

1 This question is about ecology.

(a) Give **two** abiotic (non-living) factors which will affect the growth of plants on a school playing field.

Give a reason why each factor will affect the growth of the plants.

Abiotic factor 1 _____

Reason _____

Abiotic factor 2 _____

Reason _____

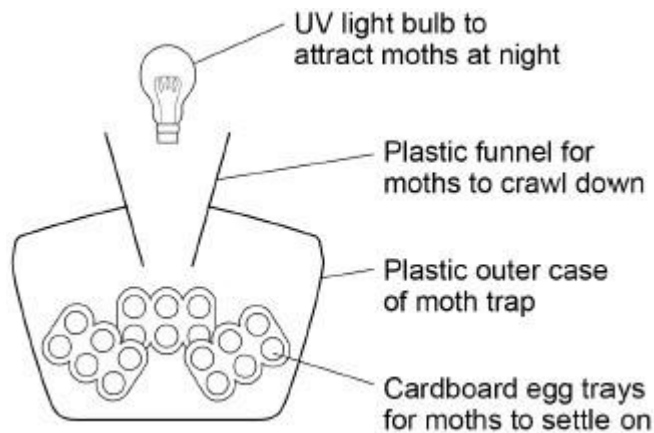
(4)

Students were studying the ecology of their playing field.

They wanted to count the population of ruby tiger moths.

Figure 1 shows the moth trap they used.

Figure 1



This is the method used.

1. Set up the moth trap on the playing field.
2. Leave the trap for several days with the light on.
3. Take the trap to the laboratory and carefully remove the egg trays.
4. Count the number of ruby tiger moths.
5. Release the moths on the playing field.

(b) The students needed other equipment to identify the ruby tiger moths.

What **two** other pieces of equipment did the students need?

Tick **two** boxes.

Electron microscope

Hand lens

Moth guide

Quadrat

Tape measure

(2)

(c) Suggest **one** reason why the moths were counted in the laboratory.

(1)

(d) Suggest **one** hazard in using the moth trap.

(1)

(e) What precaution should the students take to minimise the hazard you suggested in part (d)?

(1)

Figure 2 shows a caterpillar of the ruby tiger moth.

The head is sometimes bright orange in colour or there is a red stripe on the back.

Figure 2



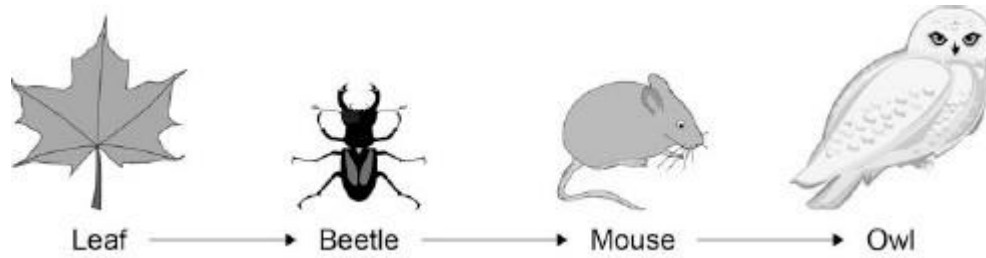
(f) Give **one** reason why caterpillars of the ruby tiger moth have very few predators.

(1)
(Total 10 marks)

2

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

(1)

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

(1)

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

Tick **one** box.

Community

Ecosystem

Population

Species

(1)

(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

(2)

(Total 5 marks)

3

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

(1)

(b) What gases cause global warming?

Tick **two** boxes.

Carbon dioxide

Methane

Nitrogen

Oxygen

Water vapour

(2)

(c) Give **two** effects of global warming that could reduce biodiversity in an area.

1. _____

2. _____

(2)

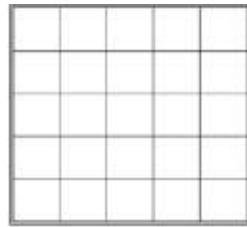
(Total 5 marks)

4

A student investigated the number of ribwort plants in a field.

The student used the apparatus shown in **Figure 1**.

Figure 1



Quadrat



Tape measure

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 .

