1 This question is about pollution.

(a) The name of one type of mayfly larva that lives in streams is *Ephemera danica*.

(i) What does this name indicate about the classification of this animal?

Write **1** in the box next to the classification indicated by the name *Ephemera*.
Write **2** in the box next to the classification indicated by the name *danica*.

class	
family	
genus	
kingdom	
order	
species	

[1]

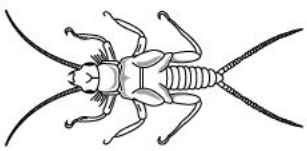
(ii) The **binomial system** is used to name *Ephemera danica*.

Why is the binomial system important when scientists name organisms?

.....

..... **[1]**

(b) Look at the picture of a stonefly larva.



This is an indicator species used to show levels of water pollution.

Stonefly larvae live underneath stones in fast-flowing streams.

Stonefly larvae have adapted legs that end in small hooks and the body is flattened.

Explain why stonefly larvae are described as **specialists**.

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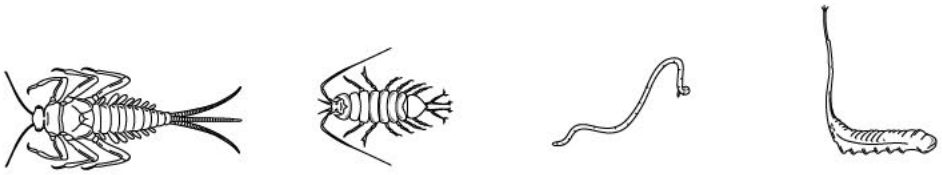
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..... **[2]**

(c) Look at the diagrams.

They are indicator species used to show levels of water pollution.



mayfly larva | water louse | sludgeworm | rat-tailed maggot

low pollution ⟶ high pollution

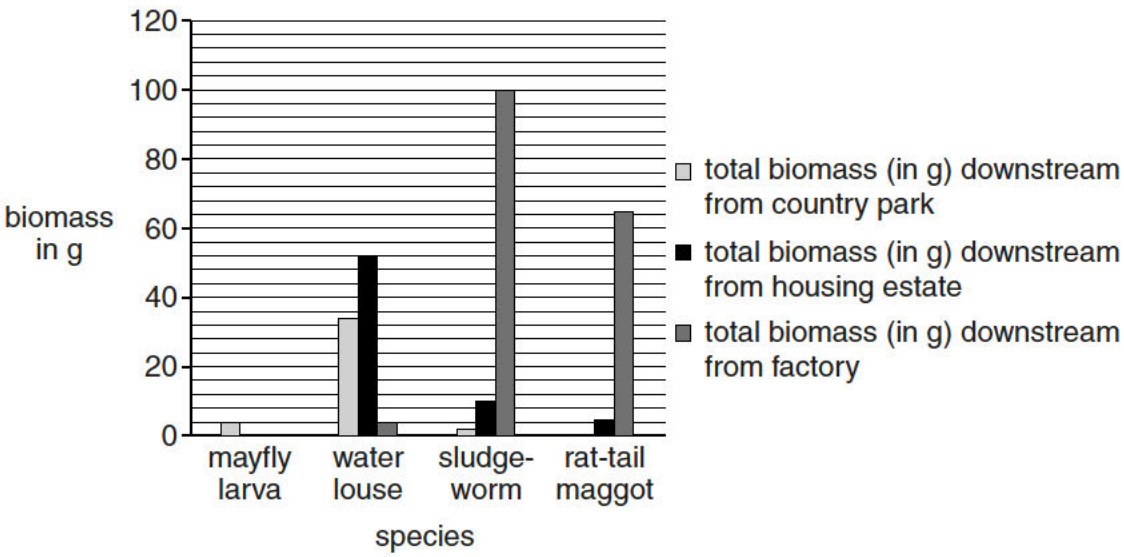
The County Council want to find out pollution levels in a local stream.

