



Please write clearly in block capitals.

Centre number

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Candidate number

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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	



J U N 2 5 8 4 6 1 2 F 0 1

IB/G/Jun25/G4006/E8

8461/2F

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ANSWER IN THE SPACES PROVIDED**



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

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

Turn over ►



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	



01.4

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]

01.5

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	☐
---	--------------------------	---	--------------------------	---	--------------------------	---	--------------------------

01.6

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	☐
---	--------------------------	---	--------------------------	---	--------------------------

01.7

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]



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0	2
---	---

Some human responses are reflex actions.

0	2	.	1
---	---	---	---

Give **two** features of a reflex action.

[2 marks]

1 _____

2 _____

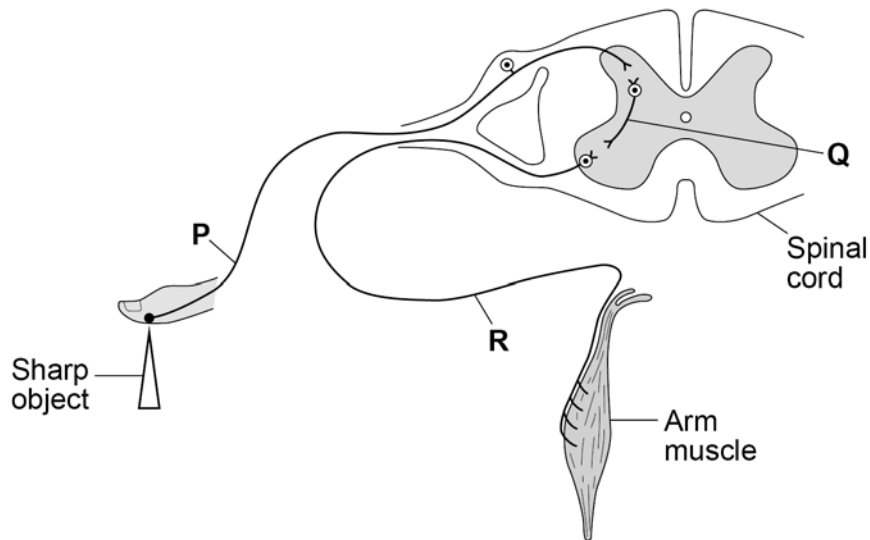
Question 2 continues on the next page

Turn over ►



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 _____.



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
P	Motor
Q	Reflex
R	Relay
	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

Turn over ►



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

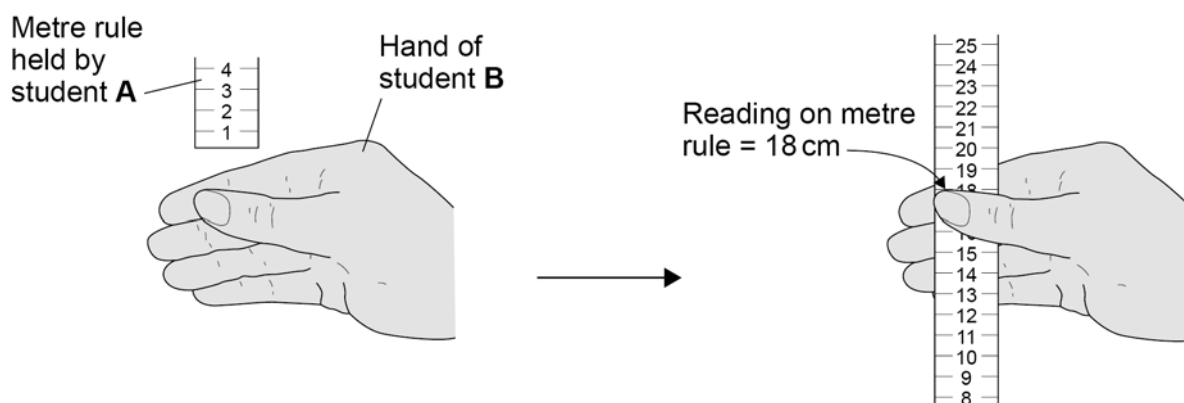


Table 1 shows the results.

