

# AQA

GCSE

# Combined Science: Trilogy

# H

SET A – Biology: Paper 2 Higher Tier

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Time allowed: 1 hour 15 minutes

## Materials

### For this paper you must have:

- a ruler
- a calculator

## Instructions

- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information

- There are 70 marks available on this paper.
- 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.
- When answering questions 01.4, 02.1 and 07.1 you need to make sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.

## Advice

- In all calculations, show clearly how you work out your answer.

Name: .....

01 In a park, some grassland is left to grow wild except for a path, which is mown regularly.

Students used a transect line to investigate how the path affected the distribution of four different plant species.

Figure 1.1 shows the line of the transect.

The students placed quadrats every metre along the transect.

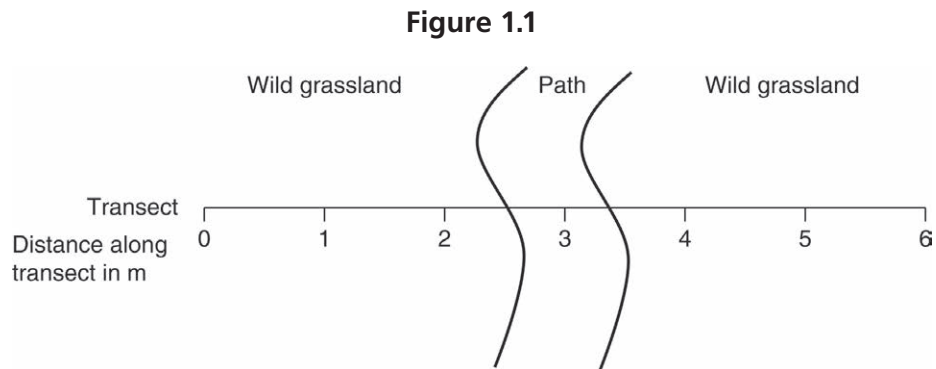


Table 1.1 shows their results.

**Table 1.1**

Distance along transect in m		0	1	2	3	4	5	6
Number of individual plants of each species per quadrat	Species A	5	4	3	0	4	6	5
	Species B	0	0	1	8	2	0	0
	Species C	4	3	2	0	3	4	4
	Species D	0	0	2	3	1	0	0

**01.1** Look at **Table 1.1**.

What is the mode number per quadrat for species D?

Answer: .....

**[1 mark]**

**01.2** Look at **Table 1.1**.

What is the median number per quadrat for species A?

Answer: .....

