Ecology part 3 AQA Triple Biology

Name: _____

Class: _____

Date: _____

Time: **74 minutes**

Marks: **74 marks**

Comments:

1. Students investigated a food chain in a garden.

lettuce → snail → thrush (bird)

The students:

- estimated the number of lettuce plants in the garden
- estimated the number of snails feeding on the lettuces
- counted two thrushes in the garden in 5 hours.

The table below shows the students' results and calculations.

Organism	Population size	Mean mass of each organism in g	Biomass of population in g	Biomass from previous organism that is lost in g	Percentage of biomass lost
Lettuce	50	120.0	6000		
Snail	200	2.5	500	5500	91
Thrush	2	85.0	170	330	66

(a) (i) Give **two** ways that biomass is lost along a food chain.

_____

_____

_____

_____

(2)

(ii) Scientists estimate that about 90% of the biomass in food is lost at each step in a food chain.

Suggest **one** reason why the students' value for the percentage of biomass lost between the snails and the thrushes is only 66%.

_____

_____

(1)

(b) European banded snails have shells with different colours (light or dark) and with stripes or with no stripes.

Figure 1 shows two examples of European banded snails.

Figure 1

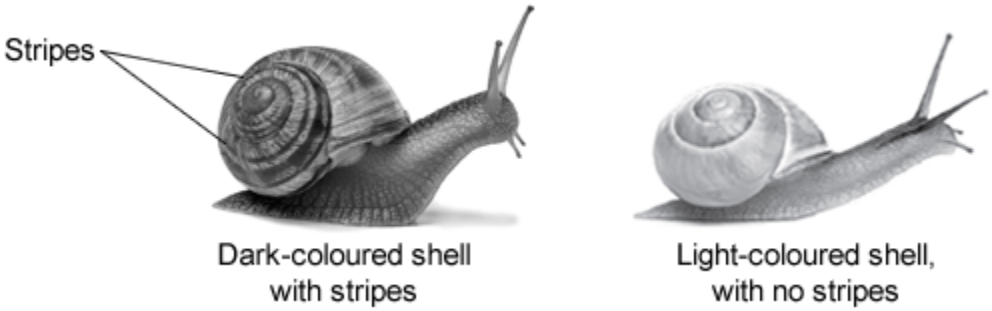
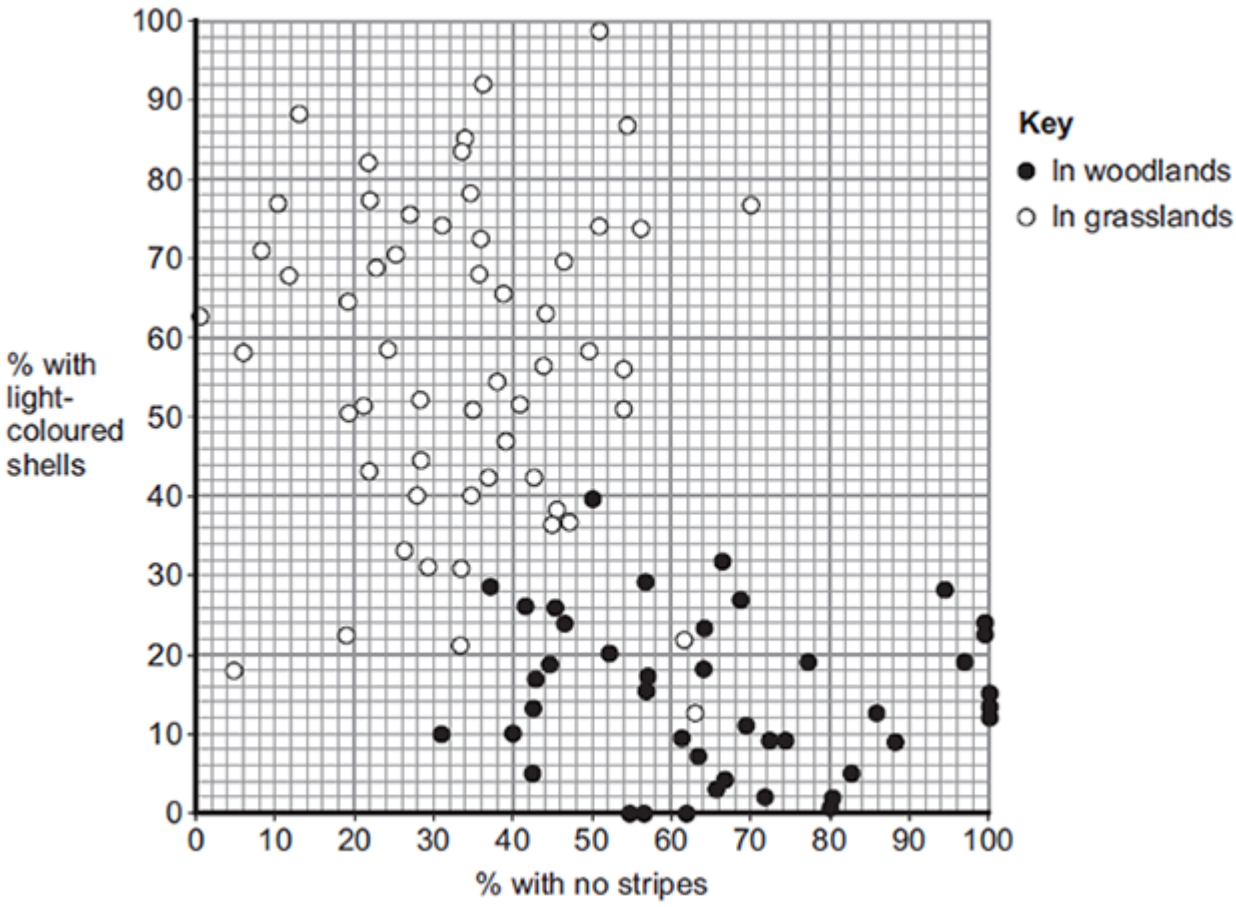


