Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname

Forename(s)

Candidate signature

GCSE
BIOLOGY

H

Higher Tier Paper 2H

Monday 11 June 2018 Morning Time allowed: 1 hour 45 minutes

A

Materials

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

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

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0 1 Many human actions are reflexes.

0 1 . 1 Which two of the following are examples of reflex actions?

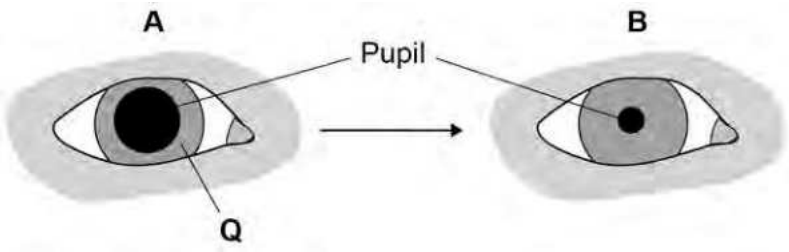
[2 marks]

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 2 *

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

Name structure Q.

[1 mark]

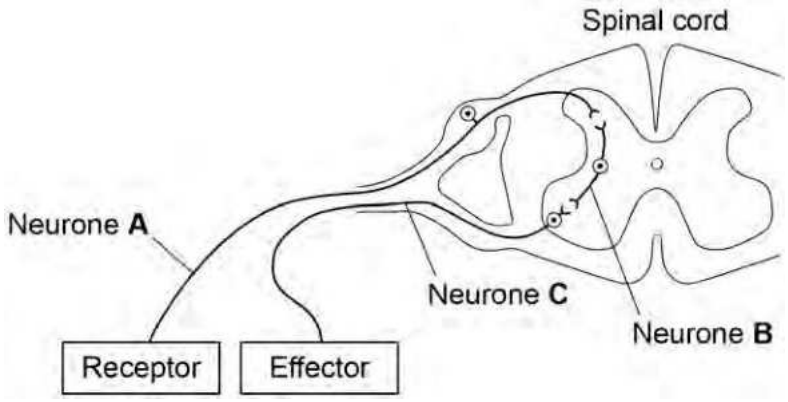
0 1 . 4 Describe how structure Q causes the change in the size of the pupil from A to B.

[1 mark]

Question 1 continues on the next page

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]

11

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Turn over for the next question

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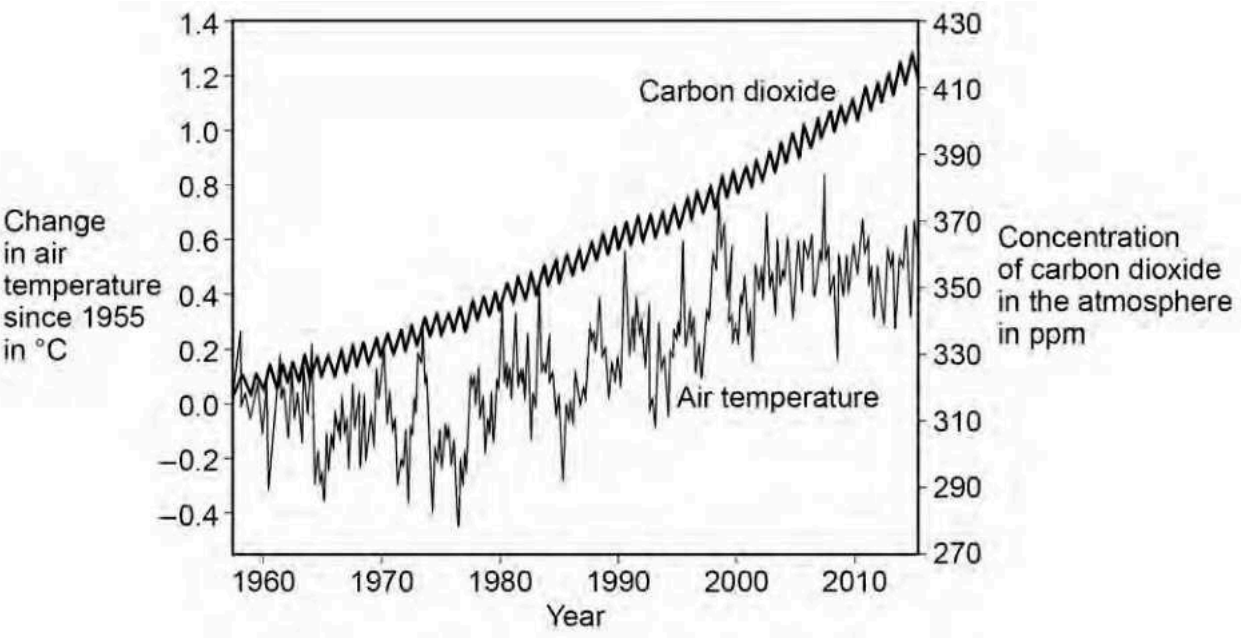
ANSWER IN THE SPACES PROVIDED

