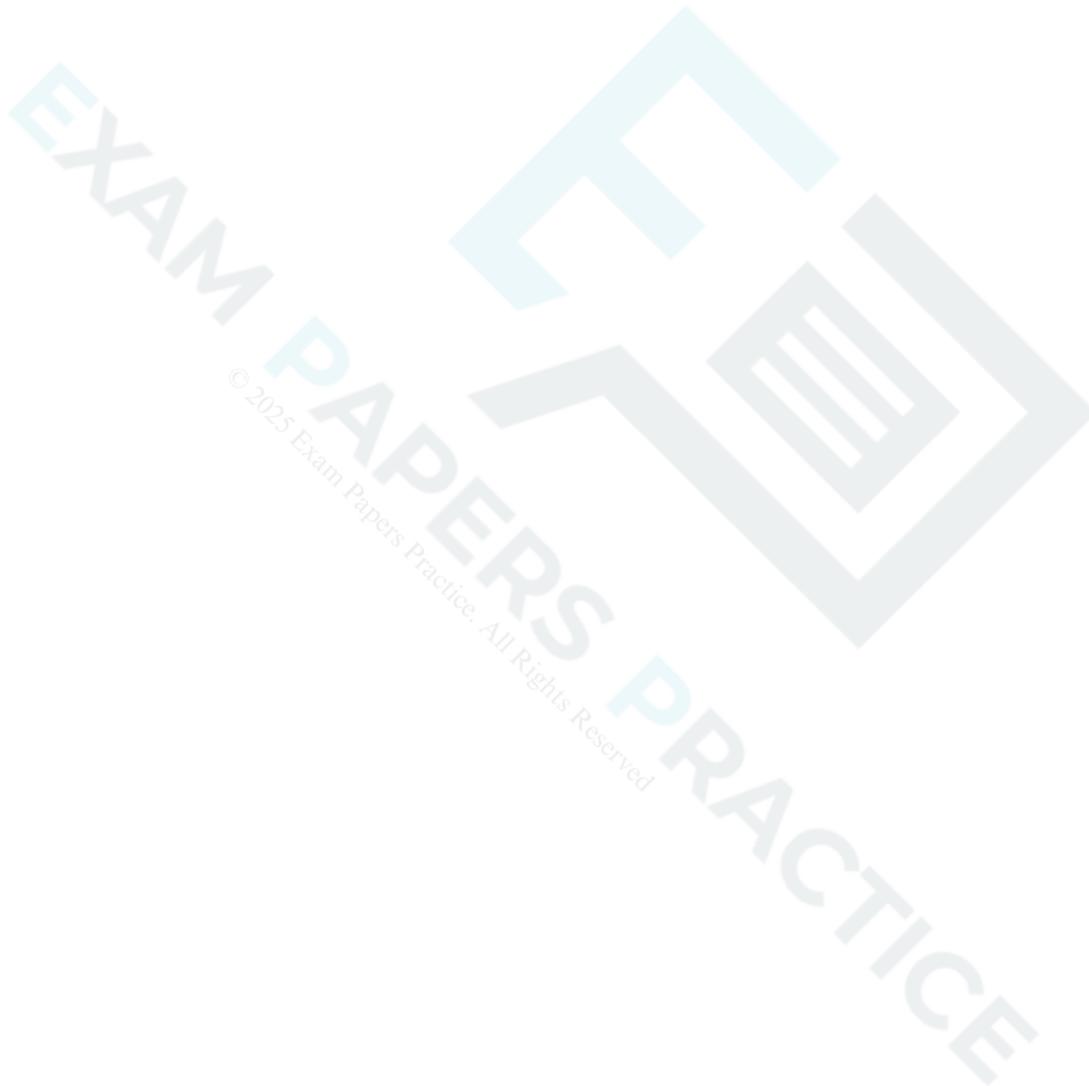


Question	Answer/Indicative content	Marks	Guidance
1	<p>All types of plate boundaries generate tectonic hazards for people. To what extent are those at convergent boundaries the most damaging?</p> <p>AO1</p> <p>Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of tectonic hazards created at plate boundaries.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of the tectonic hazards created at plate boundaries.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of the tectonic hazards created at plate boundaries.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of the tectonic hazards created at plate boundaries.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2</p> <p>Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of whether tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which tectonic hazards created at convergent plate boundaries are the most damaging to</p>	<p>33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of tectonic hazards generated at plate boundaries could potentially include:</p> <ul style="list-style-type: none"> • Divergent plate boundaries <ul style="list-style-type: none"> ◦ Seismic activity along transform faults ◦ Uprising of magma creating shield volcanoes • Conservative plate boundaries <ul style="list-style-type: none"> ◦ Friction causing seismic activity • Convergent plate boundaries; <ul style="list-style-type: none"> ◦ Faulting and fracturing in the Benioff zone causing seismic activity ◦ Subduction causing basaltic magma to melt and rise to form strato-volcanoes releasing explosive eruptions <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the extent to which tectonic hazards generated at convergent plate boundaries are the most damaging to people compared with tectonic hazards created at other plate boundaries could potentially include:</p> <ul style="list-style-type: none"> • Use of exemplar seismic or volcanic activity and the associated impact on people. E.g. VEI 4 eruption of Merapi, Indonesia in 2010 at the convergent boundary between Indo-Australian and Eurasian plate. Pyroclastic flows reached 15km at their furthest extent (southerly), lava bombs thrown 4km from summit, lahars caused widespread disruption. 367 killed, 277 injured and 410,000 made homeless. Communications disrupted as ash and pyroclastic flows destroyed infrastructure. • Ridges of diverging boundaries on average 2.5m below ocean surface so hazards limited

Question	Answer/Indicative content	Marks	Guidance
	<p>people compared with hazards created at other plate boundaries.</p> <p>Relevant concepts are authoritatively discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of whether tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to the extent to which tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of whether tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to the extent to which tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Concepts are discussed but their use lacks precision.</p>		<ul style="list-style-type: none"> • Comparison with diverging boundaries causing effusive eruptions occur here, leading to shield volcanoes which are often erupting under the ocean, and have little effect on people. • Earthquakes tend to be shallow with less strength caused as magma rises through the chamber and the vent. • However, Eyafjallajökull, Iceland 2010 (VEI 4), which disrupted European airports shut for several days in April 2010 costing airlines £130 million a day, tourists stranded, many goods spoiled as fruit and flowers were left to rot in exporting nations in Africa and the Caribbean. • Comparison with hazards created at conservative boundaries e.g. San Andreas Fault. People here experience earthquakes on a regular basis, in July 2019 earthquakes were occurring once a minute, with one at 7.1, and one at 6.4 on the Richter scale. No major impacts reported. • Measures of ‘more damaging’ must be linked to people e.g. accept environmental impacts that are discussed in terms of use by people e.g. recreation / tourism

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of whether tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which tectonic hazards created at convergent plate boundaries are the most damaging to people compared with hazards created at other plate boundaries.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The</p>		

Question	Answer/Indicative content	Marks	Guidance
	information is supported by limited evidence and the relationship to the evidence may not be clear.		
	Total	33	



Question	Answer/Indicative content	Marks	Guidance
2	<p>'Evidence from the past contributes to accurate predictions of future climate change.' Discuss.</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of past evidence and predictions of future climate change.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of past evidence and predictions of future climate change.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of past evidence and predictions of future climate change.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of the past evidence and predictions of future climate change.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how evidence from the past contributes to accurate predictions of future climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to whether evidence from the past contributes to accurate predictions of future climate change.</p> <p>Relevant concepts are authoritatively</p>	<p>33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of past evidence and predictions of future climate change could potentially include:</p> <ul style="list-style-type: none"> • Past <ul style="list-style-type: none"> ◦ Methods used to reconstruct past climate ◦ Past climate to reveal periods of greenhouse and icehouse Earth ◦ How natural forcing has driven climate change in the geological past ◦ Humans have influenced the climate system, leading to a new epoch, the Anthropocene • Future <ul style="list-style-type: none"> ◦ An effective human response relies on knowing what the future will hold e.g. importance of the carbon cycle, influence of positive and negative feedback, future emission scenarios ◦ The global cooperation of nations is also vital to managing climate change <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate whether evidence from the past contributes to accurate predictions of future climate change could potentially include:</p> <ul style="list-style-type: none"> • Without understanding the past we cannot understand the present or begin to adjust the future. • Using a variety of methods helpful for ensuring a realistic picture e.g. sea-floor sediments, ice cores, lake sediments, tree rings and fossils • We need to understand natural forcing in order to interpret results appropriately e.g. external and internal forcing mechanisms • Using past data we need to use evidence of human influences

Question	Answer/Indicative content	Marks	Guidance
	<p>discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how evidence from the past contributes to accurate predictions of future climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to whether evidence from the past contributes to accurate predictions of future climate change.³</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how evidence from the past contributes to accurate predictions of future climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to whether evidence from the past contributes to accurate predictions of future climate change.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how evidence from the past contributes to accurate predictions of future climate change.</p> <p>Demonstrates basic application of</p>		<p>especially since the industrial revolution to appreciate the speed of change and it's relative significance</p> <ul style="list-style-type: none"> • Consideration of the reliability of past data • Using a range of methods enables a more accurate reading e.g. glacial retreat, sea level rise, global temperatures as well as atmospheric water vapour and anthropogenic greenhouse gas emissions • The rate of change globally is different now as: <ul style="list-style-type: none"> ◦ technologies develop faster, ◦ increased globalisation leading to quicker communications ◦ much increased population growth <p>This limits the effectiveness of past climate change data for predicting the future.</p> <ul style="list-style-type: none"> • Society is seeing evidence of significant climate change in the recent past in contrast to evidence of slower changes over previous centuries / millennia. • It should be noted that atmospheric fluctuations are a natural phenomena.

Question	Answer/Indicative content	Marks	Guidance
	<p>knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to whether evidence from the past contributes to accurate predictions of future climate change.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
3	<p>'Vulnerability to climate change depends on location rather than the level of economic development.' Discuss.</p> <p>AO1</p> <p>Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of vulnerability to climate change and locational (spatial) factors and level of economic development.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of vulnerability to climate change and locational factors and level of economic development.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of vulnerability to climate change and locational factors and level of economic development.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of vulnerability to climate change and locational factors and level of economic development.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2</p> <p>Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how the vulnerability to climate change depends on location and level of economic development.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which the</p>	<p>33</p> <p>AO1 x9</p> <p>AO2 x24</p>	<p>Indicative content</p> <p>AO1 – 9 marks Demonstrating knowledge and understanding of vulnerability to climate change and locational factors and level of economic development could potentially include:</p> <ul style="list-style-type: none"> • What is climate change, including discussion of rates • Implications of climate change for people and the environment, such as changes to ecosystems, economies, health and extreme weather in different locations, and how these are projected to change in the future • The vulnerability of people and the environment to the impacts of climate change • Case studies of contrasting countries at different stages of economic development including current socio-economic and environmental impacts and the opportunities and threats they present, technological socio-economic and political challenges associated with effective mitigation and adaptation <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the extent to which vulnerability to climate change depends on location rather than the level of economic development, could potentially include:</p> <ul style="list-style-type: none"> • Level of economic development can determine mitigation and level of adaptation and therefore affect vulnerability for both people and environment • Vulnerability determined by effects, some of which are localised geographically e.g. only specific latitudes affected by vulnerability to tropical storms, or coastal flooding with rising sea level affects coastal zones • It could be argued that level of economic development is critical factor

Question	Answer/Indicative content	Marks	Guidance
	<p>vulnerability to climate change depends on location rather than the level of economic development.</p> <p>Relevant concepts are authoritatively discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how the vulnerability to climate change depends on location and level of economic development.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to the extent to which the vulnerability to climate change depends on location rather than the level of economic development.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how the vulnerability to climate change depends on location and level of economic development.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to the extent to which the vulnerability to climate change depends on location rather than the level of economic development.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a</p>		<p>e.g. Southern Bangladesh and South East USA are both affected by tropical storms, but Bangladesh is often more adversely affected e.g. in 1991 138,000 killed compared with 2005 in USA where 1400 died</p> <ul style="list-style-type: none"> • However, vulnerability for some people is greater e.g. farmers in marginal environments – combination of geographical vulnerability and employment that is dependent on the changing environment • Population density could be argued to affect vulnerability as in higher density areas, greater proportions of the population is at risk increasing vulnerability • Global warming is most rapid at the poles, increasing vulnerability to polar environments and population e.g. Inuits in the Arctic • Impact of heat waves on humans • Low lying coastal areas and the impact of powerful storms • Impact to the global distribution of ecosystems • Coastal flooding