Figure 2 shows results from surveys in woodlands and in grasslands of the percentage of snails with light-coloured shells and the percentage of snails with no stripes.

Each point on the graph represents the results of one survey in one habitat.

Figure 2



(i) **Figure 2** is a scatter graph.

Why is a scatter graph used for this data?

_____

_____

(1)

(ii) Compare the general appearance of snails that live in woodlands with the general appearance of snails that live in grasslands.

_____

_____

_____

_____

(2)

(iii) Suggest a reason for the general appearance of snails that live in woodlands.

_____

_____

(1)

(Total 7 marks)

2. Ragwort is a plant that often grows as a weed in grassland.

The image below shows a ragwort plant.

© Difydave/iStock

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 m^2.

The table below shows the students' results.

Quadrat number	Number of ragwort plants
1	1
2	0
3	3
4	0
5	0
6	0
7	5
8	0
9	0
10	2

(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 = _____

(2)

(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. ☐

(1)

(c) 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** _____

_____

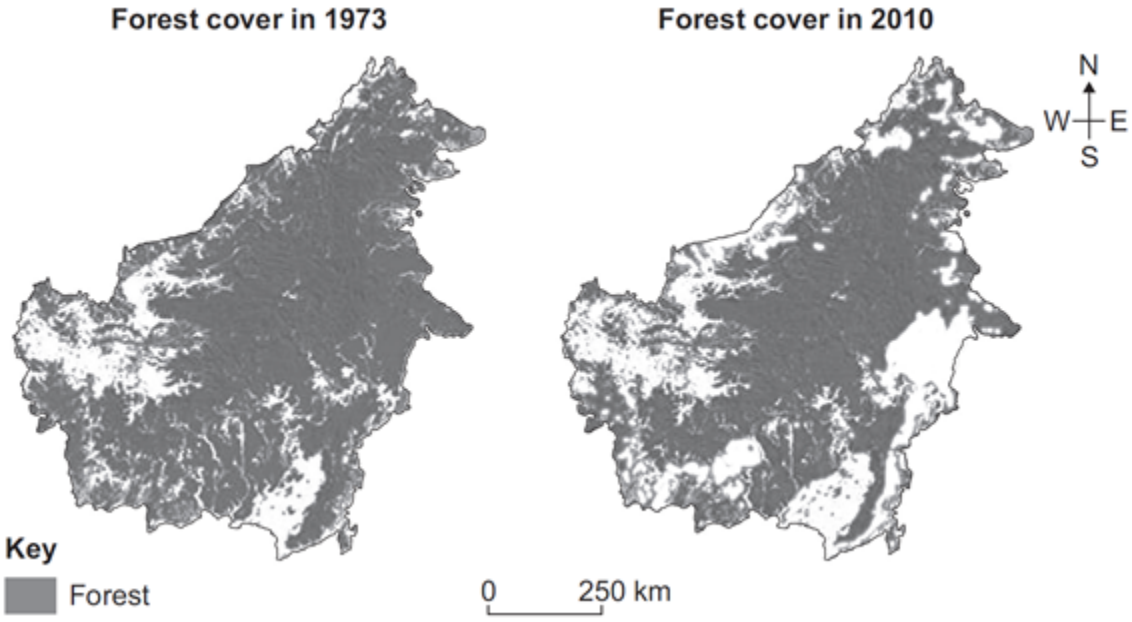
_____

_____

(3)

(Total 6 marks)

3. The figure below shows the amount of forest cover on an island in Asia, in 1973 and in 2010.



(a) (i) Deforestation has decreased the amount of forest cover on the island.

Describe the change in the pattern of forest cover on the island.

