

Organisation of an Ecosystem

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.7 Ecology
Sub-Topic	Organisation of an Ecosystem
Difficulty Level	Silver Level
Booklet	Question Paper 1

Time Allowed: 57 minutes

Score: / 57

Percentage: /100

Grade Boundaries:

Q1. Students used quadrats to estimate the population of dandelion plants on a field.

- (a) Describe how quadrats should be used to estimate the number of dandelion plants in a field.

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(4)

- (b) The field measured 40 m by 145 m.

The students used 0.25 m² quadrats.

The students found a mean of 0.42 dandelions per quadrat.

Estimate the population of dandelions on the field.

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Estimated population of dandelions =

(2)

- (c) In one area of the field there is a lot of grass growing in the same area as dandelions.

Suggest why the dandelions may **not** grow well in this area.

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(4)
(Total 10 marks)

Q2. Moose are animals that eat grass.

Figure 1 shows a moose.

Figure 1



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Figure 2 shows a food chain.

Figure 2

Grass → Moose → Wolves

(a) Name the secondary consumer shown in **Figure 2**.

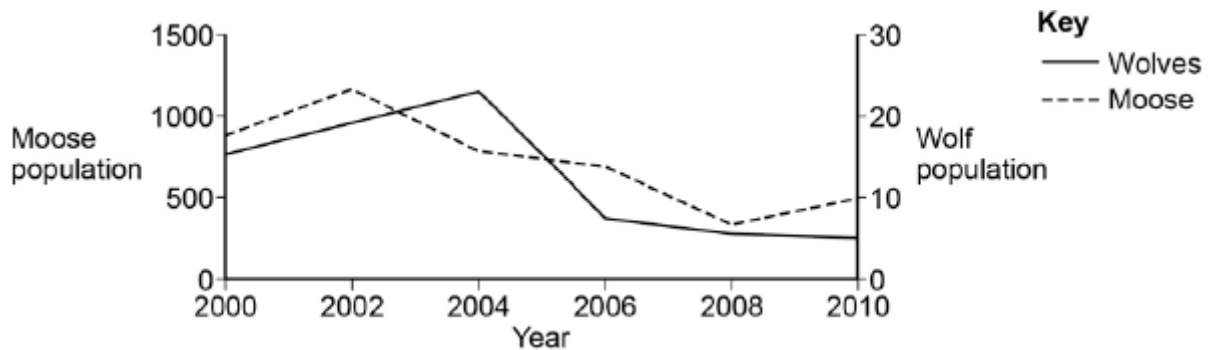
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(1)

- (b) **Figure 3** shows how the moose population and wolf population have changed in one area.

This is a predator-prey cycle.

Figure 3



In 2004 the line on **Figure 3** for wolves is above the line for moose.

How does **Figure 3** show that there are more moose than wolves in 2004?

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(1)

- (c) Suggest why the moose population decreased between 2002 and 2004.

Use information from **Figure 3**.

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(1)

- (d) The number of wolves is one biotic factor that could affect the size of the moose population.

Give **two** other biotic factors that could affect the size of the moose population.

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- (e) Moose have distinct characteristics such as antlers.

Describe how moose may have evolved to have large antlers.

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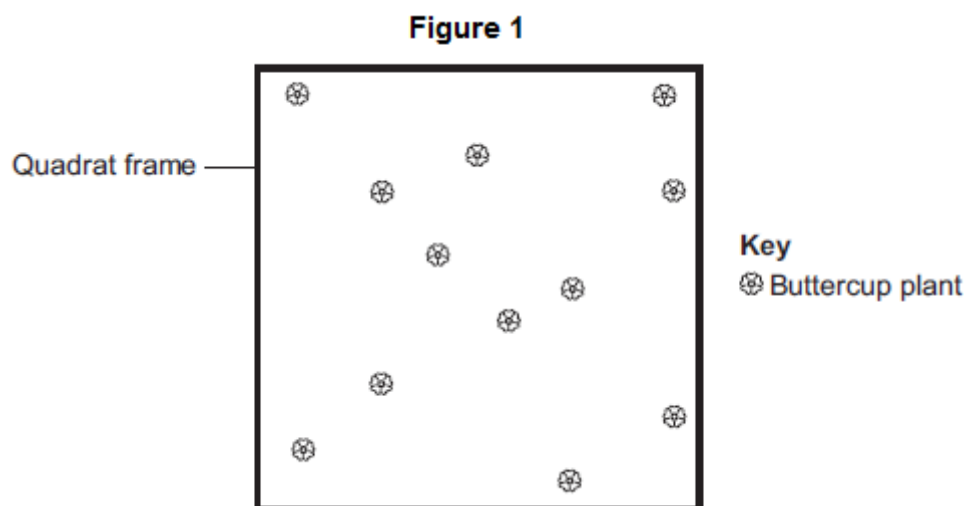
(5)
(Total 10 marks)

Q3.A grassy field on a farm measured 120 metres by 80 metres.

