GCE

Geography

H081/02: Geographical debates

AS Level

Mark Scheme for June 2022

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING
SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.

5. **Crossed Out Responses**
   Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

   Rubric Error Responses – Optional Questions
   Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

   Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
   - there is nothing written in the answer space

   Award Zero '0' if:

   - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response: Not applicable in F501
    a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
    b. **To determine the mark within the level**, consider the following:

Descriptor	**Award mark**
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. Annotations

Annotation	Meaning
	Highlight
	Off page comment
λ	Omission
?	Indicates questionable points / comments
R	Rubric error (place at start of Question not being counted)
L1	Level 1
L2	Level 2
L3	Level 3
L4	Level 4
DEV	Development of point
IRRL	Irrelevant; a significant amount of material that does not answer the question
SEEN	Point has been seen and noted
NE	No Examples
BP	Must be used on all blank pages where there is no candidate response
EVAL	Evaluation
	Highlighting an issue e.g. irrelevant paragraph. Use in conjunction with another stamp e.g IRRL

12. Subject Specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper and its rubrics
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet Instructions for Examiners. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners.**

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Question			Answer	Mark	Guidance
1	(a)		Explain how **two** human activities have increased emissions of different greenhouse gases since the pre-industrial era. • Deforestation (✓) burning of cleared tress releases CO_2 into the atmosphere (DEV) • Fertiliser production (✓) releases nitrous oxides during the manufacturing process (DEV) • Rice cultivation/cattle rearing (✓) produces methane in waste products (DEV)	**4** **AO1** **x4**	**AO1 – 4 marks** 1x2 marks (✓) for mention of each human activity 1x 2 marks (DEV) for correct explanation linking the human activity to greenhouse gas emissions. Must be linked to two, different greenhouse gases
1	(b)		**Examine how the historical background of the global warming debate has evolved over time.** **Level 3 (5-6 marks)** Demonstrates **thorough** knowledge and understanding of the historical background of the global warming debate (AO1). **Place specific details** should be **accurate** with the amount helping determine where within the Level the response lies. Demonstrates **thorough** application of knowledge and understanding to provide an **accurate, clear** and **developed** analysis as to how the historical background of the global warming debate has evolved over time (AO2). **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of the historical background of the global warming debate (AO1). **Place specific** material is present which is **partially accurate** with the amount helping determine where within the Level the response lies. Demonstrates **reasonable** application of knowledge and understanding to provide a **sound** analysis showing some	**6** **AO1** **x3** **AO2** **x3**	**AO1 - 3 marks** Knowledge and understanding of how the historical background of the global warming debate has evolved over time could potentially include: • Early 20th century the prevailing belief was that carbon emissions would have little impact upon the earth on account of its size and due to diffusion of any excess into the oceans. • In the 1950s some experiments revealed that this is not the case and the global warming debate emerged – since then concentrations of carbon dioxide have been measured in Mauna Loa, Hawaii to enable the Keeling and Hockey Stick curves to be constructed. • The 1970s involved a debate between long term warming and cooling – computer models and satellite imagery provided evidence more for the former than the latter. • The IPCC was created in 1988 to research climate change by collating peer-reviewed articles volunteered by scientists globally. Now on the Fifth Assessment Report, the findings suggest warming of a minimum of 2ºC without mitigation.

			accuracy and development as to how the historical background of the global warming debate has evolved over time (AO2). **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the historical background of the global warming debate (AO1). Little or no **place specific** material is present and or is inaccurate. Demonstrates **basic** application of knowledge and understanding to provide a **simple analysis** showing limited accuracy and little development as to how the historical background of the global warming debate has evolved over time (AO2). **0 marks** No response or no material worthy of credit.		• More recently, 97% of climate scientists agree that global warming is taking place and the debate has moved more into the political arena to notions of tipping points and effective methods of mitigation. **AO2 - 3 marks** Application of knowledge and understanding to analyse and examine how the historical background of the global warming debate has evolved over time could potentially include: • Significant demand for evidence has been required both spatially and temporally on account of the huge variation of the earth's climate. This has been provided by the scientific research community including the IPCC, NOAA and NASA. • Satellite imaging and computer modelling has played a vital part – the improvement in technology has moved the debate on. • Activists such as Greta Thunberg have also made the debate more accessible
1	**(ci)**		**Study Fig. 1 which shows projected global temperature increase by 2100.** **Identify evidence from Fig.1 that indicates that there is uncertainty regarding the amount of future warming.** • The error margins surrounding the scenarios are fairly large (✓) for example, with current policies it the total amount of warming could be anywhere between 2.1ºC and 3.9 ºC (a range of 1.8 ºC) • The three scenarios quoted on the infographic, along with the Paris Agreement goal, all are suggestive of different outcomes (✓)	**4** **AO3** **x4**	**AO3 – 4 marks** 4 x 1 mark (✓) for each piece of evidence from fig.1 that indicates uncertainty regarding the amount of future warming. Specific parts of the infographic should be mentioned within the answer.

			• The thermometer itself goes all the way to 5ºC which suggests that the amount of warming could be higher than the scenarios quoted (✓)		
1	**(cii)**		**Using evidence from Fig. 1, analyse reasons for the uncertainty that exists in terms of future warming scenarios.** **Level 3 (5-6 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for the uncertainty that exists in terms of future warming scenarios (AO2). Demonstrates **thorough** investigation and interpretation of the resource to fully evidence uncertainty that exists in terms of future warming scenarios. There must be strong ideas linking resource evidence to the possible reasons for the uncertainty that exists in terms of future warming scenarios (AO3). **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for the uncertainty that exists in terms of future warming scenarios (AO2). Demonstrates **reasonable** investigation and interpretation of the resource to fully evidence uncertainty that exists in terms of future warming scenarios. There must be good ideas linking resource evidence to the possible reasons for the uncertainty that exists in terms of future warming scenarios (AO3). **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for the uncertainty that	**6** **AO2** **x3** **AO3** **x3**	**AO2 - 3 marks** Application of knowledge and understanding to analyse reasons for the uncertainty that exists in terms of future warming scenarios could potentially include: • There are many factors which influence the climate which need to be taken into account. • Positive and negative feedback mechanisms amplify or reduce temperature changes – these are complex which makes predictions for the future difficult. • Human activity and how humans respond to the problem of global warming will significantly influence the amount of warming that will be experienced by 2100 – there is no clear consensus as to how this will be tackled on a global scale yet. • Residence times and potencies of GHGs vary which may influence predictions up to 2100. **AO3 - 3 marks** Evidence from the infographic of reasons for the uncertainty that exists in terms of future warming scenarios could potentially include: • The Paris Agreement goal of 1.5ºC is likely to be exceeded from the infographic suggesting a lack of global consensus on dealing with it. • “Pledges and Targets” along with “Optimistic Policies” produce similar outcomes with regards to temperature rise (both 2.8ºC, with error margins only 0.1ºC different) which suggests that they are using similar, or potentially flawed, data.

			exists in terms of future warming scenarios (AO2). Demonstrates **basic** investigation and interpretation of the resource to fully evidence uncertainty that exists in terms of future warming scenarios. There must be some ideas linking resource evidence to the possible reasons for the uncertainty that exists in terms of future warming scenarios (AO3).		• The large error margin for "Current Policies" (1.8ºC) shows that there is a high degree of uncertainty for the future which likely arises from the complexity of the carbon cycle along with uncertainty about how effective current policies are.
1	**(d)**		**'Carbon credits and carbon trading provide the most effective method for reducing carbon emissions on a global scale'. To what extent do you agree?** **Level 4 (10–12 marks)** Demonstrates **comprehensive** and accurate knowledge and understanding of carbon credits and carbon trading, along with alternative mitigation methods which act on a global scale (AO1). Demonstrates **comprehensive** application of knowledge and understanding to provide a detailed and convincing evaluation offering secure judgements leading to rational conclusions that are evidence based as to the effectiveness of carbon credits and carbon trading for reducing carbon emissions on a global scale (AO2). **Level 3 (7-9 marks)** Demonstrates **thorough** and mainly accurate knowledge and understanding of carbon credits and carbon trading, along with alternative mitigation methods which act on a global scale (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation offering generally secure judgements with some link between rational conclusions and evidence as to the effectiveness of carbon credits and carbon trading for reducing carbon	**12** **AO1** **x6** **AO2** **x6**	**AO1 - 6 marks** Knowledge and understanding of carbon credits and carbon trading, along with alternative mitigation methods which act on a global scale, could potentially include: • Outlining what carbon credits and carbon trading involves – "cap-and-trade" where polluters either cut their emissions or incur costs – these can also be traded. • Use of the EUETS as an example (introduced in 2003, more than 11,000 power stations across the EU, €100 fine for every 1 tonne excess). • Outlining the details of alternative international options such as the IPCC in terms of policy making, international directives such as the Paris Agreement, and national policies. **AO2 - 6 marks** Application of knowledge and understanding to evaluate the effectiveness of carbon credits and carbon trading for reducing carbon emissions on a global scale could potentially include:

			emissions on a global scale (AO2). **Level 2 (4-6 marks)** Demonstrates **reasonable** and some accurate knowledge and understanding of carbon credits and carbon trading, along with alternative mitigation methods which act on a global scale (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation offering generalised judgements and conclusions with limited links to evidence as to the effectiveness of carbon credits and carbon trading for reducing carbon emissions on a global scale (AO2). **Level 1 (1-3 marks)** Demonstrates **basic** and/or inaccurate knowledge and understanding of carbon credits and carbon trading, along with alternative mitigation methods which act on a global scale (AO1). Demonstrates **basic** application of knowledge and understanding offering either unsupported or minimal if any evaluation. Judgements and conclusions, if any, are simplistic regarding the effectiveness of carbon credits and carbon trading for reducing carbon emissions on a global scale (AO2).		<u>Carbon trading and credits as the most effective method</u> • Aviation and other forms of transport are included in the scheme, which it is often not in the Paris Agreement. • Crucially, the number of allowances issued to use or trade is reduced each year which promotes movement to more renewable forms of energy over time – this is done gradually to provide businesses some time to respond. • International directives such as the Kyoto Protocol and the Paris Agreement often fail due to a lack of consensus – too many countries are involved to enable quick and effective action. <u>Carbon trading and credits as not the most effective method</u> • EUETS doesn't include agriculture and transport – only 50% of emitters are covered by the scheme. • Early criticisms included too many allowances being issued, slowing the effectiveness of the scheme. • Some industries that cannot cope with the costs incurred could move overseas where regulations are less strict, therefore not assisting carbon emission reduction on a global scale. • International directives such as the Paris Agreement involve more countries, many of which are more polluting than those involved in carbon trading, which creates a more global response. • Nations and regions are setting up their own responses beyond policy-making on a larger scale e.g. UK cities declaring climate emergencies. These

					are often more manageable given smaller spatial scales. • Carbon trading does little to publicise to people on an individual scale issues relating to the climate and often international approaches rely at least in part on individual efforts.

Question			Answer	Mark	Guidance
2	(a)		**Explain <u>two</u> factors that influence the global distribution of tuberculosis.** • poverty (✓) especially in poor communities in low-middle-income countries as in sub-Saharan Africa and SE Asia (DEV) • overcrowded living conditions (✓) high density population, poorly ventilated housing – infection spreads from person to person through the air (DEV) • high prevalence in communities where immune systems are compromised (✓) by other conditions such as living with HIV, diabetes and malnutrition (DEV) • limited access to healthcare (✓) for example in rural areas in LIDCs or in areas of conflict (DEV)	**4** **AO1x4**	**AO1 – 4 marks** 2 x 1 mark (✓) for each correct factor, and 2 x 1 mark (DEV) for each explanatory point. Focus should be on the knowledge and understanding of factors that influence the global distribution of tuberculosis.
2	(b)		**Examine how climate change provides conditions for emerging infectious diseases to spread.** **Level 3 (5-6 marks)** Demonstrates **thorough** knowledge and understanding of climate change (AO1). **Place specific details** should be **accurate** with the amount helping determine where within the Level the response lies. Demonstrates **thorough** application of knowledge and understanding to provide an **accurate, clear** and **developed** analysis as to how climate change provides conditions for emerging infectious diseases to spread (AO2). **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of climate change (AO1). **Place specific** material is present which is **partially**	**6** **AO1x3** **AO2x3**	**Indicative content** **AO1 - 3 marks** Knowledge and understanding of climate change could potentially include: • effects of global warming such as increase in temperatures, rainfall and humidity • impacts on regional weather patterns such as greater frequency / intensity / incidence of extreme events such as cyclones and flooding • impacts of changes to ocean currents on rainfall and temperatures of nearby land masses **AO2 - 3 marks** Application of knowledge and understanding to analyse how climate change provides conditions for emerging infectious diseases to spread could potentially include:

			accurate with the amount helping determine where within the Level the response lies. Demonstrates **reasonable** application of knowledge and understanding to provide a **sound** analysis showing some accuracy and development as to how climate change provides conditions for emerging infectious diseases to spread (AO2). **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of climate change (AO1). Little or no **place specific** material is present and or is inaccurate. Demonstrates **basic** application of knowledge and understanding to provide a **simple analysis** showing limited accuracy and little development as to how climate change provides conditions for emerging infectious diseases to spread (AO2). **0 marks** No response or no material worthy of credit.		• transmission of vector-borne diseases stimulated in areas of rising temperatures and rainfall as vectors such as mosquitos are able to survive and develop • increasing number and geographical range of vector habitats as a result of rising temperatures and rainfall. E.g. Dengue formerly confined to tropics now found in 28 US states • areas prone to flooding long enough for re-emergence of water-borne diseases such as cholera, leptospirosis, hepatitis A, largely as a result of contaminated drinking water • vector-borne diseases can emerge after flooding such as malaria epidemics or West Nile fever as in parts of Europe
2	**(c)**	**(i)**	**Study Fig.2 which shows estimated prevalence of exposure to malaria infection during pregnancy in sub-Saharan Africa, 2018.** **Identify evidence that Fig.2 lacks accuracy in representing incidence of malaria in sub-Saharan Africa.** • only pregnant females counted and not non-pregnant females (✓) • only pregnant females counted; no reference to male malaria infection rates (✓) • no reference to national statistics; only sub regional statistics provided (✓) • not clear that the sub regions are comparable in size / population (✓) • three years out of date, 2018 (✓)	**4** **AO3x4**	**AO3 – 4 marks** 4 x 1 mark (✓) for each inaccuracy.

