

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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I declare this is my own work.

# GCSE COMBINED SCIENCE: TRILOGY

# F

Foundation Tier  
Biology Paper 2F

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.

## 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>TOTAL</b>	



0 1

Figure 1 shows a place where peat is being removed from a peat bog.

Figure 1



0 1 . 1

Why is peat removed from peat bogs?

[1 mark]

Tick (✓) **one** box.

To increase biodiversity

To produce garden compost

To protect rare habitats



0 1 . 2 Peat can decay.

Name **one** type of organism that causes decay.

[1 mark]

---

0 1 . 3 Complete the sentences.

Choose answers from the box.

[2 marks]

carbon dioxide

nitrogen

oxygen

sulfur dioxide

The organisms that cause decay respire.

The gas used for respiration is \_\_\_\_\_.

The gas produced by respiration is \_\_\_\_\_.

**Question 1 continues on the next page**

**Turn over ►**



**0 1 . 4** Peat bogs cover a total area of 3 700 000 km<sup>2</sup>.

In 2020, 46% of peat bogs were frozen.

How can the area of peat bogs that were frozen be calculated?

**[1 mark]**

Tick (✓) **one** box.

$$3\,700\,000 \times \frac{46}{100} \quad \square$$

$$\frac{46}{3\,700\,000} \times 100 \quad \square$$

$$\frac{3\,700\,000}{46} \times 100 \quad \square$$

**0 1 . 5** The percentage of peat bogs that are frozen decreases each year.

Suggest why the **percentage** of peat bogs that are frozen is decreasing.

**[1 mark]**

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0 1 . 6

Which **two** human activities **decrease** the area of land available for other animals and plants?

**[2 marks]**Tick (✓) **two** boxes.

Building factories

Recycling plastics

Replanting hedgerows

Reusing glass bottles

Quarrying rocks

---

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

0	2
---	---

A student investigated the effect of either **seeing** a stimulus or **hearing** a stimulus on reaction time.

First, the student measured their reaction time to **seeing** a colour change.

This is the method used.

1. Sit in front of a computer with a reaction timer program open.
2. Press a key on the keyboard as quickly as possible when the computer screen changes colour.
3. Record the reaction time.
4. Repeat steps 1 to 3 four more times and calculate the mean reaction time.

Next, the student measured their reaction time to **hearing** a sound.

This is the method used.

5. Sit in front of a computer with a reaction timer program open.
6. Press a key on the keyboard as quickly as possible when the computer produces a sound.
7. Record the reaction time.
8. Repeat steps 5 to 7 four more times and calculate the mean reaction time.



**0 2 . 1** Table 1 shows some variables in this investigation.

**Table 1**

Variable	Independent variable	Dependent variable	Control variable
Distractions from background sounds			
Reaction time			
Type of stimulus			

Identify each variable as an independent variable, a dependent variable or a control variable.

Tick (✓) **one** box in each row on **Table 1**.

**[3 marks]**

**0 2 . 2** How could the method be improved?

**[1 mark]**

Tick (✓) **one** box.

Measure the reaction time with a stopwatch.

Only test reaction time to seeing a colour change.

Repeat both methods 10 times.

**Question 2 continues on the next page**

**Turn over ►**



0 2 . 3

A shorter reaction time means the student reacted faster.

The student reacted faster as each test was repeated.

Suggest **one** reason why the student's reactions got faster.

[1 mark]

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**Table 2** shows the results.

**Table 2**

<b>Method</b>	<b>Mean reaction time in milliseconds</b>
Seeing the stimulus	350
Hearing the stimulus	220





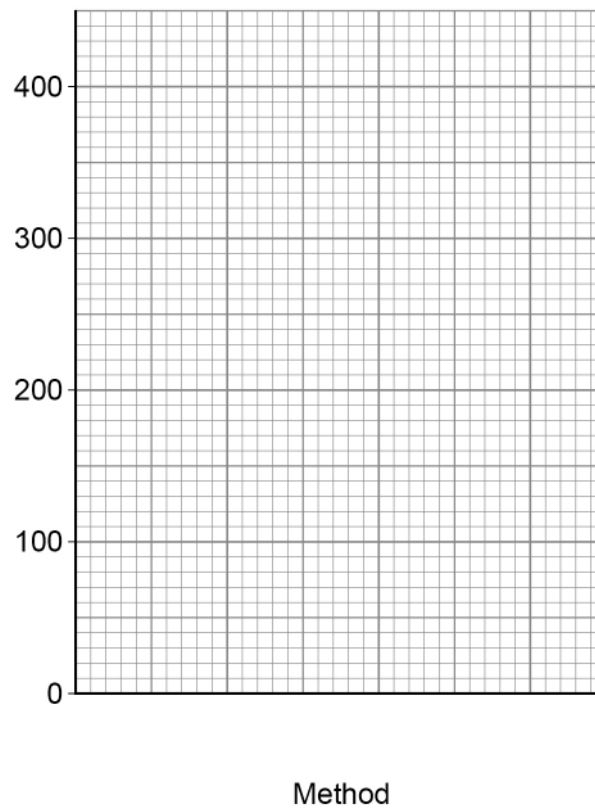
**0 2 . 4** Complete **Figure 2**.

