Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

# GCSE BIOLOGY

**F**

Foundation Tier Paper 2F

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 | |
| 10 | |
| **TOTAL** | |

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

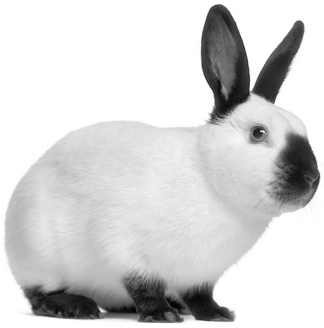
Answer **all** questions in the spaces provided.

*Do not write outside the box*

**0 1** Some people keep rabbits as pets.

**Figure 1** shows two types of rabbit.

**Figure 1**



**Himalayan rabbit**
has black patches

**White rabbit**
has no black patches

The fur colour pattern in the Himalayan rabbit is caused by a dominant allele.

**0 1 . 1** What is a dominant allele?

**[1 mark]**

Tick (✓) **one** box.

An allele expressed only if a rabbit has two copies of the allele ☐

An allele expressed only if it is inherited from the male rabbit ☐

An allele expressed when a rabbit has only one copy of the allele ☐

**Question 1 continues on the next page**

*Do not write outside the box*

In Questions **01.2** and **01.3**, use the following symbols:

**H** = dominant allele for Himalayan fur pattern

**h** = recessive allele for white fur.

**0 1 . 2** What is the genotype of a white rabbit?

**[1 mark]**

Tick (✓) **one** box.

**HH** ☐ **Hh** ☐ **hh** ☐

A male Himalayan rabbit was crossed with a female Himalayan rabbit.

The male rabbit and the female rabbit each had the heterozygous genotype **Hh**.

Some of the offspring were Himalayan rabbits and some of the offspring were white rabbits.

**0 1 . 3** Complete the Punnett square diagram in **Figure 2**.

You should show:

- the male gametes
- the offspring genotypes.

**[3 marks]**

**Figure 2**

| | | **Female** | |
|---|---|---|---|
| | | **H** | **h** |
| **Male** | | HH | |
| | | | |

*Do not write outside the box*

**0 1 . 4** Some of the offspring in **Figure 2** are homozygous and some are heterozygous.

Draw a ring around the genotype of **one homozygous** offspring in **Figure 2**.

**[1 mark]**

**0 1 . 5** Four offspring were born.

How many of the four offspring would you expect to be Himalayan rabbits?

Use **Figure 2**.

**[1 mark]**

Tick (✓) **one** box.

1 ☐ 2 ☐ 3 ☐ 4 ☐

**0 1 . 6** Inheritance of sex in rabbits is the same as inheritance of sex in humans.

A female rabbit has two X chromosomes in each body cell.

How many X chromosomes does a male rabbit have in each body cell?

**[1 mark]**

Tick (✓) **one** box.

0 ☐ 1 ☐ 2 ☐

**0 1 . 7** Some of the offspring in **Figure 2** would be male and some of the offspring would be female.

How many of the four offspring in Question **01.5** would you predict to be female?

**[1 mark]**

_____

**9**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

**0 2** Some human responses are reflex actions.

**0 2 . 1** Give **two** features of a reflex action.

**[2 marks]**

1 _____

_____

2 _____

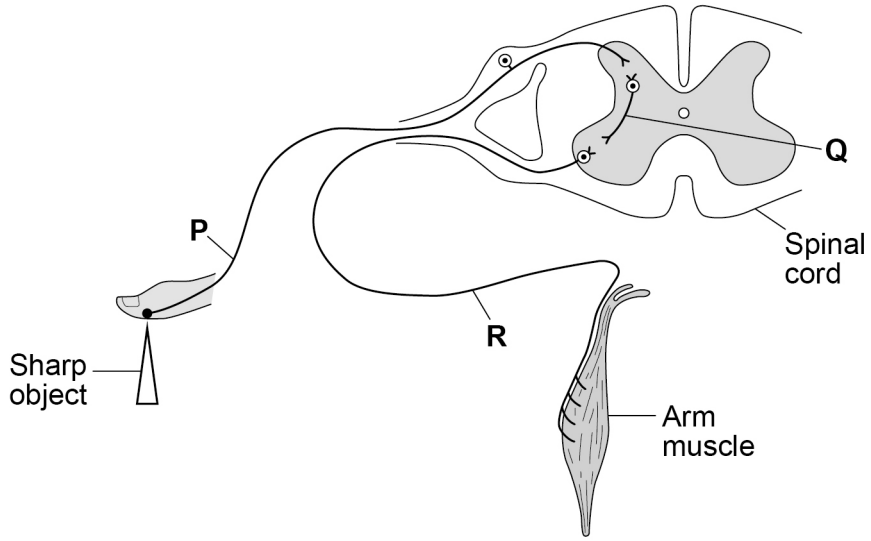
_____

**Question 2 continues on the next page**

*Do not write outside the box*

**Figure 3** shows the nerve pathway for moving a hand away from a sharp object.

**Figure 3**




**0 2 . 2** Complete the sentences.

Choose answers from the box.

**[2 marks]**

| | | | |
|---|---|---|---|
| **coordinator** | **effector** | **receptor** | **stimulus** |

When the finger touches the sharp object, the point

stimulates the _____.

Nerve impulses reach the arm muscle which is the _____.