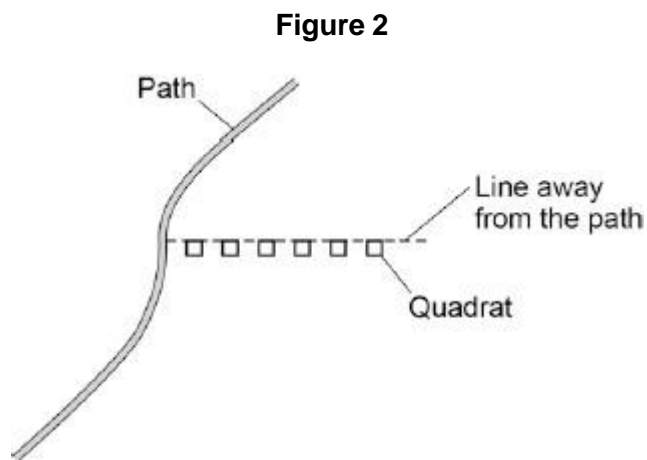
Calculate the total number of ribwort plants in the field.

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.

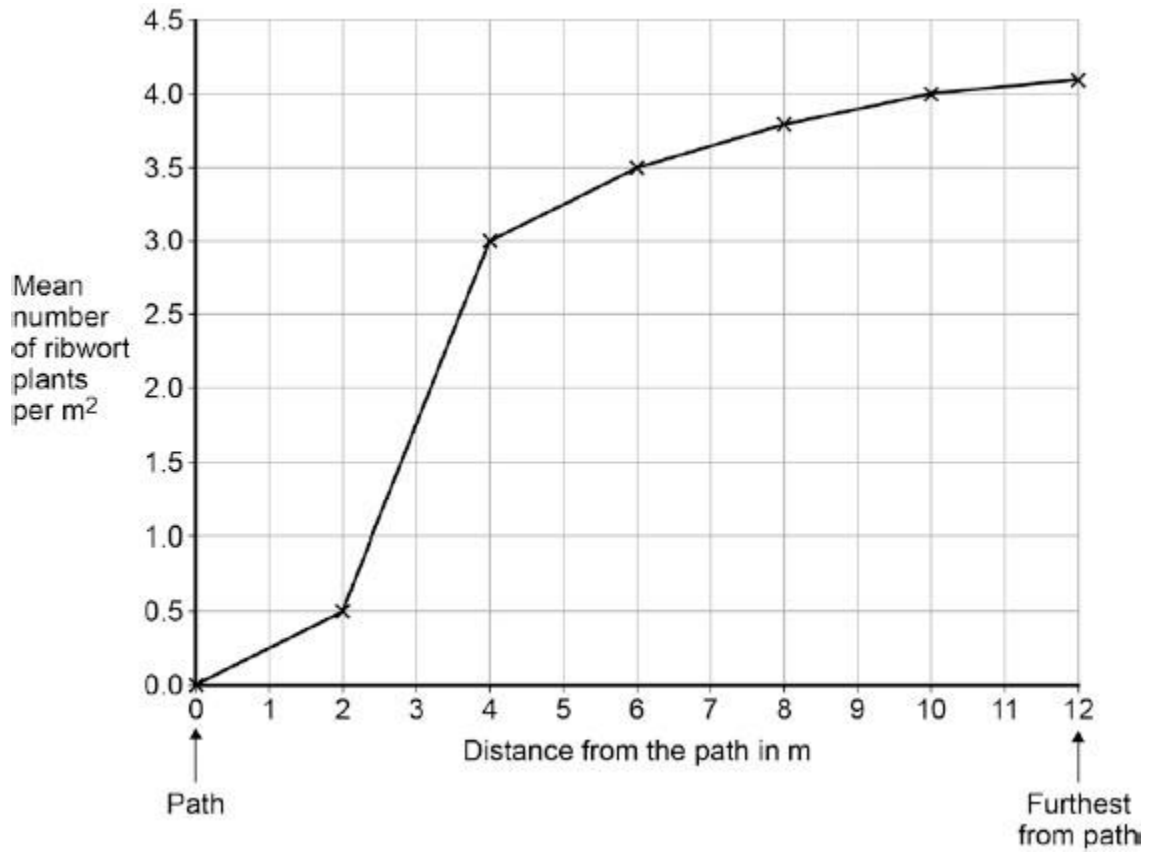


What is the name given to the line in **Figure 2**?

(1)

(d) **Figure 3** shows the students' results.

Figure 3



Describe the relationship shown in **Figure 3**.

