Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4461/02

SCIENCE A
HIGHER TIER
BIOLOGY 1

A.M. THURSDAY, 12 January 2012

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**8**	
2	**6**	
3	**4**	
4	**6**	
5	**6**	
6	**3**	
7	**8**	
8	**6**	
9	**7**	
10	**6**	
Total	**60**	

4461 020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

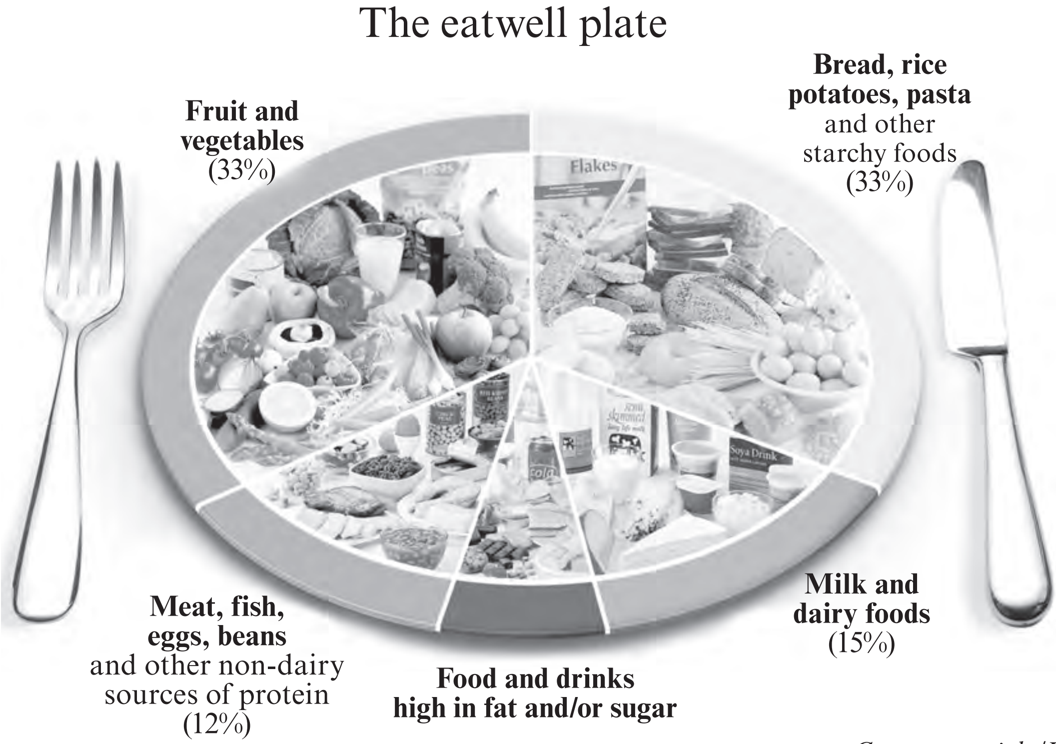
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to questions 2 and 8.

Examiner only

Answer **all** *questions*

1. *(a)* The eatwell plate shows the types and percentages of foods that we should eat for a healthy diet.



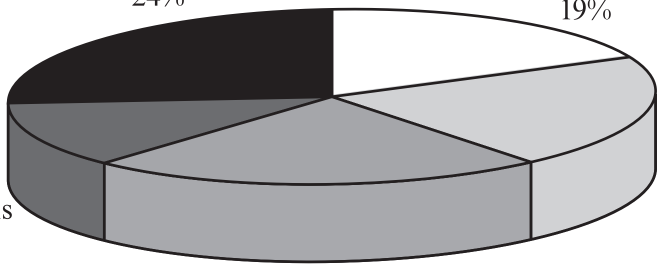
Crown copyright/FSA

Calculate the percentage of the eatwell plate that should come from **Foods and drinks high in fat and/or sugar**. Show your working. [2]

Answer .... %

Examiner only

(b) The chart below shows the percentages of different types of food bought at the shops.