*Do not write outside the box*

**0 2 . 3** **P**, **Q** and **R** in **Figure 3** are three types of neurone.

Draw **one** line from each letter to the type of neurone.

**[3 marks]**

| Letter | Type of neurone |
|---|---|
| | Motor |
| **P** | |
| | Reflex |
| **Q** | |
| | Relay |
| **R** | |
| | Sensory |

**0 2 . 4** The gap between two neurones is called a synapse.

How does information travel across the synapse?

**[1 mark]**

Tick (✓) **one** box.

As a chemical ☐

As pain ☐

As sound ☐

**Question 2 continues on the next page**

*Do not write outside the box*

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 4**.

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 two more times.

**Figure 4**

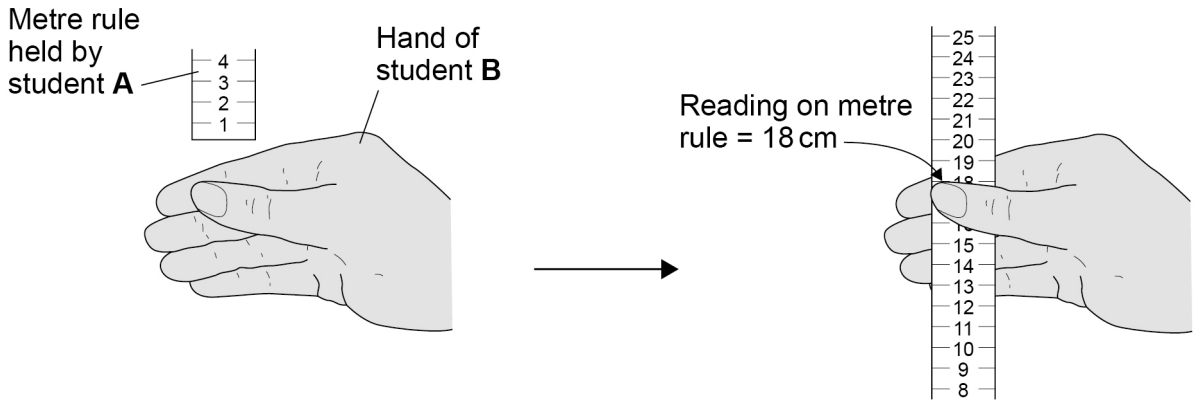



**Table 1** shows the results.

**Table 1**

| Test | Reading on metre rule in cm |
|---|---|
| 1 | 18 |
| 2 | 17 |
| 3 | 13 |
| **Mean** | **X** |

*Do not write outside the box*

**0 2 . 5** Calculate mean value **X** in **Table 1**.

**[2 marks]**

**X** = _____ cm

**0 2 . 6** The students concluded:

'Practice improved the speed of student **B**'s reaction.'

Give evidence for the students' conclusion.

Use **Table 1**.

**[1 mark]**

**0 2 . 7** Suggest **one** way to improve the investigation.

**[1 mark]**

**12**

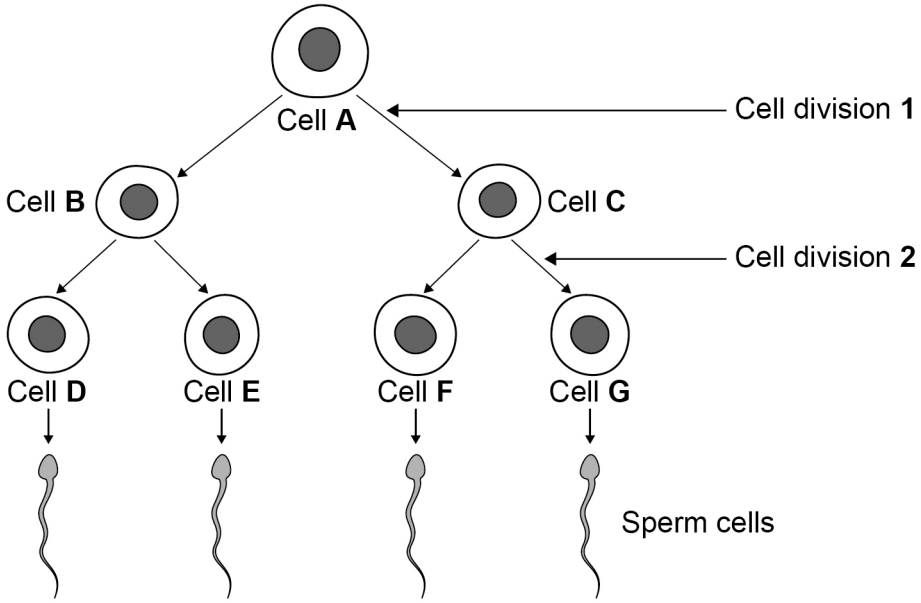
**Turn over for the next question**

*Do not write outside the box*

**0 3** New cells are produced by cell division.

**Figure 5** shows sperm formation in a human.

**Figure 5**




**0 3 . 1** Where in the body are sperm cells produced?

**[1 mark]**

_____

**0 3 . 2** How many chromosomes are there in cell **A** and in cell **D**?

Choose answers from the box.

**[2 marks]**

| | | | |
|---|---|---|---|
| **23** | **24** | **46** | **92** |

Cell **A** _____

Cell **D** _____

*Do not write outside the box*

**0 3 . 3** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| | | |
|---|---|---|
| **differentiation** | **evolution** | **fertilisation** |

A sperm cell joins with an egg cell in a process called _____.

