



Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier

Biology Paper 2H

H

8464/B/2H

Friday 9 June 2023

Afternoon

Time allowed: 1 hour 15 minutes

[Turn over]



At the front of this book, write your surname and other names, your centre number, your candidate number and add your signature.

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.**
- **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 70.**
- **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
---	---

Sexual reproduction in humans involves the production of egg cells and sperm cells.

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

**Name the type of cell division that produces egg cells and sperm cells.
[1 mark]**

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

Sexual reproduction produces offspring that are genetically different from each other.

Give TWO reasons why sexual reproduction causes variation in the offspring. [2 marks]

1 _____

2 _____

[Turn over]



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Polydactyly is an inherited disorder.

The allele for polydactyly is dominant, D.

A person with two copies of the allele d will NOT have polydactyly.

0 1 . 3

A person with the genotype DD is homozygous.

What word describes the genotype Dd?
[1 mark]

[Turn over]



0	1	.	4
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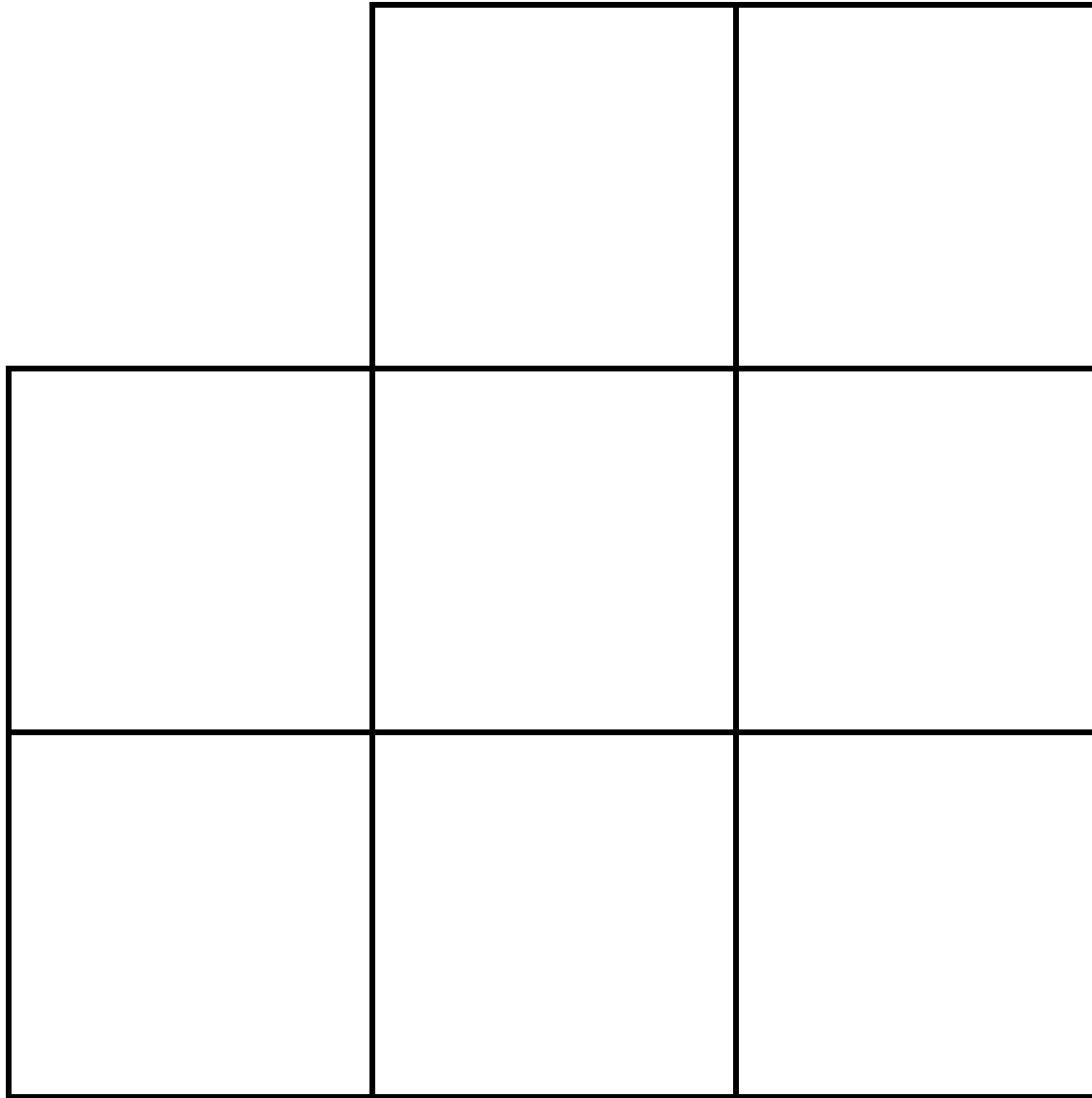
A person with the genotype Dd and a person with the genotype dd plan to have a child.

