Fragile environments and climate change-1

Name: _____

Class: _____

Date:_____

Time:

Total Marks Available:

Total Marks Archived:

Level: IGCSE Mathematics A

Subject: Geography

Exam Board: Edexcel IGCSE Geography- it is however suitable for use by mathematics student of other boards

Topic: Fragile environments and climate change-1

Type: Mark Scheme

To be used by all students preparing for Edexcel IGCSE Geography- Students of other Boards may also find this useful

Mark Scheme

Q1.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** A period of time with abnormally low rainfall (1). B, C, and D are all incorrect as they are not referring to the meaning of drought.	(1)

Question number	Answer	Mark
(ii)	**AO1 (2 marks)** • The spread of desert conditions (1) and decline of soil quality (1). • Degradation of land/drying out of land (1) as a result of human activities/climate change (1). Accept any other appropriate response.	(2)

Question number	Answer	Mark
(iii)	**AO1 (1 mark)** C Install water storage devices. A, B and D are all incorrect as they are not methods to mange the imapcts of desertification.	(1)

Q2.

Question Number	Answer	Mark
(i)	**AO1 (1 mark)** D solar (1). The answer cannot be A, B or C as these are all incorrect.	**(1)**

Question Number	Answer	Mark
(ii)	**AO1 (1 mark)** A Changes in the shape of the earth's orbit (1). The answer cannot be B, C, D as these are all incorrect.	**(1)**

Q3.

Question number	Answer	Mark
(i)	**AO4 (2 marks)** Award 1 mark for a correct answer and 1 mark for working. (new number) 390 – (old number) 293 = increase of 97 (1) (increase of 97) divided by (old number) 293 × 100 = percentage increase of 33% (1) Accept any other appropriate working.	**(2)**

Question number	Answer	Mark
(ii)	**AO3 (2 marks)** Award 1 mark for the identification of a pattern and 1 mark for further detail through description or use of supporting data from the resource, up to a maximum of 2 marks. • There is an overall positive relationship (1) but in some years, e.g. 1945–50, annual average global temperature falls while carbon dioxide increases (1). • As annual average global temperature goes up, so does carbon dioxide concentration (1), but the increase in global temperature fluctuates a lot more than carbon dioxide concentration (1). Accept any other appropriate response.	**(2)**

Q4.

Question number	Answer	Mark
(i)	**(AO4) 2 marks** Award 1 mark for a correct answer and one mark for working: 1960 = 0.1 and 2015 = 2.7 (1) or working out with similar numbers, i.e. understands idea of difference / subtraction (highest and lowest values). Range = 2.6 (1) Allow 2.4-2.8 as correct. **Note units not required.**	**(2)**

Question number	Answer	Mark
(ii)	**AO3 (2 marks)** Award 1 mark for the identification of a trend and 1 mark for further detail through evidence from the resource from the resource, up to a maximum of 2 marks. • Overall there has been a substantial increase in CO_2 emissions 0.3- just under 10 gigatonnes (1). The greatest increase was in the last 15 years (1). • Overall there has been a substantial increase in CO_2 emissions 0.3- just under 10 gigatonnes (1). The rate of increase was however slower between 1960 1995 compared to the period after that (1). Accept any other appropriate response. Must state an overall trend, i.e. increase, for credit. Data not required for credit.	**(2)**

Q5.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** B intensive farming B is the correct answer as the other options are natural causes,	(1)

Question number	Answer	Mark
(ii)	**AO1 (1 mark)** D significant increase in mining D is the correct answer as the other options are not direct causes,	(1)

Q6.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** • Desertification means the spread of desert-like conditions into nearby areas/the outward expansion of deserts into their surrounding regions (1). Accept any other appropriate response.	**(1)**

Question number	Answer	Mark
(ii)	**AO3 (2 marks)** Award 1 mark for any of the following, up to a maximum of 2 marks. • USA (1) • Australia (1) • South Africa (1)	**(2)**

Question number	Answer	Mark
(iii)	**AO2 (2 marks)/AO3 (2 marks)** Award 1 mark for the identification of a possible reason for the pattern shown on Figure 7a (AO3) and a further mark for an explanation of the reason (AO2), up to a maximum of 2 marks per idea. • A lack of rainfall in named area (1) reduces vegetation cover (1). • Some areas have less vegetation than others (1), which increases the chances of soil erosion happening (1). • Some areas experience intense rainfall/flash floods (1), which increases the rate of run-off/reducing soil moisture (1). • Over-farming in named area(s) (1) reduces soil fertility over time (1). Accept any other appropriate response.	(4)

Q7.

