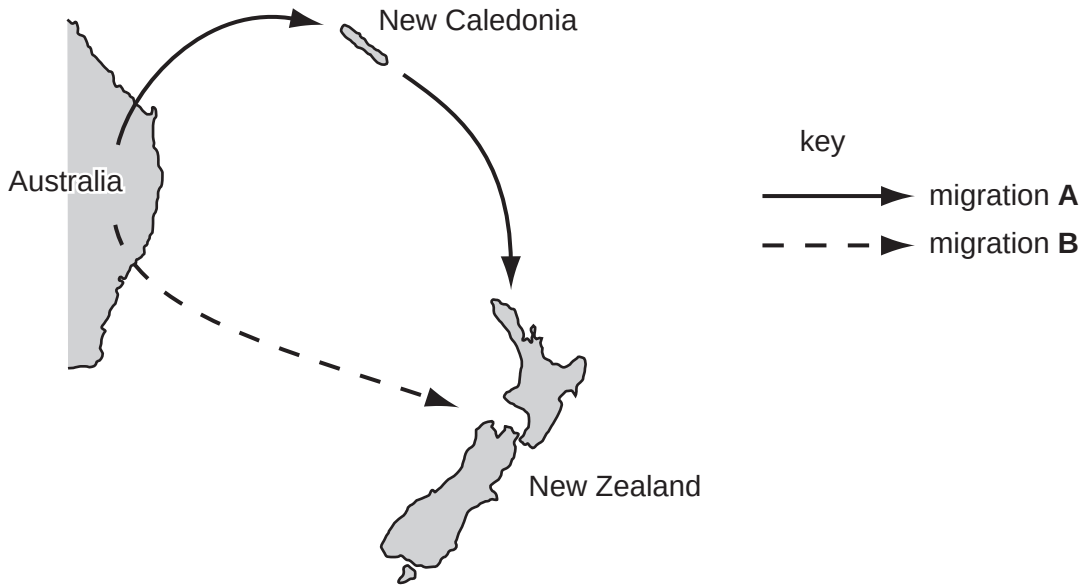


Fig. 1.3

Explain how the results in Fig. 1.2 support the idea that the eight cicada species in New Zealand originated from two migrations of cicadas as shown in Fig. 1.3.

You can use the numbers from Fig. 1.2 in your answer.

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..... [3]

For Examiner's Use

Islands in the Pacific have been colonised by populations of animals that have migrated from Australia, mainland Asia and the Americas. Over many generations these populations have changed. Now they are unable to breed with animals of the original populations in Australia, mainland Asia and the Americas.

(e) Explain how natural selection has resulted in changes in the populations of animals on islands in the Pacific.

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..... [4]

[Total: 13]

Question 2 begins on page 8.

For Examiner's Use

2 **(a)** Define the term *excretion*.

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..... [3]

Fig. 2.1 shows a kidney tubule and the blood vessels associated with it.