(2)

(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

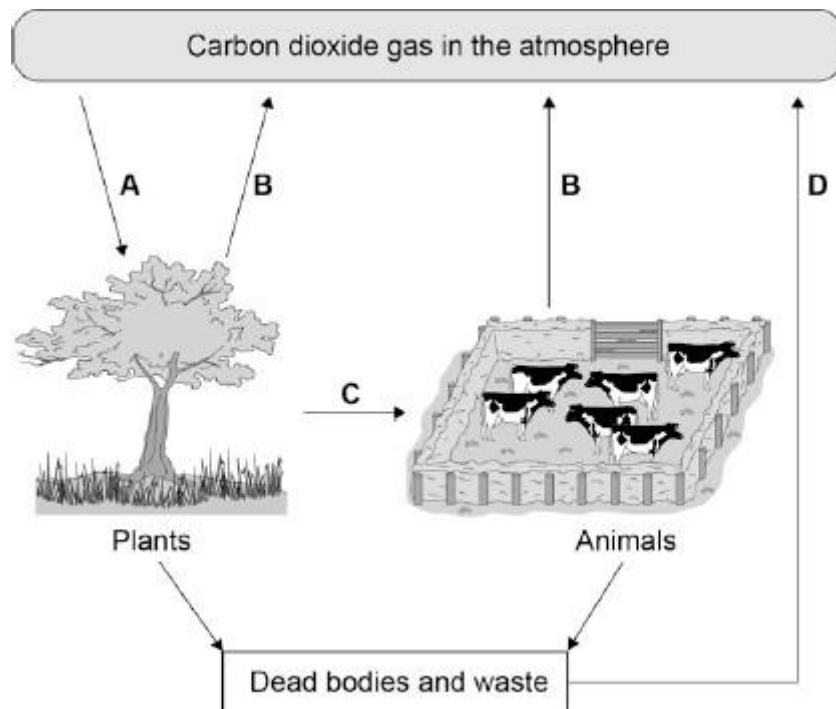
There are more nutrients in the soil near the path

There are fewer animals near the path

(1)
(Total 7 marks)

5

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

(1)

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

Tick **one** box.

A

B

C

D

(1)

(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. _____

(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?

(1)

(Total 7 marks)

6

In 2017, the city of Manchester began a 'City of Trees' project.

The city council intend to plant 3 million trees over the next 25 years.

The trees will be planted:

- to make woodlands larger
- to make new woodlands
- in parks, streets and in people's gardens.

(a) How will the trees benefit **the people** living in Manchester?

Tick **two** boxes.

By dropping leaves on the streets in autumn.

By hiding the road signs.

By helping people relax in outdoor spaces

By putting soot in the air.

By reducing the noise pollution.

(2)

(b) How will the trees benefit **the environment** in Manchester?

Tick **two** boxes.

By giving more space for car parks.

By hiding old buildings.

By making new habitats for plants and animals.

By providing a resting place for migrating birds.

By taking more oxygen out of the air.

(2)

It was suggested that 360 000 trees should be planted in the first year.

(c) How many trees would still need to be planted in the remaining 24 years?

Number of trees = _____

(1)

(d) If the council planted an equal number of trees in each remaining year how many would they plant each year?

Number of trees per year = _____

(2)

The council says that planting new trees will increase biodiversity in the area.

(e) What is the definition of biodiversity?

Tick **one** box.

The arrival of new predators in an ecosystem.

The evolution of new species by natural selection.

The recycling of carbon in the environment.

The variety of different species of organisms in an ecosystem.

(1)

(f) Suggest **one other** way the council could increase biodiversity in Manchester.

(1)

(Total 9 marks)