_____

_____

_____

_____

(2)

(ii) Give **two** possible reasons why the amount of forest has decreased between 1973 and 2010.

1. _____

_____

2. _____

_____

(2)

(b) Scientists are concerned about the effects of a decrease in forest cover on ecosystems.

Give **two** possible negative effects of the decrease in forest cover on ecosystems.

1. _____

_____

2. _____

_____

(2)

(Total 6 marks)

4. Some students wanted to estimate the number of plantain plants in a grassy field.

The field measured 100 metres × 50 metres.

The students:

- chose areas where plantains were growing
- placed 10 quadrats in these areas
- counted the number of plantains in each of the 10 quadrats.

Each quadrat measured 25 cm × 25 cm.

The table below shows the students' results.

Quadrat number	Number of plantain plants
1	2
2	1
3	4
4	1
5	3
6	2
7	4
8	1
9	1
10	1

(a) Complete the following calculation to estimate the number of plantain plants in the field.

Use the students' results from the table above.

Total number of plantains in 10 quadrats = _____

Total area of 10 quadrats = _____ m^2

Mean number of plantains per m^2 = _____

_____

Area of field = _____ m^2

Therefore estimated number of plantains in field = _____

_____

(3)

(b) The students' method would **not** give a valid estimate of the number of plantain plants in the field.

Describe **three** improvements you could make to the students' method.

For each improvement, give the reason why your method would produce more valid results than the students' method.

Improvement 1 _____

Reason _____

_____

Improvement 2 _____

Reason _____

_____

Improvement 3 _____

Reason _____

_____

(3)

(Total 6 marks)

5. (a) Which term describes organisms that can tolerate very hot or very cold places?

Draw a ring around the correct answer.

an environmental species	**an extremophile species**	**an indicator species**

(1)

(b) **Figure 1** shows photographs of an Adelie penguin and a chinstrap penguin. Adelie penguins and chinstrap penguins live in the Antarctic at temperatures below 0 °C.

Figure 1

Adelie penguin

© pilipenkoD/iStock/Thinkstock

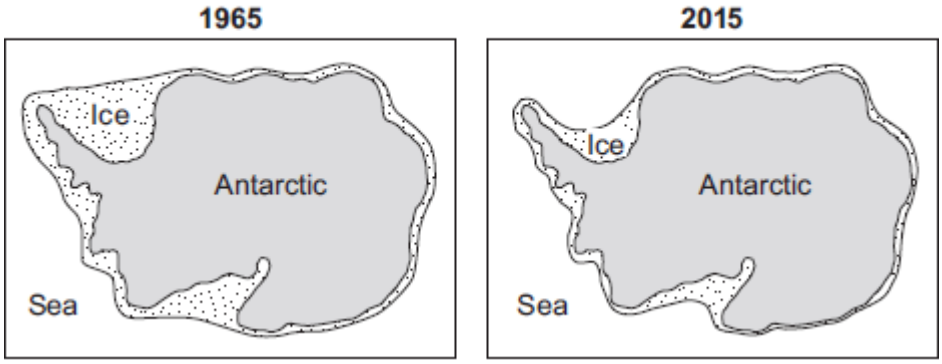
Chinstrap penguin

© Jenny Grayson/iStock/Thinkstock

Adelie penguins spend most of their time on the ice around the Antarctic.
Chinstrap penguins live mainly in the sea around the ice.
Since 1965 the number of Adelie penguins has **decreased** by 6 million.

Figure 2 shows changes to the ice around the Antarctic over the past 50 years.

Figure 2



(i) Use information from **Figure 2** to explain why the number of Adelie penguins has decreased since 1965.

_____

_____

_____

_____

_____

_____

(2)

(ii) Suggest what has happened to the number of chinstrap penguins since 1965.

Draw a ring around your answer. **increase / decrease**

Give a reason for your answer.

_____

_____

(1)

(c) The number of penguins can be used to monitor changes in temperature of the environment.

Temperature readings could also be taken using a thermometer.

What is the advantage of using penguins, instead of a thermometer, to monitor changes in temperature of the environment?

Tick (✓) **one** box.

Living organisms show long-term changes. ☐

Thermometers cannot measure temperatures below 0 °C. ☐

Thermometers do not give accurate readings. ☐

(1)

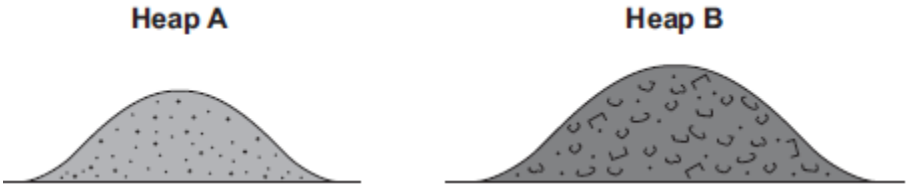
(Total 5 marks)

6. A gardener investigates if turning over the waste in a compost heap makes the waste decay more quickly.

The gardener:

- makes two separate heaps of garden waste, heap **A** and heap **B**
- turns over the material in heap **A** every 2 weeks
- does **not** turn over the material in heap **B**
- estimates the amount of decay in the two heaps after 6 months.

