AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE BIOLOGY

H

Higher Tier Paper 2H

Monday 9 June 2025 Morning Time allowed: 1 hour 45 minutes

Materials

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

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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
- The maximum mark for this paper is 100.
- 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	

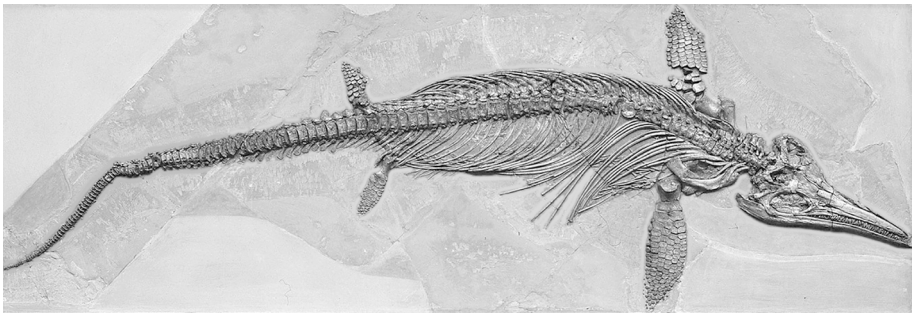
Answer **all** questions in the spaces provided.

Do not write outside the box

0 1 Ichthyosaurs are reptiles that lived in the sea millions of years ago.

Figure 1 shows the fossilised remains of an ichthyosaur.

Figure 1



0 1 . 1 Suggest how the fossil in **Figure 1** was formed after the ichthyosaur died.

[2 marks]

0 1 . 2 The length of the image of the ichthyosaur in **Figure 1** is 120 mm.

The real length of the ichthyosaur was 17 times longer than the image in **Figure 1**.

Calculate the real length of the ichthyosaur.

Give your answer in metres.

[3 marks]

Real length of ichthyosaur = _____ metres

Do not write outside the box

0 1 . 3 **Table 1** gives the classification of the ichthyosaur in **Figure 1**.

Table 1

Classification group	**Name**
Kingdom	Animalia
	Chordata
Class	Reptilia
Order	Ichthyosauria
	Ichthyosauridae
Genus	Ichthyosaurus
Species	intermedius

Complete **Table 1**.

[2 marks]

Choose answers from the box.

Community	**Family**	**Mammal**	**Phylum**	**Population**

0 1 . 4 Ichthyosaurs were predators.

Ichthyosaurs are now extinct.

Scientists think that extinction of the ichthyosaurs was caused by increased competition with other predators for food.

Suggest **two other** possible causes of extinction of the ichthyosaurs.

[2 marks]

1 _____

_____

2 _____

_____

9

Do not write outside the box

0 2 Students investigated how many daisy plants were growing in a field at different distances from a tree.

This is the method used.

1. Place a 20-metre tape measure on the ground, with the tree at 0 metres.

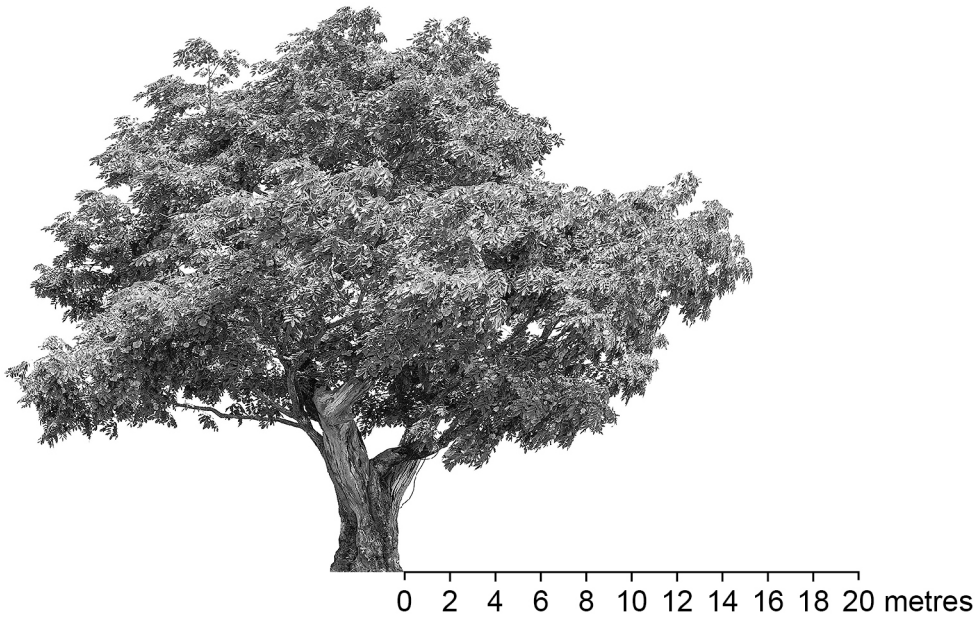
2. Place a 1 m^2 quadrat on the ground every 4 metres along the tape measure.

