A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE
BIOLOGY
Higher Tier Paper 2H
8461/2H

Monday 11 June 2018 Morning

Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

For this paper you must have:
- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions in the spaces provided.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**

INFORMATION

- **There are 100 marks available on this paper.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

0 1 **Many human actions are reflexes.**

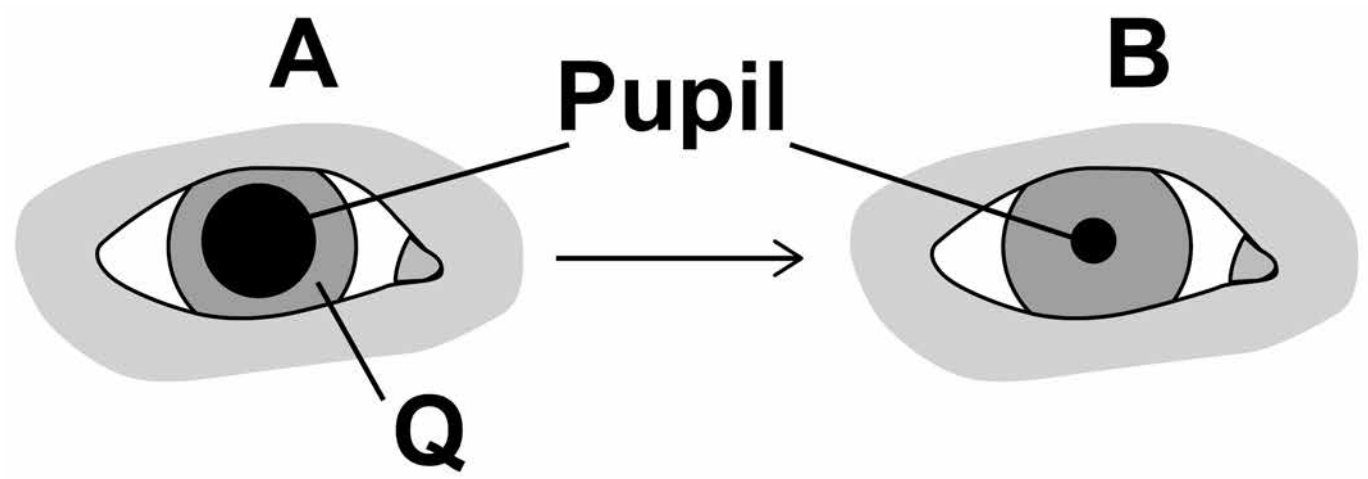
0 1 . 1 **Which TWO of the following are examples of reflex actions?**
[2 marks]

Tick TWO boxes.

- ☐ **Jumping in the air to catch a ball**
- ☐ **Raising a hand to protect the eyes in bright light**
- ☐ **Releasing saliva when food enters the mouth**
- ☐ **Running away from danger**
- ☐ **Withdrawing the hand from a sharp object**

FIGURE 1 shows how the size of the pupil of the human eye can change by reflex action.

FIGURE 1



0 1 . 2 Name ONE stimulus that would cause the pupil to change in size from A to B, as shown in FIGURE 1. [1 mark]

_____

0 1 . 3 Structure Q causes the change in size of the pupil.

Name structure Q. [1 mark]

_____

[Turn over]

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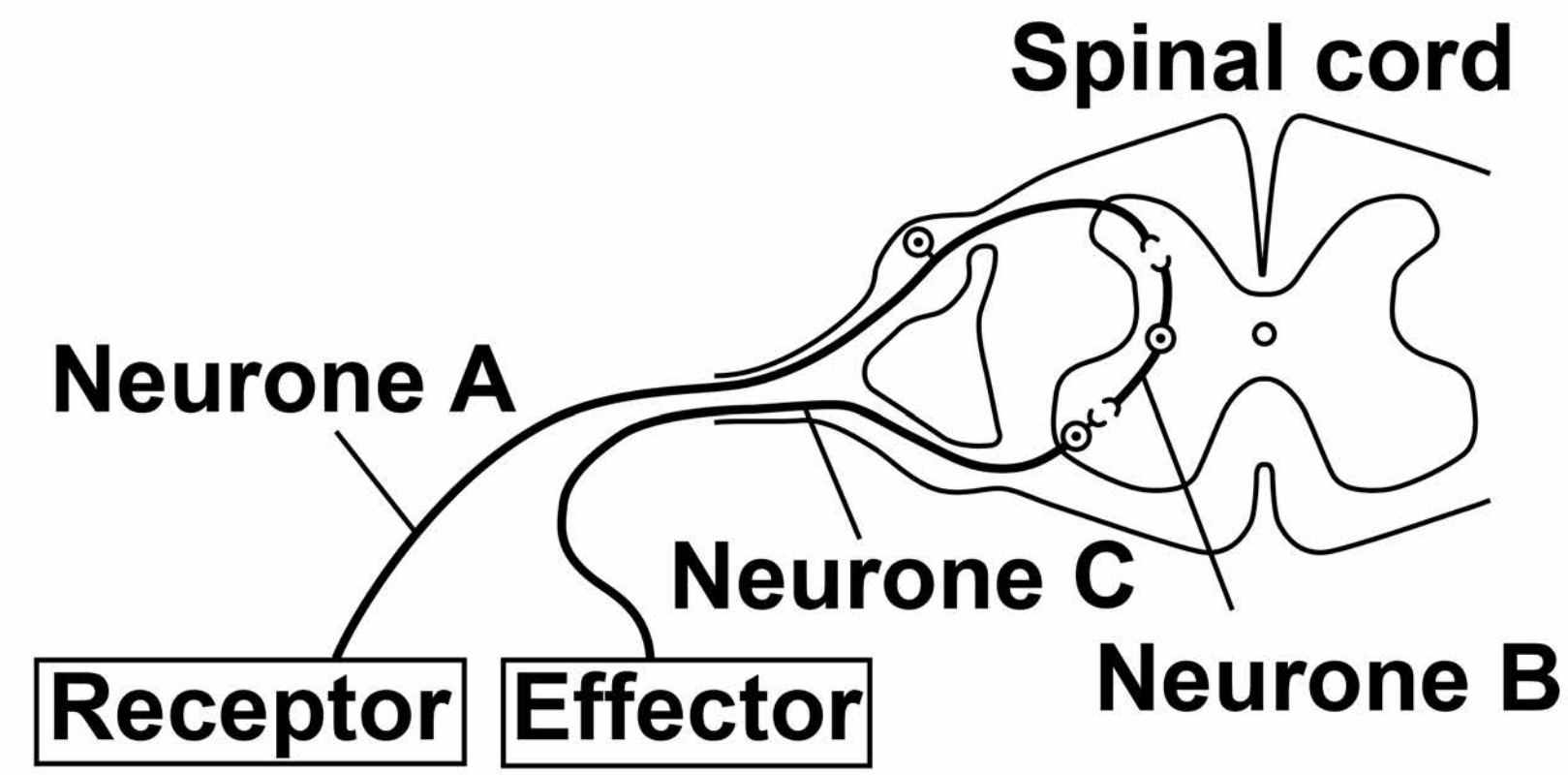
0 1 . 4 **Describe how structure Q causes the change in the size of the pupil from A to B.**
[1 mark]

0 1 . 5 **FIGURE 2 shows some structures involved in the coordination of a reflex action.**