Question	Answer/Indicative content	Marks	Guidance
	<p>simple analysis that shows limited accuracy of how the vulnerability to climate change depends on location and level of economic development.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which the vulnerability to climate change depends on location rather than the level of economic development.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
4	<p>Examine how climate change may be impacting the water cycle in tropical rainforests.</p> <p>Level 4 (10–12 marks) Demonstrates comprehensive knowledge and understanding of climate change and the water cycle in tropical rainforests (AO1).</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide clear, developed and convincing analysis that is fully accurate of how climate change may be impacting the water cycle in tropical rainforests (AO2).</p> <p>This will be shown by including well-developed ideas about how climate change may be impacting the water cycle in tropical rainforests.</p> <p>There are clear and explicit attempts to make appropriate synoptic links between content from different parts of the course of study.</p> <p>Level 3 (7–9 marks) Demonstrates thorough knowledge and understanding of climate change and the water cycle in tropical rainforests (AO1).</p> <p>Demonstrates thorough application of knowledge and understanding to provide clear and developed analysis that shows accuracy of how climate change may be impacting the water cycle in tropical rainforests (AO2).</p> <p>This will be shown by including well-developed ideas about either climate change or the water cycle in tropical rainforests and developed ideas for the other focus.</p> <p>There are clear attempts to make synoptic links between the content from different parts of the course of study but these are not always appropriate.</p>	<p>12 AO1 x6 AO2 x6</p>	<p>Indicative content AO1 – 6 marks Knowledge and understanding of climate change and the water cycle in tropical rainforests could potentially include:</p> <ul style="list-style-type: none"> • Climate change <ul style="list-style-type: none"> ◦ increase in surface, atmospheric and oceanic temperatures ◦ rising sea level ◦ increasing atmospheric water vapour ◦ climate modelling to show influence of positive and negative feedback • Water cycle in the tropical rainforest <ul style="list-style-type: none"> ◦ water cycles specific to tropical rainforests ◦ physical factors affecting the flows and stores in the water cycle, including temperature ◦ explore changes to the flows and stores within the water cycle caused by natural factors <p>AO2 – 6 marks Application of knowledge and understanding to analyse how climate change may be impacting the water cycle in tropical rainforests could potentially include:</p> <ul style="list-style-type: none"> • tropical rainforests have high average annual temperatures and high average annual rainfall, with little or no ‘dry’ season. • Some areas are predicted to be much drier as a result of climate change with a pronounced dry season. • Precipitation may be less frequent and more intense leading to increased run-off and reduced stores of water. This could cause increased stress on plants and reduced ability to grow as water supplies limited • precipitation feedback loops likely to change as precipitation events are less frequent, but high • temperatures cause continued high rates of evaporation from interception

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 2 (4–6 marks) Demonstrates reasonable knowledge and understanding of climate change and the water cycle in tropical rainforests (AO1).</p> <p>Demonstrates reasonable application of knowledge and understanding to provide sound analysis that shows some accuracy of how climate change may be impacting the water cycle in tropical rainforests (AO2).</p> <p>This will be shown by including developed ideas about either climate change or the water cycle in tropical rainforests and simple ideas for the other focus.</p> <p>There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant.</p> <p>Level 1 (1–3 marks) Demonstrates basic knowledge and understanding of climate change and the water cycle in tropical rainforests (AO1).</p> <p>Demonstrates basic application of knowledge and understanding to provide simple analysis that shows limited accuracy of how climate change may be impacting the water cycle in tropical rainforests (AO2).</p> <p>This will be shown by including simple ideas about climate change and the water cycle in tropical rainforests.</p> <p>There are limited attempts to make synoptic links between content from different parts of the course of study.</p> <p>0 marks No response or no response worthy of credit.</p>		<p>storage on leaf surfaces and transpiration from the soil</p> <ul style="list-style-type: none"> continued high temperatures will continue to allow high capacity for water storage in the atmosphere, however vegetation storage likely to decrease
	Total	12	

Question		Answer/Indicative content	Marks	Guidance
5	a	<p>Identify <u>three</u> limitations of <u>Fig. 1</u> as a source of information about the greenhouse effect.</p> <p>Possible limitations include:</p> <ul style="list-style-type: none"> • GHGs present throughout the atmosphere not just in an upper level layer • No indication of different types and efficacy of GFGs • Nothing to indicate where the GHGs originate from - natural or anthropogenic • No scale to show the relevance of the width of arrows – i.e. absence of quantification • Lack of information about the source e.g. date • No labelling of incoming radiation flows as short-wave 	<p>3 AO3 x3</p>	<p>AO3 – 3 marks</p> <p>3x1 (✓) for limitations of the data identified through critical questioning of the resource.</p>

Question	Answer/Indicative content	Marks	Guidance
b	<p>Explain how geoengineering can cut global emissions of greenhouse gases.</p> <p>Level 3 (5-6 marks) Demonstrates thorough knowledge and understanding of how geoengineering can cut global emissions of greenhouse gases (AO1). This will be shown by including well-developed ideas about how geoengineering can cut global emissions of greenhouse gases.</p> <p>Level 2 (3-4 marks) Demonstrates reasonable knowledge and understanding of how geoengineering can cut global emissions of greenhouse gases (AO1). This will be shown by including developed ideas about how geoengineering can cut global emissions of greenhouse gases.</p> <p>Level 1 (1-2 marks) Demonstrates basic knowledge and understanding of how geoengineering can cut global emissions of greenhouse gases (AO1). There may be simple ideas about how geoengineering can cut global emissions of greenhouse gases.</p> <p>0 marks No response or no response worthy of</p>	6 AO1 x6	<p>Indicative content AO1 – 6 marks</p> <p>Knowledge and understanding of how geoengineering can cut global emissions of greenhouse gases could potentially include:</p> <ul style="list-style-type: none"> • geoengineering = use of technology to modify environment on a <u>large-scale</u> • two types of strategy - ↓ amount of insolation entering atmosphere; ↓ level of CO₂ in atmosphere – NB it is only geoengineering that reduces emissions of GHGs that is relevant • carbon removal: fertilising oceans with iron to absorb carbon dioxide through increased phytoplankton growth • carbon capture: developing plastic trees which absorb and store carbon dioxide • enhanced weathering – crushing huge quantities of some types of rock to ↑ surface area → accelerated weathering absorbing CO₂ to form carbonates – sequestration
	Total	9	

Question	Answer/Indicative content	Marks	Guidance
6	<p>Explain the influence of climate change on raised beaches.</p> <p>Level 3 (6-8 marks) Demonstrates thorough knowledge and understanding of how climate change influences raised beaches (AO1). This will be shown by including well-developed ideas with a clear appreciation of how climate change influences raised beaches.</p> <p>Level 2 (3-5 marks) Demonstrates reasonable knowledge and understanding of how climate change influences raised beaches (AO1). This will be shown by including developed ideas with some appreciation of how climate change influences raised beaches.</p> <p>Level 1 (1-2 marks) Demonstrates basic knowledge and understanding of how climate change influences raised beaches (AO1). This will be shown by including simple ideas with no or limited appreciation of how climate change influences raised beaches.</p> <p>0 marks No response or no response worthy of credit.</p>	<p style="text-align: center;">8 AO1 x8</p>	<p>Indicative content: AO1 – 8 marks Knowledge and understanding of how climate change could influence raised beaches could potentially include:</p> <ul style="list-style-type: none"> • The influence of past climate; <ul style="list-style-type: none"> ◦ during inter-glacial periods the raised beach would have been a shore platform being eroded by abrasion at high tide and weathered by organic acids from molluscs at low tide ◦ as sea level dropped when global temperatures lowered, abrasion would be less influential as the depth of water and power of the waves also reduced until even at high tide, the shore platform was no longer covered and a raised beach was formed ◦ eustatic/isostatic change as climate changes over the centuries • The influence of present climate; <ul style="list-style-type: none"> ◦ higher seasonal temperatures would encourage greater rates of chemical weathering; Van't Hoff's Law ◦ precipitation would enable organic acids to weather the rock if vegetated. ◦ if the raised beach was exposed, salt crystallisation would weather it slowly, although this is most effective in temperatures of 26-28°C • The influence of future climate change could also be relevant
	Total	8	

Question	Answer/Indicative content	Marks	Guidance
7	<p>Assess the success of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of adaptation strategies to reduce the vulnerability of human populations at risk from climate change</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence</p>	<p>33</p> <p>AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of adaptation strategies reducing the vulnerability of human populations at risk from climate change could potentially include:</p> <ul style="list-style-type: none"> • Definition/examples of adaption • Framework of adaption and its implementation in a range of communities e.g. retreat, accommodation and protection strategies • What future homes, offices, cities, transport and economies will look like following adaptation throughout the 21st century • Vulnerability – why people continue to live in areas prone to risk/ability to cope with risk. Two contrasting case studies to illustrate adaptation strategies and associated technological, socio-economic and political challenges associated with them <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the success of adaptation strategies to reduce the vulnerability of human populations at risk from climate change could potentially include:</p> <ul style="list-style-type: none"> • Success may be judged in a number of different ways e.g. sustainability, cost benefit analysis, appropriate technology etc. • A wide range of case studies can be used to exemplify • Economic development can affect success of strategies e.g. managed retreat in UK, including land use zoning through shoreline management plans, has worked; however, in Bangladesh 140 million live on the Ganges-Brahmaputra delta unable to afford to move

Question	Answer/Indicative content	Marks	Guidance
	<p>based of the success of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Relevant concepts are authoritatively discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions of the success of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence of the success of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of</p>		<ul style="list-style-type: none"> • Reducing deforestation in EDCs and LIDCs is a more sustainable soft option for reducing vulnerability to climate change (minimise floods, reduce soil erosion e.g. UN’s REDD scheme educating and paying local tribes to protect the rainforest); significantly cheaper than hard engineering structures such as steel and concrete structures on slopes or storm surge barriers in the Netherlands. Many challenges in the physical management of large areas as well as training/education needs for local communities to make the schemes successful • Some technological adaptations use simple technology and are environmentally friendly. Training/education needed. Examples rainwater harvesting, use of grey water, sunshades for windows, white walls and ceilings, green roofs etc • In Bangladesh protection of coastal mangroves forests, a priority. However, local communities motivated by economic gain, clearing the forest for agriculture and lucrative fish farming, limiting success of coastal protection measures • In Australia there is much more hard engineering protecting economic centres as well as land use planning to prevent building in flood prone areas, relocation of high value residential and business areas as well as dam projects to mitigate increasing drought. • The success of adaptation projects will be debated and the impacts on vulnerable populations explored to allow credit for evaluation • Evaluation of other methods of mitigating against climate change

Question	Answer/Indicative content	Marks	Guidance
	<p>knowledge and understanding to provide a simple analysis that shows limited accuracy of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions of the success of adaptation strategies to reduce the vulnerability of human populations at risk from climate change.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
8	<p>'Changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.' Discuss</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of changes in anthropogenic greenhouse gas emissions since the pre-industrial era and economic development at a national scale.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of changes in anthropogenic greenhouse gas emissions since the pre-industrial era and economic development at a national scale.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of changes in anthropogenic greenhouse gas emissions since the pre-industrial era and economic development since 1850 at a national scale.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of changes in anthropogenic greenhouse gas emissions since the pre-industrial era and economic development at a national scale.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Demonstrates comprehensive application</p>	<p>33</p> <p>AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of changes in anthropogenic greenhouse gas emissions since the pre-industrial era and economic development at a national scale could potentially include:</p> <ul style="list-style-type: none"> • Definition/examples of 'anthropogenic' gas emissions • the balance of anthropogenic emissions around the world and how this has changed in recent history • how anthropogenic emissions influence the global mean energy budget • example(s) of economic development at national scale <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the extent to which changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale could potentially include:</p> <ul style="list-style-type: none"> • Evaluation of different greenhouse gases and their variations in contributions and their contributions to global warming e.g. carbon dioxide increased significantly since 1960, related to changes in ACs in particular, although mix changing. Note China and India despite large contribution to global emissions have relatively low emissions per capita • Depending on case studies used comments relating to population growth, land-use changes and energy demand and mix as well as other principal activities responsible for greenhouse gas emissions • Contribution of factors responsible for changes in emissions over time and space other than economic development e.g. response to international protocols, new

Question	Answer/Indicative content	Marks	Guidance
	<p>of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Relevant concepts are authoritatively discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to the extent to which changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to the extent to which changes in anthropogenic greenhouse gas emissions since the pre-industrial era</p>		<p>technologies, political pressure etc</p> <ul style="list-style-type: none"> • Prediction of future trends also applicable and may indicate higher level answer • Reasons GHGs can increase as a result of industrialisation (demand for energy, technological advances, transport and manufacturing, population growth, land use change). • Reference to current situation and countries currently reducing GHG emissions • Higher level answer likely to include discussion about international protocol and political pressure

Question	Answer/Indicative content	Marks	Guidance
	<p>reflect economic development at a national scale.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which changes in anthropogenic greenhouse gas emissions since the pre-industrial era reflect economic development at a national scale.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p>		

Question			Answer/Indicative content	Marks	Guidance
			<p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
			Total	33	

EXAM PAPERS PRACTICE

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Question	Answer/Indicative content	Marks	Guidance
9	<p>Assess how responses to climate change are affected by issues of <u>either</u> human rights <u>or</u> territorial integrity.</p> <p>Level 4 (10-12 marks) Demonstrates comprehensive knowledge and understanding of responses to climate change and issues of either human rights or territorial integrity (AO1). Demonstrates comprehensive application of knowledge and understanding to provide clear, developed and convincing analysis that is fully accurate of how responses to climate change are affected by issues of either human rights or territorial integrity (AO2). This will be shown by including well-developed ideas about how responses to climate change are affected by issues of either human rights or territorial integrity. There are clear and explicit attempts to make appropriate synoptic links between content from different parts of the course of study.</p> <p>Level 3 (7-9 marks) Demonstrates thorough knowledge and understanding of responses to climate change and issues of either human rights or territorial integrity (AO1). Demonstrates thorough application of knowledge and understanding to provide clear and developed analysis that shows accuracy of how responses to climate change are affected by issues of either human rights or territorial integrity (AO2). This will be shown by including well-developed ideas about either responses to climate change or issues of either human rights or territorial integrity and developed ideas for the other focus. There are clear attempts to make synoptic links between the content from different parts of the course of study, but these are not always appropriate.</p> <p>Level 2 (4-6 marks) Demonstrates reasonable knowledge and understanding of responses to climate</p>	<p style="text-align: center;">12</p> <p>AO1 x6 AO2 x6</p>	<p>Indicative content AO1 – 6 marks Knowledge and understanding of responses to climate change and issues of <u>either</u> human rights <u>or</u> territorial integrity could potentially include:</p> <p>Responses to climate change could include:</p> <ul style="list-style-type: none"> • Work of the IPCC, international directives (e.g. Kyoto protocol), EU climate directives all depend on co-operation at all scales for success • Carbon trading and carbon credits • National and sub-national policies • There are a range of methods at a range of scales <p>Issues of human rights</p> <ul style="list-style-type: none"> • How human rights are promoted and protected by global governance e.g. treaties, laws, institutions, norms • Contributions and interactions of global governance of different organisations (UN/national government/NGO) at a range of scales • How global governance of human rights has consequences for citizens and places both positive and negative <p>OR - Issues of territorial integrity</p> <ul style="list-style-type: none"> • How access to resources can cause territorial conflict • Role of institutions, treaties, laws and norms in regulating conflict • Interventions and interactions of organisations at a range of scales • Consequences for local communities (both positive and negative) <p>AO2 – 6 marks Application of knowledge and understanding to analyse how responses to climate change are affected by issues of <u>either</u> human rights <u>or</u> territorial integrity could potentially include:</p>