Question number	Indicative content
	AO2 (4 marks), AO3 (4 marks), AO4 (4 marks) **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include:

	AO2 • Responses to climate change are many and varied. • Responses can be shorter-term as well as longer term and they can be mitigate (reduce cause) or adaptation (live with impacts) • Responses can be localised, e.g. managing traffic, more sustainable buildings and heating systems. • Responses can be based round "polluter pays" principle or more of an incentivised solution, e.g. FITs to encourage green energy technology. **AO3** • Countries, places and regions which have the greatest carbon footprints do not always have the most robust solutions in terms of responses. • Cutting of CO2 emissions is complex, controversial and politically difficult, especially taken as a long-term objective where growth and development might be at risk. • In order for mitigation responses to be effective, many would argue that they need top be global, rather than country or even regionally-based. • Some places might see adaptation as the best responses as they have the resources and technical capability to withstand shorter and longer-term climate change shocks and impacts. • The development pathways to secure money for climate change responses going from the richest nations to the poorest to counter the most significant drivers is seen as a good approach. **AO4** • Figure 7a shows "hotspots" in China, India and USA especially as well as much of Europe if taken as a region in itself. • Figure 7a shows some countries and regions have made very little contribution to carbon emissions, e.g. parts of Sub- Saharan Africa.

Question number	Indicative content	
	• Figure 7b shows a range of different drivers which are all linked to human activity and climate change. • Figure 7b shows causes that can operate at different geographical scales. • Figure 7b shows that deforestation can be linked to agricultural land conversion e.g. livestock farming.	
Level	**Mark**	**Descriptor**
	0	No acceptable response.
Level 1	1–4	• Demonstrates isolated elements of understanding of concepts and the interrelationship between places, environments and processes. (AO2) • Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (A04)
Level 2	5–8	• Demonstrates elements of understanding of concepts and the interrelationship between places, environments and processes. (AO2) • Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)

Level 3	9–12	• Demonstrates accurate understanding of concepts and the interrelationship of places, environments and processes. (AO2) • Applies understanding to deconstruct information and provides logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Q8.

Question number	Indicative content
	AO2 (4 marks), AO3 (4 marks), AO4 (4 marks) **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include:

	AO2 • Climate change is the increasing temperatures associated with average weather conditions or longer-term average conditions. • Ecosystems and places are affected by water and drought stress linked to climate change. • Low lying places will be threatened by rising sea levels caused by climate change. • Biodiversity will be threatened by animals migrating because they cannot easily / quickly adapt to the changing climate of their current habitat. • Climate change will affect global atmospheric circulation systems thereby affecting many places. **AO3** • Figure 7a shows that China, India and USA are the worse emitters, and to some extent they will suffers the effects of climate change although they may be able to adapt especially in the richest parts of those nations. • Perhaps the worst impact will be felt by the people and nations who do not emit, e.g. parts of Africa, small island states (SIDs) etc. Sea level rise for the latter is especially significant especially as they often don't have a voice on the global stage. • 7a shows emissions for a whole country; arguably a more useful measure are emission per capita. • Changes in farming, through adaptation, may mitigate against the risks of climate change. So, the evidence in Figure 7c may not be reliable and conclusions not valid. • Overall the view is likely to be broadly correct, with exceptions.

	AO4 • Figure 7a shows China, India and USA as the biggest emitters (total CO_2). • Figure 7a shows that a large number of nations, especially in the southern hemisphere have a low total CO_2 output. • Figure 7a shows a good deal of variability between countries and global regions. • Figure 7c shows nine different climate change impacts. • Figure 7c shows that the climate change impacts are grouped into three categories: ocean, land and atmosphere. • Figure 7c shows a selected range of climate change impacts.