**Question 3 continues on the next page**

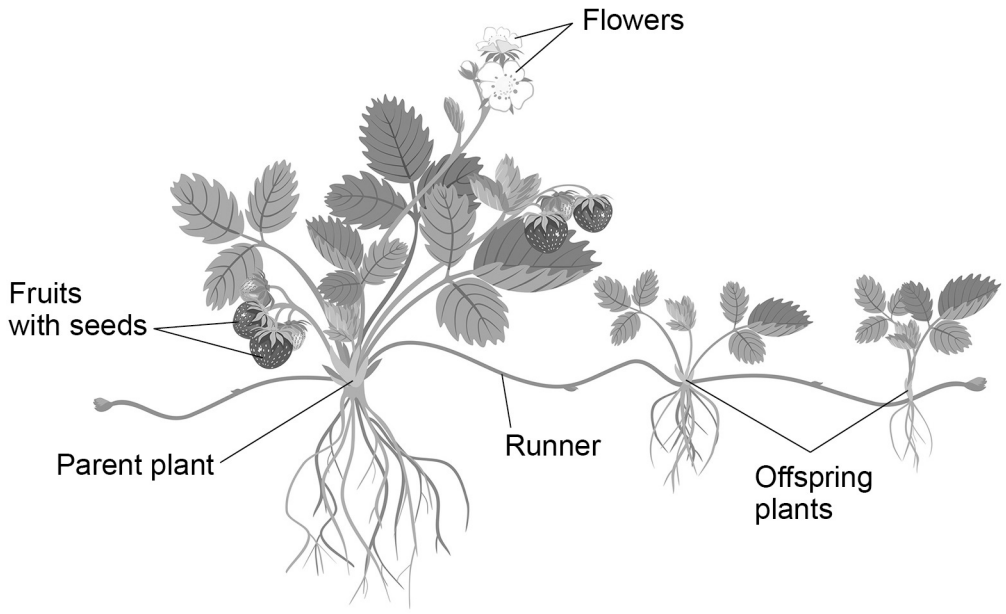
*Do not write outside the box*

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 3 . 4** Meiosis produces gametes.

What is the name of the male gamete in a flower?

**[1 mark]**

Tick (✓) **one** box.

Embryo ☐

Ovum ☐

Pollen ☐

*Do not write outside the box*

**0 3 . 5** Which process produces new cells in runners?

**[1 mark]**

Tick (✓) **one** box.

- Binary fission ☐
- Evolution ☐
- Mitosis ☐

**0 3 . 6** Substances used for growth pass through the runners from the parent plant to the offspring plants.

Which **two** substances pass through the runners?

**[2 marks]**

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- DNA ☐
- Insulin ☐
- Sugar ☐
- Water ☐

**Question 3 continues on the next page**

*Do not write outside the box*

Sexual reproduction and asexual reproduction each have different advantages for the strawberry plant.

**0 3 . 7** Give **one** advantage of reproducing **sexually**.

**[1 mark]**

**0 3 . 8** Give **one** advantage of reproducing **asexually**.

**[1 mark]**

**10**

*Do not write outside the box*

**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

**0 4** It is important to maintain the water balance of the body.

The volume of water a person gained and lost was measured on a day the person did no exercise.

**Table 2** shows how much water the person gained and lost by different methods on the day.

**Table 2**

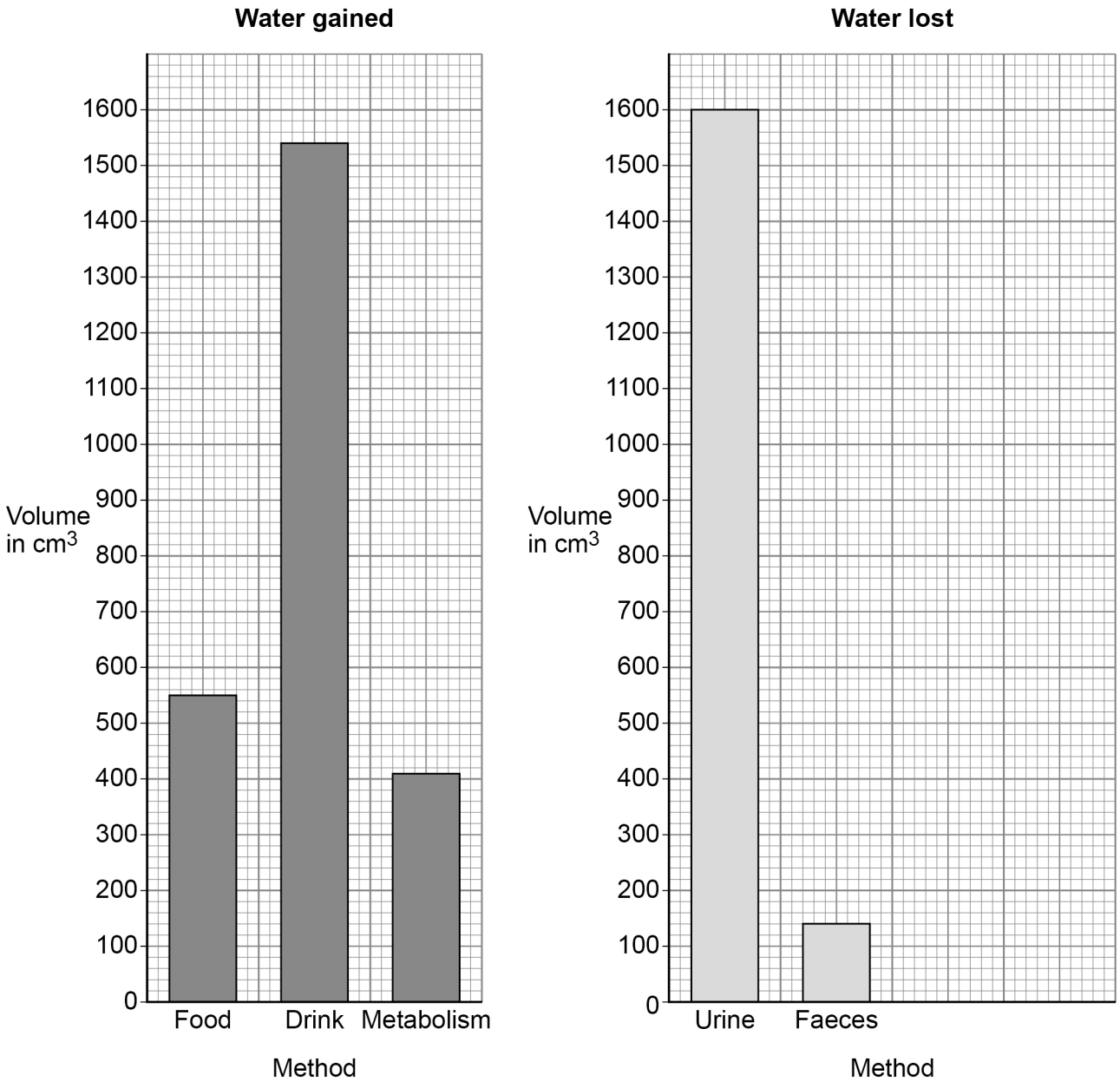
| **Water gained** | |
|---|---|
| **Method** | **Volume in $cm^3$** |
| Food | 550 |
| Drink | 1540 |
| Metabolism | 410 |
| **Total** | 2500 |