The diagram shows the two heaps of garden waste at the beginning of the investigation.



(a) Suggest **two** factors, other than time, the gardener should control to make the investigation fair.

1. _____

_____

2. _____

_____

(2)

(b) Name **one** type of living thing that causes decay.

_____

(1)

(c) The gardener's results are shown in the table.

Compost heap	Estimated amount of decay
A	A lot
B	Very little

(i) Why does turning over the material in heap **A** make the material decay more quickly?

_____

_____

(1)

(ii) The gardener puts decayed material around his plants to help them grow.

Suggest why the plants in a woodland grow well each year **without** material from compost heaps being added.

_____

_____

_____

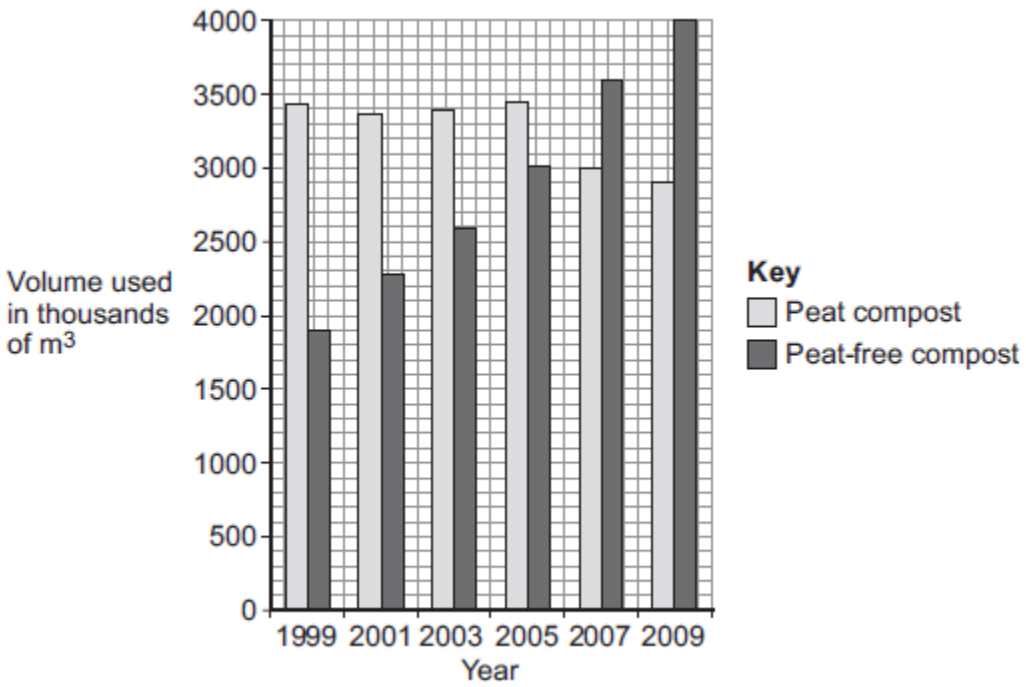
_____

(2)

(Total 6 marks)

7. Human activities have many effects on our ecosystem.

The graph shows the volume of peat compost and peat-free compost used in gardening from 1999 to 2009.



(a) Describe the trends shown in the graph.

_____

_____

_____

_____

_____

(2)

(b) What effect does the destruction of peat bogs have on the gases in the atmosphere?

_____

_____

(1)

(c) Deforestation is also damaging ecosystems.

Describe **one** effect of deforestation on ecosystems.

_____

_____

(1)

(Total 4 marks)

8. In many areas of the world the mass of household waste produced each year is increasing.

(a) Give **two** reasons why the mass of household waste is increasing each year.

1. _____

_____

2. _____

_____

(2)

(b) The table below shows how the mass of household waste in the UK has changed from 2004 to 2012.

Year	Total mass of household waste in thousands of tonnes (including total household recycling)	Total mass of household recycling in thousands of tonnes	Percentage of household waste recycled
2004	25 658	5785	22.5
2006	25 775	7976	30.9
2008	24 334	9398	38.6
2010	23 454	9733	
2012	22 643	9782	43.2

(i) Calculate the percentage of household waste recycled in 2010.

_____

_____

_____

_____

_____ %

(2)

(ii) The UK government has been encouraging a ‘zero waste economy’.

In a ‘zero waste economy’, we reduce, reuse and recycle as much waste as possible.

