AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier
Biology Paper 2H

Friday 9 June 2023 Afternoon Time allowed: 1 hour 15 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.

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

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.

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ANSWER IN THE SPACES PROVIDED

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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]

Meiosis

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 sperm are not genetically identical

2 DNA from both parents

Question 1 continues on the next page

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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]

Heterozygous

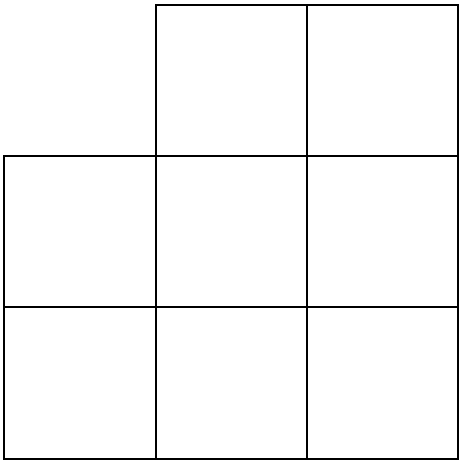
0 1 . 4 A person with the genotype **Dd** and a person with the genotype **dd** plan to have a child.

Determine the probability that the child will have polydactyly.

You should:

- complete the Punnett square diagram
- identify any offspring genotype that would have polydactyly.

[5 marks]



Probability that the child will have polydactyly = _____

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0 1 . 5 Embryos can be screened for the alleles that cause inherited disorders.

Give **two** advantages of embryo screening.

[2 marks]

1 can decide whether to continue with pregnancy

2 can prepare for baby (with disorder)

11

Turn over for the next question

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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. ☑

0 2 . 2 What evidence is used to study species that have become extinct?

[1 mark]

Fossils

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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]

Methods of reducing rate of evolution and linked explanation
• doctors should not prescribe antibiotics inappropriately
o so fewer C. difficile are exposed to antibiotic(s)
• do not use antibiotics to treat mild (bacterial) infection
o because the immune system can respond (to mild bacterial infection)
• do not use antibiotics to treat (any) viral infections
o because antibiotics do not kill viruses
• patients should complete their course of antibiotics
o so (more likely that) all C. difficile are killed
o so none survive to mutate (and form resistant strains)
• the agricultural use of antibiotics should be restricted
o so fewer C. difficile are exposed to antibiotic(s)
• hand washing after going to toilet
o will reduce spread of C. difficile
• people with diarrhoea / C. difficile should stay away from school / work
o to reduce spread of C. difficile
• develop new antibiotic against C. difficile
o so all C. difficile are killed
o so none survive to mutate and form (another) resistant strain
• develop vaccine against C. difficile
o would decrease the use of antibiotics

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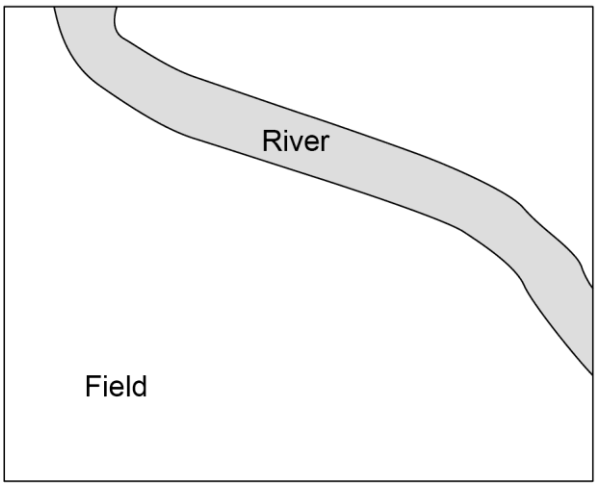
0 3 **Figure 1** shows a river next to a field.

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]

measure / string / transect / line
at right angles to river (edge)
place quadrat at intervals (along transect)
count the (different plant) species (in each quadrat) at each distance
repeat for 2 more transects