Table 1

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



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

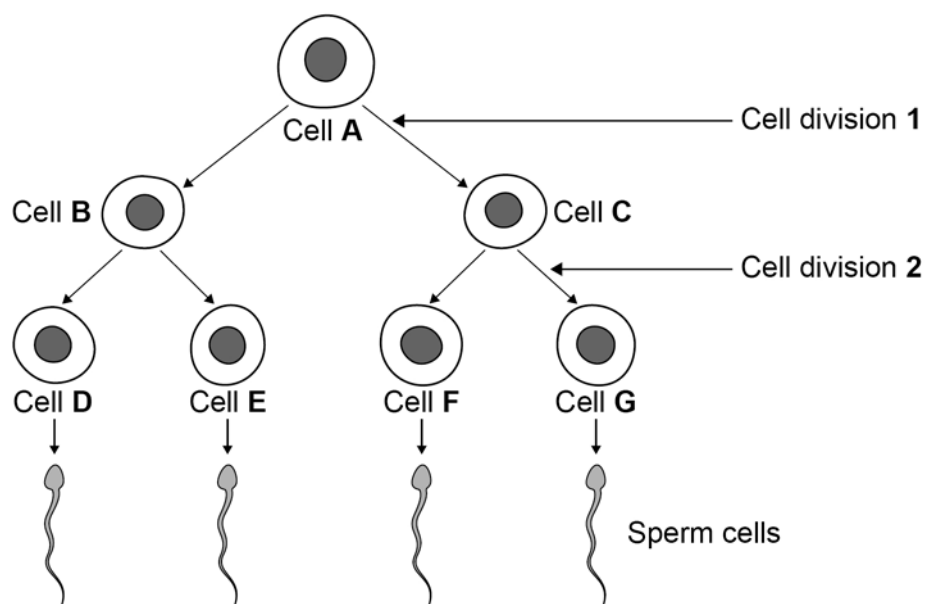
Turn over for the next question**Turn over ►**

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 _____



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

Turn over ►

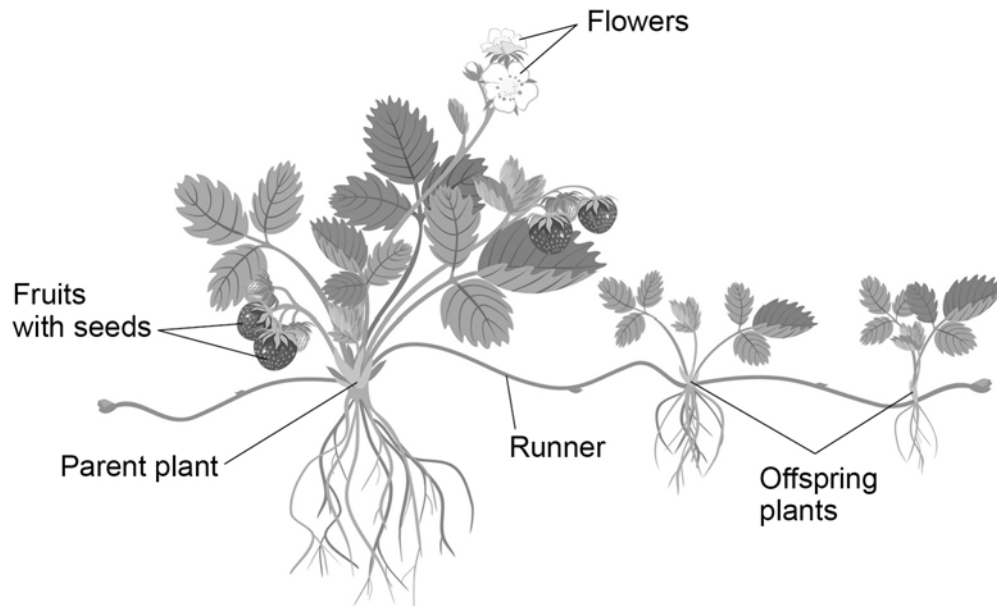


Strawberry plants can reproduce both **sexually** and **asexually**.