			• figures are clearly estimates, rounded to nearest thousand (✓)		
2	(c)	(ii)	**Using evidence from Fig.2, analyse reasons for variation in prevalence of malaria infection in sub-Saharan Africa.** **Level 3 (5-6 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for variation in prevalence of malaria infection in sub-Saharan Africa (AO2). Demonstrates **thorough** investigation and interpretation of the resource to fully evidence variation in prevalence of malaria infection in sub-Saharan Africa. There must be strong ideas linking resource evidence to the possible reasons for variation in prevalence of malaria infection in sub-Saharan Africa (AO3). **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for variation in prevalence of malaria infection in sub-Saharan Africa (AO2). Demonstrates **reasonable** investigation and interpretation of the resource to fully evidence variation in prevalence of malaria infection in sub-Saharan Africa. There must be good ideas linking resource evidence to the possible reasons for variation in prevalence of malaria infection in sub-Saharan Africa (AO3). **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for variation in	**6** **AO2x3** **AO3x3**	**Indicative content** **AO2 - 3 marks** Application of knowledge and understanding to analyse reasons for variation in prevalence of malaria infection in sub-Saharan Africa could potentially include: • higher prevalence / greatest risk within tropics where warmer, wetter and more humid - Anopheles mosquito thrives in warm, humid conditions where stagnant water to lay larvae • higher prevalence within tropics where longer season / all year round transmission • lower prevalence in areas of high altitude where cooler or desert areas where too arid • lower prevalence further away from the equator / tropics where transmission only seasonal since longer cold / cooler season • malaria transmission cannot occur in areas where there has been successful intervention such as high levels of investment in public health – insecticides, draining of breeding areas, mosquito nets, education • risk higher in areas where high density populations and poor sanitation **AO3 - 3 marks** Evidence from investigation and interpretation of the data in Fig.2 could potentially include: • Central Africa and West Africa have high proportion of areas within tropics / close to Equator with year round malaria transmission • East and Southern Africa have higher proportion of

			prevalence of malaria infection in sub-Saharan Africa (AO2). Demonstrates **basic** investigation and interpretation of the resource to fully evidence variation in prevalence of malaria infection in sub-Saharan Africa. There must be some ideas linking resource evidence to the possible reasons for variation in prevalence of malaria infection in sub-Saharan Africa. (AO3).		area further from the Equator / tropics, more seasonal • East and Southern Africa have portion of areas which are highland or desert with lower rates of malaria transmission • South Africa, one example of country in southern Africa, which is more developed where intervention is more successful

2	**(d)**		**To what extent do you agree that NGOs play the most important role in dealing with a disease outbreak.**
			
			Level 4 (10–12 marks)
			Demonstrates **comprehensive** and accurate knowledge and understanding of the role of NGOs and other organisations in dealing with a disease outbreak (AO1).
			
			Demonstrates **comprehensive** application of knowledge and understanding to provide a detailed and convincing evaluation offering secure judgements leading to rational conclusions that are evidence based as to the relative importance of NGOs and other organisations in dealing with a disease outbreak (AO2).
			
			Level 3 (7-9 marks)
			Demonstrates **thorough** and mainly accurate knowledge and understanding of the role of NGOs and other organisations in dealing with a disease outbreak (AO1).
			
			Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation offering generally secure judgements with some link between rational conclusions and evidence as to the relative importance of NGOs and other organisations in dealing with a disease outbreak (AO2).
			
			Level 2 (4-6 marks)
			Demonstrates **reasonable** and some accurate knowledge
				12
				AO1x6
				AO2x6
					Indicative content
					
					AO1 - 6 marks
					Knowledge and understanding of the role of NGOs and other organisations in dealing with a disease outbreak could potentially include:
					• NGOs such as MSF and British Red Cross:
					  ○ work 'in the field' with local communities and households
					  ○ provide clean drinking water, medicine, food, health care, immunisation, hygiene
					  ○ provide education about how to avoid infection
					  ○ provide skilled doctors and nurses working in both urban and remote rural areas
					• other players / international organisations such as WHO, UNICEF, national governments
					  ○ work in cooperation / co-ordination with other organisations such as World Bank, NGOs and CSOs such as Gates Foundation
					  ○ research and monitor to make predictions / prevent further outbreaks
					  ○ support UN member states to devise health strategies
					  ○ develop global / international strategies
					  ○ provide rapid response, water, shelter, medicines, vaccination programmes

			and understanding of the role of NGOs and other organisations in dealing with a disease outbreak (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation offering generalised judgements and conclusions with limited links to evidence as to the relative importance of NGOs and other organisations in dealing with a disease outbreak (AO2). **Level 1 (1-3 marks)** Demonstrates **basic** and/or inaccurate knowledge and understanding of the role of NGOs and other organisations in dealing with a disease outbreak (AO1). Demonstrates **basic** application of knowledge and understanding offering either unsupported or minimal if any evaluation. Judgements and conclusions, if any, are simplistic regarding the relative importance of NGOs and other organisations in dealing with a disease outbreak (AO2). **0 marks** No response or no material worthy of credit.		**AO2 - 6 marks** Application of knowledge and understanding to analyse and evaluate the relative importance of NGOs and other organisations in dealing with a disease outbreak could potentially include: • evaluation of importance of the role of NGOs in dealing with a disease outbreak • evaluation of importance of the role of other international and national organisations in dealing with a disease outbreak • idea that effectiveness of these organisations is enhanced as they work together and co-ordinate their work • consideration that NGOs and other organisations can be effective / relatively important at different geographical scales e.g. NGOs in local communities, WHO at national and global scales • consideration that NGOs can be effective / important over different time scales, short-term and longer-term

Question			Answer	Mark	Guidance
3	(a)		**Explain <u>two</u> factors that cause horizontal variation of salinity in the world's oceans.** • precipitation (✓) direct precipitation of rain and snow into oceans decreases salinity as concentration of salt is decreased by these inputs of fresh water (DEV) • sea water evaporation (✓) increases salinity as concentration of salt increases; evaporation removes water, which rises into the atmosphere and leaves the salt behind (DEV) • sea water freezing (✓) formation of ice floes in which salt is removed, increasing salinity (DEV) • melting of glaciers and icebergs (✓) these do not contain salt; the input of their freshwater decreases salinity by decreasing concentration of salt (DEV) • groundwater and river flow (✓) salinity decreases with input from major rivers; concentration of salt decreases as a result of input of fresh water (DEV)	**4** **AO1x4**	**AO1 – 4 marks** 2 x 1 mark (✓) for each correct factor, and 2 x 1 mark (DEV) for each explanatory point. Focus should be on the knowledge and understanding of factors that cause variation in salinity in the world's oceans.
3	(b)		**Examine how climate change is altering sea level.** **Level 3 (5-6 marks)** Demonstrates **thorough** knowledge and understanding the effects of climate change on sea level (AO1). **Place specific details** should be **accurate** with the amount helping determine where within the Level the response lies. Demonstrates **thorough** application of knowledge and understanding to provide an **accurate, clear** and **developed** analysis as to how climate change is altering sea level (AO2). **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of the effects of climate change on sea level (AO1).	**6** **AO1x3** **AO2x3**	**Indicative content** **AO1 - 3 marks** Knowledge and understanding of the effects of climate change on sea level could potentially include: • eustatic sea level rise averages approximately 3mm/yr over the last 20 years • the rate of SL rise is accelerating • this is a global phenomenon and is the direct result of global warming • currently thermal expansion of water is the main cause of SL rise **AO2 - 3 marks** Application of knowledge and understanding to analyse

			Place specific material is present which is **partially accurate** with the amount helping determine where within the Level the response lies. Demonstrates **reasonable** application of knowledge and understanding to provide a **sound** analysis showing some accuracy and development as to how climate change is altering sea level (AO2). **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of the effects of climate change on sea level (AO1). Little or no **place specific** material is present and or is inaccurate. Demonstrates **basic** application of knowledge and understanding to provide a **simple analysis** showing limited accuracy and little development as to how climate change is altering sea level (AO2). **0 marks** No response or no material worthy of credit.		how climate change is altering sea level could potentially include: • thermal expansion of water: global warming causes increase in surface water temperature; this causes an increase in the volume of water in the oceans, hence and overall rise in global sea level • melting of glaciers and small ice caps: global warming causes increase in air temperature; this causes net ablation loss of alpine glaciers and small ice caps, with melt water contributing to rising SL via river flow • melting at the margins of large land-based ice sheets such as Greenland and Antarctica: although ice is tending to accumulate at their centres, they are melting and thinning at their oceanic edges at an accelerating rate as ice flows outwards from the centres • reduction in the area and thickness of sea ice in the Arctic: as ice is lost, the albedo effect is reduced; more solar radiation is absorbed and not reflected leading to further melting of Arctic ice in a continued and irreversible process – the 'ice-albedo feedback loop'
3	**(c)**	**(i)**	**Study <u>Fig.3</u> which shows extent of Arctic sea ice in 1980 and 2019.** **Identify evidence from Fig. 3 that indicates changes in the extent of Arctic sea ice.** • greatest extent of loss between Alaska and NE Russia / Siberia (✓) • north coast of Russia completely ice free (✓) • Alaska completely ice free (✓) • retreat along NE coast of Greenland (✓) • loss of ice between islands of Canadian archipelago (✓) • overall loss of Arctic sea ice (✓)	**4** **AO3x4**	**AO3 – 4 marks** 4 x 1 mark (✓) for each piece of evidence from Fig.3 that identifies change in the extent of Arctic sea ice between 1980 and 2019.

3	(c)	(ii)	**Using evidence from Fig. 3, analyse reasons for the changes in extent of Arctic sea ice identified in (c)(i).** **Level 3 (5-6 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for changes in extent of Arctic sea ice (AO2). Demonstrates **thorough** investigation and interpretation of the resource to fully reasons for changes in extent of Arctic sea ice. There must be strong ideas linking resource evidence to the reasons for the changes in extent of Arctic sea ice (AO3). **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for changes in extent of Arctic sea ice (AO2). Demonstrates **reasonable** investigation and interpretation of the resource to fully evidence reasons for changes in extent of Arctic sea ice. There must be good ideas linking resource evidence to reasons for the changes in extent of Arctic sea ice (AO3). **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for the changes in extent of Arctic sea ice (AO2). Demonstrates **basic** investigation and interpretation of the resource to fully evidence reasons for changes in extent of Arctic sea ice. There must be some ideas linking resource evidence to reasons for the changes in extent of Arctic sea ice (AO3).	**6** **AO2x3** **AO3x3**	**Indicative content** **AO2 - 3 marks** Application of knowledge and understanding to analyse reasons for the changes in extent of Arctic sea ice identified in 3(c)(i) could potentially include: • Changes in the net deficit of the heat budget at high latitudes • Role of human activity in increasing greenhouse gas emissions and rising temperatures in high latitudes • Possible influences of ocean currents such as Gulf Stream brining warmer water than previously • Idea of sea ice thinning initially as temperatures rise before complete melting; sea ice is thinner at its edges in lower latitudes • Idea of threshold/positive feedback, as reduced sea ice cover means less reflection of solar radiation and more absorption, raising sea temperatures and causing further melting **AO3 - 3 marks** Evidence from investigation and interpretation of Fig.3 could potentially include: • Overall reduction due to general increase in global temperatures • More significant loss of ice in lower latitudes where temperatures would have been closer to melting point than at higher latitudes • Less significant reduction between islands of Canadian archipelago where sea ice was limited in extent already

