

# AQA

GCSE

# Biology

## SET A – Paper 2 Higher Tier

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# H

### Materials

Time allowed: 1 hour 45 minutes

#### 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 100 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 02.4, 03.1, 10.1 and 11.1 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: .....

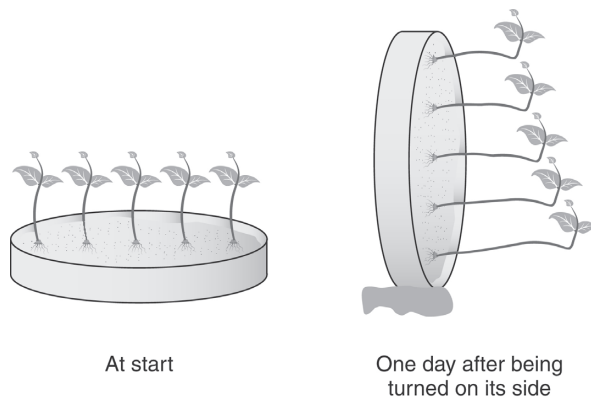
**01** A student was investigating the effect of gravity on plant growth.

She grew some cress seeds on wet cotton wool in a Petri dish.

When the cress seedlings started to grow, the student turned the dish on its side.

**Figure 1.1** shows the results.

**Figure 1.1**



**01.1** State **one** variable the student should control.

Describe how it should be controlled.

Explain why it is important to control it.

Variable: .....

How variable should be controlled: .....

.....

Why it is important to control the variable: .....

.....

**[3 marks]**

**01.2** Explain why it was important to grow more than one seedling.

.....

**[1 mark]**

**01.3** The seedlings grew upwards because of the effect of gravity.

This is controlled by a hormone called auxin.

Auxin moves downwards under the effect of gravity.

Explain how auxin caused the seedlings to grow upwards after the dish was turned on its side.

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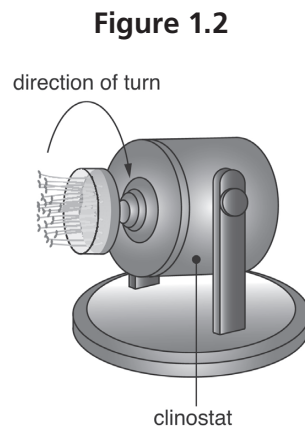
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**[2 marks]**

**01.4** The student repeated the experiment.

All the conditions were kept the same as the first time, **except** this time the dish was placed on a device which rotated the dish.

This is shown in **Figure 1.2**



Describe how you would expect the cress seedlings to grow this time.

Explain why the cress seedlings would grow this way.

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**[3 marks]**

**Turn over >**

02 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 2.1 shows the line of the transect.

The students placed quadrats every metre along the transect.

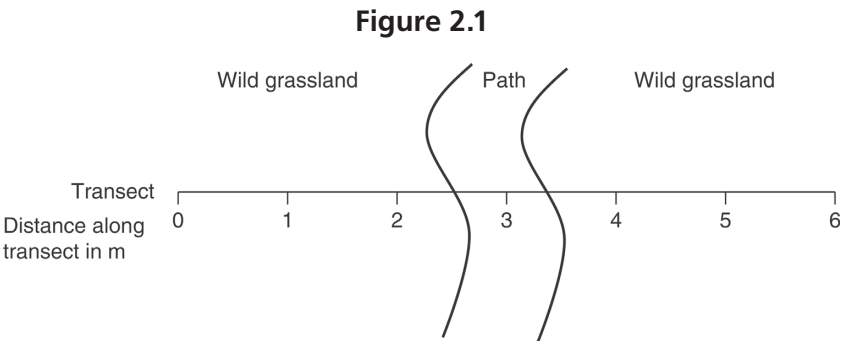


Table 2.1 shows their results.

Table 2.1

Distance along transect in m		0	1	2	3	4	5	6
Number of individual plants of each species per quadrat	Species A	10	8	6	0	8	12	10
	Species B	0	0	2	16	4	0	0
	Species C	8	6	4	0	6	8	8
	Species D	0	0	4	6	2	0	0

02.1 Look at Table 2.1

What is the mode number per quadrat for species D?

