Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

235/02

SCIENCE
HIGHER TIER
BIOLOGY 1

A.M. THURSDAY, 13 January 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**6**	
3	**3**	
4	**5**	
5	**5**	
6	**6**	
7	**5**	
8	**8**	
9	**6**	
Total	**50**	

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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 of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions.*

1. In tigers the normal fur colour is mainly orange with black stripes. This orange colour is caused by a dominant allele **R**.

Tiger

Source: *Google Images*

Over a number of years, a pair of heterozygous orange tigers named Sashi and Ravi produced 13 cubs in a Zoo in India. Three of these cubs were white. (White with black stripes).

(a) (i) State the genotypes of Sashi and Ravi. [1]

Sashi ..... Ravi .....

(ii) Complete the Punnett square below to show how the white cubs were produced. [2]

Gametes		

(b) Complete the Punnett square below to show how an orange tiger mated with a white tiger could produce offspring **all** of which were orange. [2]

Gametes		

(c) The orange tigers and the white tigers are the same species *(Panthera tigris)*.
What name is given to the differences that are found between organisms of the same species? [1]

.....

6

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2. *(a)* (i) Name the organ in the body which produces insulin. [1]

.....

(ii) I. How does insulin reduce the concentration of glucose in the blood? [1]

.....

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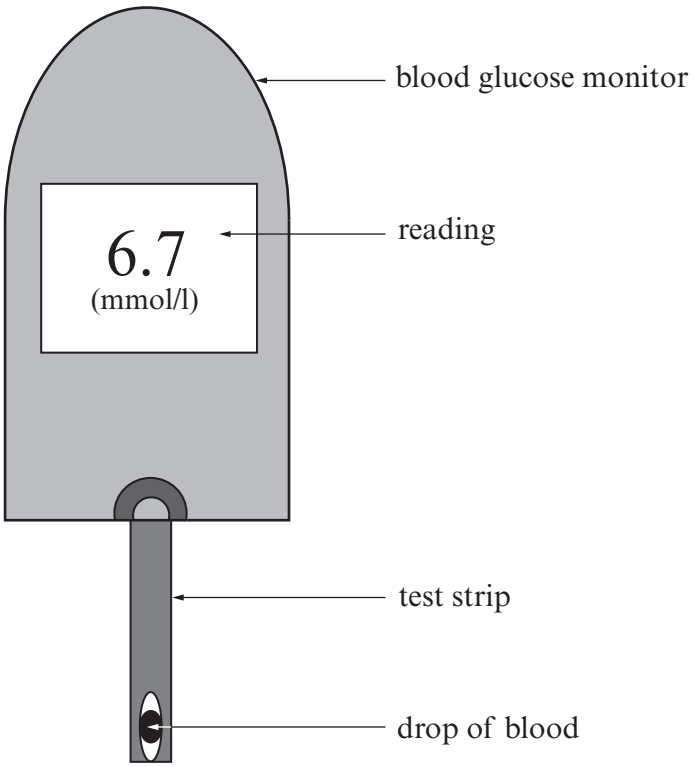
II. In which organ in the body does this take place? [1]

.....

(b) Owen has diabetes. He measures his blood glucose level using a monitor.



Owen injects himself with a measured dose of insulin before each meal. The dose depends on his blood glucose reading. If the glucose reading is high, Owen injects a higher dose of insulin.

Owen monitors his blood glucose regularly throughout each day. He records his readings in a diary. He tries to keep his blood glucose reading within the normal range of 4.0 - 7.0 (mmol/l).

The table below shows a section from Owen's diary over a 3 day period.

	Owen's blood glucose level (mmol/l)						
Date	*Before breakfast*	*2 hours after breakfast*	*Before midday meal*	*2 hours after midday meal*	*Before evening meal*	*2 hours after evening meal*	*Before bed*
29 Jan 09	7.0		9.1	6.8	4.3	(14.2)	12.9
30 Jan 09	9.0	7.5	7.1		6.2		7.9
31 Jan 09	5.3		7.4		(2.9)		8.2

(i) Suggest a reason for:

I. the high reading 2 hours after the evening meal on 29 Jan (circled); [1]

.....

.....

II. the low reading before the evening meal on 31 Jan (circled). [1]

.....

.....

(ii) Suggest why Owen always measures his blood glucose before bedtime. [1]

.....

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3. Some people are at higher risk of heart attack because their blood contains a high level of cholesterol.

