

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4461/02

SCIENCE A/BIOLOGY

**BIOLOGY 1
HIGHER TIER**

A.M. WEDNESDAY, 8 January 2014

1 hour

**Suitable for Modified
Language Candidates**

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	6	
3.	6	
4.	7	
5.	6	
6.	7	
7.	4	
8.	4	
9.	3	
10.	6	
11.	6	
Total	60	

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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

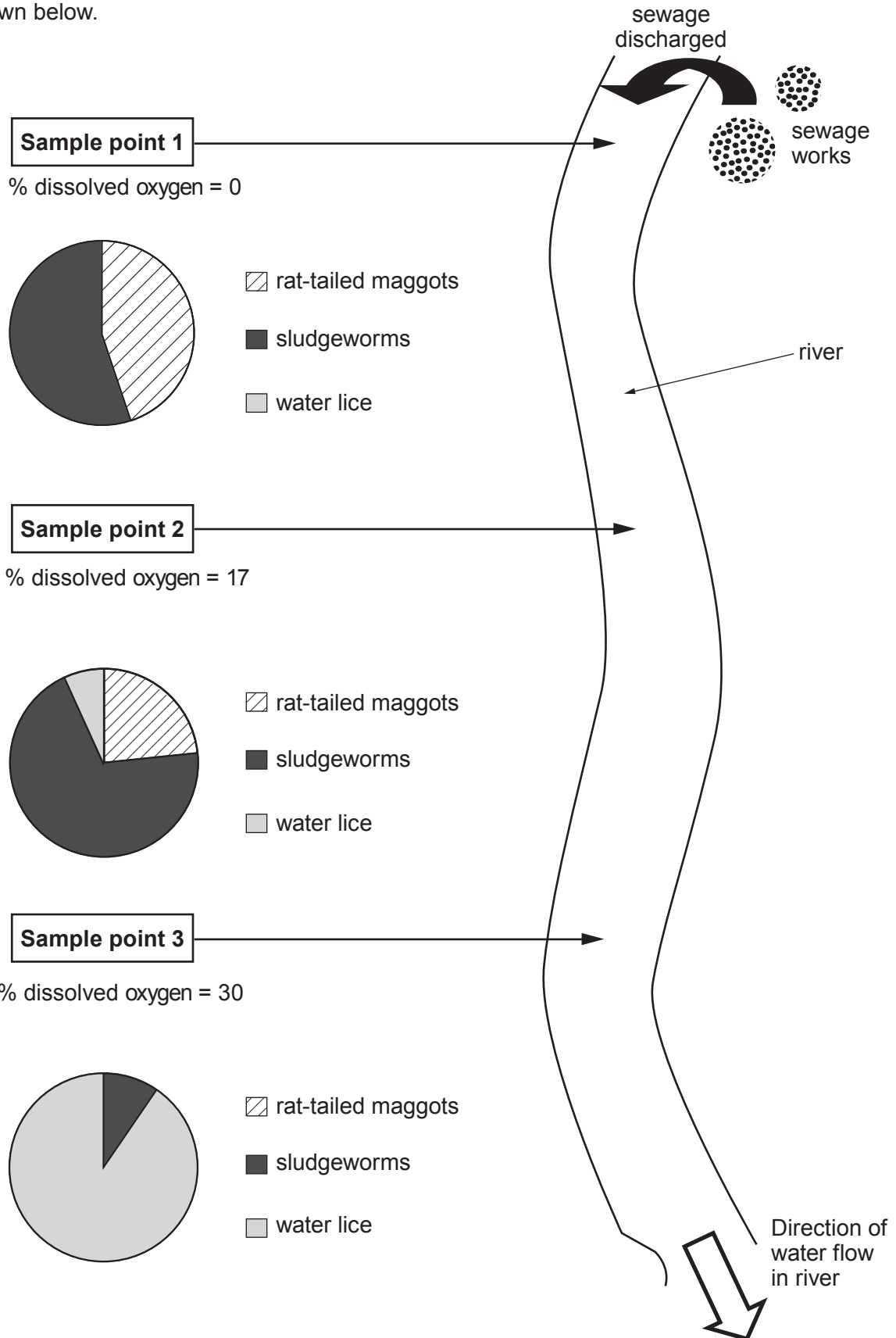
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to questions **4** and **11**.

Answer **all** questions.

1. Recent flooding in the UK caused sewage to go into a river. Two weeks after this happened the Environment Agency took samples of river water at 3 sample points 0.5 km apart.

The percentage (%) of dissolved oxygen in the sample was measured. The animals found in the river water samples were counted. The data was then plotted as pie charts. The results are shown below.