Answer: ..... [1 mark]

## 02.2 Look at Table 2.1

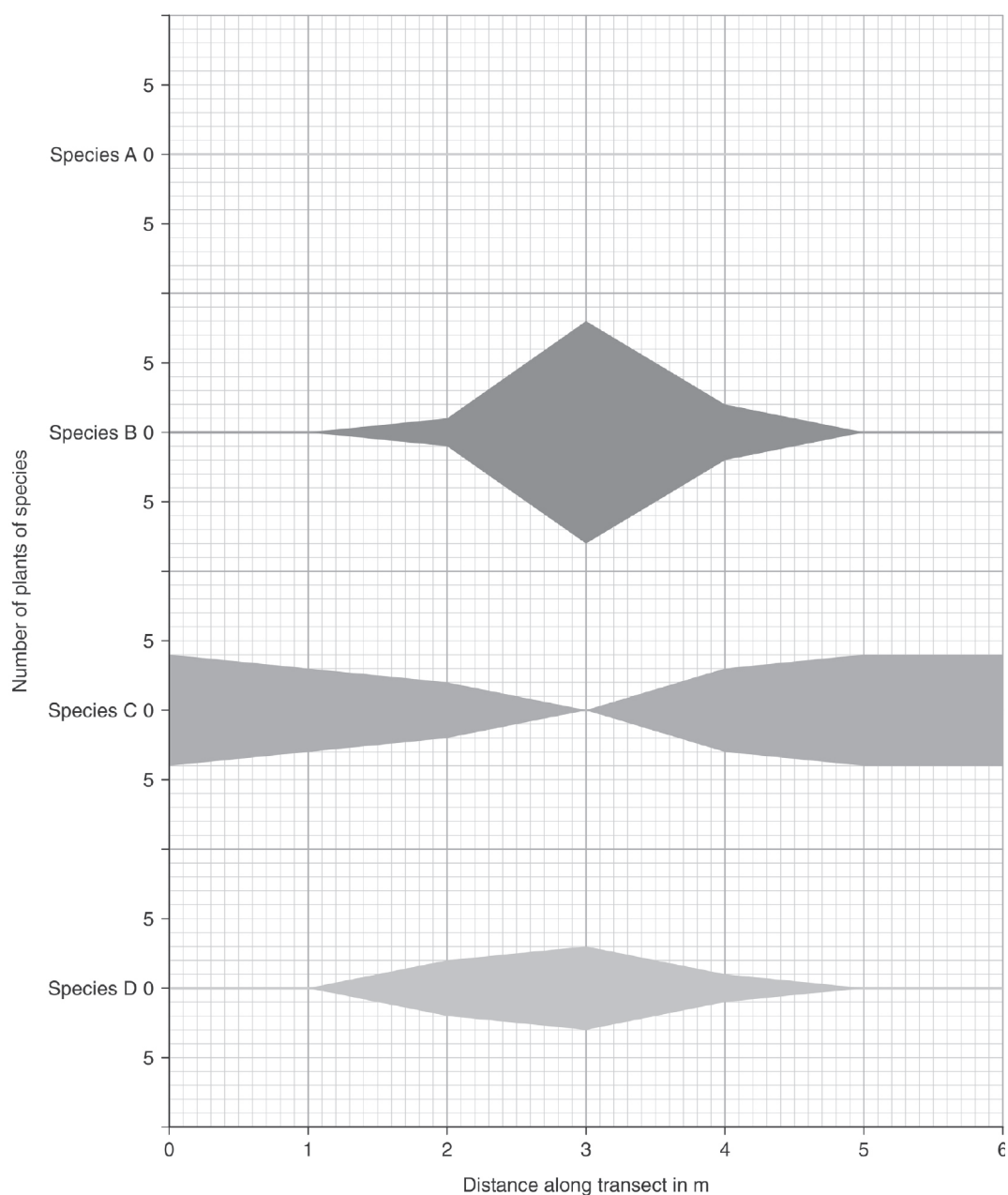
What is the median number per quadrat for species A?

Answer: ..... [1 mark]

## 02.3 Figure 2.2 shows kite diagrams of the results.

Use the data for **species A** from Table 2.1 to complete Figure 2.2

**Figure 2.2**

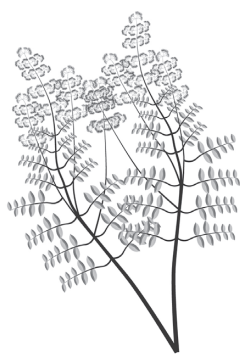


[4 marks]

Question 2 continues on the next page

02.4 Figure 2.3 shows pictures of each plant species.

**Figure 2.3**



Species A



Species C



Species B



Species D

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

Use information from **Table 2.1** and **Figures 2.1, 2.2 and 2.3** to help you answer.

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**[4 marks]**

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Each student used their right hand.

There were eight girls and six boys in the group.