Simvastatin and Pravastatin are drugs which lower the cholesterol in the blood.

A trial was carried out to find out which of the 2 drugs was more effective in reducing heart attacks.

- The same number of patients were given either Simvastatin, Pravastatin or a placebo (a pill containing neither drug).
- The patients did not know which pill they were taking.
- The level of cholesterol in the blood of the patients at the start of the trial was the same.

The results are shown in the table below.

Treatment	People who had heart attacks (%)
Simvastatin	26
Pravastatin	11
Placebo	33

(a) Suggest what conclusion the researchers came to at the end of the trial. [1]

.....

.....

(b) Suggest **one** reason why a placebo was used in this trial. [1]

.....

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(c) Give **one** way in which the trial was kept fair. [1]

.....

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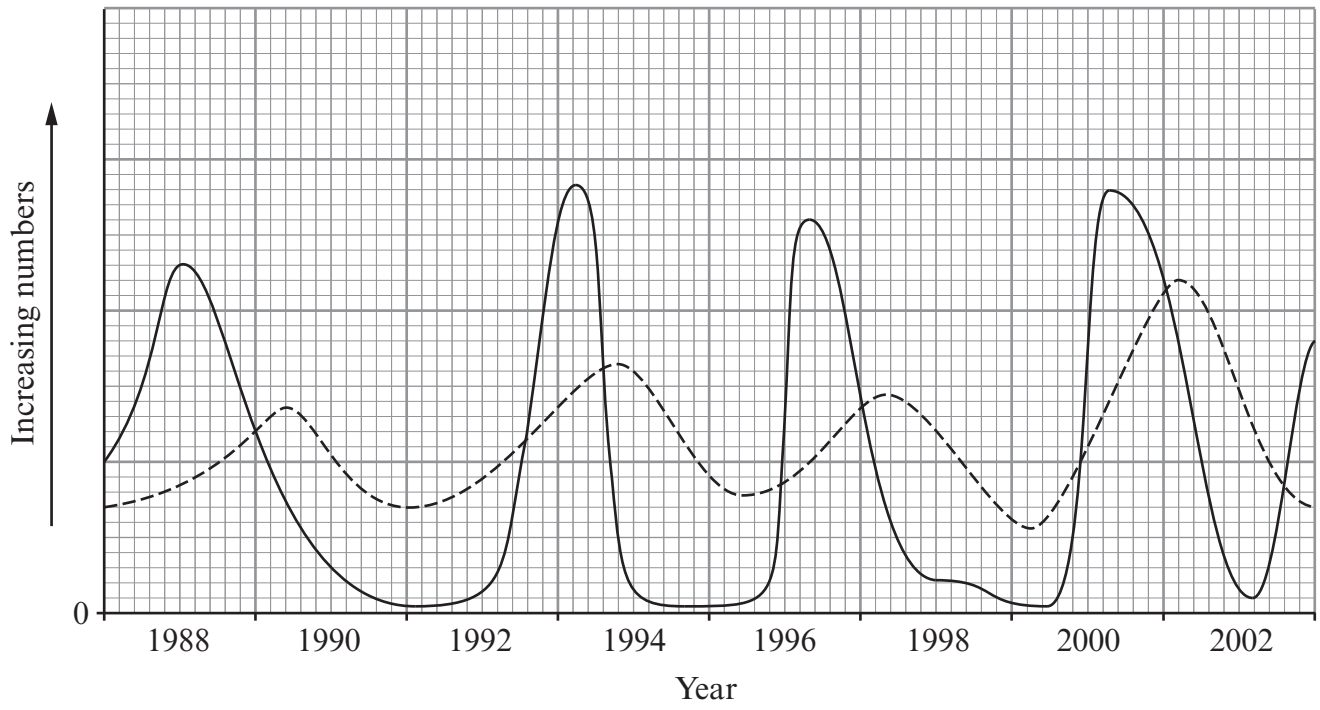
3

Examiner only

4. Lemmings are small mammals that are found in the Arctic. Their main predator is the Arctic fox. The population of lemmings peaks and troughs at regular intervals.
The graph shows the population of lemmings and Arctic foxes between 1988 and 2002.



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(a) What is the approximate period of time between the population peaks of lemmings? [1]

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(b) Use the graph to state the relationship between the number of lemmings and the number of Arctic foxes. [1]

.....

(c) Suggest **two** factors, other than predation, that might be responsible for the decrease in lemming populations after each peak. [2]

(i) .....

(ii) .....