3. Count the number of daisy plants in each quadrat.

4. Take a soil sample from each quadrat to find the percentage of water in the soil.

Figure 2 shows the tree and the tape measure.

Figure 2



This is the method used for finding the percentage of water in each soil sample (step 4):

5. Weigh an empty container.

6. Place the soil sample in the container and weigh again.

7. Heat the container of soil in an oven at 100 °C for several hours.

8. Allow the container of soil to cool and weigh again.

9. Repeat steps 7 and 8 until there is no further change in mass.

Do not write outside the box

0 2 . 1 Suggest why the students repeated steps **7** and **8** until there was no further change in mass.

[1 mark]

Question 2 continues on the next page

Do not write outside the box

Table 2 shows the results.

Table 2

	Distance from the tree in metres				
	4	**8**	**12**	**16**	**20**
Mass of fresh soil in grams	250	266	260	248	252
Mass of dried soil in grams	225	234	209	184	181
Mass of water lost from soil in grams	25	32	51	64	71
Percentage of water in soil	10	12	20	26	**X**
Number of daisies per m^2	0	7	15	28	32

0 2 . 2 Calculate percentage **X** in **Table 2**.

Give your answer to the nearest whole number.

[3 marks]

Percentage **X** (nearest whole number) = _____ %

0 2 . 3 Describe the effect of distance from the tree on the percentage of water in the soil between 4 metres and 16 metres.

Use **Table 2**.

[1 mark]

Do not write outside the box

0 2 . 4 A student concluded:

'As the water content of the soil increases, so does the number of daisy plants.'

Describe **two** changes to the investigation that would increase the validity of the student's conclusion.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 5 The percentage of water in the soil is an abiotic factor.

Suggest **three** other **abiotic** factors that might have caused more daisy plants to grow further away from the tree.

Do **not** refer to water in your answer.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

10

Turn over for the next question

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0 3 Tropisms help plants survive.

0 3 . 1 What is geotropism?

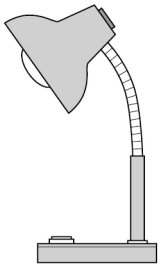
[2 marks]

0 3 . 2 Plan an investigation to find the effect of the direction of light on the growth of plant seedlings.

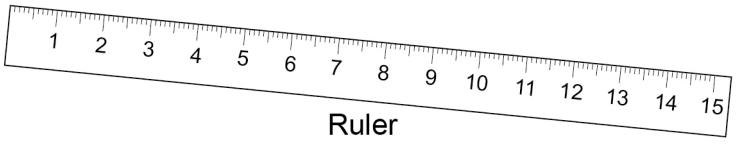
You may use the equipment shown in **Figure 3** and any other laboratory equipment.

[6 marks]

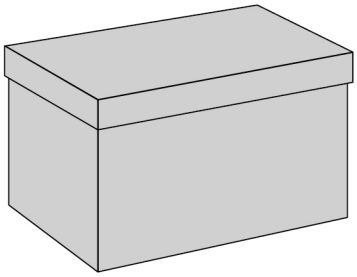
Figure 3



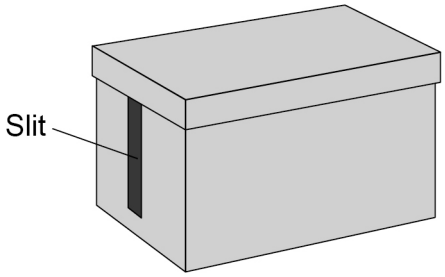
Lamp



Ruler



Cardboard box



Cardboard box with slit cut in one side

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Question 3 continues on the next page

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Plant responses are controlled by hormones.