					• Significant reduction off Russian coast due to Gulf Stream warming • Significant reduction off Alaskan coast enhanced by heat generated from oil/gas industry
3	**(d)**		**'Off-shore oil exploitation poses greater threats to people than to the environment.' To what extent do you agree?** **Level 4 (10–12 marks)** Demonstrates **comprehensive** and accurate knowledge and understanding of threats to people and the environment caused by off-shore oil exploitation (AO1). Demonstrates **comprehensive** application of knowledge and understanding to provide a detailed and convincing evaluation offering secure judgements leading to rational conclusions that are evidence based as to the relative significance of threats to people and the environment caused by off-shore oil exploitation (AO2). **Level 3 (7-9 marks)** Demonstrates **thorough** and mainly accurate knowledge and understanding of threats to people and the environment caused by off-shore oil exploitation. (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation offering generally secure judgements with some link between rational conclusions and evidence as to the relative significance of threats to people and the environment caused by off-shore oil exploitation (AO2). **Level 2 (4-6 marks)** Demonstrates **reasonable** and some accurate knowledge and understanding of threats to people and the environment	**12** **AO1x6** **AO2x6**	**Indicative content** **AO1 - 6 marks** Knowledge and understanding of threats to people and the environment caused by exploitation of off-shore oil production could potentially include: *Threats to people* • oil installations, potential for fire / explosion, human casualties • oil spills can affect human activity such as fishing industry and tourism • ancillary industries / urban growth, may lead to loss of amenity value of countryside, traffic congestion • pressure on existing resources as a result of rapid growth e.g. services • potentially damaging to health, air pollution • overdependence on this one industry for jobs in a possible boom and bust local economy *Threats to the environment* • oil spills from shipping / rigs and rig explosion can affect bird / fish / seal populations • marine ecosystem disturbance – noise, stirring up sea bed, impact on food chains • environmental impacts on land areas connected such as terminals, agglomeration of industry, housing, services, infrastructure • pollution from shipping – globally significant greenhouse gas emissions; locally air pollution in and around major oil ports

			caused by off-shore oil exploitation. (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation offering generalised judgements and conclusions with limited links to evidence as to the relative significance of threats to people and the environment caused by off-shore oil exploitation (AO2). **Level 1 (1-3 marks)** Demonstrates **basic** and/or inaccurate knowledge and understanding of the impact of threats to people and the environment caused by off-shore oil exploitation. (AO1). Demonstrates **basic** application of knowledge and understanding offering either unsupported or minimal if any evaluation. Judgements and conclusions, if any, are simplistic regarding the relative significance of threats to people and the environment caused by off-shore oil exploitation (AO2). **0 marks** No response or no material worthy of credit.		**AO2 - 6 marks** Application of knowledge and understanding to analyse and evaluate the relative significance of threats to people and the environment caused by off-shore oil exploitation could potentially include: • threats to people can be economic, social, environmental and political; for example the boundary dispute in Atlantic waters off the Ivory Coast and Ghana over exploration rights • threats to the environment can be marine, land and atmospheric • terrestrial threats arise from development of terminals which can be rapid as the multiplier effect occurs leading to changing land use, increased traffic flows, noise, land and air pollution – particular problems when oil pipelines are laid on-shore in tundra regions • threats can vary in significance over time for example, economic shock as changes in price of oil can be volatile or environmental shock if there is a sudden oil spill • threats can vary in spatial terms, for example as technology enables drilling in deeper and stormier environments, such as ecosystem disruption • threats can vary in intensity depending on the effectiveness of planning and management and the ability to deal with disasters • some evaluation of the relative significance of the threats e.g. threats to people outweighing threats to environment – the conclusion may depend on particular examples / geographical location / region or country / scale involved

Question			Answer	Mark	Guidance
4	(a)		**Explain <u>two</u> political factors that might cause inequality in food security.** • system of land tenure / land ownership (✓) productivity can vary depending on land ownership; private ownership often more productive leading to food security than state ownership or where tenancy requires rent to a landlord (DEV) • land grabbing policy (✓) unequal power relations between foreign national governments, seeking to improve their own food security and local farmers in developing countries who face growing food insecurity as a result (DEV) • effectiveness of strategies / policies of a national government (✓) attempts to alleviate food shortages within its own country such as India's National Food Security Bill or its earlier Green Revolution policies (DEV)	**4** **AO1x4**	**AO1 – 4 marks** 2 x 1 mark (✓) for each correct factor, and 2 x 1 mark (DEV) for each explanatory point. Focus should be on the knowledge and understanding of political factors that might cause inequality in food security.
4	(b)		**Examine how the food security of an indigenous group living in an extreme environment can be threatened.** **Level 3 (5-6 marks)** Demonstrates **thorough** knowledge and understanding of threats to the food security of an indigenous group living in an extreme environment (AO1). **Place specific details** should be **accurate** with the amount helping determine where within the Level the response lies. Demonstrates **thorough** application of knowledge and understanding to provide an **accurate, clear** and **developed** analysis as to how the food security of an indigenous group living in an extreme environment can be threatened (AO2).	**6** **AO1x3** **AO2x3**	**Indicative content** **AO1 - 3 marks** Knowledge and understanding of threats to the food security of an indigenous group living in an extreme environment could potentially include: • the indigenous group live in an area of low species diversity and delicate food webs, making the ecosystem particularly vulnerable to change • their food security depends on food harvested from the natural environment • the effects of climate change such as global warming or increasing incidence of extreme weather events has severe impact on food availability

			Level 2 (3-4 marks) Demonstrates **reasonable** knowledge and understanding of threats to the food security of an indigenous group living in an extreme environment (AO1). **Place specific** material is present which is **partially accurate** with the amount helping determine where within the Level the response lies. Demonstrates **reasonable** application of knowledge and understanding to provide a **sound** analysis showing some accuracy and development as to how the food security of an indigenous group living in an extreme environment can be threatened (AO2). **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of threats to the food security of an indigenous group living in an extreme environment (AO1). Little or no **place specific** material is present and or is inaccurate. Demonstrates **basic** application of knowledge and understanding to provide a **simple analysis** showing limited accuracy and little development as to how the food security of an indigenous group living in an extreme environment can be threatened (AO2). **0 marks** No response or no material worthy of credit.		**AO2 - 3 marks** Application of knowledge and understanding to analyse how the food security of an indigenous group living in an extreme environment can be threatened could potentially include: • hunting and retrieving seals and narwhal in a sustainable way is increasingly difficult for example for Inuit people as ice melts in the Arctic • some fish stocks dependent on ice cover have declined in Arctic waters • Inuit food sources such as caribou have declined in numbers since they are affected by earlier spring and changes in their own food sources • and other animals migrating north have brought diseases lethal to caribou • the belief among Inuit peoples that increasing pollution / contamination is affecting the quality and safety of their natural food supplies; this is leading to use of store-bought foods to which they now have access, contributing to a range of health and economic problems Another case study would be equally valid.
4	**(c)(i)**		**Study Fig.4, which shows production of three types of vegetable in selected European countries, 2017. Identify evidence from Fig. 4 that indicates differences in vegetable production.** **of differences in vegetable production.**	**4** **AO3x4**	**AO3 – 4 marks** 4 x 1 mark (✓) for each piece of evidence from Fig.4 that identifies differences in vegetable production.

			• Spain and Italy both have total production which is at least double that of any other country, > 6 000 tonnes (✓) • Spain, Italy and Portugal have much higher proportion of tomato production than the other countries (✓) • Germany and Poland have highest production of carrots > 1 000 tonnes (✓) • Netherlands and Spain have higher proportions of onion production than other countries >1 000 tonnes (✓) • Germany's tomato production is significantly smaller than any other nation (✓) • France and Poland have more evenly balanced production of the three vegetables (✓) • Overall tomato production is the greatest tonnage of all three crops (✓)		
4	**(c)(ii)**		**Using evidence from Fig.4, analyse reasons for differences identified in 4(c)(i).** **Level 3 (5-6 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to possible reasons for differences in crop production (AO2). Demonstrates **thorough** investigation and interpretation of the resource to fully evidence differences in crop production. There must be strong ideas linking resource evidence to possible reasons for differences in crop production (AO3). **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to reasons for possible reasons for differences in crop production (AO2).	**6** **AO2x3** **AO3x3**	**Indicative content** **AO2 - 3 marks** Application of knowledge and understanding to analyse possible reasons for differences in crop production identified in 4(c)(i) could potentially include: • climate • relief • soils • length of growing season • area under cultivation • technology • methods of food production • access to markets • demand for goods **AO3 - 3 marks** Evidence from investigation and interpretation of Fig.4

			Demonstrates **reasonable** investigation and interpretation of the resource to fully evidence differences in crop production. There must be good ideas linking resource evidence to the possible reasons for differences in crop production (AO3). **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to possible reasons for differences in crop production (AO2). Demonstrates **basic** investigation and interpretation of the resource to fully evidence differences in crop production. There must be some ideas linking resource evidence to possible reasons for differences in crop production (AO3).		could potentially include: • dominance of tomato production in southern European countries where climatic conditions are favourable • scale of carrot production in northern European countries where soils and climatic conditions are favourable • intensive production methods in the Netherlands including value of its soils and investment in glasshouses • large size of Spain and Italy with extensive areas under crop production • length of growing season longer in southern Europe / Mediterranean climate of Spain, Italy, Portugal may enable multiple cropping during the year • low lying flat land of Netherlands enables easy use of large machinery • proximity of southern Europe to own domestic markets and the large markets of northern Europe, especially for out-of-season tomatoes
4	**(d)**		**'Human factors are the main cause of increased risk to food security.' Discuss this statement in the context of a <u>case study</u> of <u>one</u> dryland area.** **Level 4 (10–12 marks)** Demonstrates **comprehensive** and accurate knowledge and understanding of human and other factors causing increased risk to food security in a dryland area (AO1). Demonstrates **comprehensive** application of knowledge and understanding to provide a detailed and convincing evaluation offering secure judgements leading to rational conclusions that are evidence based as to the relative impact of human and other factors on increased risk to food security in a dryland area (AO2).	**12** **AO1x6** **AO2x6**	**Indicative content** **AO1 - 6 marks** Knowledge and understanding of human and other factors causing increased risk to food security in a dryland area could potentially include: *Human factors* • demographic; population growth which may lead to deforestation / use of marginal land for agriculture with further impact on environment / productivity • farming practices; overgrazing / over-cultivation may lead to desertification with impacts on soil fertility / erosion and in time further increase the risk • demand for irrigation water; and its impact on

			Level 3 (7-9 marks) Demonstrates **thorough** and mainly accurate knowledge and understanding of human and other factors causing increased risk to food security in a dryland area (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation offering generally secure judgements with some link between rational conclusions and evidence as to the relative impact of human and other factors on increased risk to food security in a dryland area (AO2). **Level 2 (4-6 marks)** Demonstrates **reasonable** and some accurate knowledge and understanding of human and other factors causing increased risk to food security in a dryland area (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation offering generalised judgements and conclusions with limited links to evidence as to the relative impact of human and other factors on increased risk to food security in a dryland area (AO2). **Level 1 (1-3 marks)** Demonstrates **basic** and/or inaccurate knowledge and understanding of the impact of human and other factors causing increased risk to food security in a dryland area (AO1). Demonstrates **basic** application of knowledge and understanding offering either unsupported or minimal if any evaluation. Judgements and conclusions, if any, are simplistic regarding the relative impact of human and other factors on increased risk to food security in a dryland area (AO2).		salinisation • economic; poverty / wealth of households / communities / governments • level of technology *Other factors* • climate change; such as increased temperature / drought • fragility / resilience of the natural ecosystem • hydrology / water scarcity • political; such as marginalisation through poor governance, the effects of land grabbing and political instability / conflict • effectiveness of government strategies to deal with food security / desertification **AO2 - 6 marks** Application of knowledge and understanding to analyse and evaluate the relative impact of human and other factors on increased risk to food security in a dryland area could potentially include: • evaluation of the relative impacts of different human factors • evaluation of the relative impacts of physical / environmental factors • evaluation of the impact of political factors • food security risks can be increased by a combination of economic, social, environmental and political factors; these factors are inter-related and rarely operate in isolation • risk can change at different rates over time, short- or long-term causing variation in its level of urgency; this may depend on the cascading / knock on effects within the natural ecosystem • risk can vary in spatial terms and scale according to the type of dryland environment – desert or semi-desert ecosystems for example • risk might be increased by increasing dependency

			0 marks No response or no material worthy of credit.		of communities on food aid

Question			Answer	Mark	Guidance
5	(a)		**Explain two ways in which the basic structure of the earth has a role in the theory of plate tectonics.** • The structure of the earth consists of the solid inner and liquid outer core of a temperature of approximately 5000ºC, the semi-molten asthenosphere and the rigid lithosphere (✓) • The temperature difference between the core and the lithosphere drives the convection currents in the semi-molten asthenosphere (DEV) • Detail about how convection currents work: the warm semi-molten rock adjacent to the core heats and rises in the asthenosphere, as it reaches the lithosphere it cools and sinks (DEV) • The lithosphere is brittle and solid and therefore is broken into plates (✓) which move as a result of the underlying convection currents in the asthenosphere (DEV)	**4** **AO1** **x4**	**AO1 – 4 marks** 1 x 2 marks for each reference to the basic structure of the earth, including reference to the lithosphere, asthenosphere and convection currents (accept core, mantle and crust). 2 x 1 mark (DEV) for correct explanation linking to the theory of plate tectonics.
5	(b)		**Examine how movements of the Earth's crust form mid-oceanic ridges.** **Level 3 (5-6 marks)** Demonstrates **thorough** knowledge and understanding of movements of the Earth's crust that relate to mid-oceanic ridges (AO1).	**6** **AO1** **x3** **AO2** **x3**	**AO1 - 3 marks** Knowledge and understanding of movements of the Earth's crust that relate to mid-oceanic ridges could potentially include: • Divergence of plates at divergent (constructive) plate boundaries • Forms a location where magma rises through the asthenosphere.