Determine the probability that the child will have polydactyly.

You should:

- complete the Punnett square diagram on the opposite page**
- identify any offspring genotype that would have polydactyly.**

[5 marks]



Probability that the child will have polydactyly = _____

[Turn over]



0	1	.	5
---	---	---	---

Embryos can be screened for the alleles that cause inherited disorders.

Give TWO advantages of embryo screening. [2 marks]

1 _____

2 _____

11



0	2
---	---

It is estimated that 99.9% of all species that have ever existed are now extinct.

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

Why is the percentage of species that are extinct only an estimate? [1 mark]

Tick (✓) ONE box.

☐

All individuals of one species have the same genes.

☐

Extinction is always caused by humans.

☐

Humans have not found evidence of every species.

[Turn over]



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

What evidence is used to study species that have become extinct? [1 mark]

0	2	.	3
---	---	---	---

A bacterium called ‘Clostridioides difficile’ (‘C. difficile’) can infect the human digestive system.

‘C. difficile’ can multiply and produce toxins. The toxins cause diarrhoea.

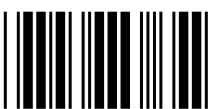
Doctors are concerned that new strains of ‘C. difficile’ may evolve. Antibiotics may NOT be able to kill these new strains.



Explain how the evolution of antibiotic resistant 'C. difficile' can be slowed down. [6 marks]

[illegible]

[Turn over]