0 3 . 3 Which hormone controls a plant's response to the direction of light?

[1 mark]

0 3 . 4 How does the hormone you named in Question **03.3** control the plant's response to the direction of light?

[1 mark]

Tick (✓) **one** box.

All parts of the plant have the same concentration of hormone. ☐

The hormone has an effect when it breaks down. ☐

There is an uneven distribution of the hormone. ☐

0 3 . 5 Explain how a plant's response to light helps the plant survive.

[3 marks]

13

Do not write outside the box

0 4 Human growth hormone (hGH) is made by the pituitary gland.

0 4 . 1 Name **one other** hormone made by the pituitary gland.

[1 mark]

0 4 . 2 hGH is a protein.

A child with a deficiency of hGH can be given injections of hGH.

What would happen to the hGH if it was given as a tablet that was swallowed?

[1 mark]

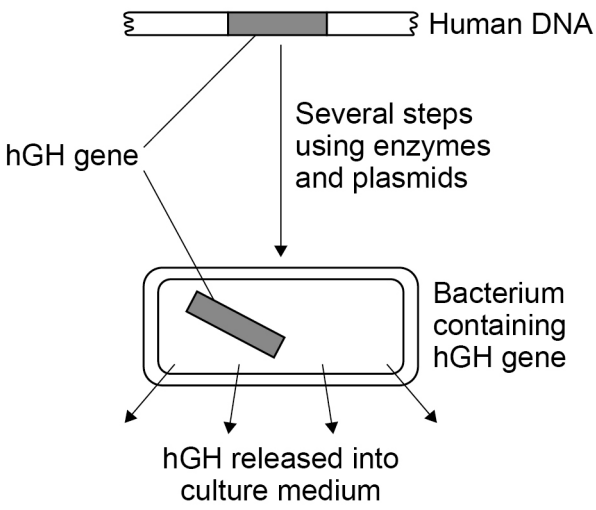
Question 4 continues on the next page

Do not write outside the box

Scientists can use genetic engineering to make hGH.

Figure 4 shows a summary of the process.

Figure 4



0 4 . 3 Describe how scientists can transfer the gene for hGH from human cells to bacterial cells.

Use information from **Figure 4**.

[4 marks]

Extra space

Do not write outside the box

0 4 . 4 Growth hormone (GH) can be extracted from the urine of farm animals.

It is better to use hGH made by genetic engineering than to use GH from the urine of farm animals.

Suggest **two** reasons why.

Do **not** refer to ethical reasons or religious beliefs in your answer

[2 marks]

1 _____

_____

2 _____

_____

8

Turn over for the next question

Do not write outside the box

0 5 Peat bog is a specialised habitat for some living organisms.

0 5 . 1 Peat has been removed from peat bogs so that the land can be used for farming or forestry.

Give **two** uses of the peat removed from peat bogs.

[2 marks]

1 _____

_____

2 _____

_____

The destruction of peat bogs can affect biodiversity.

0 5 . 2 What is meant by 'biodiversity'?

[1 mark]

_____

_____

Do not write outside the box

0 5 . 3 Explain how the destruction of peat bogs can affect biodiversity:

- in the local area
- globally.