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



0 2 . 1 Complete Table 1.

Use information from Figure 3.

[2 marks]

Choose answers from the box.

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			

Do not write outside the box

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 and your own knowledge.

[4 marks]

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

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Turn over for the next question

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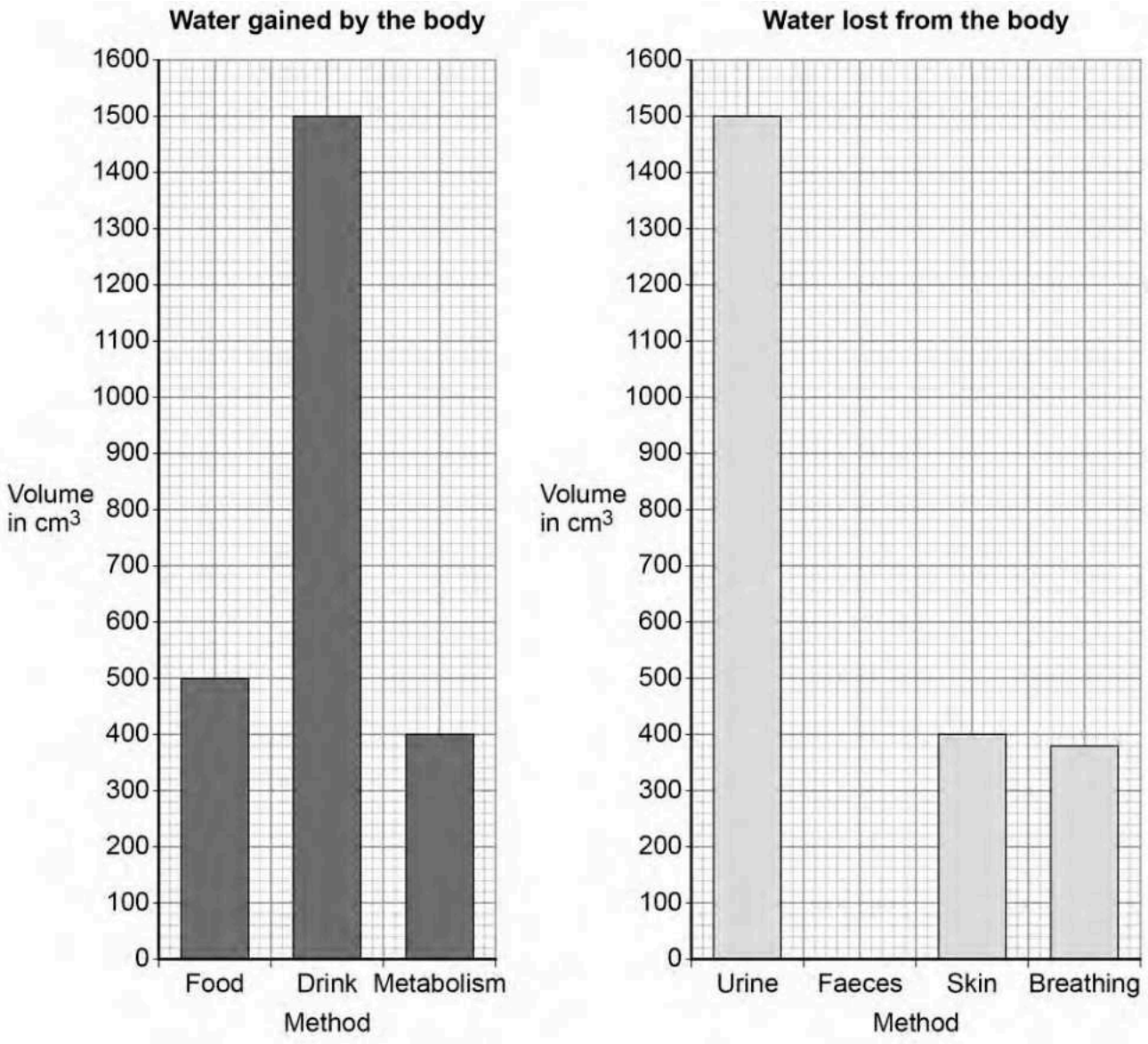
ANSWER IN THE SPACES PROVIDED