| **Water lost** | |
|---|---|
| **Method** | **Volume in $cm^3$** |
| Urine | 1600 |
| Faeces | 140 |
| Sweat | 420 |
| Breathing | 340 |
| **Total** | 2500 |

*Do not write outside the box*

**Figure 7** shows some of the data from **Table 2**.

**Figure 7**




**0 4 . 1** Complete **Figure 7**.

**[2 marks]**

You should:

- plot the data for sweat and for breathing from **Table 2**
- label each bar.

**Question 4 continues on the next page**

*Do not write outside the box*

**0 4 . 2** On another day, the person ran in a long-distance race.

What would happen to the volume of water lost by sweating on the day of the race?

**[1 mark]**

Tick (✓) **one** box.

Decrease ☐

No change ☐

Increase ☐

**0 4 . 3** The kidneys control the amount of water in the body.

Draw **one** line from each process in the kidneys to the name of that process.

**[3 marks]**

| **Process in the kidneys** | **Name of process** |
|---|---|
| Removes water from the blood | Coordination |
| Takes excess water out of the body | Excretion |
| Takes water back into the blood | Filtration |
| | Reabsorption |

*Do not write outside the box*

**0 4 . 4** A person with kidney failure can be treated by dialysis or by a kidney transplant.

**For dialysis:**

- a person needs 3 dialysis sessions each week
- each session can last 6 to 8 hours
- each session has to happen in a hospital.

**For a kidney transplant:**

- a suitable donor is needed
- a surgical operation is needed.

Evaluate the use of a kidney transplant instead of dialysis for treating kidney failure.

Include your own knowledge in your answer.

**[4 marks]**

Extra space

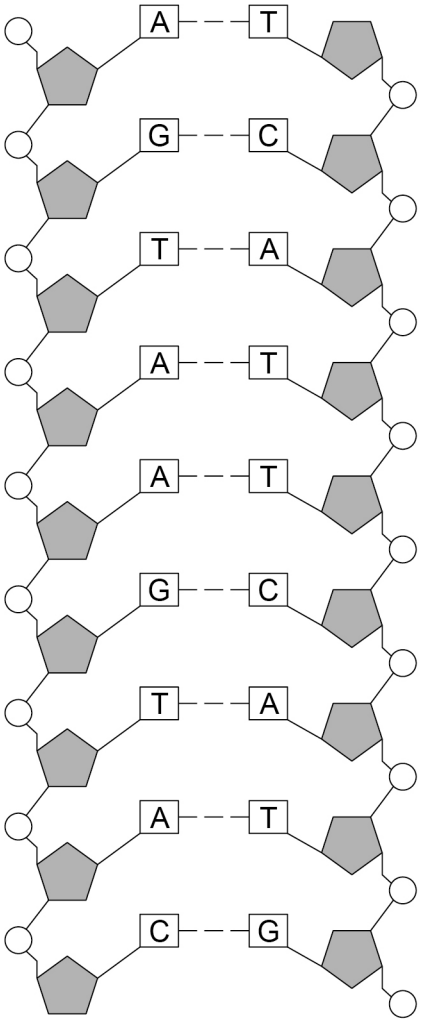
**10**

**Turn over for the next question**

*Do not write outside the box*

**0 5** **Figure 8** shows part of a DNA molecule.

**Figure 8**




The letters **A**, **C**, **G** and **T** in **Figure 8** represent four different compounds.