A newspaper concluded that: **‘The government’s ‘zero waste economy’ has been successful.’**

Use information from the table to describe the reasons for and against the newspaper’s conclusion.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(c) (i) Some waste releases carbon dioxide and methane into the atmosphere.
An increase in carbon dioxide and methane contributes to global warming.

Global warming can cause sea levels to rise.

Describe **two** other possible effects of global warming on our environment.

1. _____

_____

2. _____

_____

(2)

(ii) Storing the carbon dioxide helps to prevent more global warming.
Carbon dioxide can be stored (sequestered) in trees when they photosynthesise.

Give **one** different way in which carbon dioxide is sequestered in our environment.

_____

_____

(1)

(Total 11 marks)

9. The world population is increasing and the need for food is increasing.

Mycoprotein is a high-protein food made in fermenters using the organism *Fusarium*.

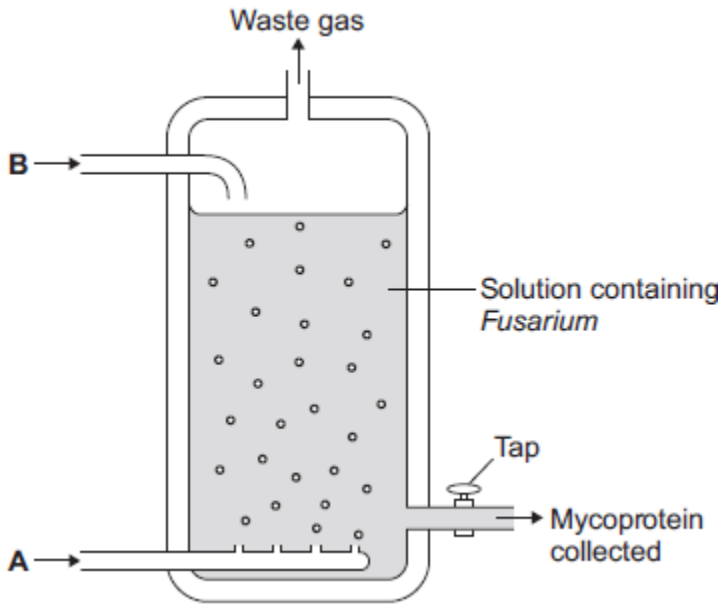
The process takes only a few weeks to produce a large amount of food.

(a) (i) What type of organism is *Fusarium*?

Draw a ring around the correct answer.

bacterium **fungus** **virus**

The diagram below shows a fermenter used in mycoprotein production.



(1)

(ii) *Fusarium* makes mycoprotein. *Fusarium* respires aerobically.

Suggest which gas is added to the fermenter at point **A**.

_____

(1)

(iii) Another substance is added to the fermenter at point **B**. This substance is used in aerobic respiration.

Name this substance.

_____

(1)

(b) People need to eat protein to grow and to be healthy.

Some people think that it would be an advantage to get more food from mycoprotein and less from farming animals.

Suggest **two** possible advantages of getting more food from mycoprotein.

1. _____

_____

2. _____

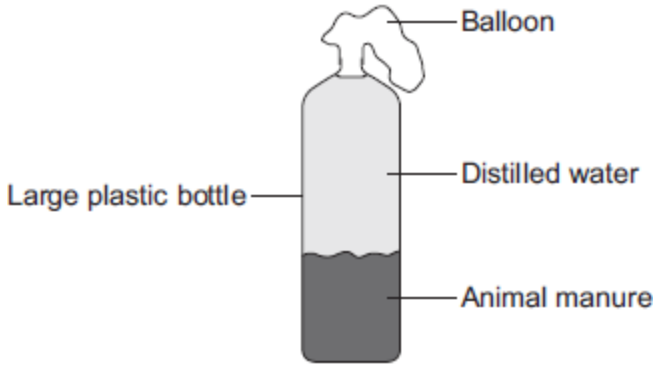
_____

(2)

(Total 5 marks)

10. Some students set up biogas generators to find out which type of animal manure produced the most biogas.

The diagram shows the apparatus they used.



The students:
Step 1: Put some cow manure into the plastic bottle
Step 2: Filled the bottle with distilled water
Step 3: Attached a balloon over the top of the bottle
Step 4: Put the bottle in a warm room for 10 days
Step 5: Measured the diameter of the balloon on day 10
Step 6: Repeated steps 1 to 5 using each type of animal manure.

The students' results are shown in the table.

Type of animal manure	**Diameter of balloon on day 10 in cm**
Cow	29
Horse	26
Sheep	34
Pig	32

(a) What is the main gas found in biogas?

_____

(1)

(b) The students concluded that sheep manure is the best type of manure to use in a biogas generator.

A teacher told the students that the design of their investigation meant that their conclusion might **not** be correct.

Suggest **two** reasons why.

1. _____

_____

2. _____

_____

(2)

(c) Another student suggested that adding potato to the manure would increase the amount of biogas produced.