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	☐

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

Turn over ►



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



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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

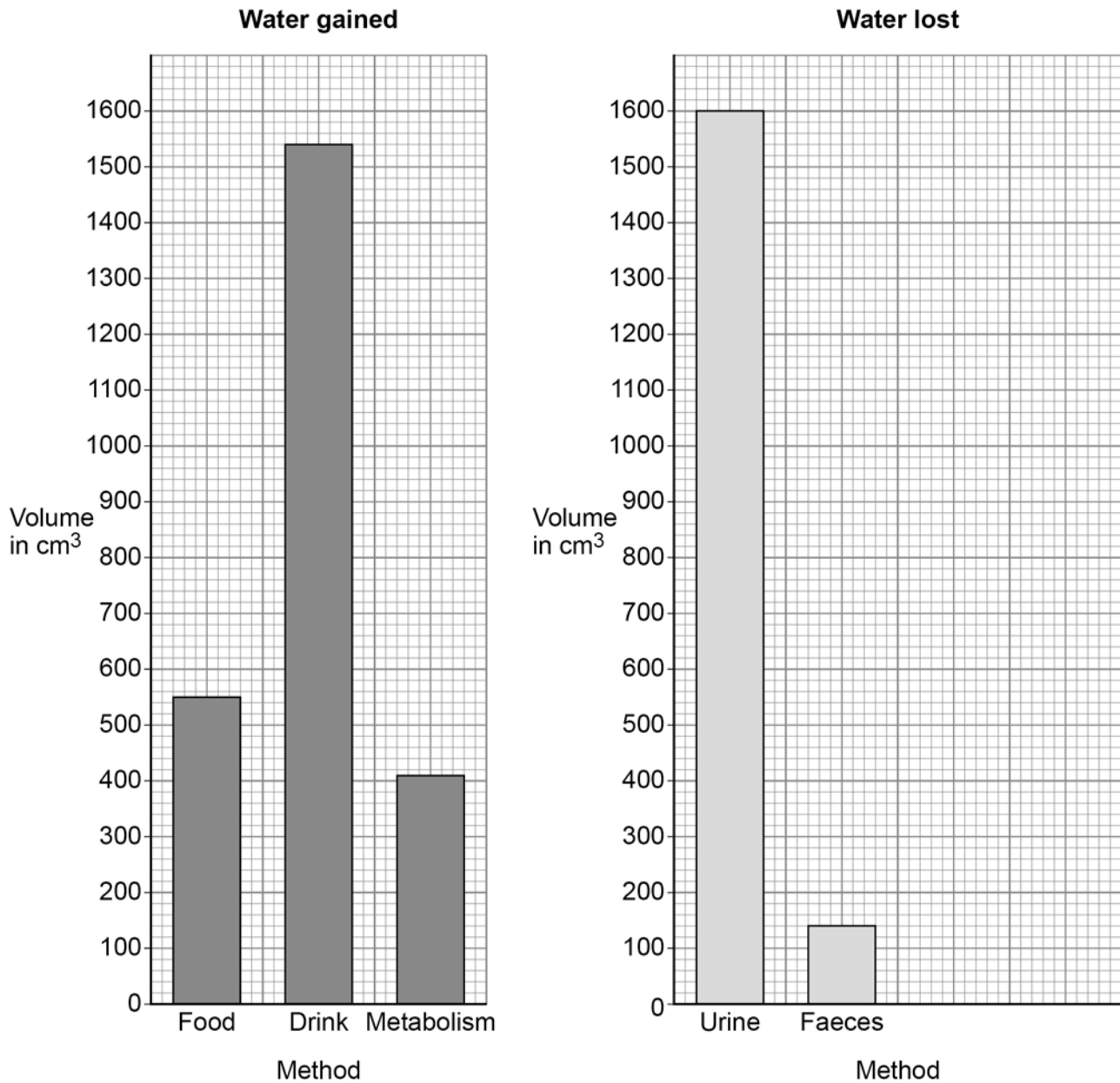
Water gained	
Method	Volume in cm ³
Food	550
Drink	1540
Metabolism	410
Total	2500