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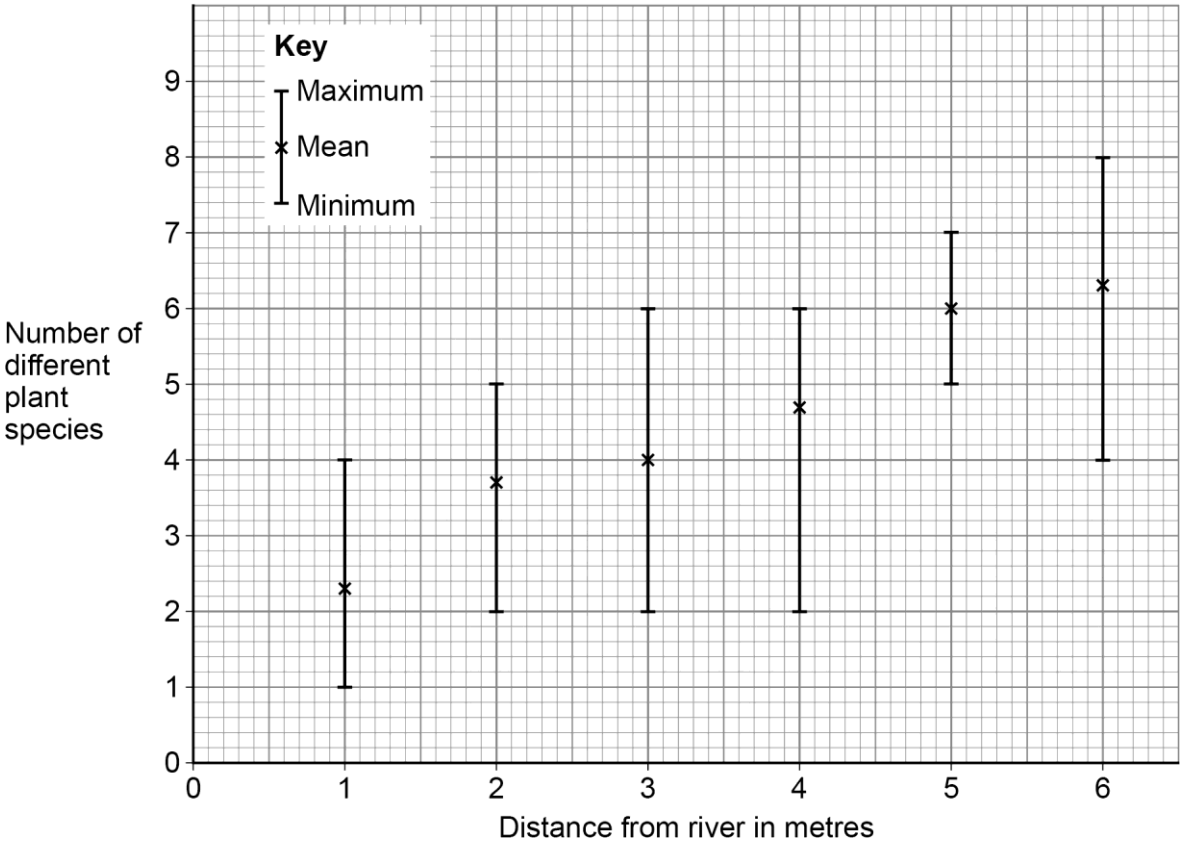
0 3 . 2 Students used a valid method to investigate how the distance from the river affects the number of different plant species in the field.

Figure 2 shows the results.

Figure 2



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. ☐

Question 3 continues on the next page

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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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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]

consequences of increasing number of cows
- fewer plants
- due to more trampling
- due to more plants being eaten (by cows)
- (fewer plants so) less photosynthesis
- so more carbon dioxide in the atmosphere
- (more) cows will release carbon dioxide
- from respiration
- (more) cows release methane
- deforestation to provide farmland
- more (cow) faeces entering river / streams / watercourses

environmental implications
- o carbon dioxide is a greenhouse gas
- o methane is a greenhouse gas
- o global warming may be greater
- o description of consequence(s) of global warming
- o description of consequence(s) of (cow) faeces entering river / streams / watercourses
- o less land available to grow crops
- o effects of deforestation (eg reduced biodiversity)

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Turn over for the next question

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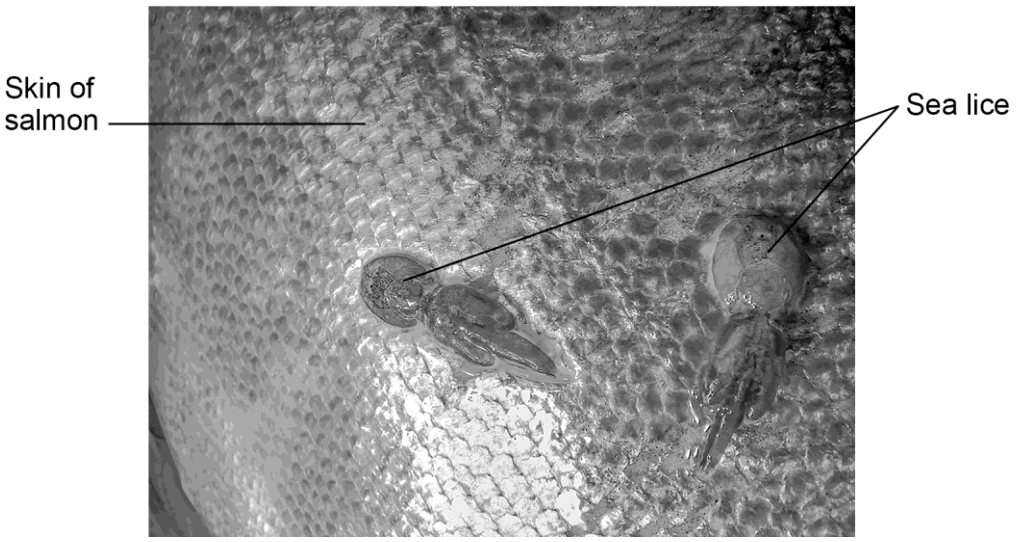
0 4 Sea lice are small animals that feed on the skin and blood of salmon fish.