Question	Answer/Indicative content	Marks	Guidance
	<p>change and issues of either human rights or territorial integrity (AO1). Demonstrates reasonable application of knowledge and understanding to provide sound analysis that shows some accuracy of how responses to climate change are affected by issues of either human rights or territorial integrity (AO2). This will be shown by including developed ideas about either responses to climate change or issues of either human rights or territorial integrity and simple ideas for the other focus. There are some attempts to make synoptic links between content from different parts of the course of study, but these are not always relevant.</p> <p>Level 1 (1-3 marks) Demonstrates basic knowledge and understanding of responses to climate change and issues of either human rights or territorial integrity (AO1). Demonstrates basic application of knowledge and understanding to provide simple analysis that shows limited accuracy of how responses to climate change are affected by issues of either human rights or territorial integrity (AO2). This will be shown by including simple ideas about responses to climate change or issues of either human rights or territorial integrity. There are limited attempts to make synoptic links between content from different parts of the course of study.</p> <p>0 marks No response or no response worthy of credit.</p>		<ul style="list-style-type: none"> • where human rights or territorial integrity are stable, the international responses to climate change are likely to be stable, experience greater success and uniformity e.g. ACs and some EDCs • a wide range of examples could be used, at a variety of different scales. Although question specifies international responses, these could be exemplified at a national or sub-national scale (e.g. Scottish v. UK emission targets) • International responses could have varying rates of success e.g. less unified response, if any, to climate change where human rights (China/India exemption from Kyoto), or territorial integrity under dispute (eg Azawad, Tuareg Mali, where instability has led to UN involvement, but not related to responses to climate change), • Role of other organisations such as World bank and Oxfam. • A country's right to development – some don't sign up to initiatives as they believe it is their right to economic prosperity. • Response to climate change can be about the rights of citizens to be free from issues associated with it • Countries experiencing human rights abuses can be more prone to suffering the consequences of climate change. • Many are of the belief that ACs should pay LIDCs to protect the environment and mitigate against climate change.
	Total	12	

Question		Answer/Indicative content	Marks	Guidance
10	a	<p>Identify <u>three</u> limitations of Fig. 1 as a source of information about shrinking ice as a result of climate change.</p> <p>The photograph shows the meltwaters and a distant glimpse of the Franz Josef glacier, New Zealand. Possible limitations include:</p> <ul style="list-style-type: none"> • No evidence on rate of change i.e. no early photo to compare • Reasons for melting of ice/shrinking of glacier not clear e.g. temperature data • No clear evidence of scale e.g. scale of glacier and valley which can inform comments regarding rate of change • Franz Josef is just one glacier and not necessarily representative of all • Who produced the source – bias / purpose of photo • Time of year photo taken – seasonal change to extent of ice 	<p style="text-align: center;">3</p> <p>AO3 x3</p>	<p>AO3 – 3 marks</p> <p>3x1 (✓) for three limitations of the photograph as a source of information identified through critical study of the resource.</p>

Question		Answer/Indicative content	Marks	Guidance
	b	<p>Explain the role and possible bias of the media in shaping the public image of climate change.</p> <p>Level 3 (5-6 marks) Demonstrates thorough knowledge and understanding of the role and possible bias of the media in shaping the public image of climate change (AO1).</p> <p>This will be shown by including well-developed ideas about the role and possible bias of the media in shaping the public image of climate change.</p> <p>Level 2 (3-4 marks) Demonstrates reasonable knowledge and understanding of the role and possible bias of the media in shaping the public image of climate change (AO1).</p> <p>This will be shown by including developed ideas about either the role or possible bias of the media in shaping the public image of climate change.</p> <p>Level 1 (1-2 marks) Demonstrates basic knowledge and understanding of either the role or possible bias of the media in shaping the public image of climate change (AO1).</p> <p>There may be simple ideas about either the role or possible bias of the media in shaping the public image of climate change.</p> <p>0 marks No response or no response worthy of credit.</p>	<p>6</p> <p>AO1 x 6</p>	<p>Indicative content AO1 – 6 marks</p> <p>Knowledge and understanding of the role and possible bias of the media in shaping the public image of climate change could potentially include:</p> <p>Role</p> <ul style="list-style-type: none"> • Crucial role in forming public opinion as many do not read scientific papers, reports, blogs + specialist websites • Social media growing in popularity as source of information / opinion <p>Bias</p> <ul style="list-style-type: none"> • Simplistic and sensational reporting in some media • Social media in particular unregulated allowing unsubstantiated claims to be made • Not necessarily representative of scientific research – overwhelming majority of scientific research supports idea of anthropogenic climate change - false balance by giving equal weighting to dissenting views - increasing appearance of controversy • Political leanings of the media organisation will slant the content e.g. right leaning publications are more sceptical than left and their differences make the issue appear more contentious than it is • Some of the strongest opinions are from large wealthy companies (with media influence) seeking to protect profits from extraction and use of fossil fuels by opposing climate change evidence • Role and bias to be considered for bottom of L2+.
		Total	9	

Question	Answer/Indicative content	Marks	Guidance
11	<p>To what extent are national and sub-national policies more effective than international responses to climate change?</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of international, national and sub-national responses to climate change.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of international, national and sub-national responses to climate change.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of international, national and sub-national responses to climate change.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of international, national and sub-national responses to climate change.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how national and sub-national policies can successfully respond to climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to whether national and sub-national policies are more effective in responding to climate change than international responses.</p> <p>Relevant concepts are authoritatively</p>	<p>33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of international, national and sub-national responses to climate change could potentially include:</p> <ul style="list-style-type: none"> • Role of the IPCC <ul style="list-style-type: none"> ◦ Created by the UN & WMO to provide objective scientific and transparent reports on climate change which are neutral and non-binding • International directives <ul style="list-style-type: none"> ◦ The Kyoto Protocol 1997 first legally binding international agreement responding to climate change. ◦ Most countries achieved the 5% target set, however 12 failed to achieve their targets. • Carbon trading and credits schemes <ul style="list-style-type: none"> ◦ EU ETS is the most successful scheme. It operates over 31 countries and involves 11,000 heavy energy-using installations and airlines. The scheme accounts for 45% of EU GHG emissions • National policies <p>These are wide ranging in scope and content. E.g. Denmark</p> <ul style="list-style-type: none"> ◦ committed to 100% renewable energy by 2050 through wind & solar power, carbon taxes, tax relief for hydrogen & electric cars, subsidised public transport, cycling and management of methane in agriculture ◦ Adaptation policies have also been created with ‘climate-proof neighbourhoods’, improvements to the Copenhagen’s drainage system, raised dykes & storm barriers • Subnational policies e.g. California, USA recognised as world leader. State wide legislation in 2006 towards clean energy, cap-and-trade system, promoting renewable energies

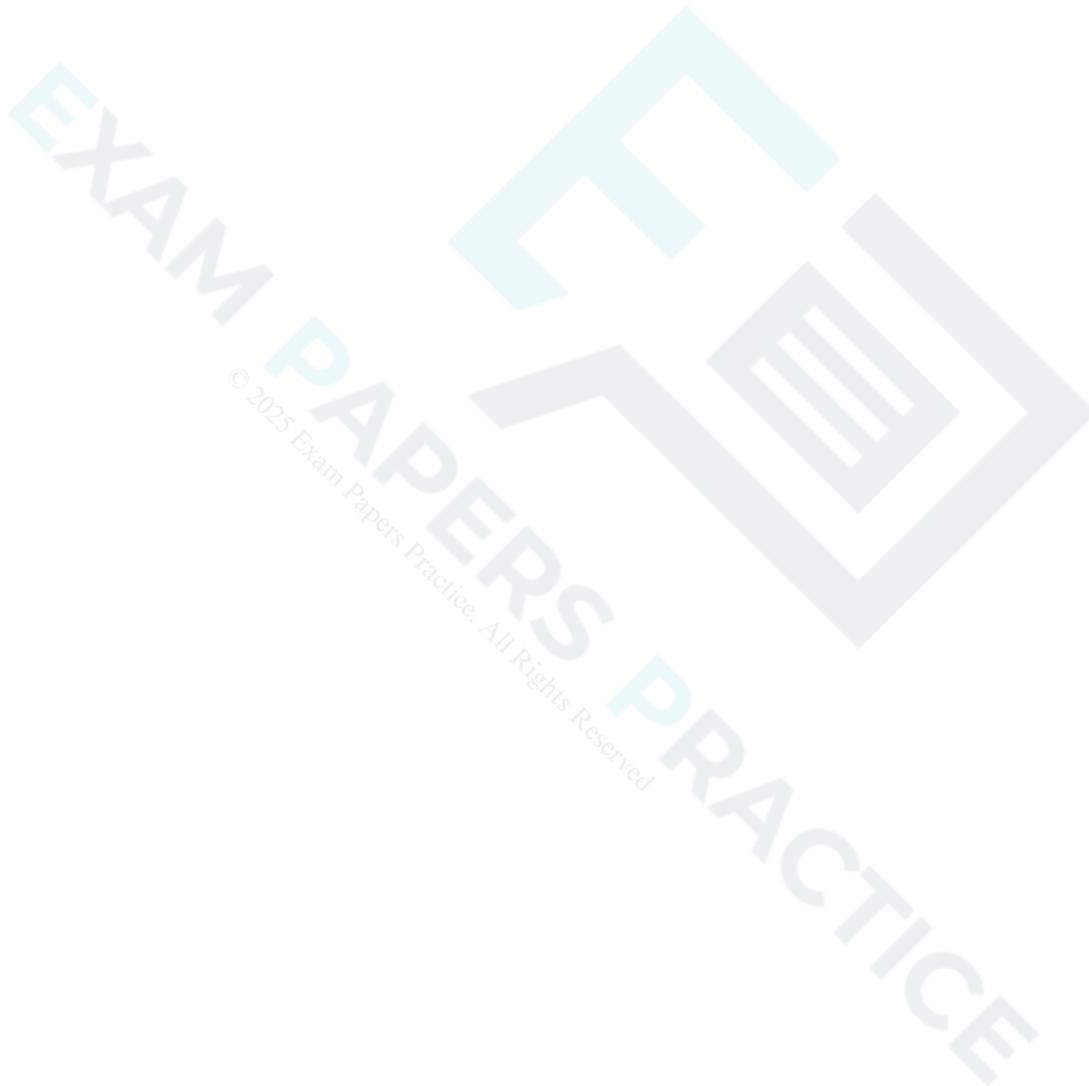
Question	Answer/Indicative content	Marks	Guidance
	<p>discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how national and sub-national policies can successfully respond to climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to whether national and sub-national policies are more effective in responding to climate change than international responses.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how national and sub-national policies can successfully respond to climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to whether national and sub-national policies are more effective in responding to climate change than international responses.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how national and sub-national policies can successfully respond to climate change.</p>		<p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the extent to which national and sub-national policies are more effective in responding to climate change than international responses could potentially include:</p> <ul style="list-style-type: none"> • Limitations of sub-national policies: smaller political force, smaller population, smaller impact, although potentially fewer political obstacles • Benefits of sub-national policies: policing change often easier, policy appropriate to geography and population in that area so more targeted and more successful, potentially faster process from conception to implementation • Limitations of national policies: contrasts within country may limit success e.g. rural/urban or core/periphery divides, smaller impact than international policies • Benefits of national policies: single government, less complicated political system, faster implementation, policy can be more targeted for geography/culture/development than international options • The UN climate conference in Paris 2015 used the most recent IPCC report to discuss a legally binding universal international agreement which 174 countries had ratified by 2017, and 197 signed. In this instance it is difficult to say which is the most effective; the report or the conference bringing countries together and encouraging ratification – without the report, would the international directive have become legally binding? Without the ratification by nations there is limited success as was seen with Kyoto Protocol 1997 and the USA, Russia, China, Japan and India who are not party to that agreement. • The Kyoto Protocol was informed by the SAR (Second Assessment Report) 1996 from IPCC, indicating that they