Use the information from the diagram opposite to answer the following questions.

- (a) The presence of which **two** animals in the samples indicates **high** levels of water pollution? [2]

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- (b) Which animal cannot live in highly polluted water? [1]

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- (c) (i) What happens to the percentage of dissolved oxygen as the water flows downstream? [1]

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- (ii) Rat-tailed maggots need oxygen to live. At **Sample point 1** there is no oxygen dissolved in the water. Suggest how the rat-tailed maggots can live in this water? [1]

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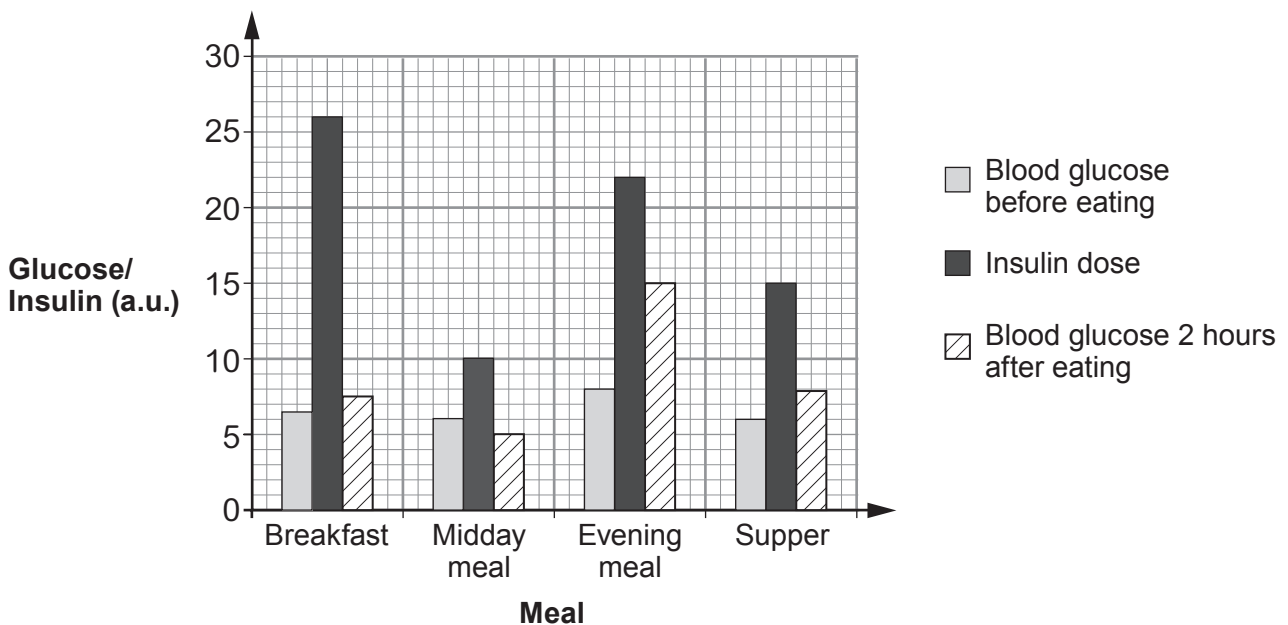
2. Anna has been a diabetic for 6 months. She injects herself with insulin before meals in order to control the level of glucose in her blood. Like all diabetics who have not been injecting insulin for very long she finds it difficult to get the dose correct. Before every meal Anna carries out the following procedure.

1. Measures the concentration of glucose in her blood.
2. Estimates whether the meal she is about to eat has a high, medium or low level of glucose (sugar) in it.
3. Inject insulin, the dose of which depends on the level of glucose in the meal.

Two hours after the meal she measures the concentration of glucose in her blood again.

Anna records all this information on an App, called **Glucose Buddy**, on her iPhone.

The chart below shows Anna's complete record for one day on **Glucose Buddy**.



- (a) (i) Which meal of the day did Anna estimate contained the lowest level of glucose? Give a reason for your answer. [2]

Meal

Reason

.....