*Do not write outside the box*

**0 5 . 1** What are **A**, **C**, **G** and **T** called?

**[1 mark]**

Tick (✓) **one** box.

Bases ☐

Fatty acids ☐

Sugars ☐

**0 5 . 2** The section of DNA shown in **Figure 8** contains the following sequence of these compounds:

**A G T A A G T A C**

A sequence of three compounds codes for one amino acid.

How many amino acids would this section of DNA code for?

**[1 mark]**

**0 5 . 3** Sometimes a change occurs in the sequence of the compounds **A**, **C**, **G** and **T** in the DNA.

What name is given to a change in DNA?

**[1 mark]**

Tick (✓) **one** box.

Differentiation ☐

Mutation ☐

Natural selection ☐

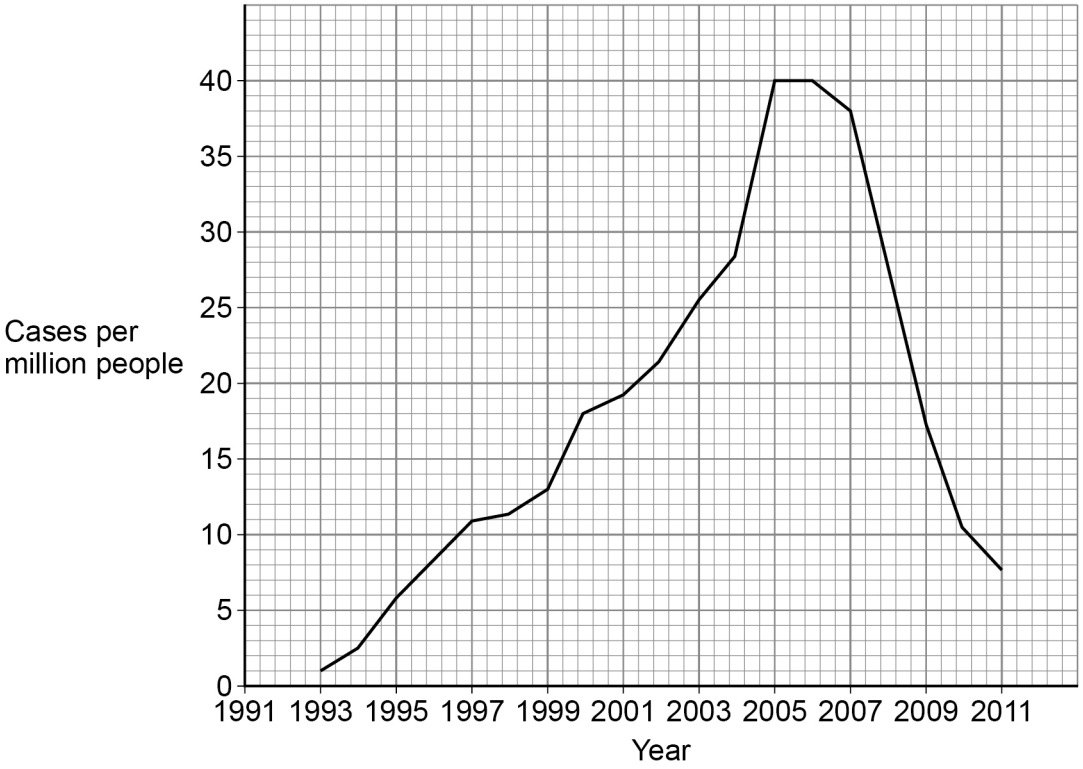
*Do not write outside the box*

Changes in the DNA of a bacterial pathogen can produce new strains of the pathogen.

Many people have been infected with a bacterial pathogen called MRSA.

**Figure 9** shows how many cases of MRSA occurred in one country from 1993 to 2011.

**Figure 9**




**0 5 . 4** Calculate the mean rate of increase in MRSA cases per year in the 12 years from 1993 to 2005.

**[3 marks]**

Mean rate of increase = _____ cases per million people per year

*Do not write outside the box*

**0 5 . 5** Most antibiotics will **not** kill MRSA bacteria.

Which word describes bacteria that are **not** killed by antibiotics?

**[1 mark]**

Tick (✓) **one** box.

Immune ☐

Powerful ☐

Resistant ☐

**0 5 . 6** **Figure 9** shows that the number of cases of MRSA decreased after 2006.

Suggest **one** reason for this decrease.

**[1 mark]**

_____

_____

**8**

**Turn over for the next question**

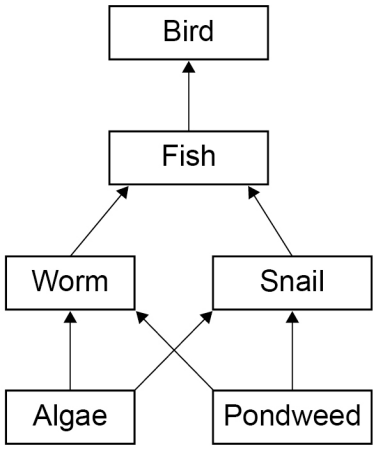
*Do not write outside the box*

**0 6** Different species in a habitat may depend on each other for food.

Several food chains may be linked together to form a food web.

**Figure 10** shows a food web in a lake.

**Figure 10**




**0 6 . 1** Most organisms in the food web get their energy by eating other organisms.

Where does the pondweed get energy from?