14

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8



1 4

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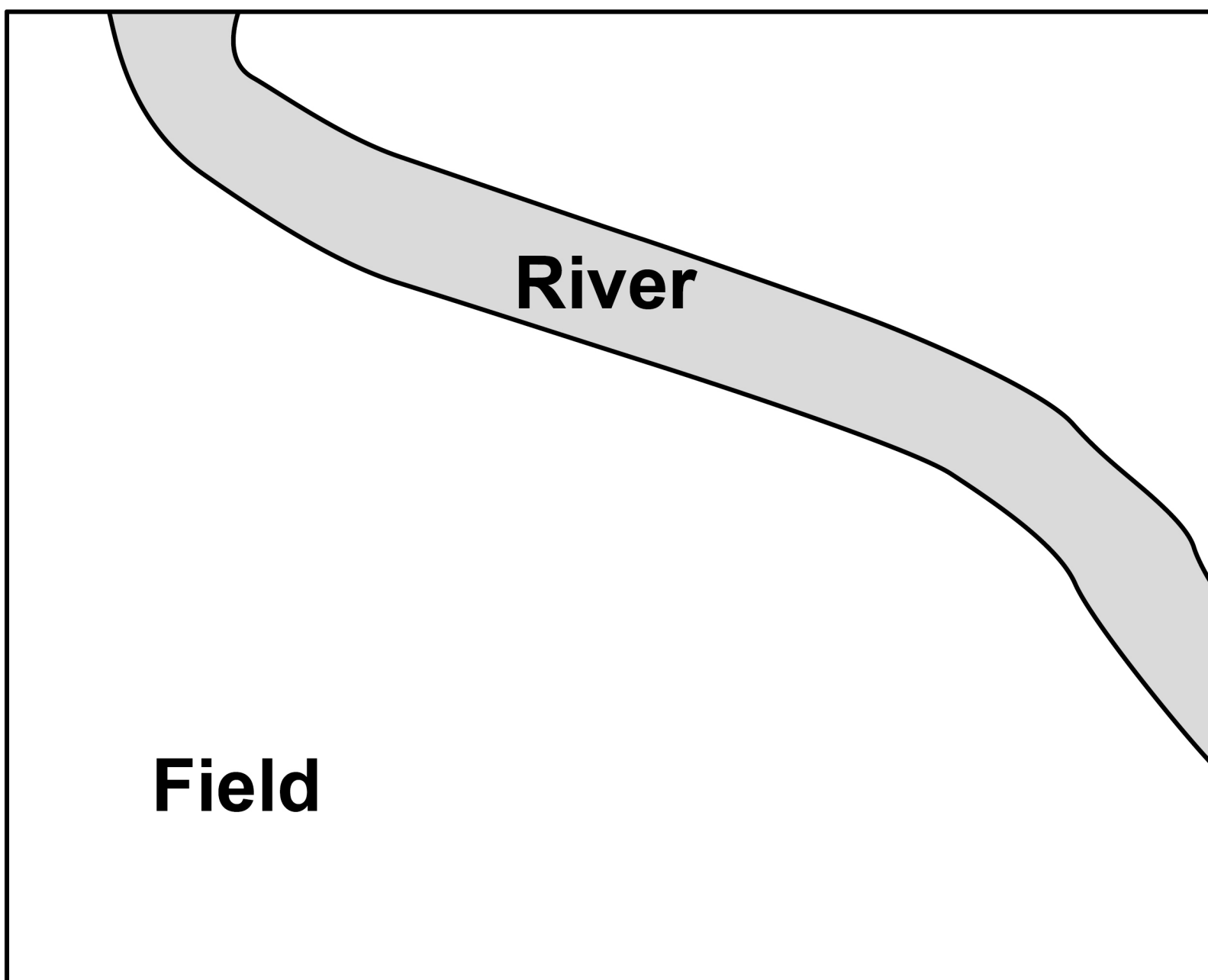
[Turn over]



0	3
---	---

FIGURE 1 shows a river next to a field.

FIGURE 1



0	3	.	1
---	---	---	---

Describe a method to investigate how the distance from the river affects the number of different plant species in the field.

You should explain how to use a transect in your method. [4 marks]

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[Turn over]



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0	3	.	2
---	---	---	---

Students used a valid method to investigate how the distance from the river affects the number of different plant species in the field.