- (ii) Anna tries to keep her blood glucose level below 8 a.u. Suggest reasons why her blood glucose level was still 15 a.u. two hours after she ate her evening meal. Use only the chart and the information opposite for your answer. [2]

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- (b) How does insulin lower the level of glucose in the blood? [2]

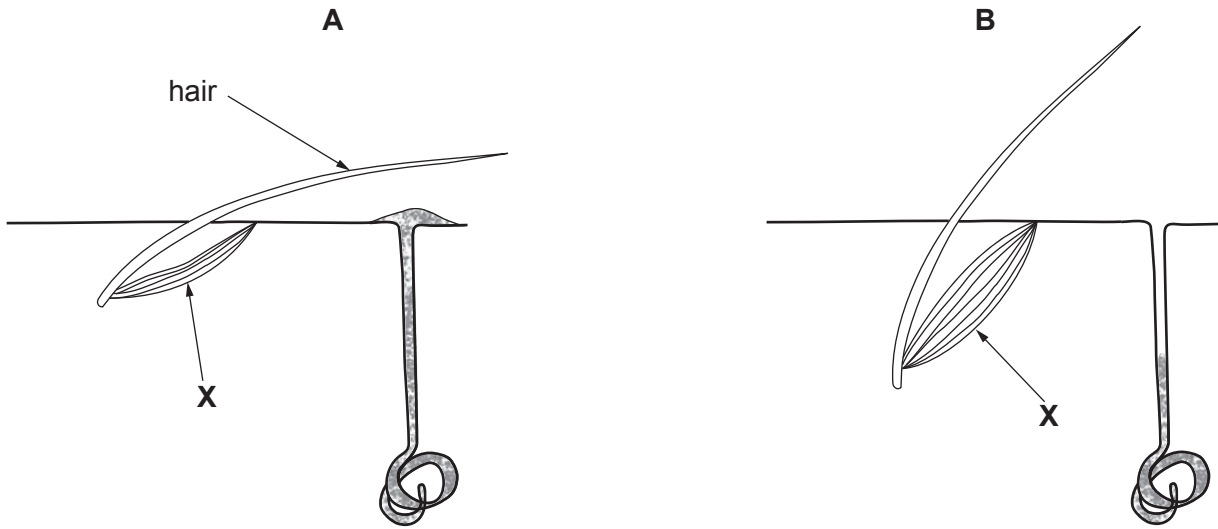
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3. Diagrams **A** and **B** below show the skin under two different environmental conditions.



(a) (i) Which of the diagrams shows the skin in hot conditions? [1]

(ii) Give **two** reasons for your answer. [2]

I.

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.....

II.

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(b) If blood vessels had been drawn on the diagrams, the blood vessels in the skin in diagram **B** would be narrower than in diagram **A**. Explain how this helps to control body temperature. [2]

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(c) State how structure **X** on the diagrams above causes the hair to appear as it does in diagram **B**. [1]

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Examiner
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5. Mrs Hughes is a well known breeder of both yellow and black Labrador dogs. The allele for black coat (**B**) is dominant to the allele for yellow coat (**b**). Mrs Hughes finds it easier to sell black Labrador puppies because they are more popular. She only produces yellow Labrador puppies when there is a demand for them.

Mrs Hughes has recently bought a black Labrador dog. It has many of the features which judges look for in dog shows. She does not know its genotype.

- (a) State the meaning of the term *genotype*. [1]

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- (b) (i) Mrs Hughes wants to breed from the black Labrador she has just bought but needs to know its genotype. How could she find out its genotype? Give a full explanation of the cross she could carry out and the expected results. [3]

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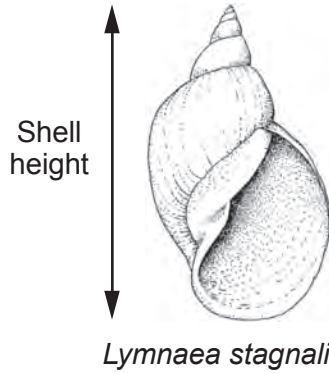
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- (ii) Complete the Punnett squares below to show the **possible** results of this cross. [2]

