Materials
For this paper you must have:
- Ruler
- Pencil, Rubber, Protractor and Compass
- Scientific calculator, which you are expected to use when appropriate

Instructions
- Answer all questions
- Answer questions in the space provided
- All working must be shown
- Do all rough work in this book. Cross out any rough work you don't want to be marked

Information
- The marks for the questions are shown in brackets
Feeding relationships can be shown using food chains.

The figure below shows a food chain for organisms in a habitat.

(a) What is the producer in the food chain?

Tick one box.

- Beetle
- Leaf
- Mouse
- Owl

(b) Name the primary consumer in the food chain.

___________________________________________________________________
(c) What is the group of leaves, beetles, mice and owls in a habitat called?

Tick one box.

- Community
- Ecosystem
- Population
- Species

(d) What are two abiotic factors that can affect the food chain?

Tick two boxes.

- Availability of food
- Light intensity
- New diseases
- New predators
- Wind direction

(Total 5 marks)
Ragwort is a plant that often grows as a weed in grassland.

The image below shows a ragwort plant.

Some students estimated the number of ragwort plants growing in a field on a farm.

The students:
• placed a quadrat at 10 random positions in the field
• counted the number of ragwort plants in each quadrat.

The quadrat measured 1 metre × 1 metre. The area of the field was 80 000 m².

The table below shows the students' results.

<table>
<thead>
<tr>
<th>Quadrat number</th>
<th>Number of ragwort plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>
(a) Complete the following calculation to estimate the number of ragwort plants in the field.

Use information from the table above.

Total number of ragwort plants in 10 quadrats = _____________________

Mean number of ragwort plants in 1 m\(^2\) = __________________________

Therefore estimated number of ragwort plants in field = _________________

(b) What could the students do to get a more accurate estimate?

Tick (✔) one box.

Place the quadrat in 100 random positions. □

Place the quadrat only in areas where they could see ragwort plants. □

Place the quadrat in positions at the edge of the field. □
The farmer who owned the field kept horses.

If horses eat ragwort, the ragwort can poison them.

The farmer considered two methods of controlling ragwort in his field.

**Method 1**: Spraying with a selective weed killer

**Method 2**: Pulling out the ragwort plants by hand

**In Method 1**:

- the cost of the weed killer was £420
- the weed killer would not harm the grass but would kill all other plants
- the farmer could apply the weed killer from a sprayer towed by a tractor.

**Method 2** could be done by local volunteers.

What are the advantages and disadvantages of using **Method 2** instead of **Method 1** for controlling ragwort?

**Advantages of Method 2**

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

**Disadvantages of Method 2**

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

(3)
(Total 6 marks)
Global warming may reduce biodiversity in some areas.

(a) What is biodiversity?

Tick one box.

- The different habitats in an ecosystem
- The interaction of living and non-living factors in a habitat
- The interdependence of organisms on Earth
- The total number of organisms in an ecosystem
- The variety of different species on Earth

(b) What gases cause global warming?

Tick two boxes.

- Carbon dioxide
- Methane
- Nitrogen
- Oxygen
- Water vapour
(c) Give two effects of global warming that could reduce biodiversity in an area.

1. _________________________________________________________________
   ___________________________________________________________________

2. _________________________________________________________________
   ___________________________________________________________________

(2)
(Total 5 marks)
The figure below shows the carbon cycle.

Use the information from the figure above to answer the questions.

(a) In process A, carbon dioxide in the atmosphere is taken into plants.

What is process A?

Tick one box.

- Evaporation
- Fossilisation
- Photosynthesis
- Respiration

(1)
(b) In process B, carbon dioxide is released from plants and animals into the atmosphere.

What is process B?

Tick one box.

- Burning
- Feeding
- Photosynthesis
- Respiration

(c) In which process is carbon passed from one organism to another?

Tick one box.

- A
- B
- C
- D

(d) What will happen to the concentration of carbon dioxide in the atmosphere if lots of trees are cut down?

___________________________________________________________________
___________________________________________________________________

(1)
(e) Greenhouse gases cause global warming.
Carbon dioxide is a greenhouse gas.
Name two other greenhouse gases.
1. _________________________________________________________________
2. _________________________________________________________________

(f) When living organisms die the dead material decays and is broken down.
The process of decay returns carbon dioxide to the atmosphere.
What type of organism causes decay?
______________________________________________________________

(Total 7 marks)
Peat can be burnt as a fuel.