You should:

- plot the data from **Table 2** as a bar chart
- label each bar
- label the y-axis.

**[2 marks]**

**Figure 2**



**0 2 . 5** Compare the reaction time when seeing the stimulus with the reaction time when hearing the stimulus.

**[1 mark]**

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8

Turn over ►

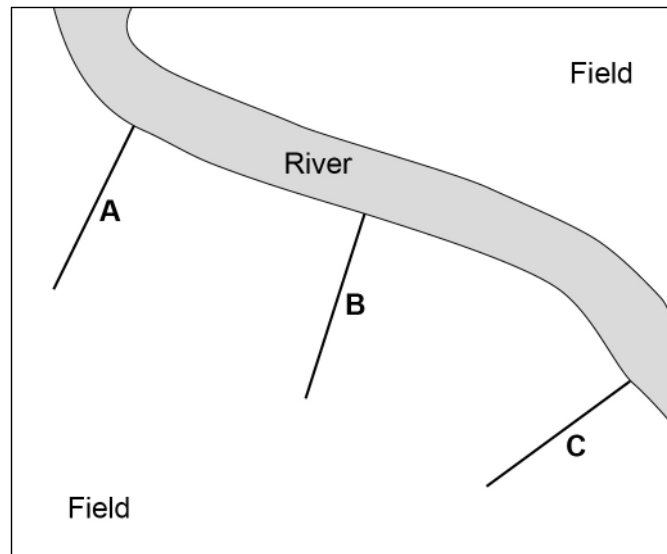


0 3

A student investigated how the distance from a river affects the number of different plant species.

**Figure 3** shows a river between two fields.

**Figure 3**



0 3 . 1

**A, B** and **C** show the positions of three transects.

Where should the student position another transect for this investigation?

Draw the extra transect line on **Figure 3**.

**[1 mark]**



03.2

The student recorded the number of different plant species at 1 m intervals along each transect.

Which piece of equipment should be used at 1 m intervals along the transect?

[1 mark]

Tick (✓) **one** box.