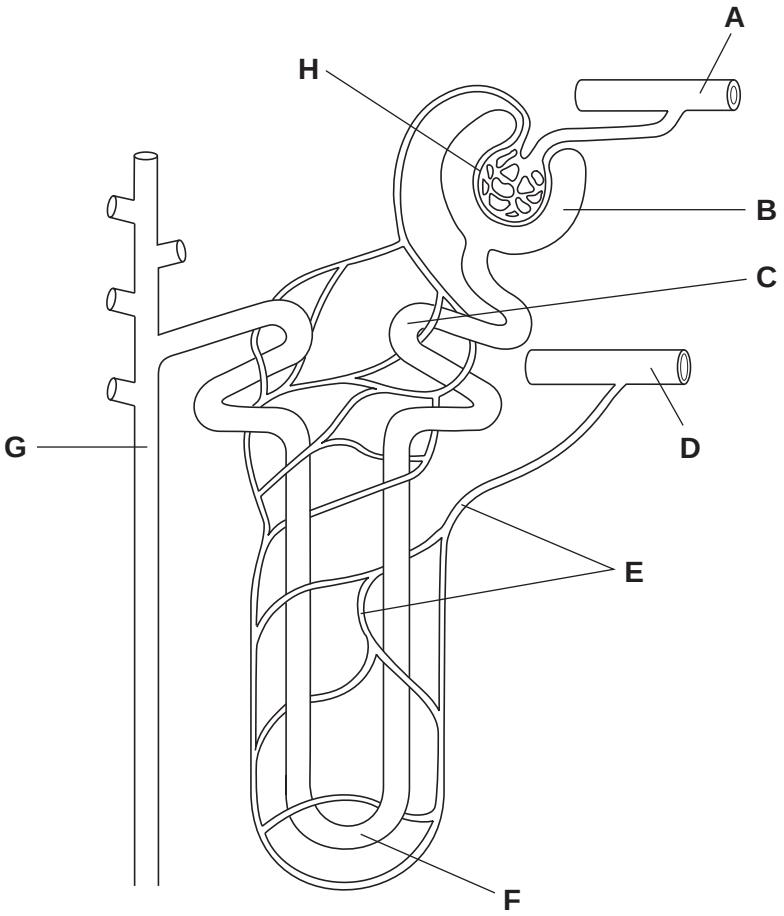


Fig. 2.1

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(b) Table 2.1 shows some processes that occur in a kidney.

In Table 2.1, write the **letter** of the part shown in Fig. 2.1 where each process occurs.

You must put **one** letter in each box. You may use the same letter more than once.

Table 2.1

process	letter
filtration of blood	
reabsorption of most of the solutes from the filtrate	
water is absorbed by osmosis to determine the concentration of urine	
unfiltered blood returns to the renal vein	

[4]

(c) Table 2.2 lists the components of blood, filtrate and urine.

Table 2.2

component	blood	filtrate	urine
red blood cells	✓	×	×
white blood cells	✓		
plasma proteins	✓		
glucose	✓		
urea	✓		
salts	✓		
water	✓		

Complete the table by using ticks (✓) and crosses (×) to show whether or not each component is present in filtrate and in urine of a healthy person. The first component has been done for you. [2]

[Total: 9]

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3 Mycoprotein is a form of single cell protein. It is produced by growing the fungus, *Fusarium venenatum*, in a fermenter. As the fungus grows in the fermenter it produces large quantities of hyphae which are extracted and processed as shown in Fig. 3.1.