(d) The lemming is the preferred food of the Arctic fox. When the lemming population crashes the Arctic foxes eat Brent geese instead. Describe how the numbers of Brent geese might change between 1988 and 1992. [1]

.....

5

Turn over.

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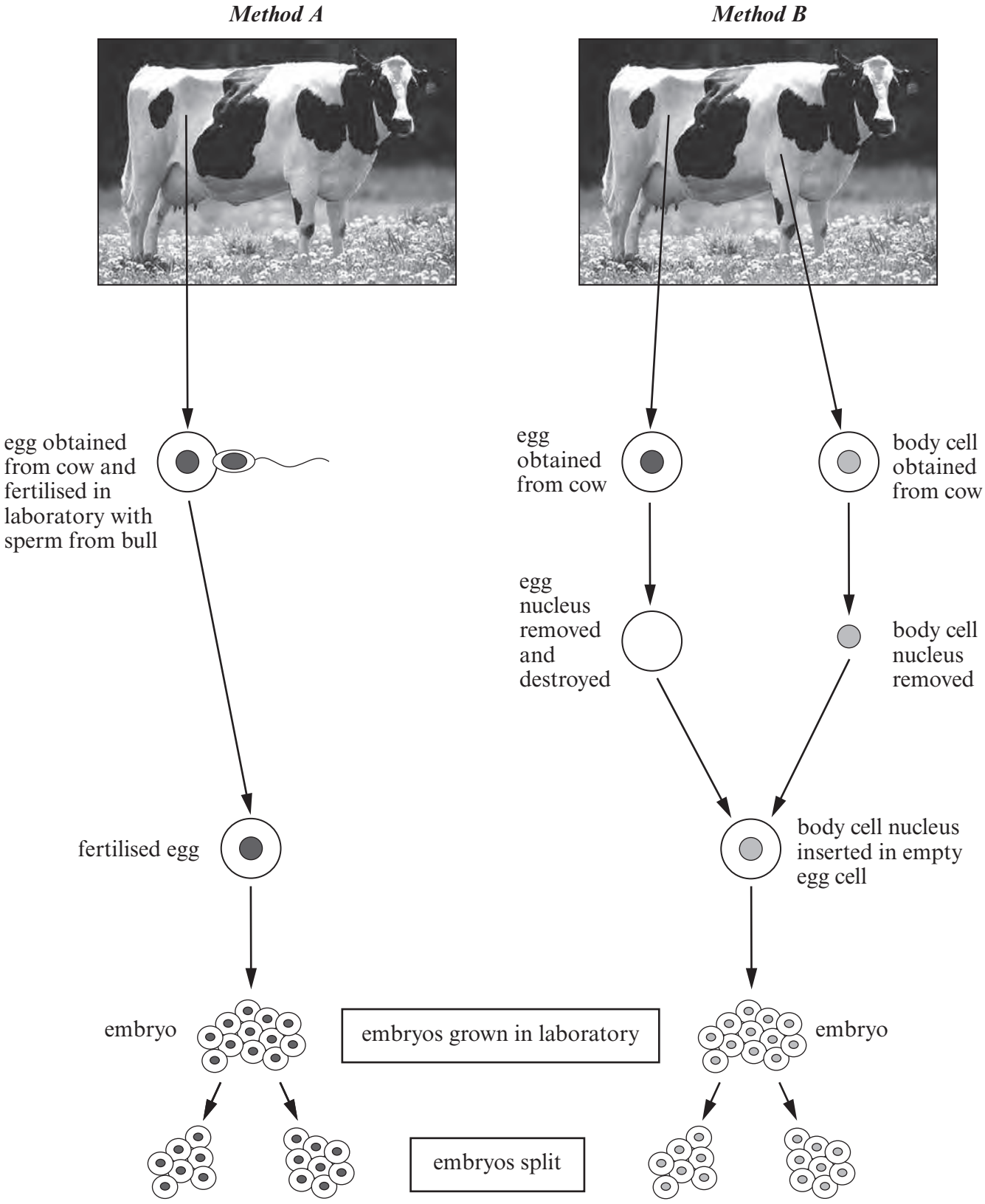
5. A farmer had cows which produced a high yield of milk. The farmer decided to produce calves from these dairy cows. She wanted to produce as many calves as possible in the shortest time and decided to use embryo splitting. Two methods were available as shown below.



Female embryos are selected and placed into surrogate mother cows and develop into normal calves.