[6 marks]

Extra space

9

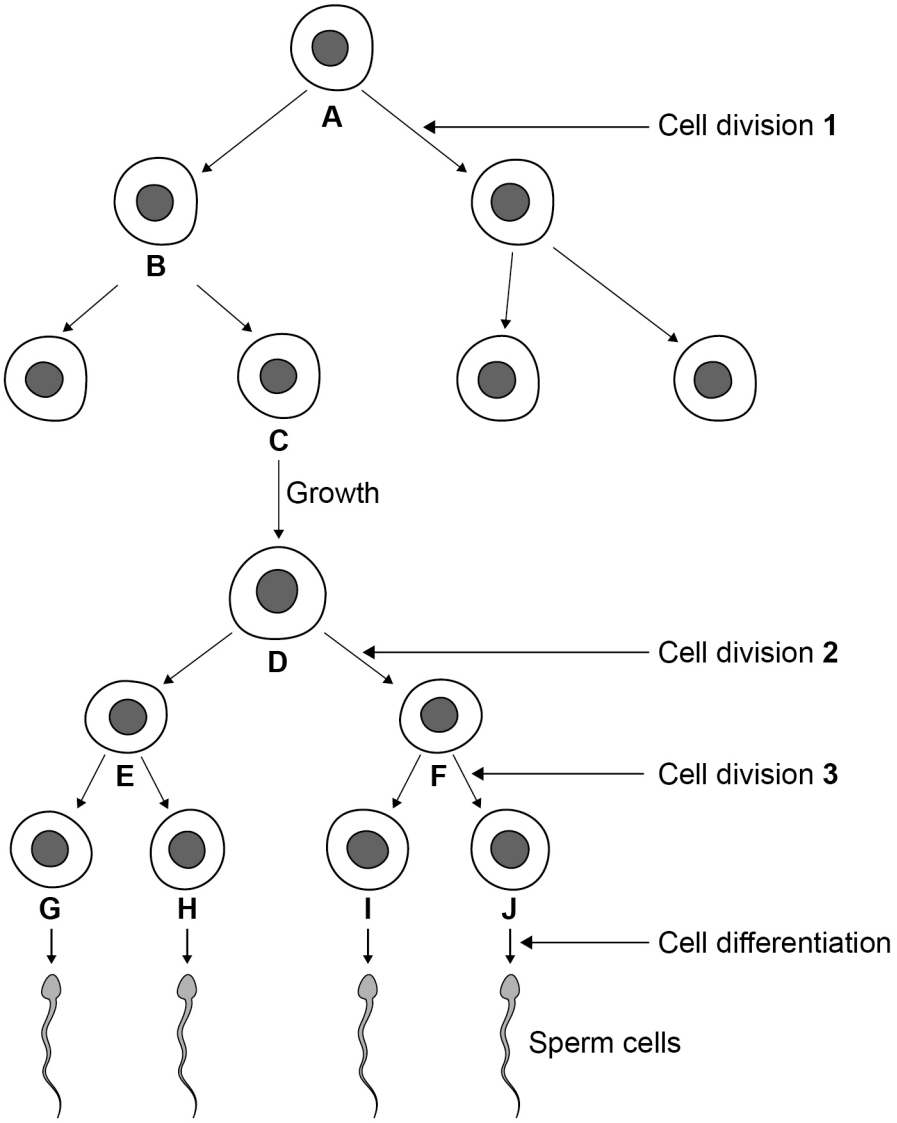
Turn over for the next question

Do not write outside the box

0 6 New cells are produced by cell division.

Figure 5 shows sperm formation in a human.

Figure 5



Do not write outside the box

0 6 . 1 Which cell division in **Figure 5** represents mitosis?

[1 mark]

Tick (✓) **one** box.

Cell division **1** ☐

Cell division **2** ☐

Cell division **3** ☐

0 6 . 2 Which two cells in **Figure 5** are genetically identical?

[1 mark]

Tick (✓) **one** box.

A and **C** ☐ **B** and **I** ☐ **F** and **J** ☐ **G** and **H** ☐

0 6 . 3 How many chromosomes are there in cell **J** in **Figure 5**?

[1 mark]

_____

0 6 . 4 How many of the cells **C**, **D**, **E**, **F**, **G**, **H**, **I** and **J** contain a Y chromosome?

Use **Figure 5**.

