Ecology part 8 AQA Triple Biology

Name: _____

Class: _____

Date: _____

Time: **115 minutes**

Marks: **108 marks**

Comments:

1. The theory of evolution states that organisms alive today evolved by natural selection from other species that are now extinct.

(a) Which **two** scientists proposed the theory of evolution by natural selection?

Tick (✓) **two** boxes.

Alexander Fleming	☐
Alfred Russel Wallace	☐
Carl Linnaeus	☐
Carl Woese	☐
Charles Darwin	☐

(2)

Fossils provide evidence for evolution.

The figure below shows a fossil footprint of a dinosaur.

(b) What is a fossil?

_____

_____

_____

_____

(2)

(c) How was the fossil in the figure above formed?

Tick (✓) **one** box.

Body parts were replaced by minerals. ☐

The animal walked on mud. ☐

The animal was frozen in ice. ☐

(1)

(d) Dinosaurs are extinct.

Give **two** causes of extinction.

1 _____

_____

2 _____

_____

(2)

(e) Which **two** of the following provide evidence for evolution?

Tick (✓) **two** boxes.

Bacteria can become resistant to an antibiotic. ☐

Early forms of life lived in the ocean. ☐

Older fossils are simpler than more recent ones. ☐

Older layers of rock are closer to the surface. ☐

(2)

(Total 9 marks)

2. All living organisms respire.

(a) What is the chemical equation for aerobic respiration?

Tick (✓) **one** box.

$6\ O_2 + 6\ CO_2 \rightarrow 6\ H_2O + C_6H_{12}O_6$ ☐

$6\ H_2O + C_6H_{12}O_6 \rightarrow 6\ H_2O + 6\ CO_2$ ☐

$6\ H_2O + 6\ CO_2 \rightarrow 6\ O_2 + C_6H_{12}O_6$ ☐

$6\ O_2 + C_6H_{12}O_6 \rightarrow 6\ H_2O + 6\ CO_2$ ☐

(1)

(b) Name the sub-cellular structures where aerobic respiration takes place.

_____

(1)

(c) Energy is released in respiration.

Give **two** uses of the energy released in respiration.

1 _____

_____

2 _____

_____

(2)

(d) Describe **two** differences between aerobic and anaerobic respiration in humans.

Do **not** refer to oxygen in your answer.

1 _____

_____

2 _____

_____

(2)

(e) What are the **two** products of anaerobic respiration in plant cells?

Tick (✓) **two** boxes.

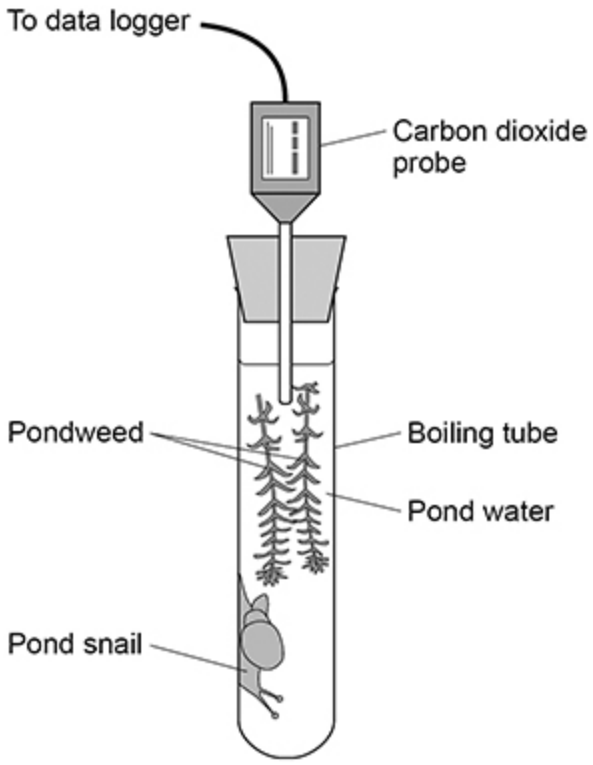
Carbon dioxide	☐
Ethanol	☐
Glucose	☐
Lactic acid	☐
Water	☐

(2)

A scientist investigated respiration and photosynthesis using some pondweed and a pond snail.

Figure 1 shows the apparatus used.

Figure 1



The apparatus was left in a well-lit room for 5 days.

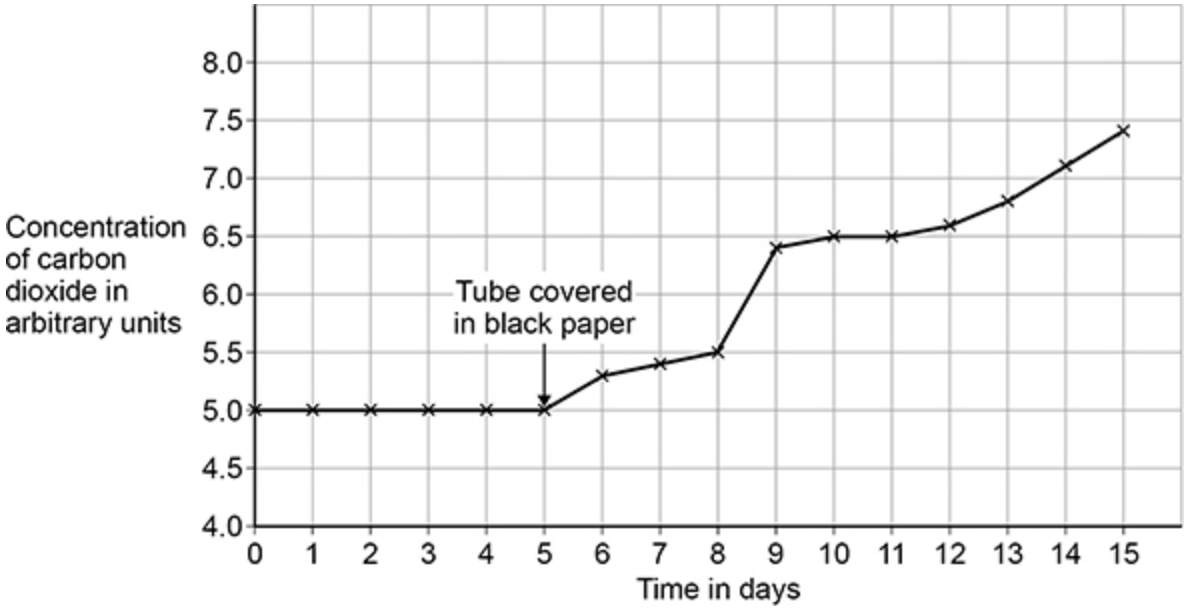
The data logger recorded the concentration of carbon dioxide continuously.

After 5 days, the scientist completely covered the boiling tube with black paper.

The data logger continued to record the concentration of carbon dioxide.

Figure 2 shows the concentration of carbon dioxide inside the boiling tube over 15 days.

Figure 2



(f) Explain why the concentration of carbon dioxide in the tube stayed the same between day 0 and day 5.

_____

_____

_____

_____

(2)

(g) Suggest why the concentration of carbon dioxide increased between day 5 and day 10.

_____

_____

_____

_____

(1)

(h) On day 10, the pond snail died.

Explain why the death of the pond snail caused the concentration of carbon dioxide to increase after day 10.