FIGURE 2

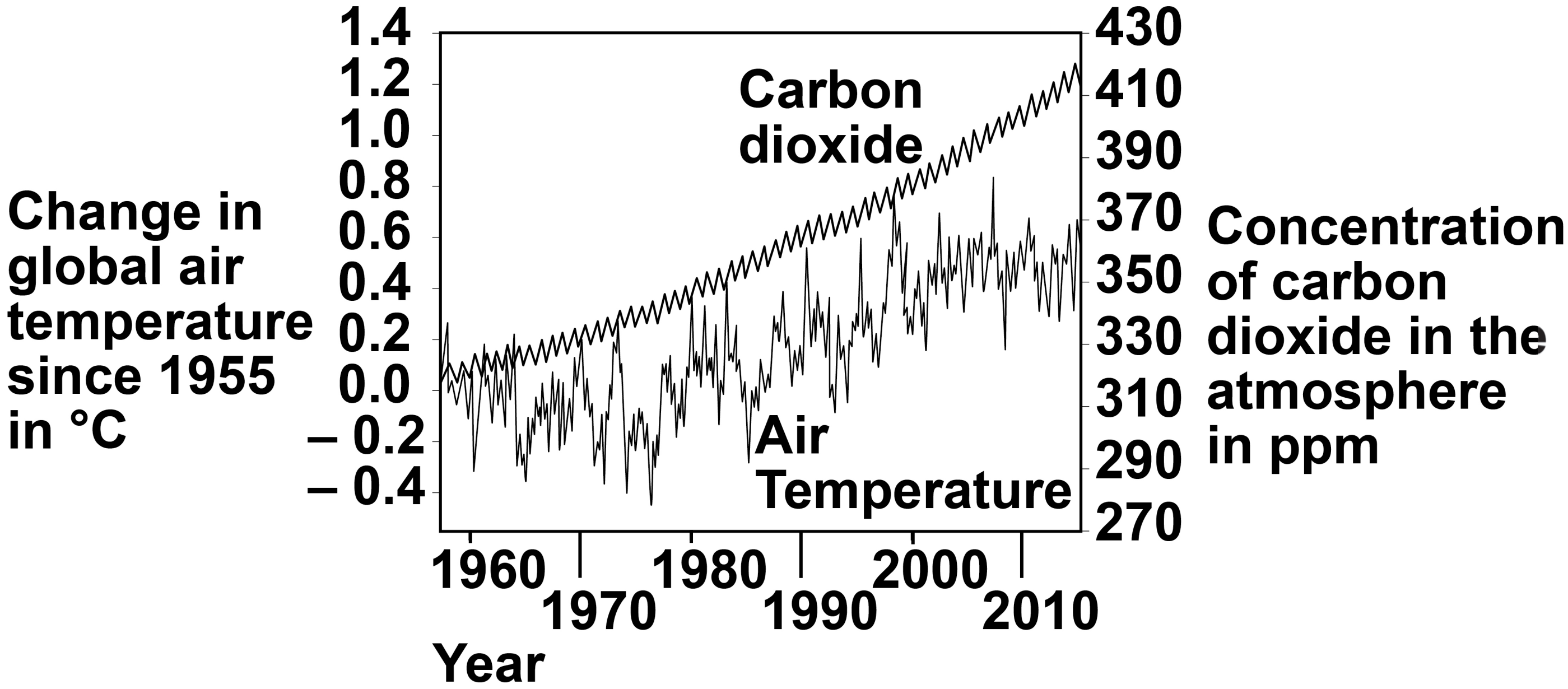


Describe how the structures shown in FIGURE 2 help to coordinate a reflex action.
[6 marks]

0 2 **Many scientists think that global air temperature is related to the concentration of carbon dioxide in the atmosphere.**

FIGURE 3 shows changes in global air temperature and changes in the concentration of carbon dioxide in the atmosphere.

FIGURE 3



[Turn over]

0 2 . 1 **Complete TABLE 1, on page 13.**

Use information from FIGURE 3, on page 11.
[2 marks]

Choose answers from the list below.

You may use each answer once, more than once or not at all.

constant

decreasing

increasing

TABLE 1

	1960 – 1977	1977 – 2003	2003 – 2015
Trend in carbon dioxide concentration	Increasing		
Trend in air temperature			

[Turn over]

Many scientists think that an increase in carbon dioxide concentration in the atmosphere causes an increase in air temperature.

0 2 . 2 How would an increase in the concentration of carbon dioxide in the atmosphere cause an increase in air temperature? [1 mark]

0 2 . 3 **Evaluate evidence for and against the theory that an increase in the concentration of carbon dioxide in the atmosphere causes an increase in air temperature.**

Use data from FIGURE 3, on page 11, and your own knowledge. [4 marks]

[Turn over]

In each year, the concentration of carbon dioxide in the atmosphere is higher in the winter than in the summer.

0 2 . 4 Give ONE human activity that could cause the higher concentration of carbon dioxide in the winter. [1 mark]

0 2 . 5 Give ONE biological process that could cause the lower concentration of carbon dioxide in the summer. [1 mark]

0 2 . 6 **Give TWO possible effects of an increase in global air temperature on living organisms. [2 marks]**