A student wanted to estimate the number of buttercup plants growing in the field.

The student found an area where buttercup plants were growing and placed a 1 m × 1 m quadrat in one position in that area.

Figure 1 shows the buttercup plants in the quadrat.



The student said, 'This result shows that there are 115 200 buttercup plants in the field.'

- (a) (i) How did the student calculate that there were 115 200 buttercup plants in the field?

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(2)

- (ii) The student's estimate of the number of buttercup plants in the field is probably not accurate. This is because the buttercup plants are not distributed evenly.

How would you improve the student's method to give a more accurate estimate?

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(2)

- (b) Sunlight is one environmental factor that might affect the distribution of the buttercup plants.

- (i) Give **three other** environmental factors that might affect the distribution

of the buttercup plants.

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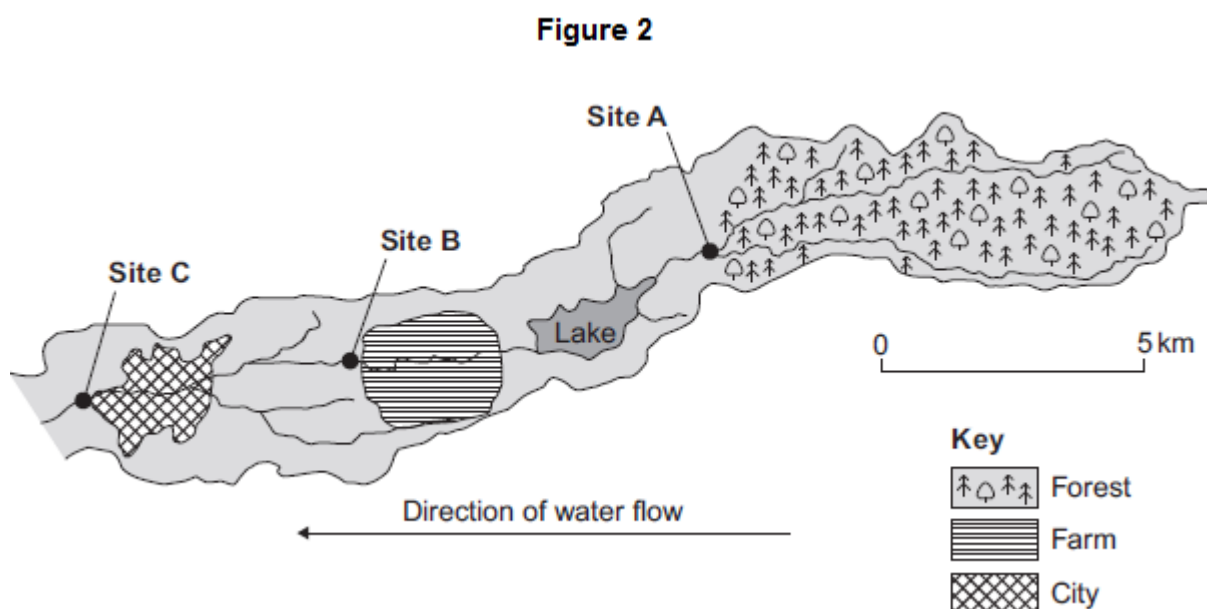
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(3)

- (ii) Explain how the amount of sunlight could affect the distribution of the buttercup plants.

(3)

- (c) **Figure 2** is a map showing the position of the farm and a river which flows through it.



Every year, the farmer puts fertiliser containing mineral ions on some of his fields. When there is a lot of rain, some of the fertiliser is washed into the river.

- (i) When fertiliser goes into the river, the concentration of oxygen dissolved in the water decreases.

Explain why the concentration of oxygen decreases.

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(5)

- (ii) There is a city 4 km downstream from the farm.

Apart from fertiliser, give **one** other form of pollution that might go into the river as it flows through the city.