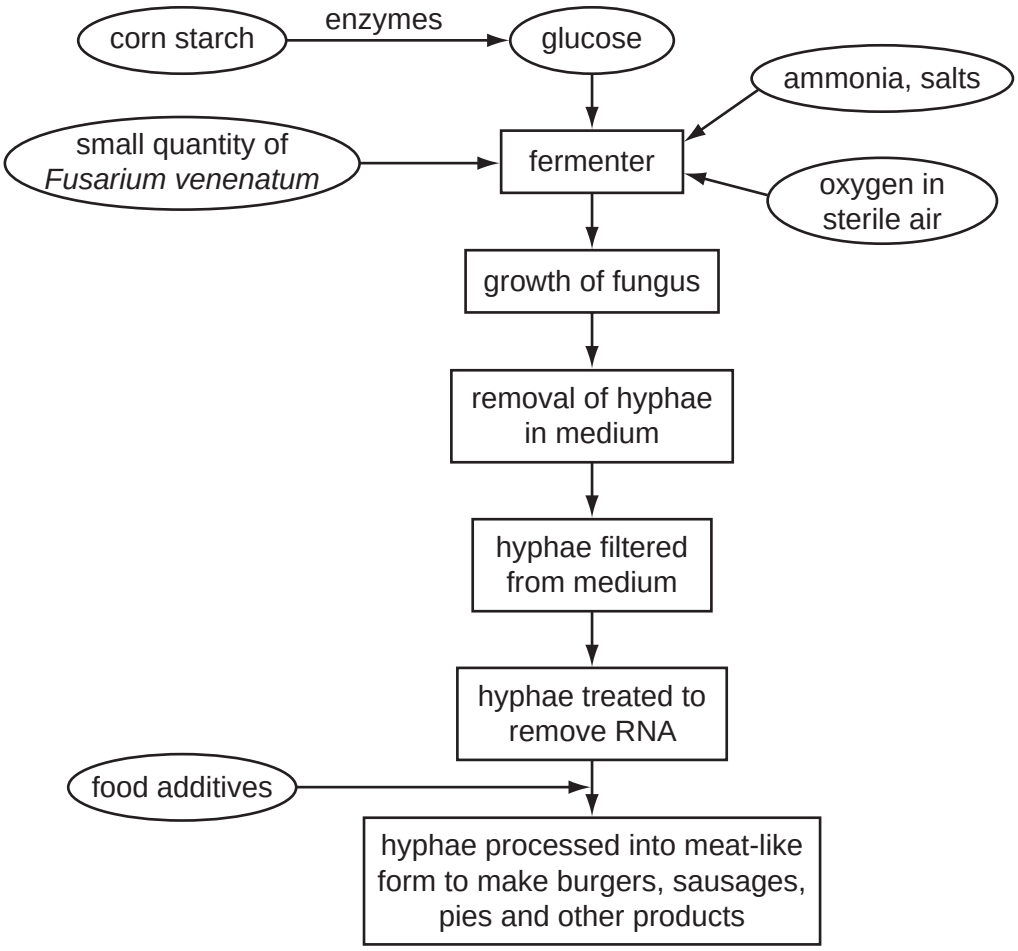


Fig. 3.1

(a) (i) Name an enzyme used to digest the corn starch.

.....[1]

(ii) Explain why it is necessary to digest the corn starch.

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.....[2]

For Examiner's Use

(b) Explain why sterile conditions are necessary in the fermenter.

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..... [2]

In 2008, there were riots in some parts of the world in protest against shortages of staple foods, such as rice.

(c) Explain why it is better ecologically for people to eat foods made from plants rather than from animal products, such as meat.

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..... [3]

(d) Describe three possible advantages of using foods prepared from mycoprotein as substitutes for animal products, such as meat.

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2 .....

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3 .....

..... [3]

For Examiner's Use

(e) Discuss whether production of foods made from mycoprotein might **not** reduce food shortages in the future.

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..... [3]

[Total: 14]

4 Niusila Opeloge from Samoa holds a Commonwealth Games record for weightlifting. He can lift 338 kg. Weightlifting is an example of an anaerobic sport as muscles act over a short period of time.

(a) Write a balanced chemical equation for anaerobic respiration in muscle.

…….. → …….. [2]

Weightlifting involves contraction of the muscles of the arms.

Fig. 4.1 shows the muscles that move the forearm.

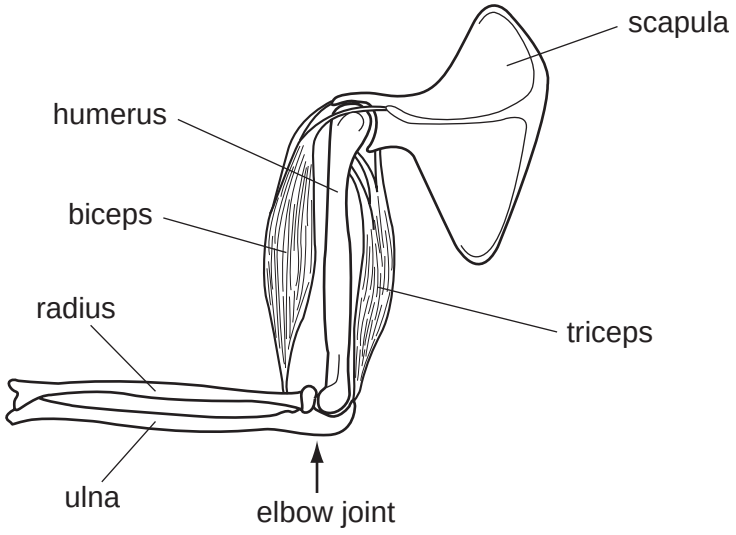


Fig. 4.1

(b) Describe how the muscles identified in Fig. 4.1 work to move the forearm up.

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..... [2]

For Examiner's Use

Exercise that occurs over a longer period of time than weightlifting often involves aerobic respiration as well as anaerobic respiration.

Fig. 4.2 shows the oxygen consumed by an athlete during and after a 5000 metre race.