Level	Mark	Descriptor
	0	No acceptable response.
Level 1	1–4	• Demonstrates isolated elements of understanding of concepts and the interrelationship between places, environments and processes. (AO2) • Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (A04)
Level 2	5–8	• Demonstrates elements of understanding of concepts and the interrelationship between places, environments and processes. (AO2) • Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	9–12	• Demonstrates accurate understanding of concepts and the interrelationship of places, environments and processes. (AO2) • Applies understanding to deconstruct information and provides logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Q9.

Question number	Indicative content
	AO2 (4 marks)/AO3 (4 marks)/AO4 (4 marks) **Marking instructions** Markers must apply the descriptors in line with the general marking guidance and the qualities outlined in the levels-based mark scheme below. **Indicative content guidance** The indicative content below is not prescriptive and candidates are not required to include all of it. Other relevant material not suggested below must also be credited. Relevant points may include the following. **AO2** • The term climate change can be defined in a range of ways, often to suit different arguments. • Climate change will have an impact on soil, temperature, rainfall and weather events. • Climate change could threaten fragile environments, e.g. tropical rainforests or coral reefs, in terms of structure, function and biodiversity. • Fragile environments may be threatened by rising sea levels caused by climate change; ecosystem biodiversity could be threatened by animals migrating because they cannot adapt to the changing climate of their current habitat. • Responses may be either based around adaptation or mitigation.

AO3

- Attempts to mitigate against climate change threats, e.g. through sustainable management, can vary significantly for different fragile environments (judgements will depend on case studies).
- A specific ecosystem's natural ability to adapt to climate change can vary, which means impacts of climate change will be 'threats' only to ecosystems that cannot adapt.
- A main cause of climate change is greenhouse gas emissions – and the challenge is to reduce these emissions. This can be done by reducing fossil fuel consumption, finding alternative energy sources, reducing deforestation, e.g. in tropical rainforests, and developing carbon capture technologies. However, different groups of people have different opinions about which strategy is the best/most effective.
- The challenge of climate change crosses international boundaries and, therefore, international cooperation is crucial, e.g. Kyoto, 1997. However, arriving at agreement is never a straightforward process.
- The development of alternative energy sources, such as wind farms, nuclear power, HEP and solar panels will reduce fossil fuel consumption, but the development of each type of source has its own advantages and disadvantages.

AO4

- Figure 7a shows rapid increases in temperature and CO_2.
- Figure 7c shows an overall increase in all types of climate disasters during the period 1980–2011.
- Figure 7c shows that the most significant rises have been in storms and floods: up to 100 storms and around 50–200 floods per year.
- Droughts and extreme temperatures show some variability per year but storms and floods show much higher variability.
- Figure 7c indicates that there is only a moderate increase in both droughts and floods over the 1908–2011 period.

Level	Mark	Descriptor
	0	No acceptable response.
Level 1	1–4	• Demonstrates isolated elements of understanding of concepts and the interrelationship between places, environments and processes. (AO2) • Attempts to apply understanding to deconstruct information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. Judgements are supported by limited evidence. (AO3) • Uses some geographical skills to obtain information with limited relevance and accuracy, which supports few aspects of the argument. (AO4)
Level 2	5–8	• Demonstrates elements of understanding of concepts and the interrelationship between places, environments and processes. (AO2) • Applies understanding to deconstruct information and provide some logical connections between concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently, leading to judgements that are supported by evidence occasionally. (AO3) • Uses geographical skills to obtain accurate information that supports some aspects of the argument. (AO4)
Level 3	9–12	• Demonstrates accurate understanding of concepts and the interrelationship of places, environments and processes. (AO2) • Applies understanding to deconstruct information and provides logical connections between concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently, leading to judgements that are supported by evidence throughout. (AO3) • Uses geographical skills to obtain accurate information that supports all aspects of the argument. (AO4)

Q10.

