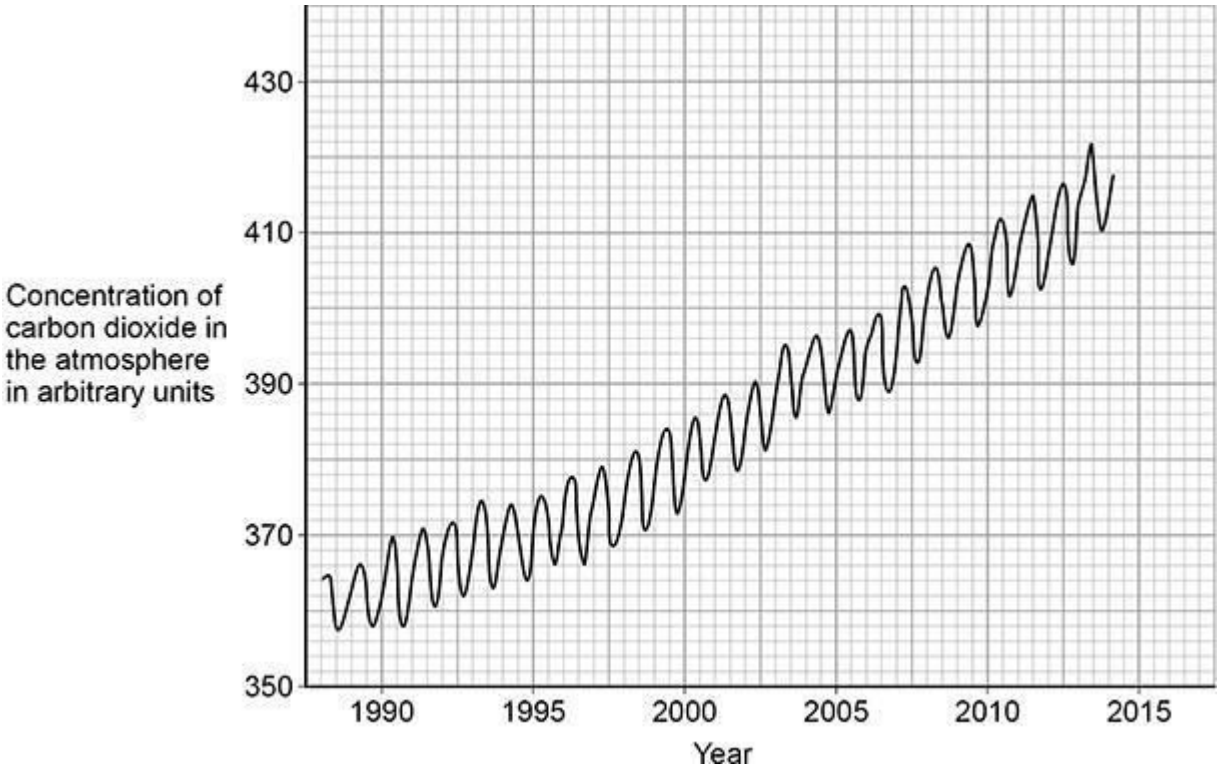
Questions are for both triple and combined science students unless indicated in the question

Q1.

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.