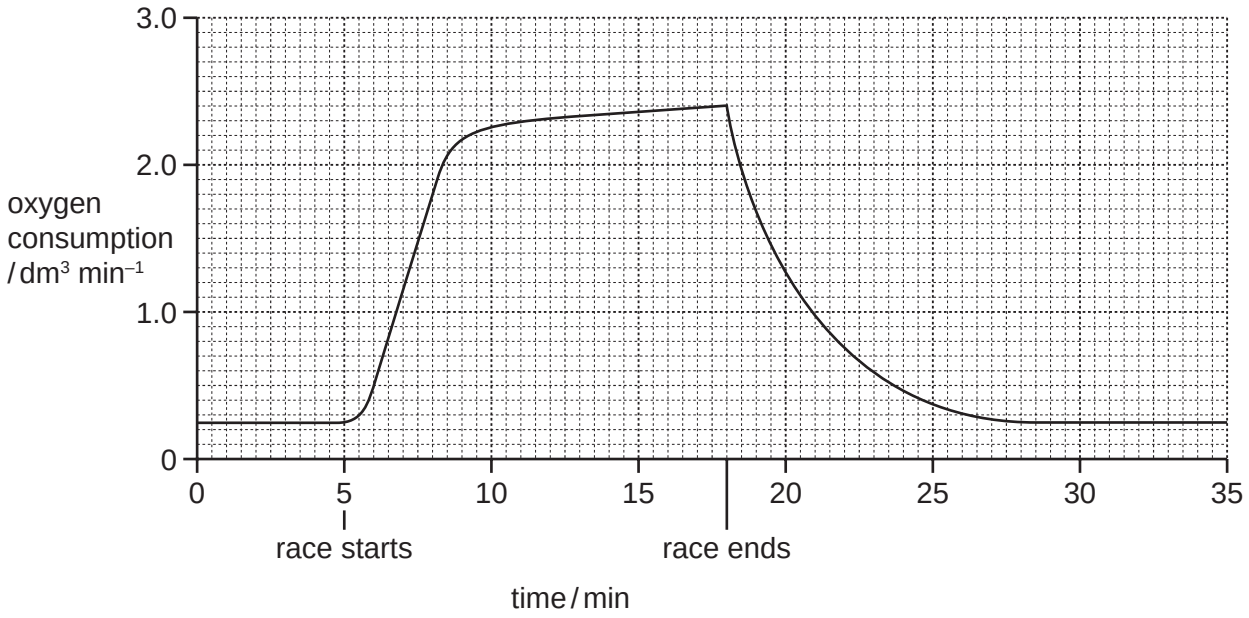


Fig. 4.2

(c) Describe the athlete's oxygen consumption during **and** after the race as shown in Fig. 4.2.

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

during .....

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after .....

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..... [4]

(d) Explain why the oxygen consumption does not return immediately to the resting level after the exercise is finished.

For Examiner's Use

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..... [5]

[Total: 13]

For Examiner's Use

5 Fertilisers are used to increase crop yields. Many fertilisers contain compounds of nitrogen and are called 'nitrogen fertilisers'.

The development in the early twentieth century of the Haber-Bosch process for converting nitrogen from the air into ammonia made the production of these fertilisers possible.

(a) Fig. 5.1 shows the global use of nitrogen fertilisers between 1960 and 2003.