1 _____

_____

2 _____

_____

_____

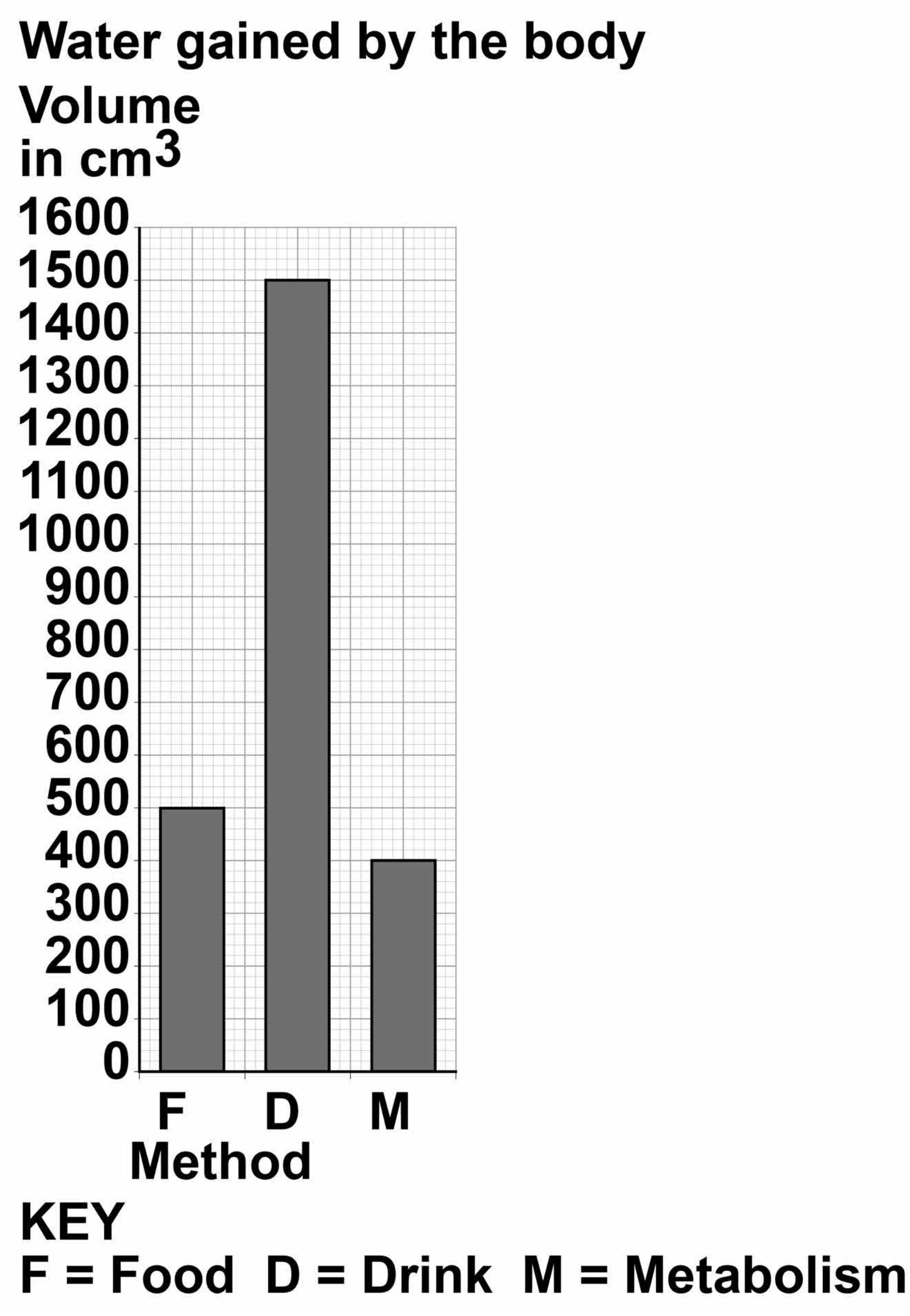
11

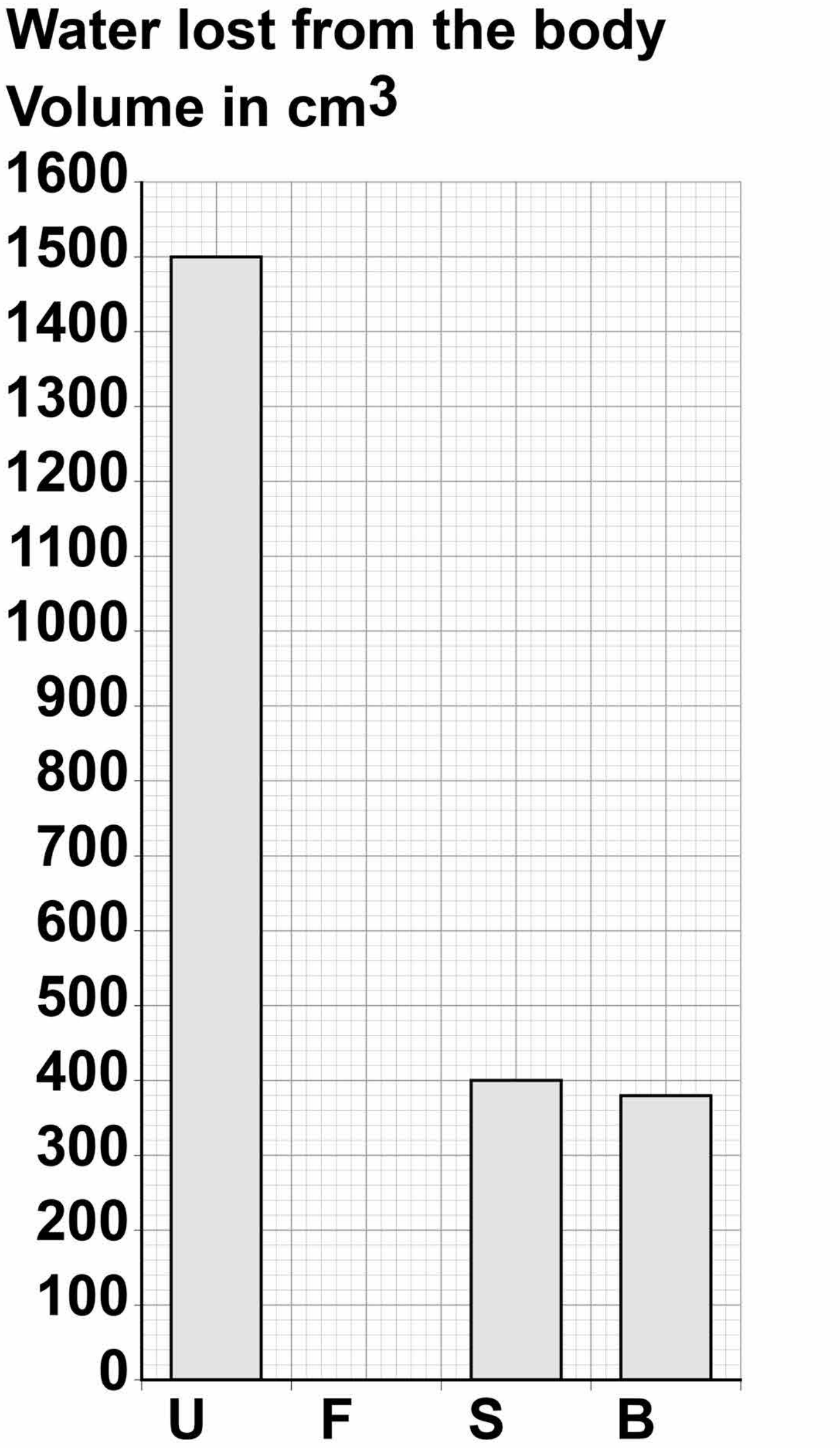
0 3 **It is important to maintain water balance in the body.**

FIGURE 4, on pages 20 and 21, shows how much water a person gained and lost by different methods in one day.

[Turn over]

FIGURE 4





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When water is balanced, the volume of water taken in by the body is equal to the volume of water lost from the body.

0 3 . 1 Calculate the volume of water the person lost in one day in faeces.

Use information from FIGURE 4 on pages 20 and 21. [2 marks]

Volume lost in faeces =

_____ cm^3

0 3 . 2 **FIGURE 4, on pages 20 and 21, shows that one method of gaining water is by metabolism.**

Which metabolic process produces water? [1 mark]

Tick ONE box.

- ☐ **Breakdown of protein to amino acids**
- ☐ **Changing glycogen into glucose**
- ☐ **Digestion of fat**
- ☐ **Respiration of glucose**

The next day, the person ran a 10-kilometre race.

The volume of water lost from the body through the skin and by breathing increased.

0 3 . 3 Explain why more water was lost through the skin during the race. [2 marks]

0 3 . 4 **Explain why more water was lost by breathing during the race. [3 marks]**

