AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.7.3 BIODIVERSITY AND THE EFFECT OF HUMAN INTERACTION ON ECOSYSTEMS (PACK 4)

SCORE	PERCENTAGE
/147	%

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

Every year scientists have recorded the date when migrating birds arrived at summer breeding grounds in the UK.

The records show that for every 1 °C increase in mean global temperature, the birds arrived one day earlier.

(a) What will the birds be competing for when they arrive at their UK breeding grounds?

Tick **two** boxes.

Eggs ☐

Food ☐

Light ☐

Mates ☐

Oxygen ☐

(2)

(b) Birds that arrive early might survive better than birds that arrive later.

Suggest **one** reason why.

_____

_____

(1)

(c) Global temperatures are increasing every year.

This is because of an increase of greenhouse gases in the atmosphere.

Name **one** greenhouse gas.

_____

(1)

(d) Global warming affects the migration of animals.

Give **one** other effect of global warming.

_____

_____

(1)

STEMUP.CO.UK

(e) Which **two** human activities cause global warming?

Tick **two** boxes.

- Burning fossil fuels ☐
- Eating vegetables ☐
- Farming cows ☐
- Turning off lights ☐
- Using too much water ☐

(2)

(f) Which gas in the atmosphere causes acid rain?

Tick **one** box.

- Carbon monoxide ☐
- Oxygen ☐
- Ozone ☐
- Sulfur dioxide ☐

(1)
(Total 8 marks)

Q2.

A class of eight students measured the population of water fleas living at the edge of a large pond.

This is the method each student used.

1. Put some pond water in a white tray.
2. Take a pond net and scoop at the edge of the pond a few times.
3. Empty the pond net into the water in the tray.
4. Count the number of water fleas in the tray.

The photograph below shows a student working.

STEMUP.CO.UK



(a) The students did **not** control some variables.

Give **two** variables the students should have controlled to make this a valid method.

1. _____

_____

2. _____

_____

(2)

The eight students then used a different method to obtain valid results.

Table 1 shows their results.

Table 1

Student	Number of water fleas per 1000 cm^3 pond water
A	66
B	37
C	51
D	102
E	40
F	122
G	75
H	19

(b) Calculate the students' mean value for the population of water fleas at the edge of

STEMUP.CO.UK

the pond.

_____

_____

Mean population = _____ water fleas per 1000 cm^3 pond water

(1)

(c) What was the range of the students' results?

Range = _____

(1)

(d) Suggest **one** reason why such a wide range of results was found.

_____

_____

(1)

(e) The teacher then sampled the centre of the pond eight times.

His mean value was 12 water fleas per 1000 cm^3 pond water.

What conclusion can you make about the distribution of water fleas in the pond?

Use the students' mean value from part **(b)** to compare with the teacher's mean value.

_____

_____

(1)

Scientists counted some different invertebrates living in a pond in 2014 and in 2016

Table 2 shows the results.

Table 2

Invertebrate species	**Number of invertebrates**	
	2014	**2016**
Bloodworms	13	48
Freshwater shrimps	24	9
Mayfly nymphs	32	0
Water snails	19	24

(f) Calculate the change in the number of bloodworms between 2014 and 2016

_____

Change = _____ bloodworms

STEMUP.CO.UK

(1)

(g) Calculate the number of shrimps in the pond in 2016 as a percentage of the number of shrimps in the pond in 2014

_____

Percentage = _____ %

(1)

(h) Invertebrate species found in a pond can be used as an indicator of the pollution level.

Table 3 shows which species can survive in different levels of pollution.

Table 3

Invertebrate species	**Pollution level**		
	Low	**Medium**	**High**
Bloodworms	✓	✓	✓
Freshwater shrimps	✓	✓	✗
Mayfly nymphs	✓	✗	✗
Water snails	✓	✓	✓

Key
✓ = Can survive
✗ = Cannot survive

What conclusion can you make about the change in the level of pollution in the pond between 2014 and 2016?

Give **one** reason for your conclusion.

Use the data in **Table 2** and **Table 3**

_____

_____

_____

_____

(2)

(i) Water pollution and global warming are two problems that have been caused by the rapid increase of the human population.

Suggest **two** other problems caused by the rapid increase of the human population.

1. _____

_____

STEMUP.CO.UK

2. _____

_____

(2)

(Total 12 marks)

Q3.

Many people eat shellfish called oysters.

An oyster has 20 chromosomes in each body cell.

(a) Which arrangement of chromosomes will a male oyster have in each body cell?

Tick **one** box.

One X and one Y chromosome and 8 pairs of other chromosomes	☐
Two X and two Y chromosomes and 8 pairs of other chromosomes	☐
One X and one Y chromosome and 9 pairs of other chromosomes	☐
Two X chromosomes and 9 pairs of other chromosomes	☐

(1)

(b) Oyster gametes only contain half the amount of DNA compared to a normal oyster body cell.

Describe the type of cell division that produces gametes.

_____

_____

_____

_____

_____

_____

(3)

Biologists have discovered a way to produce oysters that have three sets of chromosomes (triploid) instead of the usual two sets (diploid).