[1 mark]

_____

Question 6 continues on the next page

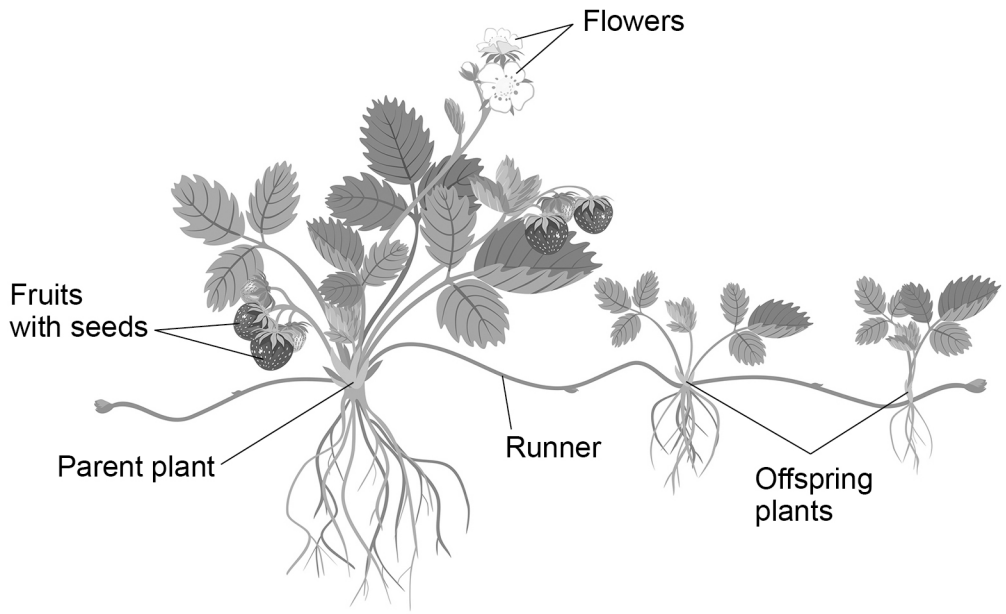
Do not write outside the box

Strawberry plants can reproduce both sexually and asexually.

Figure 6 shows a strawberry plant reproducing:

- sexually using flowers, fruits and seeds
- asexually using horizontal stems called runners.

Figure 6



0 6 . 5 Explain why the offspring produced using runners are genetically identical.

[2 marks]

Do not write outside the box

0 6 . 6 Explain why the offspring produced using flowers, fruits and seeds are **not** genetically identical.

[2 marks]

0 6 . 7 Describe **two** advantages of **asexual** reproduction for the survival of strawberry plants.

[2 marks]

1

2

0 6 . 8 Describe **two** advantages of **sexual** reproduction for the survival of strawberry plants.

[2 marks]

1

2

12

Turn over for the next question

Do not write outside the box

0 7 Two students investigated reaction time.

This is the method used.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 7**.

2. Student **A** lets go of the metre rule.

3. Student **B** catches the metre rule as quickly as possible.

4. Student **A** writes down the reading from the scale on the metre rule.

5. Students **A** and **B** repeat steps 1 to 4 another six times.

Figure 7

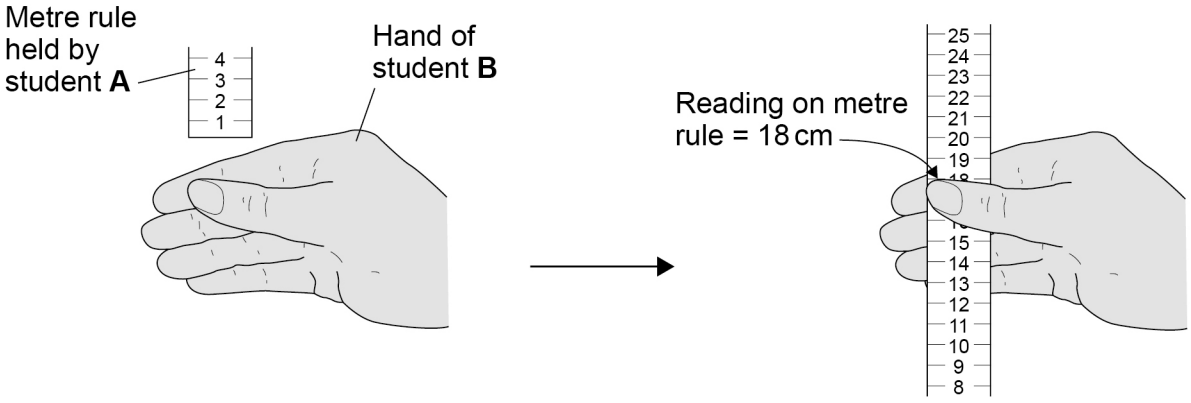


Table 3 shows the results.