Crown copyright/FSA

Which **three** types of food are bought in a greater percentages than shown in the eatwell plate? Tick (✓) the three boxes. [1]

Meat, fish, eggs ☐

Fruit and vegetables ☐

Bread, rice, potatoes, pasta ☐

Milk and dairy foods ☐

Foods and drinks high in fat and/or sugar ☐

4461
020003

Examiner only

(c) The table below shows the fat content of a meal.

Food	Fat content (g)
Doner kebab	50.2
Mayonnaise	11.5
Packet of crisps	11.5
Doughnut	13.3
Total	86.5

The Guideline Daily Amount of fat for an average female is 70g.
Calculate the excess fat content of this meal. [1]

Answer .... g

(d) Why do food labels often give information on fat content **per 100g of food**? [1]

....

(e) Explain why it is unhealthy to eat too much fat. [2]

....

....

....

....

(f) Give **one** use for fat in the human body. [1]

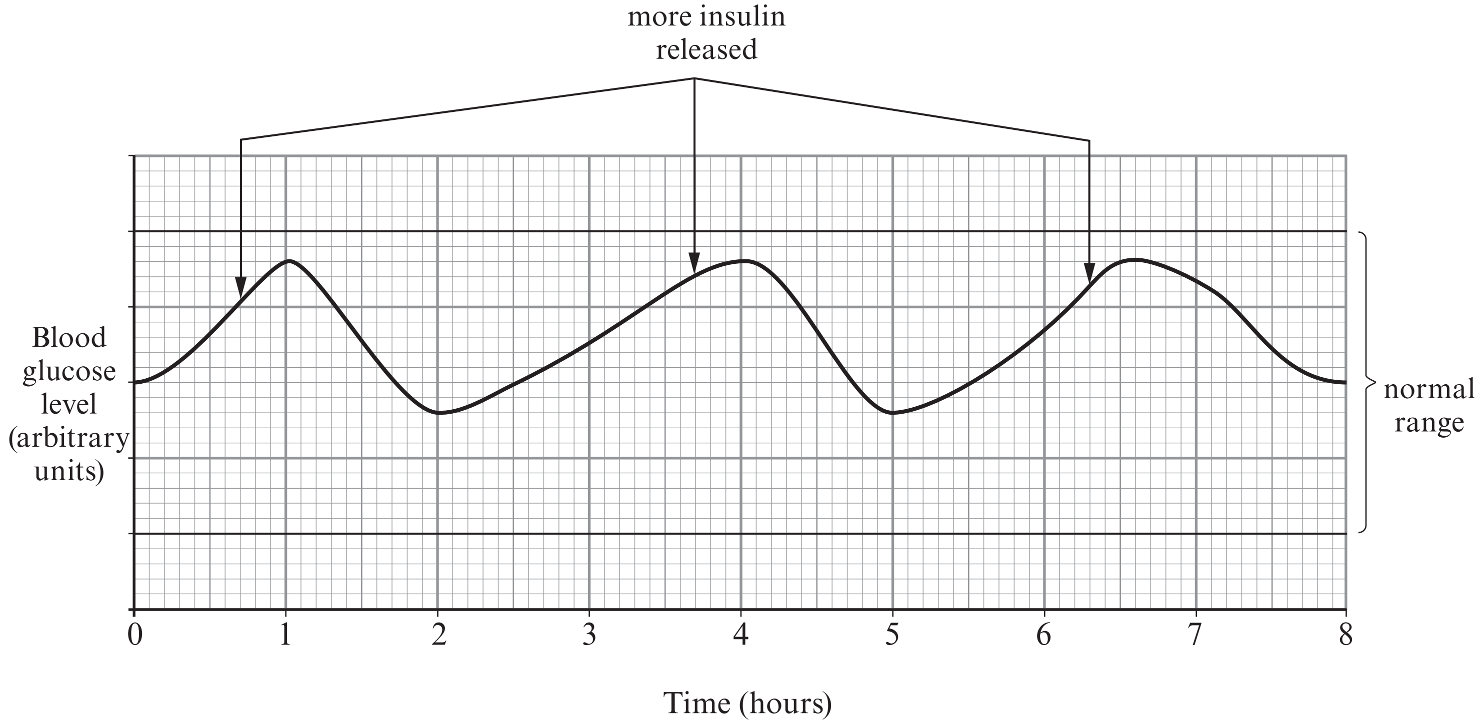
....