**[1 mark]**

Tick (✓) **one** box.

Carbon dioxide ☐

Mineral ions ☐

Sunlight ☐

Water ☐

*Do not write outside the box*

**0 6 . 2** Name **one** organism from **Figure 10** that is a primary consumer.

**[1 mark]**

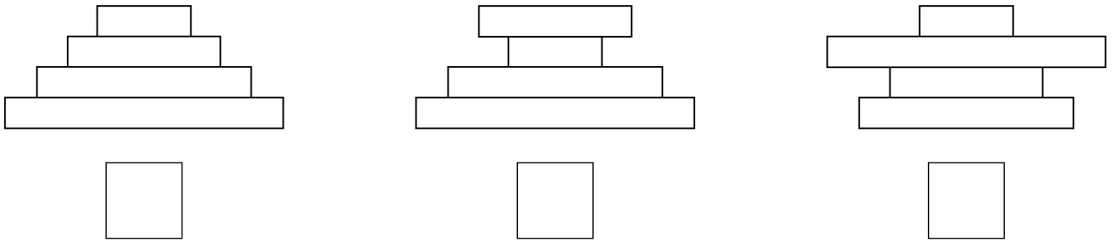
---

**0 6 . 3** There are four trophic levels in **Figure 10**.

Which is the correct pyramid of biomass for the food web in **Figure 10**?

**[1 mark]**

Tick (✓) **one** box.



**0 6 . 4** One of the food chains in **Figure 10** is:

algae ⟶ worm ⟶ fish ⟶ bird

10% of the biomass in each trophic level is transferred to the next trophic level.

What percentage of the biomass in the algae is transferred to the fish?

**[1 mark]**

Tick (✓) **one** box.

10% ☐ 1% ☐ 0.1% ☐

**Question 6 continues on the next page**

*Do not write outside the box*

**0 6 . 5** What are **two** ways that **energy** is lost from organisms in the food chain?

**[2 marks]**

Tick (✓) **two** boxes.

Diffusion ☐

Faeces ☐

Movement ☐

Osmosis ☐

Photosynthesis ☐

**0 6 . 6** Scientists counted the number of fish, snails and worms in a sample taken from the lake.

**Table 3** shows the results.

**Table 3**

| | **Tally** | **Number of organisms in the sample** |
|---|---|---|
| Fish | 𝍸 | |
| Snails | 𝍸 𝍸 \|\| | |
| Worms | 𝍸 𝍸 𝍸 𝍸 \|\|\| | |

Complete **Table 3**.

**[2 marks]**

8

*Do not write outside the box*

**0 7** Many farmers keep animals such as cows and chickens.

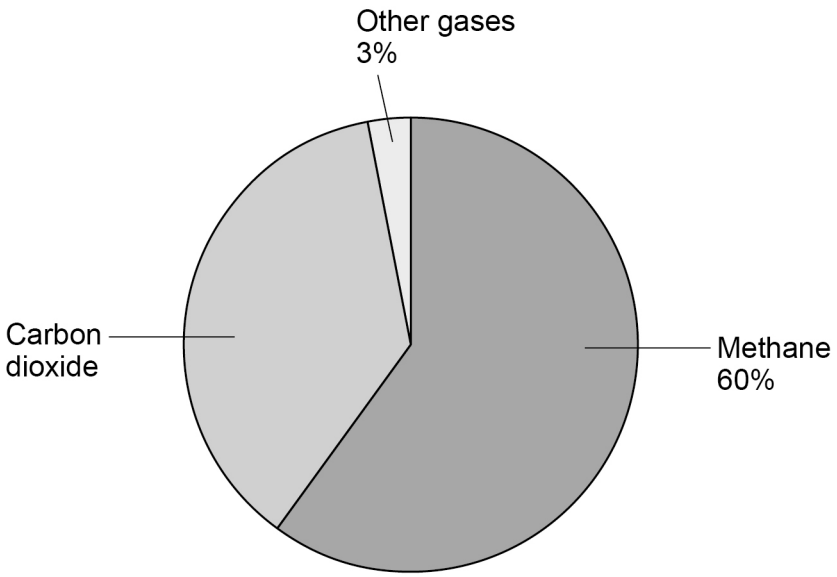
The animals produce a lot of manure (faeces).

The farmer can put the manure into a biogas generator.

In the biogas generator, microorganisms produce biogas.

**0 7 . 1** **Figure 11** shows the percentages of the gases found in a sample of biogas.

**Figure 11**




Calculate the percentage of carbon dioxide in the biogas in **Figure 11**.