Why would adding potato increase the amount of biogas produced?

Tick (✓) **one** box.

The potato contains a lot of carbohydrate.	☐
The potato contains a lot of protein.	☐
The potato contains a lot of water.	☐

(1)

(Total 4 marks)

11. (a) Describe **three** ways in which large-scale deforestation in tropical areas has **increased** the concentration of carbon dioxide in the atmosphere.

1. _____

_____

2. _____

_____

3 _____

_____

(3)

(b) Suggest **two** reasons why deforestation also causes a reduction in biodiversity.

_____

_____

_____

_____

(2)

(c) Scientists are thinking of new ways to try to repair the damage done by deforestation.

One way is by carbon sequestration.

(i) What is **carbon sequestration**?

_____

_____

(1)

(ii) Suggest **one** way in which carbon can be sequestered.

_____

_____

(1)

(Total 7 marks)

12. A project called Garden Bird Watch counts the UK populations of common birds. 16 000 people count the number of birds in their gardens every week of the year.

The results are analysed by researchers and written up in important scientific magazines.

(a) Suggest **one** advantage of this method of collecting data.

_____

_____

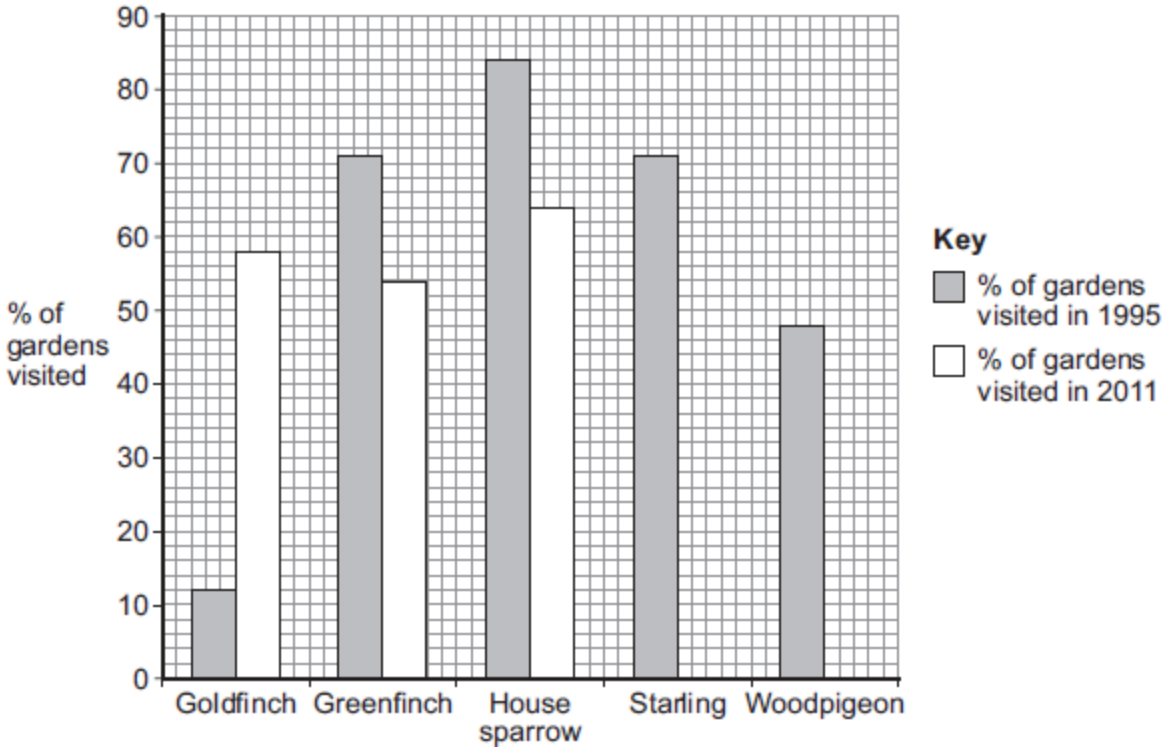
The table below shows the percentage (%) of gardens visited by different bird species in 1995 and in 2011.

Bird species	**% of gardens visited in 1995**	**% of gardens visited in 2011**
Goldfinch	12	58
Greenfinch	71	54
House sparrow	84	64
Starling	71	42
Woodpigeon	48	80

(1)

(b) (i) Complete the bar chart below, by plotting the data from the table above for 2011.

Some have been done for you.



Bird species

(2)

(ii) In this survey, the results from 16 000 gardens were sent in.

How many gardens were visited by woodpigeons in 2011?

_____

(2)

(iii) Which bird species has increased the most from 1995 to 2011?

_____

(1)

(c) The change in the number of woodpigeons may be partly because they have spread to towns and cities.
Suggest why this increase in woodpigeons in towns and cities might have occurred.