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

Figure 4 shows how much water a person gained and lost by different methods in one day.

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.

[2 marks]

_____

_____ cm3

_____

_____

Volume lost in faeces = _____

0 3 . 2 Figure 4 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 ☐

Question 3 continues on the next page

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]

8

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Turn over for the next question

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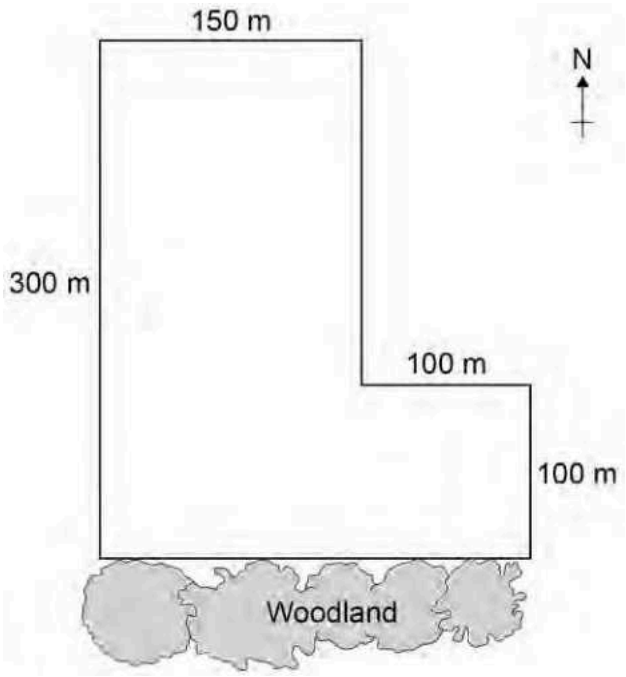
ANSWER IN THE SPACES PROVIDED

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

Do not write outside the box

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 = _____

Question 4 continues on the next page

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]

Do not write outside the box

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

Turn over for the next question

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.

Tick one box for each statement. [2 marks]

Table 3

Statement	Statement is true for		
	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			

Do not write outside the box

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.