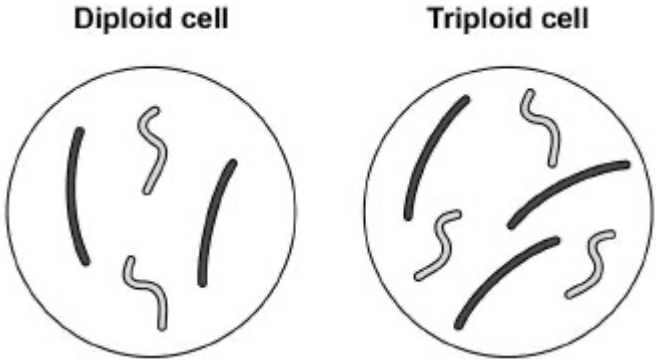
The triploid oysters cannot reproduce and so they grow more quickly.

Diploid oysters do not taste good in the reproductive season. Triploid oysters taste good all year.

The diagram below shows the chromosomes in a diploid cell and in a triploid cell.

STEMUP.CO.UK

Only two sets of chromosomes are shown.



(c) Suggest why the triploid oysters are **not** able to reproduce.

_____

_____

_____

(1)

(d) Explain why the triploid oysters grow more quickly than the diploid oysters.

_____

_____

_____

_____

_____

_____

(2)

(e) The population of diploid oysters growing in the wild has reduced by over 80% in the last 20 years.

Suggest **two** environmental factors which may be causing this reduction.

Give a reason why each factor may be causing the reduction in the population.

1. _____

_____

2. _____

_____

(2)

(f) Oyster farmers grow the triploid oysters from young seed oysters.

The production of seed oysters involves the use of a chemical called cytochalasin B. Cytochalasin B has been shown to cause cancer in mice.

STEMUP.CO.UK

Evaluate the production of triploid oysters for supermarkets and restaurants.

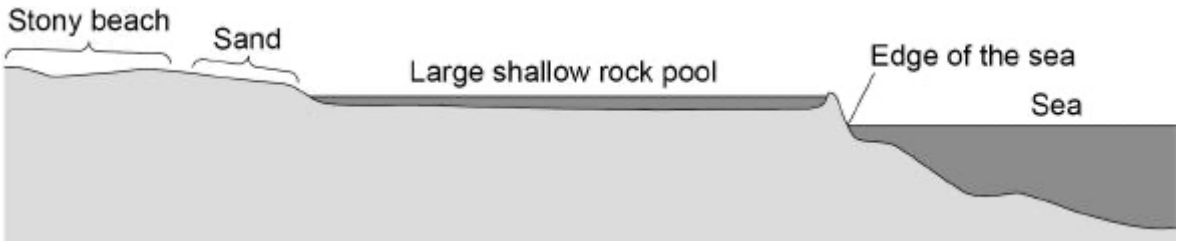
(6)

(Total 15 marks)

Q4.

Figure 1 shows a rocky shore.

Figure 1



Students were asked to investigate how the abundance and distribution of different organisms change as you move from the edge of the sea to the stony beach.

(a) Describe a method the students could use.

STEMUP.CO.UK

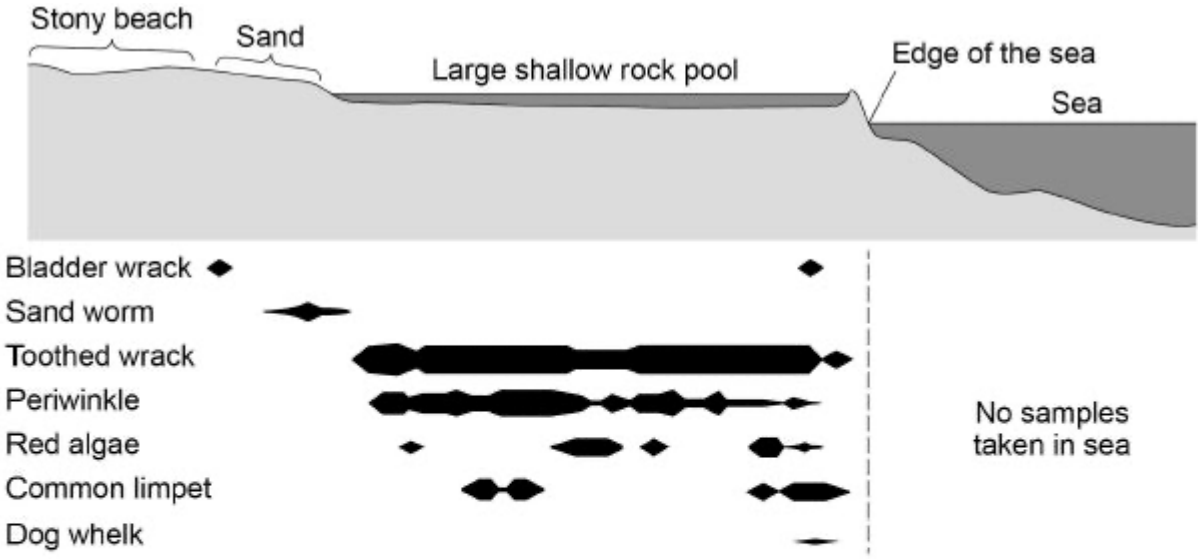
(6)

(b) A kite diagram shows the distribution and number of organisms.

Figure 2 shows a kite diagram of the results from a similar investigation on the same rocky shore.

Figure 2

STEMUP.CO.UK



Which organism was most abundant?

Give a reason for your answer.

