Oxford Revise | Geography | Answers

Chapter 6 What evidence is there for climate change?

All exemplar answers given are worth full marks.

1 (a)

(i) From 800 000 years ago to the present, Antarctic temperatures have fluctuated up and down from lows around 10°C lower to 3°C higher than today.

(ii) The CO_2 graph shows a very similar pattern to the temperature graph, apart from the most recent period when it continues to rise sharply, up to 415ppmv.

(b)

(i) The CO_2 content of the air bubbles trapped in the ice from when the snow fell can be analysed. The higher the CO_2 content, the warmer the temperatures were when the snow fell.

(ii) The analysis of rings of trees fossilised in peat bogs show how the climate has changed in the past. Wider rings suggest when the climate was wetter and warmer and so the tree grew more. The opposite would be the case if the climate became colder and drier. Evidence of more recent climatic changes can be found in historical documents such as paintings and harvest records. In the 18th century, fairs took place on the River Thames when it froze over, showing that winters were much colder than now.

(c) The burning of fossil fuels has increased the amount of carbon dioxide emissions into the atmosphere. This has resulted in global warming, as temperatures increased by up to 6°C. This causes the melting of the polar ice caps. Other sources of melt water are the glaciers and ice sheets inland. The melt water from these sources eventually reaches the sea, where levels could rise by up to a metre by the end of the century.

(d) This question is level-marked:

Level	Marks	Description
3	5–6	• Thorough knowledge, understanding or analysis of the issue, process or concept. • Uses well-developed ideas and line of reasoning is clear and logically structured. • Information presented is relevant and substantiated.
2	3–4	• Reasonable knowledge, understanding or analysis of the issue, process or concept. • Uses developed ideas and line of reasoning with some structure. • Information presented is mostly relevant and supported by some evidence.
1	1–2	• Basic knowledge, understanding or analysis of the issue, process or concept. • Uses simple ideas with no developed points made. • Information is basic, unstructured, and supported by limited evidence.
	0	No response or no response worth of credit.

Example answer: *The UK climate is changing with increasing average temperatures, warmer and wetter winters, and warmer and drier summers and this will have both positive and negative impacts. Positive social impacts will be the reduced heating costs and fewer cold-related deaths in winter. However, negative impacts are significantly more deaths in the elderly owing to their vulnerability to heatwaves. Coastal homes will be lost because of sea level rise and cliff erosion, and the extreme rainfall events causing devastating flash flooding. The warmer summers will benefit the tourist industry as more people may holiday in the UK. Some agricultural land will be lost to coastal flooding and there will be an increased need to invest in major sea defences. Environmental impacts will mean that trees and plants will flower earlier and new crops like grapes can survive in southern England. However, coastal and salt marsh flooding and erosion will damage some important wildlife habitats. It would mean that some species of plants and animals that previously would not survive in the UK will now be able to establish themselves, increasing biodiversity.*

2

(a) The greenhouse effect is caused by natural and human processes. Gases in the atmosphere, such as carbon dioxide, act like a glass roof on a greenhouse. They trap some of the energy radiated from the Sun preventing it escaping back into space, increasing the Earth's temperature. This benefits the Earth, stopping it getting too cold. Human actions, particularly the burning of fossils fuels, has had a negative effect and caused the enhanced greenhouse effect. The extra carbon dioxide produced makes the layer of greenhouse gases thicker. This means more of the Sun's energy is trapped, increasing the Earth's temperature. This results in climate change due to global warming.

(b) Scientists cannot be sure whether the increase in global temperatures taking place at present will continue. Governments have put forward plans to try and stop temperatures rising further. The replacement of fossil fuel electricity generation by renewable energy may or may not be successful. They cannot know whether people are prepared to change their lifestyles by recycling more, conserving energy, reforestation, and other mitigating plans.

(c) Evidence for contemporary climate change include actual climate changes and the resultant direct and indirect effects. In the UK there have been more extreme weather events with more frequent storms and higher summer temperatures. Drought conditions and flash floods occur more regularly causing more damage to buildings, and increased erosion by rivers and seas. The UK is now warm enough to grow vineyards, and species of insects and birds which normally were only found in the warmer countries further south are now being found in this country. Ski resorts in the Alps have been forced to use artificial snow or move to higher altitudes, because the warmer winters mean there is less snow falling.