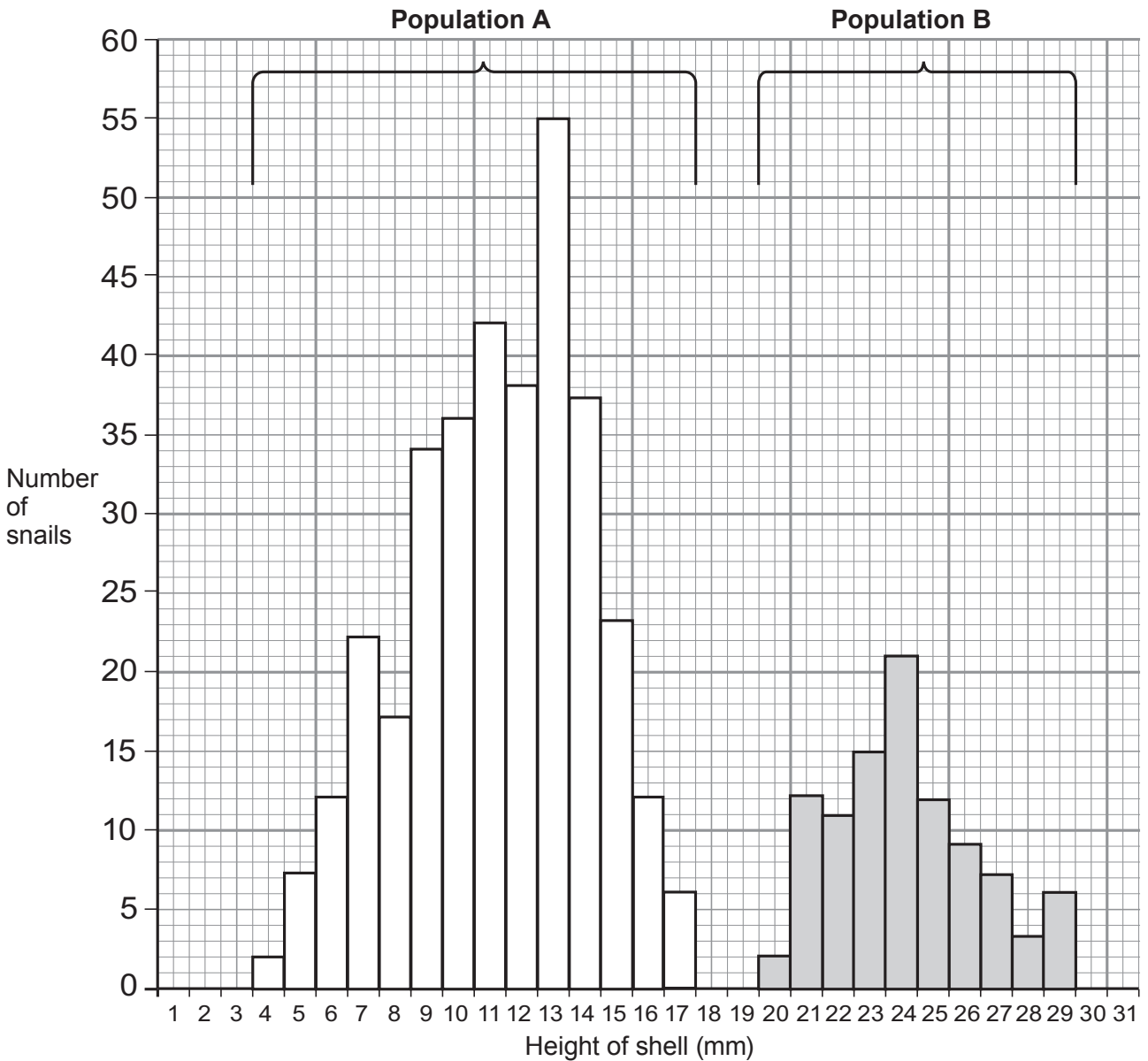
Gametes		

Gametes		

6. The heights of the shells of two separate populations of the pond snail, *Lymnaea stagnalis*, were measured in an investigation into variation.



The bar charts below show the results for the two populations. They are labelled population **A** and population **B**.



- (a) (i) Populations **A** and **B** show the same type of variation. Name the type of variation. [1]

(ii) What evidence is shown in the bar charts to suggest that population **B** is older than population **A**? [1]

.....

(iii) What are the **two** least common shell heights in population **A**? [1]

..... and

(iv) Calculate the difference in the **maximum** shell height between population **A** and population **B**. [1]

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(b) Suggest **three** environmental factors that could account for the variation shown in the separate populations. [3]

I.

II.

III.

7. The owner of a garden centre wanted to know whether young strawberry plants in two boxes **X** and **Y** had been grown from seeds or had been grown asexually. He allowed them to grow to maturity (fully grown) in identical conditions.

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Plants from box **X** produced identical flowers, all at the same time.
Plants from box **Y** produced flowers which varied in shape and size. Some of which were produced earlier than others.

(a) State why plants from box **X** could be described as *clones*. [1]

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(b) (i) Explain how sexual reproduction results in the variation seen in the plants in box **Y**. [2]