_____

_____

_____

_____

(2)

(c) The shallow rock pool in **Figure 2** has a **higher biodiversity** than the sand or the stony beach.

Suggest **three** reasons why.

_____

_____

_____

_____

_____

_____

(3)

STEMUP.CO.UK

(Total 11 marks)

Q5.

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 = _____

STEMUP.CO.UK

(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)

Q6.

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

The project plans to plant 3 million trees over the next 25 years.

The trees will be used to:

- make existing woodlands larger
- link existing woodlands
- create new woodlands
- plant in parks, public gardens and along streets
- give to people to plant in private gardens.

(a) It was suggested that the council plant 3.6×10^5 trees in the first year.

The rest of the trees would be planted in equal numbers over the remaining years.

STEMUP.CO.UK

Calculate how many trees would need to be planted in each of the remaining years.

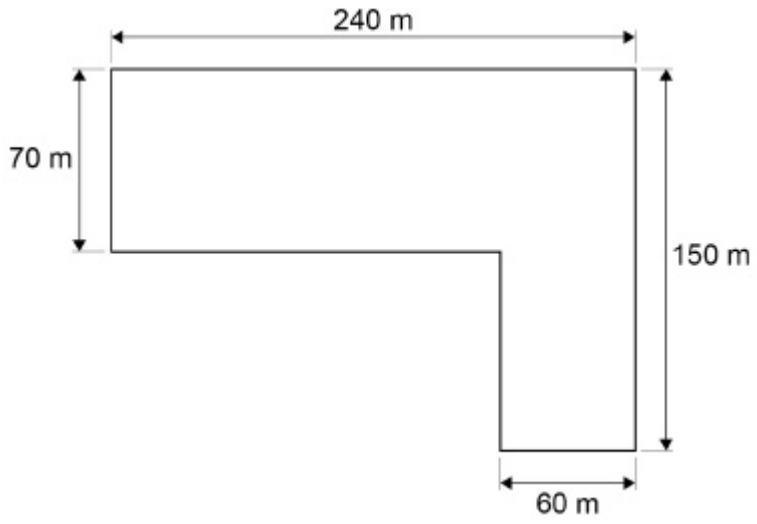
Give your answer in standard form.

Number of trees = _____ per year

(3)

(b) Students investigated the number of bluebells in one of the existing woodlands.

The diagram shows the dimensions of the woodland.



The students used a 0.25 m^2 quadrat to sample the bluebell population.

The mean number of bluebells per quadrat was 6

Estimate the population of bluebells in the woodland.

Population = _____ bluebells

(2)

(c) A Manchester resident says that this project will 'fight pollution' and 'increase biodiversity' in their city.

Explain how the 'City of Trees' project will:

- reduce pollution

STEMUP.CO.UK

- increase biodiversity.

(6)
(Total 11 marks)

Q7.

Tobacco mosaic virus (TMV) can infect many species of plant.

TMV spreads throughout the whole plant, causing discolouration of the leaves.

(a) Suggest how TMV spreads within the plant from one part to another.

(1)

(b) Describe how TMV can pass from one plant to another.

(1)

Plants can be genetically modified (GM) to be resistant to TMV.

(c) What **two** ways is the process of genetic modification different from selective breeding?

STEMUP.CO.UK

Tick **two** boxes.

GM is faster. ☐

GM is less dependent on chance at fertilisation. ☐

GM is less likely to give the desired characteristics in the offspring. ☐

GM is only used in plants, not animals. ☐

GM requires less specialist equipment. ☐

(2)

(d) Describe the process of genetic modification that is used to produce a plant that is resistant to a disease.

(4)

(e) Fields planted with genetically modified (GM) crops may have lower biodiversity than fields planted with non-GM crops.

Why is a reduction in biodiversity more likely to result in the extinction of a species?

(2)

(f) Maintaining hedgerows around fields helps improve biodiversity.

Suggest **one** other reason why farmers maintain hedgerows around fields of crops.