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(a) The farmer wanted to increase the number of cows with a high milk yield. Which of the Methods A or B, would you advise the farmer to use?

Method .....

Explain your answer. [2]

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.....

.....

.....

(b) The scientists carrying out the embryo splitting process would have to guarantee to the farmer that only **female** calves would be produced when Method A is used. How would they do this? [2]

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.....

(c) What word is used to describe the calves produced by embryo splitting? [1]

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5

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6. *(a)* Cigarette smokers become addicted to tobacco because it contains a chemical that affects nerve centres in the brain.

Name this chemical ..... [1]

(b) Smokers who try to give up the habit sometimes use patches of material containing the addiction-causing chemical. The patches are attached to the skin.
How does this chemical pass from the skin to the brain? [1]

.....

(c) In *The Times* in 1994, it was reported that a parrot kept as a pet in a living room, died of lung cancer. Its owner smoked 40 cigarettes each day.
What does this suggest about the benefits of banning smoking in public places such as restaurants and shops? [1]

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(d) State **one** withdrawal symptom of giving up smoking. [1]

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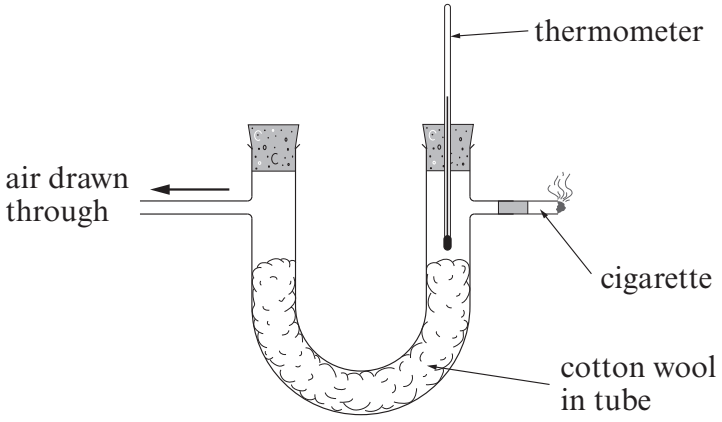
(e) The following apparatus was used in a fume cupboard to investigate some effects of smoking.



Within 3 minutes the cotton wool had changed colour.

Which part of the body is represented by the cotton wool? ..... [1]

(f) Other than lung cancer, state **one** of the harmful effects of smoking. [1]

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.....

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6

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7. *(a)* Underline the correct answer to complete the statement below: [1]

A withdrawal reflex action begins with

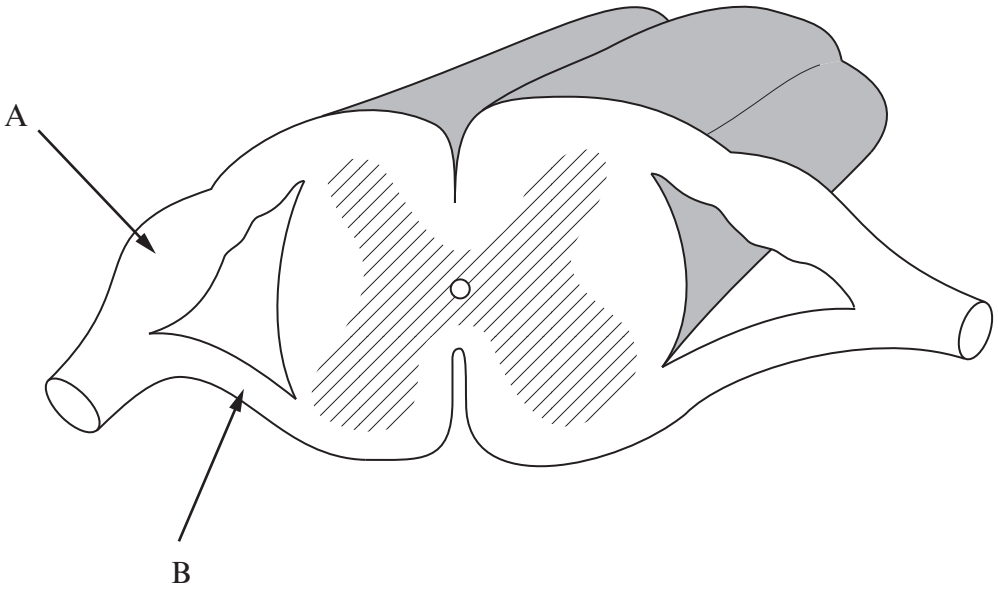
(i) a painful sensation;

(ii) stimulation of a receptor;

(iii) an unconscious impulse in the spinal cord;

(iv) an unconscious impulse in the brain.