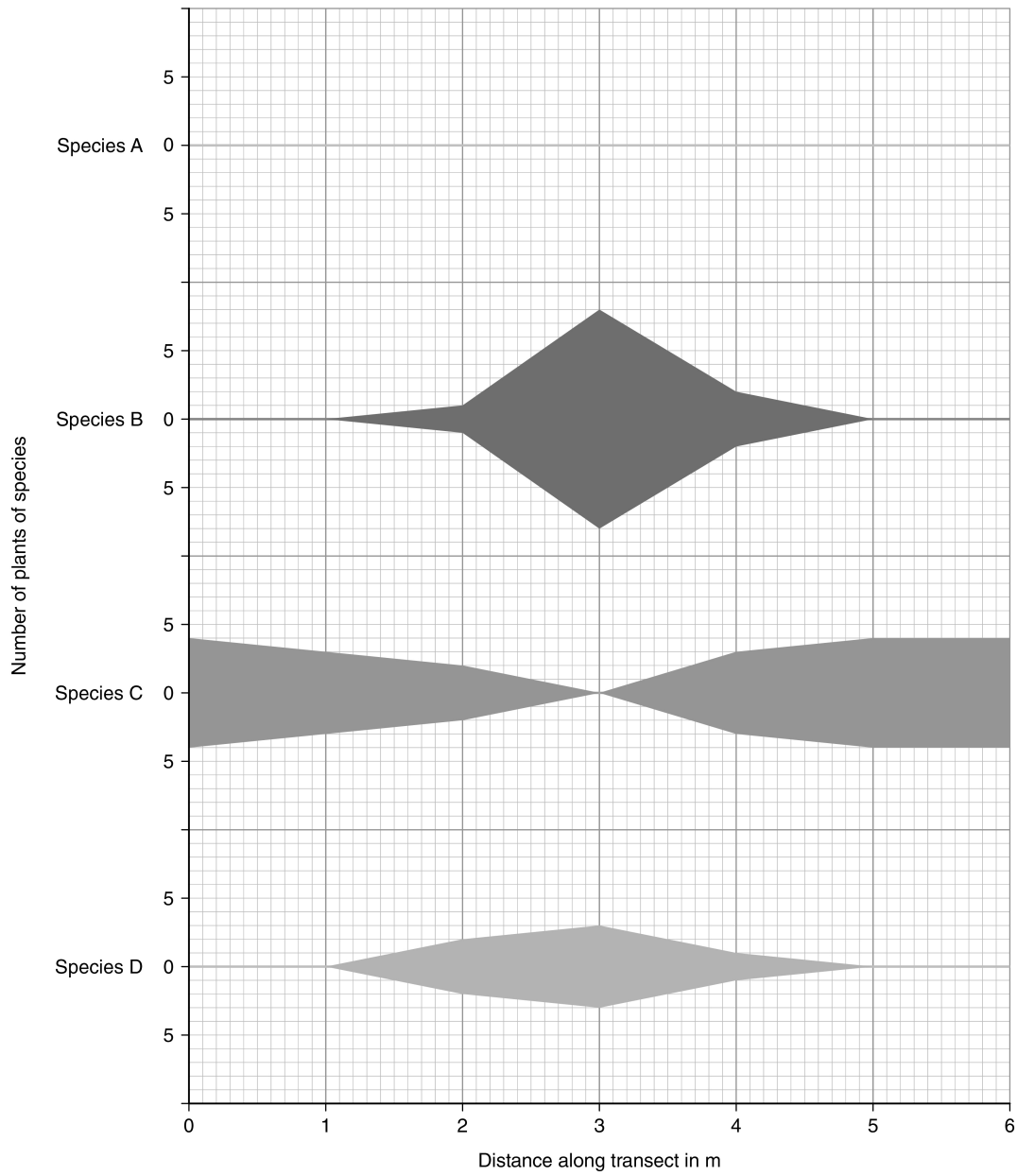
**[1 mark]**

**Question 1 continues on the next page**

01.3 Figure 1.2 shows kite diagrams of the results.

Use the data for **species A** from **Table 1.1** to complete **Figure 1.2**.

Figure 1.2

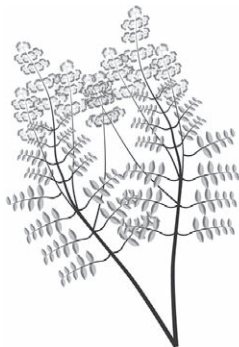


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[4 marks]

01.4 Figure 1.3 shows pictures of each plant species.

Figure 1.3



Species A



Species C



Species B



Species D

Suggest reasons for the distributions of the four species along the transect.

Use information from **Table 1.1** and **Figures 1.1, 1.2** and **1.3** to help you answer.

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[4 marks]

Turn over >

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02 A group of students investigated their reaction times.

They each took it in turn to press a timer button as soon as they heard a buzzer.

Each student used their right hand.

Each student took the test three times and recorded their shortest reaction time.

There were eight girls and six boys in the group.

Table 2.1 shows their results.

Table 2.1

	Shortest reaction times in s								Mean reaction time in s
Girls	0.21	0.16	0.18	0.19	0.18	0.16	0.20	0.19	0.18
Boys	0.19	0.15	0.32	0.16	0.17	0.20			0.20

02.1 One of the students made this conclusion:

**Girls have shorter reaction times than boys.**

Evaluate the method used and the student's conclusion.

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[6 marks]

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02.2 Figure 2.1 shows the nerve pathway involved in the investigation.

**Figure 2.1**

Sound of buzzer → Ear → Brain → Hand muscles → Press button

In **Figure 2.1**, which is the receptor and which is the effector?

Receptor: .....

Effector: .....

[2 marks]

02.3 How does information pass along a nerve pathway?

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.....

[2 marks]

Question 2 continues on the next page

**02.4** One of the students says:

**Pressing the button quickly is an example of a reflex action.**

Is the student correct?

Give a reason for your answer.

Is the student correct? .....

Reason: .....

.....

**[1 mark]**



03 Cells can divide by mitosis or meiosis.

03.1 Table 3.1 shows some features of mitosis or meiosis.

Complete Table 3.1 by putting a tick (✓) or cross (X) in each of the empty boxes.