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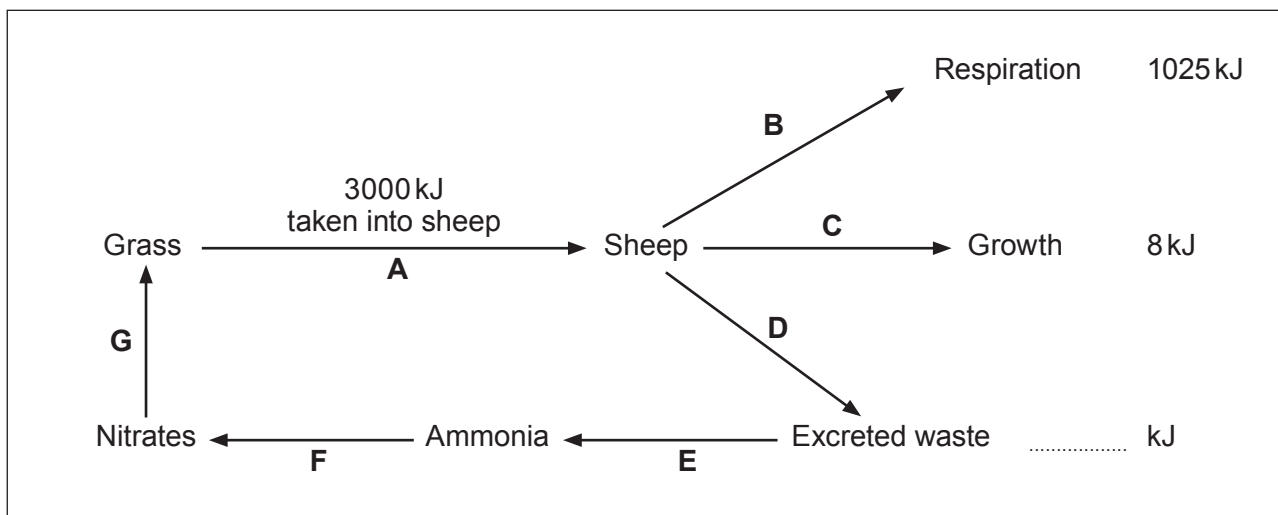
(ii) Give **one** advantage to the species of variation produced by sexual reproduction. [1]

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8. The following flow chart shows part of the nitrogen cycle. It also shows the energy relationships between some organisms and their environment.



- (a) (i) Complete the flowchart above to show how much energy is in the excreted waste. [1]
- (ii) A percentage of the energy taken into the sheep is used in growth. Calculate this percentage. Show your method in the space below. [1]

Answer %

- (b) Use the flow chart above to state
- (i) the letter which represents the action of urease [1]
- (ii) a letter which represents protein production [1]

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9.



Leeches help in hunt for rare species

Leeches feed on the blood of mammals. Leeches can keep blood cells in their digestive systems for four months. It was suspected that several endangered species of mammals existed on an island. These mammals had not been seen on the island for 25 years. Their genetic profiles had been stored in laboratories.

Explain how scientists could use leeches, collected on the island, and the technique of genetic profiling to prove that the endangered species of mammals still exist. [3]

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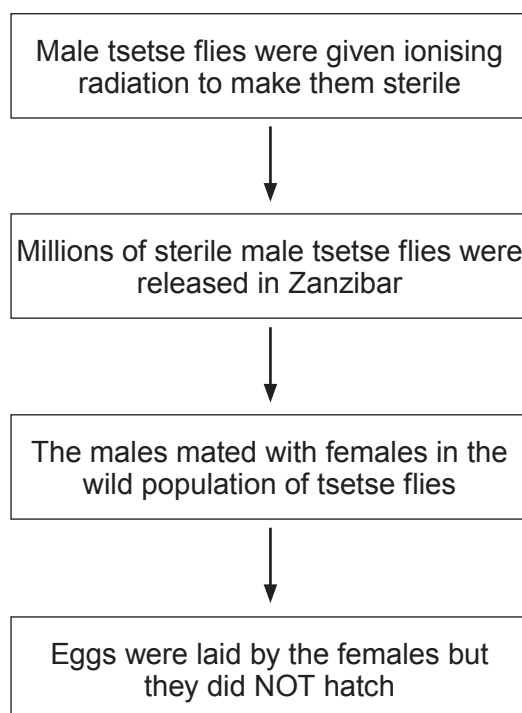
10. The photograph below shows a male tsetse fly (*Glossina palpalis*).



© Ray Wilson/Alamy

- The tsetse fly *Glossina palpalis* is a pest.
- One method of pest control relies on releasing sterile male insects (insects which cannot produce sex cells) into wild populations.
- Sterile male tsetse flies have been used in pest control in this way, in a successful attempt at controlling the tsetse fly population in Zanzibar.
- Zanzibar is a small island off the coast of the continent of Africa.

The principle of this method of pest control is as follows:



(a) State how ionising radiation caused the tsetse flies to become sterile.

[1]

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(b) State **three** disadvantages of using insecticides compared to the method of pest control described opposite. [3]

I.

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II.

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III.

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(c) Suggest why the use of sterile male tsetse flies as a method of pest control is more likely to be successful on the small island of Zanzibar than it would be on the mainland of Africa. [2]

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