			Place specific details should be **accurate** with the amount helping determine where within the Level the response lies. Demonstrates **thorough** application of knowledge and understanding to provide an **accurate**, **clear** and **developed analysis** as to how movements of the Earth's crust form mid-oceanic ridges (AO2). **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of movements of the Earth's crust that relate to mid-oceanic ridges (AO1). **Place specific** material is present which is **partially accurate** with the amount helping determine where within the Level the response lies. Demonstrates **reasonable** application of knowledge and understanding to provide a **sound analysis** showing some accuracy and development as to how movements of the Earth's crust form mid-oceanic ridges (AO2). **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of movements of the Earth's crust that relate to mid-oceanic ridges (AO1). Little or no **place specific** material is present and or is inaccurate. Demonstrates **basic** application of knowledge and understanding to provide a **simple analysis** showing limited accuracy and little development as to how movements of the Earth's crust form mid-oceanic ridges (AO2). **0 marks** No response or no material worthy of credit.		• Average depth of 2.5km below the ocean surface. • Often long chains of mountains, e.g. the Mid-Atlantic Ridge, with some islands penetrating the ocean surface e.g. Iceland. • Links to sea-floor spreading. • Occasionally segmented by transform faults. • Pillow lavas where underwater eruptions have occurred. **AO2 - 3 marks** Application of knowledge and understanding to analyse how movements of the Earth's crust form mid-oceanic ridges form could potentially include: • Mid-oceanic ridges form where plates are moving apart as a result of constructive/ divergent plate movement. E.g. the Mid-Atlantic Ridge where the North American and Eurasian plates are moving apart at an average of 2.5cm per year. • Shape is dependent upon the rate of spreading, which itself is determined by the amount of magma brought to the surface by convection currents. • Superheated seawater can chemically change basalt to create black smokers.
5	**(ci)**		**Study <u>Fig. 5</u> which shows the VEI (Volcanic Explosive Index).** **Identify evidence from Fig. 5 that indicates how the VEI measures volcanic activity.**	**4** **AO3** **x4**	**AO3 – 4 marks** 4 x 1 mark (✓) for correct identification of how the VEI measures volcanic activity.

			• The VEI value is related to magnitude (the quantity of ejected tephra) and intensity (speed of eruption/ explosiveness) as seen by the inclusion of volume and column height (✓) • The scale runs from 0 to 8; 0 being non-explosive (0.0001km³) to 8 being a very explosive eruption (1,000km³) (✓) • Larger circles suggest a more explosive eruption (✓) for example, a VEI of 8 produces in excess of 1,000km³ of tephra, compared to VEI of 7 which produced 100km³ of ash (✓) • The relationship between VEI and ash ejected is not linear but exponential/ logarithmic as seen by the disproportionate increase in size of the circles for higher VEI values (✓). This is evidenced by the rapidly increasing diameter size of the circles with VEI value (✓). • The erupted tephra volume increases 10x with each increase in VEI (✓) • Evidence of the magnitude-frequency relationship where more explosive eruptions are much rarer (✓) e.g. 3598 VEI 2 compared to 50 VEI 6.		Specific parts of the infographic should be mentioned within the answer.
5	**(cii)**		**Using evidence from <u>Fig. 5</u>, analyse reasons for variations in VEI measurements.** **Level 3 (5-6 marks)** Demonstrates **thorough** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to possible reasons for variations in VEI measurements (AO2). Demonstrates **thorough** investigation and interpretation of the resource to fully evidence variations in VEI measurements. There must be strong ideas linking resource evidence to possible reasons for variations in VEI	**6** **AO2 x3** **AO3 x3**	**AO2 - 3 marks** Application of knowledge and understanding to analyse the reasons for variations in VEI measurements could potentially include: • Plate boundaries lead to variations in levels of explosion; subduction zones often involve high VEI measurements whilst divergent plate boundaries with effusive eruptions have low VEI measurements. • Levels of explosiveness are often related to the rock composition and the abundance of silica

			measurements (AO3). **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to possible reasons for variations in VEI measurements. (AO2). Demonstrates **reasonable** investigation and interpretation of the resource to fully evidence variations in VEI measurements. There must be good ideas linking resource evidence to possible reasons for variations in VEI measurements (AO3). **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide clear and developed analysis that shows accuracy as to possible reasons for variations in VEI measurements (AO2). Demonstrates **basic** investigation and interpretation of the resource to fully evidence variations in VEI measurements. There must be some ideas linking resource evidence to possible reasons for variations in VEI measurements (AO3).		influencing viscosity – more silica traps gas bubbles which increases the VEI measurement. • Supervolcanoes have a VEI measurement of 8 – they operate differently which explains their high level of explosion - the caldera is believed to collapse which releases ash around the caldera circumference so a high amount of tephra is released in a relatively short amount of time. **AO3 - 3 marks** Evidence from the infographic for variations in VEI measurements could potentially could potentially include: • VEI measurements of 8 producing 1000km³ of tephra compared to 0.01km³ for a VEI of 3. • Column height also reflects the level of explosion, a VEI of 8 can have an ash cloud reaching 25km vertically whereas a VEI of 3 only reaches 3-15km³. • The circle diameter of VEI 8 (supervolcano) is approximately double that of VEI 7, which is double that of 6 – highlighting the logarithmic nature of the VEI scale so that it accounts for a wide variety of eruption types.
5	**(d)**		**To what extent does the capacity of people to cope with tectonic hazards change over time?** **Level 4 (10–12 marks)** Demonstrates **comprehensive** and accurate knowledge and understanding of capacity of people to cope with tectonic hazards (AO1). Demonstrates **comprehensive** application of knowledge and understanding to provide a detailed and convincing evaluation offering secure judgements leading to rational conclusions that are evidence based	**12** **AO1** **x6** **AO2** **x6**	**AO1 - 6 marks** Knowledge and understanding of the capacity of people to cope with tectonic hazards could potentially include: • Coping with tectonic hazards could include: ○ Mitigating against the event e.g. lava diversion channels for volcanic eruptions or land-use zoning for earthquakes. ○ Mitigating against vulnerability e.g. community preparedness and building design. ○ Mitigate against losses e.g. insurance and rescue and emergency relief.

			as to the capacity of people to cope with tectonic hazards over time (AO2). **Level 3 (7-9 marks)** Demonstrates **thorough** and mainly accurate knowledge and understanding of the capacity of people to cope with tectonic hazards (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation offering generally secure judgements with some link between rational conclusions and evidence as to the capacity of people to cope with tectonic hazards changes over time (AO2). **Level 2 (4-6 marks)** Demonstrates **reasonable** and some accurate knowledge and understanding of capacity of people to cope with tectonic hazards (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation offering generalised judgements and conclusions with limited links to evidence as to the capacity of people to cope with tectonic hazards changes over time (AO2). **Level 1 (1-3 marks)** Demonstrates **basic** and/or inaccurate knowledge and understanding of capacity of people to cope with tectonic hazards (AO1). Demonstrates **basic** application of knowledge and understanding offering either unsupported or minimal if any evaluation. Judgements and conclusions, if any, are simplistic regarding the capacity of people to cope with tectonic hazards changes over time (AO2). **0 marks** No response or no material worthy of credit.		• Mention may be made about the changes in the frequency and impacts of tectonic hazards over time, possibly through the use of the disaster risk equation (R=(H x V)/ C. • Mention may be made of the Park model for countries who regularly experience tectonic hazards and how their capacity to cope changes after each event. • A comparative approach may be taken with the use of contrasting case studies. **AO2 - 6 marks** Application of knowledge and understanding to evaluate the extent to which the capacity of people to cope with tectonic hazards changes over time could potentially include: <u>The capacity to cope does change over time</u> • Capacity to cope may improve with time should resources be available e.g. money, expertise, which is often the case in ACs, whereas it may diminish over time where resources are used in largely mitigating losses which is often the case in LIDCs. • Technology improvements in education, prediction, the role of land-use mapping, means that capacity to cope on a global scale, particularly in ACs, is improving with time. • In LIDCs there may be a lack of affordable options on a variety of scales meaning that capacity to cope does change, but negatively. <u>The capacity to cope does not change over time</u>

					• Most disasters follow a similar pattern in terms of response – the Park model highlights these. • On small timescales, such as between events, there may be negligible observable improvements in capacity to cope on account of the relief, rehabilitation and reconstruction phases always playing out.

Question			Answer	Mark	Guidance
6	(a)		**With reference to <u>Fig. 6</u>, suggest how recent changes in atmospheric carbon dioxide concentrations may affect <u>one</u> landscape system you have studied.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of recent changes in atmospheric carbon dioxide and ONE landscape system (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed interpretation that shows accuracy of how recent changes in atmospheric carbon dioxide concentrations may affect ONE landscape system (AO2). This will be shown by including **well-developed** ideas linking resource evidence on changes in atmospheric carbon dioxide concentrations to ONE landscape system. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of recent changes in atmospheric carbon dioxide and ONE landscape system (AO1).	**8** **AO1 x4** **AO2 x4**	**AO1 - 4 marks** Knowledge and understanding of how recent changes in atmospheric carbon dioxide concentrations may affect ONE landscape system could potentially include: • increases in surface, atmospheric and oceanic temperatures • shrinking of valley glaciers and ice sheets • rising sea level • increasing atmospheric water vapour • decreasing snow cover and sea ice. This could also include a conceptual overview of: • the components of coastal landscape systems, including inputs, processes and outputs • the flows of energy and material through coastal systems • sediment cells. How landforms in submergent landscapes are influenced by rising sea level due to a warming climate, including: • climate changes that occurred during a previous time period and the resultant sea level rise

			Demonstrates **reasonable** application of knowledge and understanding to provide a sound interpretation that shows some accuracy of how recent changes in atmospheric carbon dioxide concentrations may affect ONE landscape system (AO2). This will be shown by including **developed** ideas linking resource evidence on changes in atmospheric carbon dioxide concentrations to ONE landscape system. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of recent changes in atmospheric carbon dioxide and ONE landscape system (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple interpretation that shows limited accuracy of how recent changes in atmospheric carbon dioxide concentrations may affect ONE landscape system (AO2). There will be **simple** ideas linking resource evidence on changes in atmospheric carbon dioxide concentrations to ONE landscape system. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		• the influence of sea level rise and geomorphic processes in shaping landforms, including rias, fjords and shingle beaches • the modification of these landforms by processes associated with present and future climate and sea level changes. • Reference to relevant landforms and processes within the chosen landscape system – specific points will depend upon the landscape system studied by candidates; coastal, glaciated or dryland. Candidates demonstrate that they have knowledge and understanding of some of these in the context of their chosen landscape system. **AO2 - 4 marks** Application of knowledge and understanding to interpret how recent changes in atmospheric carbon dioxide concentrations may affect ONE landscape system could potentially include: • The main impacts of an increasing amount of carbon dioxide in the atmosphere includes climate change, ocean acidification and potentially an increase in vegetation growth. • The link between carbon dioxide and temperatures may be briefly outlined through reference to the enhanced greenhouse effect. • Reference to figure 6 e.g. average global carbon dioxide levels have steadily risen from 2005 to present from 378ppm to 412ppm (data retrieved from the figure). • Rate of increase shown at Figure 6 is at a rate of approximately 2.4ppm per year.

					• Figure 6 shows a percentage increase of atmospheric carbon dioxide concentrations of 9% in 14 years. • The resource (Figure 6 shows) that there have not been any anomalous years in this timespan, particularly as the average seasonal cycle has been removed. <u>Coastal landscapes - possible examples</u> • An increase in the global average temperature as a result of the enhanced greenhouse effect will lead to sea level rise due to thermal expansion and the melting of land-based ice. This rise will cause coastal landscapes to experience more erosion and retreat through hydraulic action and abrasion. • Rising sea level may also cause the formation of rias at some river mouths; other landforms such as bars and tombolos might also modify as transportation processes alter. • Ocean acidification is the result of carbon dioxide diffusing into water – the ocean has decreased by a pH of 0.1 since pre-industrial levels. This will increase levels of corrosion, particularly at coastlines which are predominantly chalk or limestone. • Weathering by carbonation may increase due to increases in atmospheric carbon dioxide creating more concentrated carbonic acid in rainwater. This is also likely to happen at a faster rate if the atmospheric temperatures are higher. • More flash floods from a changing climate may bring more sediment load from rivers into oceans, altering the sediment budgets and levels of transportation and deposition around some coastal areas. <u>Glaciated landscapes - possible examples</u>

					• An increase in the global average temperature as a result of the enhanced greenhouse effect will lead to an increase in ablation, leading to glacial retreat. • Specifically, temperature increases are likely to lead to more evaporation and more basal sliding from slippage – more glaciers are likely to become warm-based globally. • Weathering by carbonation may increase due to increases in atmospheric carbon dioxide creating more concentrated carbonic acid in rainwater. This is also likely to happen at a faster rate if the atmospheric temperatures are higher. • Freeze-thaw weathering is likely to increase due to warmer temperatures, potentially creating more scree to form at high altitudes. • An increase in meltwater could lead to an increase in the number of tarns and flood events. • Periglacial environments will experience a deepening of the active layer. Previous frozen ice could melt and release carbon dioxide and methane, triggering positive feedback. <u>Dryland landscapes - possible examples</u> • Weathering by carbonation may increase due to increases in atmospheric carbon dioxide creating more concentrated carbonic acid in rainwater. This is also likely to happen at a faster rate if the atmospheric temperatures are higher. • Change in drainage and water availability e.g. more flash floods or a loss of permanent rivers to intermittent. • Greater aridity due to warming global temperatures as evaporation levels further exceed precipitation levels. • Polar drylands will experience a deepening of the active layer and an increase in freeze-thaw weathering as more melting and re-freezing of ice takes place.