_____

_____

_____

_____

_____

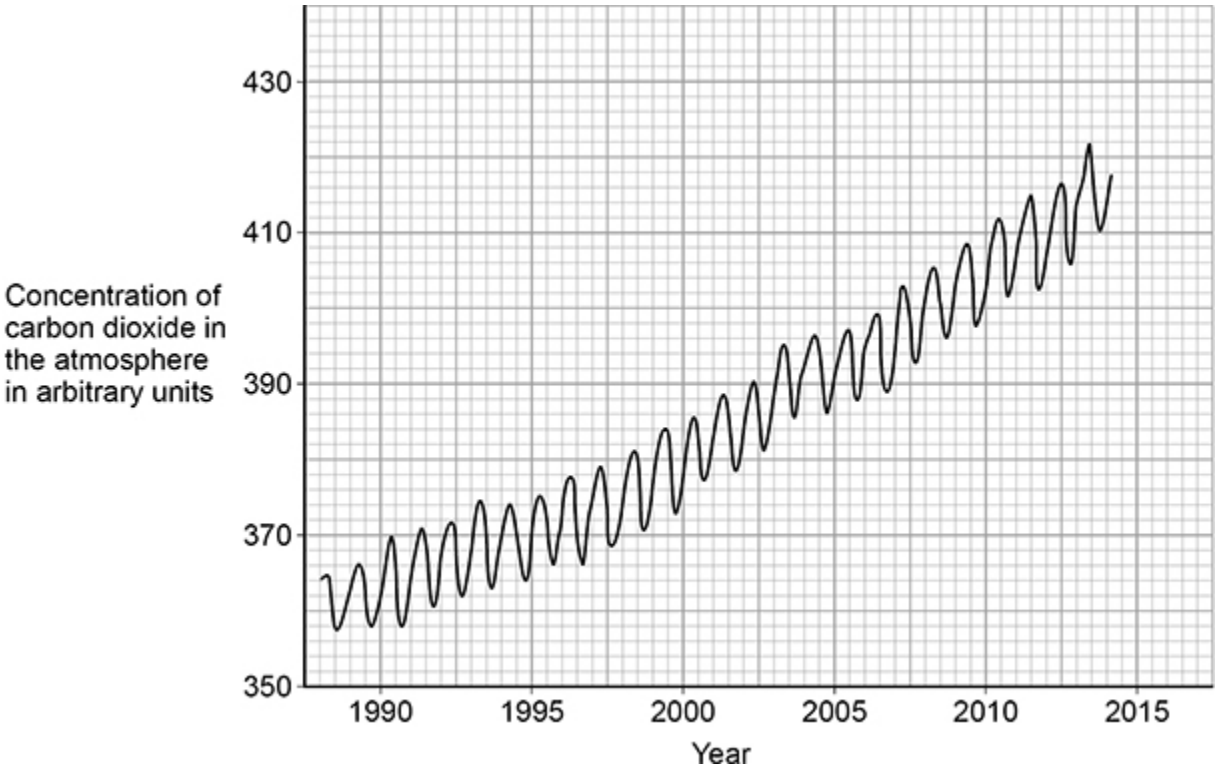
_____

(3)

(Total 14 marks)

3. Scientists are very concerned about the changes in concentration of carbon dioxide in the Earth's atmosphere.

The graph below shows the concentration of carbon dioxide in the atmosphere between 1988 and 2014.



(a) Describe **two** patterns shown in the graph above.

Use data from the graph above in your answer.

1 _____

_____

_____

_____

2 _____

_____

_____

_____

(4)

(b) Give **two** human activities that affect the concentration of carbon dioxide in the atmosphere.

1 _____

_____

2 _____

_____

(2)

(c) The trend shown in the graph above may continue for many years.

Explain what effect the changing concentration of carbon dioxide in the atmosphere could have on living organisms.

(4)

(Total 10 marks)

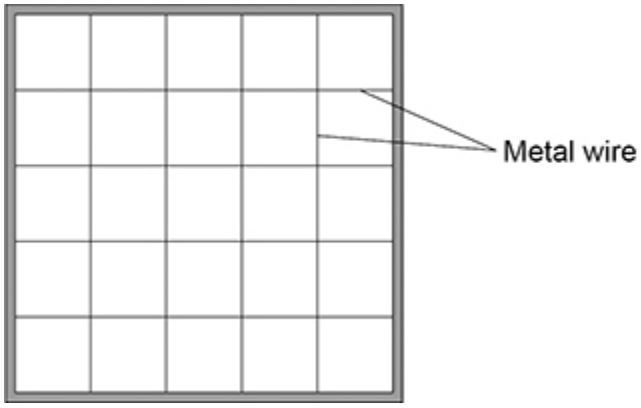
4. A student estimated the percentage cover of buttercup plants in a field.

The student used a quadrat.

The quadrat was divided into 25 equal squares.

Figure 1 shows the quadrat.

Figure 1



This is the method used.

1. Place the quadrat on the ground.
2. Record how many squares in the quadrat contain buttercup plants.
3. Place the quadrat in a new position in the field.
4. Record how many squares in the quadrat contain buttercup plants.
5. Repeat steps 3 and 4 another three times.

(a) What method should the student have used for placing the quadrat?

Tick (✓) **one** box.

Place the quadrat where there are many buttercup plants.	☐
Place the quadrat only where there are no trees.	☐
Place the quadrat using random coordinates.	☐
Use the same person to place all the quadrats.	☐

(1)

The student calculated the percentage cover of buttercup plants for each quadrat.

The table below shows the student's results.

Quadrat number	**Number of squares containing buttercup plants**	**Percentage cover of buttercup plants**
1	10	40
2	13	52
3	22	88
4	20	80
5	10	40
	Mean	**X**

(b) Calculate mean value **X** in the table above.

_____

_____

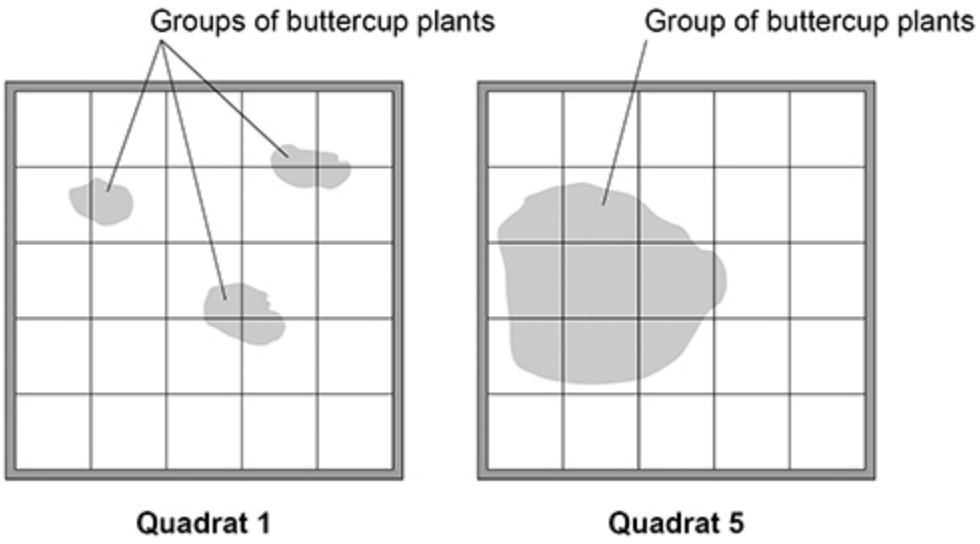
X = _____ %

(2)

The table above shows that quadrat **1** and quadrat **5** each had 40% cover of buttercup plants.