_____

_____

_____

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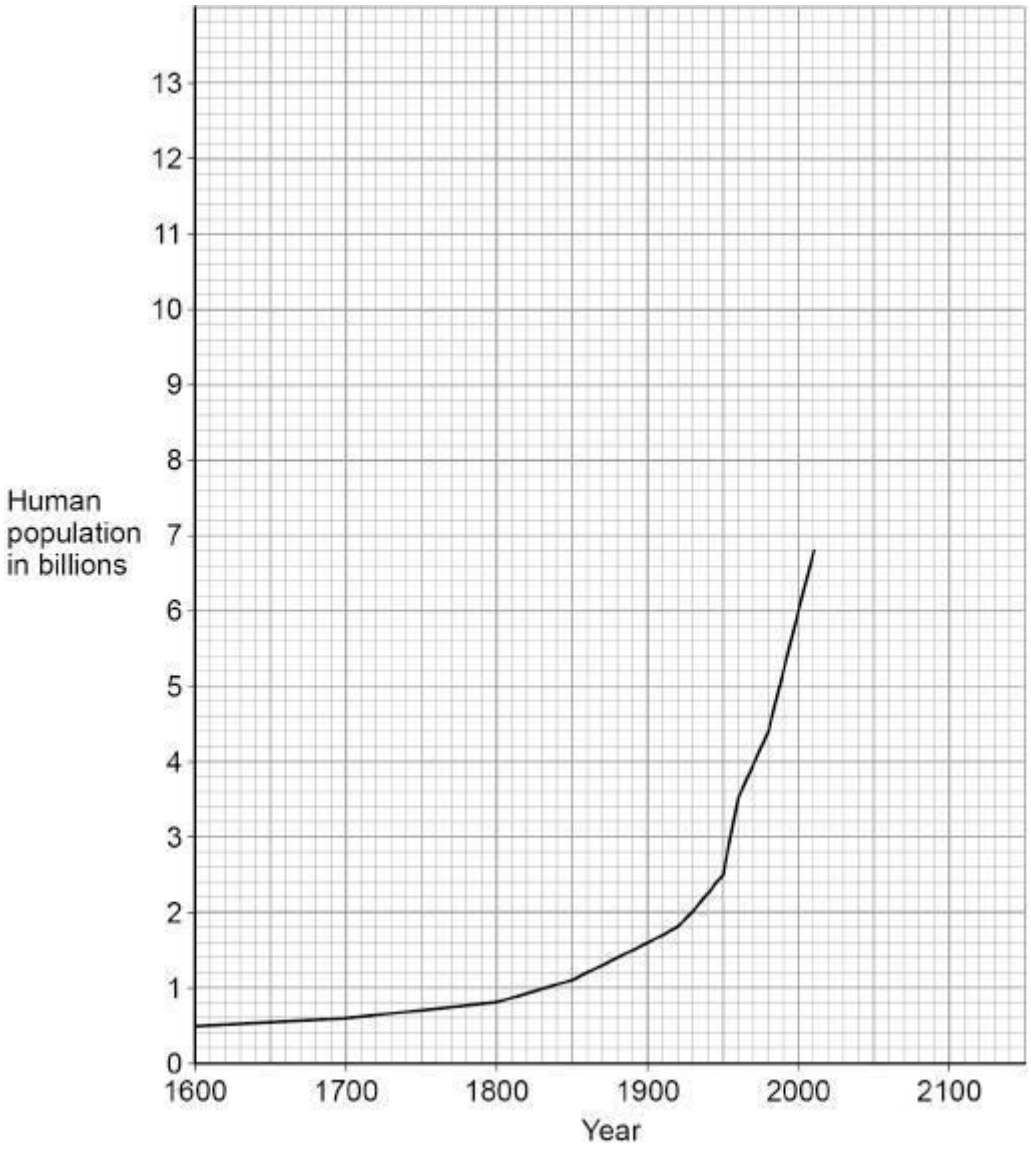
(4)

(Total 10 marks)

Q2.

The graph below shows the human population from 1600 to 2010.



In 1900 the human population was 1.6 billion.

(a) Calculate how many times greater the human population was in the year 2000 compared with the year 1900.

_____

_____

_____

Number of times greater = _____

(2)

(b) In 1950 the human population was 2.5 billion.

Calculate the mean annual increase in the human population between 1900 and 1950.

_____

_____

_____

Mean annual increase = _____ billion per year

(2)

(c) Predict the human population in 2050 if the current rate of population increase continues.

You should draw an extrapolation line on the graph above.

_____

_____

_____

Predicted human population = _____

(2)

(d) The increasing human population has caused a decline in fish stocks.

Describe how fishing quotas can help to return fish stocks to a sustainable level. **(triple only)**

_____

_____

_____

_____

(2)

(e) Farming techniques have changed in recent years.

Describe:

- why more land is being used for farming
- how increased farming has decreased biodiversity.**(triple only)**

_____

_____

_____

_____

_____

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_____

(6)

(f) Genetic modification of crop plants can help meet the demands of the increasing human population.