Question	Answer/Indicative content	Marks	Guidance
	<p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to whether national and sub-national policies are more effective in responding to climate change than international responses.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		<p>are mutually dependent and mutually effective, however there has not been international directives following all of the five reports</p> <ul style="list-style-type: none"> • IPCC involves range of scientific opinion and strives towards a non-bias and consensus across the scientific community – this in itself could be argued to be the most effective of geopolitical methods as one united voice is a much stronger political force which has led to international directives and subsequent national policy • The Kyoto Protocol was ineffective in a number of ways; firstly EDCs and LIDCs were exempt particularly China & India (prioritised economic development over climate mitigation), secondly one third of ACs failed to reach their targets, thirdly the USA failed to ratify the agreement and as one of the largest contributors this caused a significant amount of controversy • EU has pioneered this with the world's largest trading scheme however many argue the targets are not rigorous and are too easy for nation states to meet. 2020 targets were met by a number of nations in 2011, in comparison some member states have been very slow to implement directives. The UK increased renewable energy output by 90% in 4 years in response to the Renewables Directive <p><u>Examiner's Comments</u></p> <p>This was by far the more popular of the two questions in this Option. Candidates were generally secure in their knowledge of international responses to climate change. Kyoto and Paris were frequently mentioned with varying degrees of authority as regards their details. The setting of targets as regards carbon emissions linked to restricting temperature rise was mentioned by most. It was encouraging that the majority were able to describe the aims of the various protocols and to assess their</p>

Question	Answer/Indicative content	Marks	Guidance
			<p>relative effectiveness in terms of compliance or otherwise by various nation states. If there was a weakness it was that too much was made of Kyoto in contrast to the Paris Conference of 2015 given that this more recent agreement has superseded Kyoto in terms of international policies. The weaker responses barely, if at all mentioned Paris. That said, the inherent flaws in Kyoto were well used in many of the more convincing discussions. The tensions evident at the international scale were also well outlined among the upper quartile candidates. Less convincing discussions tended to rely on simply stating that President Trump did not believe in global warming and so had pulled the USA out of the agreement signed at Paris. The other international scale policy mentioned frequently was that of the EU. The EU's emissions trading system (EUETS) was assessed with candidates pointing out the benefits of a smaller group of countries working together especially given that inevitably they are located close by each other and so share similar issues.</p> <p>National policies were most often set in the context of ACs such as Denmark, the UK or Germany. There were detailed descriptions of national policies such as Denmark's aim to move to zero-emission cars by 2035, reducing methane emissions from agriculture and reduction in the use of oil and gas for heating.</p> <p>Sub-nationally was quite often ignored in the weaker answers but was a feature of the stronger ones. The examples most cited were those of California and Copenhagen. Cap and trade, promotion of renewable technologies, climate proof neighbourhoods were mentioned as being positive steps taken by communities.</p> <p>Evaluation of the national and sub-national scales tended to suggest that it can be a more straightforward task to arrive at a policy covering smaller spatial areas and</p>

Question			Answer/Indicative content	Marks	Guidance
					that co-ordinating implementation and policing is easier. It was a feature of the more sophisticated discussions that the symbolic value of large scale international accord has value and that while the handful of countries responsible for a disproportionately large share may not fully agree, the fact that global warming is just that, global, means that international policies are significant.
			Total	33	



Question	Answer/Indicative content	Marks	Guidance
12	<p>'Predicting what the future will hold for the carbon cycle is essential when responding to climate change.' Discuss.</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of the importance of carbon cycle for climate modelling and predicting climate change in the future.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of the importance of carbon cycle for climate modelling and predicting climate change in the future</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of the importance of carbon cycle for climate modelling and predicting climate change in the future.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of the importance of carbon cycle for climate modelling and predicting climate change in the future.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the role of prediction for the carbon cycle in responding effectively to climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to whether predicting what the future will hold for the carbon cycle is</p>	<p align="center">33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding the importance of carbon cycle for climate modelling and predicting climate change in the future could potentially include:</p> <ul style="list-style-type: none"> • Carbon emissions • CO2 is the second most important greenhouse gas after water vapour • Carbon cycle, its climatic impact • Positive and negative feedback in the carbon cycle • Climate modelling • IPCC predictions • future scenarios including a range of inter-related factors that are not all directly linked to the carbon cycle <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate whether predicting what the future will hold for the carbon cycle is essential when responding to climate change could potentially include:</p> <ul style="list-style-type: none"> • Discussion of the global carbon cycle, future predictions and response to climate change could be explored at a range of scales ie global, national and local (grassroots initiatives) • Predicting the future may not be as easy as we think <ul style="list-style-type: none"> ◦ Relative importance of all inter-related factors that affect climate change from CO2 to cloud cover ◦ Implications of future scenarios based on the carbon cycle lead to decisions managing response ◦ Level of understanding of inter-relating factors varies so reliability of predictions may be debatable • Climate is global • Responses to climate change that focus on the carbon cycle may be international or national including the ideas below;

Question	Answer/Indicative content	Marks	Guidance
	<p>essential when responding to climate change.</p> <p>Relevant concepts are authoritatively discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of the role of prediction for the carbon cycle in responding effectively to climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to whether predicting what the future will hold for the carbon cycle is essential when responding to climate change.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of the role of prediction for the carbon cycle in responding effectively to climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to whether predicting what the future will hold for the carbon cycle is essential when responding to climate change.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of the role of prediction for the</p>		<ul style="list-style-type: none"> • Reducing energy use which would reduce GHGs. <ul style="list-style-type: none"> ◦ National - UK bringing in regulations on EPCs in 2008, offering incentives for improving EPCs because domestic demand accounts for 1/3 of primary energy consumption ◦ EU Renewable Energy Directive forced UK to work towards 15% increase in renewable sources of energy leading to e.g. closure of several coal-fired power stations e.g. Ferrybridge 0215, Eggborough 2016 ◦ Australia bound by Copenhagen 2013 to cap-and-trade scheme and targets for increased energy consumption from renewable sources • Restoring carbon in long-term storage e.g. carbon capture and storage is expensive but feasible – it offsets 80% of carbon pollution from power stations, however it is limited to areas with suitable geology e.g. porous rocks beneath impermeable strata and expense e.g. Drax project cut in 2016, pilot project only in Peterhead UK • Protecting tropical forests from deforestation to maintain carbon reservoir – UNREDD programme • Geoengineering techniques e.g. fertilising oceans with iron to stimulate phytoplankton growth & increase photosynthesis (more CO₂ absorbed), enhanced weathering or increasing CO₂ capture using artificial trees made from a plastic resin <p><u>Examiner's Comments</u></p> <p>This question was less frequently seen by examiners of the two in the Option. It was disappointing that too few candidates were secure in their knowledge and understanding of the carbon cycle. In particular, the important distinction between the fast and slow carbon cycles was rarely discussed. The more convincing</p>



Question	Answer/Indicative content	Marks	Guidance
	<p>carbon cycle in responding effectively to climate change.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to whether predicting what the future will hold for the carbon cycle is essential when responding to climate change.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4</p> <p>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3</p> <p>There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2</p> <p>The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1</p> <p>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		<p>discussions made authoritative use of terms such as 'flux', 'sink' and 'sequester' as well as employing ideas such as feedback to highlight the relationship between the carbon cycle and climate change.</p> <p>Candidates tended to focus more on the responses to climate change they were aware of and did not link these clearly enough to the carbon cycle. A minority of candidates saw this question as an opportunity to 'write all they could remember' of mitigation and adaptation strategies. Measures such as those aimed at reducing carbon emissions were well known such as various international agreements (Kyoto, Copenhagen, Paris), cap and trade schemes and replacement of fossil fuel energy generation by renewables. Geoengineering, such as artificial plants absorbing CO₂ and fertilising oceans to stimulate phytoplankton growth were mentioned by some but hardly ever linked explicitly with the carbon cycle.</p> <p>A very few considered the effectiveness of predictions such as the need to make assumptions and simplify both natural processes and human actions when modelling in order to predict. In this context comments about the level of detail required were rarely included. The role of chance was not well known but comments about the 'rights' of LIDCs and EDCs to improve the lives of their populations which is likely to involve increased energy demand were included by a good number. It was interesting to read comments about just how complex and dynamic the carbon cycle is which makes predictions so challenging.</p>
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
13	<p>Examine how impacts of climate change can affect informal representations of place.</p> <p>Level 4 (10-12 marks) Demonstrates comprehensive knowledge and understanding of impacts of climate change and informal representations of place (AO1).</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide clear, developed and convincing analysis that is fully accurate of how impacts of climate change can affect informal representations of place (AO2).</p> <p>This will be shown by including well-developed ideas about impacts of climate change and informal representations of place.</p> <p>There are clear and explicit attempts to make appropriate synoptic links between content from different parts of the course of study.</p> <p>Level 3 (7-9 marks) Demonstrates thorough knowledge and understanding of impacts of climate change and informal representations of place (AO1).</p> <p>Demonstrates thorough application of knowledge and understanding to provide clear and developed analysis that shows accuracy of how impacts of climate change can affect informal representations of place (AO2).</p> <p>This will be shown by including well-developed ideas about either impacts of climate change or informal representations of place and developed ideas for the other focus.</p> <p>There are clear attempts to make synoptic links between the content from different parts of the course of study but these are</p>	<p>12 AO1 x6 AO2 x6</p>	<p>Indicative content AO1 – 6 marks Knowledge and understanding of impacts of climate change and informal representations of place could potentially include:</p> <ul style="list-style-type: none"> • Any impact of climate change is relevant, although candidates will probably focus on impacts e.g. rise in temperatures leading to alteration of flood events both in pattern and intensity, change in precipitation patterns leading to arid conditions, shrinking glaciers, coral bleaching, ecosystem change, new diseases, droughts, desertification etc • Informal representations of place can be through a wide variety of media/sources e.g. film, television, music, art, photography, literature, graffiti, blogs, social media • Candidates may use examples at a variety of scales from a town through to a place such as the Arctic. <p>AO2 – 6 marks Application of knowledge and understanding to analyse how impacts of climate change can affect informal representations of place could potentially include:</p> <ul style="list-style-type: none"> • Candidates may focus on one place alone, or a variety of places. • There is a very wide variety of material candidates might use <ul style="list-style-type: none"> ◦ television e.g. Norwegian political drama <i>Occupied</i> where oil interests prevent climate action in Russia; American sci-fi drama <i>Incorporated</i> depicts Miami ravaged by climate change ◦ film e.g. <i>Day After Tomorrow</i> with its images of New York under enormous snow drifts; <i>Before the Flood/An Inconvenient Truth/Chasing Ice</i> documentary film examples are acceptable,

Question	Answer/Indicative content	Marks	Guidance
	<p>not always appropriate.</p> <p>Level 2 (4-6 marks) Demonstrates reasonable knowledge and understanding of impacts of climate change and informal representations of place (AO1).</p> <p>Demonstrates reasonable application of knowledge and understanding to provide sound analysis that shows some accuracy of how impacts of climate change can affect informal representations of place (AO2).</p> <p>This will be shown by including developed ideas about either impacts of climate change or informal representations of place and simple ideas for the other focus.</p> <p>There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant.</p> <p>Level 1 (1-3 marks) Demonstrates basic knowledge and understanding of impacts of climate change and informal representations of place (AO1).</p> <p>Demonstrates basic application of knowledge and understanding to provide simple analysis that shows limited accuracy of how impacts of climate change can affect informal representations of place (AO2).</p> <p>This will be shown by including simple ideas about impacts of climate change and informal representations of place.</p> <p>There are limited attempts to make synoptic links between content from different parts of the course of study.</p> <p>0 marks No response or no response worthy of credit</p>		<p><i>Waterworld</i> depicting a flooded earth after polar ice caps have melted</p> <ul style="list-style-type: none"> ◦ music e.g. Erik Ian Walker's Climate within ClimateMusic Project using music and displays to educate about the earth; UN's <i>Love Song to Earth</i>, Joni Michell's Big Yellow Taxi, Michael Jackson's Earth Song, Daniel Crawford's <i>Planetary Bands</i>, Warming World ◦ art e.g. Olafur Eliasson's <i>Your Waste of Time</i>, John Sabraw's <i>Toxic Sludge</i>, Naziha Mestaoui's <i>One Beat, One Tree</i>, Paulo Grangeon's <i>Pandas on Tour</i> ◦ photography – vast range including images taken by candidates and published by news agencies ◦ literature e.g. McCarthy's <i>The Road</i>, Margaret Atwood's <i>The Year of the Flood</i>, Lloyd's <i>The Carbon Diaries 2015</i>, McEwan's <i>Solar</i>, Kingsolver's <i>Flight Behaviour</i> ◦ graffiti and blogs – candidate might have carried out some fieldwork in their local vicinity <ul style="list-style-type: none"> • Candidates may make reference to the media debate on climate change to demonstrate how impacts of climate change can affect informal representations of place e.g. Attenborough. They may discuss how reporting on impacts of climate change by news agencies has affected informal representations of a particular place through this debate. • Climate activism e.g. Extinction Rebellion, Friday lunch time demonstrations (school/college); Greta Thunberg media exposure <p><u>Examiner's Comments</u></p> <p>A key influence on the quality of answers was the degree to which a candidate understood what informal representations of place meant. Given this is an important element in the content of the compulsory Changing Spaces; Making Places topic,</p>

Question			Answer/Indicative content	Marks	Guidance
					<p>examiners were disappointed to encounter significant numbers of answers where this understanding was limited.</p> <p>Any impact of climate change was relevant with coastal flooding, temperature rise and ecosystem change frequently discussed. There was, however, a very restricted coverage of the diversity of possible informal representations. Media images of coastal flooding such as in Bangladesh, wild fires in California or coral bleaching on the Great Barrier Reef were commonly cited. Candidates also mentioned how perceptions are altering with pictures of positive impacts of climate change such as vineyards in the United Kingdom.</p>
			Total	12	