Water lost	
Method	Volume in cm ³
Urine	1600
Faeces	140
Sweat	420
Breathing	340
Total	2500



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

Turn over ►



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



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

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

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

Include your own knowledge in your answer.

[illegible]

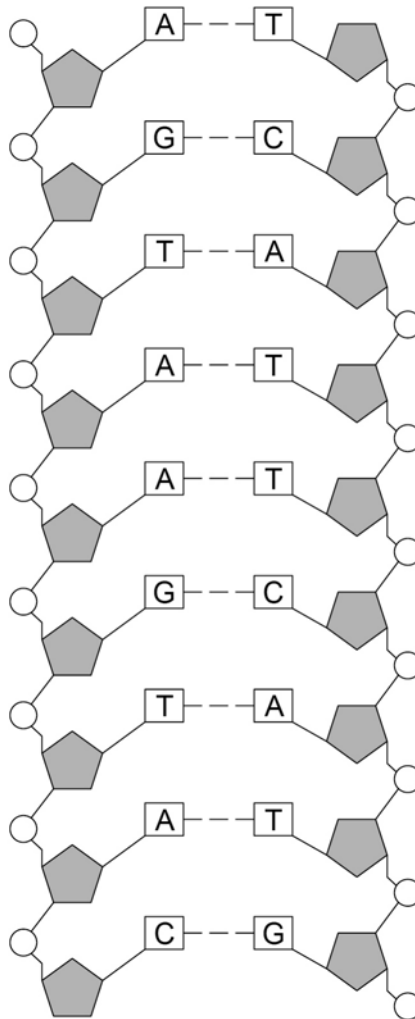
Turn over for the next question



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.