Table 3

Test	Reading on metre rule in cm
1	18
2	15
3	12
4	16
5	14
6	23
7	14
Mean	16

Do not write outside the box

0 7 . 1 What is the median result in **Table 3**?

[1 mark]

Tick (✓) **one** box.

14 cm ☐ 15 cm ☐ 16 cm ☐ 18 cm ☐

0 7 . 2 Calculate student **B**'s mean reaction time.

Use the equation:

$$t = \sqrt{\frac{2d}{980}}$$

d = mean distance in cm
t = mean reaction time in s

Give your answer in milliseconds.

Give your answer to 3 significant figures.

Use data from **Table 3**.

[4 marks]

Mean reaction time (3 significant figures) = _____ milliseconds

Question 7 continues on the next page

Do not write outside the box

The method and **Figure 7** are repeated below.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 7**.

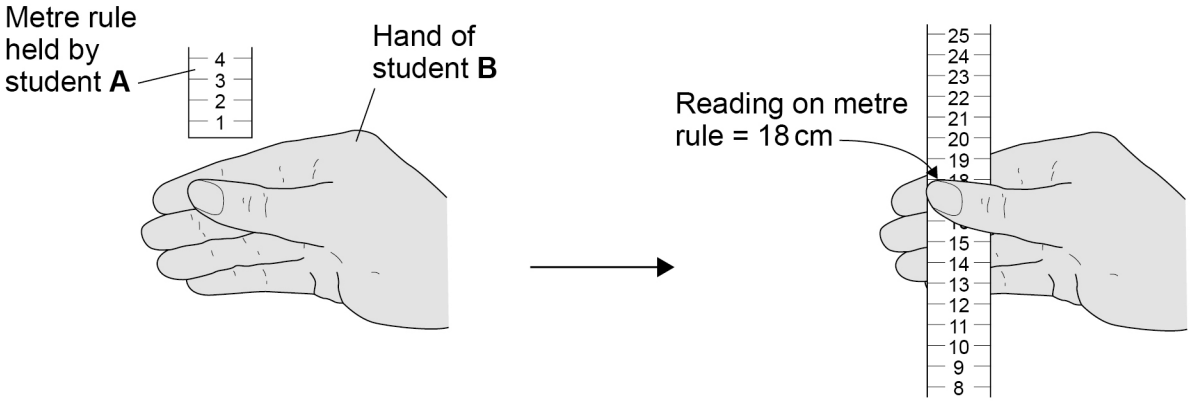
2. Student **A** lets go of the metre rule.

3. Student **B** catches the metre rule as quickly as possible.

4. Student **A** writes down the reading from the scale on the metre rule.

5. Students **A** and **B** repeat steps 1 to 4 another six times.

Figure 7



0 7 . 3 Describe **two** ways the students could improve the investigation.

Do **not** refer to repeating results in your answer.

[2 marks]

1 _____

_____

2 _____

_____

Do not write outside the box

0 7 . 4 Catching the rule was a response to a stimulus.

Describe how student **B**'s response was coordinated by the nervous system.

[6 marks]

Extra space

13

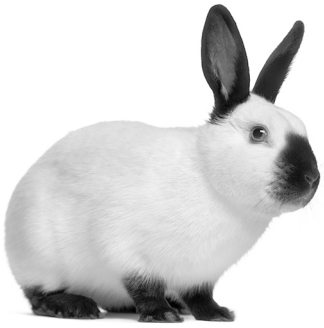
Turn over for the next question

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0 8 Some people keep rabbits as pets.

Figure 8 shows two types of rabbit.

Figure 8



Himalayan rabbit
has black patches



White rabbit
has no black patches

The Himalayan fur pattern is controlled by a dominant allele.

A heterozygous male Himalayan rabbit was crossed many times with each of two female Himalayan rabbits, **A** and **B**.