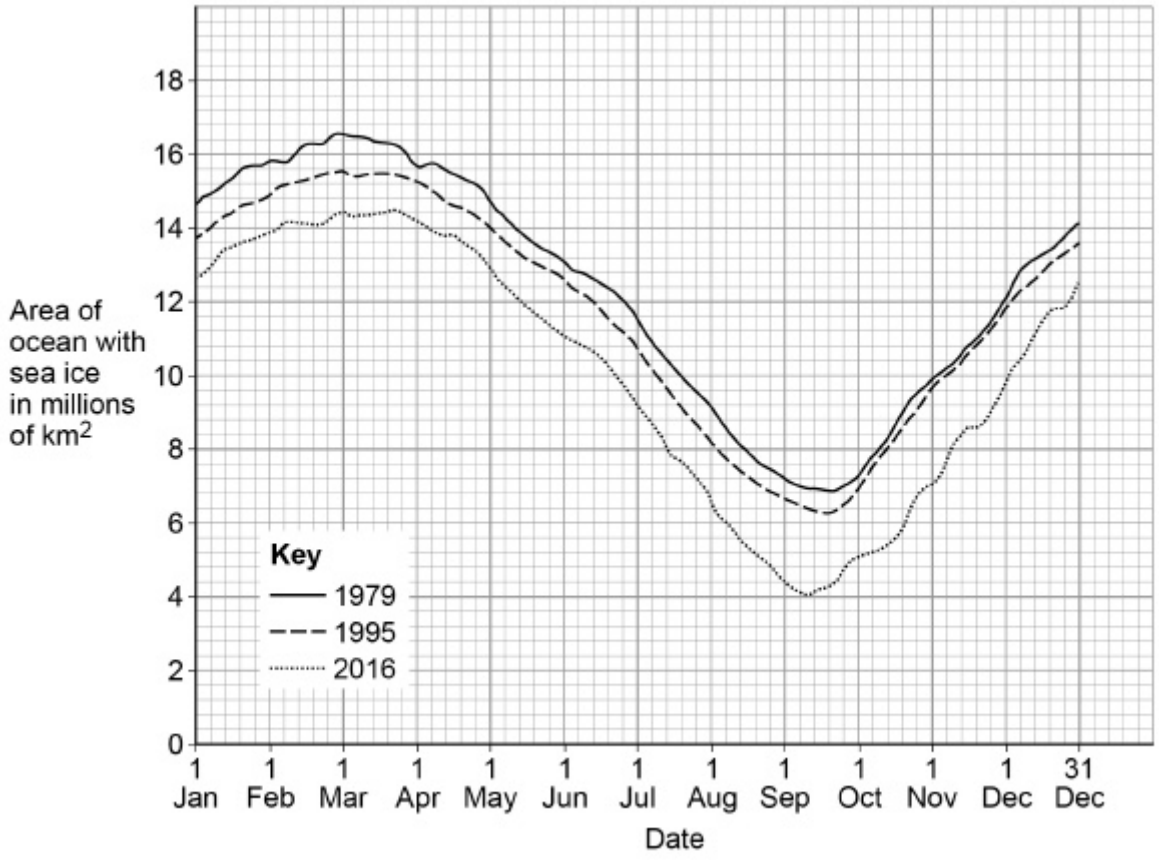
STEMUP.CO.UK

(1)
(Total 11 marks)

Q8.

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. _____

_____

(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.

_____

_____

STEMUP.CO.UK

(6)
(Total 8 marks)

Q9.

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	☐

STEMUP.CO.UK

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)

Q10.

Peat can be burnt as a fuel.

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

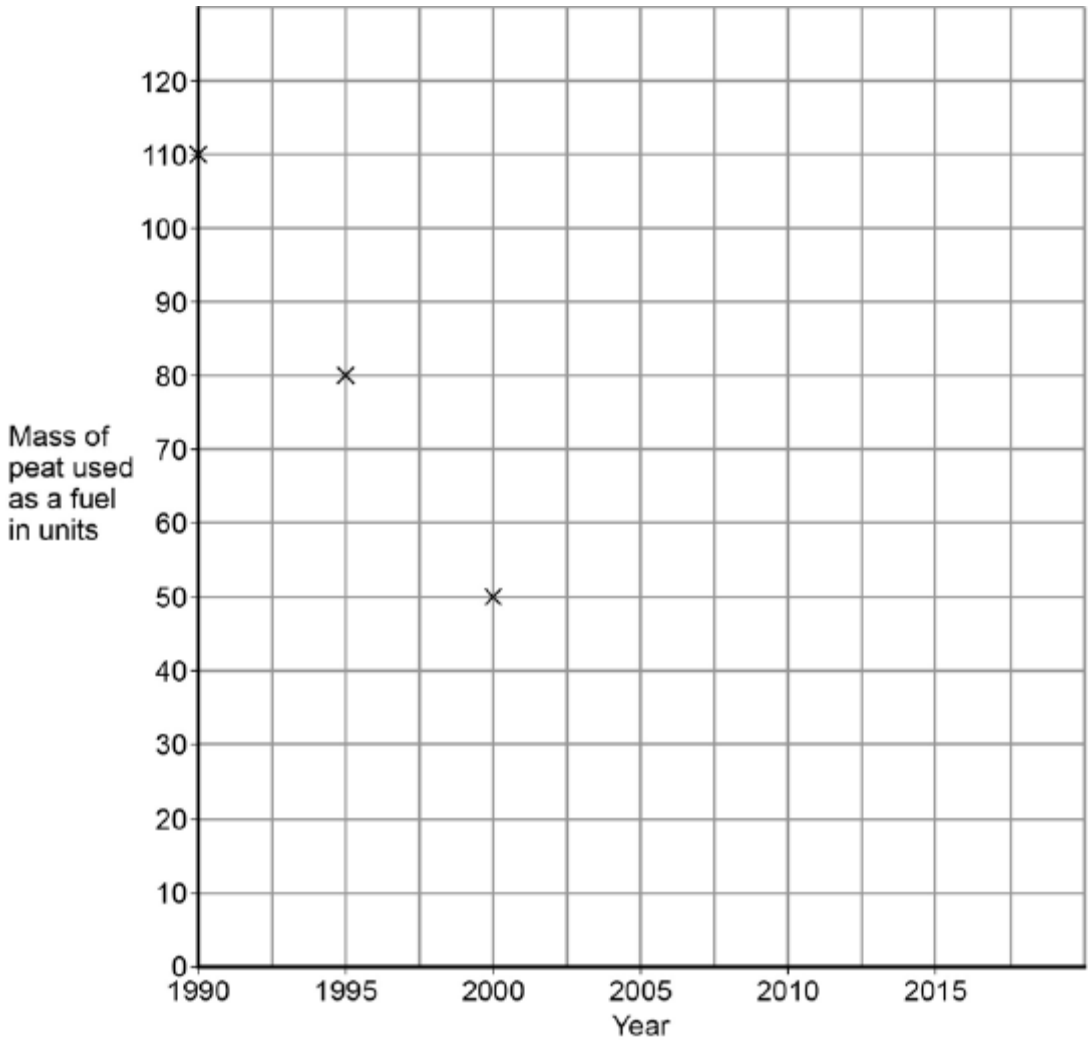
Table 1

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

STEMUP.CO.UK



(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

STEMUP.CO.UK



© 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)

Q11.