### Table 3.1

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

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

**[6 marks]**

**Question 3 continues on the next page**

**03.2** Figure 3.1 shows the nerve pathway involved in the investigation.

**Figure 3.1**

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

In **Figure 3.1**, which is the receptor and which is the effector?

Receptor: .....

Effector: .....

**[2 marks]**

**03.3** How does information pass along a nerve pathway?

.....  
.....

**[2 marks]**

**03.4** 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]**



**04** Cells can divide by mitosis or meiosis.

**04.1** Table 4.1 shows some features of mitosis or meiosis.

Complete Table 4.1 by putting a tick (✓) or cross (X) in each of the empty boxes.

**Table 4.1**

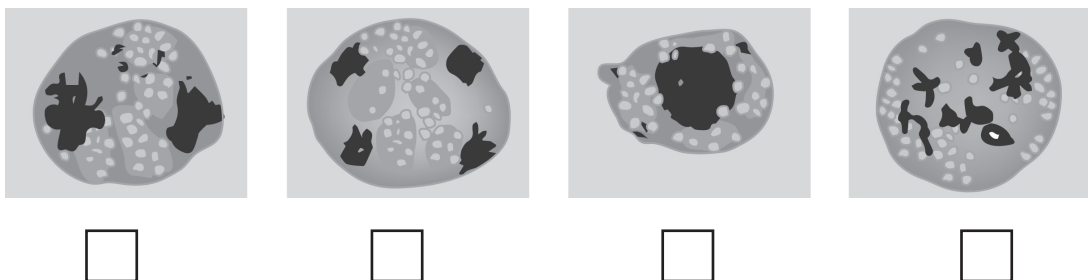
	Mitosis	Meiosis
Involved in body growth		
New cells produced have two copies of each chromosome		
Produces gametes		
Produces genetically identical cells		

[2 marks]

**04.2** Figure 4.1 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 4.1**



[2 marks]

Question 4 continues on the next page

**04.3** 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]**

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

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

.....

**[1 mark]**

**05** *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. Several embryos are inserted into the mother's uterus.

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

.....

**[1 mark]**

**05.2** Where does fertilisation take place?

.....

**[1 mark]**

**05.3** Usually several embryos are inserted into the mother.

Explain why more than one embryo is inserted.

Describe the possible disadvantages of inserting several embryos.

Reason: .....

.....

.....

Disadvantages: .....

.....

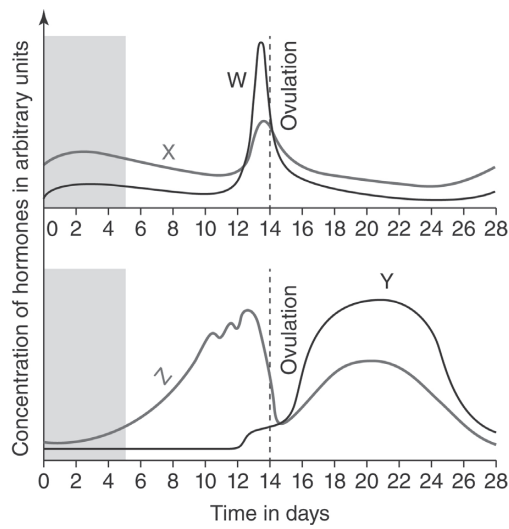
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**[4 marks]**

**Question 5 continues on the next page**

05.4 Figure 5.1 shows how the levels of four hormones vary during the menstrual cycle.

Figure 5.1



Write down the correct letter for each hormone.

FSH = .....

LH = .....

Oestrogen = .....

Progesterone = .....