7 Peat can be burnt as a fuel.

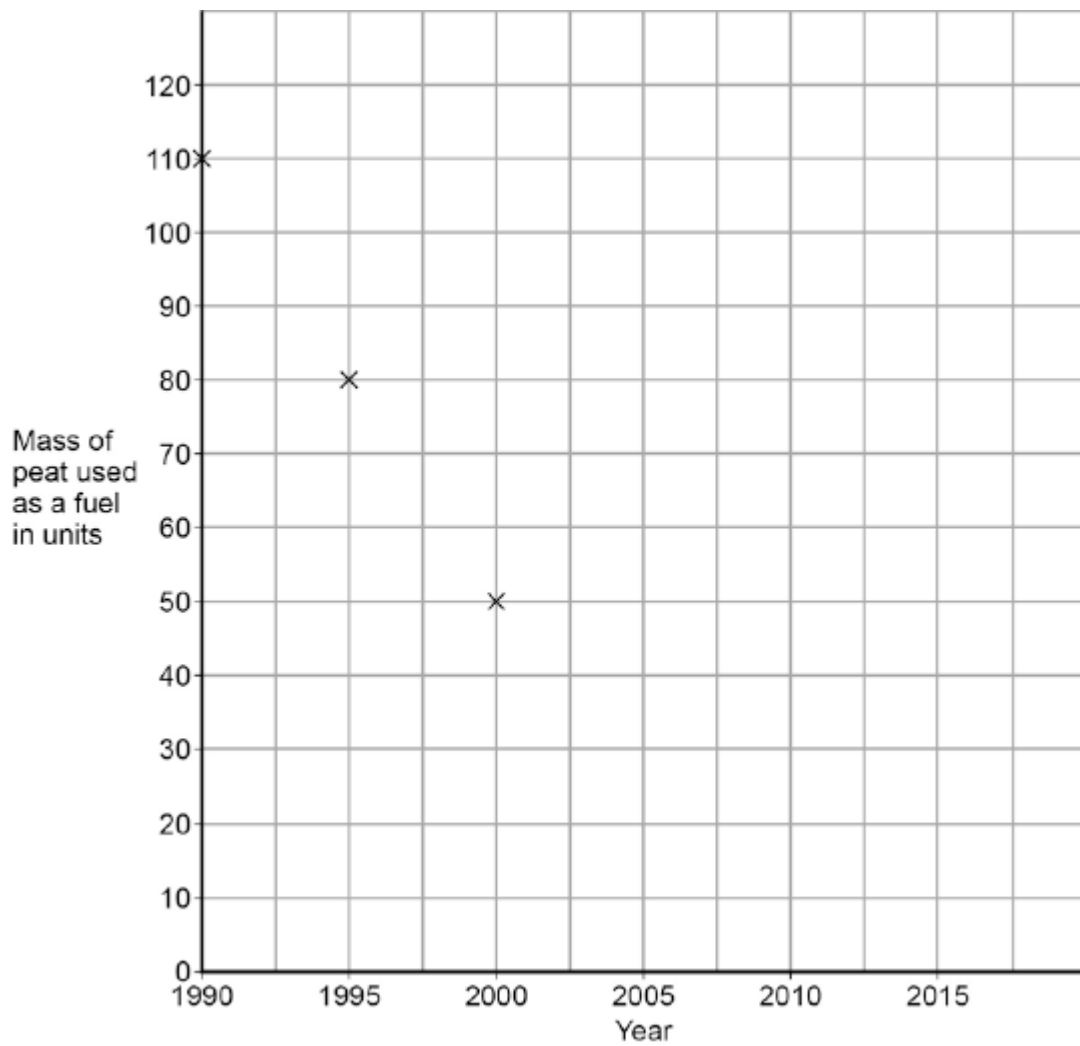
Table 1 shows the amount of peat used as a fuel in the UK over 20 years.

Table 1

Year	Mass of peat used as a fuel in units
1990	110
1995	80
2000	50
2005	20
2010	10

Figure 1 shows some of the information from Table 1.

Figure 1



(a) Complete **Figure 1** by plotting the points for 2005 and 2010.

(2)

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

Use information from **Figure 1**.

(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



© afe207/Thinkstock

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 2

Feature compared to peat compost	Advantage	Disadvantage
Coconut fibre is transported longer distances		
Coconut fibre is a waste product		
Coconut fibre traps less air in the soil, so roots absorb fewer mineral ions		

(2)

(Total 5 marks)

8 Moose are animals that eat grass.

Figure 1 shows a moose.

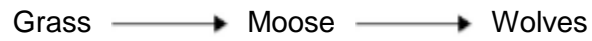
Figure 1



©Wildnerdpix/iStock/Thinkstock

Figure 2 shows a food chain.

Figure 2



(a) What word describes the grass in Figure 2?

Tick **one** box.

Consumer

Predator

Prey

Producer

(1)

(b) What word describes the wolves in **Figure 2**?

Tick **one** box.

Communities

Predators

Prey

Producers

(1)

- (c) **Figure 3** and **Figure 4** show how the moose population and the wolf population changed in one area.

