1. Study the photographs below showing some causes of climate change.

To what extent is climate change the result of human actions?

Use the photographs above and your own understanding.

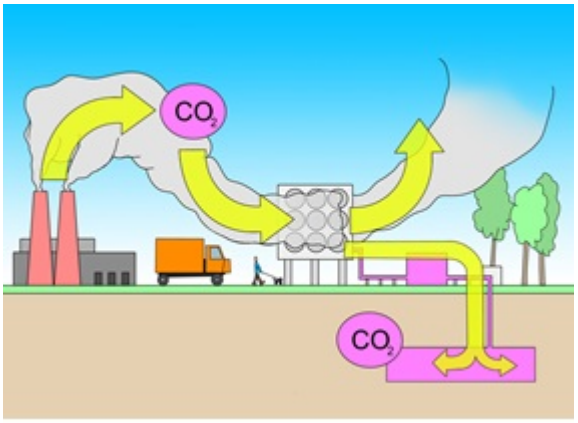
(Total 9 marks)
(+ 3 SPaG marks)

2. Study the photographs below showing strategies used to manage climate change.

Mitigation strategies

Alternative energy

Carbon capture



Adaptation strategies

Adjusting to rising sea levels

Growing draught-resistant crops

'Managing climate change involves both reducing causes (mitigation) and responding to change (adaptation).'

Do you agree?

Explain your answer.

Use the photographs above and your own understanding.

(Total 9 marks)
(+3 SPaG marks)

Mark schemes

1.

Level	Marks	Description
3 (Detailed)	7 – 9	AO1 Demonstrates detailed knowledge of the factors which affect climate change. AO2 Shows thorough geographical understanding of places, environments and processes. AO3 Demonstrates thorough application of knowledge and understanding in evaluating the importance of human and physical factors to climate change.
2 (Clear)	4 – 6	AO1 Demonstrates clear knowledge of the factors which affect climate change. AO2 Shows some geographical understanding of places, environments and processes. AO3 Demonstrates reasonable application of knowledge and understanding in evaluating the importance of human and physical factors to climate change.
1 (Basic)	1 – 3	AO1 Demonstrates limited knowledge of the factors which affect climate change. AO2 Shows slight geographical understanding of places, environments and processes. AO3 Demonstrates limited application of knowledge and understanding in evaluating the importance of human factors to climate change.
	0	No relevant content.

- **Level 3 (detailed)** responses will be developed. Appropriate use of the pictures (direct or inferred) and specific own understanding, with some evaluation.
- **Level 2 (clear)** responses are likely to be linked statements with some elaboration. Some use of the pictures (direct or inferred) and own understanding.
- **Level 1 (basic)** responses are likely to consist of simple statements, with limited use of subject vocabulary. May only use information derived from the pictures.
- An answer that lacks consideration of the relative importance of physical and human factors is limited to Level 2.

Indicative content

- The command is “to what extent”, so the focus of the question is an evaluation of the degree to which human factors are responsible for climate change. e.g. Fully agree, disagree, partially agree. Many may feel that human factors are largely to blame for the rapid rise in temperatures (global warming) in recent times. Answers should consider their relative importance, supported by evidence.

- Knowledge of long term changes in climate since start of Quaternary period. Patterns of alternating cold periods (glacials) and warm periods (interglacials). Up to 10 glacial periods in past million years. Ice age continued until 12 000 years before present.

- Knowledge of the enhanced greenhouse effect and the role of greenhouse gases such as CO_2, methane and nitrous oxides. Evidence of recent temperature change, with predictions of rises of up to 5° C by 2100.

- Knowledge of the evidence for climate change e.g. ice and sediment cores, tree rings, pollen analysis, temperature records, rising sea levels, loss of ice volumes.

- Understanding the contribution of increased use of fossil fuels, inferred in the pictures. Fossil fuels account for over 50% of global greenhouse gas emissions. Burning these releases carbon dioxide into the atmosphere. Fossil fuels are used in transportation, building, heating homes, manufacturing industry, and generating electricity.