8

Examiner only

2. The hormone insulin helps to keep blood glucose levels within a narrow, normal range.

The graph shows changes in blood glucose levels during a period of eight hours and the points when more insulin was released into the blood.



Use the above information, **and your own knowledge**, to explain how blood glucose levels are controlled in the human body. [6 QWC]

....

....

....

....

....

....

....

....

....

....

....

....

6

4461
020005

Examiner only

3. The legal blood alcohol limit for driving in the UK is 80 mg of alcohol per 100 ml of blood. In some countries, it is illegal to drive with **any** alcohol in the blood. This is the zero limit.

(a) (i) Why is it dangerous to drive after exceeding the legal limit of blood alcohol? [1]

....

....

(ii) Give **one** reason why some people think that there should be a **zero** limit in the UK. [1]

....

....

(*b*) Alcohol is an addictive drug.
Explain what is meant by 'an addictive drug'. [2]

....

....

....

4

Examiner only

4. Red squirrels and grey squirrels live in woodland. The two squirrel species compete for similar resources. Where the two species share the same habitat, the greys usually outcompete the reds.

Red squirrel

Grey squirrel

The island of Anglesey used to have a large population of red squirrels. In the early 1970s, grey squirrels started to arrive across the road bridges. The number of grey squirrels on the island grew rapidly. By the mid 1980s, red squirrels had disappeared from many parts of the island. In 1998, conservation groups started to control the numbers of grey squirrels and the red squirrel was re-introduced into several woodlands.

4461 020007

(a) Anglesey is 710 km^2 in area. Only 3% of the area is mature woodland suitable for red squirrels.

Calculate the area of woodland suitable for red squirrels. Show the working. [2]

.... km^2

(b) Give **two** resources for which both squirrel species compete. [2]

1. ....

2. ....

(c) Apart from competition between the squirrels for resources, give **two** *other* factors that might limit the size of the squirrel populations. [2]

1. ....