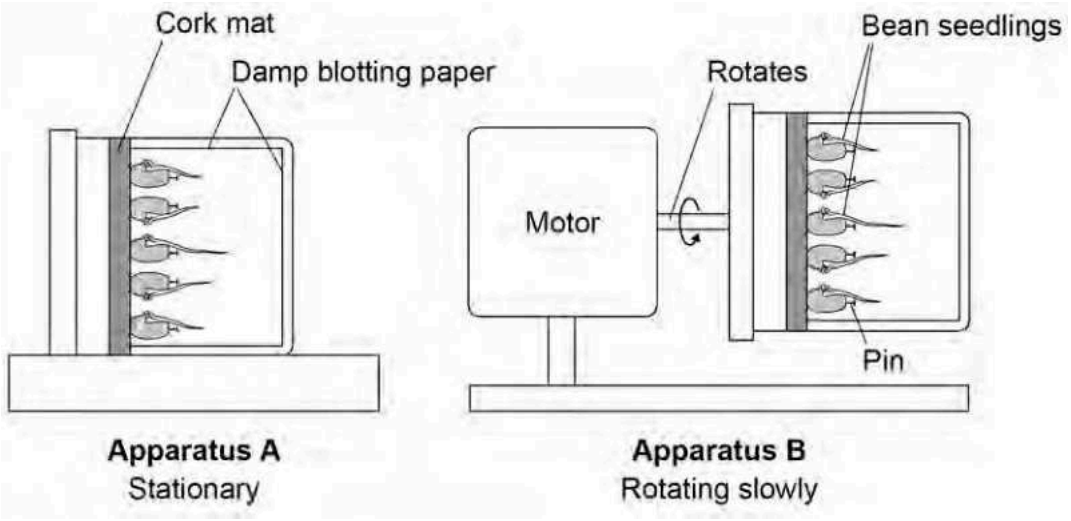
[4 marks]

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.

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 ☐

Do not write outside the box

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				

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]

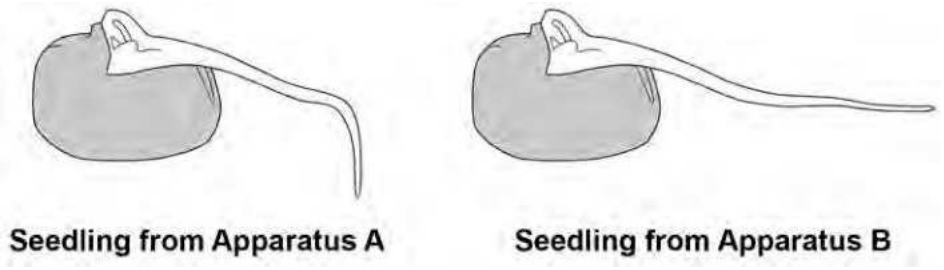
0 6 . 4 Suggest one improvement the students could make to obtain a more valid mean length change for the seedlings in apparatus B.

[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]

Do not write outside the box

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

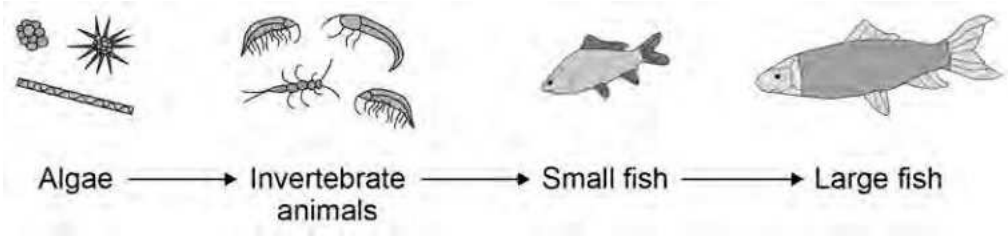
10

Turn over for the next question

0 7 Figure 8 shows:

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

Figure 8



Biomass in g/m2:	840	200	40	10

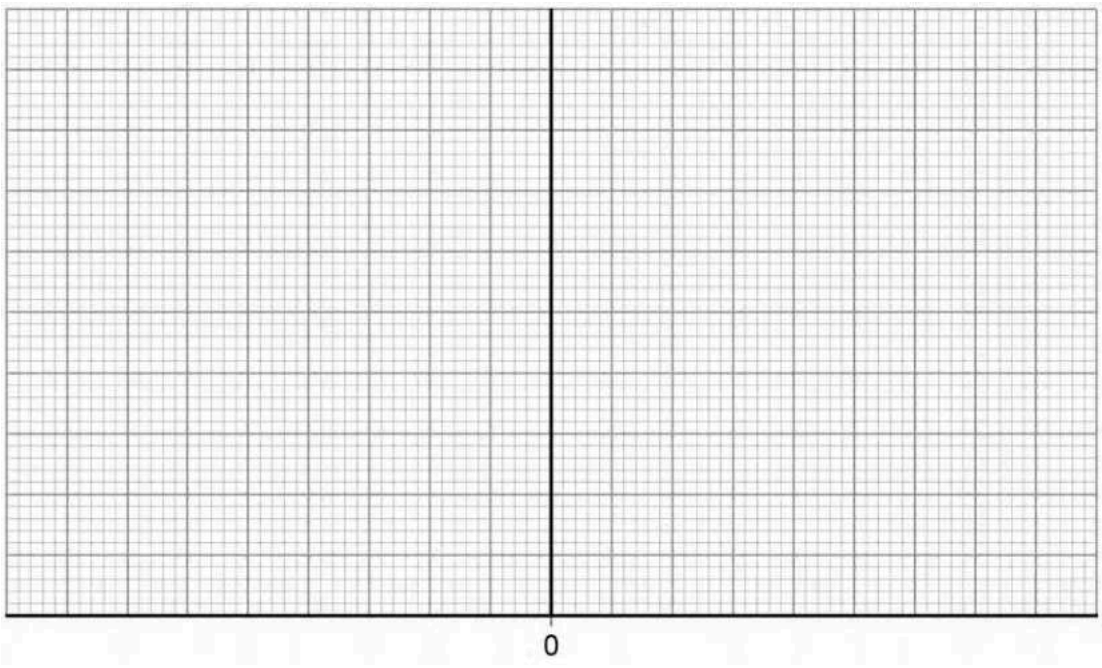
0 7 . 1 Draw a pyramid of biomass for the food chain in Figure 8 on Figure 9 .

You should:

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

[4 marks]

Figure 9



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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]

Question 7 continues on the next page

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]

13

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Turn over for the next question

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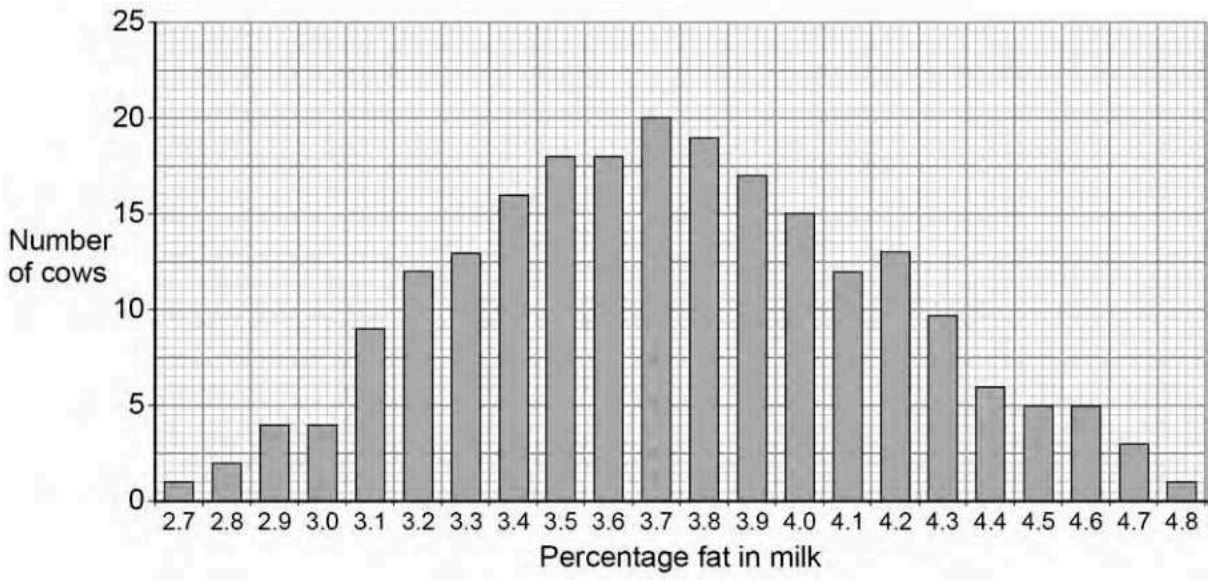
ANSWER IN THE SPACES PROVIDED

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.