Figure 2 shows the results for quadrat **1** and quadrat **5**.

Figure 2



(c) The student's method of estimating the percentage cover of buttercup plants is **not** accurate.

How does **Figure 2** show this?

Tick (✓) **one** box.

Quadrat 1 has more groups of buttercup plants. ☐

The area of buttercup plants in quadrat 5 is much larger. ☐

The buttercup plants are in ten squares in both quadrats. ☐

(1)

(d) The student wanted to get a more valid estimate of the percentage cover of buttercup plants in the field.

Suggest **two** improvements to the method to make the results more valid.

1 _____

_____

2 _____

_____

(2)

(e) Give **three** environmental factors that would affect the growth of buttercup plants in a field.

1 _____

2 _____

3 _____

(3)

(Total 9 marks)

5. Potato blight is a disease of potato plants.

Potato blight is caused by the fungus *Phytophthora infestans.*

(a) What is the genus of the fungus that causes potato blight?

Tick (✓) **one** box.

Infestans	☐
Phytophthora	☐
Phytophthora infestans	☐

(1)

(b) The fungus grows near the surface of the potato.

How does growing near the surface help the fungus to respire?

Tick (✓) **one** box.

The fungus can get nitrogen from the soil. ☐

The fungus can get oxygen from the air. ☐

The fungus can get water from the potato. ☐

(1)

A farmer sprays his potato plants with a pesticide.

The pesticide kills the fungus that causes potato blight.

Spraying the crop with a pesticide could decrease biodiversity in a river flowing through his farm.

(c) What does 'biodiversity in a river' mean?

Tick (✓) **one** box.

The variety of species of animals in the river. ☐

The variety of species of organisms in the river. ☐

The variety of species of plants in the river. ☐

(1)

(d) The farmer sprayed pesticide on his potato plants. The next day it rained heavily.

Explain why the biodiversity in the river decreased.

_____

_____

_____

_____

(2)

Another method of preventing potato blight is to breed potatoes that are resistant to blight.

Resistance to potato blight is controlled by two alleles:

R = a dominant allele for having resistance to blight.
r = a recessive allele for **not** having resistance to blight.

A scientist crosses two potato plants. Each plant has the genotype **Rr**.

(e) Complete the diagram below to show the possible genotypes of the offspring produced.

		Male gametes	
		R	**r**
Female gametes	**R**	**RR**	
	r		

(2)

(f) Draw a ring around **one** of the homozygous genotypes in the diagram above.

(1)

(g) What percentage of the offspring in the diagram will be resistant to potato blight?

Tick (✓) **one** box.

25% ☐ 50% ☐ 75% ☐ 100% ☐

(1)

(h) Potatoes can also reproduce asexually.

Potatoes from one plant can be planted in the ground to produce new potato plants.

All the new plants from a parent plant that is resistant to blight will also be resistant to blight.

Explain why.

_____

_____

_____

_____

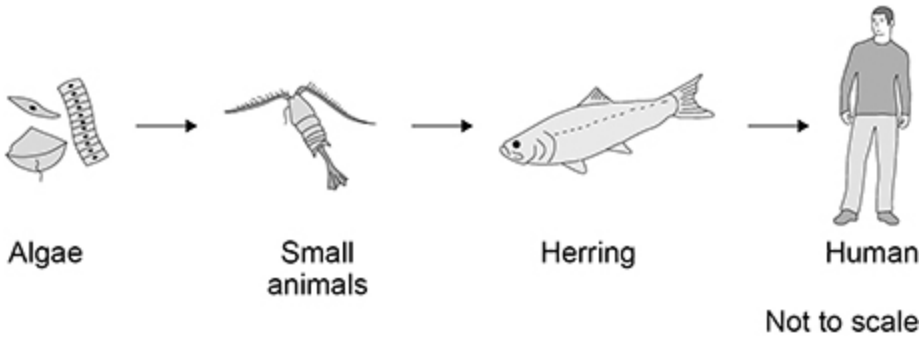
(2)

(Total 11 marks)

6. People eat fish caught in the North Sea.

Figure 1 shows a food chain.

Figure 1



(a) The algae make glucose by photosynthesis.

Which **two** substances do the algae need for photosynthesis?

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Nitrogen ☐
- Oxygen ☐
- Starch ☐
- Water ☐

(2)

(b) What is the source of energy for photosynthesis?

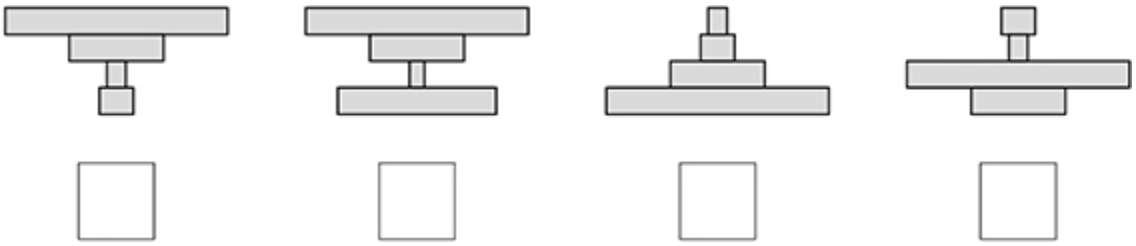
Tick (✓) **one** box.

- Light ☐
- Mineral ions ☐
- Protein ☐
- Water ☐

(1)

(c) Which pyramid of biomass is correct for the food chain shown in **Figure 2**?

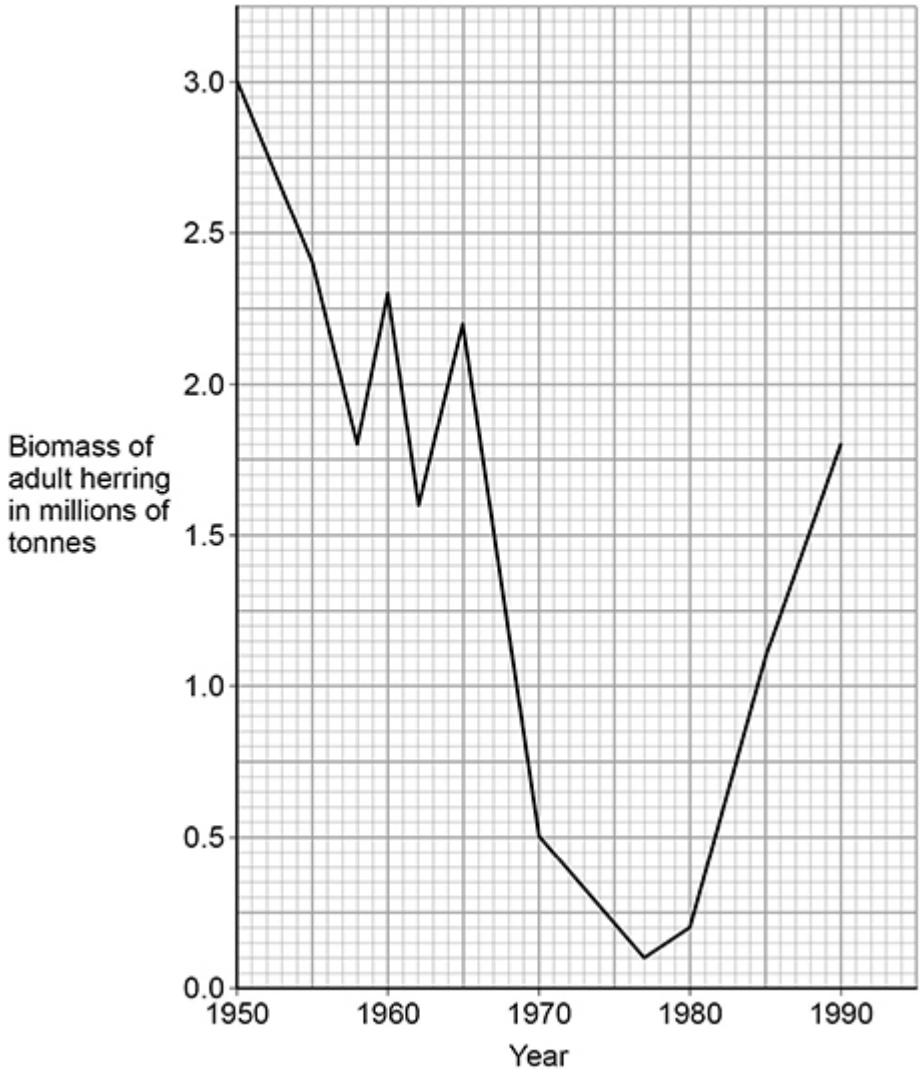
Tick (✓) **one** box.