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(1)

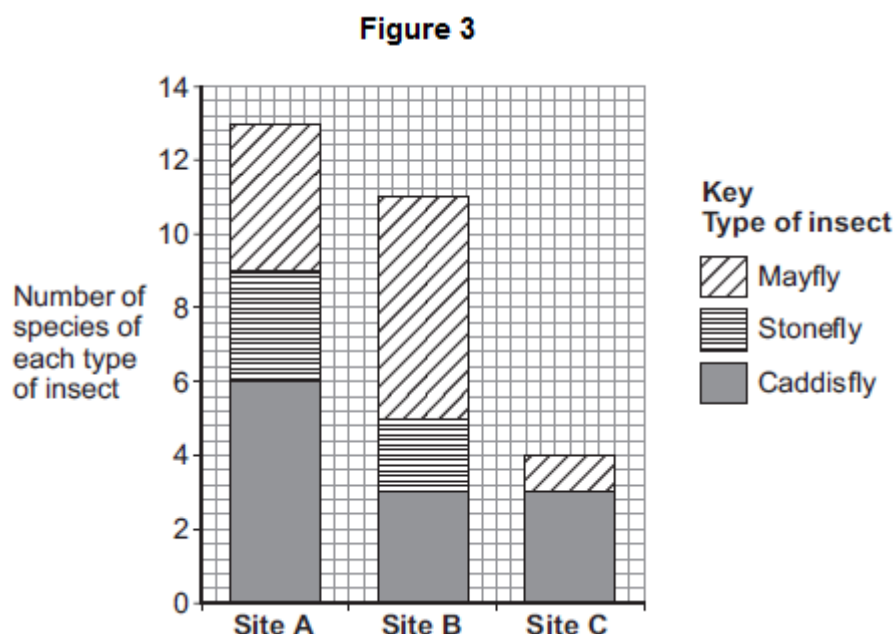
- (d) Three sites, **A**, **B** and **C**, are shown in **Figure 2**.

Scientists took many samples of river water from these sites.

The scientists found larvae of three types of insect in the water: mayfly, stonefly and caddisfly. For each type of insect the scientists found several different species.

The scientists counted the number of different species of the larvae of each of the three types of insect.

Figure 3 shows the scientists' results.



- (i) How many more species of mayfly were there at Site **B** than at Site **A**?

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(1)

- (ii) Suggest what caused this increase in the number of species of mayfly.

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(1)

- (iii) The scientists stated that the number of species of stonefly was the best indicator of the amount of oxygen dissolved in the water.

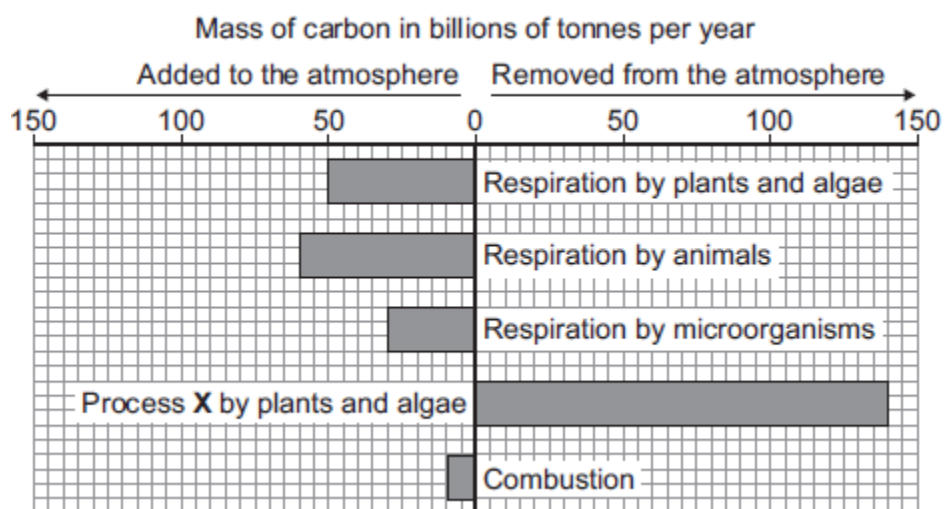
Use information from **Figure 3** to suggest why.

(1)

(Total 19 marks)

Q4. This question is about carbon.

The graph shows the mass of carbon added to and removed from the atmosphere each year.



- (a) Name process **X**.

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(1)

- (b) (i) Calculate the mass of carbon added to the atmosphere by respiration per year.

Answer = billion tonnes

(1)

- (ii) Some scientists are concerned that the mass of carbon in the atmosphere is changing.

How does the data in the graph support this idea?

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(1)

(Total 3 marks)

Q5. Freshwater streams may have different levels of pollution. The level of pollution affects which species of invertebrate will live in the water.