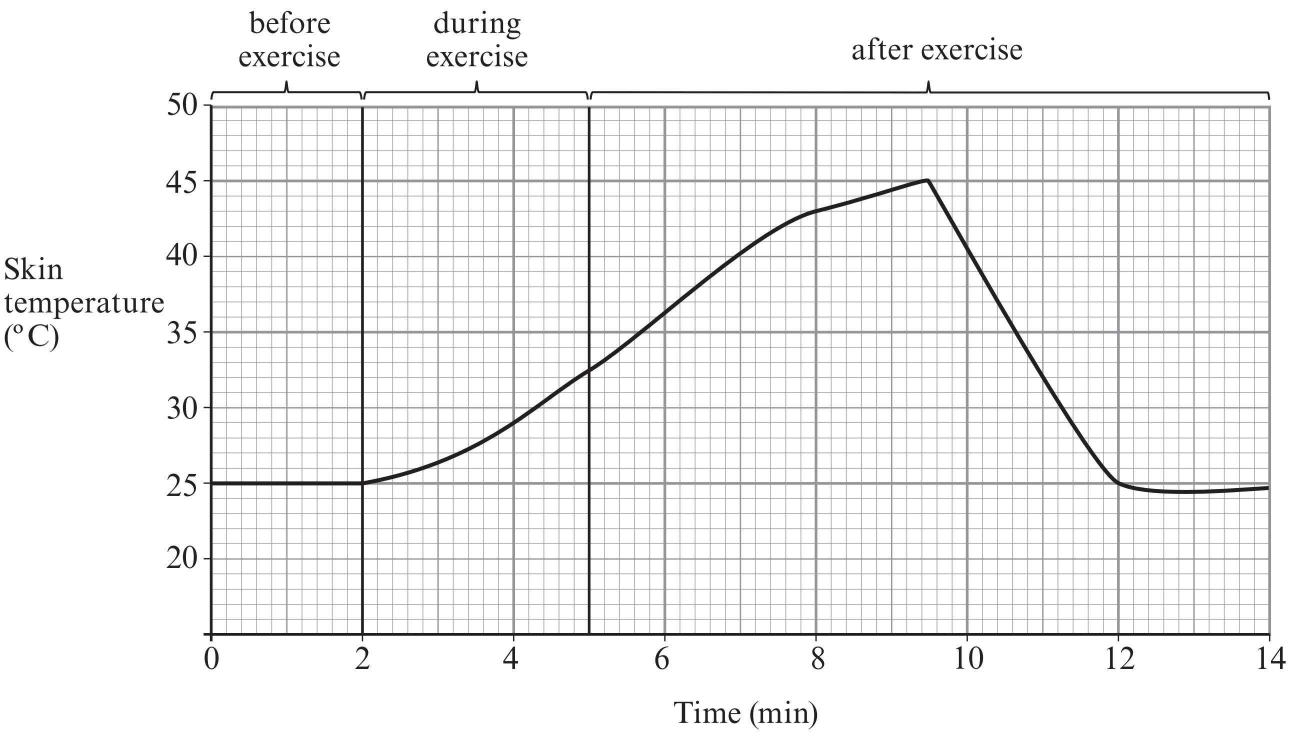
2. ....

6

Turn over.

Examiner only

5. *(a)* Gareth's skin temperature was measured before, during and after exercise. The results are shown on the graph.



From the graph:

(i) State the rise in skin temperature during exercise. [1]

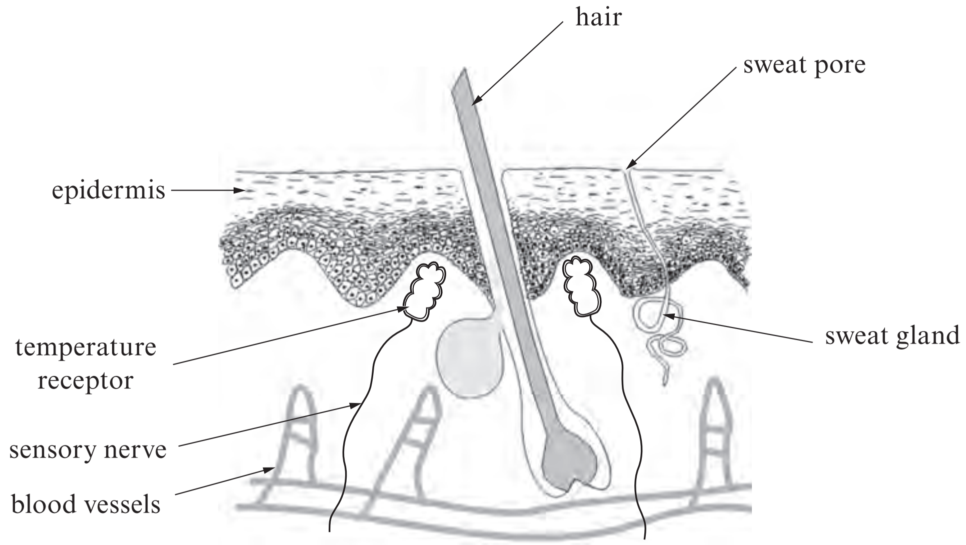
.... °C

(ii) For how long after the exercise stops does skin temperature continue to rise? [1]

.... min

Examiner only

(b) The diagram shows a section through Gareth's skin.



Using the diagram and your own knowledge:

(i) Describe how information about the rise in skin temperature reaches the brain. [2]

....