The results of the two types of cross were different.

- Crosses with female **A**: **all** of the 210 offspring were Himalayan rabbits.
- Crosses with female **B**: **some** of the 240 offspring were Himalayan rabbits and **some** were white rabbits.

In Questions **08.1** and **08.2**, use the following symbols to represent alleles:

H = dominant allele for Himalayan fur

h = recessive allele for white fur.

0 8 . 1 What is the genotype of female Himalayan rabbit **A**?

Give the reason for your answer.

[2 marks]

Genotype _____

Reason _____

_____

Do not write outside the box

0 8 . 2 Determine the probability that one of the offspring from a cross with female Himalayan rabbit **B** will be white.

You should:

- draw a Punnett square diagram
- use the symbols **H** and **h**
- identify the phenotype of each offspring genotype.

[4 marks]

Probability of offspring being white = _____

Question 8 continues on the next page

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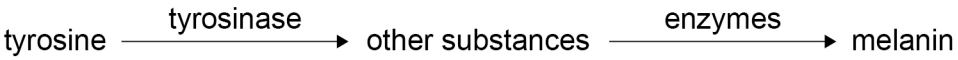
Adult Himalayan rabbits have:

- white fur over most of the body
- black fur on the nose, ears and feet.

The black colour is caused by production of a substance called melanin.

Figure 9 shows how melanin is made from another substance called tyrosine.

Figure 9



0 8 . 3 White rabbits have one base change in the gene that codes for the enzyme tyrosinase.

Explain how a change of one base in the DNA of the gene coding for tyrosinase could stop the tyrosinase working.

[4 marks]

Do not write outside the box

For the first four weeks of life, Himalayan rabbits produce white fur over the whole body.

The black areas of fur start to develop after four weeks.

In the first four weeks, young rabbits stay in the nest with their mother.

A rabbit's body temperature is 39 °C.

The tyrosinase in Himalayan rabbits is:

- most active between 15 °C and 25 °C
- **not** active above 35 °C.

0 8 . 4 The fur on the nose, ears and feet of Himalayan rabbits is white for the first four weeks of life.

Explain what causes the fur to be white in the first four weeks of life.

[2 marks]

0 8 . 5 From the age of four weeks, young rabbits move from the nest to the outside environment.

Explain why a Himalayan rabbit develops black nose, ears and feet from the age of four weeks.

[3 marks]

Do not write outside the box

0 8 . 6 Melanin is also produced in human skin.

Melanin absorbs ultraviolet (UV) radiation from sunlight and prevents the radiation reaching deep into the skin.

UV radiation is a type of ionising radiation.

Explain the advantage of producing melanin in human skin when exposed to bright sunlight.

[2 marks]

17

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0 9 Type 2 diabetes is a condition that has become more common in recent years.

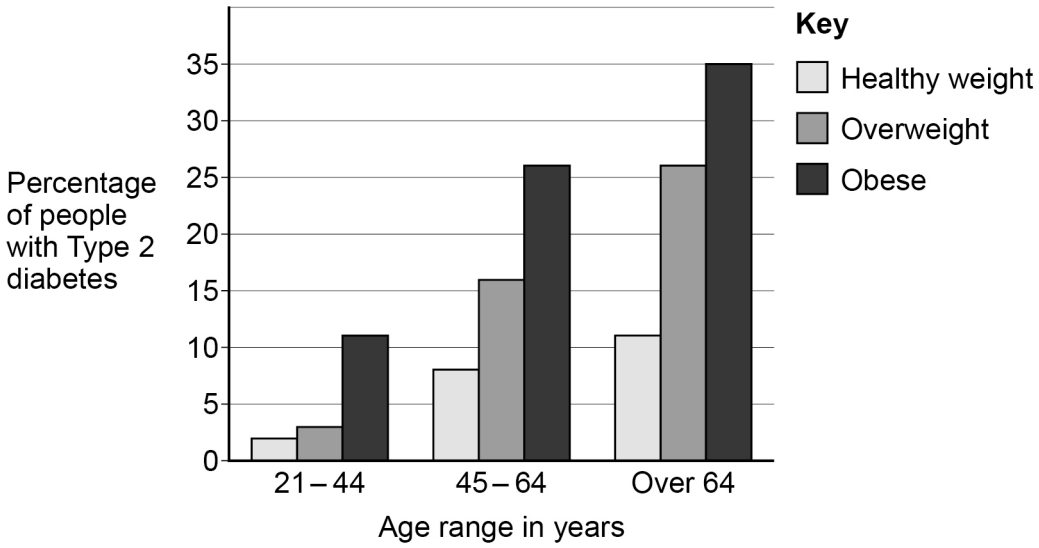
0 9 . 1 Scientists recorded the percentage of people of different ages who had Type 2 diabetes.