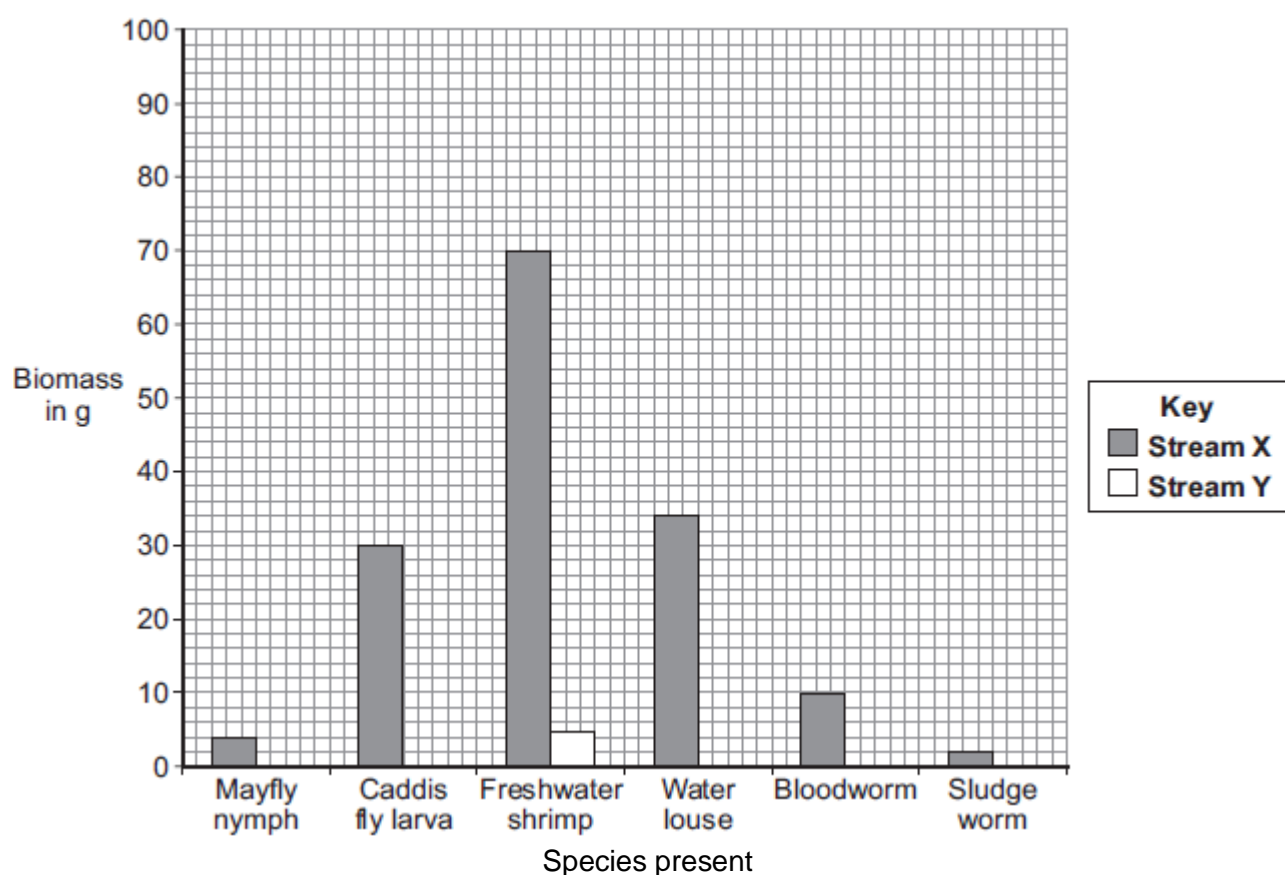
Table 1 shows the biomass of different invertebrate species found in two different streams, **X** and **Y**.

Table 1

	Biomass in g	
Invertebrate species	Stream X	Stream Y
Mayfly nymph	4	0
Caddis fly larva	30	0
Freshwater shrimp	70	5
Water louse	34	10
Bloodworm	10	45
Sludge worm	2	90
Total	150	150

- (a) The bar chart below shows the biomass of invertebrate species found in **Stream X**.
- (i) Complete the bar chart by drawing the bars for water louse, bloodworm and sludge worm in **Stream Y**.

Use the data in **Table 1**.



(2)

- (ii) **Table 2** shows which invertebrates can live in different levels of water pollution.

Table 2

Pollution level	Invertebrate species likely to be present
Clean water	Mayfly nymph
Low pollution	Caddis fly larva, Freshwater shrimp
Medium pollution	Water louse, Bloodworm
High pollution	Sludge worm

Which stream, **X** or **Y**, is more polluted?

Use the information from **Table 1** and **Table 2** to justify your answer.