6	(b)		**Examine how a changing climate could have a role in driving economic change in places.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of a changing climate and factors driving economic change (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how a changing climate could have a role in driving economic change (AO2). There must be **well-developed** ideas of how a changing climate could have a role in driving economic change. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of changing climate and factors driving economic change (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis that shows some accuracy of how a changing climate could have a role in driving economic change (AO2). There must be **developed** ideas of how a changing climate could have a role in driving economic change. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of changing climate and factors driving economic change (AO1).	**8** **AO1 x4** **AO2 x4**	**AO1 - 4 marks** Knowledge and understanding of a changing climate and economic change could potentially include: • A brief overview of how the climate has changed since the late-nineteenth century and is likely to change in the future, e.g. 0.85ºC rise as a global average with aims to cap any further rise to a total of 1.5ºC, sea level rise of 0.19m, expectations for regional weather patterns to be disrupted with extreme weather events such as droughts, storms and heatwaves to occur with greater frequency and intensity. • Economic change may include reference to tourism, location of TNCs, deindustrialisation, employment sector changes, nation states. **AO2 - 4 marks** Application of knowledge and understanding to analyse the ways in which a changing climate could have a role in driving economic change could potentially include: • Investment into research industries / renewable energy companies– expansion of the quaternary sector. • Warming temperatures are likely to influence the location of primary industries such as farming (crop tolerance ranges being exceeded, spread of diseases that reduce crop yields, water shortages from drought), fishing (warming oceans alter fish grounds) and forestry (increase in some places due to more favourable conditions, particularly in term of temperature but may decrease in some places as temperature tolerance ranges are exceeded). • Rising sea levels are likely to cause industries in coastal locations to relocate further inland due to the increased threat of flooding – may lead to a spiral of decline/ negative multiplier effect in these areas.

			Demonstrates **basic** application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how a changing climate could have a role in driving economic change (AO2). This will be shown by including **simple** ideas of how a changing climate could have a role in driving economic change. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		• Melting snow and glaciers is likely to influence winter sports resorts due to less predictable snowfall and a lack of tourists – may lead to a spiral of decline/ negative multiplier effect in these areas. • Mid-latitude regions which are unlikely to experience severe climatic changes compared to low and high latitude regions may experience a positive multiplier effect due to industries relocating and the provision of employment. • Likely to influence tourism in different areas – increased number of forest fires in Australia and California may deter tourists leading to negative economic change whereas warmer summers in Europe may encourage more “stay-cations” where people travel abroad less frequently, leading to positive economic change. • Expansion of quaternary industries such as climate change research and engineering e.g. for the construction of high-albedo buildings and renewable energy sites. • Links are likely to be made between changing climates and economic change through the use of positive and negative multiplier effects. • Economic change may be discussed within the context of varying spatial scales.

Question			Answer	Mark	Guidance
7	(a)		**With reference to Fig. 7, suggest how outbreaks of communicable disease might be influenced by shifting flows of people.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of communicable disease outbreaks and shifting flows of people (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed interpretation that shows accuracy of how communicable disease outbreaks are linked to shifting flows of people (AO2). This will be shown by including **well-developed** ideas linking resource evidence on communicable disease outbreaks to shifting flows of people. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of communicable disease outbreaks and shifting flows of people (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound interpretation that shows some accuracy of how communicable disease outbreaks are linked to shifting flows of people (AO2). This will be shown by including **developed** ideas linking resource evidence on communicable disease outbreaks to shifting flows of people. There are some attempts to make synoptic links between content from different parts of the course	**8** **AO1 x4** **AO2 x4**	**Indicative content** **AO1 - 4 marks** Knowledge and understanding of communicable disease outbreaks and shifting flows of people could potentially include: *Disease outbreaks* • sudden occurrence in short space of time • rapid rise to high numbers of cases • occurrence at different times / possibility of return • outbreaks in different localities at same time *Shifting flows of people* • migration • tourist flows • journey to work • school holidays • movements to markets • refugees, IDP camps • large scale movements to events / festivals such as Chinese New Year **AO2 - 4 marks** Application of knowledge and understanding to interpret how communicable disease outbreaks and shifting flows of people are linked could potentially include: • introduction of infectious disease to new area by recent migrant population, causing outbreak in a different place • tourist movement at international, intercontinental scale carrying communicable disease at a particular time / season. • reference to Figure 7 commenting on the increased cases of Swine Flu in July / August during the busy tourist seasons; also a peak in October / November linked to half term breaks in schools • commuting could introduce disease outbreak in a large office

			of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of communicable disease outbreaks and shifting flows of people (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple interpretation that shows limited accuracy of how communicable disease outbreaks are linked to shifting flows of people (AO2). There will be **simple** ideas linking resource evidence on communicable disease outbreaks to shifting flows of people. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		/ work place • where people travel long distance to regular / weekly markets such as possible cause of disease outbreaks in some LIDCs • possible disease outbreaks in refugee camps • major events in some cases can involve movement of millions of people increasing the incidence of disease outbreaks

7	**(b)**		**Examine how prevalence of disease decreases over time through government investment in services.**
			
			Level 3 (6-8 marks)
			Demonstrates **thorough** knowledge and understanding of decrease in prevalence of disease over time and government investment in services (AO1).
			
			Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how decrease in prevalence of disease over time is affected by government investment in services (AO2).
			
			There must be **well-developed** ideas of how decrease in prevalence of disease over time is affected by government investment in services.
			There are clear attempts to make synoptic links between
				8
				AO1 x4
				AO2 x4
					Indicative content
					
					AO1 - 4 marks
					Knowledge and understanding of prevalence of diseases over time and government investment in services could potentially include:
					
					• deaths from many diseases such as smallpox, cholera, typhoid and diarrhoea have decreased in developed countries over the last 200 years
					• this is largely the result of government investment in public services to provide –
					  ○ improved housing conditions
					  ○ better hygiene / sanitation
					  ○ more effective public health policy
					  ○ education
					  ○ medical advances / treatments

			content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of decrease in prevalence of disease over time and government investment in services (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis that shows some accuracy of how decrease in prevalence of disease over time is affected by government investment in services (AO2). There must be **developed** ideas of how decrease in prevalence of disease over time is affected by government investment in services. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of decrease in prevalence of disease over time and government investment in services (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how decrease in prevalence of disease over time is affected by government investment in services (AO2). This will be shown by including **simple** ideas of how decrease in prevalence of disease over time is affected by government investment in services. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		**AO2 - 4 marks** Application of knowledge and understanding to analyse how prevalence of disease decreases over time through government investment in services could potentially include: • over time countries such as the UK have progressed through the epidemiological transition during which there has been a decline in number of deaths from diseases • government investment in services has played a significant role in this transition by raising standards of living and increasing life expectancy, anti-smoking campaigns and legislation to reduce incidence of lung cancer • investment in housing with improved sanitation and less overcrowding reduces prevalence of infectious disease such as TB and other respiratory diseases • investment in provision of clean drinking water helping to reduce water-borne diseases such as cholera • development of a more effective public health policy including education to improve awareness and improvement in nutrition to strengthen immunity against diseases such as rickets • investment in vaccination programmes to reduce prevalence or even eradication of communicable / infectious diseases over time such as smallpox • investment in research and new monitoring/treatments for cancers, heart disease.

Question			Answer	Mark	Guidance
8	(a)		**With reference to Fig.8, suggest how latitudinal variation in average surface temperatures of the world's oceans may influence place identity.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of latitudinal variation in average surface temperatures of the world's oceans and place identity (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed interpretation that shows accuracy of how latitudinal variation in average surface temperatures of the world's oceans may influence place identity (AO2). This will be shown by including **well-developed** ideas linking resource evidence of latitudinal variation in average surface temperatures of the world's oceans to place identity. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of latitudinal variation in average surface temperatures of the world's oceans and place identity (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound interpretation that shows some accuracy of how latitudinal variation in average surface temperatures of the world's oceans may influence place identity (AO2). This will be shown by including **developed** ideas linking resource evidence of latitudinal variation in average surface temperatures of the world's oceans to place	**8** **AO1 x4** **AO2 x4**	**Indicative content** **AO1 - 4 marks** Knowledge and understanding of latitudinal variation in average surface temperatures of the world's oceans and place identity could potentially include: *Latitudinal variation in average surface temperatures of world's oceans* • Horizontal and vertical variations in salinity and temperature. • The global distribution of warm and cold surface currents. • The pattern of circulation in the North Atlantic, including both surface and deep currents. *Place identity* • demographic • socio-economic • cultural **AO2 - 4 marks** Application of knowledge and understanding to interpret how latitudinal variation in average surface temperatures of the world's oceans may influence place identity could potentially include: • seasonal flows of population / transient populations in ports / coastal settlements which are not ice-free all year • small permanent populations in coastal settlements where ocean surface temperatures are low; limited employment opportunities • ports / coastal settlements which are not ice-free all year lack economic diversity, such as those based on fishing industry • construction of storm barriers / coastal defences / buildings in coastal settlements in areas at risk of hurricanes / tropical storms • hunting and fishing way of life / culture of indigenous

			identity. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of latitudinal variation in average surface temperatures of the world's oceans and place identity (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple interpretation that shows limited accuracy of how latitudinal variation in average surface temperatures of the world's oceans may influence place identity (AO2). There will be **simple** ideas linking resource evidence of latitudinal variation in average surface temperatures of the world's oceans to place identity. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		populations influenced by seasonal variation in sea ice and nature of ecosystems within Arctic circle • importance of tourism and linked economic activity in coastal settlements where warmer ocean water such as Mediterranean coasts **Use of the data provided from Figure 8 to support the ideas** • surface temperature 0ºC at 70ºN • surface temperature below 0ºC at 70ºS • surface temperature approx. 27ºC at Equator • surface temperatures over 20ºC within tropics • rapid and continued decline between southern tropic and Antarctic • less rapid decline between 35ºN and 60ºN
8	**(b)**		**Examine how acidification of oceans might contribute to economic change in places.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of acidification of oceans and economic change (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how acidification of oceans might contribute to economic change in places (AO2). There must be **well-developed** ideas of how acidification of oceans might contribute to economic change in places. There are clear attempts to make synoptic links between	**8** **AO1 x4** **AO2 x4**	**Indicative content** **AO1 - 4 marks** Knowledge and understanding of acidification of oceans and economic change could potentially include: *Acidification* • oceans are sinks in the Earth's carbon cycle which absorb a high percentage of anthropogenic generated carbon dioxide • this has caused a rapid change in oceanic pH; there has been approximately 30% increase in acidity since mid-18th century • this has had a direct impact on marine ecosystems and further impact on human societies which are closely linked to them *Economic change in places*

			content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of acidification of oceans and economic change (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis that shows some accuracy of how acidification of oceans might contribute to economic change in places (AO2). There must be **developed** ideas of how acidification of oceans might contribute to economic change in places. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of acidification of oceans and economic change (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how acidification of oceans might contribute to economic change in places (AO2). This will be shown by including **simple** ideas of how acidification of oceans might contribute to economic change in places. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		• loss of employment / livelihood • loss of revenue • impact on coastal property • impact on food security **AO2 - 4 marks** Application of knowledge and understanding to analyse how acidification of oceans might contribute to economic change in places could potentially include: • marine ecosystems affected by acidification have experienced fall in fish and shellfish stocks; societies dependent on these resources have suffered loss of income and fall in employment related to the commercial fishing industry, including aquaculture • societies dependent on seafood for subsistence such as in coral atolls experience food insecurity and with few other alternatives, there has been natural population decline and emigration • where tourism is an important industry / source of income, such as eco-tourism based on coral reefs, there has been loss of income and employment since acidification causes loss of coral • for some island communities dependent on coral for natural coastal protection, the loss of coral has threatened lives, property and amenities such as beaches which erode faster, leading to greater proportion of spending on sea defences and / or emigration

Question			Answer	Mark	Guidance
9	(a)		**With reference to Fig.9, suggest how changes in the global number of undernourished people may be linked to changes in social inequality.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of changes in the global number of undernourished people and changes in social inequality (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed interpretation that shows accuracy of how changes in the global number of undernourished people are linked to changes in social inequality (AO2). This will be shown by including **well-developed** ideas linking resource evidence on global number of undernourished people and social inequality. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of changes in the global number of undernourished people and changes in social inequality (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound interpretation that shows some accuracy of how changes in the global number of undernourished people are linked to changes in social inequality (AO2). This will be shown by including **developed** ideas linking resource evidence on global number of undernourished people and social inequality.	**8** **AO1 x4** **AO2 x4**	**Indicative content** **AO1 - 4 marks** Knowledge and understanding of changes in global number of undernourished people and changes in social inequality could potentially include: *Changes in global number of undernourished people* • Current trends in global food security using data such as undernourishment and hunger statistics and the Global Food Security Index. • How the pattern of food security is dynamic and varies both between and within countries. • The social, economic and political factors affecting food security such as land ownership systems, competition and land grabbing and how these vary from place to place • Regions, countries and people whose food security is most at risk across the development spectrum • Case studies of two places at contrasting levels of economic development to illustrate the implications of poor food security on the lives of people. *Changes in social inequality* • at global scale narrowing / widening of development gap • at national scale increase / decrease in internal inequalities, including regional, intra-urban and local community scale • attitudes towards gender inequality • the influence of changing employment opportunities and income, access to health and education services, and food security • the impact of political factors such as conflict, government policies **AO2 - 4 marks** Application of knowledge and understanding to interpret how