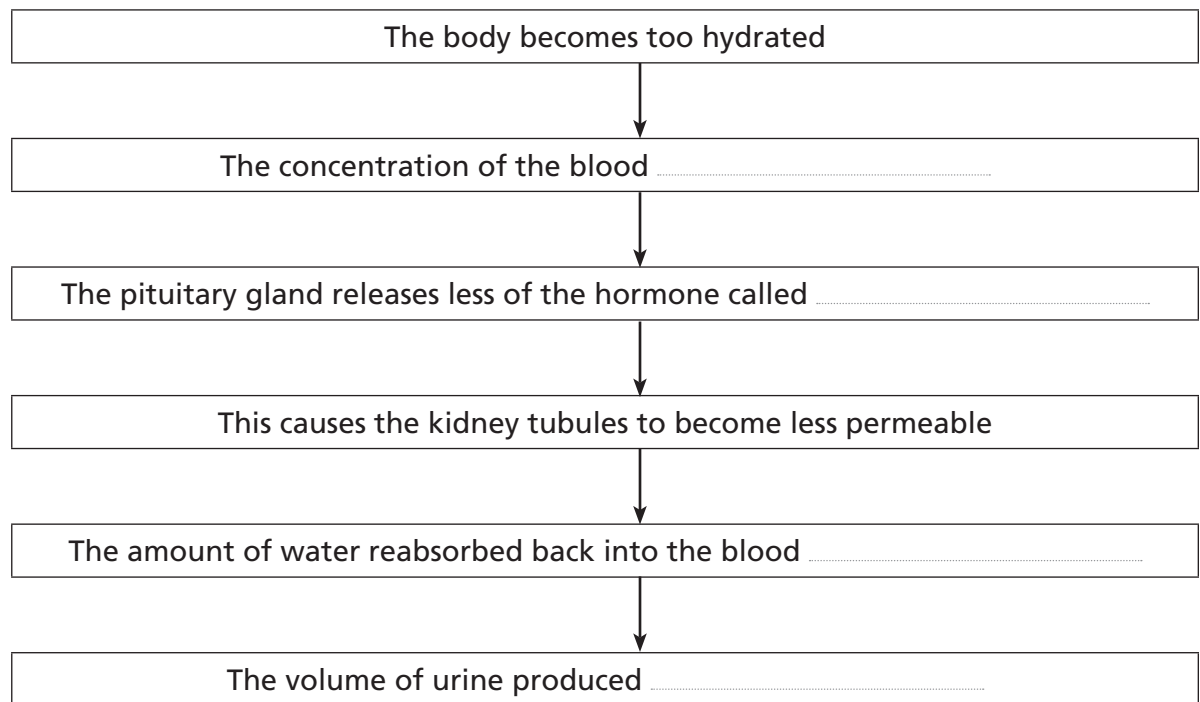
[3 marks]

06 The amount of water in the body is controlled by a negative feedback system.

06.1 Figure 6.1 shows part of this negative feedback system.

Complete the missing words.

Figure 6.1



[4 marks]

06.2 Why is this type of system called a **negative feedback** system?

.....

.....

[1 mark]

06.3 If the body is dehydrated we still need to produce some urine.

Give a reason why.

.....

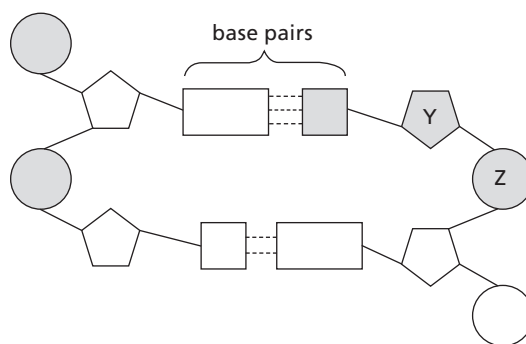
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[1 mark]

Turn over >

07 Figure 7.1 shows part of a DNA molecule.

Figure 7.1



07.1 Identify the parts labelled Y and Z.

Y = .....

Z = .....

[2 marks]

07.2 What is the name of the shaded part made up of Y, Z and one base?

.....

[1 mark]

07.3 Why is DNA described as a **polymer**?

.....  
.....

[1 mark]

07.4 The sequence of bases along part of one strand is:

A      T      T      C      G      C      T      C      A

Write down the corresponding sequence of bases on the complementary strand.

.....

[2 marks]

07.5 The sequence of bases is part of a gene coding for a protein.

How many amino acids are coded for by the following sequence?

A      T      T      C      G      C      T      C      A

.....

[1 mark]

**08** 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**.

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

**[1 mark]**

.....

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

**[1 mark]**

.....

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

**[1 mark]**

.....

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

Explain your answer.

**[2 marks]**

Answer: .....

Explanation: .....

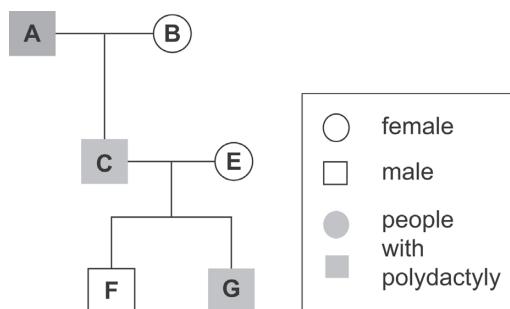
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**Question 8 continues on the next page**

**08.5** Figure 8.1 shows a family tree in which polydactyly occurs.

**Figure 8.1**



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

Give reasons for your answers.

**A** = .....

**C** = .....

Reasons: .....

.....