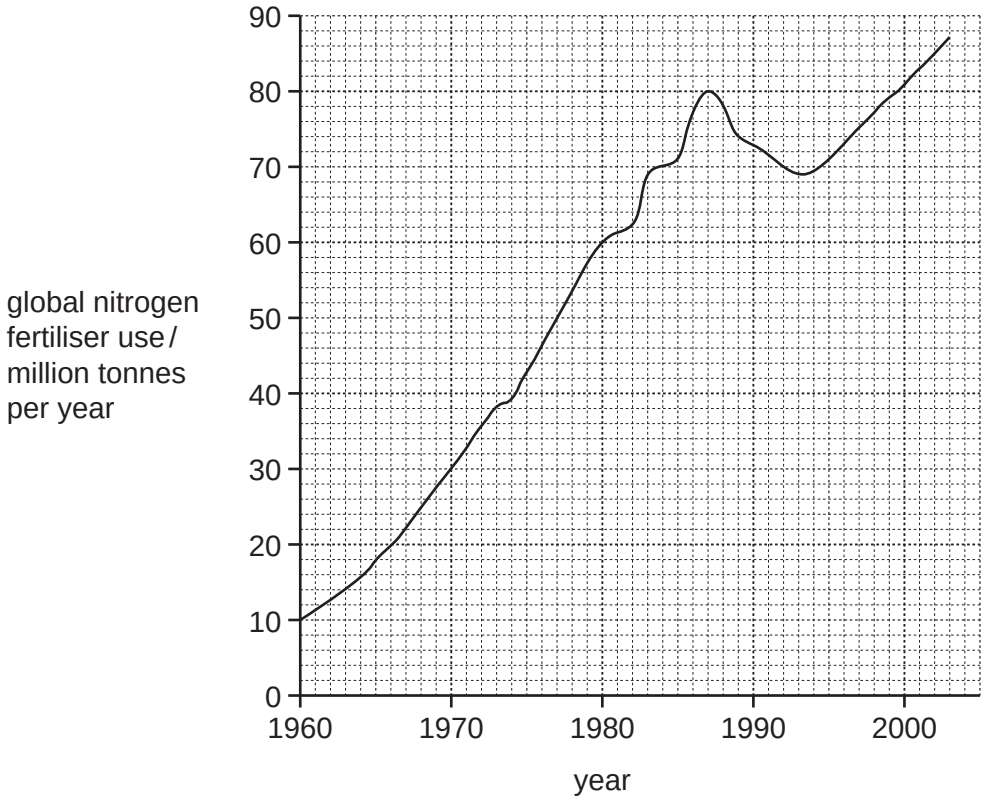


Fig. 5.1

(i) Calculate the percentage increase in the global use of nitrogen fertilisers between 1970 and 1987. Show your working.

Answer .....% [2]

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(ii) Explain why the use of nitrogen fertilisers has increased.

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..... [3]

(b) Some farmers increase the fertility of their soils by adding organic fertilisers, such as manure, and by using legume crops in a crop rotation. Manure contains protein, urea and ammonia in the waste from farm animals.

(i) Explain how nitrogen, in the form of nitrate ions, becomes available in a soil after the addition of manure.

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(ii) Explain why legume crops, such as peas, beans, alfalfa and clover are used in crop rotations.

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..... [3]

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(c) The overuse of fertilisers can lead to environmental problems. Soils, rivers, lakes, the sea and the atmosphere have all been affected by this pollution.

Outline the undesirable effects of the overuse of fertilisers.

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..... [5]

[Total: 17]

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6 Haemoglobin is a protein that is made inside developing red blood cells in the bone marrow.

(a) (i) State the function of haemoglobin.

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[1]

(ii) Name the small molecules that are combined to make haemoglobin.

.....

[1]

(iii) Name the mineral ion provided in the diet that is needed to make haemoglobin.

.....

[1]

There are many different varieties of haemoglobin. The gene for haemoglobin exists as two alleles, $\mathbf{Hb^A}$ and $\mathbf{Hb^S}$.

People with the genotype $\mathbf{Hb^SHb^S}$ have a condition called sickle cell anaemia.

(b) Describe the features of sickle cell anaemia.

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[3]

(c) The allele for $\mathbf{Hb^S}$ is rare in many parts of the world, but it is more common in parts of tropical Africa.

Explain why $\mathbf{Hb^S}$ is more common in parts of tropical Africa.

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[3]

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(d) The parents of people with sickle cell anaemia rarely have this condition.

Explain, using a genetic diagram, how two parents who do not have sickle cell anaemia may have a child with the condition.

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parental genotypes ..... × .....

gametes .... + ...

genotype of child with sickle cell anaemia .....

[3]

(e) Sickle cell anaemia is an example of variation in humans. There are many causes of variation, including nuclear fall-out.

Suggest how nuclear fall-out could cause variation in humans.

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..... [2]

[Total: 14]

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Figure 1.2	© Peter Arensburger et al; *Biogeography and phylogeny of the New Zealand cicada genera (Hemiptera: Cicadidae) based on nuclear and mitochondrial DNA data;* Journal of BIogeography; 2004
Figure 5.1	© http://lepo.it.da.ut.ee/~olli/eutr/html/htmlBook_4.html

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