

Advance Information Short | Human Interventions in the Carbon Cycle

Water & Carbon Cycles 3.1.1.4

01.4 Humans have accelerated climate change, but their creativity holds the key to managing this change.' To what extent do you agree with this statement?

(20 marks)

Sample
Advance Information
Short 2022
Paper 1

Turn over ►

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Advance Information
Short 2022
Paper 1

Extra space

Turn over ►

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Advance Information Short I Human Interventions in the Carbon Cycle

Mark Scheme

01.4 Humans have accelerated climate change, but their creativity holds the key to managing this change.' To what extent do you agree with this statement?

(20 marks)

Marks for this question: AO1 = 10, AO2 = 10

The demands of the question are:

AO1 – An understanding of human impact on the carbon cycle over time and the impact of the carbon cycle on global climate. An awareness of strategies to influence carbon transfers and mitigate the impacts of climate change.

AO2 – Application of knowledge and understanding to show the extent to which humans both accelerate climate change but also hold the key to managing the change.

Answers may include:

AO1

- Changes in the carbon cycle over time, to include natural variation (including wild fires, volcanic activity) and human impact (including hydrocarbon fuel extraction and burning, farming practices, deforestation, land use changes)
- The carbon budget and the impact of the carbon cycle upon and, in turn, the atmosphere, including global climate
- Human interventions in the carbon cycle designed to influence carbon transfers and mitigate the impacts of climate change

AO2

- The part of the statement about humans accelerating climate change is likely to be approached first. The term 'accelerate' is used in the question as emissions enhance the natural greenhouse effect, therefore accelerating climate change. This could be related to burning hydrocarbon fuel, farming, deforestation and land use changes. Examples may be used to develop these points
- Some may then look at how human creativity could hold the key to managing climate change. This may be linked to the carbon cycle as a system, considering how carbon transfers can be managed or mitigated
- For example, replacing use of fossil fuels for energy with renewables could keep more carbon in the lithosphere and reduce emissions into the atmosphere
- For example, protecting mature trees and planting more native species could capture more carbon from the atmosphere, storing it in the sink
- The role of human creativity in climate change mitigation could then be explored and is likely to be supported with examples such as carbon sequestration and storage
- The role of this creativity is then likely to be challenged, exploring the limitations of human's in tackling climate change
- For example, lack of international agreement about strategies to tackle climate change

Credit any other valid approach. (See example of Level 4 answer)

Level/Mark range	Criteria/Descriptor
Level 4 (16 - 20 marks)	<ul style="list-style-type: none"> Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question. Interpretations are comprehensive, sound and coherent (AO2). Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout (AO2). Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2). Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout (AO1). Full and accurate knowledge and understanding of key concepts, processes and interactions and change throughout (AO1). Detailed awareness of scale and temporal change which is well integrated where appropriate (AO1).
Level 3 (11 - 15 marks)	<ul style="list-style-type: none"> Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question. Interpretations are generally clear and support the response in most aspects (AO2). Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding (AO2). Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2). Generally clear and relevant knowledge and understanding of place(s) and environments (AO1). Generally clear and accurate knowledge and understanding of key concepts, processes and interactions and change (AO1). Generally clear awareness of scale and temporal change which is integrated where appropriate (AO1).
Level 2 (6 - 10 marks)	<ul style="list-style-type: none"> Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question. Interpretations are partial but do support the response in places (AO2). Some partially relevant analysis and evaluation in the application of knowledge and understanding (AO2). Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2). Some relevant knowledge and understanding of place(s) and environments which is partially relevant (AO1). Some knowledge and understanding of key concepts, processes and interactions and change. There may be a few inaccuracies (AO1). Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies (AO1).

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Level 1 (1 - 5 marks)	<ul style="list-style-type: none"> • Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question (AO2). • Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence (AO2). • Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts (AO2). • Very limited relevant knowledge and understanding of place(s) and environments (AO1). • Isolated knowledge and understanding of key concepts, processes and interactions and change. There may be a number of inaccuracies (AO1). • Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies (AO1).
Level 0 (0 marks)	<ul style="list-style-type: none"> • No relevant content/nothing worthy of credit.

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(20 marks)

Student Response

Climate change is a natural process, as shown by climate records created using ice cores and tree ring analysis and by evidence of past ice ages. The climate changes due to changes in the Earth's orbit and tilt and through volcanic activity. However, this change is being accelerated by the action of people as they increase carbon emissions and reduce carbon sinks.

I strongly agree that climate change is being accelerated by human activity, including extraction and burning of hydrocarbons, deforestation and farming and changing land use. This is illustrated in the Amazon Rainforest, where significant parts are starting to emit more carbon than they are absorbing. A study published in 2021 showed that rainforest in Brazil released 20% more CO₂ into the atmosphere than it took out between 2010 and 2019, causing negative feedback in the system. This change in carbon transfers is related to deforestation, forest degradation and fires.

Whilst humans have accelerated climate change, I also agree that their creativity holds the key to managing and mitigating this change, as long as there is the will to do this. Climate change is a global issue, so actions to tackle it at a global scale are vital, an example being the Amazon Soy Moratorium (ASY), a collaborative project between organisations around the world, including the government, industry and NGOs. Companies have agreed to not buy soy from traders who get their supplies from farmers who clear the rainforest or threaten the way of life of indigenous people. Whilst Brazil's soy production has gone up, deforestation for soy has stayed low.

However, global agreements won't solve problems unless they lead to action. The Paris Agreement, adopted at COP 21 in 2015, is an agreement to limit warming to 1.5°C above pre-industrial levels and requires countries to have climate plans to achieve this goal. Although it is impressive that so many countries have signed, this agreement will only work if their climate plans are ambitious enough to make a difference. Wealthy countries pledged financial support, but haven't fulfilled their pledges. Greenhouse gas emissions continued to grow between 2015 and 2018. This shows that human creativity in coming up with agreements will only allow us to mitigate climate change if there is the political will.

Individual people can also use creativity to contribute to the management of climate change. We can think creatively about our life styles and make use of products and ideas created by others. Homeowners can install solar panels or ground source heat pumps or buy their electricity from a supplier such as Green Energy UK, who only supply green gas and renewable energy. We can choose to use public transport or walk/cycle rather than driving. Again, the limitation is whether we have the will to make the changes which will make a difference. In our high-consumption society we need to take action to tackle many issues, such as fast fashion and food waste, if we are to mitigate climate change.

There is no simple answer to this question. Whilst human activity is undeniably accelerating climate change and creativity could hold the key to mitigating this, people need to be willing to take action at different scales, from individual to global. As recognition of the cost of climate change and its differing impacts around the world grows, there is hope that people will do what is needed to limit warming to 1.5°C through responsible and creative actions.