**[2 marks]**

Percentage of carbon dioxide = _____ %

**Question 7 continues on the next page**

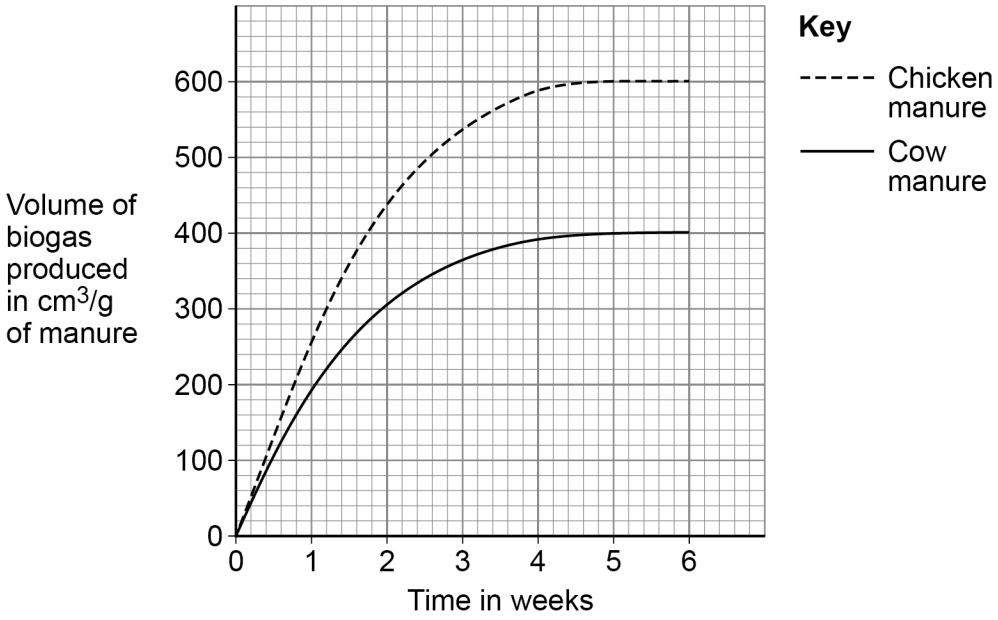
*Do not write outside the box*

**0 7 . 2** Scientists investigated biogas production from manure produced by cows and by chickens.

The scientists measured the production of biogas for 6 weeks.

**Figure 12** shows the results.

**Figure 12**




The scientists made **three** conclusions from the results.

Give evidence from **Figure 12** to support each conclusion.

**[3 marks]**

**Conclusion 1:** 'It is better to use chicken manure than cow manure for making biogas.'

Evidence _____

_____

**Conclusion 2:** 'Biogas production is fastest in the first week.'

Evidence _____

_____

**Conclusion 3:** 'After 4 weeks it is a waste of money to run the biogas generator.'

Evidence _____

_____

*Do not write outside the box*

Another group of scientists investigated the effect of adding fish fat to the manure used for biogas production.

Fish fat is a waste product from the sea fishing industry.

**Table 4** shows the results.

**Table 4**

| | **Volume of biogas produced in $cm^3/g$** | **Volume of methane produced in $cm^3/g$** | **Percentage (%) of methane in the biogas** |
|---|---|---|---|
| No fish fat | 426 | 256 | 60 |
| Fish fat added | 999 | 599 | 60 |

**0 7 . 3** Complete the sentences.

**[3 marks]**

Choose answers from the box.

| **decreases** | **stays the same** | **increases** |
|---|---|---|

Each answer may be used once, more than once or not at all.

When fish fat is added, the volume of biogas

produced _____.

When fish fat is added, the volume of methane

produced _____.

When fish fat is added, the percentage of methane in

the biogas _____.

**Question 7 continues on the next page**

*Do not write outside the box*

A farmer has a farm 250 kilometres from the sea.

The farmer has a biogas generator on the farm.

The farmer adds manure to the biogas generator.

**0 7 . 4** The farmer decided **not** to add fish fat to the manure in the biogas generator.

Suggest **one** reason why.

**[1 mark]**

**0 7 . 5** There is some manure left in the biogas generator.

Explain why the farmer spreads the manure on fields where crops will be grown.

**[2 marks]**

**11**

*Do not write outside the box*

**Turn over for the next question**

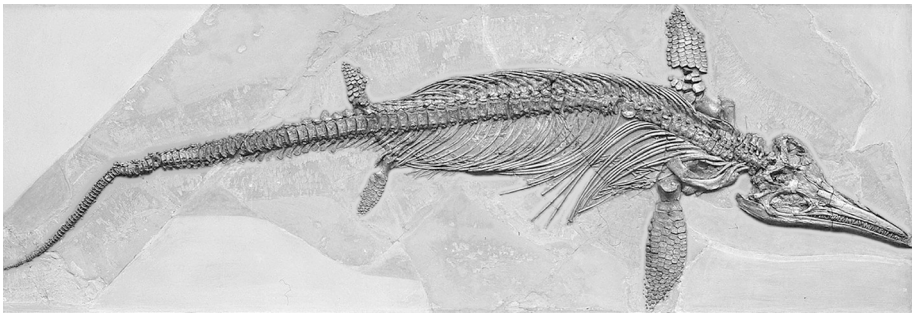
**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

**0 8** Ichthyosaurs are reptiles that lived in the sea millions of years ago.

**Figure 13** shows the fossilised remains of an ichthyosaur.

**Figure 13**



**0 8 . 1** Suggest how the fossil in **Figure 13** was formed after the ichthyosaur died.

**[2 marks]**

**0 8 . 2** The length of the image of the ichthyosaur in **Figure 13** is 120 mm.

The real length of the ichthyosaur was 17 times longer than the image in **Figure 13**.

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 8 . 3** **Table 5** gives the classification of the ichthyosaur in **Figure 13**.

**Table 5**

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

Complete **Table 5**.