Figure 3 shows sea lice attached to the skin of a salmon, *Oncorhynchus keta*.

Figure 3



0 4 . 1 What is the genus name of salmon?

[1 mark]

Oncorhynchus

0 4 . 2 Which domain are sea lice classified in?

[1 mark]

eukaryota

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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]

select fish that have / get least / less / no (attachment of) sea lice
and breed (selected fish) together
select offspring that have least sea lice
and
breed (selected offspring) together
repeat over many generations until all offspring have no sea lice (attached)

0 4 . 4 Explain the advantages to salmon farmers of producing salmon that do **not** have sea lice attached to their skin.

[3 marks]

sea lice will not be feeding on salmon (skin / blood)
(so) salmon grow larger / faster
(so) salmon can be sold for more money

Question 4 continues on the next page

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0 4 . 5 Explain the **disadvantage** of selectively breeding salmon.

Do **not** refer to cost or to time in your answer.

[2 marks]

all fish genetically similar
(therefore) all may have (same)
inherited disorder / defect

10

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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]

ovary

0 5 . 3 Describe why microscopes are needed in the process of IVF.

[1 mark]

To be able to select eggs

Question 5 continues on the next page

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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]

(hormones / FSH / LH used in IVF)
cause an increase in progesterone and oestrogen

progesterone / oestrogen maintain uterus lining
(uterus) lining is prepared / ready for embryo to be inserted / implanted

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

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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]

$\frac{135}{450} = 0.3$

Ratio (whole numbers) = 3 : 7

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]

Age

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 Success rate is slow

2 Multiple births are a risk mother / baby

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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]

water (content of the baby)

0 6 . 2 Explain why the control of body temperature is important.

[2 marks]

to maintain (temperature close to) optimum / optimal conditions / temperature for enzyme action

Question 6 continues on the next page

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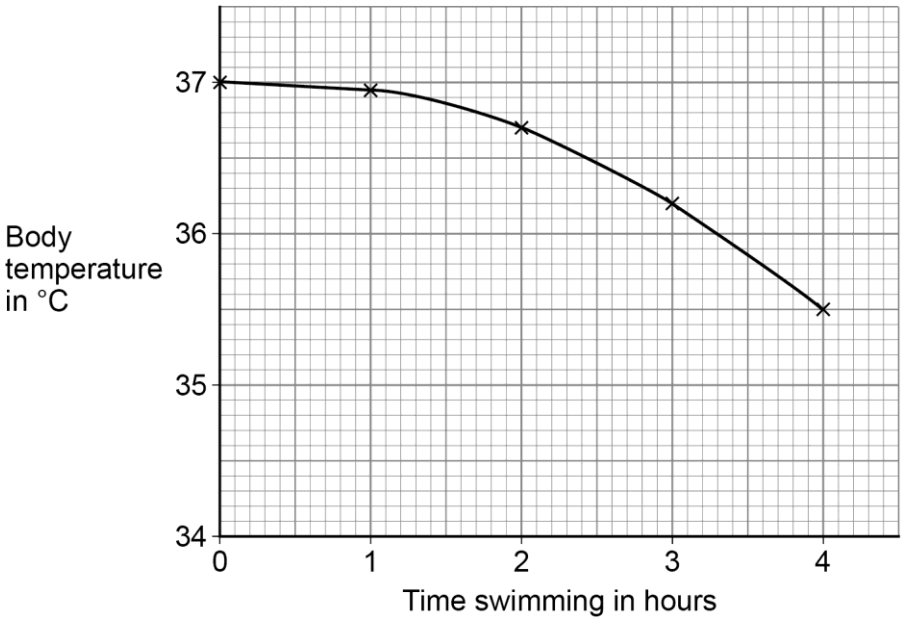
The body temperature of long-distance swimmers can change as the length of time swimming in cold water increases.

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

Figure 4



0 6 . 3 Calculate the mean rate of body temperature decrease per hour in the first 4 hours of the swim.

[2 marks]

$\frac{37.0 - 35.5}{4}$

Rate = 0.375 °C per hour

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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]

$= \frac{37 \times 5.5}{100}$

$= 2.035\ °C$

$37 - 2.035 = 34.965$

Body temperature (2 significant figures) = 35 °C

Question 6 continues on the next page

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

0 6 . 5 Which gland secretes hormones to stimulate the adrenal glands?

[1 mark]

pituitary gland

0 6 . 6 Explain the role of the adrenal glands in responding to a decrease in body temperature.

[5 marks]

adrenal glands) release / produce adrenaline
(to) increase heart rate
(so) more / faster delivery of oxygen and glucose to brain / muscles
(because) more oxygen / glucose needed for respiration
to move muscles to increase body temperature

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0 6 . 7 Explain how the thyroid gland controls the response to a decrease in body temperature by negative feedback.

[3 marks]

decreasing body temperature
causes thyroid gland to)
release / produce thyroxine
(which) increases / stimulates
(basal) metabolic rate
(so) increasing body
temperature which decreases
the release / production of
thyroxine

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END OF QUESTIONS

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