_____

_____

(1)

(Total 7 marks)

1. (a) (i) any **two** from:

- not all eaten
  allow eaten by other animals
- used for respiration
  ignore used / lost in heat / movement
- lost as CO_2 / water / urea
- lost as faeces **or** not all digested
  if neither mark awarded allow 1 mark for lost as waste

ignore references to energy losses

do not allow for growth / repair / reproduction

2

(ii) any **one** from:

- thrushes eat other things
- thrush numbers likely to vary (considerably)
  allow it is only an estimate (of population size) ***or*** *only counted thrushes for 5 hours*
- thrushes were not present all the time
- thrushes feed on a much bigger area

1

(b) (i) any **one** from:

- there are two dependent variables
- there is no independent variable
- to show the association / correlation / pattern (between the two variables)

1

(ii) (snails in woodlands)
more have dark(er) colour(ed shells) **or** fewer have light-coloured shells
allow converse for grassland, if clear

1

(shells have) no / fewer stripes or have no stripes
allow converse for grassland, if clear

1

(iii) less likely to be seen (by predators / birds / thrushes)
allow camouflaged (from predators / birds / thrushes)
allow light coloured shells with stripes would be more visible (to predators / birds / thrushes in woodland (than grassland)).

1

[7]

2. (a) 88 000

correct answer = 2 marks

allow 1 mark for 1.1 (in 1 m^2)

or

allow 1 mark for answer = [candidate's value in 1m^2] × 80 000

2

(b) Place the quadrat in 100 random positions.

1

(c) any **three** from:

must include at least one advantage and one disadvantage for full marks

Advantages:

- less cost / free
- less likely to kill other (harmless species of) plants
- weedkiller may be toxic **or** may cause water pollution
- weedkiller may accumulate up food chains

allow uneven distribution of ragwort so much wastage of weedkiller

Disadvantages:

- volunteers may mistake other species for ragwort
- volunteers may miss plants

allow weeds will grow back

- some ragwort left to poison horses
- time consuming
- difficulties getting enough volunteers

if no other disadvantages; allow ref. to issues with volunteers – eg don't turn up / not careful / don't finish the job

3

[6]

3. (a) (i) forest at the edges (of the island) has been removed

allow centrally the forest remains

1

an appropriate area on the island is identified eg south east **or** bottom right

1

(ii) any **two** from:

- (to provide land) for farming / agriculture
- (to provide land) for quarrying
- (to provide land / wood) for building

allow to provide timber

- to provide fuel
- to produce paper

allow forest fires

2

(b) any **two** from:

- decreased biodiversity
- loss of habitats
- increased carbon dioxide (concentration)
- global warming

allow effects of global warming eg flooding / rise in sea level

allow soil erosion

2

[6]

4.

(a) 160 000

if incorrect answer / no answer:

allow max. 2 for method:

1 mark for mean = total number ÷ area of ten quadrats

eg $\frac{20}{0.625}$ *or* $\frac{20 \times 8}{5}$ *or* $\frac{160}{5}$ *or 32*

1 mark for final answer = mean × field area

eg mean × 5000

3

(b) Improvement: place quadrats randomly
and
Reason: avoid bias / (more) representative / (more) reliable

allow 1 mark if 2 correct improvements but no reasons / only incorrect reasons

1

Improvement: more quadrats
and
Reason: overcome random variation / (more) typical / (more) representative / (more) reliable / repeatable

1

Improvement: larger quadrats **or** repeat when plants are bigger
and
Reason: less likely to miss plants

ignore accurate, valid, precise and fair

ignore anomalies

1

[6]

5.

(a) an extremophile species

1

(b) (i) smaller ice area

allow smaller amount of ice

allow less ice

1

(so) less habitat

allow fewer places to live / nest

1

(ii) **either** increase
as more sea to live in
or
as less competition for food

or decrease
as less space (ice) to lay eggs
or
predators more likely to eat them

there is no mark for increase / decrease alone. The mark is for an appropriate reason linked to increase / decrease

if increase / decrease not ringed the mark may be awarded if it is clear in the explanation which is intended

1

(c) Living organisms show long-term changes.

1

[5]

6. (a) any **two** from:

- amount of waste on each heap

  allow size of heap
- (type of) materials on each heap

  *if neither marking points one or two awarded, allow **1** mark for same waste*
- put heaps in same (environmental) conditions.

  e.g. keep at same (outside) temperature

  allow put in same place

2

(b) microorganisms / microbes / bacteria / fungi / decomposers

ignore detritivores / examples (such as worms, maggots, insects)

ignore pathogens / germs

*do **not** allow viruses*

1

(c) (i) oxygen / air added (when turning over)

allow idea that decay will be aerobic

allow bacteria / microorganisms need oxygen / air

allow (microorganisms) respire faster

1

(ii) any **two** from:
- dead leaves / fruit / plants (fall off / onto the ground)
- (fallen dead leaves / fruit / plants) decay
- minerals / ions / nutrients are recycled / released.

ignore references to carbon dioxide

*allow animal waste **or** dead animals*

2

[6]

7. (a) any **two** from:
- (volume of) peat compost has been steady and then declined **or** volume of peat compost has declined since 2005

allow 2007 instead of 2005
- (volume of) peat-free compost has increased (since 1999)
- (volume of) peat is higher than peat-free until 2005, then peat-free compost is higher (than peat)

allow 2007
- total volume of peat and peat-free compost has increased.

