

GCSE Biology (9 – 1)

Sustainability and Human Impact

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/4
2	/9
3	/8
4	/7
5	/6
6	/8
7	/11
8	/10
Total	/62
%	
Grade	

Information

- The maximum mark for this paper is 63 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. There is a complex relationship between human demands for resources and the need to maintain biodiversity and a healthy global environment.

For each of the multiple choice questions below circle the letter of the correct answer for each.

- a) Burning fossil fuels can release sulphur dioxide gas into the atmosphere.
What is a direct consequence of this?

- A It causes global warming by enhancing the greenhouse effect.
- B It damages the ozone layer, increasing UV radiation.
- C It dissolves in water droplets to form acid rain.
- D It leads to eutrophication in rivers and lakes.

(1 mark)

- b) The human population is increasing, putting pressure on resources and the environment.
Which human activity directly **increases** the amount of methane in the atmosphere?

- A Large scale deforestation by burning trees.
- B The use of CFCs in refrigerators and aerosols.
- C The combustion of petrol in car engines.
- D Growing rice in paddy fields and farming cattle.

(1 mark)

- c) Biodiversity is the variety of all the different species of organisms on Earth.
Which of the following would lead to a **decrease** in biodiversity?

- A A captive breeding programme for endangered animals in zoo.
- B The reintroduction of hedgerows and field margins around fields.
- C The use of large scale monoculture in farming.
- D The protection of rare habitats, such as ancient woodland.

(1 mark)

- d) Deforestation has a number of environmental consequences.
Why does the removal of trees lead to an increase in soil erosion?

- A There are fewer roots to hold the soil together.
- B There is an increase in the rate of transpiration.
- C There are fewer animals living in the area.
- D There is an increase in the rate of photosynthesis.

(1 mark)

(Total for Question 1 is 4 marks)

2. Lough Neagh is the largest lake in Northern Ireland.

Scientists monitor the water quality in large lakes like Lough Neagh.

A rapid increase in the population of algae, known as an algal bloom, can be a sign of pollution.

a) Name **one** type of pollutant from human activity that causes algal blooms.

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(1 mark)

b) An algal bloom will eventually die off. This can cause the death of fish and other aquatic animals.

Explain why the decay of a large quantity of algae leads to a decrease in the fish population.

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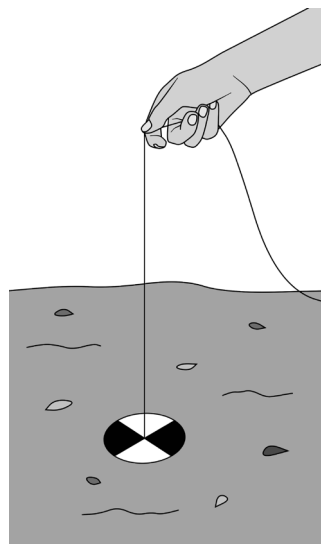
(3 marks)

Since the 1980's scientists have monitored the clarity of the water in Lough Neagh.

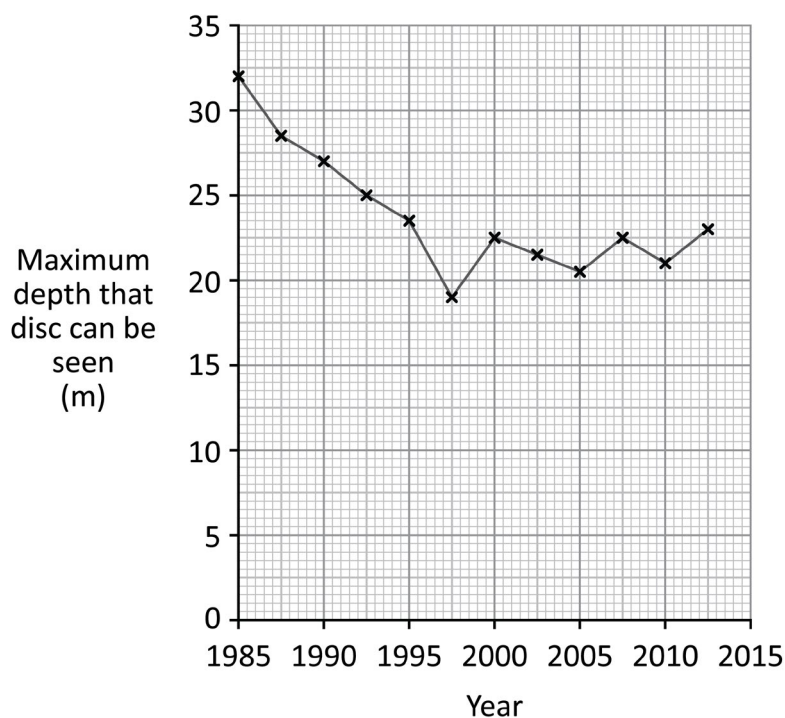
The method involves lowering a black and white disc into the water.