The UK contains large areas of peat bogs that have been present for thousands of years.

(a) Peat is removed from peat bogs.

The peat can be mixed with air and added to garden compost.

The release of carbon dioxide from peat is a problem.

Give **two other** reasons why gardeners should use less peat-based compost in the future.

1. _____

_____

2. _____

_____

(2)

STEMUP.CO.UK

(b) Explain why mixing peat with air leads to the release of carbon dioxide.

(4)

(Total 6 marks)

Q12.

In the last 200 years the concentration of carbon dioxide in the Earth's atmosphere has risen.

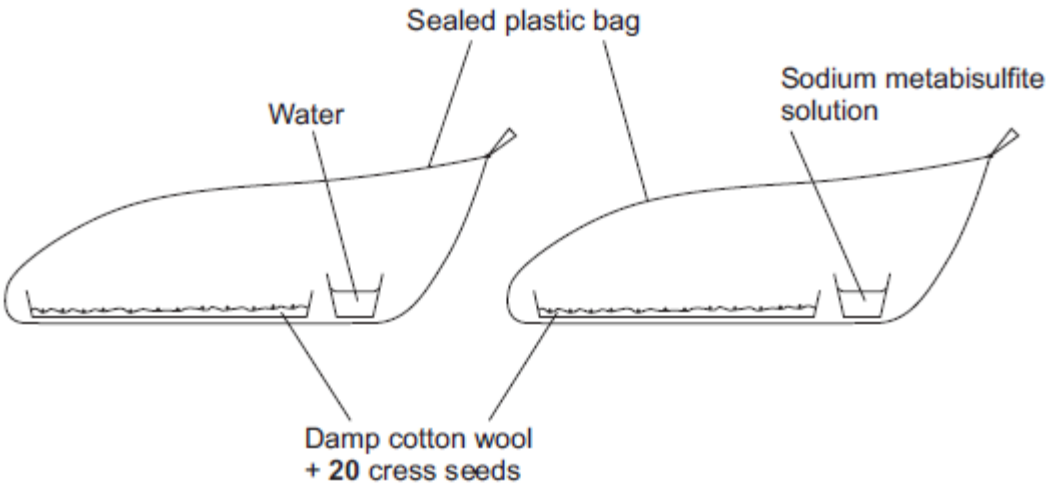
Explain how a rise in carbon dioxide concentration in the atmosphere can decrease biodiversity.

(Total 6 marks)

Q63.

(a) The diagram shows an investigation to find out if sulfur dioxide gas affects the growth of cress seeds.

STEMUP.CO.UK



Sodium metabisulfite solution gives off sulfur dioxide gas.

Both bags were left in a warm laboratory for several days. The number of seeds that grew in each bag was counted.

What was the dependent variable in this investigation?

_____

_____

(1)

(b) The investigation was carried out five times.

The table below shows the five sets of results.

	Number of seeds that grew					**Mean**
Bag containing water	15	17	15	16	17	16
Bag containing sodium metabisulfite solution	5	9	8	5	8	7

(i) The mean percentage of seeds that grew in the bag containing water was 80%.

Calculate the mean percentage of seeds that grew in the bag containing sodium metabisulfite solution.

_____

_____

_____%

(1)

(ii) Give **one** conclusion you can make from these results.

_____

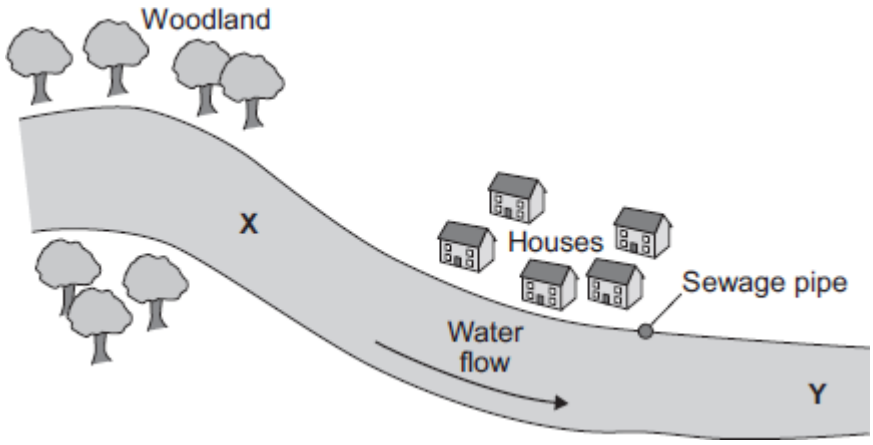
STEMUP.CO.UK

(1)

(Total 3 marks)

Q64.

Scientists investigated the water quality at points **X** and **Y** in a river. The scientists sampled the invertebrate animals living at these points.