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**[4 marks]**

**08.6** 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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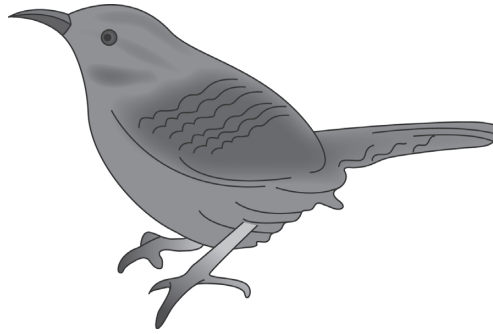
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**[1 mark]**



09 Figure 9.1 shows a type of bird called a St Kilda wren.

Figure 9.1



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.

**09.1** 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]

Question 9 continues on the next page

**09.2** 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]**

**09.3** 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]**

**09.4** 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: .....

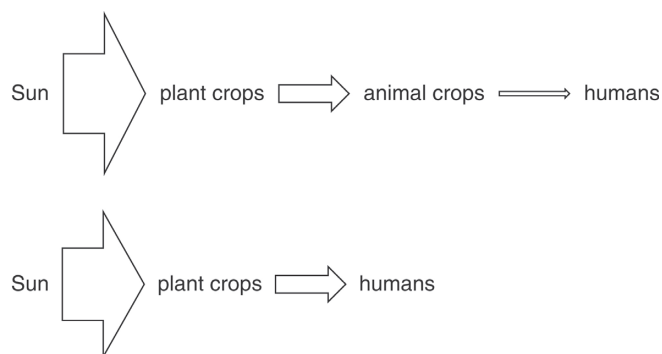
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**[2 marks]**

The size of the arrows represents how much energy or biomass is transferred to each trophic level.

### Figure 10.1



**10.1** Use information from **Figure 10.1** and your own knowledge to help you:

- compare the efficiency of humans feeding at different trophic levels, giving reasons for the differences
- suggest any implications this may have for the diets of humans as the human population continues to increase.

**[6 marks]**

**Question 10 continues on the next page**

**10.2** The body of a fish:

- is the same temperature as the water it swims in
- is supported by water, so it does **not** need to use as much energy to move as an animal on land.

Use this information, **Figure 10.1** and your own knowledge to help you explain this statement:

**Food chains involving fish are usually longer than food chains involving animals living on land.**

**[2 marks]**

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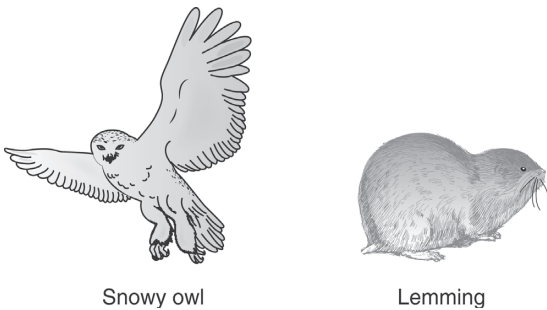
11 Bylot Island is in the Arctic.

Not many animal species live on Bylot Island.

Two species that do live there are snowy owls and lemmings as shown in **Figure 11.1**

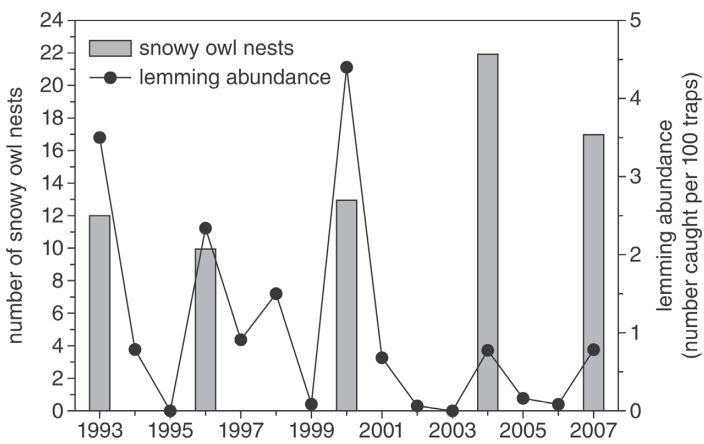
Snowy owls catch and eat lemmings.

Figure 11.1



11.1 **Figure 11.2** shows data from Bylot Island.

Figure 11.2



Question 11 continues on the next page

Suggest explanations for these patterns.

**[6 marks]**

**11.2** 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]****11.3** 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.**

Explain why these two statements are both valid.

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**[2 marks]****END OF QUESTIONS**

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