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

☐

Turn over ►

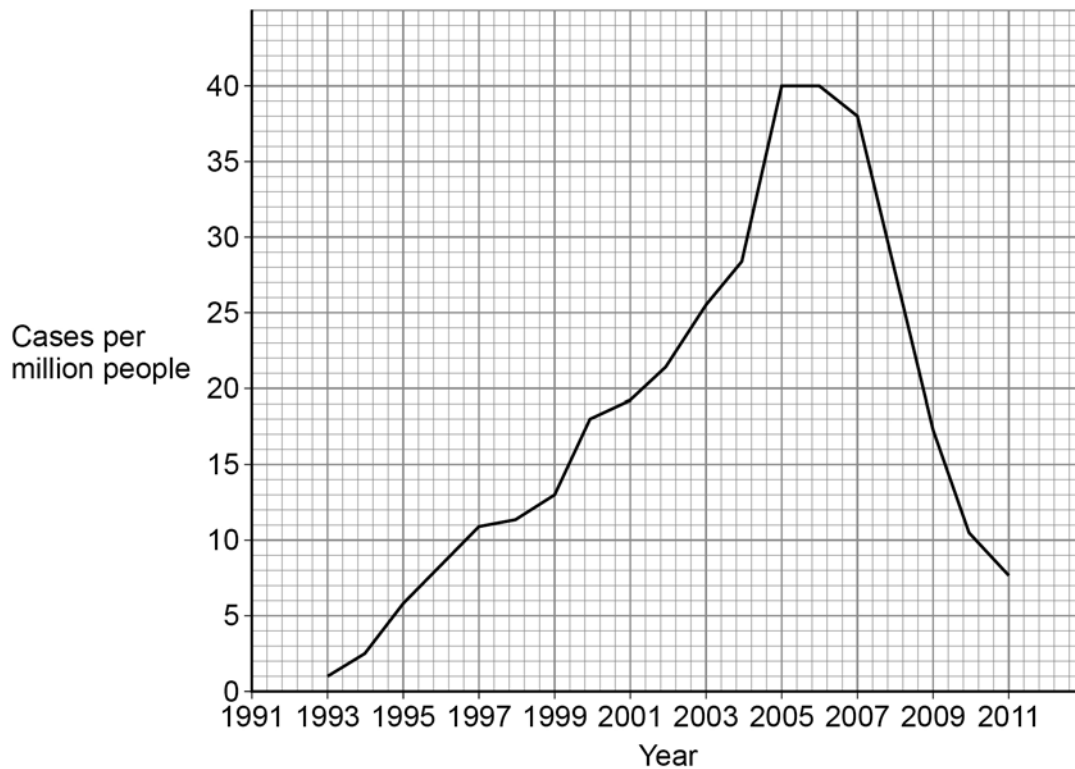


Changes in the DNA of a bacterial pathogen can produce new strains of the pathogen.

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



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

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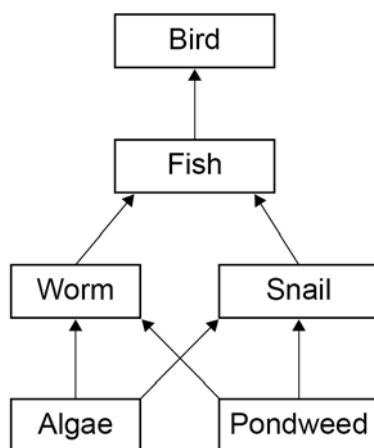
0 6

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

☐


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

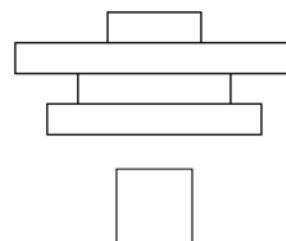
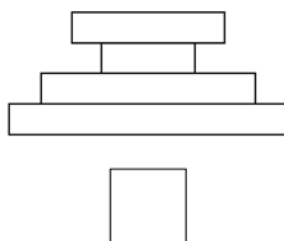
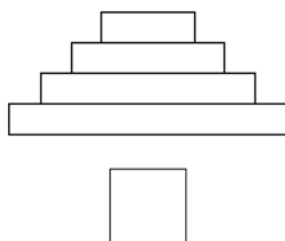
[1 mark]

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

Turn over ►



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		
Snails		
Worms		

Complete **Table 3**.**[2 marks]**

8



0 7

Many farmers keep animals such as cows and chickens.

The animals produce a lot of manure (faeces).

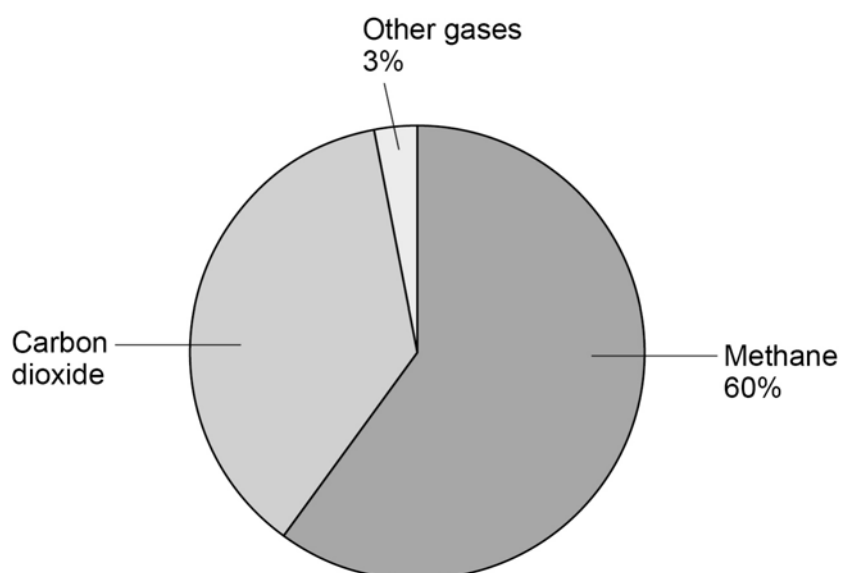
The farmer can put the manure into a biogas generator.