Figure 10



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

Give the mean percentage of fat in the milk of these cows.

[1 mark]

Mean percentage = _____

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 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Do not write outside the box

0 8 . 3 Give the evidence from Figure 10 which shows the percentage of fat in the milk is controlled by several genes.

[1 mark]

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]

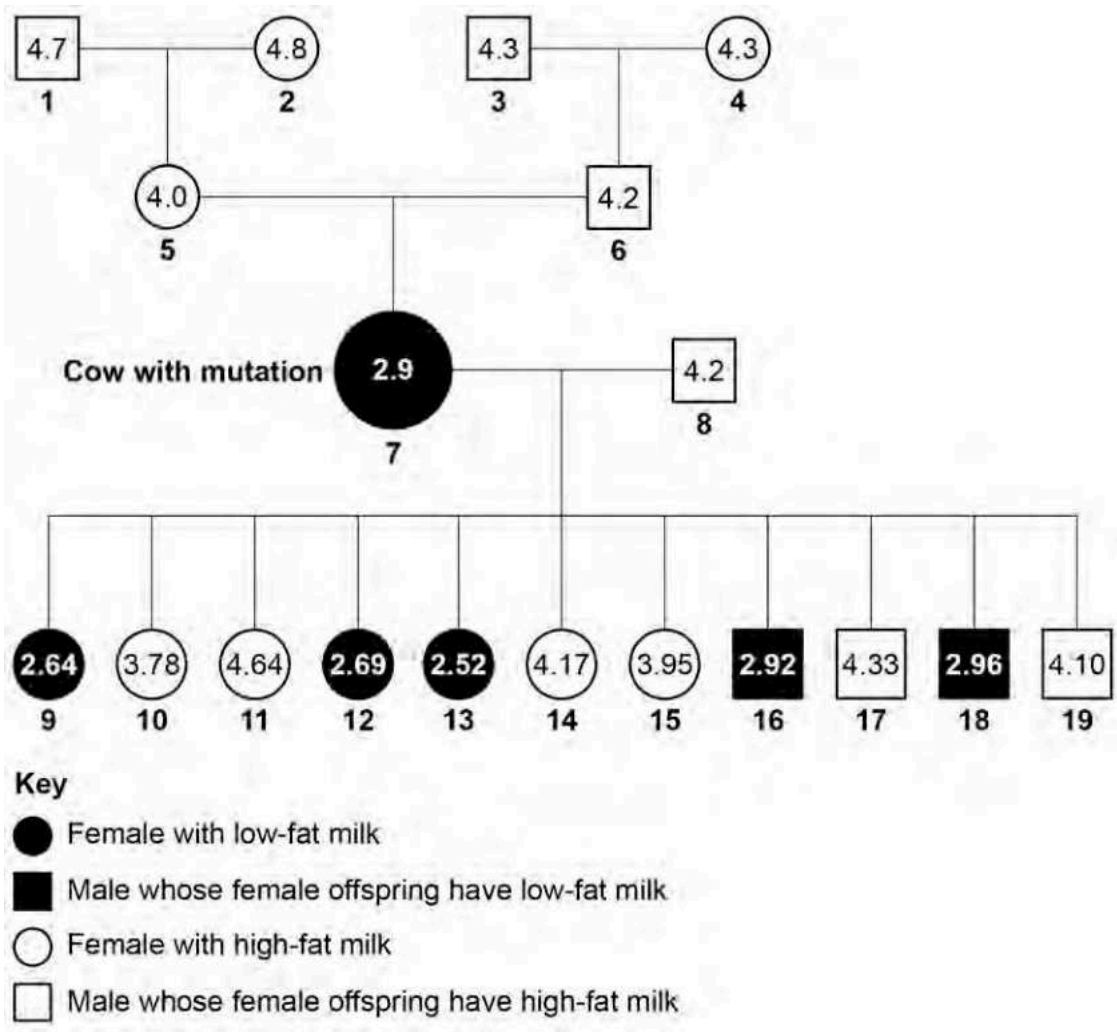
Question 8 continues on the next page

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



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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]

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]

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

Do not write outside the box

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]

16

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0 9 Figure 12 shows a ring-tailed lemur.