(b) The diagram shows a section through the spinal cord in a human.



(i) In a reflex arc, name the type of nerve cell which is present in [2]

A .....

B .....

(ii) I. Name the nerve cell which links A and B in the spinal cord. [1]

.....

II. Name the gaps between nerve cells. [1]

.....

5

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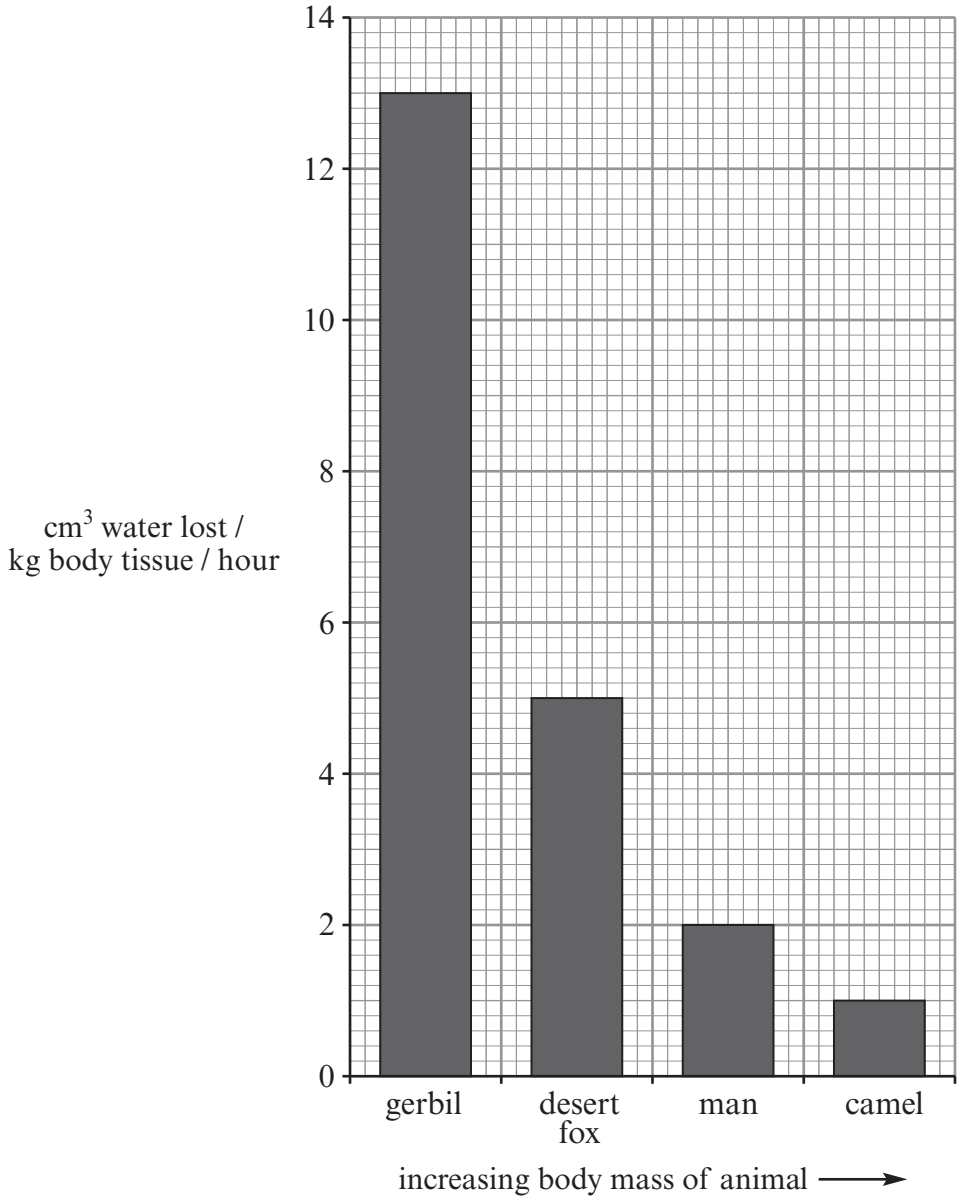
8. Different mammals have to lose different volumes of water to keep their body temperatures constant in a desert. This is shown in the bar chart below:



Use the data in the bar chart to answer the following.