Golden rice is a genetically modified (GM) crop.

What is the advantage of golden rice compared with non-GM rice? Tick (✓) one box.

Golden rice contains protein-rich mycoprotein	☐
Golden rice has improved nutritional value	☐
Golden rice produces human insulin	☐

(1)

(g) Suggest one reason why some people are concerned about the use of golden rice.

_____

_____

(1)

(Total 16 marks)

Q3.

Figure 1 shows a flightless bird called the dodo (*Raphus cucullatus*).

Figure 1

The dodo:

- was 1 m tall
- had a mass of 20 kg
- lived in rainforests on a tropical island
- ate fruits
- made its nest on the ground.

A female dodo laid only one egg each year.

Humans arrived on the island in the year 1507. By 1681 the dodo was extinct.

(a) What is the genus of the dodo?

Tick (✓) one box.

Animal	☐
Bird	☐
Raphus	☐

(1)

(b) Before the arrival of humans, there were no other large animals living on the island.

Suggest two reasons why the dodo became extinct soon after the arrival of humans.

1 _____

_____

2 _____

_____

(2)

Today, humans are cutting down large areas of tropical rainforests.

(c) Suggest one use of the land after the trees have been removed.

_____

_____

(1)

(d) Why does the removal of trees cause an increase in carbon dioxide in the atmosphere?

Tick (✓) two boxes.

There are fewer animals.	☐
There is less photosynthesis.	☐
There is less respiration.	☐
The soil dries out.	☐
The trees are burned.	☐

(2)

(e) What effect would an increase in carbon dioxide in the atmosphere have on global air temperature?

Tick (✓) one box.

Decrease	☐
Increase	☐

Stay the same ☐

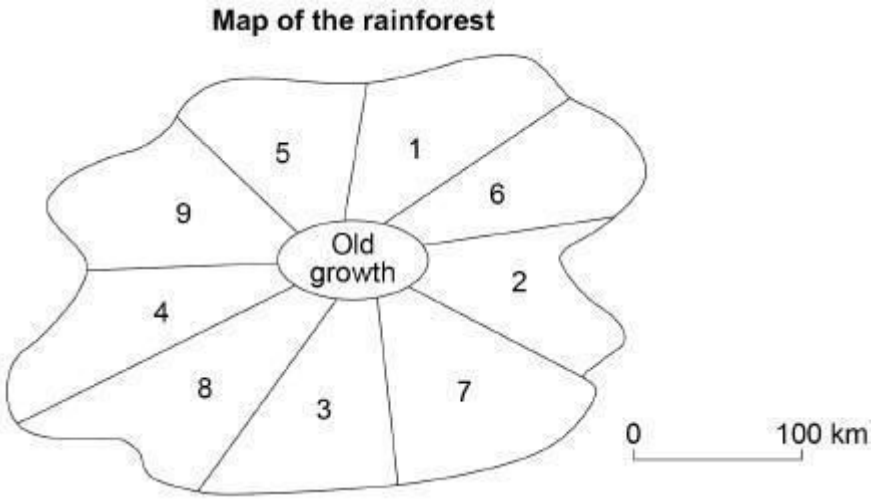
(1)

'Sustainable forestry' reduces the harmful effects of cutting down trees on the environment.

Figure 2 shows a method of 'sustainable forestry'.

Numbers 1–9 show different parts of a rainforest.

Figure 2



The trees are cut down in the sequence 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9

- The trees are cut down in only one area at any one time.
- It takes 30 years to cut down the trees in each area.
- The trees in the 'Old growth' area are never cut down.

(f) How many years would it take to cut down the trees in all of the numbered areas in Figure 2?

_____

_____

_____

Number of years = _____

(2)

(g) The rainforest contains:

- 750 species of trees
- 400 species of birds

- 150 species of butterflies
- many other species of plants and animals.