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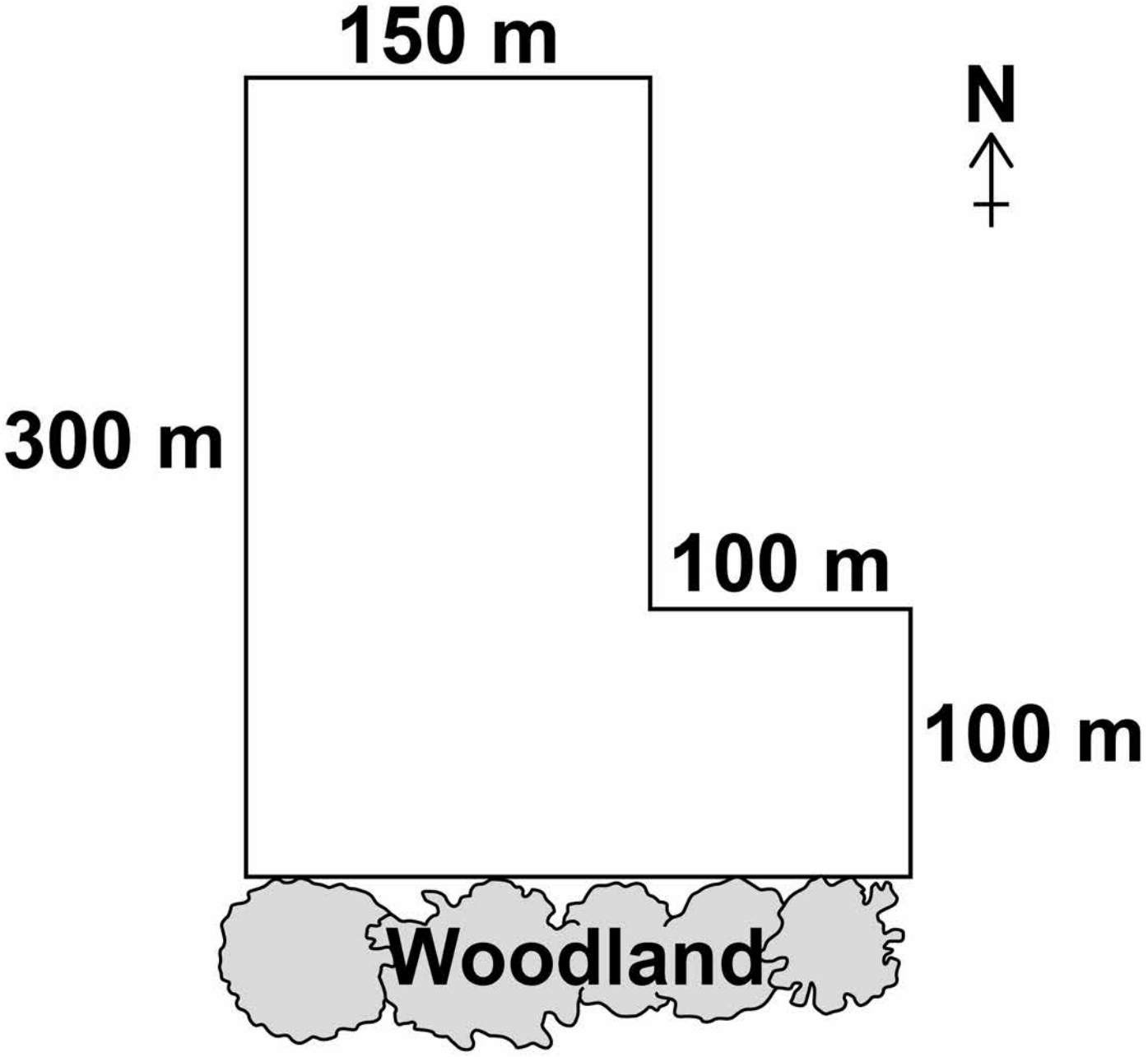
[Turn over]

0 4 **Some students investigated the size of a population of dandelion plants in a field.**

FIGURE 5 shows the field.

FIGURE 5



The students:

- **placed a 1 m x 1 m square quadrat at 10 random positions in the field**
- **counted the number of dandelion plants in each quadrat.**

TABLE 2 shows the students' results.

TABLE 2

Quadrat number	Number of dandelion plants
1	6
2	9
3	5
4	8
5	0
6	10
7	2
8	1
9	8
10	11

[Turn over]

0 4 . 1 **Why did the students place the quadrats at random positions? [1 mark]**

_____

_____

_____

0 4 . 2 **Estimate the total number of dandelion plants in the field.**

Calculate your answer using information from FIGURE 5 and TABLE 2.

Give your answer in standard form. [5 marks]

Total number of dandelion plants =

Quadrats 5, 7 and 8 were each placed less than 10 metres from the woodland.

These quadrats contained low numbers of dandelion plants.

The students made the hypothesis:

‘Light intensity affects the number of dandelion plants that grow in an area.’

0 4 . 3 Plan an investigation to test this hypothesis. [6 marks]

[Turn over]

BLANK PAGE

0 4 . 4 **Light is an environmental factor that affects the growth of dandelion plants.**

Give TWO other environmental factors that affect the growth of dandelion plants. [2 marks]

1 _____

_____

2 _____

_____

14

0 5 **Cell division is needed for growth and for reproduction.**

0 5 . 1 **TABLE 3 contains three statements about cell division.**

Complete TABLE 3. [2 marks]

Tick ONE box for each statement.

TABLE 3

	Statement is true for		
Statement	**Mitosis only**	**Meiosis only**	**Both mitosis and meiosis**
All cells produced are genetically identical			
In humans, at the end of cell division each cell contains 23 chromosomes			
Involves DNA replication			

[Turn over]

Bluebell plants grow in woodlands in the UK.

- **Bluebells can reproduce sexually by producing seeds.**
- **Bluebells can also reproduce asexually by making new bulbs.**

0 5 . 2 One advantage of asexual reproduction for bluebells is that only ONE parent is needed.

Suggest TWO other advantages of asexual reproduction for bluebells. [2 marks]

1 _____

_____

2 _____

_____

_____

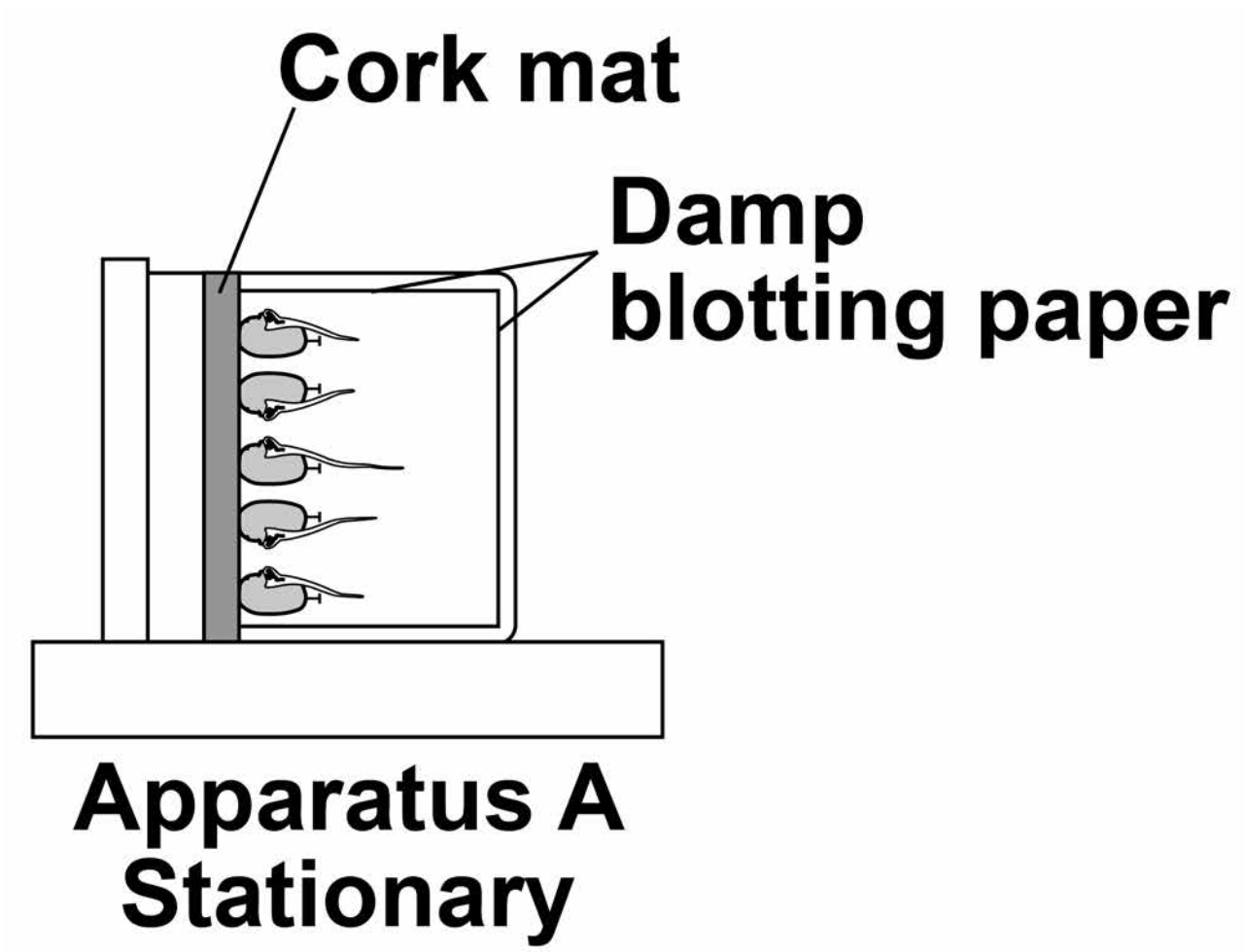
0 5 . 3 **Explain why sexual reproduction is an advantage for bluebells.**
[4 marks]