2

(b) increases carbon dioxide (in the atmosphere)

ignore methane

1

(c) any **one** from:
- reduces biodiversity
- destruction of habitats
- disruption of food chains.

1

[4]

8. (a) (rapid) growth in population (size)

1

increase in the standard of living

accept description of increased standard of living, eg more packaging, more food thrown away or overbuying resources

1

(b) (i) 41.5

allow 1 mark for 9733 ÷ 23454

or

allow 1 mark for 0.415

or

*allow 1 mark for 41.49 **or** 41 **or** 41.4*

2

(ii) any **four** from

arguments for:

- there has been a reduction in total waste
- there has been an increase in (total mass of) recycling
- there has been an increase in the percentage of waste recycled
- it (may) not be possible to achieve zero waste.

arguments against:

- there is still a lot of waste (not recycled)
- there has only been a small reduction in total waste
- there was one year (2006) where total waste went up
- the rate of increase of percentage recycled is slowing down
- no information on materials reused
- no information on waste from factories / industry

max 3 marks for a one sided argument

allow as reason against if clear

allow still more than half or 56.8% of waste (not recycled).

4

(c) (i) any **two** from:

- reduce biodiversity **or** extinction
- change in migration patterns
- change in species distribution
- change in climate

ignore rise in sea levels

ignore temperature change

accept correct examples of climate change e.g. storms, flooding, drought

references to weather changing is insufficient

allow ice caps melting or habitat destruction.

2

(ii) any **one** from:

- absorbed by oceans / ponds / lakes
- peat bogs

allow used for skeletons / shells of sea creatures

allow in fossil fuels / limestone.

1

[11]

9. (a) (i) fungus

1

(ii) oxygen / O_2

accept air

accept O_2

*do **not** allow O^2 / O / O2*

1

(iii) glucose (syrup)

allow carbohydrate / sugar

ignore food / starch

allow oxygen if oxygen / air not given in (a)(ii)

1

(b) any **two** from:

- quick er
- suitable for vegetarians
- cheap er
- more efficient **or** less land / methane

ignore high in protein

ignore sustainability unqualified

ignore less pollution unqualified

allow less animals harmed / killed

*allow food chain is shorter **or** has less trophic levels*

allow less energy lost (from the food chain)

*do **not** allow no energy lost*

allow low(er) in calories (than some meat)

allow low(er) in fat / healthier (than some meat)

allow source of fibre / prevent constipation

2

[5]

10. (a) methane / CH_4

allow CH_4

*do **not** allow CH^4 **or** ch4 or CH4*

1

(b) any **two** from:

- didn't carry out repeats
- only tested four types of manure
- don't know the mass of manure was the same each time
- inaccuracies in measuring (diameter of) balloon
- bottles might have been different sizes
- temperature of the room may have been different.

2

(c) The potato contains a lot of carbohydrate

1

[4]

11. (a) decrease in photosynthesis (as fewer trees) causes less removal of CO_2

accept forest cleared for livestock which respire and give out CO_2

ignore 'Carbon sink'

1

burning / combustion releases CO_2

1

decay of wood (by microorganisms) releases CO_2

1

(b) any **two** from:

- loss of habitat / shelter
- loss of food source
- smaller populations more vulnerable / less likely to survive
- fewer plant species due to clearing

2

(c) (i) removing carbon dioxide from the air

1

(ii) any **one** from:

- growth of plants (to trap CO_2 in photosynthesis)

  allow afforestation
- CCS (carbon capture and storage)
- separate / store CO_2 from waste gases in industry
- make new peat bogs
- absorbed / dissolved in oceans / lakes / ponds
- used as calcium carbonate to form shells / bones

1

[7]

12. (a) any **one** from:

- get lots of data

  accept more reliable / reproducible

  do not accept more accurate
- cheap / free
- unlikely to be biased
- can cover a wide area at the same time / takes less time
- see seasonal variations

1

(b) (i) correct bar heights

1 *mark for each correct bar*

ignore width of bars

2

(ii) 12 800

(16000 / 100)x80 on its own for ***1*** *mark*

2

(iii) goldfinch

1

(c) any **one** from:

- more food available

  accept fewer predators
- people feed them

  accept less habitat / food in countryside
- more rubbish / waste to eat

1

[7]