Figure 3

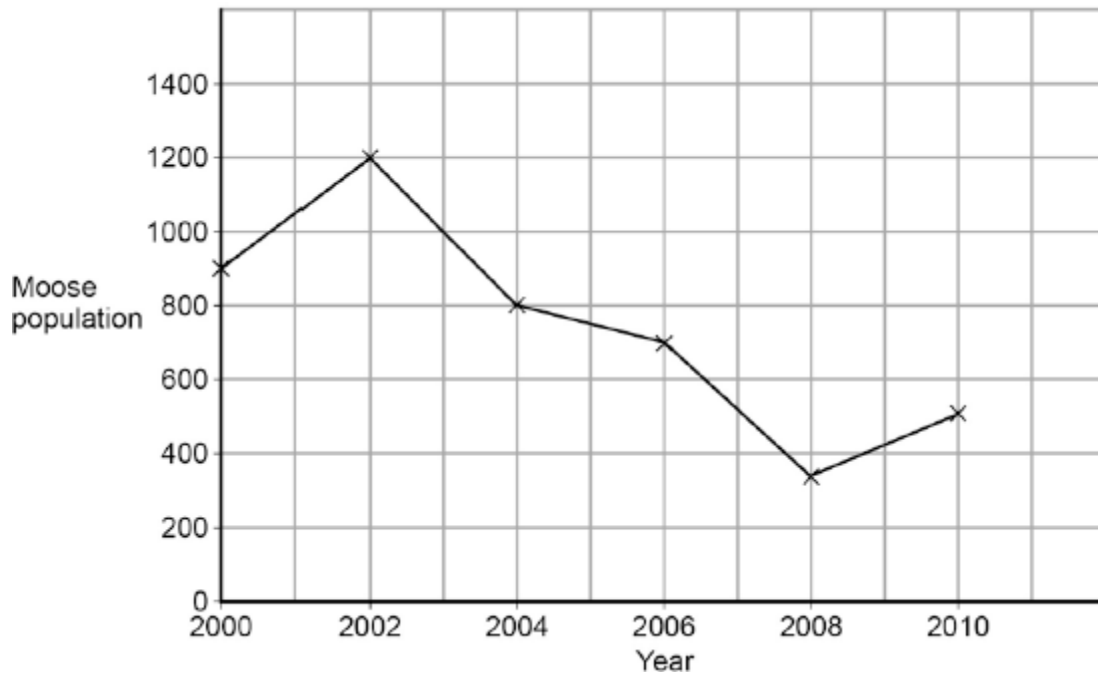
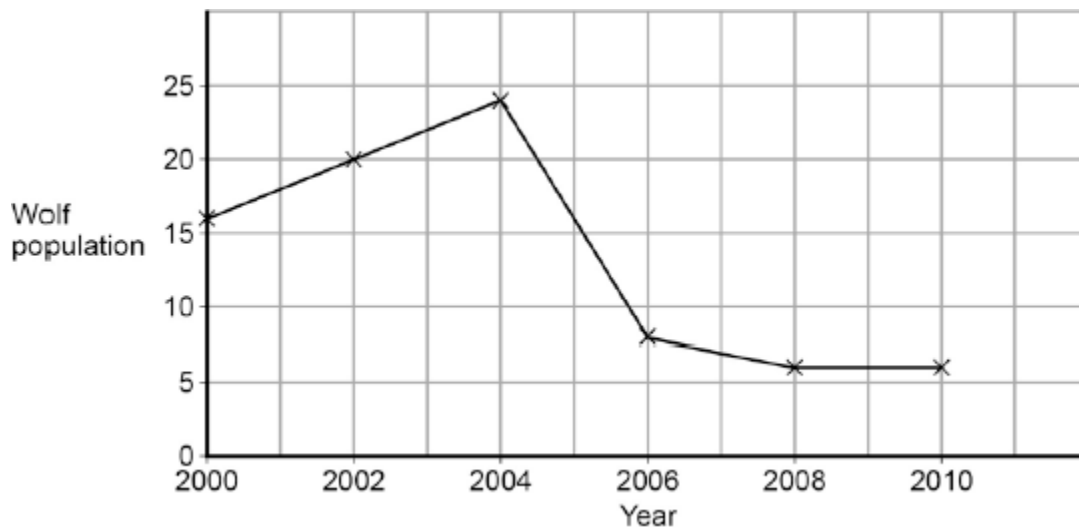


Figure 4



Look at **Figure 3**.