Question number	Answer	Mark
	AO1 (2 marks)/AO2 (2 marks) Award 1 mark (AO1) for the identification of a reason and a further mark (AO2) for an explanation of the reason, up to a maximum of 2 marks per cause. • Trees have been cut down to make room for agriculture (1). This is carried out because the land is initially fertile and can be planted with a valuable cash crop, e.g. palm oil (1). • Land is converted from a primary/natural forest into a commercial timber crop (1). This is because tropical hardwood timber, for example, has a high commercial export value (1). • Growing importance/market of fuelwood in some developing countries (1) has increased the demand for timber/the amount of illegal logging (1). • Population growth (1) has led to many areas of forest being cleared to make room for new housing (1). Accept any other appropriate response.	(4)

Q11.

Question number	Answer	Mark
	AO1 (2 marks) / AO2 (2 marks) Award 1 mark (AO1) for identification of effect and a further mark (AO2) for an explanation of the reason, up to a maximum of 2 marks per idea: • Loss of species richness from increased heat and heatwaves (1) so this means increased temperatures will greatly affect places where ecosystems are already under stress (1). • Sea level rise affecting many low lying coastal areas and world cities (1). Linked effects of salinization and loss of biodiversity (1).	
	• Droughts, and prolonged drought for some areas (1) leading to loss of health and ecosystem stress (1). • Knock-on effects may be increased tensions over natural resources at risk from climate change (1) and even greater risk of conflict in areas with fragile environments (1). Accept any other appropriate response, e.g. can be linked effects on people through environmental degradation.	(4)

Q12.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** Award 1 mark for a suitable definition. • The long-term changes in the average planetary / surface temperature of the Earth (1). Accept any other appropriate response.	(1)

Question number	Answer	Mark
(ii)	**AO3 (2 marks)** Award 1 mark for any of the following, up to a maximum of 2 marks. • Highest = China (1) • Lowest = New Zealand (1)	(2)

Question number	Answer	Mark
(iii)	**AO2 (2 marks) / AO3 (2 marks)** Award 1 mark for the identification of a possible reason for the pattern shown on Figure 7a (AO3) and a further mark for an explanation of the pattern (AO2), up to a maximum of 2 marks per idea. • The two most populated countries have the highest CO_2, e.g. China (1) this is because more people are generating more CO_2 emissions through domestic heating and lighting (1). • Countries with lower levels of development, e.g. within sub-Saharan Africa (1) have poor energy infrastructure grids and therefore use less power (1). • Places such in the Middle East have a high CO_2 footprint as energy is comparatively cheap (oil) (1) so people will be inclined to use more (1). Accept any other appropriate response.	(4)

Q13.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** **A** changes in energy received to the Earth's upper atmosphere	**(1)**

Question number	Answer	Mark
(ii)	**AO1 (2 marks)** • Cyclical variations in Earth's orbit around the sun (1) cause variations in received radiation / suns energy over long periods of time (1). • Variation in tilt / wobble of the earth (1) changes the area of the earth that receives solar energy (1). • A theory that makes a link between Earths orbit (1) and how much sun energy is received (1). • Collective effects of changes in the Earth's movements on its climate over thousands of years Accept any other appropriate response.	**(2)**

Question number	Answer	Mark
(iii)	**AO1 (1 mark)** **B** increased intensive agriculture	**(1)**

Q14.

Question number	Answer	Mark
(i)	**AO3 (2 marks)** Award 1 mark for any of the following, up to a maximum of 2 marks. Most = China (1) Least = Kenya (1)	**(2)**

Question number	Answer	Mark
(ii)	**AO2 (2 marks) / AO3 (2 marks)** Award 1 mark for the identification of a possible reason for the pattern shown on Figure 7a (AO3) and a further mark for an explanation of the reason (AO2), up to a maximum of 2 marks per idea. • Energy consumption can be linked to development (1) so countries which are rich and developed, e.g. USA have greater energy demands (1). • Low population densities mean that there is least energy consumed (1) so smaller amount of total emissions (1). • Manufacturing in places like China (1) helps explain the countries high total carbon footprint (1). • Cheap availability of oil, e.g. Middle East creates demand for carbon-based energy (1) as the fuel is lower cost and affordable (1) Accept any other appropriate response.	**(4)**

Q15.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** D Methane	**(1)**

Question number	Answer	Mark
(ii)	**AO1 (1 mark)** Award 1 mark for any of the following. • Milankovitch cycles (1). • Solar variation/sunspots (1). • Volcanic eruptions (1). Accept any other appropriate response.	**(1)**

Q16.