Microscope

Quadrat

Timer

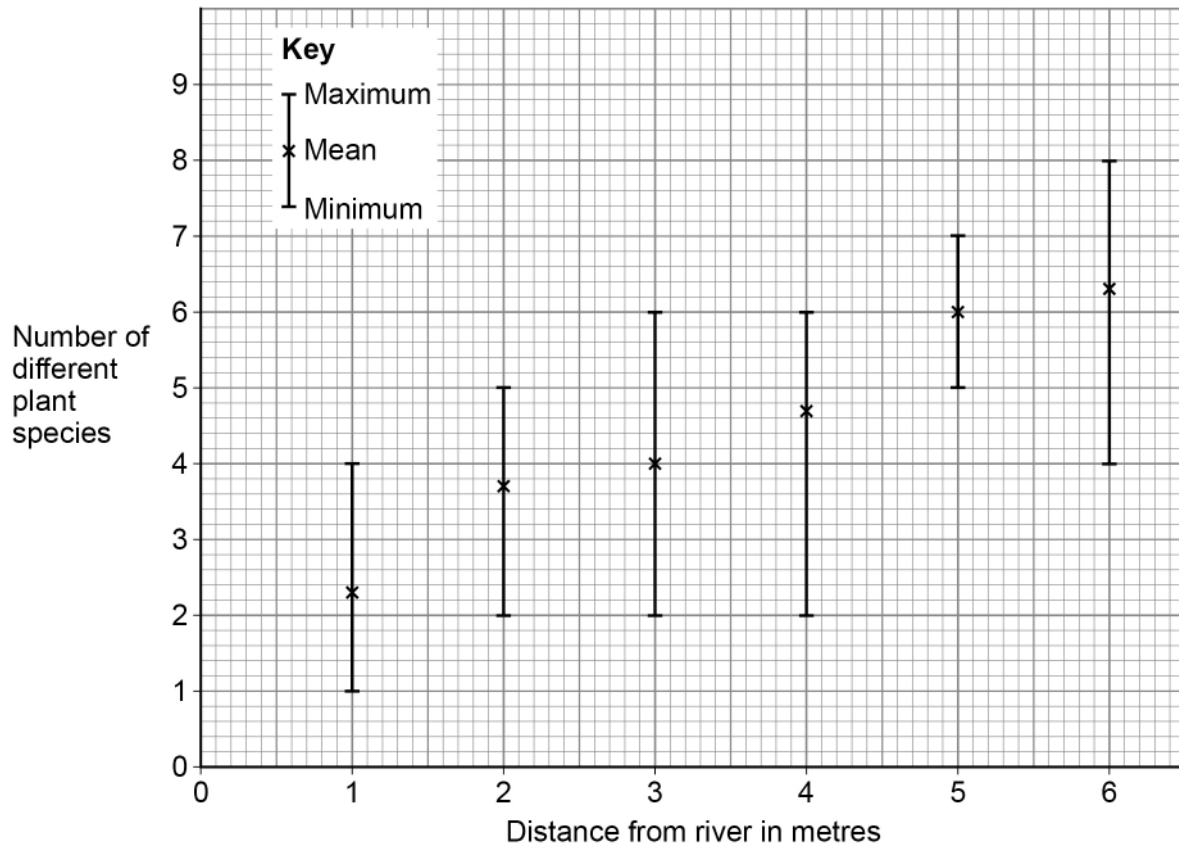
**Question 3 continues on the next page**

**Turn over ►**



Figure 4 shows the results.

Figure 4



0 3 . 3 What was the mean number of different plant species 5 m from the river?

[1 mark]

Mean = \_\_\_\_\_

0 3 . 4 What is the effect of increasing distance from the river on the mean number of different plant species?

[1 mark]

---



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**0 3 . 5** The minimum and maximum values on **Figure 4** show the range of results at each distance from the river.

Why is it useful to know the range of results?

**[1 mark]**

Tick (✓) **one** box.

To calculate the mean result

To know the uncertainty of the mean

To show the mode of the results

**0 3 . 6** Cows are kept in the fields.

Fewer plants are found where the cows often walk on the ground.

The number of cows is one **biotic** factor that affects the number of plants.

Which **two** factors are **abiotic** factors?

**[2 marks]**

Tick (✓) **two** boxes.

Consumers

Light intensity

Moisture levels

Pathogens

Predators

**Question 3 continues on the next page**

**Turn over ►**



03.7

Explain why a decrease in the number of plants across the world increases global warming.

**[2 marks]**

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**9**

0 4

Salmon are fish.

A species of salmon has the binomial name *Oncorhynchus keta*.

0 4 . 1

**Table 3** shows the classification for this species of salmon.Complete **Table 3**.

Choose answers from the box.

**[3 marks]**

Class	Domain	Genus	Kingdom	Species
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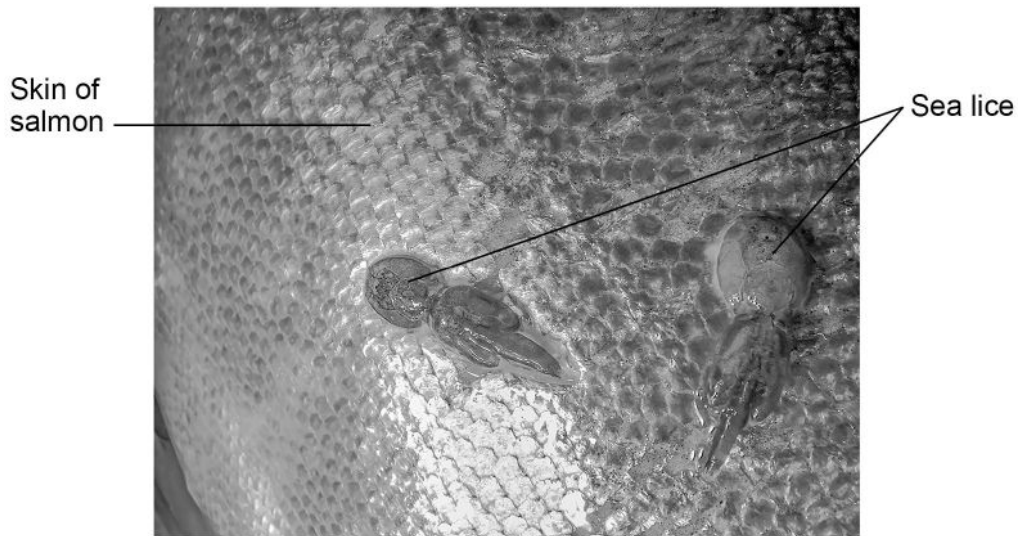
**Table 3**