The table shows their results.

Invertebrate	Level of oxygen needed for survival	Number of invertebrates sampled	
		Point X	Point Y
Stonefly nymph	High	12	0
Mayfly nymph	High	11	0
Dragonfly nymph	Medium – high	5	0
Freshwater shrimp	Medium – high	14	0
Freshwater louse	Medium – low	5	6
Red-tailed maggot	Low	0	14
Tubifex worm	Low	0	15

(a) (i) How many different species of invertebrates were found in the river at point **X** and point **Y**?

Number of **different** species of invertebrates at point **X** = _____

Number of **different** species of invertebrates at point **Y** = _____

(1)

(ii) What does this suggest about the water at points **X** and **Y** in the river?

STEMUP.CO.UK

_____

_____

(1)

(b) No Dragonfly nymphs were found at point **Y** in the river.

Use information from the table to suggest why.

_____

_____

(1)

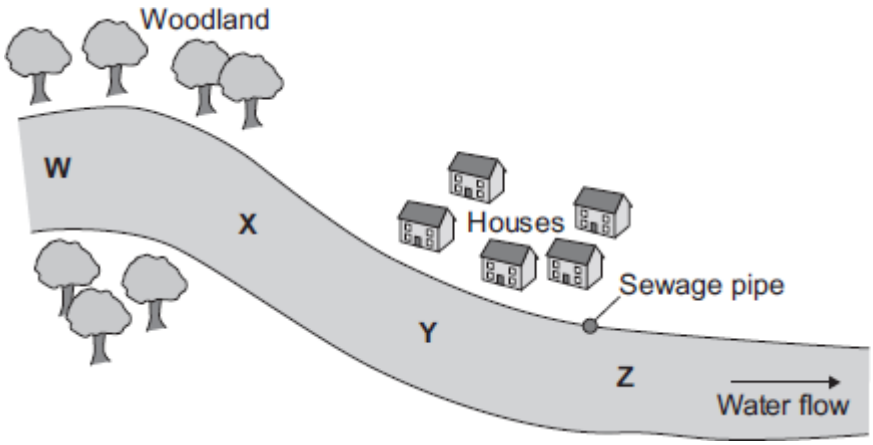
(Total 3 marks)

Q65.

Two groups of students, **Group 1** and **Group 2**, were monitoring the oxygen concentration in a river.

They measured the oxygen concentration of the water at points **W**, **X**, **Y** and **Z**. The measurements were taken on the same day, but the two groups used different oxygen sensors.

The sensors for both groups were working properly.



The results for the two groups are shown in the table.

	Concentration of oxygen in arbitrary units			
Sampling position	**W**	**X**	**Y**	**Z**
Group 1	9.4	9.3	9.4	8.5
Group 2	9	9	9	9

(a) The results of **Group 2** did not show any difference in the concentration of oxygen at the four different sampling positions. The results of **Group 1** did show differences.

Suggest why.

_____

STEMUP.CO.UK

_____

(1)

(b) The results of **Group 1** show the lowest concentration of oxygen was at sampling position **Z**.

Suggest why.

_____

_____

_____

_____

_____

_____

(3)

(c) The students also counted the number of different invertebrates living in the river at points **W**, **X**, **Y** and **Z**.

The results are shown in the table.

Invertebrate	Sampling position			
	W	**X**	**Y**	**Z**
Stonefly larva	4	5	4	0
Water snail	16	15	16	10
Bloodworm	0	0	0	25
Freshwater louse	6	5	7	5

From these results, which invertebrate is **not** suitable as an indicator of oxygen concentration in water?

_____

Give a reason for your choice.

_____

_____

(1)

(Total 5 marks)

Q66.

Approximately a third of UK household rubbish is organic matter such as food waste and gardening rubbish.

STEMUP.CO.UK



Many councils have large-scale composting schemes to decompose this rubbish. The products from this process can be sold. This pays for some of the cost of collecting and processing the rubbish.

(a) Which **two** of the following are reasons to encourage more councils to have large-scale composting schemes?

Tick (✓) **two** boxes.

There will be less household rubbish ☐

They produce substances that help plants grow ☐

They do not cost anything ☐

They reduce landfill ☐

(2)

(b) What conditions are needed to decompose organic waste?

Tick (✓) **two** boxes.