The depth at which the disc is no longer visible is recorded as a measure of water clarity.

The figure below shows the device used by the scientists.



The graph shows the results for Lough Neagh over the years.



- c) The amount of algae in a lake can change with the seasons.

Explain how this makes it important to measure water clarity at the same time each year.

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(2 marks)

- d) Using the data in the graph, what can you conclude about the level of pollution in Lough Neagh since 1985.

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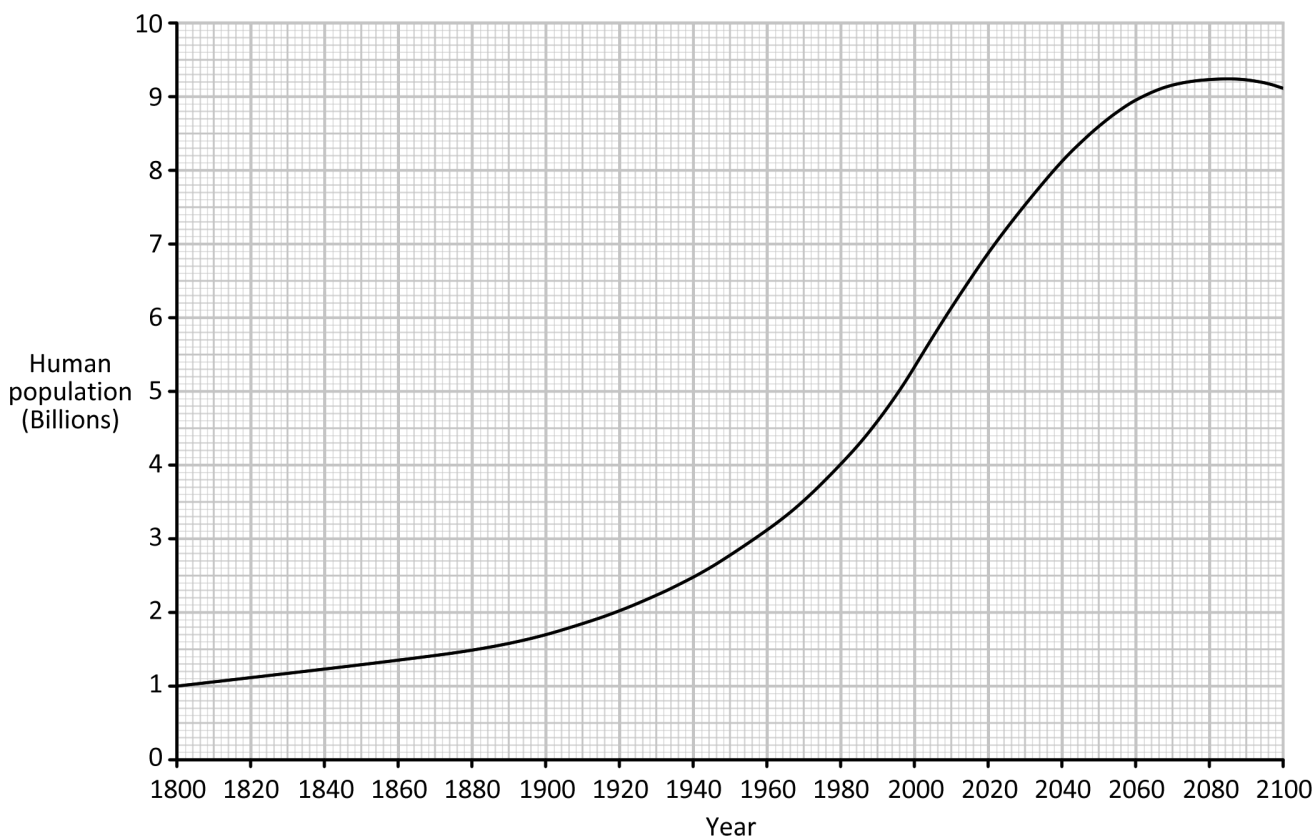
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(3 marks)

(Total for Question 2 is 9 marks)

3. The graph below shows the change in the world human population from the year 1800 and includes a prediction of how it might change in the future.



- a) Describe the pattern of growth for the world human population between 1940 and 2080, as shown in the graph.

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(2 marks)

- b) Use the data in the graph to calculate the predicted increase in the world human population, in billions, between the year 2000 and the year 2060.

Increase = ... billions

(2 marks)

c) The trend shown in the graph has a significant impact on global food security.

Explain how a rapid increase in the human population can threaten food security.