Explain how the pattern of cutting down trees shown in Figure 2 stops the biodiversity of the rainforest being reduced.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

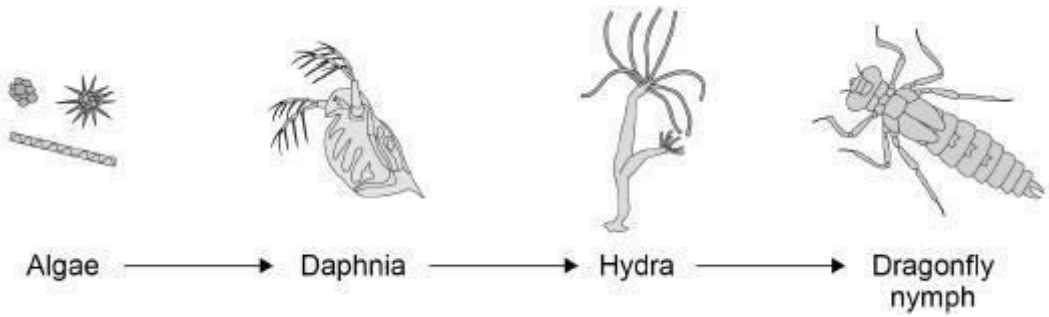
_____

(4)
(Total 13 marks)

Q4.

Figure 1 shows a food chain in a pond.

Figure 1



(a) Which term describes the Daphnia in this food chain? Tick

(✓) one box.

Apex predator ☐

Primary consumer ☐

Producer ☐

Secondary consumer ☐

(1)

(b) Draw a pyramid of biomass for the food chain.

Label each trophic level. **(triple only)**

(2)

(c) Give one reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae. **(triple only)**

_____

_____

(1)

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

The table below shows the results.

Sample number	Number of Daphnia in 1 dm3 water
1	5
2	21
3	0
4	16
5	28

(d) Calculate the mean number of Daphnia in 1 m3 of pond water.

1 m3 = 1000 dm3

_____

_____

_____

_____

_____

Mean number of Daphnia in 1 m3 of pond water = _____

(2)

(e) The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from part (d).

Give your answer in standard form.

_____

_____

_____

_____

_____

_____

_____

_____

Number of Daphnia in the pond = _____

(4)

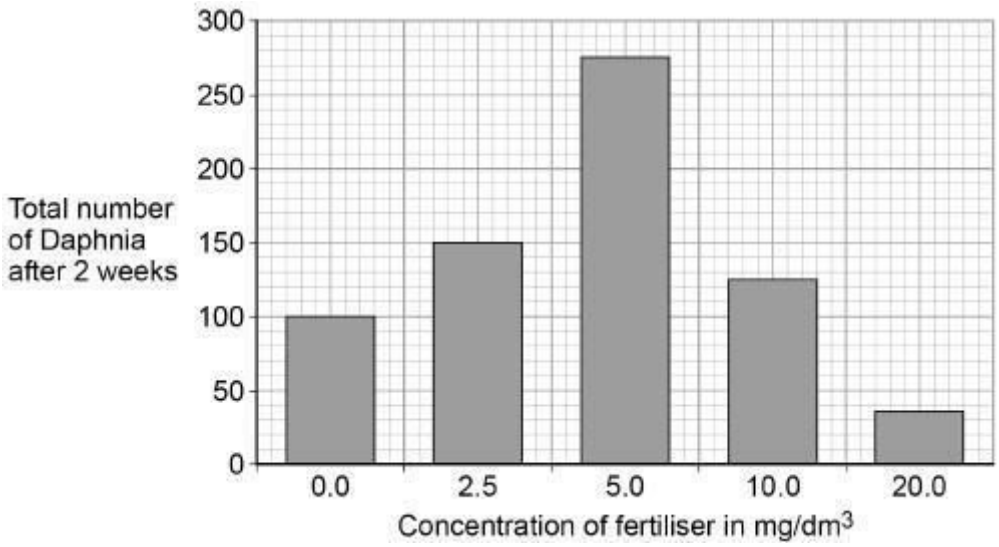
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 2 shows the results.

Figure 2



(f) A concentration of 5.0 mg/dm3 of fertiliser caused a large increase in the population of Daphnia.

Explain why.