Question		Answer/Indicative content	Marks	Guidance
14	a	<p>Identify three limitations of <u>Fig. 1</u> as a source of information about greenhouse and icehouse conditions.</p> <p>The table shows geological periods and ice ages. Possible limitations include:</p> <ul style="list-style-type: none"> • No time scale for either Periods or Ice Ages <ul style="list-style-type: none"> ◦ The estimated length of each Period / Ice Age is not given ◦ Periods / Ice Ages appear to be the same length - misleading • Only selected Ice Ages included • Greenhouse periods not indicated – assumed by default – not ice age • Details of icehouse or greenhouse not given – no indication of spatial extent or severity • Periods and Ice Ages relate to N.America (Huronian) and S.Africa (Karoo) – Europe not represented 	<p>3 AO3 x3</p>	<p>AO3 – 3 marks 3x1 (✓) for limitations of the data identified through critical questioning of the resource.</p> <p><u>Examiner's Comments</u></p> <p>The figure was a table showing geological periods and ice ages. Most candidates identified the absence of any time scale as a limitation along with the incomplete nature of the table as regards icehouse and greenhouse conditions previously existing. Other limitations commonly offered concerned the severity and spatial extent of icehouse and / or greenhouse conditions.</p>

Question	Answer/Indicative content	Marks	Guidance
b	<p>Explain methods used to reconstruct past climate.</p> <p>Level 3 (5-6 marks) Demonstrates thorough knowledge and understanding of methods used to reconstruct past climate (AO1). This will be shown by including well-developed ideas about the methods used to reconstruct past climate.</p> <p>Level 2 (3-4 marks) Demonstrates reasonable knowledge and understanding of methods used to reconstruct past climate (AO1). This will be shown by including developed ideas about the methods used to reconstruct past climate.</p> <p>Level 1 (1-2 marks) Demonstrates basic knowledge and understanding of methods used to reconstruct past climate (AO1). There may be simple ideas about the methods used to reconstruct past climate.</p> <p>0 marks No response or no response worthy of credit.</p>	<p style="text-align: center;">6 AO1 x6</p>	<p>Indicative content AO1 – 6 marks</p> <p>Two methods well explained can reach L3. More methods but in less detail can reach L3.</p> <p>Knowledge and understanding of methods used to reconstruct past climate could potentially include:</p> <ul style="list-style-type: none"> • Sea floor sediments – foraminifera builds up on the sea-floor within deposited sediments, the chemical composition of their shells indicates the temperature of the ocean when they were formed • Lake sediments – pollen deposited in sediments indicates vegetation type and paleoclimatic conditions; shells of diatoms reveal lake temperatures when they were formed; varves illustrate the conditions at the time of deposition e.g. dark layers are fine sediment in winter months whereas the lighter layers are coarse sediment (presence of meltwater) in spring/summer months • Ice cores – contain small bubbles of air which records gaseous composition of the atmosphere which give information on climatic conditions at the time the ice was formed • Tree rings – dendrochronology measures the width of annules each year (affected by moisture and / or temperature); the larger the sample of trees the greater the reliability, however some species more reliable than others e.g. oak compared with alder or pine which can miss years or have two growth rings in one year • Fossils – coral reefs are very sensitive to temperature, sunlight and water depth so fossil corals indicate the conditions when laid down in the past; some species e.g. herbivorous dinosaurs only survived in sub-tropical habits so their fossils indicate

Question	Answer/Indicative content	Marks	Guidance
			<p>existence of those conditions</p> <ul style="list-style-type: none"> • Spatial extent of glaciers / ice sheets in the past • Historical records e.g. crop prices; written documents e.g. diaries + paintings <p>Examiner's Comments</p> <p>The majority of responses offered ice core examination as one method. Those able to explain the analysis of gases released from the ice as indicating climate changes were convincing. Evidence from pollen analysis and fossils were also often quoted. Many candidates chose tree ring analysis as a method with the majority able to explain the relationship between width of tree ring and climate change as Exemplar 2 highlights. This candidate displays thorough knowledge and understanding of how tree ring analysis can aid in the reconstruction of past climates.</p> <p>Examiners were especially pleased to come across candidates who recognised that different methods offered insights into different time scales of climate change, ice cores hundreds of thousands of years, tree rings shorter timescales measured in hundreds of years.</p> <p>Exemplar 2</p> <p><i>One way to gather evidence to try and establish past climate is to study tree rings, this shows each year of growth and the rate of which the tree grows helps to determine the temperature in that area because trees grow less in a colder climate, therefore if the distance between the tree rings were small for a period of years it would suggest that there were colder temperatures during that period of time.</i></p>
	Total	9	

Question	Answer/Indicative content	Marks	Guidance
15	<p>'Physical factors influence climate change more than human factors.' Discuss. How far do you agree with this statement? AO1</p> <p>Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of physical and human factors that influence climate change.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of physical and human factors that influence climate change.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of physical and human factors that influence climate change.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of physical and human factors that influence climate change.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how physical and human factors influence climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to whether physical factors influence climate change more than human factors.</p> <p>Relevant concepts are authoritatively discussed.</p>	<p>33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Knowledge and understanding of physical and human factors that influence climate change could potentially include:</p> <ul style="list-style-type: none"> • physical / natural factors influencing climate change include tectonic events such as volcanic eruptions; cyclic changes in the earth's orbit and axis / Milankovitch cycles; variation in sunspot activity / solar energy; role of El Niño / La Niña in context of extreme events • human / anthropogenic factors influencing climate change include levels of CO₂ directly linked to combustion of fossil fuels; increases in CH₄ due to increasing numbers of livestock, increased acreage of rice padi; deforestation; and draining of wetlands • long term dynamism e.g. gradual cooling over the past 100 million years – fossil records of changing distribution of plants and animals • ice ages and interglacials of the past 2.5 million years – ice core evidence of CO₂ and oxygen isotope concentrations • during our current interglacial i.e. the last 10,000 years, especially the last 1,000 years - tree rings and pollen sequences; historical records such as diaries, paintings, harvest records • short-term recent changes e.g. last 150 years – instrumental records of air and ocean temperatures and changes in intensity and frequency of weather events such as tropical storms. <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate whether physical factors influence climate change more than human factors could potentially include:</p>

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how physical and human factors influence climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to whether physical factors influence climate change more than human factors.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how physical and human factors influence climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to whether physical factors influence climate change more than human factors.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how physical and human factors influence climate change.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to whether physical factors influence climate change more than human factors.</p>		<ul style="list-style-type: none"> • glacial and inter-glacial climatic changes which were natural events • the greenhouse effect which is a natural occurrence but it has been enhanced especially after industrialisation in the 19th century • the effects of negative and positive feedback in the earth-atmosphere system whereby the damaging effects of positive feedback may lead to a tipping point at which climate change becomes rapid and irreversible, and where negative feedback may lead to global dimming • role of the IPCC (Intergovernmental Panel on Climate Change) and other scientific organisations such as NOAA (National Oceanographic and Aeronautical Administration) in advancing knowledge and understanding of changes • the existence of a sceptical scientific point of view which includes arguments about accuracy of data, reliability of past data and places emphasis on natural processes such as variations in solar activity and frequency of volcanic eruptions • the role of political factors in the assessment of climate change such as the view from governments relying on fossil fuels to support development e.g. China, USA and Australia • data from ice cores only go back so far in time; tree ring and pollen data is regional not global • recording of data has improved e.g. quality of instruments such as thermometers, so how accurate and reliable are the data from the past.

Question	Answer/Indicative content	Marks	Guidance
	<p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
16	<p>'The vulnerability of people to the impacts of climate change is mainly the result of economic factors.' Discuss.</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of the vulnerability of people to the impacts of climate change.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of vulnerability of people to the impacts of climate change.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of vulnerability of people to the impacts of climate change.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of vulnerability of people to the impacts of climate change.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of factors which affect the vulnerability of people to the impacts of climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to whether the vulnerability of people to the impacts of climate change is mainly the result of economic factors.</p> <p>Relevant concepts are authoritatively discussed.</p>	<p style="text-align: center;">33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of the impacts of climate change in a variety of contexts could potentially include:</p> <ul style="list-style-type: none"> • rising sea levels e.g. effect on island communities such as Pacific or Indian Ocean islands; barrier beach communities along east coast of USA; delta dwelling communities such as in Bangladesh • change in ecosystems e.g. savannah lands in Africa such as Kenya and its herding people experiencing greater variability in rainfall with the consequent effect on pasture growth; tropical rainforest dwellers in Amazon basin experiencing changed rainfall patterns • impacts on human health e.g. more intense heat waves in western Europe / southern USA; invasion and spread of diseases and viruses e.g. malaria to currently unaffected areas such as southern Europe • reductions in extent and thickness of sea ice e.g. in Arctic threatening traditional way of life of indigenous peoples such as Inuit • increased intensity of storms e.g. impact of Typhoon Pam, Vanuatu. <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the influence of different factors which affect the vulnerability of people to the impacts of climate change, with economic factors as the focus, could potentially include:</p> <ul style="list-style-type: none"> • ACs can afford coastal flood defences such as Netherlands Delta Plan and Thames flood barrier. LIDCs such as Bangladesh cannot • ACs can afford water supply management to cope with decreased precipitation and or increased

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of factors which affect the vulnerability of people to the impacts of climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to whether the vulnerability of people to the impacts of climate change is mainly the result of economic factors.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of factors which affect the vulnerability of people to the impacts of climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to whether the vulnerability of people to the impacts of climate change is mainly the result of economic factors.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of factors which affect the vulnerability of people to the impacts of climate change.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers</p>		<p>variability such as Australia / S. California. LIDCs such as Mali cannot</p> <ul style="list-style-type: none"> • ACs have the resources to combat health risks. LIDCs do not • national programmes e.g. Malawi’s National Adaptation Programmes of Action (NAPA) e.g. afforestation of catchments • many low cost schemes around the world reduce vulnerability of communities to impacts, such as basic cyclone and storm surge warnings in Bangladesh or improved communication of rainfall patterns in East Africa • individual people of higher economic status can reduce their vulnerability as they can afford mitigation such as moving away from areas prone to coastal flooding • even wealthy communities have a limit to their monetary power to deal with climate change e.g. not all coastlines can be defended even in the USA or UK • the relationship between economic factors and vulnerability which can apply at a variety of scales, e.g. national, community, individuals • The relationship between other factors (environmental, social, political) and vulnerability of people to climate change such as: <ul style="list-style-type: none"> ◦ effects of change in temperature and precipitation regimes on availability and access to food. ◦ dependence of a society on climate sensitive sectors such as agriculture, forestry and fisheries ◦ ability of societies to adapt to change e.g. in agricultural practices ◦ effectiveness of governments to respond to extreme weather or effects on human health.

Question	Answer/Indicative content	Marks	Guidance
	<p>simple conclusions as to whether the vulnerability of people to the impacts of climate change is mainly the result of economic factors.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
17	<p>Examine how climate change may be impacting the carbon cycle in the Arctic tundra.</p> <p>Level 4 (10–12 marks) Demonstrates comprehensive knowledge and understanding of climate change and the carbon cycle in the Arctic tundra (AO1).</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide clear, developed and convincing analysis that is fully accurate of how climate change may be impacting the carbon cycle in the Arctic tundra (AO2).</p> <p>This will be shown by including well-developed ideas about climate change and the carbon cycle in the Arctic tundra.</p> <p>There are clear and explicit attempts to make appropriate synoptic links between content from different parts of the course of study.</p> <p>Level 3 (7–9 marks) Demonstrates thorough knowledge and understanding of climate change and the carbon cycle in the Arctic tundra (AO1).</p> <p>Demonstrates thorough application of knowledge and understanding to provide clear and developed analysis that shows accuracy of how climate change may be impacting the carbon cycle in the Arctic tundra (AO2).</p> <p>This will be shown by including well-developed ideas about either climate change or the carbon cycle in the Arctic tundra and developed ideas for the other focus.</p> <p>There are clear attempts to make synoptic links between content from different parts of the course of study but these are not always appropriate.</p>	<p style="text-align: center;">12 AO1 x6 AO2 x6</p>	<p>Indicative content AO1 – 6 Marks Knowledge and understanding of climate change and the carbon cycle in the Arctic tundra could potentially include:</p> <ul style="list-style-type: none"> • increase in surface and atmospheric temperatures • increasing atmospheric water vapour • climate modelling to show the importance of the carbon cycle • carbon cycles have inputs, outputs and stores, refer to Arctic tundra • physical factors affecting rates of flow and stores e.g. temperature, vegetation, organic matter in soil and mineral composition of rocks • short term and long term changes in the carbon cycle (including seasonality) • dynamic equilibrium in the cycle (balance between stores and flows). <p>AO2 – 6 marks Application of knowledge and understanding to analyse how climate change may be impacting the carbon cycle in the Arctic tundra could potentially include:</p> <ul style="list-style-type: none"> • permafrost is a vast carbon sink, rising Arctic temperatures (above 0 degrees for part of the year) causes a decline in permafrost (decomposition). Processes that move permafrost carbon from frozen to thawed releases the stored carbon, increasing the carbon pool. This carbon can then be released into the atmosphere • in the Arctic the rate of decomposition is usually slow and limited mainly to the summer months, a warming climate encourages faster decomposition and the release of nutrients for plant growth • rising temperatures increases the length of the growing season. There is increased photosynthesis so more atmospheric carbon dioxide is absorbed • forest fires due to periods of drought can release a significant amount of