			There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of changes in the global number of undernourished people and changes in social inequality (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple interpretation that shows limited accuracy of how changes in the global number of undernourished people are linked to changes in social inequality (AO2). There will be **simple** ideas linking resource evidence on global number of undernourished people and social inequality. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		changes in the global number of undernourished people are linked to changes in social inequality could potentially include: • at global scale, declining numbers of undernourished people as shown in Figure 9 show overall decline from just over 1bn 1991 to just over 800m 2017 which can be linked to narrowing of the development gap between rich and poor countries; decreasing levels of social inequality explained by improving access to education and health services and greater food security in some LIDCs • periods of increasing global numbers of undernourished people can be linked to widening of the development gap between some countries affected by conflict and / or poor governance; increasing levels of social inequality with limited access to education, health service and food, e.g., use of data from Figure 9 such as 1991-2, 2000-05 and 2015-17 • at national scale, increasing numbers of undernourished people can be linked to increasing social inequalities where widening regional disparities in employment, income, access to services are the result of economic change and / or ineffective government policies, e.g., use of data from Figure 9 such as 1991-2, 2000-05 and 2015-17 • decreasing numbers of undernourished people 1992-2000 and 2005-2015 (figure 9) may be linked to government policies which effectively reduce food insecurity and reduce child poverty; reference may also be made to the overall slow rate of decline, only 200m people no longer undernourished in 26 years • at intra-urban scale, increases in numbers of undernourished people may reflect inequalities in poverty within urban areas which experience industrial decline and unemployment or where housing shortages and poverty of migrants leads to growth of squatter settlements

9	(b)		**Examine how shocks to the food system caused by tectonic hazards affect place identity.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of shocks to the food system caused by tectonic hazards and place identity (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how shocks to the food system caused by tectonic hazards affect place identity (AO2). There must be **well-developed** ideas of how shocks to the food system caused by tectonic hazards affect place identity. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of shocks to the food system caused by tectonic hazards and place identity (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis that shows some accuracy of how shocks to the food system caused by tectonic hazards affect place identity (AO2). There must be **developed** ideas of how shocks to the food system caused by tectonic hazards affect place identity. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of	**8** **AO1 x4** **AO2 x4**	**Indicative content** **AO1 - 4 marks** Knowledge and understanding of shocks to the food system caused by tectonic hazards and place identity could potentially include: *Shocks to the food system caused by tectonic hazards* • impact of volcanic ash / lahar / floods on pastureland / livestock • impact of ash / tephra / pyroclastic flows on crops • impact of lava flows / lahars / floods on transport networks • impact of ash clouds on air transport • impact of ash on sulphur content / pH of soils • impact of ground shaking on food producing areas / farm buildings / livestock, transport networks and people • impact of landslides and avalanches on soils / crops / livestock • impact of earthquake activity on flooding / agricultural land *Place identity* • demographic • socio-economic • cultural • built environment • natural characteristics **AO2 - 4 marks** Application of knowledge and understanding to analyse how shocks to the food system caused by volcanic eruptions affect place identity could potentially include: • ash fall / covering can destroy livestock and crops with adverse effects on production in the short term and changing the landscape and natural ecosystems of a place • ash fall can destroy farm buildings / machinery with adverse effects on production in the long term; in LIDCs for example causing demographic effects such as out-migration from the area and impacts on the built environment such as

			shocks to the food system caused by tectonic hazards and place identity (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how shocks to the food system caused by tectonic hazards affect place identity (AO2). This will be shown by including **simple** ideas of how shocks to the food system caused by tectonic hazards affect place identity. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		abandonment of a rural area • ash, lava, lahars and floods can be a shock to distribution of food by physical disruption / damage to bridges, roads airports cutting access to markets • in the longer term, increasing soil acidity can affect crop yields adversely, causing the place to have lower carrying capacity of population with lower total population and lower densities • the impact of pyroclastic flow on an area can be devastating to all life (crops, livestock, population, ecosystems) and built structures producing a sterile landscape which only recovers in the long term e.g. Montserrat 1995 • tectonic hazards linked to seismic activity – ground shaking, liquefaction, landslides, avalanches, flooding can all have short- and longer-term impacts / shocks on food production and food security, affecting place identity of areas where food production is part of commercial or subsistence economies

Question			Answer	Mark	Guidance

10	(a)		**With reference to <u>Fig. 10</u>, suggest how the ground shaking and displacement experienced during an earthquake event may affect <u>one</u> landscape system you have studied (8)**
			
			Level 3 (6-8 marks)
			Demonstrates **thorough** knowledge and understanding of ground shaking and displacement and ONE landscape system (AO1).
			
			Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed interpretation that shows accuracy of how ground shaking and displacement can affect ONE landscape system (AO2).
				8
				AO1 x4
				AO2 x4
					AO1 - 4 marks
					Knowledge and understanding of how ground shaking and displacement experienced during an earthquake event may affect ONE landscape system could potentially include:
					• The effects earthquakes have on landforms and landscapes, including:
					  ○ Liquefaction
					  ○ Landslides and avalanches
					  ○ Tsunamis associated with sea-bed uplift and underwater landslides
					• Geology, including lithology and structure
					• The influence of flows of energy and materials on geomorphic processes, including weathering, mass movement, wave, fluvial and aeolian erosion, transportation and deposition

			This will be shown by including **well-developed** ideas linking resource evidence on ground shaking and displacement to ONE landscape system. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of ground shaking and displacement and ONE landscape system (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound interpretation that shows some accuracy of ground shaking and displacement can affect ONE landscape system (AO2). This will be shown by including **developed** ideas linking resource evidence on ground shaking and displacement to ONE landscape system. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of ground shaking and displacement and ONE landscape system (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple interpretation that shows limited accuracy of ground shaking and displacement can affect ONE landscape system (AO2).		• The formation of distinctive landforms, predominantly influenced by deposition, including beaches, spits, on-shore bars, tombolos and salt marshes. • Reference to relevant landforms and processes within the chosen landscape system – specific points will depend upon the landscape system studied by candidates; coastal, glaciated or dryland. Candidates demonstrate that they have knowledge and understanding of some of these in the context of their chosen landscape system. **AO2 - 4 marks** Application of knowledge and understanding to interpret how ground shaking and displacement experienced during an earthquake event may affect ONE landscape system could potentially include: **Use of Figure 10 to interpret the data:** • Reference to the figure e.g., moderate amplitude where a cluster exists between 0 and 40 seconds (maximum wave amplitude of 110mm) with a lull before the arrival of the other cluster at 49 seconds. Here, a much larger amplitude waves begin up to a maximum of 290mm at 52 seconds which decrease and give way to a final cluster at approximately 90 seconds (maximum amplitude of 50mm). <u>Coastal landscapes - possible examples</u> • Landforms which usually take thousands of years to modify may suddenly alter in seconds e.g. arches, cliffs or stacks collapsing. This may cause rapid advances in coastal retreat between earthquake

			There will be **simple** ideas linking resource evidence on ground shaking and displacement to ONE landscape system. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		events and a sudden increase in sediment supply at the nearshore zone. With cliffs: ○ The mass movement could be in the form of a rock fall where the cliff is 40º or more. ○ It could alternatively be a slide (linear) or slump (rotational) depending upon the local geology. • Increase in surface water waves; potentially a tsunami if the earthquake takes place at a deep-sea destructive margin which can cause significant inundation inland. • Low lying areas such as saltmarshes may become inundated, causing vegetation loss and a loss of structural stability. • Salt marshes, deltas and lagoons are also more likely to experience high levels of liquefaction due to an abundance of cohesionless sediment. <u>Glaciated landscapes - possible examples</u> • In high relief areas, ground shaking is likely to cause avalanches in glaciated areas and rock falls in post-glaciated areas – these can block transport routes and hamper rescue efforts. • Areas of cohesionless sediment such as glacial deposits, including moraine, are likely to experience high levels of liquefaction. • Dams are likely to fail and potentially collapse depending upon the shaking intensity, leading to flooding downstream. • Basal sliding may increase in the zone of plastic flow for the duration of the earthquake due to bed deformation and slippage.

					• Supraglacial transportation is likely to increase as material at higher altitudes becomes dislodged from ground shaking. • Rivers may divert channel either temporarily or permanently, depending upon the level of shaking. <u>Dryland landscapes - possible examples</u> • Areas of cohesionless sediment such as alluvial fans, Badlands and erg are likely to experience high levels of liquefaction. • Rivers may divert channel either temporarily or permanently, depending upon the level of shaking. • Collapse of landforms such as cliffs or pedestal rocks where weathering and erosion have already made them unstable. • Dams are likely to fail and potentially collapse depending upon the shaking intensity, leading to flooding downstream. • Mass movement e.g. debris flows and rockfalls which may increase the abundance of talus slopes. The higher level answers will attempt to link parts of the figure to a specific type of effect.
10	**(b)**		**Examine how earthquake activity could have a role in driving economic change in places.** **Level 3 (6-8 marks)** Demonstrates **thorough** knowledge and understanding of earthquake activity and economic change in places (AO1). Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis that shows accuracy of how earthquake	**8** **AO1 x4** **AO2 x4**	**AO1 - 4 marks** Knowledge and understanding of the ways in which earthquake activity could have a role in driving economic change could potentially include: • Earthquake activity may include ground shaking and ground displacement, liquefaction, landslides and avalanches, tsunamis and flooding.

			activity could have a role in driving economic change in places (AO2). There must be **well-developed** ideas of how earthquake activity could have a role in driving economic change in places. There are clear attempts to make synoptic links between content from different parts of the course of study. **Level 2 (3-5 marks)** Demonstrates **reasonable** knowledge and understanding of earthquake activity and economic change in places (AO1). Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis that shows some accuracy of how earthquake activity could have a role in driving economic change in places (AO2). There must be **developed** ideas of how earthquake activity could have a role in driving economic change in places. There are some attempts to make synoptic links between content from different parts of the course of study but these are not always relevant. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of earthquake activity and economic change in places (AO1). Demonstrates **basic** application of knowledge and understanding to provide a simple analysis that shows limited accuracy of how earthquake activity could have a role in driving economic change in places (AO2).		• Economic change may include reference to tourism, location of TNCs, deindustrialisation, employment sector changes, nation states. • Investment into research industries – expansion of the quaternary sector. • A variety of scales may be mentioned. **AO2 - 4 marks** Application of knowledge and understanding to analyse the ways in which earthquake activity could have a role in driving economic change could potentially include: • Damage, particularly if frequent, from ground shaking and displacement may cause TNCs to move away from the area, potentially leading to a spiral of decline/ negative multiplier effect due to a loss of local employment. • Likely to influence tourism on varying timescales – immediately after an earthquake event, tourists are likely to be discouraged from visiting, although on longer timescales they may increase in numbers due to museums and damaged buildings being a source of curiosity. • Scientists may migrate to the area for data collection purposes and the area may see an expansion in quaternary industries such as earthquake research and engineering e.g. for the construction of earthquake-proof buildings. • Coastal locations may see a decline in industry such as energy production due to the threat of tsunamis, e.g. the Fukushima Power Plant in Japan (2011).

			This will be shown by including **simple** ideas of how earthquake activity could have a role in driving economic change in places. There are limited attempts to make synoptic links between content from different parts of the course of study. **0 marks** No response or no response worthy of credit.		• Winter sports resorts in high relief areas are likely to relocate due to a lack of tourists if earthquake activity is frequent, due to the risk of avalanches. • Links are likely to be made between earthquake activity and economic change through the use of positive and negative multiplier effects. • ACs may experience an increase in investment from the government and private industries into building earthquake-proof offices to prevent TNCs from relocating, therefore minimising economic change. • Economic change may be discussed within the context of varying spatial scales.