In this area the moose population reached its peak in 2002.

What was the size of the moose population in 2002?

(1)

(d) Look at **Figure 4**.

How long after the moose population peak did the wolf population peak occur?

_____ years

(1)

(e) When the moose population increases, the wolf population increases soon after.

Why does the wolf population increase?

Tick **one** box.

There is more competition for moose

There is more food for wolves

Other animals prey on moose

There are more predators of wolves

(1)

(f) Abiotic factors and biotic factors can affect the size of the wolf population.

Which of these are **biotic** factors?

Tick **two** boxes.

Carbon dioxide levels

Humans hunting

Light intensity

Soil type

Viruses

(2)

(Total 7 marks)

Mark schemes

- 1** (a) any **two** pairs from:
- light (intensity)
• more light means more / faster photosynthesis / glucose 1
 - temperature 1
 - higher temperature more / faster photosynthesis 1
 - water 1
 - right amount for transpiration / cell function / photosynthesis 1
 - soil pH / ions
 - needed for healthy growth
- ignore 'growth' unqualified*
ignore carbon dioxide and oxygen
- (b) hand lens 1
- moth guide 1
- (c) any **one** from:
- can work gently and not disturb moths
 - moths might fly away outside 1
- (d) any **one** from:
- damage to eyes (from UV / bright light)
 - burns from hot lamp
 - diseases / pathogens from wild organisms 1
- (e) any **one** from:
- wear sunglasses
 - **or**
 - eye protection
 - wear gloves or allow lamp to cool.
 - wear gloves
 - **or**
 - wash hands after handling moths
- answer must relate to hazard* 1
- (f) bristles / hairs make it unpleasant to eat
- or**
- bright colour acts as warning to predators (that it is poisonous) 1

[10]

2	(a) Leaf	1	
	(b) Beetle	1	
	(c) Community	1	
	(d) Light intensity	1	
	Wind direction	1	
			[5]
3	(a) the variety of different species on Earth	1	
	(b) carbon dioxide	1	
	methane	1	
	(c) any two from:		
	• drought		
	• flooding		
	• temperature change		
	<i>allow temperature increase or decrease</i>		
	• rainfall change		
	<i>allow rainfall increase or decrease</i>	2	
			[5]
4	(a) Place more quadrats in the field	1	
	Place quadrats randomly	1	
	(b) 26 400	1	
	(c) transect	1	
	(d) as distance from the path increases the number of (ribwort) plants increases	1	
	steep rise from 0.5 to 3.0 between 2 and 4 m from path or numbers level off to about 4 plants from 10 m from the path	1	

(e) The ribwort plants get walked on

1

[7]

5

(a) Photosynthesis

1

(b) Respiration

1

(c) C

1

(d) (it will) rise

1

(e) water vapour

1

methane

1

(f) Microorganism

1

[7]

6

(a) by helping people relax in outdoor spaces

1

by reducing the noise pollution

1

(b) by making new habitats for plants and animals

1

by providing a resting place for migrating birds

1

(c) 2 640 000

or

2.64×10^6

1

(d) $2\,640\,000/24$ or $\frac{2.64 \times 10^6}{24}$

1

110 000

or 1.1×10^5

*an answer of 110 000 or 1.1×10^5 scores 2 marks
allow 1 mark for answer to part (c) divided by 24*

1

(e) the variety of different species of organisms in an ecosystem

1

- (f) any **one** from:
- plant different types of plants
allow plant wildflowers
 - ask zoo to breed endangered animals for the woodlands
 - reintroduction of plants or animals that no longer live in Manchester
 - protect the woodland habitats
allow sensible way to do this
 - plant hedgerows on the edge of city / in parks
 - not using landfill / recycling waste
 - ban on cutting down trees
 - sensible suggestion to reduce pollution levels

1
[9]

7 (a) both plots correct

1

suitable line of best fit

1

(b) allow range of 3–7 (units)

allow ecf from line of best fit given in 03.1

1

(c)

Advantage	Disadvantage
	✓
✓	
	✓

allow 1 mark for 2 correct

2

more than one tick in a row negates a mark

[5]

8 (a) producer

1

(b) predators

1

(c) 1200

1

(d) 2 (years)

1

(e) there is more food for wolves

1

(f) humans hunting

1

viruses

1

[7]