- Understanding of other human factors affecting climate change:
  e.g. Changes in agriculture. Producing food uses fossil fuels in the production of fertiliser and pesticides, and in transporting. Changing forest cover to farmland also releases greenhouses gases. Increases in meat, dairy and rice production create more methane. Deforestation. Plants remove CO_2 from the atmosphere and convert it to organic matter using photosynthesis. When trees are cut down this is reduced. CO_2 is also released when trees are burnt.
  Cement production. Cement is made from limestone, which contains carbon. When cement is manufactured, much CO_2 is released.

- Understanding of the effects of volcanic activity, inferred from the pictures. Volcanoes can release large amounts of ash. This can reflect the Sun’s rays causing the planet to cool. Over time however, eruptions can release large quantities of greenhouse gases e.g. Carbon dioxide. These gases can trap the Sun’s rays causing the planet to warm.

- Understanding of other natural factors affecting climate change, e.g. Effects of orbital changes. Changes from a circular to an oval orbit can affect the amount of sunlight the earth receives. It takes 100 000 years for the Earth's orbit to change from being more circular to an ellipse and back again. This eccentricity cycle coincides closely with the alternating cold (glacial) and warm (inter-glacial) periods in the Quaternary period. These changes are called Milankovitch Cycles. The Earth wobbles on its axis leading to changes in its tilt. When the Earth is more upright, it receives a greater amount of energy from the sun and experiences higher temperatures.
  Solar output. The output is measured by observing sunspots, which are not constant. They increase and decrease over an 11 year cycle, and possible longer cycles of several hundred years.

- Evaluation of the importance of human factors in climate change. Much evidence that since the start of the industrial era (about 1750) the overall effect of human activities on climate has been a warming influence. The human impact on climate during this period greatly exceeds that due to changes in natural processes, such as solar changes and volcanic eruptions. However, in the longer term scientists have measured and proved that natural causes are fundamentally responsible for climate change.

AO1 – 3 marks
AO2 – 3 marks
AO3 – 3 marks

Spelling, punctuation and grammar (SPaG)

High performance
- Learners spell and punctuate with consistent accuracy
- Learners use rules of grammar with effective control of meaning overall
- Learners use a wide range of specialist terms as appropriate.

3

Intermediate performance
- Learners spell and punctuate with considerable accuracy
- Learners use rules of grammar with general control of meaning overall
- Learners use a good range of specialist terms as appropriate.

2

Threshold performance
- Learners spell and punctuate with reasonable accuracy
- Learners use rules of grammar with some control of meaning and any errors do not significantly hinder meaning overall
- Learners use a limited range of specialist terms as appropriate.

1

No marks awarded
- The learner writes nothing
- The learner's response does not relate to the question
- The learner's achievement in SPaG does not reach the threshold performance level, for example errors in spelling, punctuation and grammar severely hinder meaning.

3

[12]

2.

Level	Marks	Description
3 (Detailed)	7 – 9	AO1 Demonstrates detailed knowledge of the strategies of mitigation and adaptation used in relation to climate change. AO2 Shows thorough geographical understanding of how different strategies help to reduce the causes of climate change and respond to climate change. AO3 Demonstrates thorough application of knowledge and understanding in evaluating the use of mitigation and adaptation strategies to respond to climate change.
2 (Clear)	4 – 6	AO1 Demonstrates clear knowledge of the strategies of mitigation and/or adaptation used in relation to climate change. AO2 Shows some geographical understanding of how different strategies help to reduce the causes of climate change and/or respond to climate change. AO3 Demonstrates reasonable application of knowledge and understanding in evaluating the use of mitigation and/or adaptation strategies to respond to climate change.
1 (Basic)	1 – 3	AO1 Demonstrates limited knowledge of the strategies of mitigation and/or adaptation used in relation to climate change. AO2 Shows basic geographical understanding of how one or more strategies help to reduce the causes of climate change and/or respond to climate change. AO3 Demonstrates limited application of knowledge and understanding in evaluating the use of mitigation and/or adaptation strategy(ies) to respond to climate change.
	0	No relevant content.

- **Level 3** (detailed) responses will be developed. Appropriate use of the photographs (direct or inferred) and specific own understanding, with some evaluation. Must cover adaptation and mitigation strategies with justification for both.
- **Level 2** (clear) responses are likely to be linked statements with some elaboration. Some use of the photographs (direct or inferred) and own understanding. Likely to cover both types of strategy.
- **Level 1** (basic) responses are likely to consist of simple statements, with limited use of subject vocabulary. May only use information derived from the photographs or be restricted to one type.
- An answer that lacks consideration of both adaptation and mitigation strategies is limited to Level 2.