Question			Answer	Mark	Guidance
11*			**Examine the view that carbon capture and storage is the most effective mitigation strategy for reducing risks of climate change.** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of mitigation strategies for reducing risks of climate change. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of mitigation strategies for reducing risks of climate change. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of mitigation strategies for reducing risks of climate change.	**20** **AO1 x10** **AO2 x10**	**AO1 - 10 marks** Knowledge and understanding of mitigation strategies (including CCS) along with risks of climate change could potentially include: • Mention of the current global risk of climate change e.g. a minimum of 1.5ºC temperature rise since pre-industrial levels. • Describing how CCS works – extracts carbon dioxide emitted by coal-burning power stations, transports via pipelines underground where it is stored in porous rocks e.g. Drax in North Yorkshire. • Outlining some of the risks associated with climate change, for example, further temperature rise, extreme weather, ocean acidification, biodiversity loss, changing crop yields. • Describing how other mitigation strategies work:

			Level 1 (1-2 marks) Demonstrates **basic** knowledge and understanding of mitigation strategies for reducing risks of climate change. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the success of mitigation strategies for reducing risks of climate change. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the success of mitigation strategies for reducing risks of climate change. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of the success of mitigation strategies for reducing risks of climate change. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the success of mitigation strategies for reducing risks of climate change. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of		○ **Energy efficiency and conservation:** building regulations and financial incentives are used in the UK to reduce energy usage, particularly for heating. ○ **Fuel shifts and low-carbon energy sources:** government policies to decarbonise the UK, therefore reducing carbon emissions from energy production. This is achieved by increasing energy usage from renewable sources and decreasing from oil and coal sources in accordance with EU directives. ○ **Forestry strategies:** reforestation and forest conservation increase the sequestration of carbon and decrease carbon emissions through deforestation and combustion. ○ **Geoengineering:** technology which modifies the environment on a large scale by either reducing the amount of insolation absorbed by the Earth (e.g. space reflectors, surface albedo techniques) or by altering the balance of gases in the atmosphere (e.g. atmospheric aerosols, ocean fertilisation). **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the view that carbon capture and storage is the most effective mitigation strategy for reducing risks of climate change could potentially include: <u>CCS being the most effective mitigation strategy:</u>

			knowledge and understanding to provide a sound analysis of the success of mitigation strategies for reducing risks of climate change. 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 success of mitigation strategies for reducing risks of climate change. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of the success of mitigation strategies for reducing risks of climate change. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the success of mitigation strategies for reducing risks of climate change. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2**		• Most likely to receive support from a variety of climate change players as it enables "business as usual" in terms of industrial activity. • Carbon dioxide is the greatest contributor of the GHGs overall to climate change and this strategy targets this in particular. • The gas is stored underground to minimise as much as possible it re-entering the atmosphere and contributing the climate change in the future – it is a long term strategy. • The problems relating to other strategies e.g. many geoengineering techniques are unlikely to go ahead due to the number of unknowns associated with it; forestry strategies are largely required in LIDCs where a substantial amount of the global forests are found which makes implementation difficult for economic reasons; energy efficiency and conservation does not reduce carbon emissions enough to limit climate change. <u>CCS not being the most effective mitigation strategy:</u> • **Problems relating to CCS include:** only targets carbon emissions and does not reduce other more potent GHGs such as methane and nitrous oxides; is not yet proven to be effective; expensive compared to other methods so unlikely to be adopted by EDCs and LIDCs in particular; does not alter behaviours which could create further climate issues in the future if any storage reservoirs fail; requires large amounts of energy; storage reservoirs with specific geological conditions are required. • **Benefits relating to other mitigation methods include:** forestry and fuel shifts are beneficial in other ways e.g. biodiversity/ improve air quality which improves investment opportunities; safer;

			The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		less expensive which is likely to increase LIDC and EDC involvement; geoengineering can limit temperature rise without adjusting GHGs which enables business as usual. • A combination of strategies is likely to be the most effective, along with adaptation to growing climate change risks (although do not over-credit mention of adaptation strategies).

Question			Answer	Mark	Guidance
12*			**'Rising sea levels offers the most significant evidence for global climate change since the late-nineteenth century'. How far do you agree with this statement?** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of rising sea levels and evidence for global climate change since the late-nineteenth century. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of rising sea levels and evidence for global climate change since the late-nineteenth century. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of rising sea levels and evidence for global climate change since the late-nineteenth century.	**20** **AO1 x10** **AO2 x10**	**AO1 - 10 marks** Knowledge and understanding of evidence for global climate change (including rising sea levels) since the late-nineteenth century could potentially include: • **Rising sea levels:** since 1900 the average rise has been 1.0mm – 2.5mm per year which is achieved through both tidal gauges and satellite altimetry. Contributions to sea level rise on a global scale include the melting of land-based ice and thermal expansion, the former of which acts as evidence for global climate change in its own right. • **Increases in surface, atmospheric and oceanic temperatures:** consistent rise of global land and ocean temperatures in the 20th century, and in particular the last 40 years which have been measured using thermometers and satellites. The high thermal heat capacity of the oceans means that they have warmed more slowly but hold more heat energy. • **Shrinking of valley glaciers and ice sheets:** glacial retreat has been a global phenomenon over the past century as seen by time lapse images (e.g. EIS), satellite imagery and historical documents

			Level 1 (1-2 marks) Demonstrates **basic** knowledge and understanding of rising sea levels and evidence for global climate change since the late-nineteenth century. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the significance of evidence, including rising sea levels, for global climate change since the late-nineteenth century. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the significance of evidence, including rising sea levels, for global climate change since the late-nineteenth century. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of the significance of evidence, including rising sea levels, for global climate change since the late-nineteenth century. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the significance of evidence, including rising sea levels, for global climate change since the late-		from the local population. Rate of loss is believed to be accelerating, most likely due to positive feedback. • **Increasing atmospheric water vapour:** satellite sensors and airborne instruments have detected an increase in water vapour in the atmosphere over recent decades. It is estimated that for every 1ºC increase in temperature caused by higher carbon dioxide levels, rising levels of water vapour will double the warming which is an example of positive feedback. • **Decreasing snow cover and sea ice:** satellite measurements have revealed a decline in spring snow cover of 2% per decade since 1966 in the Northern Hemisphere along with a dramatic decline in Arctic sea ice since 1979 of 8% per decade, both of which lead to positive feedback. **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate rising sea levels and other sources of evidence for global climate change could potentially include: <u>Rising sea levels offering the most significant evidence:</u> • Sea level changes can be measured at all coastal locations which provides a more global understanding of climate change, whereas changes to ice and snow cover can only be detected in high latitude or altitude locations. • Sea level measurements go back to 1900 offering a greater opportunity to understand longer term changes compared to some other sources of evidence.

			nineteenth century.
			
			Level 2 (3-4 marks)
			Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of the significance of evidence, including rising sea levels, for global climate change since the late-nineteenth century.
			
			Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence, including rising sea levels, for global climate change since the late-nineteenth century.
			
			Level 1 (1-2 marks)
			Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of the significance of evidence, including rising sea levels, for global climate change since the late-nineteenth century.
			
			Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the significance of evidence, including rising sea levels, for global climate change since the late-nineteenth century.
			
			Quality of extended response
			Level 4
			There is a well-developed line of reasoning which is clear and logically structured. The information
					• Similar conclusions from tidal gauge data and satellite altimetry data allow greater confidence in both sets of data.
					• Sea level changes are made up from thermal expansion and melting land-based ice, both of which are sources of climate change in their own right.
					• Less sensitive to local conditions compared to evidence such as atmospheric and oceanic temperature changes which results in fewer anomalous results.
					• Tidal gauges are inexpensive compared to measuring temperatures on a global scale which has provided a long term, accurate and global source of data.
					
					<u>Rising sea levels not offering the most significant evidence:</u>
					• **Problems relating to sea level data:**
					  ○ Sea levels can be influenced on a local scale (e.g. due to isostatic rebound, tectonic uplift, storm surges) which means that data from many locations is required to be confident that they are rising globally.
					  ○ Although the trends are the same, tidal gauges have underestimated the rate at which sea levels are rising compared to satellite altimetry data.
					  ○ The relative contributions of thermal expansion and land-based ice to rising sea levels are unknown unless other sources of evidence are also used.
					  ○ Fewer tidal gauges are present in uninhabited areas e.g. Antarctica which

			presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		limits to the extent to which they provide a global source of evidence. ○ Often rising sea levels are evident gradually as seen by higher spring tides or more frequent storm surges which can be difficult to measure as a long term average. • **Benefits of other sources of data:** ○ Shrinking valley glaciers leave long term signatures in the landscape which along with historical records provide longer term evidence of climate change. ○ Shrinking valley glaciers and decreasing snow cover offer acts as a more visual source of evidence which arguably therefore provides more compelling evidence. ○ Increases in global land and ocean temperatures are the source of the other forms of evidence and therefore require greater investigation than the others. ○ Although sea level data goes back to 1900, temperature data accurately goes back further to 1880 providing longer term data. ○ Temperature data is arguably easier to measure and therefore has been conducted in more places, more frequently over the past century therefore providing more compelling evidence. • A convergence of evidence is important – it is the combination of different sources of evidence with the same conclusions that provides powerful evidence for global climate change –

					this is particularly the case given that each source of evidence will experience different levels of positive feedback.

Question			Answer	Mark	Guidance
13*			**Evaluate the success of strategies to mitigate against non-communicable diseases.** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of mitigation strategies for non-communicable diseases. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of mitigation strategies for non-communicable diseases. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of mitigation strategies for non-communicable diseases. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of mitigation strategies for non-communicable diseases. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the success of mitigation strategies for non-communicable diseases. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the success of mitigation strategies for non-communicable diseases. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and	**20** **AO1 x10** **AO2 x10**	**Indicative content** **AO1 - 10 marks** Knowledge and understanding of mitigation strategies for non-communicable diseases could potentially include: • investment in advanced medical technology such as diagnostic techniques, radiotherapy, intervention • mass screening • research into causes, effects and control of diseases such as the different types of cancer • publicity for health campaigns / education such as changes in lifestyle • research and discovery of new drugs / treatments • work of international agencies / charities into research, prevention, diagnosis, treatment of specific diseases, including various forms of CVD, diabetes, cancer • government legislation such as use of sun beds / skin cancer • advances in surgery / chemotherapy **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the success of mitigation strategies for non-communicable diseases could potentially include: • effectiveness of strategies at different geographical scales such as level of national government investment in ACs/EDCs/LIDCs and policies which are global such as those of WHO, UNICEF and NGOs • policies / strategies which have become

			understanding to provide a clear and developed analysis of the success of mitigation strategies for non-communicable diseases. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the success of mitigation strategies for non-communicable diseases. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of the success of mitigation strategies for non-communicable diseases. 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 success of mitigation strategies for non-communicable diseases. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of the success of mitigation strategies for non-communicable diseases. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the success of mitigation strategies for non-communicable diseases. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.		increasingly effective over time within a country as they become refined / improved • success of strategies for different types of non-communicable disease as the risk changes such as cancer, diabetes and CVD risks in ACs associated with sedentary lifestyle, diet and obesity • the success of strategies in LIDCs where high levels of air pollution are difficult to control or where there is slow implementation of necessary legislation leading to higher incidence of respiratory diseases and cancers, with mortality occurring at increasingly earlier age • a country's willingness or ability to participate in international initiatives such as air pollution control and its effect on incidence of different cancers • the success of direct strategies such as more precise forms of radiotherapy, diagnostic methods such as endoscopy for early diagnosis and mass screening for breast, cervical and bowel cancer • the success of indirect strategies such as education and health campaigns to inform the public of the dangers of smoking, excessive drinking, and unbalanced diets • remaining problems of waiting times between diagnosis and treatment, and funding for GPs, hospitals and further research into cancers, diabetes and CVD • the success of international agencies and charities in research, diagnosis and treatment and their dependence on donations, legacies and charity events Answers referring to communicable rather than non-communicable disease should be limited to top of Level 2 – 8 marks - max.

			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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		

Question			Answer	Mark	Guidance
14*			**Evaluate the global impact of <u>one</u> pharmaceutical transnational corporation in disease eradication.** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of the global impact of a pharmaceutical transnational and other factors / strategies in disease eradication. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of the global impact of a pharmaceutical transnational and other factors / strategies in disease eradication. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of the global impact of a pharmaceutical transnational and other factors / strategies in disease eradication. **Level 1 (1-2 marks)**	**20** **AO1 x10** **AO2 x10**	**Indicative content** **AO1 - 10 marks** Knowledge and understanding of the global impact of a pharmaceutical transnational and other factors / strategies in disease eradication could potentially include: *Pharmaceutical transnational* • employment of scientists who identify and extract drugs from a range of natural resources • manufacture drugs / produce vaccines • conduct research / scientific breakthroughs • large investment into development of new medicines *Other factors / strategies* • global campaigns supported by WHO / UNICEF • top-down national government initiatives • grass-roots strategies which involve local communities **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the importance of a pharmaceutical transnational in

			Demonstrates **basic** knowledge and understanding of the global impact of a pharmaceutical transnational and other factors / strategies in disease eradication. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the global impact of a pharmaceutical transnational in disease eradication. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based on the importance of a pharmaceutical transnational in disease eradication. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of the global impact of a pharmaceutical transnational in disease eradication. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence on the importance of a pharmaceutical transnational in disease eradication. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of the global impact of a pharmaceutical transnational in disease eradication. Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation that offers		disease eradication could potentially include: • pharmaceutical transnationals operate on a global scale with the ability to trade globally including inflows of raw materials and distribution of products • they produce a range of medicines for use in a wide range of diseases and conditions including, diabetes 2, oncology, bacterial infections and parasitic infections • companies such as GlaxoSmithKline currently research treatments for WHO's three priority diseases – HIV/AIDS, malaria and TB • R&D work is conducted in partnership with other companies, universities and research charities • pharmaceutical companies can supply and deliver drugs such as vaccines in large quantities to places of great need such as in the developing world • although criticised in the past for exploiting rainforest ecosystems and their indigenous populations, some now such as GSK have more ethical policies which help LIDCs for example by providing discount on HIV/AIDS drugs, price capping other patented drugs and investing profits from sales into the health infrastructure of LIDCs • nevertheless eradication of disease depends on co-ordination of international and national strategies that provide an essential framework within which pharmaceutical transnational products can be delivered effectively, as required by WHO / UNICEF or governments • success in disease eradication can also depend on the work of NGOs in their grass-roots education programmes and application of vaccines and other drugs in local communities such as eradication of Guinea worm from Ghana • WHO plays a very significant role in disease eradication through its global overview and co-ordination of strategies such as community-based

			generalised judgements and conclusions, with limited use of evidence on the importance of a pharmaceutical transnational in disease eradication **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of the global impact of a pharmaceutical transnational in disease eradication. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions on the importance of a pharmaceutical transnational in disease eradication. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		surveillance, establishing global databases, quickly identifying new cases and vaccination programmes, often country by country, as in the case of smallpox eradicated in 1980 • in some instances eradication of a disease also depends on the political backing of national governments and their financial commitment, especially in LIDCs • Covid ?