(d) Whether the global effects of climate change can be considered alarming depends on whether it has positive or negative impacts, the ability of people to adapt by adopting mitigating strategies, or the extent to which a country has the finance and technological expertise to overcome the challenges caused. Apart from winter sports other forms of tourism have benefited from higher temperatures. It also benefits farming in the UK with longer growing seasons, and more opportunities to grow more and a greater variety of food. On the other hand, rising sea levels due to the melting of polar ice caps are very alarming for low-lying countries like the Maldives and the millions of people living close to the coast who face increased danger of flooding. Desertification, partly caused by the increasing drought in poorer parts of the world, means less water and food is available, leading to malnutrition and famine. The living standards of people in these countries suffer as climate change increases the danger from pests and diseases.

Attempts to mitigate or manage climate change may make it less alarming. To help reduce carbon emissions, many countries are turning to alternative sources of energy, such as wind and solar, which do not emit carbon dioxide. Planting trees which remove and store carbon dioxide from the atmosphere is another way to reduce the alarming nature of climate change. The more developed a country is, the less it is likely to have to cope with the potentially 'alarming' nature of changes to the climate.

3

(a)

(i) The general trend of the graph shows the increase in global carbon dioxide is rising rapidly.

(ii) The annual fluctuations in CO_2 concentrations reflect conversion of CO_2 to oxygen by photosynthesis during plant growing seasons and so the concentration of CO_2 falls in the spring and summer.

(b) Output from the sun has changed in the past due to the presents of sun spots. When there is a maximum output from sun spots, the Sun gives off more heat and less when there is minimum sun spot activity. When violent volcanic eruptions take place, fine particles of ash are sent out into the atmosphere which blocks out the sun, leading to a lowering of temperatures.

(c) There have been many global impacts of climate change. The sea level rises of between 30 cm and 1 m threaten heavily populated, low-lying coastal areas with flooding. The higher temperatures with more extreme weather events, such as storms, droughts, floods, heatwaves, and wildfires have forced many people have to move elsewhere. Crop yields may increase in some warmer, wetter areas, but many areas will suffer reduced crop yields, leading to food shortages. Desertification may make large areas totally unfit for cultivation. Heatwaves will lead to more heat-related illness and disease. Ecosystems and animal habitats are changing, which may result in the extinction of some species of plants and animals.

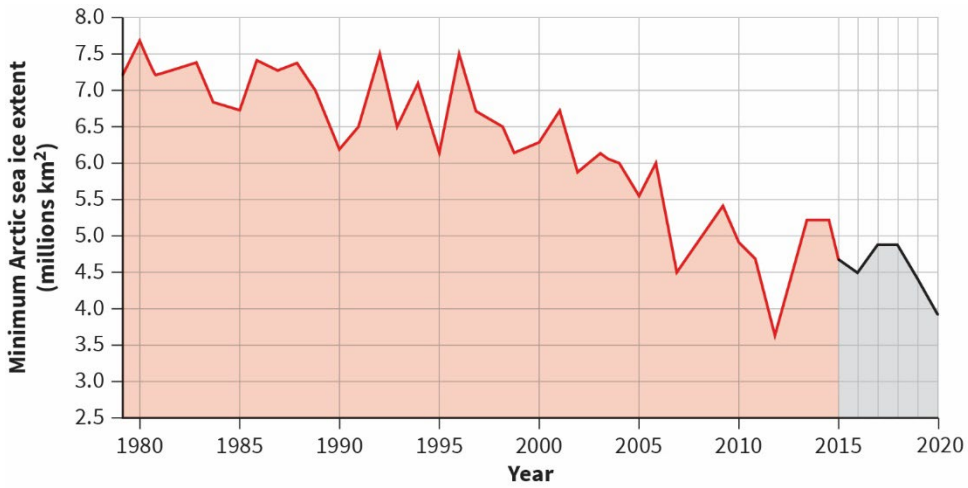
4 (a)

(i) Arctic sea ice coverage has reduced markedly since 1979 by up to 65%.