_____

_____

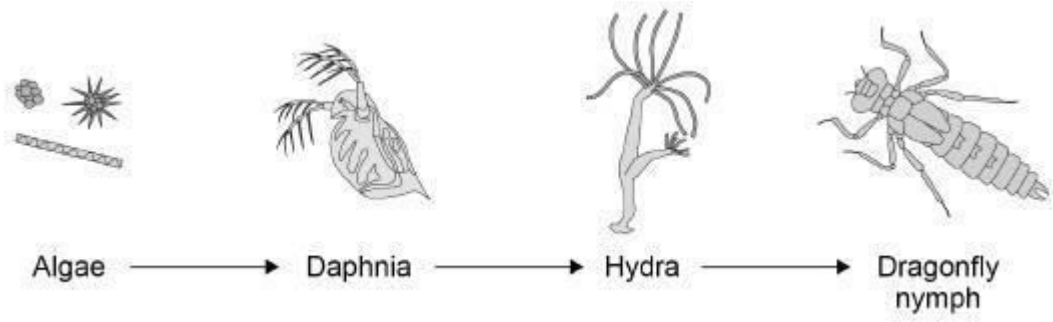
_____

_____

(2)

(g) Figure 1 is repeated below.

Figure 1



The population of Hydra will decrease when 20 mg/dm3 of fertiliser is added to the pond.

Explain why.

_____

_____

_____

_____

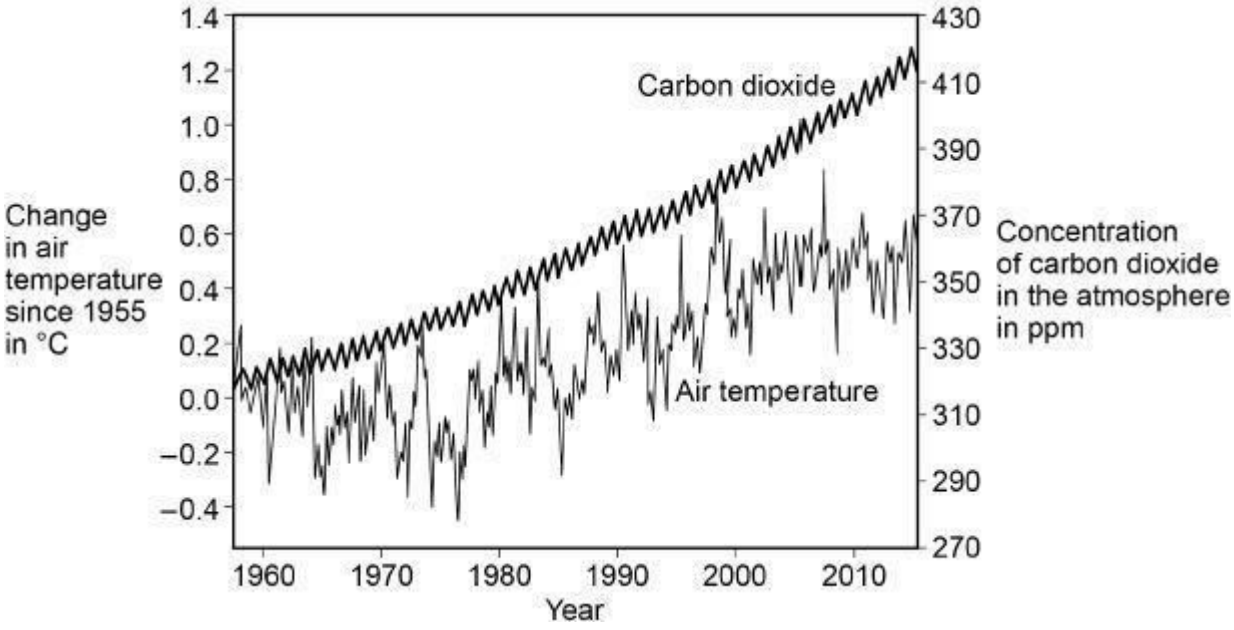
(2)

(Total 14 marks)

Q5.

Many scientists think that global air temperature is related to the concentration of carbon dioxide in the atmosphere.

The graph below shows changes in global air temperature and changes in the concentration of carbon dioxide in the atmosphere.