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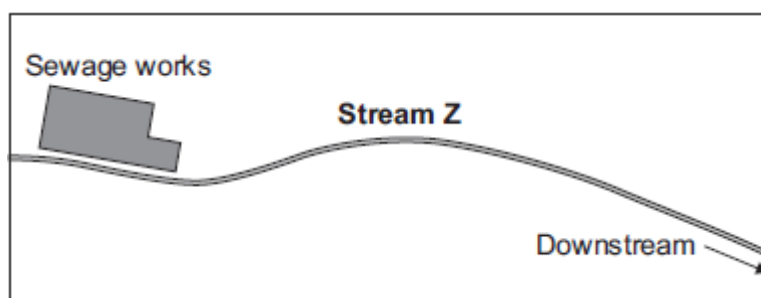
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- (b) There is a sewage works near another stream, **Z**.

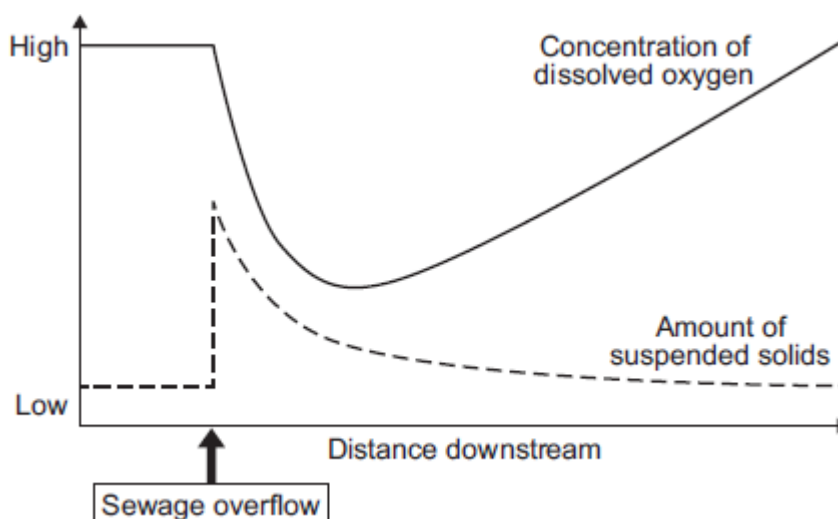


An accident caused sewage to overflow into **Stream Z**.

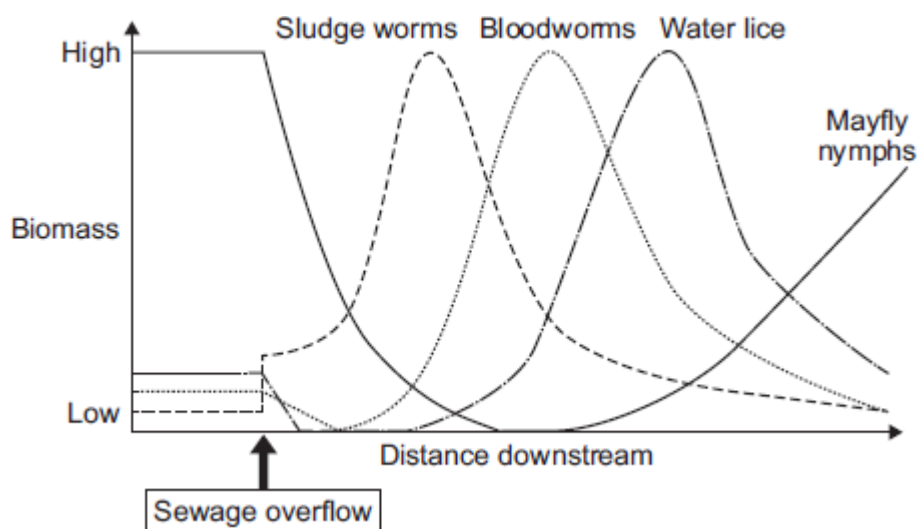
Two weeks later scientists took samples of water and invertebrates from the stream. They took samples at different distances downstream from where the sewage overflowed.

The scientists plotted the results shown in **Graphs P** and **Q**.

Graph P: change in water quality downstream of sewage overflow



Graph Q: change in invertebrates found downstream of sewage overflow



- (i) Describe the patterns shown in **Graph P**.

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- (ii) Describe the relationship between dissolved oxygen and the survival of mayfly nymphs in **Stream Z**. Suggest a reason for the pattern you have described.

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- (c) Many microorganisms are present in the sewage overflow.

Explain why microorganisms cause the level of oxygen in the water to decrease.

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(2)

(Total 13 marks)