(a) (i) What is the effect of **increasing** body mass on the volume of water lost per kg? [1]

.....

(ii) The body mass of a desert fox is 3 kg.
Calculate the volume of water it would have to lose in 12 hours to keep its body temperature constant. [2]
Show your working.

Volume of water lost = ...

Examiner only

(b) (i) Explain how the loss of water helps humans to maintain a constant body temperature. [2]

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(ii) Suggest why it is an advantage to a camel to lose so little water when keeping its body temperature constant. [1]

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(iii) Gerbils are most active in deserts at night. Suggest why this adaptation is an advantage to the gerbil. [2]

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8

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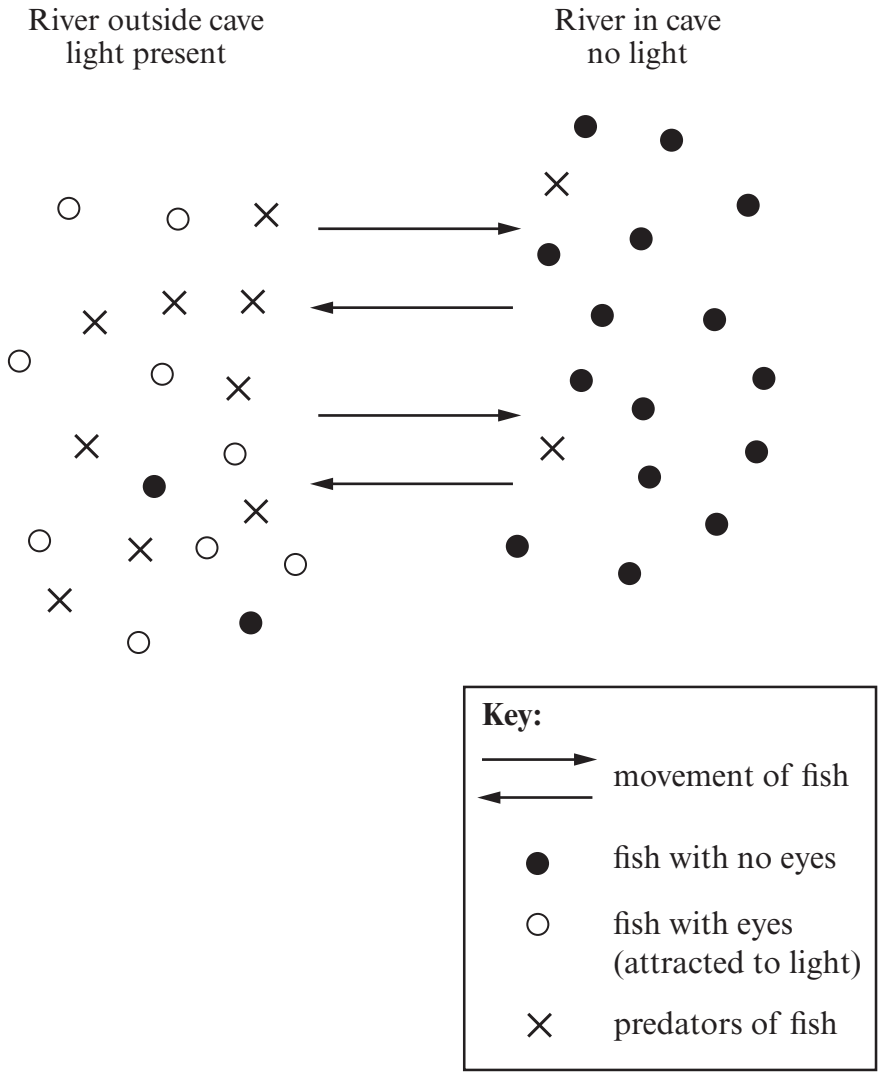
9. There are 38 known species of fish with no eyes which live in rivers flowing in caves. A scientist produced a computer model to suggest an explanation of how these blind cave fish have developed over millions of years. It is assumed that the ancestors of these fish had eyes but that occasionally some fish did not have eyes when they hatched from eggs.
Below is a computer model that the scientist produced.



(a) What name is given to the change from one species into another over millions of years? [1]

.....

(b) Name the part of the fish's chromosome which controls the development of eyes. [1]

.....

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(c) Use your knowledge and the information given to explain how natural selection has allowed the new species of blind cave fish to develop from their ancestors that had eyes. [4]

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