8

0 6 **Some students investigated geotropism in the roots of bean seedlings.**

FIGURE 6 shows the apparatus used.

FIGURE 6



This is the method used.

1. Measure the length of the root of each of 10 bean seedlings.

2. Pin 5 seedlings to the cork mat in apparatus A.

3. Pin 5 seedlings to the cork mat in apparatus B.

4. Leave A and B in a dark cupboard for 2 days.

5. After the 2 days:
   - make a drawing to show the appearance of each seedling
   - measure the length of the root of each seedling.

[Turn over]

BLANK PAGE

0 6 . 1 **Why did the students surround the seedlings with damp blotting paper? [1 mark]**

Tick ONE box.

- ☐ **To prevent light affecting the direction of root growth**
- ☐ **To prevent photosynthesis taking place in the roots**
- ☐ **To prevent the growth of mould on the roots**
- ☐ **To prevent water affecting the direction of root growth**

[Turn over]

Apparatus B is a control.

Apparatus B rotates slowly.

0 6 . 2 How does apparatus B act as a control?
[1 mark]

TABLE 4 shows the students' results.

TABLE 4

	Apparatus A					Apparatus B				
Seedling number	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Length at start in mm	**35**	**41**	**32**	**33**	**39**	**30**	**33**	**29**	**28**	**31**
Length after 2 days in mm	**49**	**57**	**43**	**45**	**54**	**45**	**45**	**44**	**29**	**44**
Length change in mm	**14**	**16**	**11**	**12**	**15**	**15**	**12**	**15**	**1**	**13**
Mean length change in mm	**14**					**11**				

[Turn over]

0 6 . 3 **One student stated:**

‘The mean length change for the seedlings in apparatus B is NOT valid.’

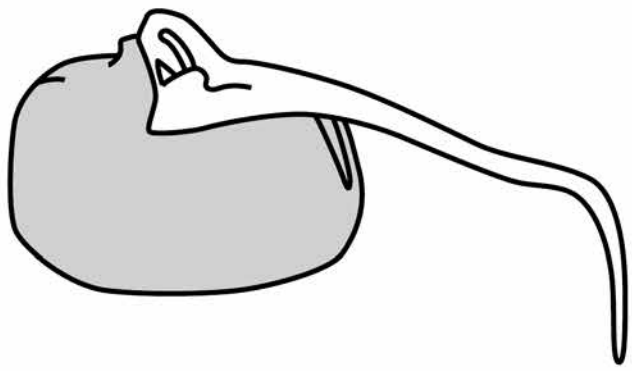
Suggest the reason for the student’s statement.
[1 mark]

0 6 . 4 **Suggest ONE improvement the students could make to obtain a more valid mean length change for the seedlings in apparatus B.**
[1 mark]

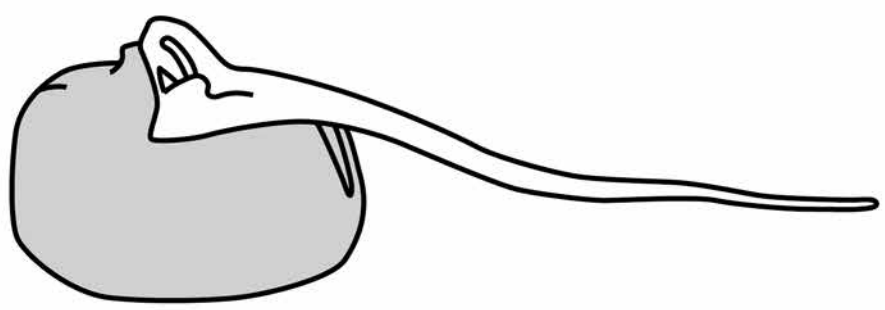
[Turn over]

0 6 . 5 **FIGURE 7 shows the students' drawings of two seedlings at the end of the 2 days.**

FIGURE 7



Seedling from Apparatus A



Seedling from Apparatus B

A plant hormone is made in the root tip.

The hormone diffuses from the tip into the tissues of the root.

Explain how the hormone causes the appearance of the seedlings in FIGURE 7 to be different.

You should refer to BOTH seedlings in your answer. [3 marks]

0 6 . 6 In horticulture plant hormones are used for controlling plant growth.

Draw ONE line from each plant hormone to the correct use of that hormone. [3 marks]

Plant hormone	Use of hormone
Auxin	To reduce the time taken for tomatoes to ripen
Ethene	To slow down the growth of plant stems
Gibberellin	To promote seed germination
	To stimulate root growth in plant cuttings

[Turn over]

10

0 7 **FIGURE 8 shows:**

- **a food chain for organisms in a river**
- **the biomass of the organisms at each trophic level.**

FIGURE 8

Algae	→	Invertebrate animals	→	Small fish	→	Large fish
Biomass in g/m^2:		**840**		**200**		**40**		**10**

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[Turn over]