**[2 marks]**

Choose answers from the box.

| **Community** | **Family** | **Mammal** | **Phylum** | **Population** |
|---|---|---|---|---|

**0 8 . 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**

**Turn over ►**

*Do not write outside the box*

**0 9** 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.

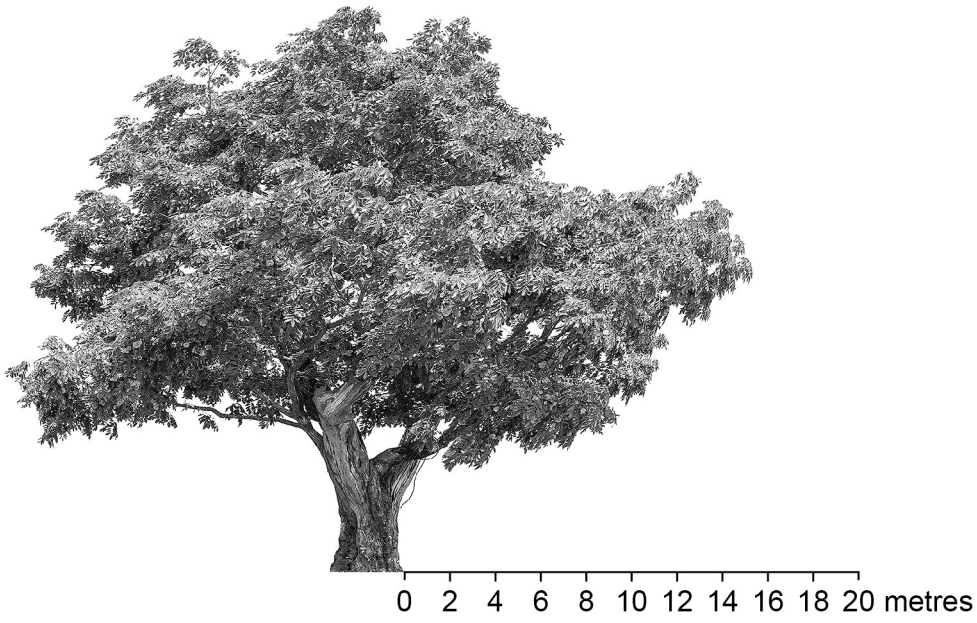
2. Place a 1 $m^2$ quadrat on the ground every 4 metres along the tape measure.

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 14** shows the tree and the tape measure.

**Figure 14**




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 9 . 1** Suggest why the students repeated steps **7** and **8** until there was no further change in mass.

**[1 mark]**

**Question 9 continues on the next page**

*Do not write outside the box*

**Table 6** shows the results.

**Table 6**

| | 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 9 . 2** Calculate percentage **X** in **Table 6**.

Give your answer to the nearest whole number.

**[3 marks]**

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

**0 9 . 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 6**.

**[1 mark]**

*Do not write outside the box*

**0 9 . 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 9 . 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**

*Do not write outside the box*

**1 0** Tropisms help plants survive.

**1 0 . 1** What is geotropism?

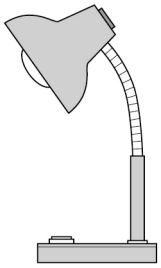
**[2 marks]**

**1 0 . 2** Plan an investigation to find the effect of the direction of light on the growth of plant seedlings.

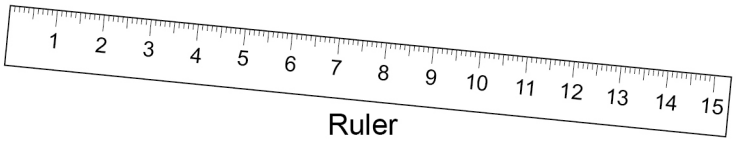
You may use the equipment shown in **Figure 15** and any other laboratory equipment.

**[6 marks]**

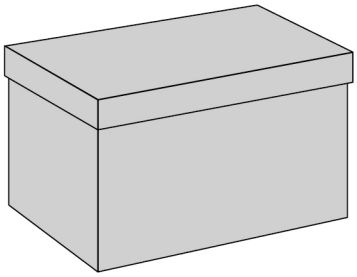
**Figure 15**



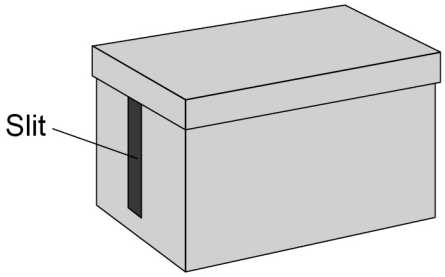
Lamp




Ruler



Cardboard box




Cardboard box with slit cut in one side

*Do not write outside the box*

Extra space

**Question 10 continues on the next page**

*Do not write outside the box*

Plant responses are controlled by hormones.

**10.3** Which hormone controls a plant's response to the direction of light?

**[1 mark]**

**10.4** How does the hormone you named in Question **10.3** 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. ☐

**10.5** Explain how a plant's response to light helps the plant survive.

**[3 marks]**

13

**END OF QUESTIONS**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

| Question number | **Additional page, if required.**<br>**Write the question numbers in the left-hand margin.** |
|---|---|
| | |

*Do not write outside the box*

| Question number | **Additional page, if required.**<br>**Write the question numbers in the left-hand margin.** |
|---|---|
| | |

*Do not write outside the box*

| Question number | **Additional page, if required.**<br>**Write the question numbers in the left-hand margin.** |
|---|---|
| | |

*Do not write outside the box*

| Question number | **Additional page, if required.**<br>**Write the question numbers in the left-hand margin.** |
|---|---|
| | |

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

**Copyright information**

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2025 AQA and its licensors. All rights reserved.