(1)

Figure 2 shows the biomass of adult herring in the North Sea between 1950 and 1990.

Figure 2



(d) Too many herring were caught in the 1960s.

Calculate the percentage decrease in the biomass of adult herring between 1960 and 1970.

Use the equation:

$$\text{percentage decrease} = \frac{(\text{biomass in 1960} - \text{biomass in 1970})}{\text{biomass in 1960}} \times 100$$

Give your answer to the nearest whole number.

Percentage decrease = _____ %

(4)

From 1977, laws were introduced to help conserve herring.

(e) Describe the change in biomass of adult herring from 1977 to 1990.

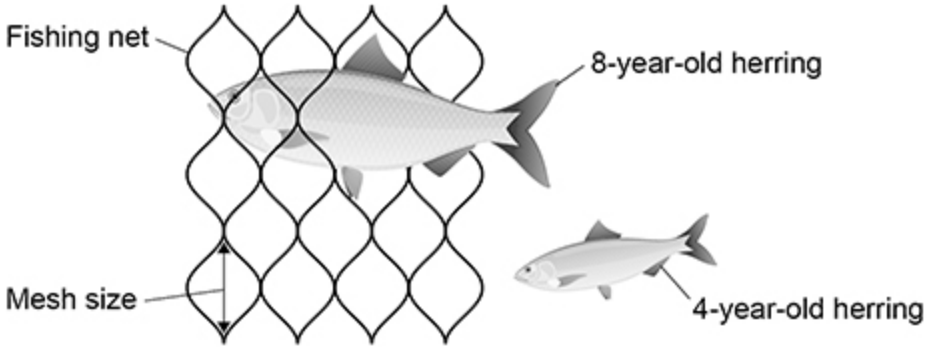
Use data from **Figure 2** in your answer.

(2)

(f) One of the laws was to control mesh size of fishing nets.

Figure 3 shows a fishing net with a legal mesh size.

Figure 3



Herring can live for up to 12 years.

Herring start to reproduce when they are 3 to 4 years old.

Explain how the control of mesh size of fishing nets has helped to conserve stocks of herring.

_____

_____

_____

_____

(2)

(Total 12 marks)

7. The Galapagos Islands are located in the Pacific Ocean.

Several species of birds called finches live on the Galapagos Islands.

These finches are very similar to each other.

Figure 1 shows two modern species of Galapagos finch and their classification.

Figure 1

Medium ground finch **Small ground finch**

Classification group	**Medium ground finch**	**Small ground finch**
Kingdom	*Animalia*	*Animalia*
	Chordata	*Chordata*
Class	*Aves*	*Aves*
	Passeriformes	*Passeriformes*
	Thraupidae	*Thraupidae*
Genus	*Geospiza*	*Geospiza*
	fortis	*fuliginosa*

(a) Complete **Figure 1** to give the names of the missing classification groups.

(2)

(b) Give the binomial name of the medium ground finch.

Use information from **Figure 1**.

_____

(1)

In each species of finch, there is a variation in beak depth.

Figure 2 shows how beak depth is measured.

Figure 2

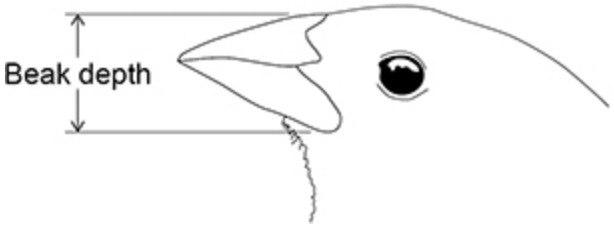
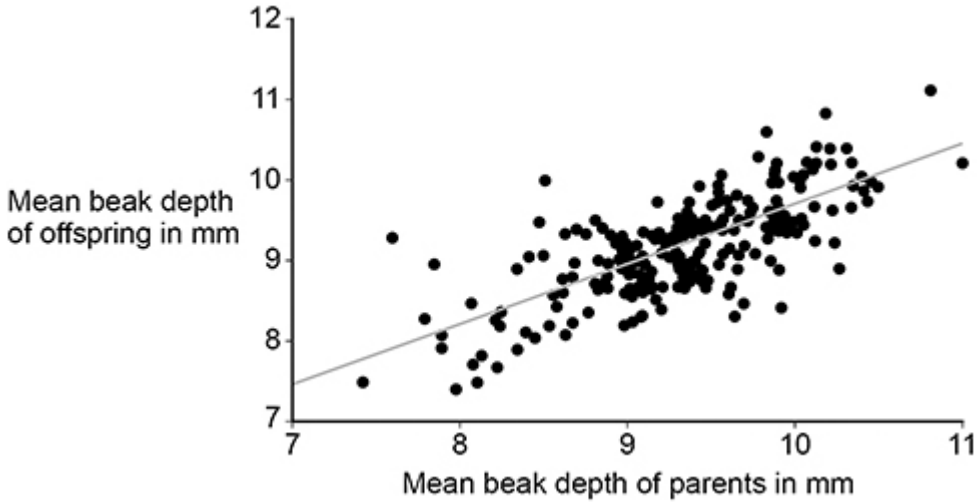


Figure 3 shows the relationship between the beak depth of parent birds and the beak depth of their offspring.

Figure 3



(c) Give evidence from **Figure 3** that beak depth is an inherited characteristic.

_____

_____

(1)

(d) Scientists suggested that more than one gene controls beak depth.

Give evidence from **Figure 3** to support the scientists' suggestion.

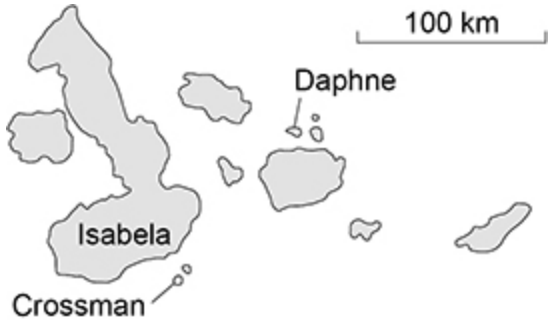
_____

_____

(1)

Figure 4 is a map of the Galapagos Islands.