....

(ii) Explain how changes in blood vessels near the skin surface help release excess heat from the body. [2]

....

....

....

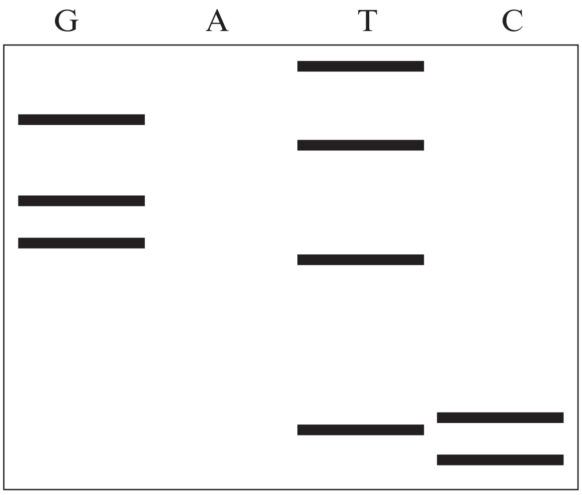
4461 020009

6

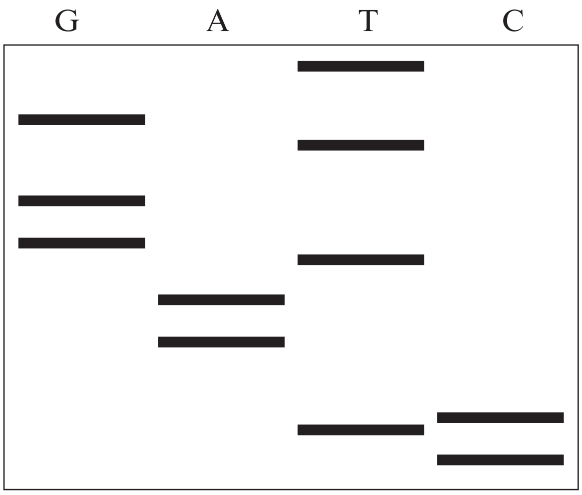
Examiner only

6. Tortoises can be legally bred in captivity. It is illegal to export or import wild tortoises. Scientists wanted to know if tortoises in a pet shop had been bred in captivity or imported. Those bred in captivity for many generations have a different pattern of chemicals in their DNA compared to the patterns of those from wild populations,
The patterns can be shown as bands. Examples from four tortoises are illustrated below.