The people were in different weight categories:

- healthy weight
- overweight
- obese.

Figure 10 shows the results.

Figure 10



Give **two** conclusions from the results in **Figure 10**.

[2 marks]

1 _____

_____

2 _____

_____

Question 9 continues on the next page

Do not write outside the box

Two groups of scientists investigated the use of different drugs to treat Type 2 diabetes.

In both investigations, the scientists measured the percentage of haemoglobin with glucose attached (Hb-G).
This showed the long-term concentration of glucose in the blood.

Investigation 1:

The scientists injected drug **A** into 175 patients with Type 2 diabetes once each day for 12 weeks.

Table 4 shows the results.

Table 4

	Mean value	
	At start	**At 12 weeks**
Percentage (%) of haemoglobin with glucose attached (Hb-G)	9.2	7.6

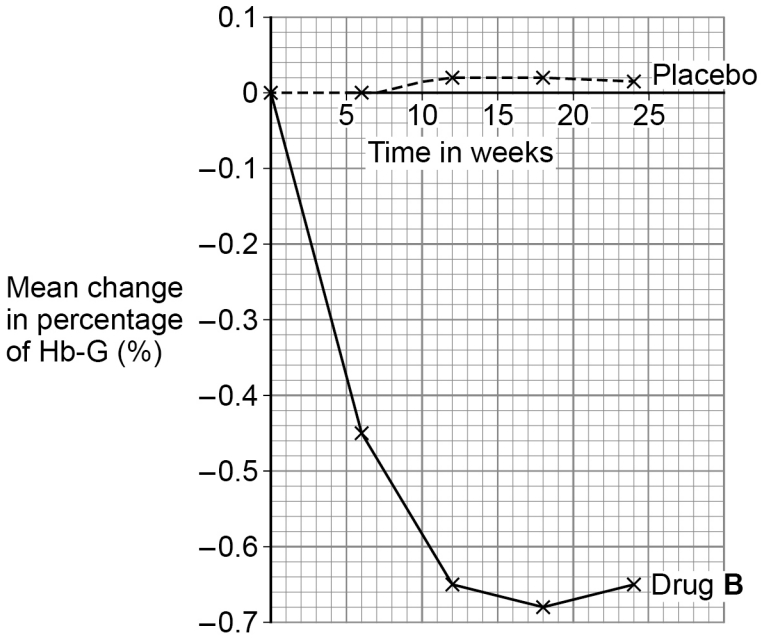
Investigation 2:

631 patients with Type 2 diabetes took one tablet containing drug **B** each day.
A control group of 630 patients took a placebo tablet each day.

The scientists measured the Hb-G in each patient's blood at the start of the investigation and at 6-week intervals up to 24 weeks.

Figure 11 shows the results.

Figure 11



Do not write outside the box

0 9 . 2 For the patients treated with drug **B** the mean percentage of Hb-G at the start was 8.3%.

What was the mean percentage of Hb-G after 12 weeks for the patients treated with drug **B**?

[1 mark]

Tick (✓) **one** box.

0.65%	☐	0.75%	☐	7.65%	☐	8.95%	☐

0 9 . 3 In a person **without** diabetes, the Hb-G value is between 4.5% and 6%.

When treating patients with Type 2 diabetes, doctors think that an Hb-G value <7% is acceptable.

Evaluate:

- the methods used in the investigations
- the usefulness of drug **A** and drug **B** for controlling Type 2 diabetes.

[6 marks]

Extra space

9

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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