Group	Classification for salmon
	Animalia
Phylum	Chordata
Family	Salmonidae
	<i>Oncorhynchus</i>
	<i>keta</i>

**Question 4 continues on the next page****Turn over ►**

**Figure 5** shows sea lice attached to the skin of a salmon.

**Figure 5**



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

On a salmon farm, the salmon are fed with food made from soya plants.

**0 4 . 2** Which food chain represents the salmon, sea lice and soya plants?

**[1 mark]**

Tick (✓) **one** box.

salmon → sea lice → soya plants

sea lice → soya plants → salmon

soya plants → salmon → sea lice





**0 4 . 3** What do the arrows in a food chain represent?

**[1 mark]**

Tick (✓) **one** box.

The different numbers in the food chain

The predators in the food chain

The producers in the food chain

The transfer of energy in the food chain

**Question 4 continues on the next page**

**Turn over ►**



Some salmon are more resistant than other salmon to sea lice infections.

Salmon farmers selectively breed salmon.

0 4 . 4

Salmon farmers select salmon that are most resistant to sea lice and breed these salmon together.

What is the next stage in selectively breeding salmon that are resistant to sea lice?

[1 mark]

Tick (✓) **one** box.

Breed together the offspring that are most resistant to sea lice.

Kill any offspring that are resistant to sea lice before the lice can attach.

Remove the gene for resistance to sea lice from the selected salmon.

0 4 . 5

When is the process of selective breeding finished?

[1 mark]

Tick (✓) **one** box.

After one generation have produced offspring

When all offspring are resistant to sea lice

When sea lice are living on all salmon



**0 4 . 6** Salmon that do **not** have sea lice are more profitable for the salmon farmer.

Suggest **one** reason why.

[1 mark]

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**0 4 . 7** What is a **disadvantage** of selectively breeding salmon?

[1 mark]

Tick (✓) **one** box.

All the salmon may suffer from the same diseases.

Fewer sea lice will infect the salmon.

The salmon will have a large variety of genes.

**Question 4 continues on the next page**

**Turn over ►**



Other fish farmers have produced genetically modified (GM) salmon.

GM salmon grow large enough to sell in 18 months.

Non-GM salmon grow large enough to sell in 3 years.

GM salmon need 25% less food than non-GM salmon to get to the same size.

0 4 . 8

Suggest **two** advantages of farming GM salmon instead of farming non-GM salmon.

**[2 marks]**

1 \_\_\_\_\_

2 \_\_\_\_\_

0 4 . 9

GM salmon are often farmed a long distance from where wild, non-GM salmon live.

What is an advantage of farming GM salmon a long distance from where wild salmon live?

**[1 mark]**

Tick (✓) **one** box.

To give the GM salmon different conditions to wild salmon

To increase the genetic differences between GM salmon and wild salmon

To reduce the risk of GM salmon breeding with wild salmon

12



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0 5

Homeostasis is the control of internal body conditions.

Control of body temperature is an example of homeostasis.

0 5 . 1

Draw **one** line from each part involved in temperature control to the function of that part.

**[3 marks]**

**Part involved in  
temperature control**

**Function**

Brain

Changes air temperature  
outside the body

Contracts to increase  
body temperature

Muscle

Coordinates information  
about body temperature

Receptor

Detects changes in skin  
temperature



**0 5 . 2** Why is homeostasis important?

**[2 marks]**

Tick (✓) **two** boxes.