**Table 1** shows the amount of peat used as a fuel in the UK over 20 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mass of peat used as a fuel in units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>110</td>
</tr>
<tr>
<td>1995</td>
<td>80</td>
</tr>
<tr>
<td>2000</td>
<td>50</td>
</tr>
<tr>
<td>2005</td>
<td>20</td>
</tr>
<tr>
<td>2010</td>
<td>10</td>
</tr>
</tbody>
</table>

**Figure 1** shows some of the information from **Table 1**.
(a) Complete Figure 1 by plotting the points for 2005 and 2010.

(b) Predict the amount of peat used as a fuel in the UK in 2015.

Use information from Figure 1.

(c) Plants in the UK are often grown in compost.

Compost usually contains peat.

The coconut fibre shown in Figure 2 is a waste product of coconut farming.

Coconut fibre can be used to produce peat-free compost.

Figure 2

![Coconut fibre](https://via.placeholder.com/150)

Table 2 shows features of peat-free compost made using coconut fibre.

Complete Table 2 to show if each feature is an advantage or disadvantage.

Put a tick in each row.

<table>
<thead>
<tr>
<th>Feature compared to peat compost</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut fibre is transported longer distances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coconut fibre is a waste product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coconut fibre traps less air in the soil, so roots absorb fewer mineral ions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Total 5 marks)
A student investigated the number of ribwort plants in a field.

The student used the apparatus shown in Figure 1.

**Figure 1**

![Quadrat and Tape measure](image)

Not drawn to scale

This is the method used.

1. Place the quadrat in an area where there are lots of ribwort plants in the field.
2. Count the number of ribwort plants inside a quadrat.
3. Repeat steps 1 and 2 four more times.

(a) How could the student improve his method so that he can collect valid results?

Tick **two** boxes.

- Count the leaves of each ribwort plant
- Place more quadrats in the field
- Place the quadrats randomly
- Use a smaller quadrat
- Weigh the ribwort plants

(2)
(b) The student calculated that the mean number of ribwort plants per m$^2$ was 3.2

The area of the field was 8250 m$^2$.

Calculate the total number of ribwort plants in the field.

___________________________________________________________________

Total number of ribwort plants = ________________

(1)

(c) Another group of students did an investigation in the field.

**Figure 2** shows how the students placed their quadrats in this investigation.

*Figure 2*

What is the name given to the line in **Figure 2**?

___________________________________________________________________

(1)
Describe the relationship shown in Figure 3.
(e) What is one reason why there are no ribwort plants next to the path?

Tick one box.

- There is less light near the path
- The ribwort plants get walked on
- There are more nutrients in the soil near the path
- There are fewer animals near the path

(Total 7 marks)

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.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(4)
(b) The field measured 40 m by 145 m.

The students used 0.25 m$^2$ quadrats.

The students found a mean of 0.42 dandelions per quadrat.

Estimate the population of dandelions on the field.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(4)

(Total 10 marks)
Human activities can affect our ecosystem.

The graph shows information about how the area of ocean with sea ice in the arctic has changed between 1979 and 2016.

(a) Give **two** conclusions you can make from the data shown in the graph.

1. _________________________________________________________________
   ___________________________________________________________________

2. _________________________________________________________________
   ___________________________________________________________________
(b) The area of ocean with sea ice in the arctic has changed.

Most scientists believe this is due to the activities of humans.

Explain the activities of humans that have led to the changes in sea ice from 1979 to 2016.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(6)
(Total 8 marks)
In the last 200 years the concentration of carbon dioxide in the Earth’s atmosphere has risen. Explain how a rise in carbon dioxide concentration in the atmosphere can decrease biodiversity.

(Total 6 marks)
Rocky shores are a type of coastal habitat.

Limpets, barnacles and periwinkles are animals that live on rocky shores.

Students investigated the distribution of these animals on one rocky shore.

The figure shows their results.

The edge of the sea was six meters from the top of the shore.

(a) Calculate the total number of animals found one metre from the top of the shore.

___________________________________________________________________
___________________________________________________________________

Total number of animals = ____________________

(1)
(b) The greatest number of animals was found two metres from the top of the shore.

One student said that this was not the most biodiverse part of the shore.

Give the reason for this statement.

___________________________________________________________________
___________________________________________________________________

(1)

(c) Give one abiotic factor and one biotic factor that could affect the distribution of these animals on the shore.

Abiotic factor ________________________________________________________

Biotic factor _________________________________________________________

(2)

(d) Describe the method the students could have used to collect the data shown in the figure.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(4)

(Total 8 marks)