Table 3.1

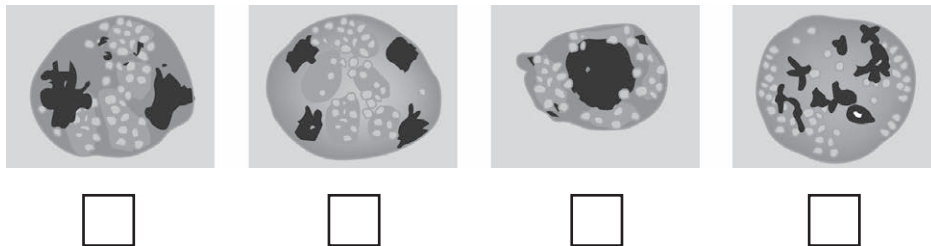
	Mitosis	Meiosis
Involved in body growth		
New cells produced have two copies of each chromosome		
Produces gametes		
Produces genetically identical cells		

[2 marks]

03.2 Figure 3.1 shows some of the stages of a cell dividing by meiosis.

Write numbers 1, 2, 3 and 4 in the boxes to show the correct sequence.

Figure 3.1



[2 marks]

**03.3** Human males have the genotype **XY** and human females have the genotype **XX**.

What is the probability of a couple having a baby girl?

Draw a genetic diagram to explain your answer.

Probability = .....

**[4 marks]**

**03.4** A couple already have one baby girl.

What is the probability that their next baby will also be a girl?

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**[1 mark]**

**04** In vitro fertilisation (IVF) includes the following steps.

1. The hormones FSH (follicle stimulating hormone) and LH (luteinising hormone) are given to the mother.
2. Eggs are collected from the mother and sperm from the father.
3. The fertilised eggs develop into embryos.
4. One or more embryos are inserted into the mother's uterus.

**04.1** Explain why the mother is given FSH and LH.

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[1 mark]

**04.2** Where does fertilisation take place?

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[1 mark]

**04.3** Often, several embryos are inserted into the mother.

Explain why more than one embryo might be inserted.

Describe the possible disadvantage of inserting several embryos.

Reason: .....

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Disadvantage: .....

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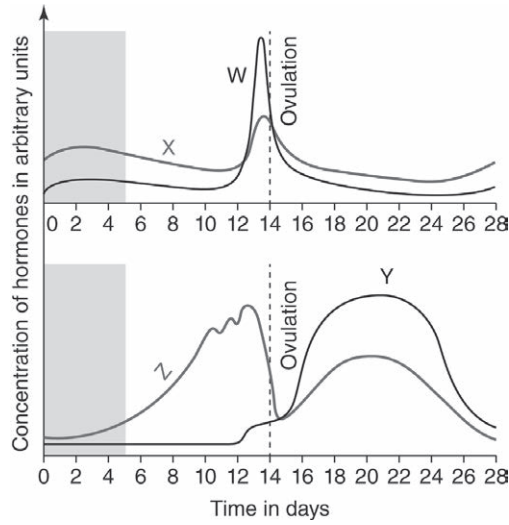
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[4 marks]

**Question 4 continues on the next page**

04.4 Figure 4.1 shows how the levels of four hormones vary during the menstrual cycle.

Figure 4.1



Write down the correct letter for each hormone.

FSH = .....

LH = .....

Oestrogen = .....

Progesterone = .....

[3 marks]

**05** Polydactyly is a condition in which a person has extra fingers or toes.

It is an inherited disorder caused by a dominant allele **D**.

The recessive allele is **d**.

**05.1** What is the genotype of someone who is heterozygous for polydactyly?

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**[1 mark]**

**05.2** What is the genotype of someone who is homozygous dominant for polydactyly?

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**[1 mark]**

**05.3** What is the phenotype of someone with the genotype **dd**?

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**[1 mark]**

**05.4** Is it possible for two parents who do **not** have the polydactyly condition to have a child with the condition?

Explain your answer.

Answer: .....

Explanation: .....

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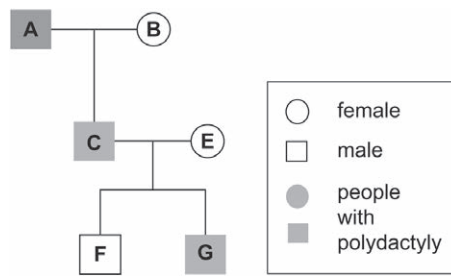
**[2 marks]**

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**Question 5 continues on the next page**

05.5 Figure 5.1 shows a family tree in which polydactyly occurs.

Figure 5.1



What are the possible genotypes of **A** and **C**?

Give reasons for your answers.

**A** = .....

**C** = .....

Reasons: .....

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[4 marks]

05.6 Unlike polydactyly, most other inherited disorders are caused by **recessive** alleles.

Suggest why inherited disorders are more commonly caused by recessive alleles.