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(2 marks)

d) Modern agricultural practices are being developed to help improve food security.

Suggest **two** ways in which large-scale farming can increase the yield of crops.

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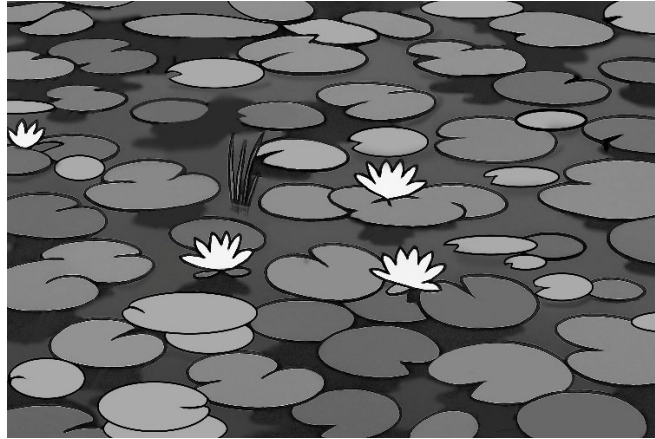
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(2 marks)

(Total for Question 3 is 8 marks)

4. The figure below shows a pond in Newcastle that has a large number of Japanese water lilies. A single Japanese water lily was planted in this pond 20 years ago.



- a) Explain why this invasive plant now covers the majority of the surface of the pond.

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(4 marks)

- b) Explain how this large population of Japanese water lilies could affect the population of native plant species living below them in the pond.

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(2 marks)

(Total for Question 4 is 7 marks)

5. A farmer spreads a large amount of nitrogen fertiliser onto a field that is next to a lake. A few weeks later, local people notice that a large number of dead fish on the surface of the lake.

Explain, in detail, the sequence of events that led to the death of the fish.

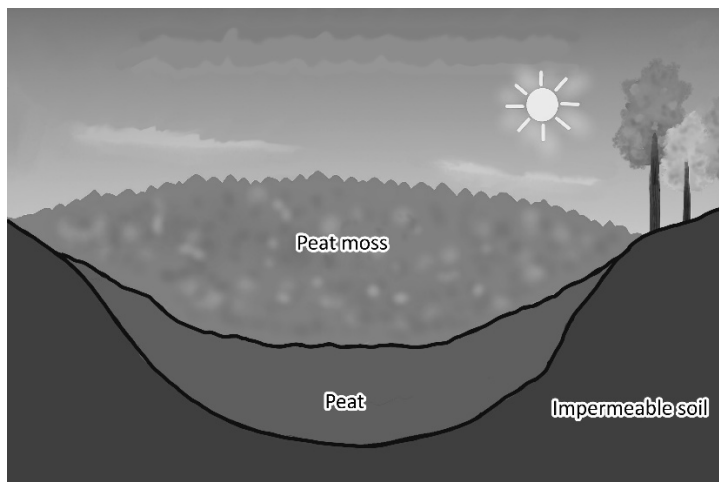
[illegible]

(6 marks)

(Total for Question 5 is 6 marks)

6. Peat bogs are areas of land that are waterlogged and acidic. Plants, such as moss, grow in these bogs. When the plants die, they do not fully decompose. Over thousands of years, a thick layer of partially rotted plant material, known as peat, builds up.

The figure below shows a cross section of a peat bog.



- a. The conditions in a peat bog slow down the rate of decomposition.
Describe **two** conditions in a peat bog that cause the rate of decomposition to be slow.

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(2 marks)

- b. Peat bogs are a very important carbon store.
Explain why the destruction of peat bogs for use as garden compost contributes to an increase in atmospheric carbon dioxide.

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(3 marks)

- c. Peat bogs are also considered important for conservation.

Other than the release of carbon dioxide, state one reason why the large-scale destruction of peat bogs is a problem.

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(1 mark)

- d. To reduce the environmental impact of gardening, people are encouraged to use '**peat free**' compost. This alternative compost is often made by local councils from household garden and food waste.

- e. Suggest **two** advantages of using compost made from household waste instead of peat based compost.

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(2 marks)

(Total for Question 6 is 8 marks)

7. This question is about fish farming.

Salmon are carnivorous fish that are grown in large numbers on fish farms. They are fed pellets made from small fish. Humans then eat the farmed salmon.

The food chain is shown below.

Algae → Small fish → Farmed salmon → Humans

a. Name the trophic level of the humans in this food chain.

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(1 mark)

b. In one fish farm, 10000 kg of pellets made from small fish were fed to the salmon. This resulted in a total mass increase of 1500 kg in the salmon.

The 1500 kg of salmon were then harvested and eaten by humans, resulting in 180 kg of new human biomass.

Calculate the percentage efficiency of biomass transfer from the salmon to the humans.