(a) Complete the table below.

Use information from the graph above.

Choose answers from the box.

You may use each answer once, more than once or not at all.

constant	decreasing	increasing

	1960 − 1977	1977 − 2003	2003 − 2015
Trend in carbon dioxide concentration	Increasing		
Trend in air temperature			

(2)

Many scientists think that an increase in carbon dioxide concentration in the atmosphere causes an increase in air temperature.

(b) How would an increase in the concentration of carbon dioxide in the atmosphere cause an increase in air temperature?

_____

_____

(1)

(c) Evaluate evidence for and against the theory that an increase in the

concentration of carbon dioxide in the atmosphere causes an increase in air temperature.

Use data from the graph above and your own knowledge.

(4)

In each year, the concentration of carbon dioxide in the atmosphere is higher in the winter than in the summer.

(d) Give one human activity that could cause the higher concentration of carbon dioxide in the winter.

(1)

(e) Give one biological process that could cause the lower concentration of carbon dioxide in the summer.

(1)

(f) Give two possible effects of an increase in global air temperature on living organisms.

1. _____

_____

2. _____

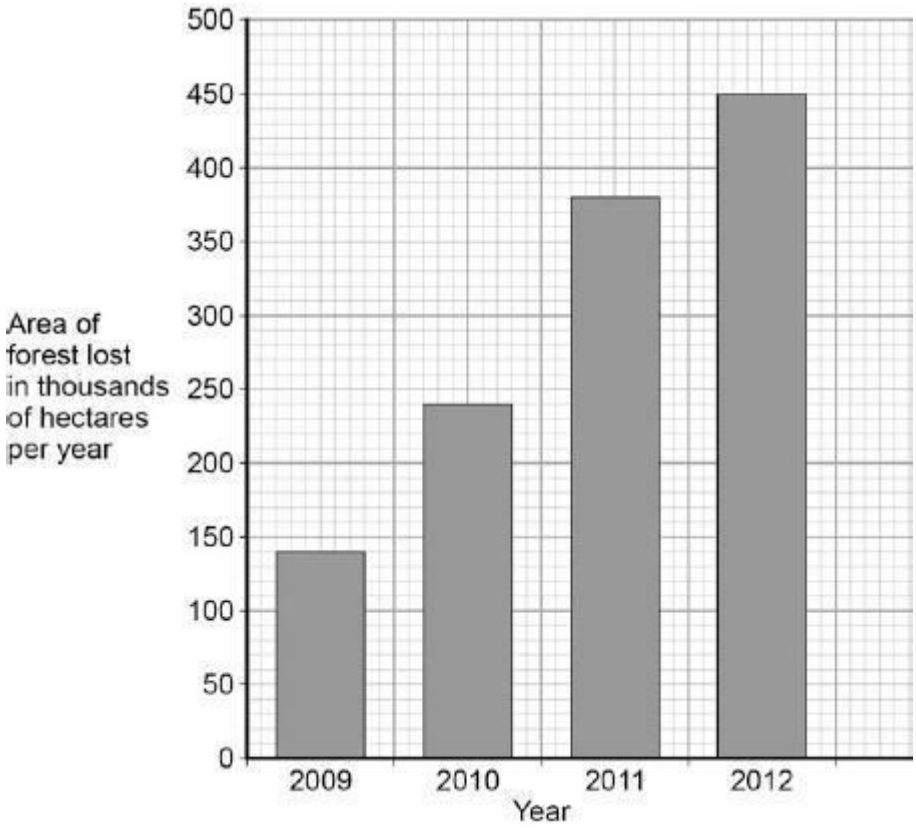
_____

(2)

(Total 11 marks)

Q6.

The graph below shows the area of forest lost in Madagascar from 2009 to 2012.



(a) The area of forest lost each year in Madagascar increased between 2009 and 2012.

Determine the total area of forest lost from the start of 2009 to the end of 2012.

_____

_____

Total area of forest lost = _____ thousand hectares

(1)

(b) What are the possible reasons for the change in the area of forest lost per year between 2009 and 2012?

Tick two boxes.