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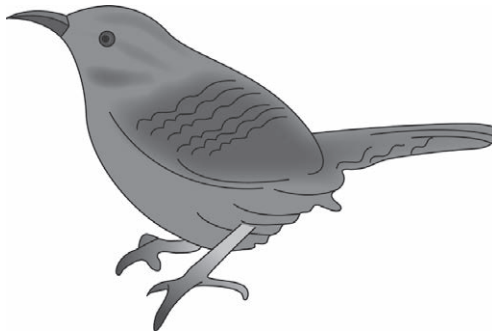
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[1 mark]

06 Figure 6.1 shows a type of bird called a St Kilda wren.

Figure 6.1



St Kilda wrens live on the island of St Kilda off the north coast of Scotland.

They are similar to wrens that live on the mainland, but St Kilda wrens are larger.

Wrens are too small to normally fly to or from the island.

Scientists think that:

- St Kilda wrens are descended from mainland wrens that were blown over to the island by strong winds
- their larger size is an adaptation to help keep warm.

Question 6 continues on the next page

**06.1** Scientists think that the St Kilda wrens have evolved from mainland wrens by natural selection.

Describe how this may have happened.

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**[4 marks]**

**06.2** Although St Kilda wrens are different from the mainland wrens they are classified as the **same** species.

Describe how you could show that the mainland wrens and the St Kilda wrens are the same species.

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**[2 marks]**



**06.3** The mainland wrens have the scientific name *Troglodytes troglodytes*.

The St Kilda wrens have the scientific name *Troglodytes troglodytes hirtensis*.

Suggest why the St Kilda wrens have this different scientific name.

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**[2 marks]**

**06.4** In the future, the St Kilda wrens may evolve to become so different from the mainland wrens that they could be classified as a different species.

Which of the following could be an appropriate name for the new species?

Tick **one** box and give a reason for your answer.

*Hirtensis hirtensis*

*Hirtensis troglodytes*

*Troglodytes hirtensis*

*Troglodytes troglodytes*

Reason: .....

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**[2 marks]**

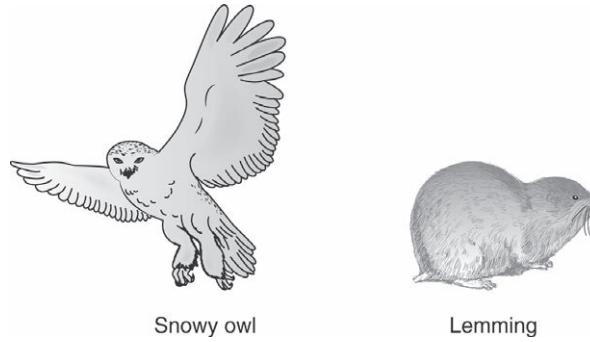
07 Bylot Island is in the Arctic.

Not many animal species live on Bylot Island.

Two species that do live there are snowy owls and lemmings, as shown in **Figure 7.1**.

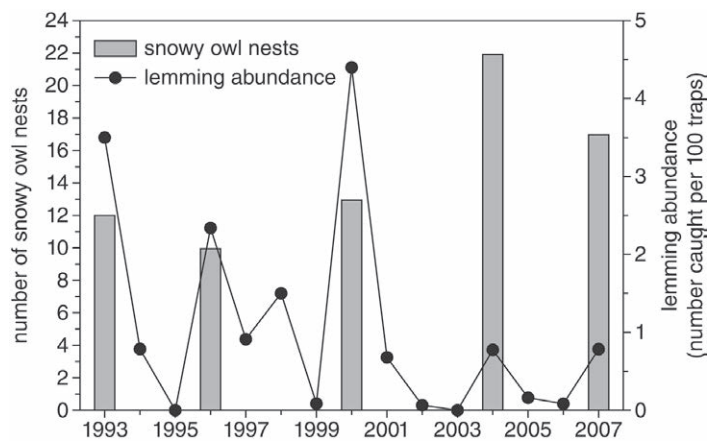
Snowy owls catch and eat lemmings.

**Figure 7.1**



07.1 **Figure 7.2** shows data from Bylot Island.

**Figure 7.2**



Describe any patterns in the data shown in **Figure 7.2**.

Suggest explanations for these patterns.

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**[6 marks]**

**07.2** Snowy owl bodies contain carbon.

Eventually this carbon is recycled back into the atmosphere as carbon dioxide.

Describe how this happens.

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**[3 marks]**

**Question 7 continues on the next page**

**07.3** Bylot Island has a low biodiversity.

**Student A** says:

**It is important to protect places like Bylot Island.**

**Student B** says:

**It is more important to protect places with a higher biodiversity like tropical rainforest.**

Evaluate these two statements.

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**[2 marks]**

**END OF QUESTIONS**