Percentage efficiency = ... %
(2 marks)

The table below shows information about the mass of fish caught in the UK between 2020 and 2024.

Year	Mass of fish caught by UK fishing vessels (Thousand tonnes)	Mass of fish caught from UK fish farms (Thousand tonnes)	Percentage of fish caught from UK fish farms (%)
2020	720	399.6	55.5
2021	680	409.7	60.3
2022	650	422.5	65.0
2023	610	454.5	74.5
2024	630	507.2	

c. Calculate the percentage of the total fish supply that came from fish farms in 2024.
The total fish supply is the mass from vessels plus the mass from farms.

Percentage = ... %
(2 marks)

d. The figure below shows a UK fish farm.



The global demand for fish as a source of protein is increasing. One way to meet this demand is by farming fish in large pens in the sea.

Evaluate the use of fish farming as a method of producing food for the growing human population.

You should refer to both the advantages and disadvantages in your answer.

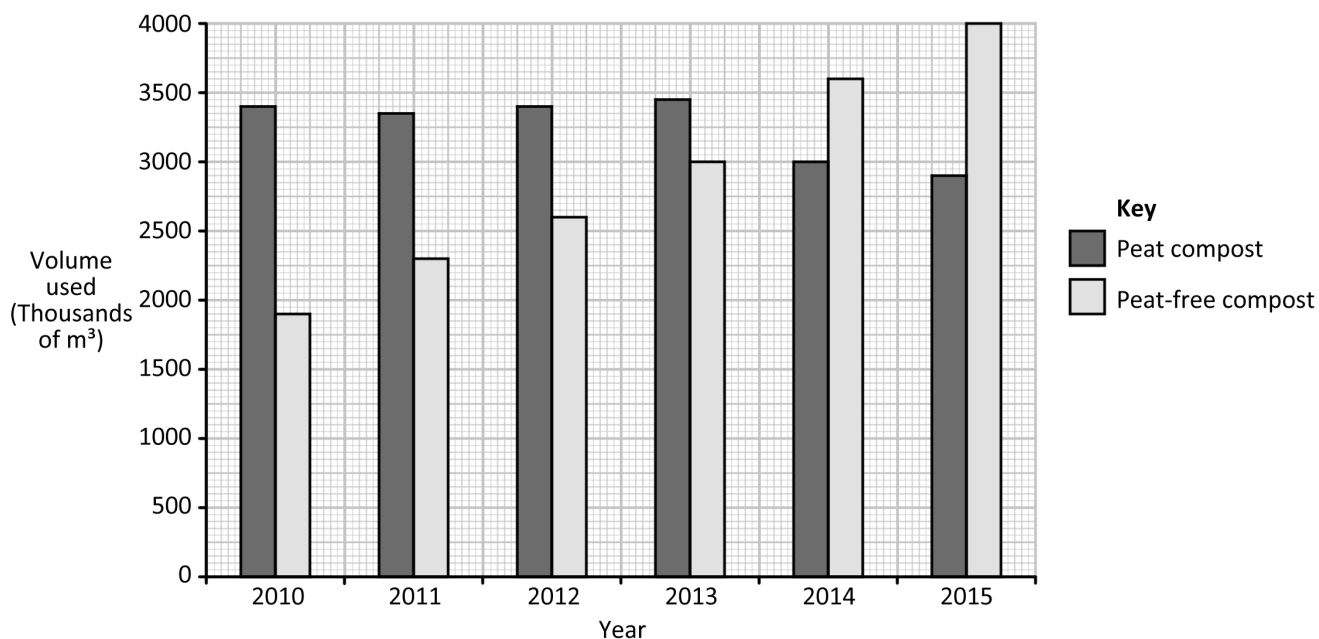
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(6 marks)

(Total for Question 7 is 11 marks)

8. In the modern world human activities have huge effects on our ecosystem.

The figure below gives the volume of compost containing peat and peat free compost sold in UK garden centres from 2010 to 2015.



a. Describe the trends shown in the figure above.

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(2 marks)

Peat bogs are areas of land that are waterlogged and acidic. These conditions prevent the complete decay of dead plant material.

Large areas of peat bog are often drained and the peat is removed to be used as garden compost.

b. Explain how the large scale removal of peat could contribute to an increase in global warming.

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(2 marks)

- b. Human activities are leading to deforestation on a global scale. This is causing significant environmental change.

One major effect of deforestation is an increase in the rate at which the Earth's average temperature is rising, a process known as global warming.

The figure below shows an area where trees have been cleared.



State the reasons why deforestation is taking place.

Explain how deforestation is causing the change in the amounts of different gases in the atmosphere.

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(6 marks)

(Total for Question 8 is 10 marks)