Plenty of carbon dioxide ☐

Dry conditions ☐

Plenty of oxygen ☐

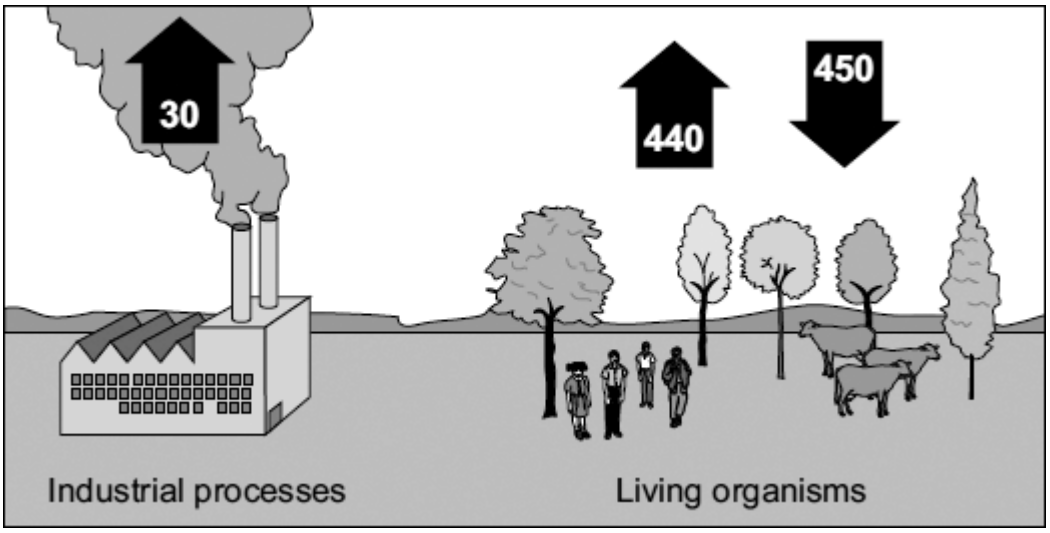
STEMUP.CO.UK

Warm conditions

(2)
(Total 4 marks)

Q67.

The diagram shows the mass of carbon dioxide released into and removed from the air each year in billions of tonnes.



(a) Complete the following sentences.

(i) Plants remove carbon dioxide from the air by a process

called _____

(1)

(ii) All organisms produce carbon dioxide during a process

called _____

(1)

(b) Too much carbon dioxide in the atmosphere can harm the environment.

Suggest **two different** ways of reducing the amount of carbon dioxide in the atmosphere.

_____

_____

_____

_____

(2)
(Total 4 marks)

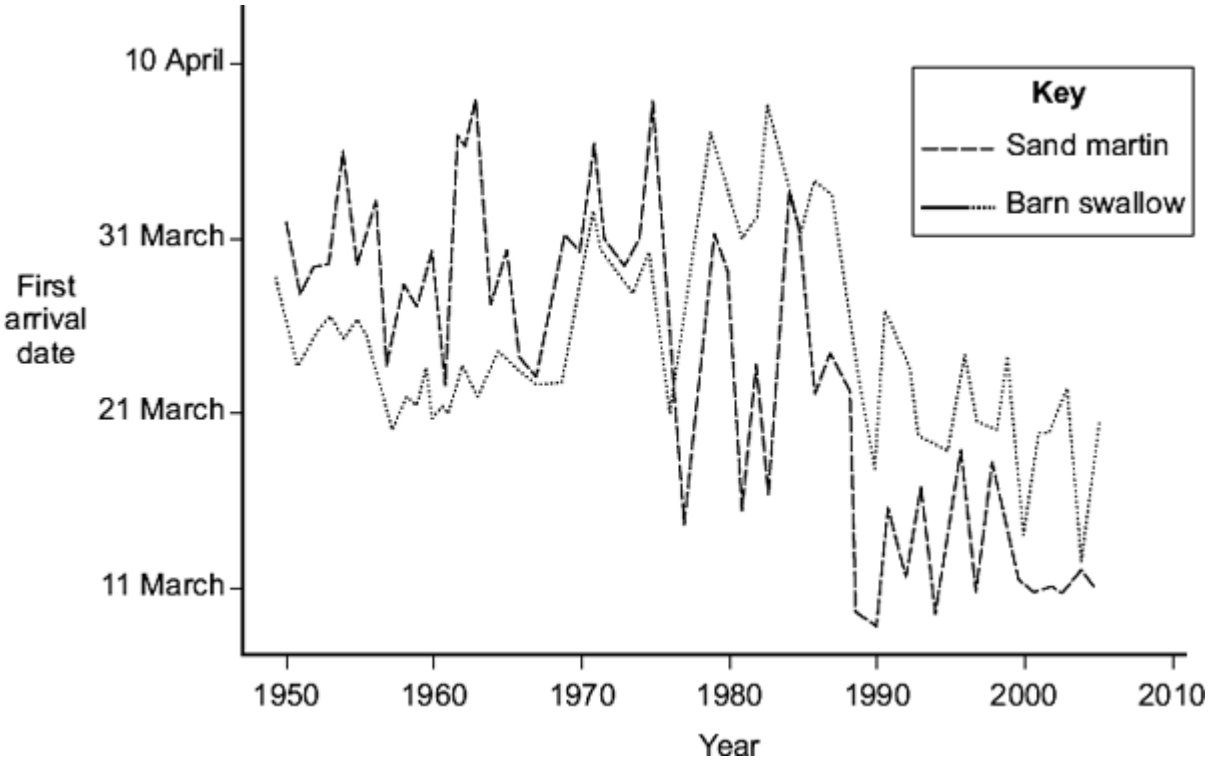
STEMUP.CO.UK

Q68.

Scientists have observed changes in the migration patterns of some species of birds.

The graph shows the arrival dates in the UK of two species of birds, the Sand martin and the Barn swallow.

Both birds feed on flying insects.



(a) What **two** changes in migratory patterns are shown in the data?

Tick (✓) **two** boxes.

Birds fly at faster speeds than they used to ☐

Barn swallows arrive later to the UK than they used to ☐

Sand martins have always arrived in the UK before Barn swallows ☐

Both birds arrive earlier to the UK than they used to ☐

After 1970 the order that the two birds arrive in the UK reversed ☐

(2)

STEMUP.CO.UK

(b) The migratory patterns of the two birds have changed.