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 2 (4–6 marks) Demonstrates reasonable knowledge and understanding of climate change and the carbon cycle in the Arctic tundra (AO1).</p> <p>Demonstrates reasonable application of knowledge and understanding to provide sound analysis that shows some accuracy of how climate change may be impacting the carbon cycle in the Arctic tundra (AO2).</p> <p>This will be shown by including developed ideas about either climate change or the carbon cycle in the Arctic tundra and simple ideas for the other focus.</p> <p>There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant.</p> <p>Level 1 (1–3 marks) Demonstrates basic knowledge and understanding of climate change and the carbon cycle in the Arctic tundra (AO1).</p> <p>Demonstrates basic application of knowledge and understanding to provide simple analysis that shows limited accuracy of how climate change may be impacting the carbon cycle in the Arctic tundra (AO2).</p> <p>This will be shown by including simple ideas about climate change and the carbon cycle in the Arctic tundra.</p> <p>There are limited attempts to make synoptic links between content from different parts of the course of study.</p> <p>0 marks No response or no response worthy of credit.</p>		<p>carbon into the atmosphere. The forest fire destroys plants which can absorb carbon from the atmosphere</p> <ul style="list-style-type: none"> ecosystems in the Arctic tundra are changing and potentially adapting to climate changes such as plant growing seasons, growth rates and species composition however this cannot compensate for the thawing permafrost.
	<p>Total</p>	<p style="text-align: center;">12</p>	

Question		Answer/Indicative content	Marks	Guidance
18	a	<p>Identify three limitations with the data evidence in Fig. 1.</p> <p>The horizontal line showing an approximate 30 year mean (from 1961-1990) gives no indication for why this time period was chosen and the data doesn't show any striking changes for this period (✓).</p> <p>The 10 year running mean shows a general pattern of increasing global surface temperatures however this doesn't show yearly / annual variations which may give a more accurate picture for analysis (✓).</p> <p>The vertical arrow on the graph identified as 'warmer than average' is only compared to the 30 year mean surface temperature not to the whole period of data shown on the graph from 1880 (✓).</p>	<p>3 AO3 x3</p>	<p>AO3 – 3 marks 3x1 (✓) for limitations of the data evidence identified through critical questioning of the resource.</p>

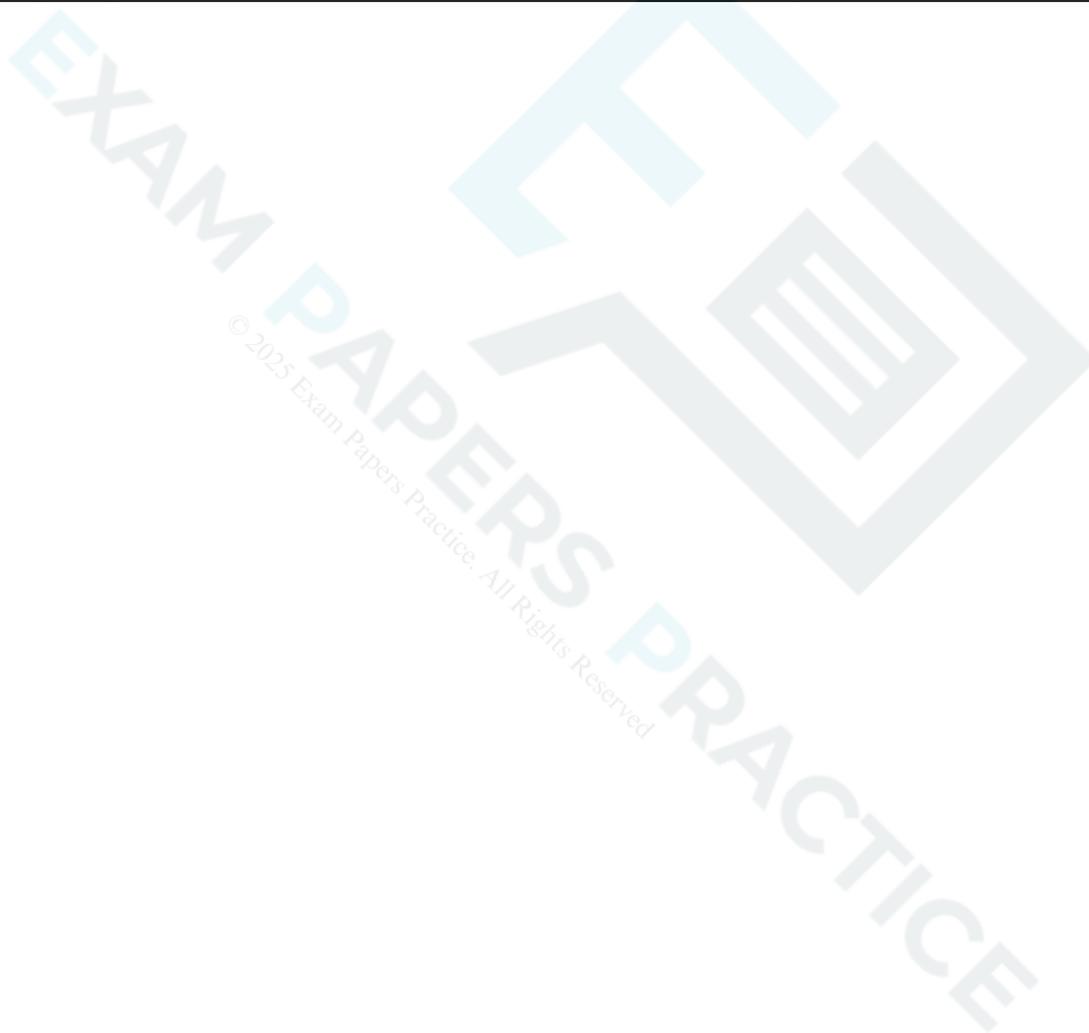
Question		Answer/Indicative content	Marks	Guidance
	b	<p>Explain how shrinking ice sheets show the world has warmed since the late-nineteenth century.</p> <p>Level 3 (5-6 marks) Demonstrates thorough knowledge and understanding of evidence which indicates the world has warmed since the late-nineteenth century (AO1).</p> <p>This will be shown by including well-developed ideas about evidence which indicates the world has warmed since the late-nineteenth century.</p> <p>Level 2 (3-4 marks) Demonstrates reasonable knowledge and understanding of evidence which indicates the world has warmed since the late-nineteenth century (AO1).</p> <p>This will be shown by including developed ideas about evidence which indicates the world has warmed since the late-nineteenth century.</p> <p>Level 1 (1-2 marks) Demonstrates basic knowledge and understanding of evidence which indicates the world has warmed since the late-nineteenth century (AO1).</p> <p>There may be simple ideas about evidence which indicates the world has warmed since the late-nineteenth century.</p> <p>0 marks No response or no response worthy of credit.</p>	6 AO1 x6	<p>Indicative content AO1 – 6 marks</p> <p>Knowledge and understanding of how shrinking ice sheets show the world has warmed could potentially include:</p> <ul style="list-style-type: none"> • Green land (1.7 million km²) Antarctica (14 million km²) have major ice sheets which are experiencing losses due to: ablation, surface melt, calving at ocean interface, melting from ocean contact (significant warming since 1940s, mainly in top 300m) • Polar ice loss has led to 11.1mm of global sea level rise since 1992 • Rising sea levels - present day melting of polar ice sheets adds approximately 1mm every year • European space agency monitoring (Cryo-sat 2), enhanced ice sheet monitoring from Nov 2010 to Sept 2013 and found the largest annual losses in Western Antarctica and the Admunsen Sea shows the largest signal of ice loss • Ice sheet loss not just about the world warming but the impact of this warming on oceans which are increasing in temperatures and ocean circulation is altering • Measuring ice sheet loss is much more recent than monitoring of global temperatures. Since late 19th century global surface temperature changes have been approx. 0.6 degrees.
		Total	9	

Question	Answer/Indicative content	Marks	Guidance
19	<p>'A country's decisions on mitigation strategies to cope with climate change are mainly influenced by economic factors.' How far do you agree with this statement? AO1</p> <p>Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of the economic factors that influence decisions on mitigation.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of the economic factors that influence decisions on mitigation.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of the economic factors that influence decisions on mitigation.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of the economic factors that influence decisions on mitigation.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how economic factors influence decisions on the mitigation of climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to whether decisions on mitigation strategies are influenced by economic factors more than other factors.</p> <p>Relevant concepts are authoritatively</p>	<p style="text-align: center;">33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of the economic factors that influence decisions on mitigation could potentially include:</p> <ul style="list-style-type: none"> • Mitigation strategies aim to reduce GHG emissions and tackle the causes of climate change. These tend to be long term approaches. Mitigation strategies range from the ratification of international treaties and agreements to specific practices within a country, for example energy efficiency and conservation. <p>Economic factors influencing decision could include:</p> <ul style="list-style-type: none"> • Cost of new technology- carbon capture, geo-engineering, sequestration technology • Economic needs of different land use e.g. plantation agriculture for export crops • Cost of the introduction of new farming practices which improve productivity and reduce negative impacts of farming such as deforestation. • Cost of infrastructure improvements for more environmentally friendly road and air travel. • Economic cost of improved energy efficiency and the development of alternative fuels e.g. renewable technology • View by EDCs and LIDCs that ACs have created the problem and should therefore bear the cost • Concern of EDCs and LIDCs that reducing GGE will reduce their ability to develop. <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate whether decisions on mitigation strategies</p>

Question	Answer/Indicative content	Marks	Guidance
	<p>discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how economic factors influence decisions on the mitigation of climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to whether decisions on mitigation strategies are influenced by economic factors more than other factors.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how economic factors influence decisions on the mitigation of climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to whether decisions on mitigation strategies are influenced by economic factors more than other factors.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how economic factors influence decisions on the mitigation of climate change.</p> <p>Demonstrates basic application of</p>		<p>are influenced by economic factors more than other factors could potentially include: Multiple factors can influence a country's decision to adopt specific mitigation strategies:</p> <ul style="list-style-type: none"> • Adaptation strategies aim to offer greater protection to those people and environments already facing risks from climate change, for example hard engineering. Mitigation and adaptation are complimentary. • Economic factors are important however, a range of technological, social, political and environmental factors will also be a consideration. • Environmental concerns relating to the level of impact within countries. • Social factors such as public engagement • The level of expertise and training in specialist fields • The political will of the government. • Social acceptance – countries vary in willingness to engage with costly schemes. • Cost benefit analysis by individual countries – if a country faces modest negative impacts of climate change the cost of implementing mitigation strategies may outweigh their benefits. • Adoption of mitigation strategies may vary with the degree to which a government sees its country as part of the cause, an AC will be more accountable in this respect than an LIDC potentially. • Emission targets are debated at a global level and level of economic development is not the only driving factor in these complex discussions. • Political commitment and willingness to engage in climate change mitigation must be balanced against a range of immediate domestic concerns. For example, individual countries may need a focus of resources on e.g. water supply, food production, industrial development and job creation, tackling poverty, disease and

Question	Answer/Indicative content	Marks	Guidance
	<p>knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to whether decisions on mitigation strategies are influenced by economic factors more than other factors.</p> <p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		<p>ill health.</p> <ul style="list-style-type: none"> The specification requires case study knowledge of the technological, socio-economic and political challenges associated with effective mitigation facing countries and this should form exemplification within this essay. <p><u>Examiner's Comments</u></p> <p>The vast majority of candidates selecting to answer in this Option discussed the influence of economic factors on decisions about mitigation strategies to cope with climate change. One issue assessors found in many discussions was a confusion in the minds of candidates between mitigation and adaptation. The former was only well understood by a minority of candidates who included discussion of strategies such as ratification of protocols (Kyoto, Paris), energy conservation measures and energy shifts, such as from fossil fuels to renewables. Convincing arguments were made as to the need for a strong domestic economy before cheap sources of carbon releasing energy are readily abandoned. That said, both India and China are investing in renewable energy production and afforestation projects can be found amongst EDCs and LIDCs. There was a disappointing absence of assessment of strategies such as carbon capture, tidal power and developments such as electric vehicles.</p> <p>Much was made in a good number of discussions of the argument that many EDCs and LIDCs perceive the current level of global warming as being directly the responsibility of the ACs. The carbon emissions from ACs of the past couple of hundred years have led to the climate change being experienced today and so it is these countries that must bear most of the costs.</p> <p>It was encouraging to read effective arguments put forward as to the economic rationale of EDCs and LIDCs in focusing on adaptive strategies. In this context, the</p>

Question			Answer/Indicative content	Marks	Guidance
					<p>efforts of Bangladesh in protecting itself from the threats of rising water levels from the ocean and river floods were often highlighted. Some of the most convincing essays went further to point out that carbon production per capita in LIDCs such as Bangladesh, was many times lower than even the lowest ranked AC. Fully evaluative essays included consideration of the socio-economic and political factors influencing attitudes towards climate change.</p>
			Total	33	



Question	Answer/Indicative content	Marks	Guidance
20	<p>'To what extent is the debate over climate change influenced by a variety of agendas.' Discuss.</p> <p>AO1</p> <p>Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of the climate change debate.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of the climate change debate.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of the climate change debate.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of the climate change debate.</p> <p>0 marks No response or no response worthy of credit.</p> <p>AO2</p> <p>Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the self-interests of different groups within the climate change debate.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which the debate over climate change is driven by self-interests of different groups.</p> <p>Relevant concepts are authoritatively discussed.</p>	<p style="text-align: center;">33</p> <p>AO1 x9 AO2 x24</p>	<p>Indicative content</p> <p>AO1 – 9 marks Demonstrating knowledge and understanding of the climate change debate could potentially include:</p> <ul style="list-style-type: none"> • A brief outline of the global warming debate. • Scientific consensus on climate change. • Evolution of a debate over time. • A range of stakeholders hold views on climate change: governments, international organisations (UN), official bodies (IPCC), NGOs, media, energy industries, the public. <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the extent to which the debate over climate change is driven by self-interests of different groups could potentially include:</p> <ul style="list-style-type: none"> • Climate change is a global issue requiring a co-ordinated response which can cause individual countries to protect their position. • UN and EU have taken a prominent role but views may be dominated by the most powerful member states e.g. US, China, Germany and their own self-interest. • Global consensus is difficult to meet – Kyoto Protocol was never ratified by the US and China; Japan and Russia withdrew from the second commitment period. • Individual countries protect their position on energy security and industrial development. • National governments have a range of positions when approaching debate; India and China as industrial super powers, scepticism of countries such as the US. • Countries produce their own climate change laws that may not reflect the global consensus.