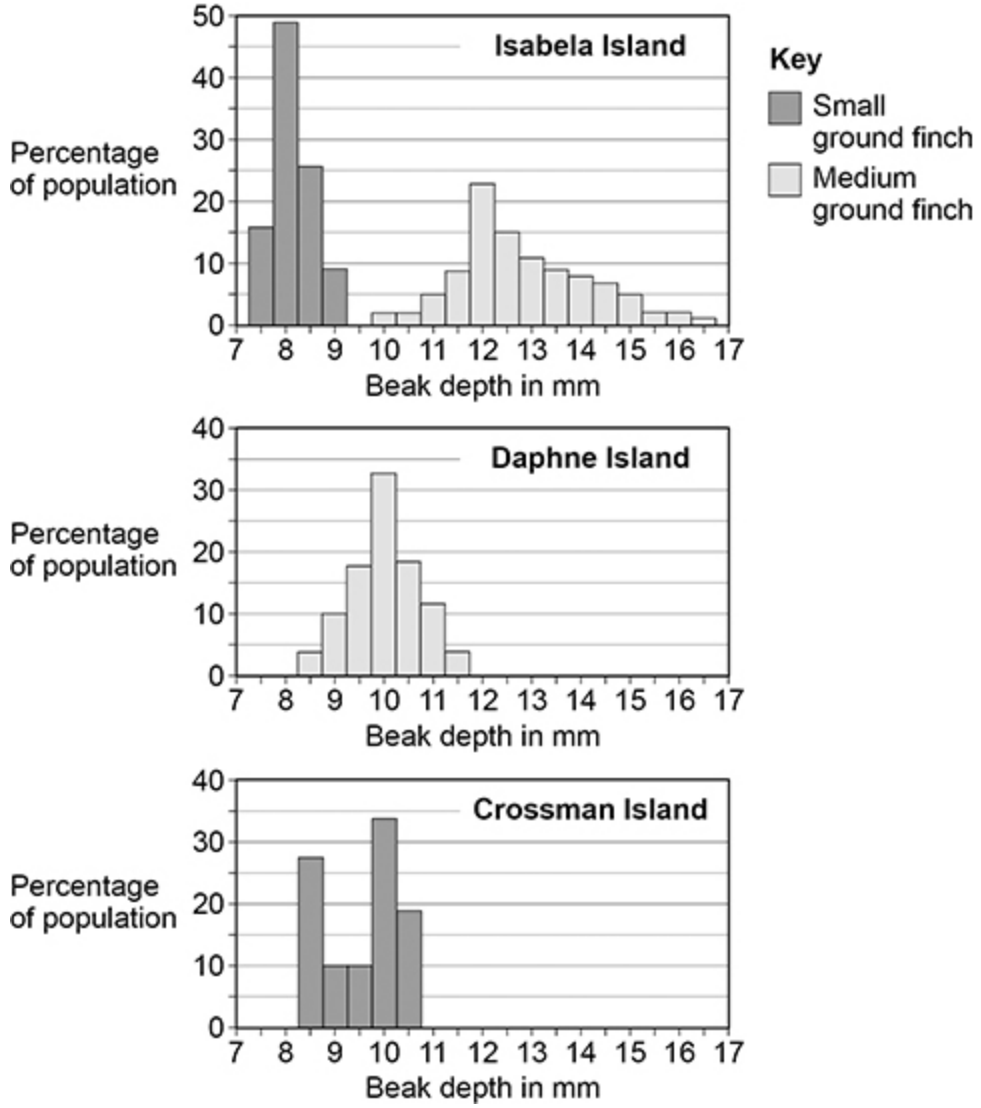
Figure 4



On Isabela Island, the medium ground finch **and** the small ground finch are found.
On Daphne Island, only the medium ground finch is found.
On Crossman Island, only the small ground finch is found.

Figure 5 shows how the beak depth of each species varies on each island.

Figure 5



The medium ground finch and the small ground finch both feed on seeds.

The size of seeds eaten by each bird depends on the depth of the bird's beak.

(e) The range of beak depth of **medium ground finches** on Isabela Island is different from the range on Daphne Island.

Explain what might have caused this difference.

(6)

(f) **Figure 5** shows:

- the **two** species of finch live on Isabela Island
- only **one** of the species lives on Daphne Island
- only **one** of the species lives on Crossman Island.

Suggest why both species of finch are able to live on Isabela Island.

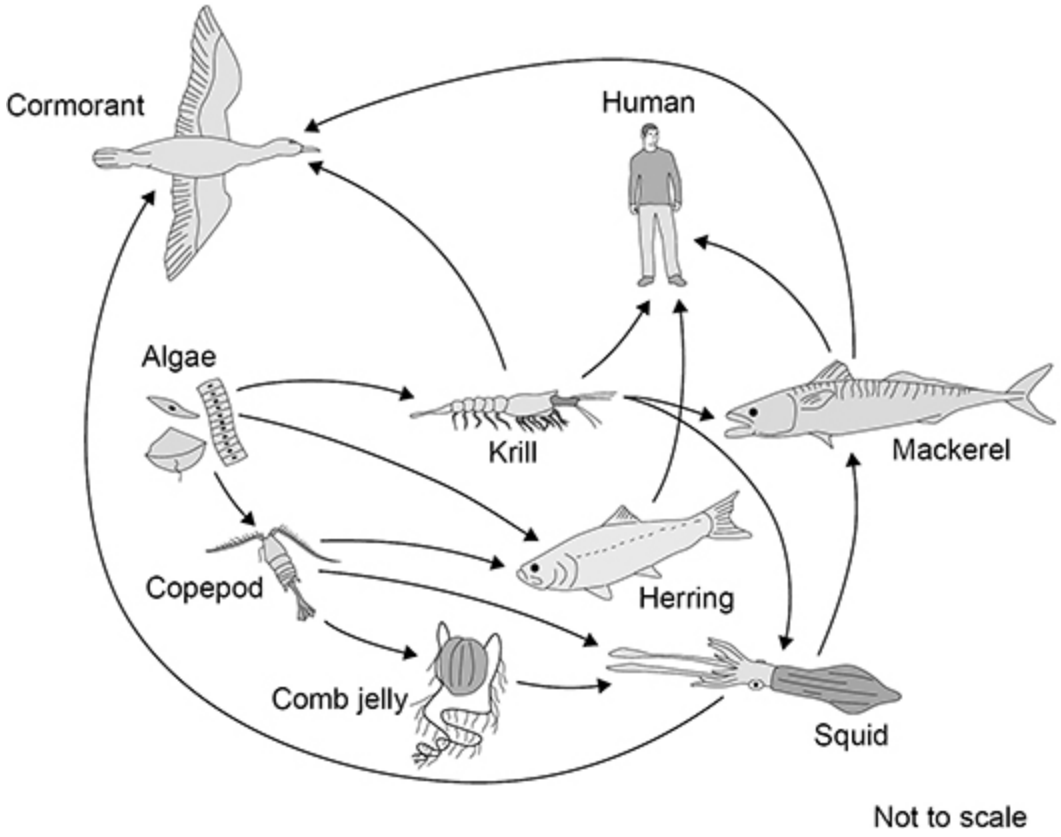
(2)

(Total 13 marks)

8. A food web contains several food chains.

Figure 1 shows a food web.