Suggest **one** reason why.

_____

_____

(1)

(Total 3 marks)

Q69.

Approximately a third of UK domestic rubbish is organic matter such as food waste and gardening rubbish.

Many councils have started industrial composting schemes to decompose these wastes. One product of the decomposition is compost (decaying organic matter).

Use this information and your own knowledge to suggest reasons why more councils should be encouraged to start industrial composting schemes.

_____

_____

_____

_____

_____

_____

(Total 3 marks)

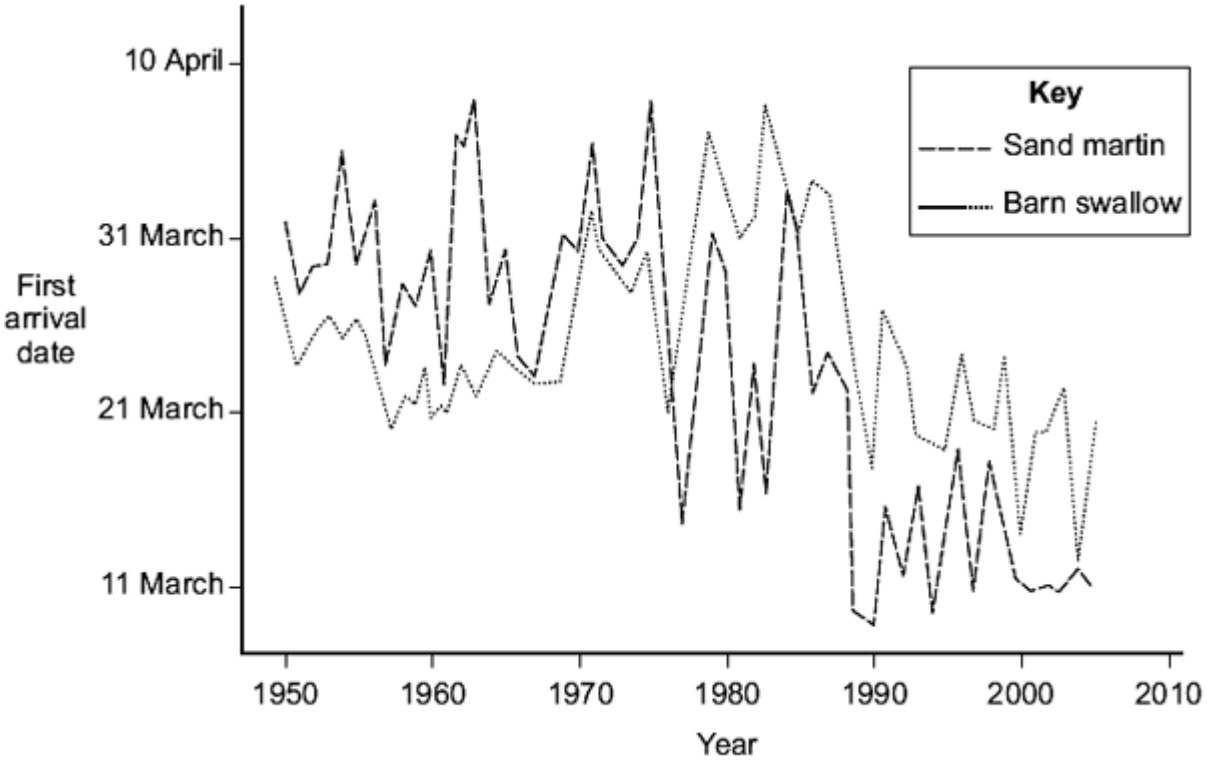
Q70.

Scientists have observed changes in the migration patterns of some species of birds.

The graph shows the arrival dates in the UK of two species of birds, the Sand martin and the Barn swallow.

Both birds feed on flying insects.

STEMUP.CO.UK



(a) Give **two** changes in migratory patterns shown in the data.

_____

_____

_____

_____

(2)

(b) Suggest reasons for the change in the migration pattern of the Sand martin.

_____

_____

_____

_____

(2)

(Total 4 marks)

Q71.

Copper is found in the Earth's crust as an ore containing copper sulfide. Large areas of land, where this ore was once quarried, are contaminated with low percentages of copper sulfide. Copper would be too expensive to extract from this contaminated land using the traditional method of quarrying and then heating in a furnace.

(a) Extracting copper from this land by the traditional method would have a major environmental impact.

STEMUP.CO.UK

Give **two** reasons why.

_____

_____

_____

_____

(2)

(b) One way to extract the copper from land that contains low percentages of copper sulfide is by bioleaching. Bioleaching uses bacteria. The bacteria produce a solution of copper sulfate.

It is possible to get copper from a solution of copper sulfate using scrap iron.

(i) It is economical to use scrap iron to get copper.

Give **one** reason why.

_____

_____

(1)

(ii) Iron can be used to get copper from copper sulfate solution.

Explain why.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q72.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

There are millions of plastic bags in use. After use most of these plastic bags are buried in landfill sites. The amount sent to landfill could be reduced if the plastic bags:

- could be reused
- could be recycled by melting and making them into new plastic products
- could be burned to release energy.

Use the information above and your knowledge and understanding to give the positive and negative environmental impacts of using these methods to reduce the amount of plastic bags sent to landfill.

STEMUP.CO.UK

(Total 6 marks)

STEMUP.CO.UK