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of the self-interests of different groups within the climate change debate.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to the extent to which the debate over climate change is driven by self-interests of different groups.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of the self-interests of different groups within the climate change debate.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to the extent to which the debate over climate change is driven by self-interests of different groups.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of the self-interests of different groups within the climate change debate.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which the debate over climate change is driven by self-interests of different groups.</p>		<ul style="list-style-type: none"> • View by emerging economies and low income countries that the advanced nations have created the problem and should therefore bear the cost. And concern that reducing GGE will reduce their ability to develop. • Political leanings of the media. • The view of energy industries with a financial interest in the debate. Many are based in emerging nations eg Mexico, Nigeria. • View of nations and industries with a high dependency on the livestock sector will have a protectionist viewpoint. • Delivering clean air technology and alternative energy supplies requires a level of investment that EDCs and LIDCs may not have. • View that the public are more driven to action if they understand how climate change will affect them – the self-interest argument. <p><u>Examiner's Comments</u></p> <p>Candidates were asked to assess the extent to which the debate over climate change is influenced by a variety of agendas. A wide range in the quality of discussion was read by assessors. The more convincing essays recognised and were confident in outlining different agendas as exemplified by stakeholders such as supra-national bodies (UN; EU), international organisations (IPCC; WHO), individual nations and the media and a wide variety of groups such as Greenpeace, NASA, university research groups and individuals and local groups such as wildlife trusts.</p> <p>The different perspectives amongst nation states was recognised by many with the more convincing candidates being familiar with contemporary events such as the Paris accord and the USA's recent withdrawal. The views of countries such as China and India were often cited but not often with sufficient detail to be really</p>

Question	Answer/Indicative content	Marks	Guidance
	<p>Concepts are not discussed or are so inaccurately.</p> <p>0 marks No response or no response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		<p>authoritative. While generalisations about examples such as the USA have some validity when based on the pronouncements of the current President, only a minority of candidates were able to nuance the discussion with material on the differing attitudes of states such as California and individual businesses.</p> <p>The role of the media was offered as being significant but too few linked this with important aspects such as the need to consider the perspectives of those owning elements of the media. The nature of scientific research, the independence of academic researchers and the scientific illiteracy of both media and the majority of people were relevant points but too few included them.</p>
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
21	<p>Examine how climate change can affect weathering and erosion processes within any one landscape system you have studied.</p> <p>Level 4 (10–12 marks) Demonstrates comprehensive knowledge and understanding of climate change and weathering and erosion processes (AO1).</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide clear, developed and convincing analysis that is fully accurate of how climate change can affect weathering and erosion processes in a landscape system (AO2).</p> <p>This will be shown by including well-developed ideas about the relationship between climate change and both weathering and erosion processes in a landscape system.</p> <p>There are clear and explicit attempts to make appropriate synoptic links between content from different parts of the course of study.</p> <p>Level 3 (7–9 marks) Demonstrates thorough knowledge and understanding of climate change and weathering and erosion processes (AO1).</p> <p>Demonstrates thorough application of knowledge and understanding to provide clear and developed analysis that shows accuracy of how climate change can affect weathering and erosion processes in a landscape system (AO2).</p> <p>This will be shown by including well-developed ideas about climate change and either weathering or erosion processes or developed ideas about climate change and both weathering and erosion processes.</p> <p>There are clear attempts to make synoptic links between content from different parts of the course of study but these are not</p>	<p style="text-align: center;">12</p> <p>AO1 x6 AO2 x6</p>	<p>Indicative content AO1 – 6 Marks Knowledge and understanding of climate change and weathering and erosion processes could potentially include:</p> <ul style="list-style-type: none"> • evidence of how climate has changed e.g. warming of past two hundred years; changes to precipitation patterns in previous pluvial periods affecting drylands; longer term climate changes affecting landscapes; rising levels relevant • specific points will depend on the landscape system studied by the candidate, coastal, glaciated or dryland – only one is studied • weathering processes such as mechanical, chemical + biological • erosional processes e.g. abrasion, attrition, hydraulic action <p>AO2 – 6 marks Application of knowledge and understanding to analyse how climate change can affect weathering and erosion processes could potentially include:</p> <ul style="list-style-type: none"> • some points will depend on the landscape system studied by the candidate, coastal, glaciated or dryland – only one is studied • weathering processes (chemical, physical + biological) likely to be more active due to higher temperatures • erosional processes likely to be more active due to higher temperatures e.g. increased meltwater at glacier base leads to higher ice velocities; increased atmospheric energy leads to stronger winds giving greater wave energy to erode coastlines and more aeolian energy for corrosion/attrition/deflation in dryland landscapes→ generate more material available to be transported as well as transporting more material themselves • regions becoming drier as a result of climate change likely to experience reduction in chemical weathering and

Question	Answer/Indicative content	Marks	Guidance
	<p>always appropriate.</p> <p>Level 2 (4–6 marks) Demonstrates reasonable knowledge and understanding of climate change and weathering and erosion processes (AO1).</p> <p>Demonstrates reasonable application of knowledge and understanding to provide sound analysis that shows some accuracy of how climate change can affect weathering and erosion processes in a landscape system (AO2).</p> <p>This will be shown by including developed ideas about climate change and either weathering and/or erosion processes.</p> <p>There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant.</p> <p>Level 1 (1–3 marks) Demonstrates basic knowledge and understanding of climate change and weathering and erosion processes (AO1).</p> <p>Demonstrates basic application of knowledge and understanding to provide simple analysis that shows limited accuracy of how climate change can affect weathering and erosion processes in a landscape system (AO2).</p> <p>This will be shown by including simple ideas about climate change and either weathering and/or erosion processes.</p> <p>There are limited attempts to make synoptic links between content from different parts of the course of study.</p> <p>0 marks No response or no response worthy of credit.</p>		<p>less water erosion for example. However, with reduction in vegetation cover, fluvial erosion might increase</p> <ul style="list-style-type: none"> • changes to the levels and types of precipitation affecting erosion such as river action in glaciated and dryland regions • increase in temperatures extend area affected by periglacial process as glaciers and ice sheets retreat; <p><u>Examiner’s Comments</u></p> <p>Candidates were asked to examine how climate change can affect weathering and erosion processes in any one of the landscape systems. For some the distinction between the two groups of processes was muddled which tended to lead to confused links made between climate change and the processes. Many responses were simply too generalised to be convincing with vague assertion about sea level rise leading to increased erosion of cliffs. Those candidates who were authoritative regarding processes and made clear links between for example rising temperatures of both atmosphere and sea surface and weathering processes, or between rising temperatures, increased quantities of water and ice movements, soon had their responses climbing to the top of Level 3 at least. Overall, it was the weakness in knowledge and understanding of landscape processes that held back many candidates.</p>
	Total	12	

Question		Answer/Indicative content	Marks	Guidance
22	a	<p>Identify three limitations of Fig.1 in showing the relationship between Gross Domestic Product (GDP) per person and total CO₂ emissions for selected countries.</p> <p>The scattergraph plots data for 10 countries across the development continuum. Possible limitations include:</p> <ul style="list-style-type: none"> • CO₂ emissions are the total for each country, not per person. The considerable contrasts in populations of the countries have quite an influence on the total emissions. • GDP is per person but is in US \$ and so is a limited indicator of wealth due to factors such as currency fluctuations and the under-counting of informal and subsistence economic activities. • No units for GDP per capita. • The dates for the two variables are different – GDP 2015 and CO₂ 2014 – not comparing like with like. • The 10 selected countries may not be a sufficiently large enough sample to offer a meaningful representation of the relationship. • Absence of line of best fit makes it difficult to see the relationship (mention of the need for a statistical test in addition) • Factors such as climatic influences need to be taken into account as regards CO₂ emissions • Accuracy and reliability of data e.g. LIDCs/EDCs/ACs 	<p>3 AO3 x3</p>	<p>AO3 – 3 marks 3x1 (seen) for limitations of the data identified through critical questioning of the resource.</p> <p>Examiner's Comments</p> <p>The figure was a scatter graph indicating the relationship between Gross Domestic Product (GDP) per person and total CO₂ emissions for selected countries. Limitations identified by candidates included that CO₂ emissions were for the whole country and not per person so not directly comparable with the GDP data. The dates for the two sets of data were a year apart and the sample of just ten countries may not offer a secure indication of the relationship were two other common limitations. Too many candidates became caught up in the mechanics of the graph with comments about the labelling of the y axis being hard to read and even that the graph should be in colour. Few picked up on possible issues of reliability and accuracy of the data.</p>
	b	<p>Explain two ways that natural forcing has driven climate change in the geological past</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of two natural forcing processes in the geological past (AO1).</p> <p>This will be shown by including well-developed ideas about the link between two natural forcing processes and climate change in the geological past.</p>	<p>6 AO1 x6</p>	<p>Indicative content AO1 – 6 marks Knowledge and understanding of natural forcing processes and how they have driven climate change in the geological past could potentially include:</p> <ul style="list-style-type: none"> • Plate tectonics + continental drift – as continents broke apart and moved so distribution of land and sea across the latitudes varied. Earth's climate varied between greenhouse and icehouse • Ocean circulation – ocean currents vital

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of one or two natural forcing processes in the geological past (AO1).</p> <p>This will be shown by including developed ideas about the link between one or two natural forcing processes and climate change in the geological past.</p> <p>Maximum L2 3 marks for one forcing process well-developed.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of one or two natural forcing processes in the geological past (AO1).</p> <p>There may be simple ideas about the link between one or two natural forcing processes and climate change in the geological past.</p> <p>0 marks No response or no response worthy of credit.</p>		<p>component of global energy budget transferring heat from low to high latitudes. Continental drift can alter pattern of ocean currents e.g. closing of the gap between Pacific and Atlantic with formation of Panama isthmus</p> <ul style="list-style-type: none"> • Natural changes in GHG – e.g. 50 million years ago CO₂ at c. 1000 ppm; 3-5 million years ago CO₂ at c. 400 ppm – causes considered to be creating of large-scale fold mt systems e.g. Himalayas which increased chemical weathering removing vast amounts of CO₂ from atmosphere • Milankovitch cycles – astronomical events e.g. changes in Earth’s axis + orbit + precession of equinoxes. Operate on timescales of 10,000 to 100,000 years. Credit tilt and orbit eccentricity separately • Volcanic eruptions – tend to affect shorter-term climate change • Solar output – sunspots used as a proxy <p><u>Examiner’s Comments</u></p> <p>There some very effective explanations of how natural forcings have driven climate change in the geological past. Detailed and authoritative accounts of the operation and outcome of Milankovitch cycles and continental drift were not uncommon with many also explaining the link between volcanic activity and climate change. The question was explicit in its focus on change ‘...in the geological past.’ While some credit was given for references to major eruptions such as Pinatubo, the more convincing responses quoted major eruptions in the geological past such as the fissure eruptions responsible for lava plateaus such as the Deccan. Less effective responses tended to become caught up with the causes of the forcing rather than its effects.</p>
	Total	9	

Question	Answer/Indicative content	Marks	Guidance
23	<p>Assess the relative effectiveness of adaptation strategies aimed at managing risks from climate change.</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of adaptation strategies aimed at managing risks from climate change.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of adaptation strategies aimed at managing risks from climate change.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of adaptation strategies aimed at managing risks from climate change.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of adaptation strategies aimed at managing risks from climate change.</p> <p>0 marks No response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how adaptation strategies manage risks from climate change.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the relative effectiveness of adaptation strategies aimed at managing risks from climate change.</p>	<p style="text-align: center;">33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks</p> <p>Demonstrating knowledge and understanding of adaptation strategies aimed at managing risks from climate change could potentially include:</p> <p>Risks from climate change:</p> <ul style="list-style-type: none"> • to people: flooding – death, injury; health risks from water borne disease, water shortages, altered distributions of vectors e.g. insects; extreme weather e.g. tropical storms, monsoon, heat waves • to environments: coastal damage from rising sea level increased wave energy; ↑ river energy from ↑ precipitation; marine and terrestrial e.g. impacts on corals and tundra <p>Adaptation strategies aimed at managing risk:</p> <ul style="list-style-type: none"> • coasts – managed re-alignment; abandonment; land-use zoning • agriculture – types of crops grown → more drought resistant varieties; methods to conserve water e.g. zero tillage; crop rotation • water supply and use - ↑ collection + storage of water; ↑ recycling grey water; ↑ efficiency of equipment e.g. washing machines • protection – hard engineering e.g. storm surge barriers, dams; soft engineering e.g. mangrove + salt marsh growth; afforestation in upland catchments • health measures e.g. ↑ air conditioning; mosquito nets; vaccines; <p>NB adaptation different from mitigation – adaptation is to reduce vulnerability of human populations at risk. Mitigation aims to lessen risks e.g. reducing GHG emissions with aim of restricting temperature rise.</p>