Figure 1



(a) The animals in **Figure 1** get their energy by eating other organisms.

Describe how the algae get energy.

_____

_____

_____

_____

(2)

(b) Name **one** primary consumer in **Figure 1**.

_____

(1)

(c) Name **one** producer in **Figure 1**.

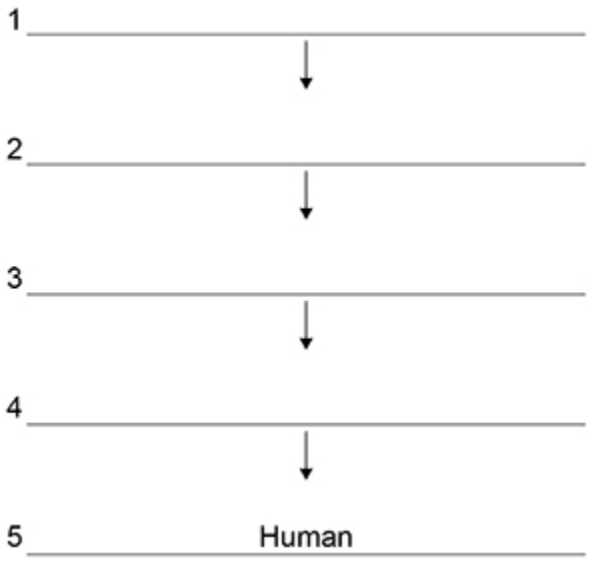
_____

(1)

(d) The different food chains in **Figure 1** have different numbers of organisms.

Complete **Figure 2** to show a food chain in **Figure 1** with **five** organisms, including the human.

Figure 2



(1)

(e) **Figure 1** shows that mackerel eat krill and squid.

The biomass of mackerel is much less than the combined biomass of krill and squid.

One reason for this is that the mackerel cannot digest all parts of the krill and squid.

Give **two** other reasons.

1 _____

_____

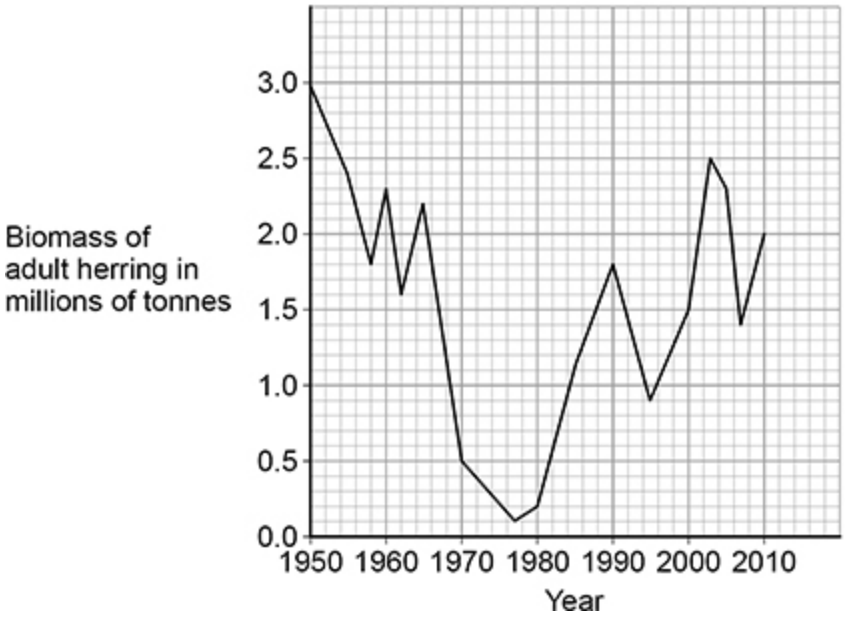
2 _____

_____

(2)

Figure 3 shows how the biomass of adult herring in the North Sea has changed between 1950 and 2010.

Figure 3



(f) Calculate the percentage decrease in the biomass of herring between 1960 and 1977.

Give your answer to the nearest whole number.

Percentage decrease = _____ %

(4)

(g) Too many herring were caught by fishermen between 1960 and 1977.

Herring can live for up to 12 years and begin to reproduce when 3 to 4 years old.

Laws have been introduced to help conserve herring:

- 1977 to 1981 – herring fishing was banned in the North Sea
- 1984 to present day – control of mesh size of fishing nets
- 1997 to present day – fishing quotas were introduced
- 1998 to present day – herring fishing was banned in breeding grounds during the breeding season.

Figure 4 shows how a minimum mesh size helps to conserve herring.

Figure 4

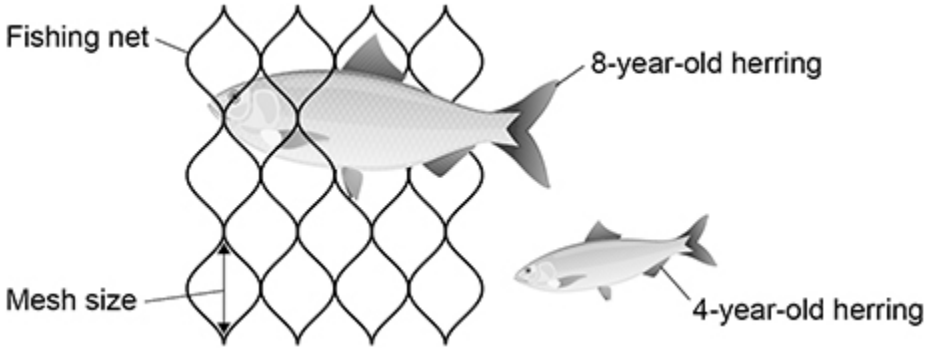
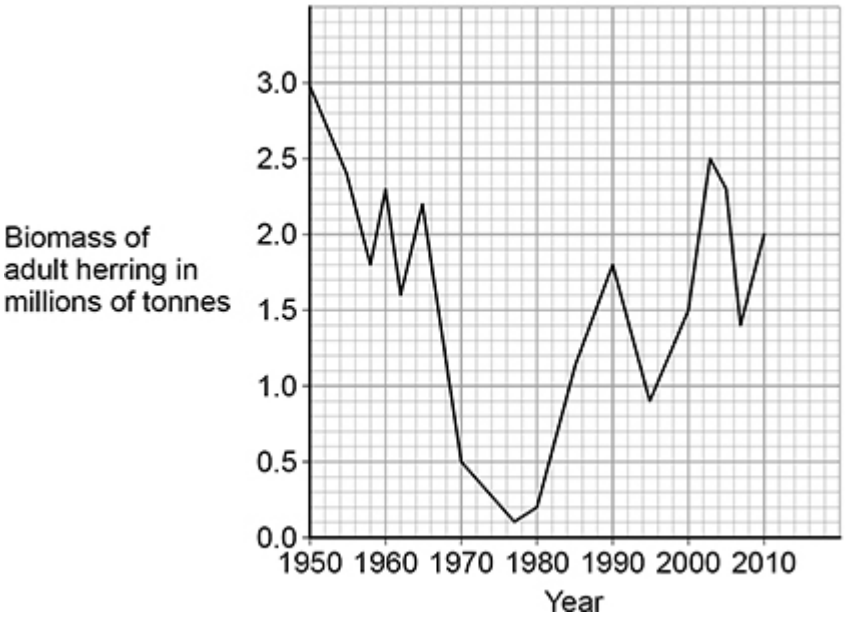


Figure 3 is repeated below.