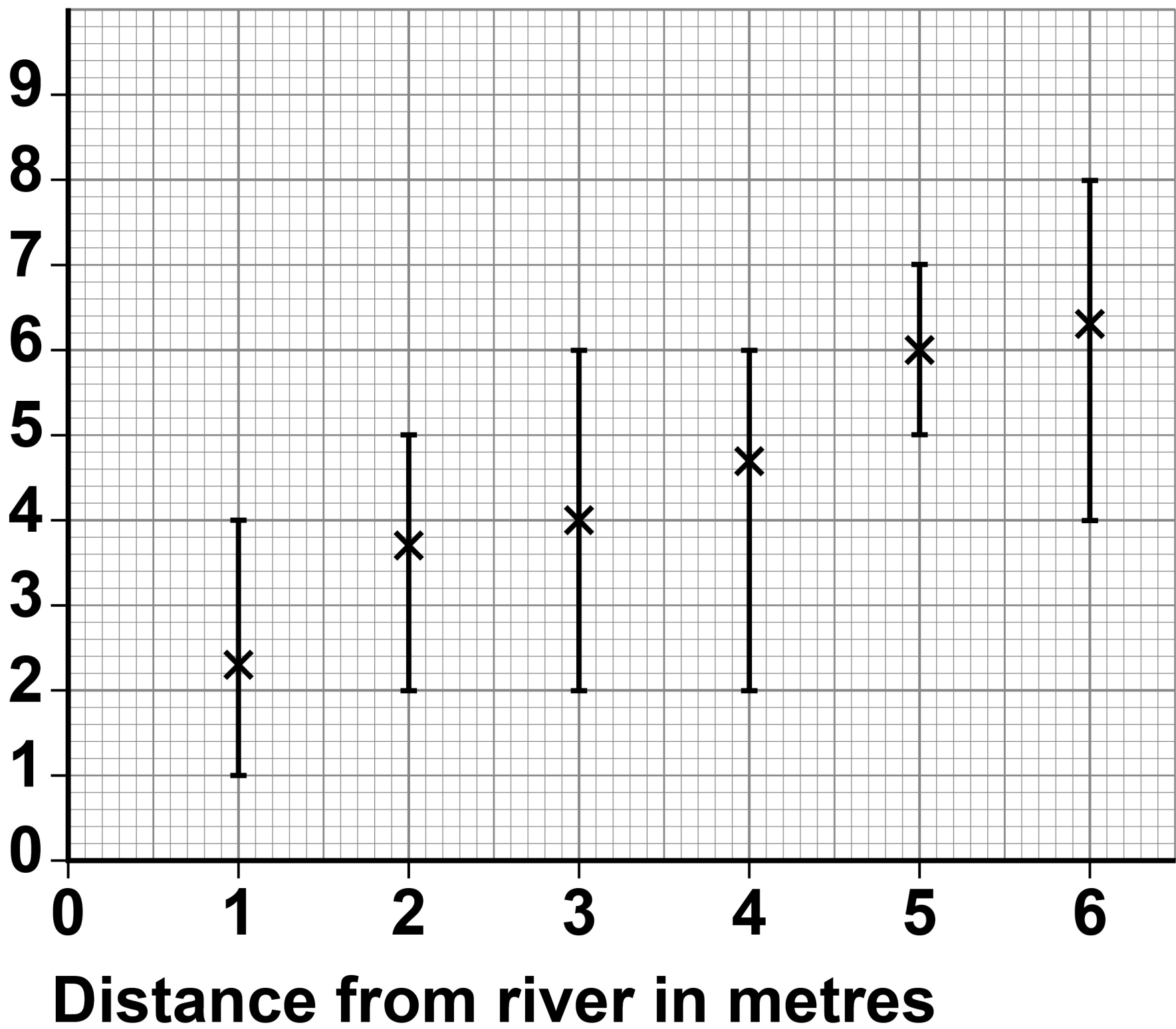
FIGURE 2, on page 20, shows the results.

[Turn over]



FIGURE 2

**Number of
different plant
species**

**KEY**

— Maximum

x Mean

— Minimum



What is shown by the data in FIGURE 2?
[1 mark]

Tick (✓) ONE box.

☐

Fewer different species are always recorded nearer to the river.

☐

The mean value students can be most certain about is 5 metres from the river.

☐

The number of species recorded 6 metres from the river is anomalous.

[Turn over]



Cows walk on the ground near the river more than they walk on the ground further from the river.

0 3 . 3

Which is an ABIOTIC factor that could affect the number of different plant species found near the river? [1 mark]

Tick (✓) ONE box.

- ☐ **Microorganisms near the roots**
- ☐ **Moisture levels in the soil**
- ☐ **Oxygen concentration in the air**
- ☐ **Primary consumers in the field**



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[Turn over]



0	3	.	4
---	---	---	---

Increasing numbers of cows are being farmed across the world.