Question number	Answer	Mark
(i)	**(AO4) 2 marks** Award 1 mark for a correct answer and one mark for working: Total = -125 (accept -120 to – 130) / 7 Mean = -17.9 (accept -17.4 to – 18.3) (1)	**(2)**

Question number	Answer	Mark
(ii)	**AO3 (2 marks)** Award 1 mark for the identification of a pattern and 1 mark for further detail through description or use of supporting data from the resource, up to a maximum of 2 marks. • Latin America has the greatest loss (1) compared to Europe which has seen the largest gains of nearly 25% (1). • Latin America has the greatest loss (1) whilst all other regions have seen net gains of between 5% to nearly 25% (1). • There are big variations between Latin America and other regions (1), the first two seeing huge losses (over 75%) and the other regions all seeing modest gains (1). Accept any other appropriate response.	(2)

Q17.

Question number	Answer	Mark
(i)	**AO1 (1 mark)** • Water vapour • Carbon dioxide / CO_2 • Methane / CH_4 • Nitrous oxide / NO • Ozone / O_3 • Chlorofluorocarbons (CFCs) • Hydrofluorocarbons (incl. HCFCs and HFCs) **Reject burning fossil fuels with no gas stated.** **Reject carbon monoxide as it is not considered a greenhouse gas.**	(1)

Question number	Answer	Mark
(ii)	**AO1 (1 mark)** B warming of the Earth's atmosphere resulting from human activities B is the correct answer as the other options do not have the correct meanings of the term.	(1)

Question number	Answer	Mark
(iii)	**AO1 (1 mark)** A cyclical movement of the Earth's orbit around the sun A is the correct answer as the other options do not have the correct meanings of the term.	(1)

Q18.

Question Number	Answer	Mark
	AO1 (1 mark) • Burning fossil fuels (1). • Deforestation (1). • Farming livestock (1). Accept any other appropriate response.	(1)

Q19.

Question number	Answer	Mark
	AO1 (2 marks) Award 1 mark for each characteristic, up to a maximum of 2 marks. May be generic statements, e.g. • Level of biodiversity • Threatened by people / development / resource extraction • At risk of climate change • Fragile soils Accept any other appropriate responses which may be more specific to a particular environment.	**(2)**

Q20.

Question number	Answer	Mark
(i)	**AO3 (1 mark)** 1970s, 1980s, 1990, 2000s, 2010s (1). Allow a range for example 1970-1980.	(1)

Question number	Answer	Mark
(ii)	**AO3 (2 marks)** Award 1 mark for the comparison using data Figure 7a and a further mark for additional development, up to a maximum of 2 marks per idea. • Global temperatures and CO2 emissions continue to rise at fast rates (1) at times following similar growth trajectories (1). • Global temperatures have varied more than CO2 emissions, with greater fluctuation in the 1970s (1), but with a more steady trajectory since 1995 (1). • CO2 emissions have tripled since 1960 (1), while global temperature anomalies have risen up to 0.725-0.8oC (1). Accept any other appropriate response.	(2)

Question number	Answer	Mark
(iii)	**AO2 (2 marks)** Award 1 mark (AO2) for identification of each reason up to a maximum of two marks. • Increased use of cars burning fossil fuels (1) • Burning coal to produce energy (1) • Deforestation (1) • Volcanic eruptions (1) • Industrialisation (1) • Population increase (1) Accept any other appropriate response.	(2)

Question number	Answer	Mark
(iv)	**AO2 (1 mark)/AO3 (1 mark)** Award 1 mark (AO3) for identification of a reason and a further mark for development of the reason (AO2), up to a maximum of 2 marks. • Data only presents patterns for a limited time period (1) which is not long enough to understand patterns of climate change (1). • The data does not show actual temperatures, but variations from a particular temperature (1) so not an accurate picture of actual changing climatic conditions (1). • The data does not show the fluctuations in temperatures that happen during the year (1) so may hide important variations in the pattern (1). • The data does not show other aspects of climate (1) such as rainfall patterns (1). Accept any other appropriate response.	(2)