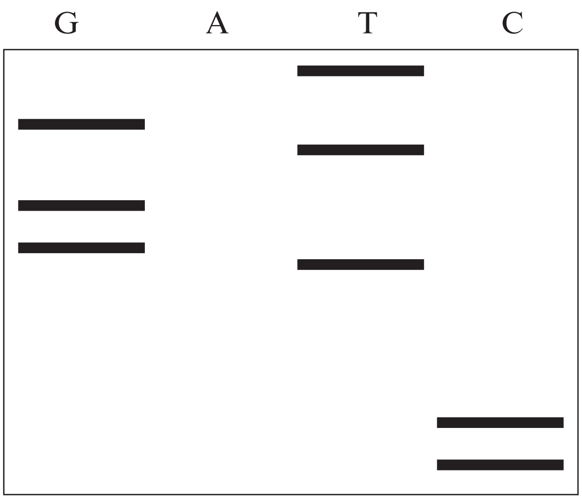
Tortoise known to be bred in captivity



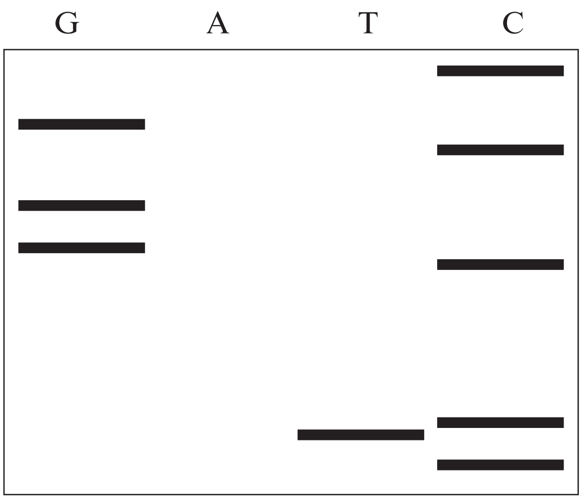
Tortoise 1



Tortoise 2



Tortoise 3



Examiner only

(a) What name is given to the patterns of DNA? [1]

....

(b) Explain how this information can be used to show that a tortoise belongs to a wild population and not to a captive population. [2]

....

....

....

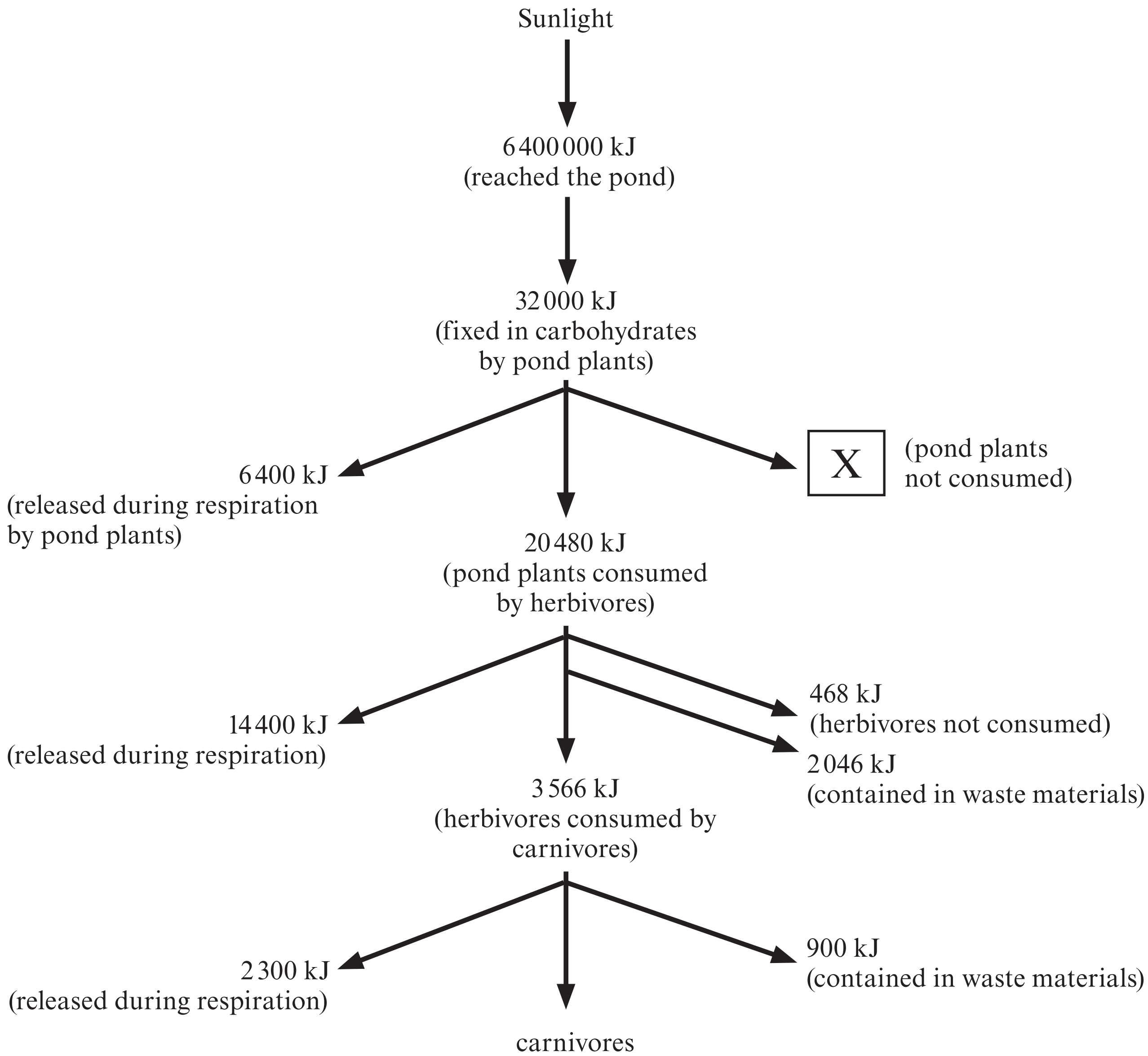
....