Explain the environmental implications of increasing numbers of cows being farmed. [6 marks]

[illegible]

25

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[Turn over]

12



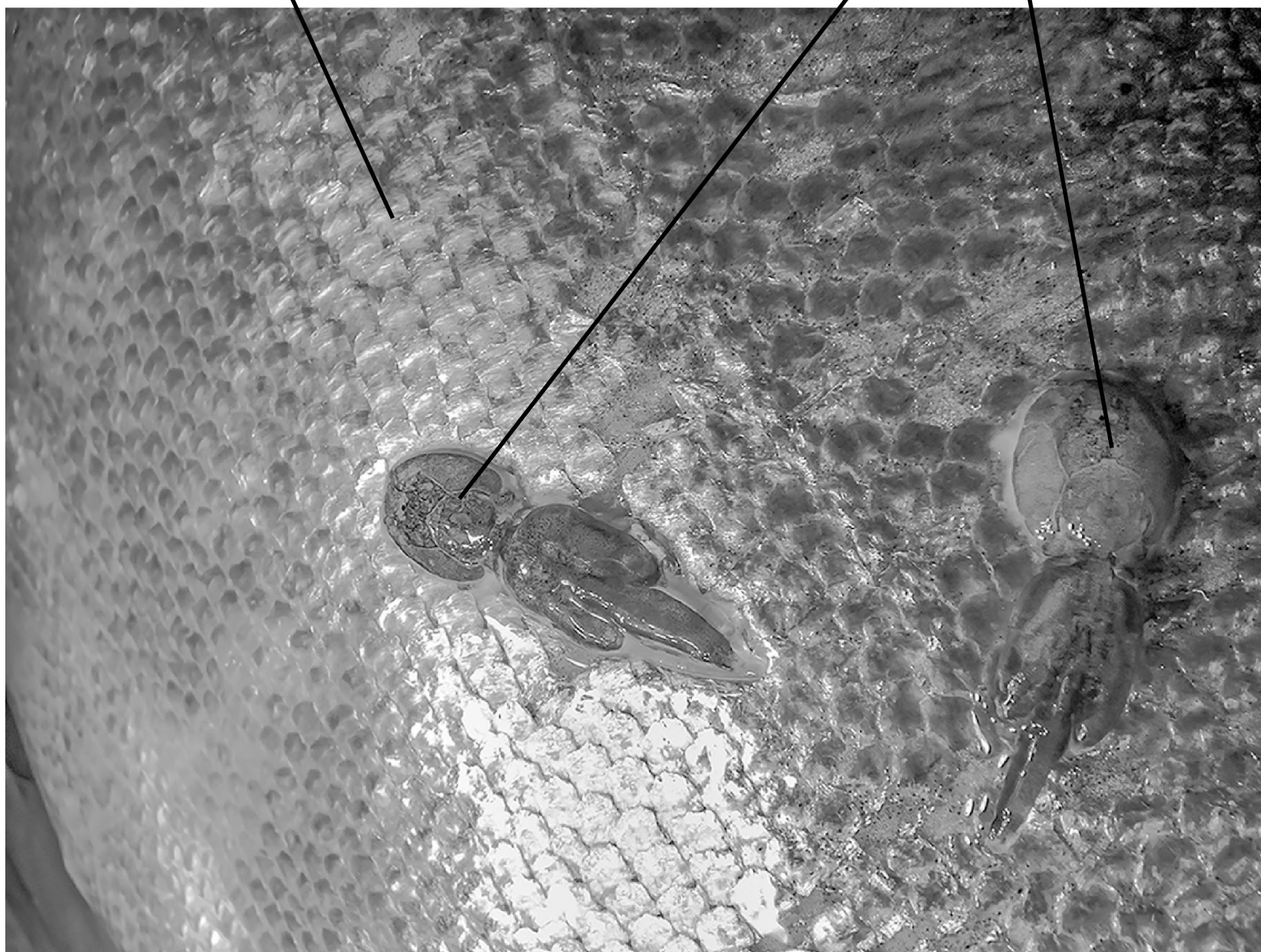
2 5

0	4
---	---

Sea lice are small animals that feed on the skin and blood of salmon fish.

FIGURE 3, on the opposite page, shows sea lice attached to the skin of a salmon, 'Oncorhynchus keta'.