Indicative content

- Responses will apply knowledge and understanding of the need to use both adaptation and mitigating strategies in combating climate change, making a judgement about the issues involved.

- The command is 'explain your answer', so responses should support the choice made. Credit responses which highlight the importance of one type of strategy, as well as those which take a more balanced or nuanced approach before reaching a conclusion.

- Knowledge of mitigation strategies. Consists of actions to limit the magnitude or rate of long-term global warming. Mitigation involves reductions in human emissions of greenhouse gases. It may also be achieved by increasing the capacity of carbon sinks, eg, through reforestation.

- Knowledge of adaptation strategies. Action taken to help communities and ecosystems cope with changing climate. The goal is to reduce vulnerability to the harmful effects of climate change (like sea-level rise, more intense extreme weather events or food insecurity). It may also involve making the most of any opportunities (for example, longer growing seasons or increased yields in some regions).

- Understanding of mitigation strategies shown in the photographs:

Alternative energy. To help reduce carbon emissions, alternative sources of energy such as hydro-electricity, nuclear power, solar, wind, and tides are increasing in importance. Most are renewable. Nuclear power uses uranium to generate electricity but does not emit CO_2 as a by-product.
Carbon capture and storage uses technology to capture CO_2 produced from the use of fossil fuels in electricity generation and industrial processes and safely storing it. Carbon dioxide from atmosphere can be converted into liquid and injected into sedimentary rock. It may be possible to capture up to 90 per cent of the CO_2 that would otherwise enter the atmosphere.

- Understanding of other mitigation strategies.

Planting trees. Trees act as carbon sinks, removing CO_2 from the atmosphere by the process of photosynthesis. They also release moisture into the atmosphere. This has a cooling effect by producing more cloud, reducing incoming solar radiation.

International agreements. The UN negotiated a new international climate change agreement for all countries at the 2015 Paris climate conference. It will be implemented from 2020. Aim is to reduce global emissions by at least 40 per cent below 2010 levels by 2030, and by 60 per cent by 2050. Intention to keep global temperature increase below 2°C. Credit reference to other climate conferences, including Madrid 2019.

Low level mitigation measures include cutting down on food waste and increasing recycling, introducing energy-saving measures at home, walking or cycling instead of taking the car, buying local food to cut down on food miles.

- Understanding of adaptation strategies shown in the photographs.

Agriculture – farmers will have to adapt as some crops may not be able to grow in a warmer or drier climate, however, drought resistant plants may be grown where rainfall is lower and other crops (eg oranges and grapes) will be able to be planted. Cultivation might be shifted to new areas and irrigation increased as rainfall patterns change.

Adjusting to rising sea levels – areas at risk from sea level rise may use sea defences to protect the land from being eroded away. Houses built on stilts may help to protect properties in vulnerable areas.

Understanding of other adaptation strategies, such as
Water supply – water transfer schemes could be used, moving water from an area of water surplus to an area of water shortage. Better management of water resources to ensure evaporation and loss are kept to a minimum. Some countries are installing desalinisation plants to cope with water supply problems.

Credit examples of mitigation and adaptation strategies.

- Evaluation of the importance of both strategies. Mitigation addresses the root causes, by reducing greenhouse gas emissions, while adaptation seeks to lower the risks posed by the consequences of climatic changes. Both approaches will be necessary, because even if emissions are dramatically decreased in the next 20–30 years, adaptation will still be needed to deal with the global changes that have already started.

AO1 – 3 marks
AO2 – 3 marks
AO3 – 3 marks

Spelling, punctuation and grammar (SPaG)

High performance
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- Learners use rules of grammar with effective control of meaning overall
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2

Threshold performance
- Learners spell and punctuate with reasonable accuracy
- Learners use rules of grammar with some control of meaning and any errors do not significantly hinder meaning overall
- Learners use a limited range of specialist terms as appropriate.

1

No marks awarded

- The learner writes nothing
- The learner's response does not relate to the question
- The learner's achievement in SPaG does not reach the threshold performance level, for example errors in spelling, punctuation and grammar severely hinder meaning.

0

[12]