Water samples were taken downstream from three different places:

- a country park
- a housing estate
- a factory.

The indicator species were measured in each sample.

Results were plotted on a graph.



What conclusion should the County Council come to about the levels of pollution in the stream?

Use evidence from the graph and your knowledge of indicator species in your answer.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 10]

2 Look at the picture of a biogas plant.



(a) Biogas is a biofuel.

Biofuels can be produced and used without causing a **net** increase in greenhouse gas levels.

Explain how.

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..... **[2]**

(b) Biogas is normally 50% methane.

Why is it important to keep the percentage of methane in biogas above 10%?

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..... **[1]**

(c) Write down **one** disadvantage of using biogas instead of natural gas.

..... **[1]**

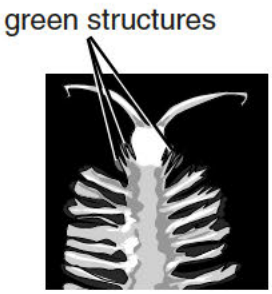
[Total: 4]

3 This question is about classifying.

Read the article about a species that was first discovered in 2009.



2009 The Year of the Green Bomber



The 'green bomber' is an annelid worm that lives at depths below 1800 metres in the seas off California. At these depths it is very dark.

Otherwise known as **Swima bombiviridis**, the green bomber worm gets its name from the green oval structures near its head. When the worm sheds them, they briefly glow in the dark with a brilliant, green light.

The green oval structures are thought to be helpful in escaping from predators.

(a) **Swima bombiviridis** is a newly discovered species.

What is meant by the term species?

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..... **[2]**

(b) Swima bombiviridis has been named using the binomial system.

What do the two parts of the name identify?

Put ticks (✓) in the boxes next to the two correct answers.

class	☐
family	☐
genus	☐
order	☐
species	☐

[2]

(c) Swima bombiviridis is more likely to survive at depths below 1800 metres than other worms. This is because of its green oval structures.

Suggest how the green oval structures make it more likely to survive.

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..... [2]

(d) A similar species of worm lives in shallow waters. It does not have green oval structures.

Scientists think that Swima bombiviridis evolved from the ancestors of the species that lives in shallow waters.

Explain how a population of worms with green oval structures may have become a separate species.

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..... [3]

[Total: 9]

4 (a) Scientists have been trying to estimate the number of different species there are on the Earth.

First they counted the number of species that have already been discovered and named.

Then they used several ways to estimate the number of species that might actually exist.

The table shows their results.

Kingdom	Number of species already discovered and named in thousands	Number of species estimated to exist in thousands
animals	953	7770
plants	216	298
fungi	43	611
protoctists (mostly single-celled)	21	64
prokaryotes (no nucleus in cells)	11	10
Total	**1244**	**8753**

(i) Which kingdom has the smallest percentage of species that have already been discovered?

Calculate this percentage.

kingdom .....

percentage of species that have already been discovered ..... %

[2]

(ii) Look at the results for prokaryotes.

Prokaryotes include microscopic organisms such as bacteria.

More species of prokaryotes have been discovered and named than scientists have estimated to exist.

One reason is that the estimate might be incorrect.