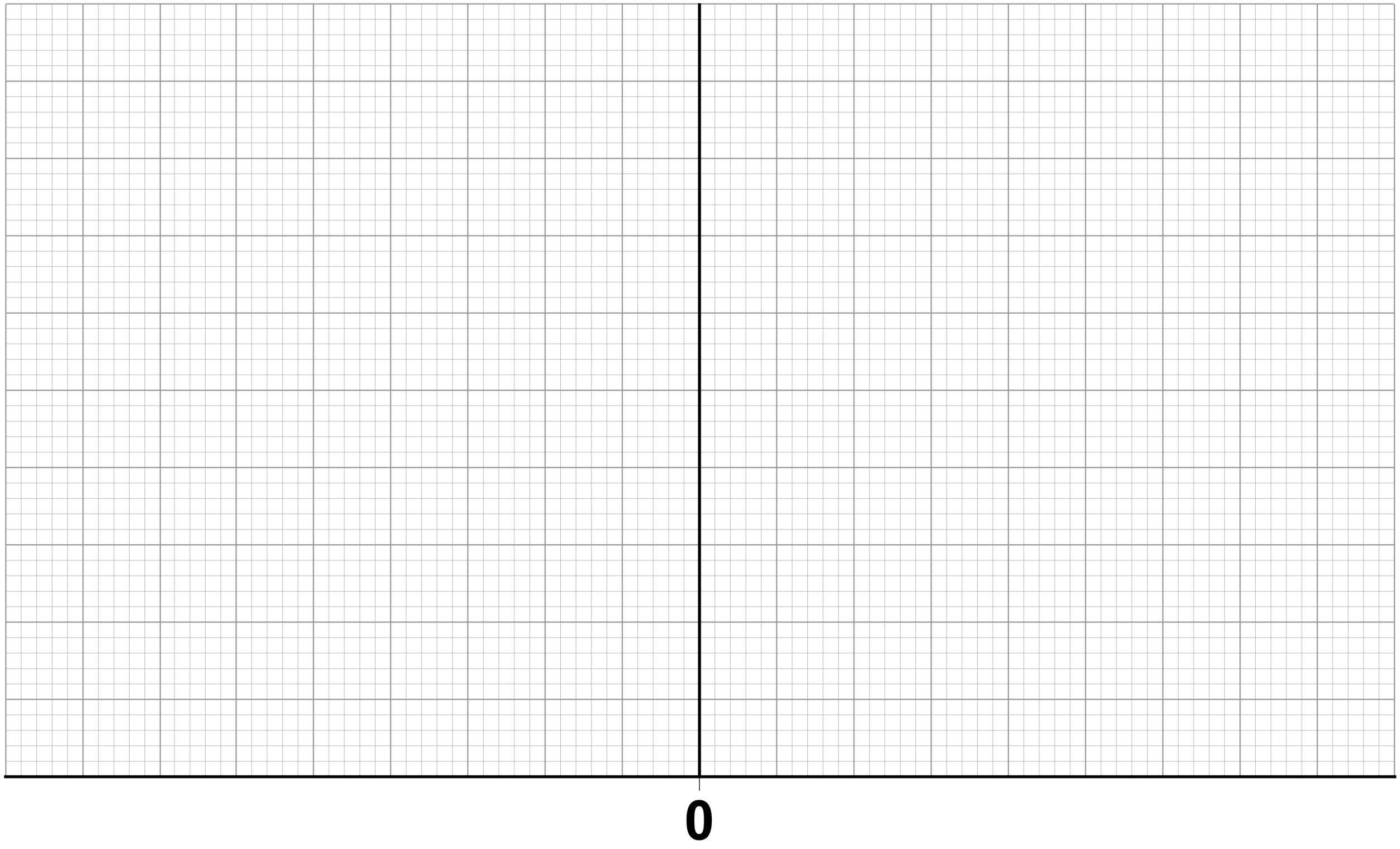
0 7 . 1 **Draw a pyramid of biomass for the food chain in FIGURE 8 on FIGURE 9.**

You should:

- **use a suitable scale**
- **label the x-axis**
- **label each trophic level.**

[4 marks]

FIGURE 9



0 7 . 2 **Calculate the percentage of the biomass lost between the algae and the large fish.**

Give your answer to 2 significant figures.
[3 marks]

Percentage loss = _____

0 7 . 3 **Give ONE way that biomass is lost between trophic levels. [1 mark]**

[Turn over]

0 7 . 4 **A large amount of untreated sewage entered the river. Many fish died.**

Untreated sewage contains organic matter and bacteria.

Explain why many fish died.

[5 marks]

[Turn over]

0 8 **Scientists want to breed cows that produce milk with a low concentration of fat.**

FIGURE 10 shows information about the milk in one group of cows.

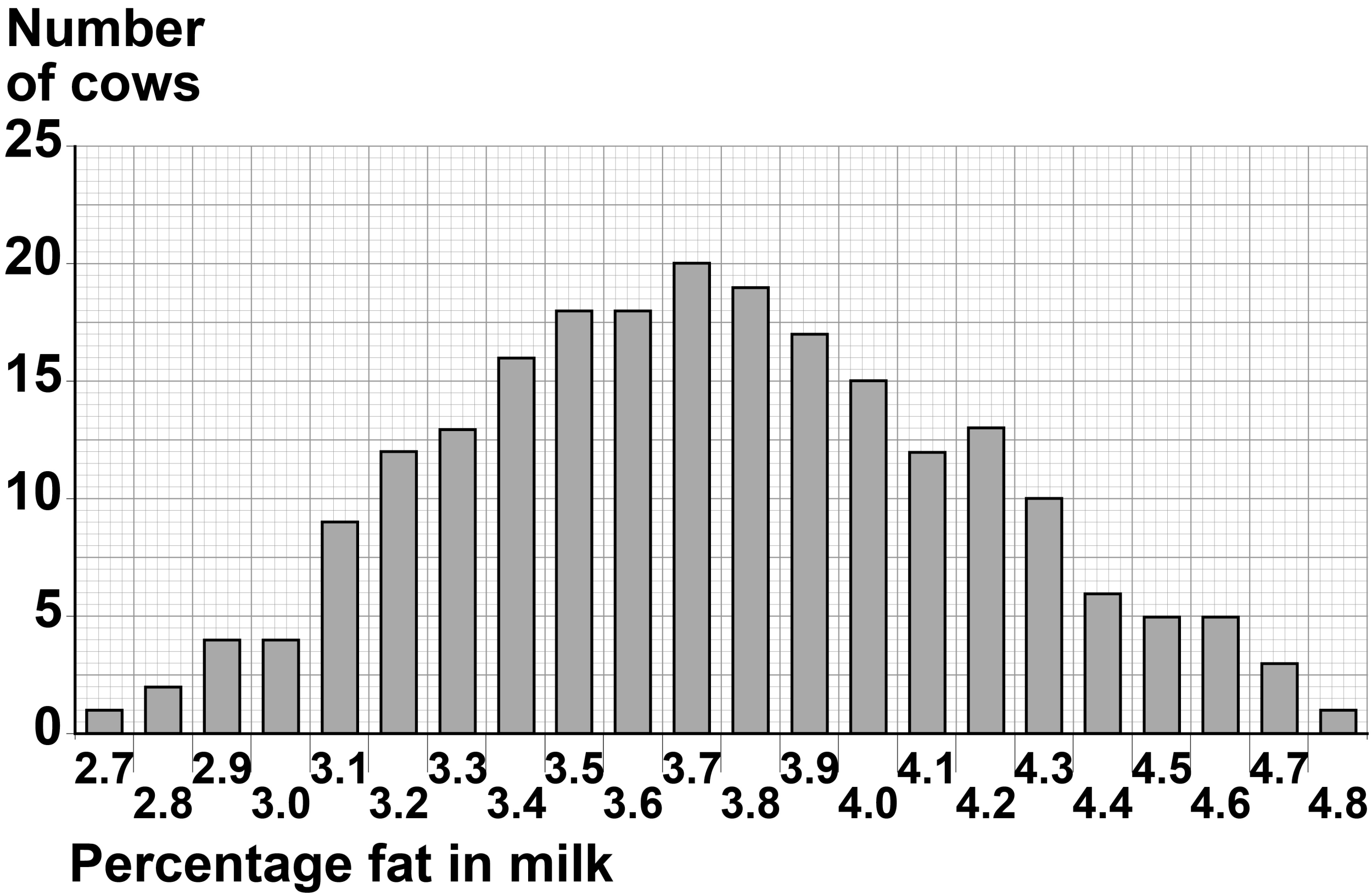
The cows were all the same type.

0 8 . 1 **In FIGURE 10 the mean percentage of fat in the milk is equal to the modal value.** **0 9**

Give the mean percentage of fat in the milk of these cows. [1 mark]

Mean percentage = _____

FIGURE 10



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0 8 . 2 **A student suggested:**

‘The percentage of fat in milk is controlled by one dominant allele and one recessive allele.’

How many different phenotypes would this produce? [1 mark]

Tick ONE box.