The local people stop growing rice	☐
Fewer new houses are needed for the population	☐
The local people decided to farm cattle	☐
More trees have been planted	☐
A company starts growing plants for biofuels	☐

(2)

(c) More forest was lost in 2012 than in 2009.

Use words from the box to complete the sentences.

carbon dioxide	excretion	nitrogen
oxygen	photosynthesis	respiration

The increase in the area of forest lost has caused an increase in the gas

_____

The increase of this gas has been caused because less of the gas is being absorbed by plants for the process of _____ .

(2)

(d) Deforestation can have negative effects on our ecosystems. What are the negative effects of deforestation?

Tick two boxes.

Animals and birds migrate because there is less food	☐

More habitats are destroyed ☐

There is less acid rain ☐

There is more biodiversity ☐

The global temperature decreases ☐

(2)

(e) Scientists try to reduce the negative effects of human activity on our ecosystems.

One way is to protect rare habitats.

Give one other way of reducing the negative effects of human activity on our ecosystems.

_____

_____

(1)

(Total 8 marks)

Q7.

Human activity affects ecosystems.

(a) Draw one line from each human activity to the effect on ecosystems.

Human activity	Effect on ecosystems
Increase in rice fields	Increases the amount of methane in the atmosphere
Destruction of peat bogs	Increases the amount of carbon dioxide that is released into the atmosphere
	Reduces the rate at which carbon dioxide is locked up as wood

(2)

(b) (i)Deforestation also affects the atmosphere.

Give two reasons why deforestation takes place.

1. _____

_____

2. _____

_____

(2)

(ii) Changes in the gases in our atmosphere can cause global warming. Give two possible effects of a rise in the Earth's temperature.

1. _____

_____

2. _____

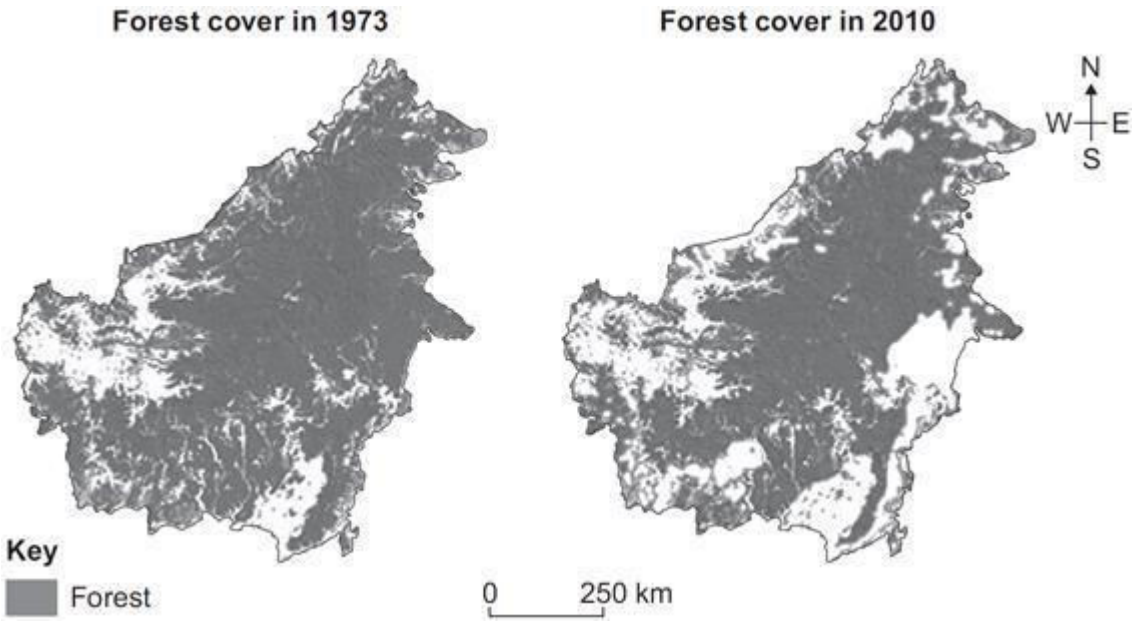
_____

(2)

(Total 6 marks)

Q8.

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)