....

3

Examiner only

7. The diagram represents the energy flow through a food web in a pond during one year.



(a) (i) By which process is the energy from sunlight fixed into carbohydrates? [1]

....

(ii) Calculate the percentage of light reaching the pond which was fixed into carbohydrates by the pond plants. [1]

Answer ....

Examiner only

(b) Only 20 480 kJ per year reach the herbivores. Calculate the energy still contained in the pond plants which were not consumed, as shown at **X** in the diagram. [1]

Answer ....

(c) Suggest **one** reason for the difference in the energy released during respiration by pond plants and by herbivores. [1]

....

....

(d) Explain how the animal waste material, containing nitrogen, is recycled and used again in the food web. [4]

....

....

....

....

....

....

....

....

8

Examiner only

8. In 1859, Europeans released 24 rabbits in Australia but there were hardly any natural predators of rabbits there.
By the 1950s the rabbit population had risen to over 60 million and they were a serious pest to crops.
In 1954 the myxoma virus, which caused a disease in rabbits, was purposely introduced to Australia to control the rabbit population.
By 1960, the rabbit population had decreased by 90%.
By 2010 the population had increased again to over 30 million.
Use the idea of natural selection to explain the changes in the rabbit population in Australia, over the last 150 years. [6 QWC]

....

....

....

....

....

....

....

....

....

....

....

....

....

....

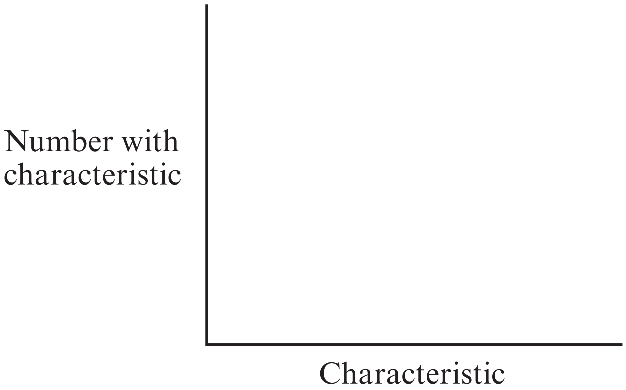
6

BLANK PAGE

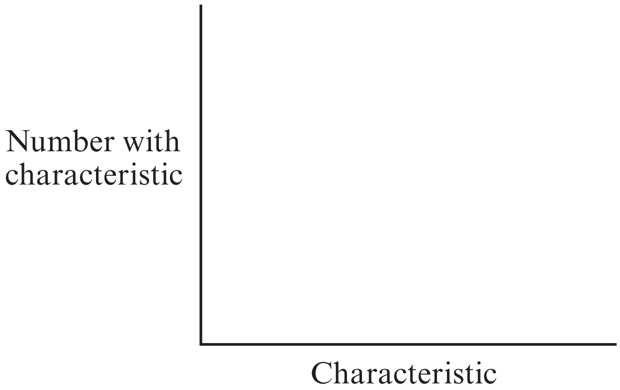
Examiner only

9. *(a)* (i) In the space below sketch bar graphs to represent continuous and discontinuous variation. [2]