Figure 12

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

Table 5

Classification group	Name
Kingdom	*Animalia*
Phylum	*Chordata*
	Mammalia
	Primates
Genus	*Lemuroidea*
	Lemur
	catta

0 9 . 1 Complete Table 5 to give the names of the missing classification groups.

[2 marks]

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

Use information from Table 5.

[1 mark]

Lemurs are only found on the island of Madagascar.

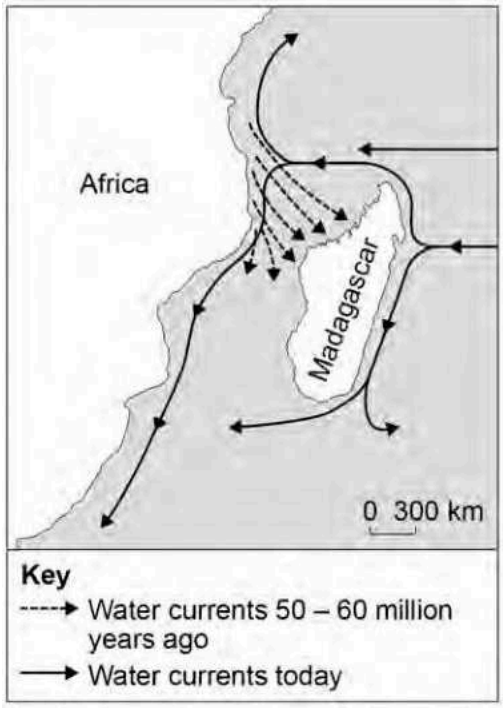
Madagascar is off the coast of Africa.

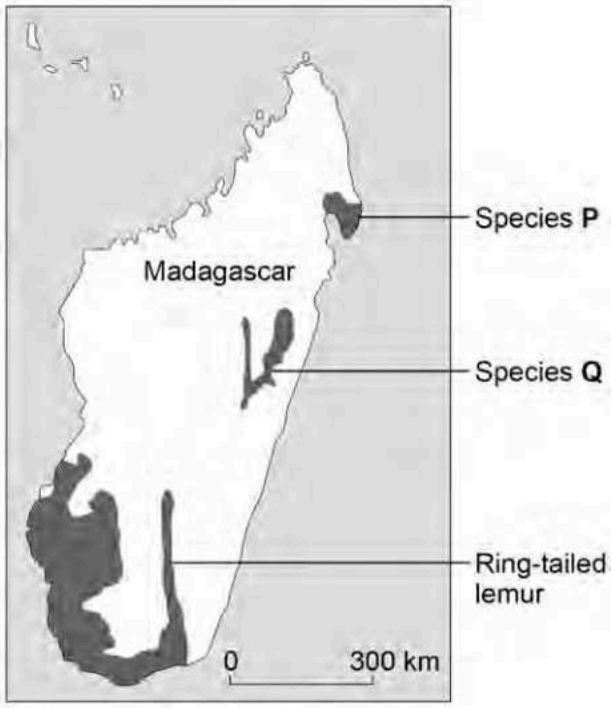
Scientists think that ancestors of modern lemurs evolved in Africa and reached Madagascar about 50-60 million years ago.
Today there are many species of lemur living on Madagascar.

Figure 13 shows information about water currents.

Figure 14 shows the distribution of three species of lemur on Madagascar.

Figure 13 Figure 14





0 9 . 3 Suggest how ancestors of modern lemurs reached Madagascar.

[1 mark]

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0 9 . 4 Describe how the ancestors of modern lemurs may have evolved into the species shown in Figure 14.

[5 marks]

9

END OF QUESTIONS

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