To allow cells to function properly

To change body temperature to match air temperature

To decrease water levels in the body throughout the day

To maintain the optimum conditions for enzymes

To prevent reactions inside cells

**Question 5 continues on the next page**

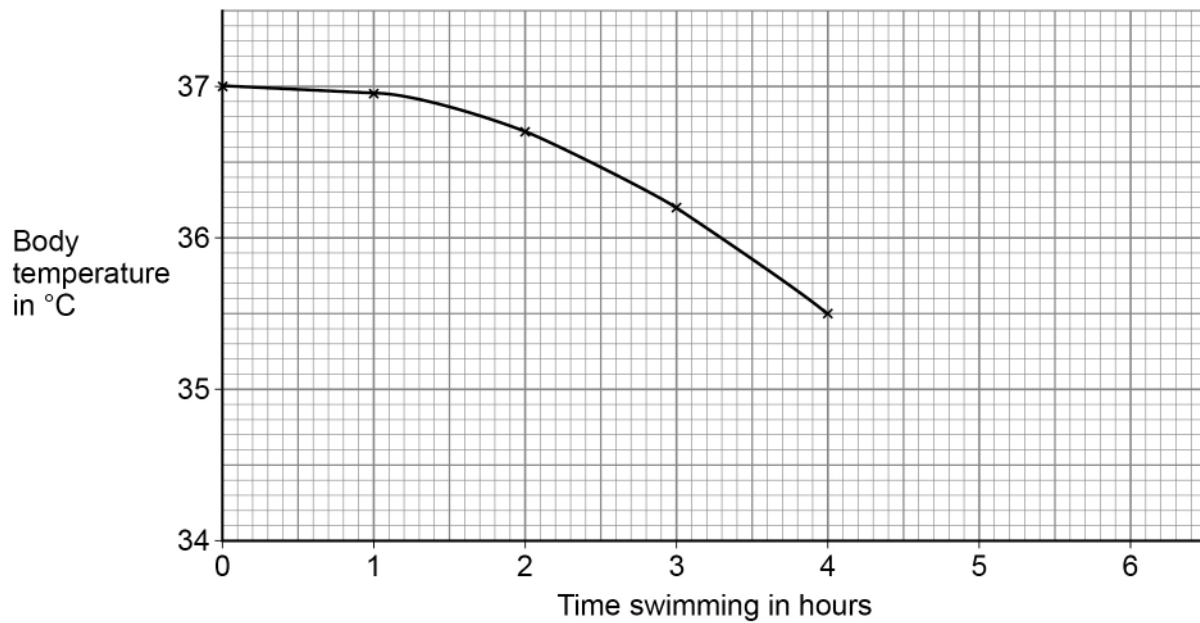
**Turn over ►**



The body temperature of a long-distance swimmer can change with the length of time swimming in cold water.

**Figure 6** shows how the body temperature of one swimmer changed in the first 4 hours of a 6-hour swim.

**Figure 6**



**0 5 . 3** Describe the trend shown in **Figure 6**.

**[1 mark]**

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0 5 . 4

Determine the change in body temperature in the first 4 hours of the swim.

**[2 marks]**

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Change in body temperature = \_\_\_\_\_ °C

0 5 . 5

Hypothermia is a dangerously low body temperature of 35 °C or colder.

Predict when the swimmer was **first** at risk of hypothermia.You should extend the line on **Figure 6**.**[2 marks]**

Prediction = \_\_\_\_\_ hours

**Question 5 continues on the next page****Turn over ►**

Swimming in cold water decreases the insulin concentration in the blood.

0 5 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

heart

pancreas

stomach

Insulin is produced by the \_\_\_\_\_.

0 5 . 7 Insulin is a hormone.

Which organ system produces hormones?

[1 mark]

\_\_\_\_\_

0 5 . 8 Complete the sentence.

Choose the answer from the box.

[1 mark]

decrease

stay the same

increase

When insulin concentration in the blood increases, blood glucose concentration will \_\_\_\_\_.

0 5 . 9 Give **one** risk factor for Type 2 diabetes.

[1 mark]

\_\_\_\_\_

14



**0 6**

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

**0 6 . 1**

Name the type of cell division that produces egg cells and sperm cells.

**[1 mark]**

---

**0 6 . 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 

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2 

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**Question 6 continues on the next page**

**Turn over ►**

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 6 . 3** A person with the genotype **DD** is homozygous.

What word describes the genotype **Dd**?

[1 mark]

---

**0 6 . 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 = \_\_\_\_\_



**0 6 . 5** Embryos can be screened for the alleles that cause inherited disorders.

Give **two** advantages of embryo screening.

**[2 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

**11**

**Turn over for the next question**

**Turn over ►**



**0 7**

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

**0 7 . 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 7 . 2**

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

**[1 mark]**

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