Figure 3



Evaluate the effect of these laws on the conservation of herring stocks.

Use data from **Figure 3** and information from **Figure 4** in your answer.

(6)

(Total 17 marks)

9. The growth of daisy plants on a lawn is affected by biotic factors and by abiotic factors.

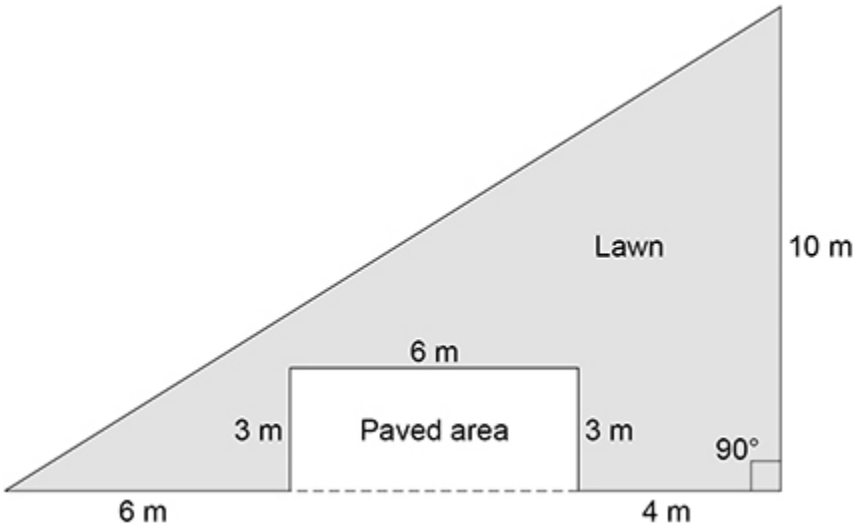
(a) The table below shows six factors.

Tick (✓) **one** box in each row to show whether the factor is biotic or abiotic.

Factor	Biotic	Abiotic
Nitrates in the soil		
Rabbits eating the plants		
Shading by a building		
Soil pH		
Temperature		
Trampling by people		

(3)

The figure below shows a plan of a garden.



A student estimates the number of daisy plants growing on the lawn.

The student places a quadrat at 10 different positions on the lawn.

The quadrat measures 50 cm × 50 cm.

The student counts the number of daisy plants in each quadrat.

(b) How should the student decide where to place the quadrat?

Give the reason for your answer.

_____

_____

_____

_____

(2)

(c) The mean number of daisy plants in each quadrat is 6.

Calculate the number of daisy plants on the lawn.

Give your answer to 3 significant figures.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Number of daisy plants on the lawn = _____

(6)

(d) Using the mean from this investigation to calculate the number of daisy plants on the lawn may **not** be accurate.

Give **two** reasons why.

1 _____

_____

2 _____

_____

(2)

(Total 13 marks)

1. (a) Alfred Russel Wallace

1

Charles Darwin

1

(b) remains of an organism

allow remains of an animal / plant

1

from a long time ago

allow from thousands / millions of years ago

1

(c) the animal walked on mud

1

(d) any **two** from:

- flooding
- drought
- ice age
- global warming

if none of these, allow

*climate change for **1** mark*

ignore weather

- volcanic activity
- asteroid collision

if neither of these, allow

catastrophic event

***or** natural disaster for **1** mark*

- (new) predators
- (new) disease / pathogen
- competition for food
- competition for mates

allow hunters / poachers

allow named example

allow lack of food

allow lack of mates

ignore competition unqualified

ignore environment change

- lack of habitat **or** habitat change

ignore isolation

ignore pollution

2

(e) bacteria can become resistant to an antibiotic

1

older fossils are simpler than more recent ones

1

[9]

2. (a) $6O_2 + C_6H_{12}O_6 \rightarrow 6H_2O + 6CO_2$

1

(b) mitochondria / mitochondrion

1

(c) any **two** from:

- movement / muscle contraction
- keeping warm
- active transport
- building larger molecules

ignore reference to metabolism unqualified

allow examples of movement

allow examples of building larger molecules e.g. making (named) proteins / cellulose

allow cell division

ignore growth

2

(d) any **two** from:

- anaerobic produces lactic acid **and** aerobic does not

*allow anaerobic creates an oxygen debt **and** aerobic does not*

- aerobic produces carbon dioxide **and** anaerobic does not
- aerobic produces water **and** anaerobic does not
- aerobic occurs (mainly) in the mitochondria **and** anaerobic does not

*allow anaerobic **only** occurs in the cytoplasm*

- anaerobic releases less energy than aerobic

allow anaerobic releases less ATP (than anaerobic)

*do **not** accept anaerobic produces / makes / creates less energy*

2

(e) carbon dioxide

1

ethanol

1

(f) pondweed takes in CO_2 for photosynthesis

1

snail **and** pondweed are respiring producing CO_2

*if no other mark awarded allow rate of respiration = rate of photosynthesis for **1** mark*

1

(g) (no light so) no photosynthesis
or
plant is not taking in CO_2

and

snail **and** plant are respiring and so are releasing CO_2

1

(h) snail is being decayed / decomposed / broken down

ignore being fed on

1

(by) decomposers / bacteria (in pond water / snail)

allow fungi / microbes / microorganisms

1

(therefore) respiration (of decomposers / bacteria) releases CO_2

*do **not** accept anaerobic respiration*

1

[14]

3. (a) (overall) increase (in concentration of CO_2)

1

(overall increase) by 54 (arbitrary units)

allow in range 45 to 65 (arbitrary units)

or

from 364 to 418 (arbitrary units)

allow from 357 to 422 (arbitrary units)

allow other correct data

1

peaks and troughs

allow description

1

each cycle is 1 year

or

variation per cycle is 8 to 16 (arbitrary units)

allow multiples such as 5 cycles every 5 years

allow answer in range 8 to 16 (arbitrary units)

1

(b) combustion

allow a named example such as burning (named) fuels

***or** driving cars*

***or** power stations*

ignore factories unqualified

1

deforestation

allow a description

*allow human activities that decrease carbon dioxide concentration such as tree-planting **or** growing crops*

*if no other mark awarded allow respiration for **1** mark*

1

(c) **Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- (higher CO_2 concentration causes) global warming
- plants photosynthesise faster
  - due to more CO_2
  - due to higher temperature
- temperature rise causes changes in rainfall patterns **or** extreme weather conditions such as storms
- less rainfall causes desertification
  - many plant species die out
  - many animal species lack food and die
  - other (drought-adapted) plants become more common
- more rainfall causes flooding
  - loss of habitat
  - may lead to extinction
- temperature rise melts (polar) ice caps **or** glaciers
  - causes flooding
  - loss of habitat
  - may lead to extinction
- changes in animal / bird migration patterns / times **or** changes in distribution of animals

[10]

4.