2		3		22		46	

0 8 . 3 **Give the evidence from FIGURE 10, on page 61, which shows the percentage of fat in the milk is controlled by several genes. [1 mark]**

[Turn over]

0 8 . 4 One of the genes codes for an enzyme used in fat metabolism.

A mutation in this gene causes a reduction in milk fat.

The mutation changes one amino acid in the enzyme molecule.

Explain how a change in one amino acid in an enzyme molecule could stop the enzyme working. [3 marks]

[Turn over]

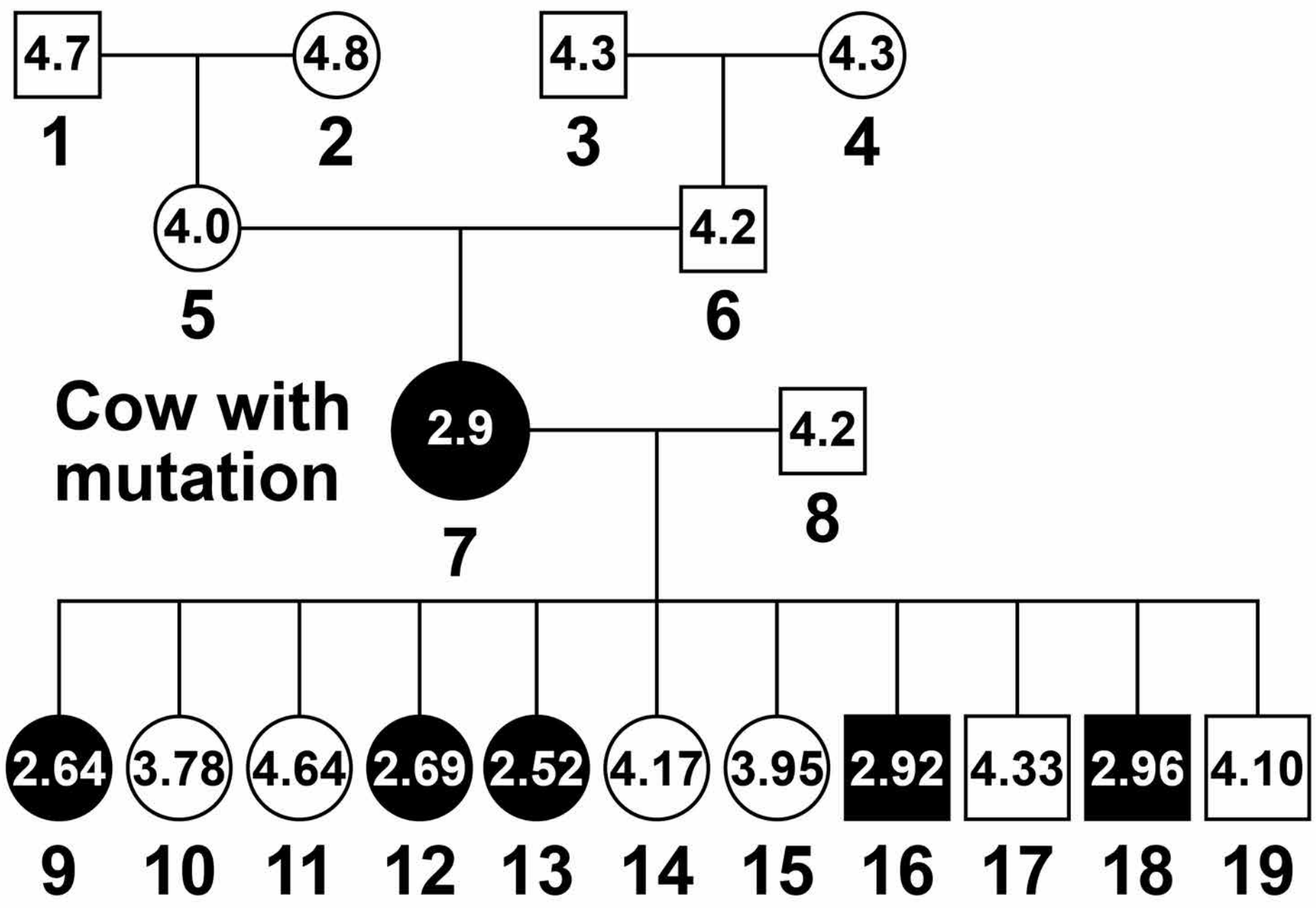
The scientists found one cow with a mutation.

The cow’s milk contained only 2.9% fat.

FIGURE 11 shows the percentage of fat in the milk of cattle related to the cow with the mutation.

The values for male cattle are the mean values of their female offspring.

FIGURE 11



KEY

● Female with low-fat milk

■ Male whose female offspring have low-fat milk

○ Female with high-fat milk

□ Male whose female offspring have high-fat milk

0 8 . 5 Animal 8 is homozygous.

The mutation in animal 7 produced a dominant allele for making low-fat milk.

Give evidence from FIGURE 11 that animal 7 is heterozygous.

[1 mark]

_____

_____

_____

[Turn over]

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0 8 . 6 **Animals 7 and 8 produced 11 offspring. These offspring were produced by in vitro fertilisation (IVF).**

The embryos from IVF were transferred into 11 other cows.

Suggest why IVF and embryo transfer were used rather than allowing animals 7 and 8 to mate naturally. [1 mark]

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0 8 . 7 **Draw a Punnett square diagram to show a cross between animals 7 and 8.**

Identify which offspring produce low-fat milk and which offspring produce high-fat milk.
[4 marks]

Use the following symbols:

D = dominant allele for making low-fat milk

d = recessive allele for making high-fat milk

0 8 . 8 **The scientists want to produce a type of cattle that makes large volumes of low-fat milk.**

The scientists will selectively breed some of the animals shown in FIGURE 11.

Describe how the scientists would do this. [4 marks]

[Turn over]

0 9 **FIGURE 12 shows a ring-tailed lemur.**

FIGURE 12

TABLE 5 shows part of the classification of the ring-tailed lemur.

0 9 . 1 Complete TABLE 5 to give the names of the missing classification groups. [2 marks]

TABLE 5

CLASSIFICATION GROUP	NAME
Kingdom	Animalia
Phylum	Chordata
	Mammalia
	Primates
	Lemuroidea
Genus	Lemur
	catta

0 9 . 2 **Give the binomial name of the ring-tailed lemur.**

Use information from TABLE 5.
[1 mark]

_____

_____

[Turn over]

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Lemurs are only found on the island of Madagascar.

Madagascar is off the coast of Africa.

Scientists think that ancestors of modern lemurs evolved in Africa and reached Madagascar about 50-60 million years ago.