Question	Answer/Indicative content	Marks	Guidance
	<p>Relevant concepts are authoritatively discussed.</p> <p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how adaptation strategies manage risks from climate change.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to the relative effectiveness of adaptation strategies aimed at managing risks from climate change.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of how adaptation strategies manage risks from climate change.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to the relative effectiveness of adaptation strategies aimed at managing risks from climate change.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how adaptation strategies manage risks from climate change.</p>		<p>AO2 – 24 marks</p> <p>Application of knowledge and understanding to analyse and evaluate the relative effectiveness of adaptation strategies aimed at managing risks from climate change could potentially include: Factors affecting the relative effectiveness of adaptation strategies in managing risks from climate change</p> <ul style="list-style-type: none"> • levels of vulnerability: vary person to person, family to family, community to community and nation to nation • fundamental variation in vulnerability ACs → EDCs → LIDCs (where vulnerability already an issue and likely to increase as 21st century progresses) • greatest challenges are for people to acquire flexibility and resilience • Availability of resources e.g. EDCs likely to generate resources to largely cope however ACs possess most of the resources to cope • political decision making at all scales • extreme events capable of overwhelming any location

Question	Answer/Indicative content	Marks	Guidance
	<p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the relative effectiveness of adaptation strategies aimed at managing risks from climate change.</p> <p>Concepts are not discussed or are inaccurately applied.</p> <p>0 marks No response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
24	<p>To what extent is the world's warming over the past 150 years the result of natural factors?</p> <p>AO1 Level 4 (7–9 marks) Demonstrates comprehensive knowledge and understanding of the causes of the world's warming over the past 150 years.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of the causes of the world's warming over the past 150 years</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of the causes of the world's warming over the past 150 years</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of the causes of the world's warming over the past 150 years</p> <p>0 marks No response worthy of credit.</p> <p>AO2 Level 4 (19–24 marks) Demonstrates comprehensive application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the factors causing the world's warming over the past 150 years.</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide a detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which the world's warming over the past 150 years is the result of natural factors.</p> <p>Relevant concepts are authoritatively discussed.</p>	<p>33 AO1 x9 AO2 x24</p>	<p>Indicative content AO1 – 9 marks Demonstrating knowledge and understanding of the causes of the world's warming over the past 150 years could potentially include:</p> <ul style="list-style-type: none"> • scientific consensus on global warming over the past 150 years – the evidence is: increases in global temperatures land and sea; shrinking ice sheets and valley glaciers; rising sea level; ↑ atmospheric water vapour; ↓ snow cover + sea ice • natural forcings operating over time scale of 150 years – volcanic eruptions e.g. Pinatubo; solar output (sun spot cycles) • human forcing – anthropogenic greenhouse gas emissions – CO₂, CH₄, other gases such as halocarbons e.g. CFCs + HFCs, N₂O – as concentrations of these gases ↑, then more of the out-going long-wave radiation is trapped in the atmosphere for longer and so warming occurs. <p>AO2 – 24 marks Application of knowledge and understanding to analyse and evaluate the extent to which the world's warming over the past 150 years is the result of natural factors could potentially include:</p> <ul style="list-style-type: none"> • important to note that global warming models combining all natural forcing factors (and not taking man-made causes of warming into account) do not match the observed changes in temperatures, in particular the global warming of the past fifty years. • recent decades seen human activities become the dominant influence bringing about environmental change – new geological epoch – Anthropocene although warming isn't apparent until later 19th century, causes were in operation before this

Question	Answer/Indicative content	Marks	Guidance
	<p>Level 3 (13–18 marks) Demonstrates thorough application of knowledge and understanding to provide a clear and developed analysis that shows accuracy the factors causing the world’s warming over the past 150 years.</p> <p>Demonstrates thorough application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions as to the extent to which the world’s warming over the past 150 years is the result of natural factors.</p> <p>Relevant concepts are discussed but this may lack some authority.</p> <p>Level 2 (7–12 marks) Demonstrates reasonable application of knowledge and understanding to provide a sound analysis that shows some accuracy of the factors causing the world’s warming over the past 150 years.</p> <p>Demonstrates reasonable application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence as to the extent to which the world’s warming over the past 150 years is the result of natural factors.</p> <p>Concepts are discussed but their use lacks precision.</p> <p>Level 1 (1–6 marks) Demonstrates basic application of knowledge and understanding to provide a simple analysis that shows limited accuracy of the factors causing the world’s warming over the past 150 years.</p> <p>Demonstrates basic application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which the world’s warming over the past 150 years is the result of natural factors.</p>		<ul style="list-style-type: none"> • atmospheric CO₂ levels comparatively stable up to 1800 at c. 280 ppm – by late 1950s c. 316 ppm, today a little over 400 ppm • atmospheric CH₄ levels c. 700 ppb in 1800 now close to 1750 ppb • enhanced greenhouse effect ↑ absorption of long-wave radiation and ↑ global temperatures • change of last 150 years associated with ↑ population, ↑ in individual carbon footprints, land-use changes e.g. deforestation + draining of wetlands, ↑ energy demand most of which been met by fossil fuel burning

Question	Answer/Indicative content	Marks	Guidance
	<p>Concepts are not discussed or are inaccurately applied.</p> <p>0 marks No response worthy of credit.</p> <p>Quality of extended response</p> <p>Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</p> <p>Level 3 There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</p> <p>Level 2 The information has some relevance and is presented with limited structure. The information is supported by limited evidence.</p> <p>Level 1 The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</p>		
	Total	33	

Question	Answer/Indicative content	Marks	Guidance
25	<p>Examine how climate change can affect place profiles.</p> <p>Level 4 (10–12 marks) Demonstrates comprehensive knowledge and understanding of climate change and place profiles (AO1).</p> <p>Demonstrates comprehensive application of knowledge and understanding to provide clear, developed and convincing analysis that is fully accurate of how climate change can affect place profiles (AO2).</p> <p>This will be shown by including well-developed ideas about the relationship between climate change and place profiles.</p> <p>There are clear and explicit attempts to make appropriate synoptic links between content from different parts of the course of study.</p> <p>Level 3 (7–9 marks) Demonstrates thorough knowledge and understanding of climate change and place profiles (AO1).</p> <p>Demonstrates thorough application of knowledge and understanding to provide clear and developed analysis that shows accuracy of how climate change can affect place profiles (AO2).</p> <p>This will be shown by including well-developed ideas about either climate change or place profiles and developed ideas for how the two might be linked.</p> <p>There are clear attempts to make synoptic links between content from different parts of the course of study but these are not always appropriate.</p> <p>Level 2 (4–6 marks) Demonstrates reasonable knowledge and understanding of climate change and place profiles (AO1).</p>	<p style="text-align: center;">12</p> <p>AO1 x6 AO2 x6</p>	<p>Indicative content AO1 – 6 Marks Knowledge and understanding of climate change and place profiles could potentially include:</p> <ul style="list-style-type: none"> • evidence of how climate has changed recently e.g. warming of past two hundred years; changes to precipitation patterns both ↑ and ↓ precipitation; leading to rising sea levels – relevant to place profiles • place profiles – includes demographic, socio-economic, cultural, political, built and natural characteristics that shape a place’s profile (identity). <p>AO2 – 6 marks Application of knowledge and understanding to analyse how climate change can affect place profiles could potentially include:</p> <ul style="list-style-type: none"> • content will depend on the chosen place profile(s) • impacts of climate change on natural characteristics of places e.g. sustained hot conditions; increasing risk of drought; increasing risk of particular diseases; changes to timing of seasons • impacts of climate change on human characteristics of places e.g. loss of livelihood of farmers due to drought → abandonment of land → outmigration; loss of livelihood of fishermen due to destruction of coral reef (bleaching) and acidification of oceans • impacts of climate change on particular demographic / socio-economic groups within a place e.g. impacts of young and elderly of extreme heatwaves • impacts of climate change on sea levels → impacts on coastal communities e.g. abandonment of some land or increased engineered defences in others.

Question	Answer/Indicative content	Marks	Guidance
	<p>Demonstrates reasonable application of knowledge and understanding to provide sound analysis that shows some accuracy of how climate change can affect place profiles (AO2).</p> <p>This will be shown by including developed ideas about either climate change or place profiles and simple ideas for how they might be linked.</p> <p>There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant.</p> <p>Level 1 (1–3 marks) Demonstrates basic knowledge and understanding of climate change and place profiles (AO1).</p> <p>Demonstrates basic application of knowledge and understanding to provide simple analysis that shows limited accuracy of how climate change can affect place profiles (AO2).</p> <p>This will be shown by including simple ideas about climate change and place profiles.</p> <p>There are limited attempts to make synoptic links between content from different parts of the course of study.</p> <p>0 marks No response worthy of credit.</p>		
	<p>Total</p>	<p>12</p>	

Question		Answer/Indicative content	Marks	Guidance
26	a	<p>Identify three limitations of Fig. 5 as a source of information about volcanic eruptions.</p> <p>Degree of accuracy of the data on volume of ejected material. Only one eruption in 20th century (Mt Pinatubo) - data may need +/- estimates (✓).</p> <p>Degree of accuracy of date especially the early eruptions (✓).</p> <p>No information on type of material ejected e.g. ash, pyroclastic flow or lava (✓) whether the material was the result of single continuous event eruptions e.g. Mt Pinatubo or several eruptions e.g. Yellowstone (✓) how explosive the eruptions were (✓).</p> <p>Quite a diverse group of eruptions e.g. island arc (Toba) / continental interior (Yellowstone) / constructive boundary (Katla) (✓)</p>	<p>3 AO3 x3</p>	<p>AO3 – 3 marks 3 x 1 (✓) for limitations of the data evidence identified through critical questioning of the resource.</p>

Question	Answer/Indicative content	Marks	Guidance
b	<p>Explain how countries attempt to mitigate against earthquake events.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of how countries attempt to mitigate against earthquake events (AO1).</p> <p>This will be shown by including well-developed ideas about how countries attempt to mitigate against earthquake events.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding how countries attempt to mitigate against earthquake events (AO1).</p> <p>This will be shown by including developed ideas about how countries attempt to mitigate against earthquake events</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of how countries attempt to mitigate against earthquake events (AO1).</p> <p>There may be simple ideas about how countries attempt to mitigate against earthquake events.</p> <p>0 marks No response worthy of credit.</p>	<p style="text-align: center;">6 AO1 x6</p>	<p>Indicative content AO1 – 6 marks</p> <p>Knowledge and understanding of how countries attempt to mitigate against earthquake events could potentially include:</p> <ul style="list-style-type: none"> • Mitigation involves modifying people's vulnerability and their losses. Nothing to be done as regards the earthquake event • Hazard mapping e.g. areas most likely to liquefy → influence land-use planning • Hazard resistant design of buildings and infrastructure e.g. cross-bracing; strengthened bridge supports • Education e.g. drills as to what to do in an earthquake event • Community/government preparedness e.g. strengthening of public buildings such as hospitals, provision of rescue teams, emergency housing/funding/insurance, acceptance of international disaster relief • Prediction and warning – not really possible as regards actual earthquake event although can alert to tsunamis. <p>Candidates may choose to use place specific detail from a case study to answer this question – but this is not a requirement</p>
	Total	9	

Question		Answer/Indicative content	Marks	Guidance
27	a	<p>Identify three limitations of Fig. 1 in showing carbon dioxide emissions in 2000.</p> <p>CO2 emissions are the total for each country, not per person (✓). Country level data means that variations in emissions within a country are hidden (✓). Data from 2000 so not that contemporary (✓). Not easy to tell the countries apart especially given the distortion of shape (✓). Source / sources of data used to compile Fig. 1 not provided so there may be issues of reliability / accuracy between countries (✓). Not possible to determine the absolute level of CO2 emissions e.g. billions of tonnes (✓).</p>	<p>3 AO3 x3</p>	<p>AO3 – 3 marks 3 x 1 (✓) for limitations of the data evidence identified through critical questioning of the resource.</p>

Question	Answer/Indicative content	Marks	Guidance
b	<p>Explain how carbon trading and carbon credits are designed to reduce greenhouse gas emissions.</p> <p>Level 3 (5–6 marks) Demonstrates thorough knowledge and understanding of how carbon trading and carbon credits are designed to reduce greenhouse gas emissions. (AO1).</p> <p>This will be shown by including well-developed ideas how carbon trading and carbon credits are designed to reduce greenhouse gas emissions.</p> <p>Level 2 (3–4 marks) Demonstrates reasonable knowledge and understanding of how carbon trading and carbon credits are designed to reduce greenhouse gas emissions. (AO1).</p> <p>This will be shown by including developed ideas how carbon trading and carbon credits are designed to reduce greenhouse gas emissions.</p> <p>Level 1 (1–2 marks) Demonstrates basic knowledge and understanding of how carbon trading and carbon credits are designed to reduce greenhouse gas emissions. (AO1).</p> <p>There may be simple ideas about how carbon trading and carbon credits are designed to reduce greenhouse gas emissions.</p> <p>0 marks No response worthy of credit.</p>	<p style="text-align: center;">6 AO1 x6</p>	<p>Indicative content AO1 – 6 marks</p> <p>Knowledge and understanding of how carbon trading and carbon credits are designed to reduce greenhouse gas emissions could potentially include:</p> <ul style="list-style-type: none"> • Carbon trading is the market-based process of buying and selling credits to emit CO₂ • A credit is a tradable emissions allowance, worth 1 tonne of CO₂ or its equivalent) • The EU Emissions Trading System (EUETS) is the largest scheme in world. Includes power stations + industrial plants across EU e.g. oil refineries, cement, iron + steel and chemical plants. Aviation operations also covered <p>Reducing GHG emissions</p> <ul style="list-style-type: none"> • A cap is set on emissions which is converted into tradable credits • Emissions monitored each year and participants must surrender enough credits to cover their emissions • If emissions > credits further credits can be purchased from those whose emissions < their credits • Number of credits reduced year on year • Participants can make money through GHG reduction by selling their surplus credits • Participants exceeding their allowances are fined.
	Total	9	