FIGURE 3**Skin of
salmon****Sea lice****[Turn over]**

0	4	.	1
---	---	---	---

What is the genus name of salmon?
[1 mark]

0	4	.	2
---	---	---	---

Which domain are sea lice classified in?
[1 mark]



0	4	.	3
---	---	---	---

Some salmon have genes that result in fewer sea lice attaching to the skin.

Describe how fish farmers can selectively breed salmon that sea lice CANNOT attach to. [3 marks]

[Turn over]



0	4	.	4
---	---	---	---

Explain the advantages to salmon farmers of producing salmon that do NOT have sea lice attached to their skin.

[3 marks]

0	4	.	5
---	---	---	---

Explain the DISADVANTAGE of selectively breeding salmon.

Do NOT refer to cost or to time in your answer. [2 marks]

[Turn over]

<hr/>
10



0	5
---	---

In Vitro Fertilisation (IVF) can be used to treat infertility.

0	5	.	1
---	---	---	---

Which hormones are given to women having IVF treatment? [1 mark]

Tick (✓) ONE box.

☐

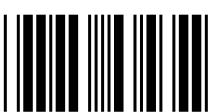
FSH and LH

☐

FSH and oestrogen

☐

LH and oestrogen



0	5	.	2
---	---	---	---

Name the target organ of the hormones used for IVF. [1 mark]

0	5	.	3
---	---	---	---

Describe why microscopes are needed in the process of IVF. [1 mark]

[Turn over]



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0	5	.	4
---	---	---	---

Describe how the hormones given to women during IVF treatment INTERACT with other hormones to prepare the body for pregnancy. [3 marks]

[Turn over]



Scientists studied women who had IVF treatment.

TABLE 1 shows the results.

TABLE 1

	NUMBER OF WOMEN
Received IVF treatment	450
Successful IVF treatment	135

0	5	.	5
---	---	---	---

Calculate the SIMPLEST ratio of the number of women who had successful IVF to the number of women who had unsuccessful IVF.

**Give the ratio in whole numbers.
[2 marks]**

Ratio (whole numbers) = _____ : _____

[Turn over]



0	5	.	6
---	---	---	---

Suggest ONE factor that can affect the probability of a woman having a child as a result of IVF treatment. [1 mark]

0	5	.	7
---	---	---	---

Give TWO arguments against the use of IVF treatment.

Do NOT refer to cost or to religion in your answer. [2 marks]

1 _____

2 _____

[Turn over]

11



0	6
---	---

The control of body temperature is an example of homeostasis.

0	6	.	1
---	---	---	---

Give ONE other internal condition controlled by homeostasis.

Do NOT refer to temperature in your answer. [1 mark]

0	6	.	2
---	---	---	---

Explain why the control of body temperature is important. [2 marks]

[Turn over]