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

Turn over ►



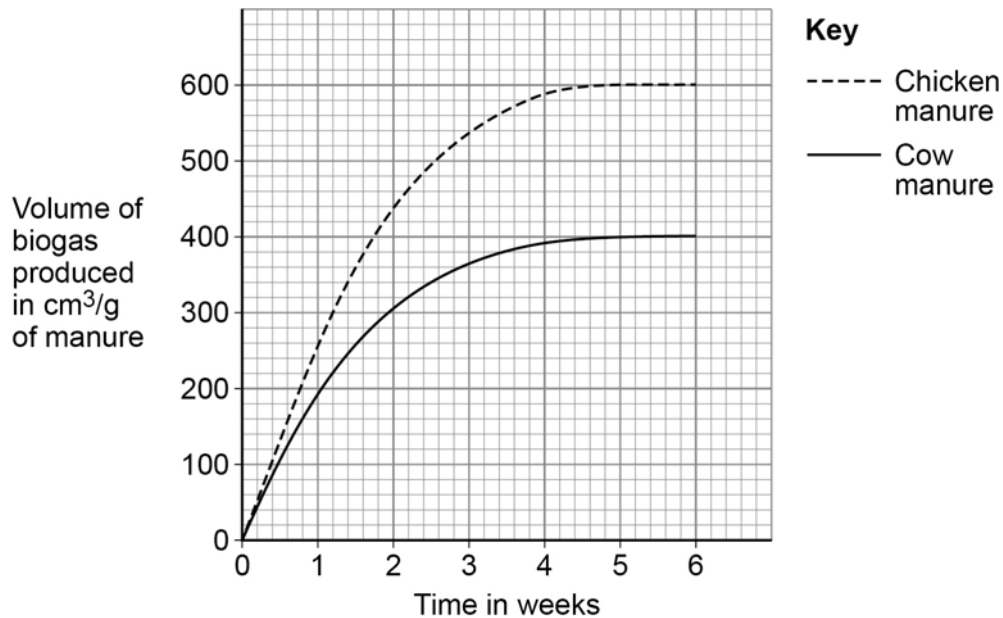
0 7 2

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 _____



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 cm³/g	Volume of methane produced in cm³/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

Turn over ►



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



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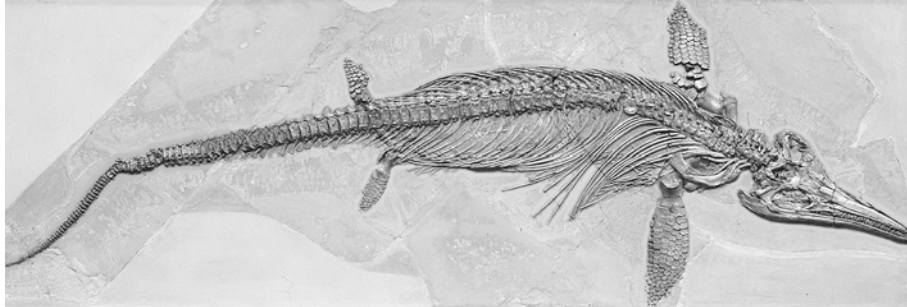