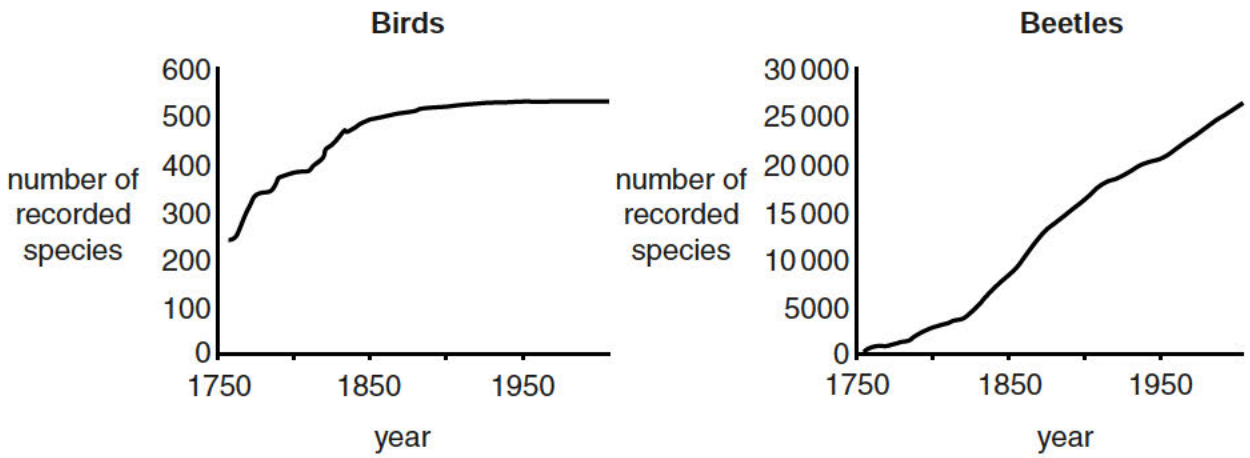
Suggest **one other** reason why.

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..... **[1]**

(b) The number of species already discovered increases as time goes on.

The graphs show the number of species of birds and beetles recorded in Europe since 1750.



Look at the two graphs.

Suggest **why** the graph for birds is **different** from the graph for beetles.

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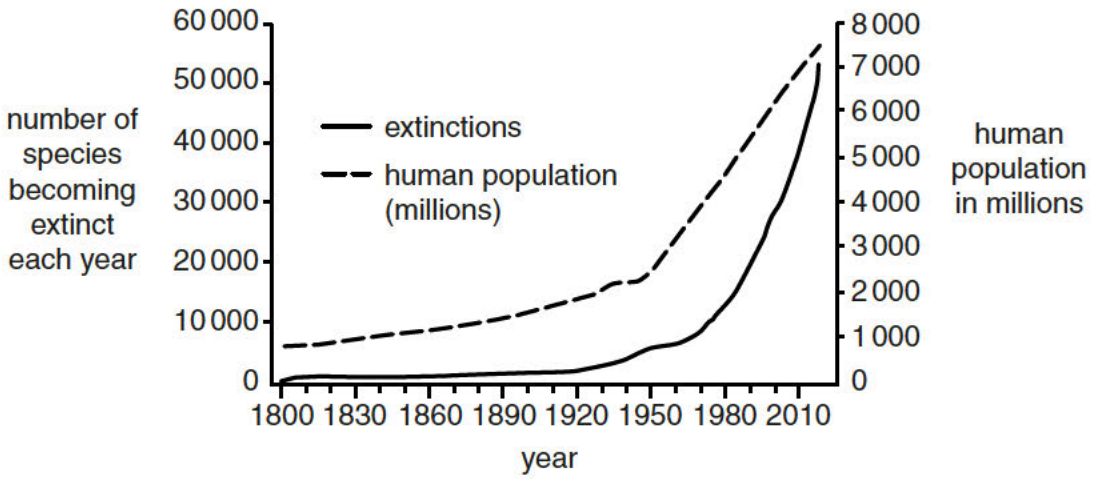
..... **[2]**

(c) Look at the graph.

It came from a website that is trying to stop species becoming extinct.

The graph shows the human population over the last 200 years.

It also shows the number of species that has become extinct each year.



(i) Does the graph **prove** that humans are causing species to become extinct?

Explain your answer.

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..... **[2]**

(ii) Suggest why the person who drew the graph chose the two vertical scales as they are.

Explain your answer.

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..... **[2]**

(iii) Other evidence could support the idea that humans are causing species to become extinct.

Suggest one piece of extra evidence that could support this idea.

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..... [1]

[Total: 10]