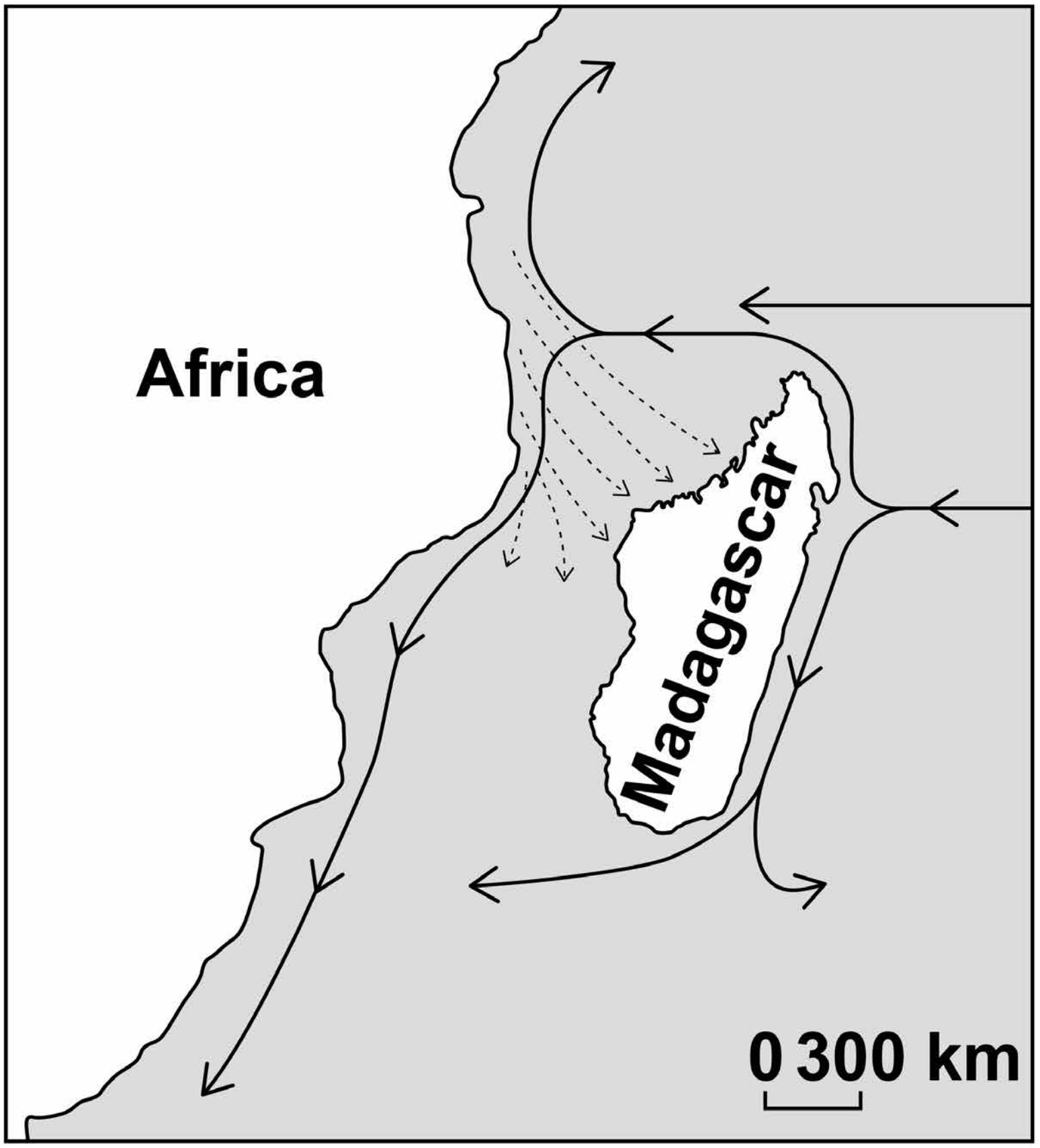
Today there are many species of lemur living on Madagascar.

FIGURE 13, on page 78, shows information about water currents.

FIGURE 14, on page 79, shows the distribution of three species of lemur on Madagascar.

[Turn over]

FIGURE 13

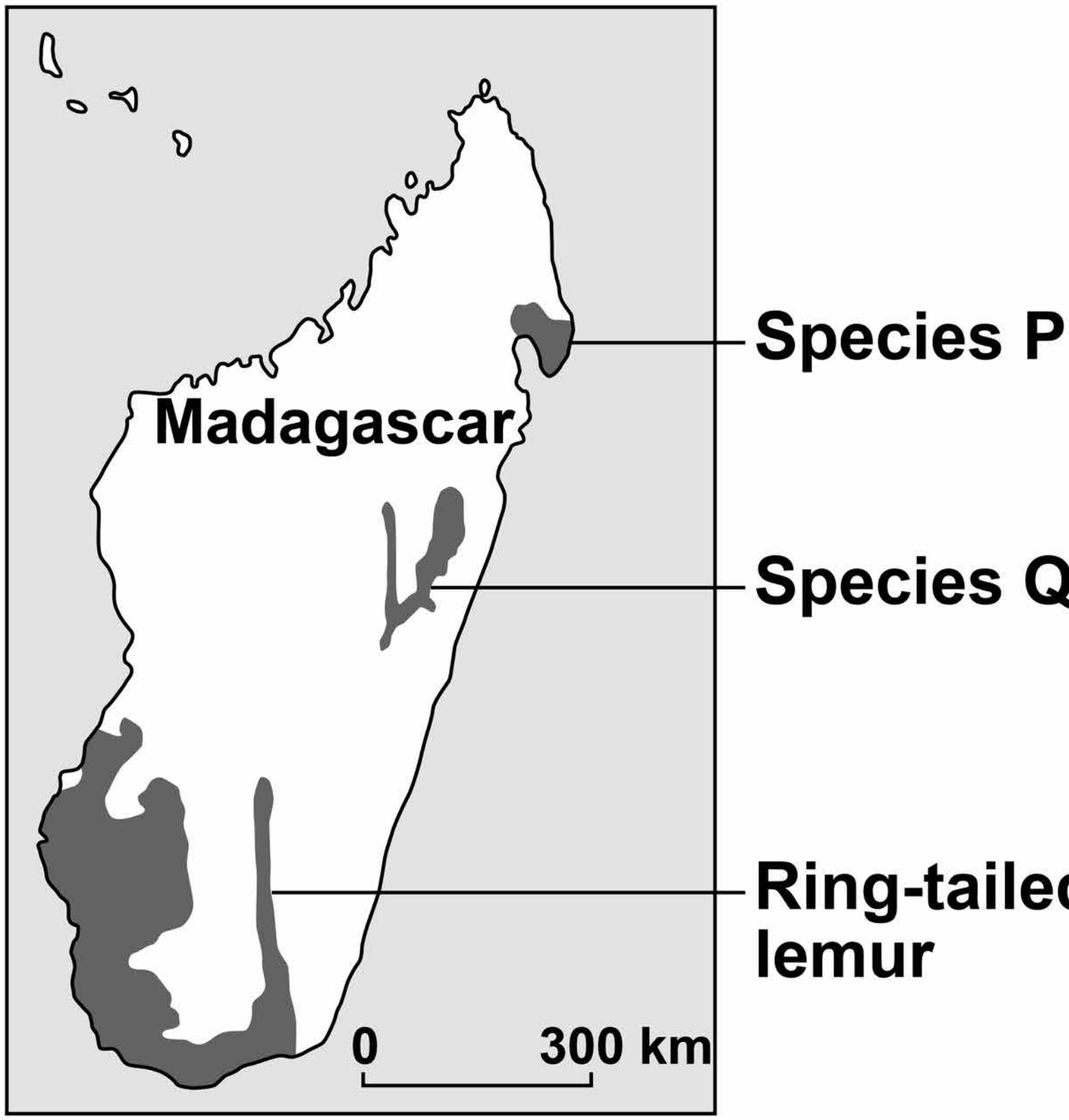


KEY

⇢ **Water currents**
50 – 60 million years ago

⟶ **Water currents today**

FIGURE 14



0 9 . 3 Suggest how ancestors of modern lemurs reached Madagascar. [1 mark]

0 9 . 4 **Describe how the ancestors of modern lemurs may have evolved into the species shown in FIGURE 14. [5 marks]**

END OF QUESTIONS

9

There are no questions printed on this page

For Examiner's Use	
Question	Mark
1	
2	
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4	
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8	
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TOTAL	