Continuous



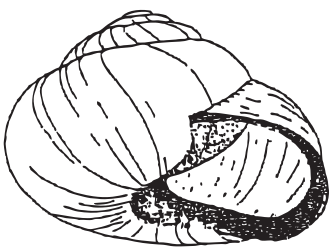
Discontinuous



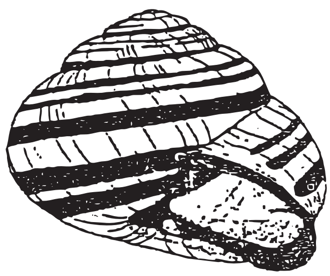
(ii) Which type of variation is controlled by more than one gene? [1]

....

(b) The snail, *Cepaea nemoralis* has either a plain or banded shell.



plain



banded

A biologist mated two snails that had plain shells. 48 offspring were produced, of which 36 had plain shells and 12 had banded shells.

Examiner only

(i) Using the letters **B** and **b** to represent the alleles for plain and banded shells, show this cross in a Punnett square. [2]

(ii) Explain these results in terms of the type of variation and genetic dominance. [2]

....

....

....

....

7

Examiner only

10. Biogas is a mixture of carbon dioxide and methane. It is produced in the soil in land-fill waste dumps and is sometimes collected and sold as fuel.
The same type and mass of waste was regularly dumped in a land-fill site for many years. The volume of biogas produced decreased after the heavy metal, lead, was illegally dumped there.

(a) Explain how carbon dioxide is produced in the land-fill site. [2]

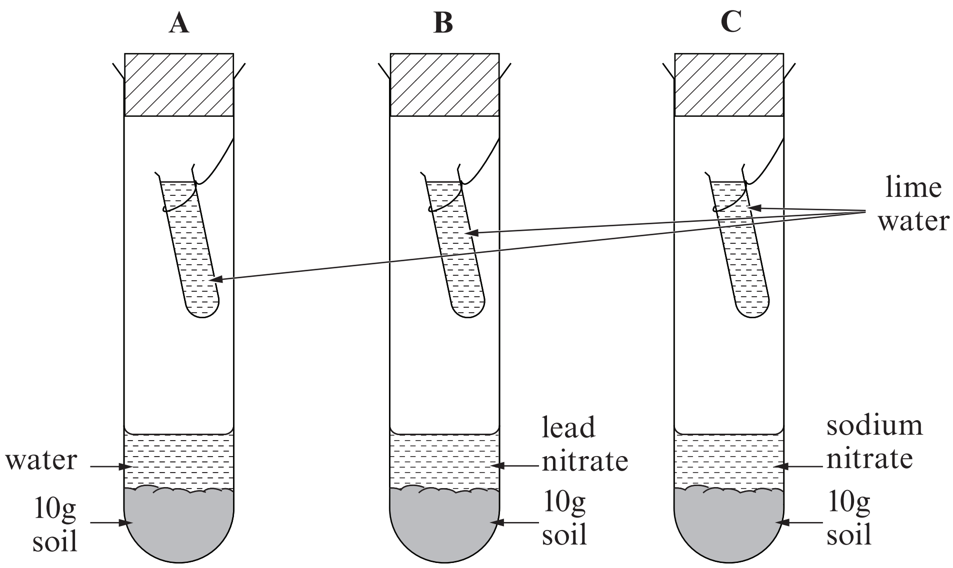
....

....

....

(b) In order to prove that lead caused the decrease in the production of carbon dioxide, an investigation took place using the following apparatus.

NOTE: Lime water changes from clear to milky in the presence of carbon dioxide.



The apparatus was left for 24 hours and the results were as follows:

	Tube		
	A	**B**	**C**
Lime water	milky	clear	milky

Examiner only

(i) Explain the results in **B**. [2]

....

....

....

(ii) Explain the purpose of sodium nitrate in **C**. [1]

....

....

(iii) Describe how you would set up a fourth tube D, to show that microorganisms were responsible for causing the colour change in the lime water. [1]

....

....

....

6