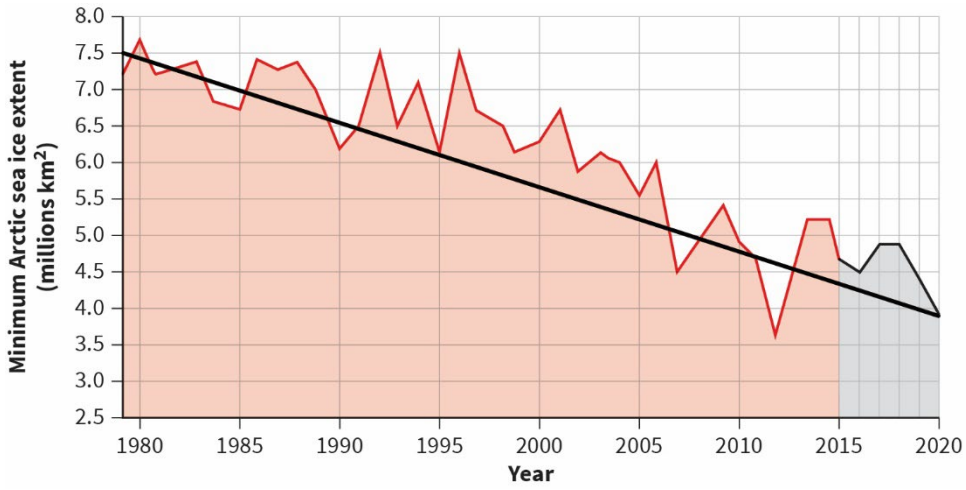
(ii) An advantage will be opening up sea trade where, previously, pack ice prevented ship movements. A disadvantage would be the rise in sea level leading to coastal flooding around the world

(b)

(i) The graph should be completed as below:



(ii) The graph should be completed as below:



(iii) The minimum Arctic sea ice extent shows annual fluctuations, but a clear declining trend overall which is accelerating.

(iv) This is due to increasing greenhouse gas emissions warming the atmosphere, raising sea surface temperatures, and melting more ice.

(c) Volcanic eruptions produce ash and sulphur dioxide into the atmosphere. This produces a layer which stops some sunlight reaching the Earth's surface, instead reflecting it back into space. This lowers the temperature of the Earth.

(d) This question is level-marked:

Level	Marks	Description
3	6–8	• Thorough knowledge, understanding or analysis of the issue, process or concept. • Uses well-developed ideas and line of reasoning is clear and logically structured. • Information presented is relevant and substantiated.
2	3–5	• Reasonable knowledge, understanding or analysis of the issue, process or concept. • Uses developed ideas and line of reasoning with some structure. • Information presented is mostly relevant and supported by some evidence.
1	1–2	• Basic knowledge, understanding or analysis of the issue, process or concept. • Uses simple ideas with no developed points made. • Information is basic, unstructured, and supported by limited evidence.
	0	No response or no response worth of credit.

Example answer: *COP26 was an international conference on dealing with climate change. The argument to maintain the aim from the earlier conference in Paris to keep global temperatures from rising more than 1.5°C. can be justified as climate change has to be tackled globally, because no one country can be effective on its own. It allowed international pressure to be exerted to reinforce the pledges made at the*

Paris conference and hopefully make all countries to adopt strategies to achieve the aim of keeping to the 1.5°C target. The need to stop global temperature from rising any further is needed because the resultant effect of higher sea level due to the melting of the polar ice caps means many low-lying coastal areas will be flooded, causing economic and social problems for many millions of people. Low-lying islands, such as the Maldives, would be particularly susceptible to this threat. There are other aspects of climate change apart from increasing temperatures, such as increased occurrence of drought, heavy rainfall, and storms, all of which will impact on agriculture with crops being destroyed or yields falling. Many less developed countries are still largely agricultural and so their populations are more likely to suffer famine or malnutrition. Climate change will also have negative effects on some ecosystems, leading to the extinction of different species of plants and animals. Plans must made to adapt to and mitigate the effects of climate change, but the most important strategies must be aimed at achieving the 1.5°C target.

Questions referring to previous content

5

(a) Hazard mitigation is the action taken to make something less severe. This means the reducing the impact of a hazard by monitoring, prediction, protection, and planning.

(b) In both cases, tectonic plates move towards each other. However, at a destructive margin, dense oceanic plate subducts under a less dense oceanic plate, or a continental plate, and is destroyed. In a collision margin, two continental plates meet and the crust crumples and lifts to form fold mountains.