0 8

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



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 _____



0	9
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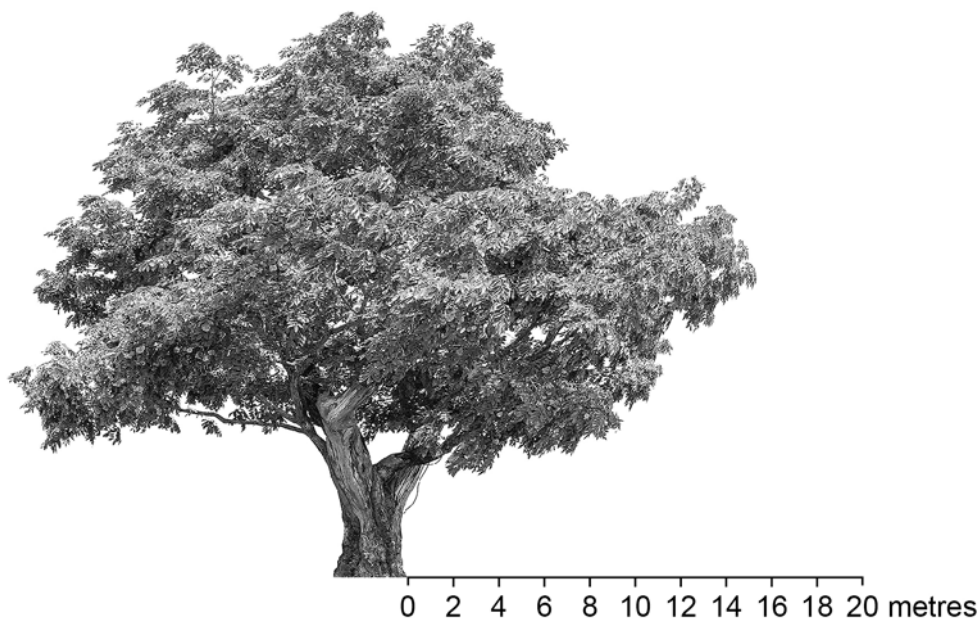
Students investigated how many daisy plants were growing in a field at different distances from a tree.

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 m² 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.

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

Turn over ►



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]



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

Turn over ►



1 0

Tropisms help plants survive.

1 0 . 1

What is geotropism?

[2 marks]

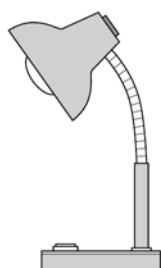
1 0 . 2

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

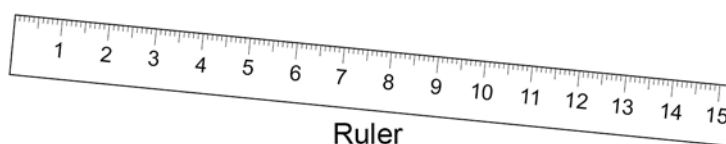
You may use the equipment shown in **Figure 15** and any other laboratory equipment.

[6 marks]

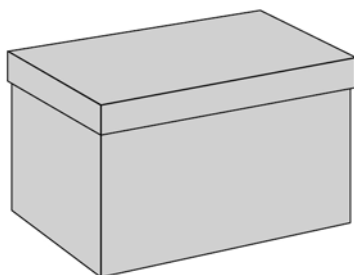
Figure 15



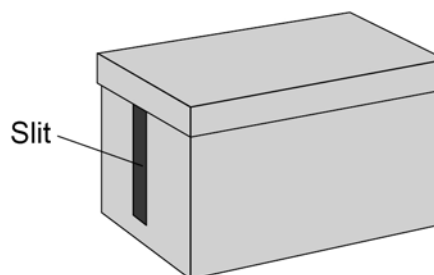
Lamp



Ruler



Cardboard box



Slit

Cardboard box with
slit cut in one side

Question 10 continues on the next page

Plant responses are controlled by hormones.

1 0 . 3

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

[1 mark]

1 0 . 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.

☐

1 0 . 5

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

[3 marks]

END OF QUESTIONS



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[illegible]

[illegible]

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