(a) place the quadrat using random coordinates

1

(b) $\frac{40 + 52 + 88 + 80 + 40}{5}$

or $\frac{300}{5}$

1

60

1

(c) the area of buttercup plants in quadrat 5 is much larger

1

(d) any **two** from:

- place (many) more quadrats
  allow repeat
  allow combine results with results of other students
- divide quadrats into more / smaller squares
- estimate actual percentage cover in quadrat (instead of counting squares)
- only count squares with at least 50% cover
  allow use a point quadrat
  ignore place quadrats randomly

2

(e) any **three** from:

- light
- water

  allow rain / moisture
- minerals / ions / salts

  allow named example such as nitrate / phosphate

  allow fertiliser

- pH
- temperature
- herbivores

  allow named example
- trampling / cultivation
- pathogens / disease
- use of weedkiller

  allow wind

  allow oxygen / air in the soil

  ignore carbon dioxide

  ignore weather

3

[9]

5. (a) *Phytophthora*

1

(b) the fungus can get oxygen from the air

1

(c) the variety of species of organisms in the river

1

(d) pesticide washed into river

allow spray drift

allow reference to run-off

allow carried by rainfall

1

pesticide kills (some) organisms / plants / animals in river

1

(e)

	R	r
R	RR	**Rr**
r	**Rr**	**rr**

*all 3 correct = **2** marks*

*2 correct = **1** mark*

*0 or 1 correct = **0** marks*

2

(f) ring drawn around **RR** / **rr** in the diagram

*allow around both **RR** and **rr***

1

(g) 75%

percentage must match student's answer in the diagram

*allow 75% if no answer to question **(e)***

1

(h) no fusion of gametes

or

(asexual reproduction involves) mitosis

allow no fertilisation

1

(so) offspring are genetically identical (to parent plant)

allow offspring are a clone

allow offspring have same DNA

allow no mixing of genes / DNA

allow no mixing of genetic material

*allow all offspring inherit **R***

1

[11]

6. (a) carbon dioxide

1

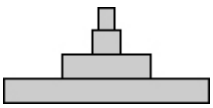
water

1

(b) light

1

(c)



1

(d) 2.3 **and** 0.5

allow figures in millions

allow in range 2.25 to 2.3 for 2.3

allow in range 0.5 to 0.55 for 0.5

1

$\frac{(2.3 - 0.5)}{2.3} \times 100$ **or** $\frac{1.8}{2.3} \times 100$

allow correct substitution of student's incorrect graph readings

1

78.2(6087....)

allow correct answer from student's substitution of incorrect graph readings ignore incorrect rounding

1

78

allow correct rounding of calculated value

1

(e) increase (in biomass of herring)

1

from 0.1 to 1.8 (million tonnes)
or
change of 1.7 (million tonnes)
or
change of 1700%

allow a tolerance of ± ½ small square for graph readings

1

(f) smaller / 4-yr-old fish not caught

allow younger fish not caught

allow (only) older fish caught

1

(so) escaping fish can reproduce

allow so younger fish can survive to reproduce

1

[12]

7. (a)

Classification group
Kingdom
Phylum
Class
Order
Family
Genus
Species

*all 4 correct = **2** marks*

*2 or 3 correct = **1** mark*

*0 or 1 correct = **0** marks*

2

(b) Geospiza fortis

ignore underlining or attempted italics or upper and lower case letters

1

(c) offspring have similar beak depths to parents

ignore same beak depths

ignore positive correlation / described

1

(d) parents of a given beak depth produce offspring with several beak depths

allow spread of results for a given parental beak depth about line of best fit

allow range of phenotypes for a given parental beak depth

1

(e) colonisers of Isabela have a range of beak depths

allow colonisers of Daphne have a range of beak depths

1

due to different combinations of alleles of several genes
or
due to different alleles of one gene
or
due to mutation

1

large range of (sizes / species of) seeds / food (on Isabela)
or
large(r) seeds (on Isabela)

allow small range of (sizes / species of) seeds / food on Daphne

or

allow small(er) seeds on Daphne

1

more competition for seeds / food (on Isabela)

allow less competition for seeds / food on Daphne

ignore competition unqualified

1

birds with larger beaks get enough food to (survive and) reproduce (on Isabela)

allow birds with smaller / medium beak sizes get enough food to (survive and) reproduce on Daphne

1

(survivors) pass on (beneficial) alleles to offspring

allow pass on genes / mutation ignore pass on chromosomes / characteristics

1

(f) Isabela is a large island with more species of plants
or
Isabela is a large island with more variety in seed / food sizes
or
Isabela is a large island with more plants / seeds / food

1

less competition for seeds / food
or
enough seeds / food for both bird species

1

[13]

8.

(a) from light / sunlight

ignore sun unqualified

1

absorbed by chlorophyll / chloroplasts

*if no other mark awarded allow by photosynthesis for **1** mark*

1

(b) krill / herring / copepod

1

(c) algae

1

(d) 1 algae
2 krill **or** copepod
3 squid
4 mackerel
(5 Human)

*all correct for **1** mark*

1

(e) any **two** from: (losses due to)

- non-eaten parts (of squid / krill)

  allow bones / shells

  allow eaten by other animals

- <u>respiration</u> **or** <u>respiring</u> (in mackerel)

  *do **not** accept respiration produces / makes / creates energy*

- excretion (by mackerel)

  allow loss of a named waste product such as CO_2 / urea

  ignore loss of waste unqualified

  ignore faeces

2

(f) 2.3 **and** 0.1 (million)

allow in the range 2.25 to 2.3 for 2.3 (million)

1

$\frac{2.3 - 0.1}{2.3} \times 100$ **or** $\frac{220}{2.3}$

1

95.65217.....

*allow answer from correct substitution of incorrect values from **Figure 3***

1

96

allow student's calculated answer correctly rounded to the nearest whole number

1

(g) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked. 1–2

1–2

No relevant content

0

Indicative content
figures may be given without units (million tonnes) throughout

points for:
- small fish are not caught so can live long enough to reproduce
- biomass / stocks have generally increased after these laws introduced
- '77-'81 law (total ban) resulted in increase in biomass, eg 0.1 to 0.48 **or** to 0.9 by '84
- '84 law (mesh size) resulted in increase in biomass, eg 0.9 to 1.8 (by '90)
- '97 law (quotas) resulted in increase, eg 1.15 to 1.25
- '98 law (ban in breeding season) resulted in increase, eg 1.25 to 2.5

points against:
- could be a cause other than the law **or** correlation does not necessarily indicate causal relationship **or** other factors
- laws superimposed so can't necessarily tell the effect of each
- each law results in an increase followed by a decrease
- quotas lead to dead fish being thrown back into sea

For **Level 3** points both for and against must be considered together with appropriate use of data

[17]

9. (a)

Factor	Biotic	Abiotic
Nitrates in the soil		✓
Rabbits eating the plants	✓	
Shading by a building		✓
Soil pH		✓
Temperature		✓
Trampling by people	✓	

all 6 correct = **3** marks
4 or 5 correct = **2** marks
2 or 3 correct = **1** mark
0 or 1 correct = **0** marks 3

3

(b) (grid and) coordinates

1

to achieve randomness

ignore throwing quadrat

*allow random coordinates for **2** marks*

*if no other mark awarded allow random walk **or** description of random walk for **1** mark*

1

(c) *(mean per m^2 =)*
24 **or** 6 × 4

1

(calculation of area of lawn =) (½ × 16 × 10) – (6 × 3)
or 80 – 18

1

(area of lawn =) 62 m^2

allow correct calculation using total area (of triangle) – area of rectangle

(total number of daisies =)
24 × 62

allow correct calculation using an incorrectly calculated area of the lawn and / or mean

1

1488

allow answer based on incorrect area

1

(answer to 3 sig figs =) 1490

allow student's calculated answer rounded to 3 sig figs

1

(d) too few quadrats **or** quadrat too small

allow sample size too small

1

sample may not be representative of the lawn

allow quadrats may not have been placed randomly

1

[13]