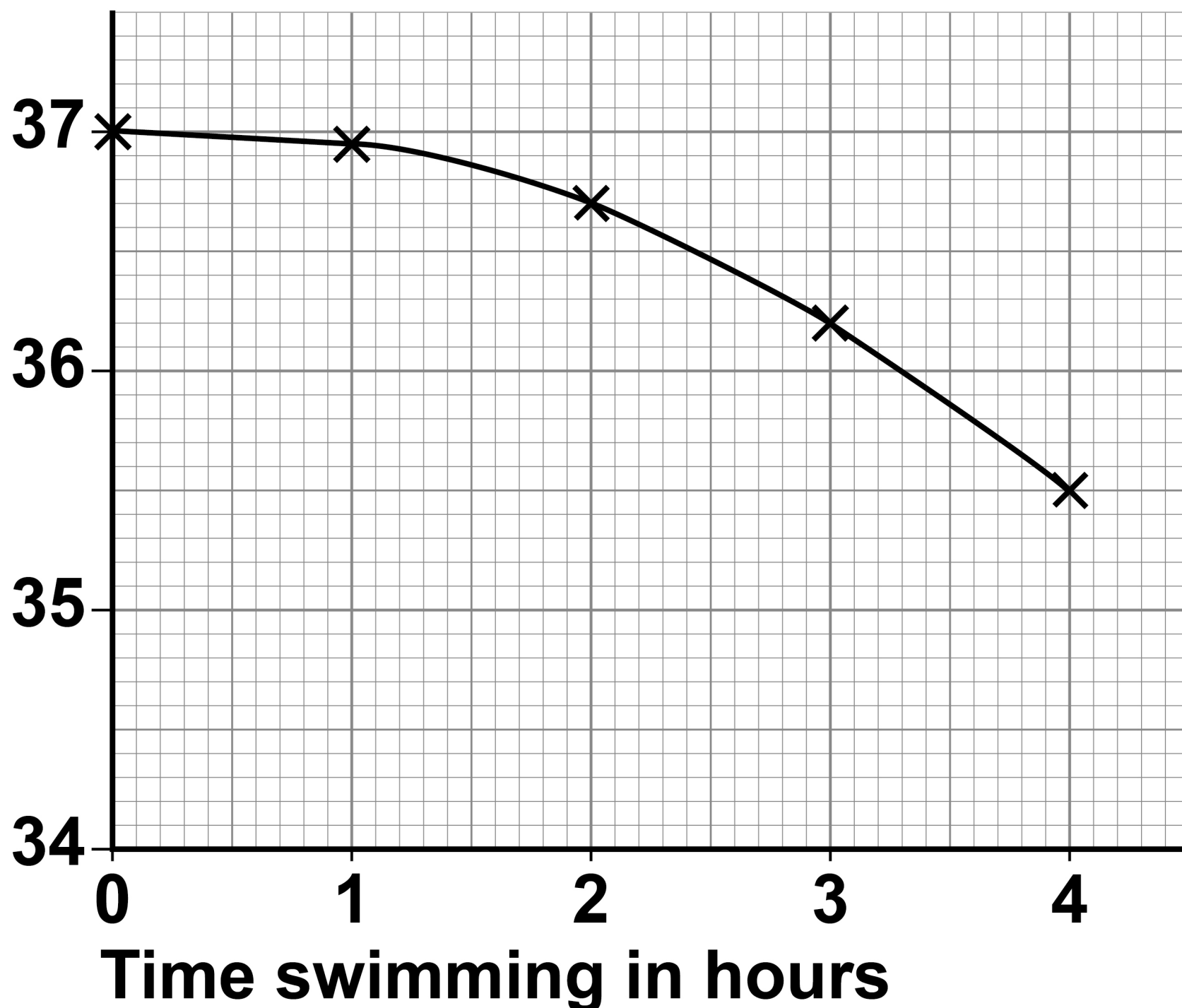


The body temperature of long-distance swimmers can change as the length of time swimming in cold water increases.

FIGURE 4 shows how the body temperature of one swimmer changed in the first 4 hours of a long-distance swim.

FIGURE 4

**Body temperature
in °C**



0	6	.	3
---	---	---	---

Calculate the mean rate of body temperature decrease per hour in the first 4 hours of the swim. [2 marks]

Rate = _____ °C per hour

[Turn over]



0	6	.	4
---	---	---	---

Hypothermia is a dangerously low body temperature.

For this swimmer, a 5.5% decrease in body temperature from the start of the swim will cause hypothermia.

Determine the body temperature at which this swimmer will start to have hypothermia.

**Give your answer to 2 significant figures.
[4 marks]**



Body temperature (2 significant figures) =
_____ °C

[Turn over]

A decrease in body temperature causes the adrenal glands and the thyroid gland to be stimulated.

06.5

Which gland secretes hormones to stimulate the adrenal glands? [1 mark]

06.6

Explain the role of the adrenal glands in responding to a decrease in body temperature. [5 marks]



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[Turn over]



0	6	.	7
---	---	---	---

Explain how the thyroid gland controls the response to a decrease in body temperature by negative feedback.

[3 marks]

END OF QUESTIONS

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18



Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

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