Question			Answer	Mark	Guidance
15*			**With reference to <u>one</u> renewable biological resource within oceans, discuss the view that its management has been of limited success.** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of management strategies and a renewable biological oceanic resource. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of management strategies and a renewable biological oceanic resource. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of management strategies and a renewable biological oceanic resource. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of management strategies and a renewable biological oceanic resource. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the success of management strategies for a renewable biological oceanic resource. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the success of	**20** **AO1 x10** **AO2 x10**	**Indicative content** **AO1 - 10 marks** Knowledge and understanding of management strategies and a renewable biological oceanic resource could potentially include: *Management strategies* • work of member states of international organisations such as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) to monitor and regulate krill stocks • the work of the United Nations in establishing the United Nations Convention on the Law of the Sea (UNCLOS) which has set up Exclusive Fishing Zones (EFZ) • The International Whaling Commission responsible for management and conservation of whale stocks • Marine Protected Areas (MPAs), established by the International Convention on Biological Diversity • use of ecosystem provisioning services in terms of direct food products *An example of a renewable biological resource within oceans* • krill is important in the food chain and webs of the Antarctic ecosystem; as a primary consumer it feeds on plankton and in turn is prey to a wide range of predators • commercial harvesting of krill has occurred since the 1970s for a variety of uses but mainly human consumption especially by Norway, China and S Korea • there are concerns over its exploitation in localities with dense concentrations which are also feeding grounds for their predators; and because of loss and thinning of

			management strategies for a renewable biological oceanic resource. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of the success of management strategies for a renewable biological oceanic resource. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the success of management strategies for a renewable biological oceanic resource. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of the success of management strategies for a renewable biological oceanic resource. 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 success of management strategies for a renewable biological oceanic resource. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of the success of management strategies for a renewable biological oceanic resource. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the success of management		sea ice linked to warming – the under-side of which is important for krill feeding and as a nursery **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the success of management strategies for a renewable biological oceanic resource could potentially include: • the stipulations such as catch limits or protected zones set up by international organisations / commissions are not easy to monitor / control • the individual stakeholders involved in exploitation of the resource have different values, and attitudes towards use of the resource • stakeholders may be from types of country with differing requirements for the resource based on their socio-economic status and / or political context • the challenge of monitoring illegal fishing • the challenge of predicting the impact of climate change, for example its effects on Antarctic sea ice and krill stocks • the scale of the areas / problems involved presents practical difficulties • on the other hand there are clear attempts by the international community to create bodies / conventions which attempt to manage the resources such as UNCLOS, CCAMLR and IWC, meeting with some success • modern technology provides increasingly reliable and accurate data on the resource itself, fishing activity and climate change, including mathematical modelling for the TAC (total allowable catch) set by CCAMLR for krill • stakeholders in CCAMLR, mostly ACs, are pursuing a broadly sustainable approach to krill harvesting with conservation balanced with fishing in order to

			strategies for a renewable biological oceanic resource. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		maintain relationships within the Antarctic ecosystem

Question			Answer	Mark	Guidance
16*			**'Oceans present hazardous obstacles to human activities'. To what extent do you agree?** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of oceans as hazardous obstacles to human activity. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of the work of oceans as hazardous obstacles to human activity. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of oceans as hazardous obstacles to human activity. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of oceans as hazardous obstacles to human activity. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed analysis of how oceans present hazardous obstacles to human activity. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence on the extent to which oceans present hazardous obstacles to human activity. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and	**20** **AO1 x10** **AO2 x10**	**Indicative content** **AO1 - 10 marks** Knowledge and understanding of oceans as hazardous obstacles to human activity could potentially include: *Human activity* • shipping / trade – major routes include the USA – Europe – Asia Pacific axis or Europe – S America, plus many lesser routes • fishing – significant economic activity in many ocean areas • recreation – cruise ships, sailing • mineral / energy exploitation – oil drilling and increasing mining activity • passenger transport – high density of ferry routes in waters of Europe, Far East for example *Hazardous obstacles* • modern piracy – significant in areas such as east Indian Ocean and off-shore SE Asia • people trafficking – such as across the Mediterranean • marine conflict zones / growth in naval power – such as conflict in the South China Sea • storms / hurricanes / monsoon **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the extent to which oceans present hazardous obstacles to human activity could potentially include: • some obstacles are presented by physical / environmental factors; examples include the incidence of storms in temperate latitudes and tropical storms / hurricanes in oceanic areas such as the Caribbean / central Atlantic – which affect

			understanding to provide a clear, developed analysis of how oceans present hazardous obstacles to human activity. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence on the extent to which oceans present hazardous obstacles to human activity**.** **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of how oceans present hazardous obstacles to human activity. Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation that offers generalised judgements, with limited use of links between conclusions and evidence on the extent to which oceans present hazardous obstacles to human activity. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of how oceans present hazardous obstacles to human activity. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple use of links between conclusions and evidence on the extent to which oceans present hazardous obstacles to human activity. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 3** There is a line of reasoning presented with some structure.		commercial shipping routes and recreational activity at particular times of year • there are obstacles relating to human factors such as number of refugees, many subject to exploitation by people traffickers making dangerous crossings in ill-suited boats across the Mediterranean between the Middle East or North Africa and Europe • political factors can present significant obstacles such as conflict over use of designated fishing grounds or contested areas which are strategically important or have potential for mineral exploitation • in terms of scale, it is significant that a very great variety of human activities are under threat from a wide range of hazardous obstacles • some obstacles are evident in particular geographical locations such as hurricanes or acts of piracy, but they are not entirely predictable which exacerbates the nature of the hazard • some human and political obstacles are being controlled or governed by global governance measures; for example UNHCR and the EU border control are trying to manage flows of migrants and ensure their safety; a substantial maritime coalition involving the EU, NATO, USA and other countries is providing military surveillance in areas of piracy • technology is also ameliorating possible impacts for example in weather prediction and in night time patrols • on the other hand, oceans provide opportunities for economic activities which have taken place relatively unhindered for long periods of time – trade, tourism, oil exploitation, fishing, ferrying passengers

			The information presented is in the most-part relevant and supported by some evidence. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		

Question			Answer	Mark	Guidance
17*			**'Attempts to increase food production have only beneficial impacts on people and the physical environment'. To what extent do you agree?** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of beneficial and other impacts of attempts to increase food production on people and the physical environment. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of beneficial and other impacts of attempts to increase food production on people and the physical environment. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of beneficial and other impacts of attempts to increase food production on people and the physical environment. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of beneficial and other impacts of attempts to increase food production on people and the physical environment.	**20** **AO1 x10** **AO2 x10**	**Indicative content** **AO1 - 10 marks** Knowledge and understanding of beneficial and other impacts of attempts to increase food production on people and the physical environment could potentially include: *Benefits* • improving supply / reducing food shortages / improve food security • health benefits e.g. reduction in malnutrition / undernourishment / anaemia • increasing life expectancy • improving health and fitness of labour force • improving health of mothers and their children • where there are effective strategies to sustain soil quality, drainage and to conserve natural ecosystems *Disadvantages* • impacts on the physical environment such as soil erosion, salinization, deforestation, desertification • increased use of chemical / pesticides can affect human health • health issues associated with excessive calorie intake such as obesity and other related non-communicable

					diseases
			AO2 **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of beneficial and other impacts of attempts to increase food production on people and the physical environment. . Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which attempts to increase food production have only beneficial impacts on people and the physical environment. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of beneficial and other impacts of attempts to increase food production on people and the physical environment. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the extent to which attempts to increase food production have only beneficial impacts on people and the physical environment. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of beneficial and other impacts of attempts to increase food production on people and the physical environment.		**AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the beneficial and other impacts of attempts to increase food production on people and the physical environment could potentially include: • evaluation of the beneficial impacts of increased food supply in reducing food shortages on human populations • evaluation of negative impacts of attempts to increase food supply on the physical environment • consideration of knock-on effects of environmental degradation in further reducing agricultural productivity • discussion of the problem for some developing countries that they face health issues at both ends of the nutritional spectrum – health issues relating to food shortages and health issues relating to food surpluses and poor diet • the impacts of improving food production is not just an issue for people in the developing world but also in ACs • increasing food production does not necessarily achieve food security; there are issues of providing safe, good quality foods which are affordable / accessible • attempts to increase food supply can have negative impacts on human health as a result of increased use of chemicals and pesticides • increasing food production also does not necessarily improve food security; this may depend on ability to obtain a balanced diet which is nutritious, especially in areas where populations are growing fast

			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 attempts to increase food production have only beneficial impacts on people and the physical environment. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of beneficial and other impacts of attempts to increase food production on people and the physical environment. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which attempts to increase food production have only beneficial impacts on people and the physical environment. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		

Question			Answer	Mark	Guidance
18*			**'Small-scale bottom up approaches are the most effective way to improve food security'. To what extent do you agree?** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of small-scale bottom up and other approaches to improve food security. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of small-scale bottom up and other approaches to improve food security. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of small-scale bottom up and other approaches to improve food security. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of small-scale bottom up and other approaches to improve food security. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of the effectiveness of small-scale bottom up and other approaches to improve food security. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational	**20** **AO1 x10** **AO2 x10**	**Indicative content** **AO1 - 10 marks** Knowledge and understanding of small-scale bottom up and other approaches to improve food security could potentially include: *Small-scale bottom-up approaches* • co-operative farming • mixed farming – recycling of nutrients • urban agriculture • education – diet, livestock grazing *Other approaches / techniques* • food aid / short term relief • capacity building to improve resilience • long-term system redesign • large-scale technological techniques • agricultural trade policies **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the extent to which small-scale bottom up approaches are the most effective way to improve food security could potentially include: • small-scale approaches can be directed at places where there is specific risk of food security within a country or region such as small urban or rural communities e.g. 'sack' gardening in Kibera, Nairobi • bottom up approaches involve local people / farmers

			conclusions that are evidence based as to the extent to which small-scale bottom up approaches are the most effective way to improve food security. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of the effectiveness of small-scale bottom up and other approaches to improve food security. Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the extent to which small-scale bottom up are the most effective way to improve food security. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of the effectiveness of small-scale bottom up and other approaches to improve food security. 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 small-scale bottom up approaches are the most effective way to improve food security. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of the effectiveness of small-scale bottom up and other approaches to improve food security. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that		themselves in self-help schemes where they have a vested interest in achieving food security • small-scale bottom up approaches more likely to achieve environmental sustainability and sustained food supply than agribusiness such as the MERET programme in Ethiopia • co-operatives contribute to sustainability of food supply providing services such as education of local people for that particular environment as part of the process, including advice on crops which are resistant to drought or heavy rain and providing a market • small-scale bottom up approaches are often supported by government inputs for example by reforming systems of land tenure and guaranteeing prices • a combination of small-scale bottom up approaches with large scale technology can be effective such as development of HYV crops and large scale water projects • whilst many of the points above apply to LIDCs, food security is important in ACs too and they depend on government policy to establish international trade deals, and national projects such as the Special Supplemental Nutrition Program for Women, Infants and Children and Temporary Assistance for Needy Families in the USA

			offers simple conclusions as to the extent to which small-scale bottom up approaches are the most effective way to improve food security. **Quality of extended response** **Level 4** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		

Question			Answer	Mark	Guidance
19*			**To what extent have risks from tectonic hazards changed over time?** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of risks from tectonic hazards. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of risks from tectonic hazards. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of risks from tectonic hazards. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of risks from tectonic hazards. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how risks from tectonic hazards have changed over time. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to the extent to which risks from tectonic hazards have changed over time. **Level 3 (5-7 marks)**	**20** **AO1 x10** **AO2 x10**	**AO1 - 10 marks** Knowledge and understanding of tectonic hazard risks could potentially include: • Hazards from earthquakes include ground shaking and ground displacement, liquefaction, landslides and avalanches and tsunamis. These are determined by the event and the setting e.g. wave type and magnitude on the Moment Magnitude Scale, relief, soil type, coastal versus inland location. • Hazards from volcanic eruptions include lava flows, pyroclastic flows, tephra, gases, lahars, floods and tsunamis. These are determined by the event and the setting e.g. eruption type and magnitude on the VEI Scale, temperature e.g. if jökulhlaups are present, boundary setting, coastal versus inland location. • Case study detail to exemplify points. **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate the extent to which risks from tectonic hazards have changed over time could potentially include: <u>Risks from tectonic hazards have changed over time</u> • Vulnerability has increased in a global scale as EDC and LIDC populations have grown in high tectonic risk areas e.g. China and India which cover the Himalaya collision boundary region. • Often the most vulnerable populations within countries inhabit the most at risk land e.g. high relief in earthquake-prone areas which has

			Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of how risks from tectonic hazards have changed over time. . Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence as to the extent to which risks from tectonic hazards have changed over time. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of how risks from tectonic hazards have changed over time. 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 risks from tectonic hazards have changed over time. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of how risks from tectonic hazards have changed over time. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions as to the extent to which risks from tectonic hazards have changed over time.		increased risk over time as populations in EDCs and LIDCs have risen. • Capacity to cope is generally high in ACs such as Japan and the USA but remains to be low in the poorest countries e.g. Indonesia – Sulawesi tsunami (2018), therefore the risk is increasing over time. • Alternatively, it could be argued that the sharing of research and technology globally, e.g. by WAPMERR, has improved capacity to cope on a global scale, therefore reducing risk over time. <u>Risks from tectonic hazards have not changed over time</u> • The frequency and magnitude of tectonic hazards does not tend to change over time as they are dependent upon the fairly consistent movement of the plates. As such, the “H” in the equation is relatively constant over broad timescales. • Changes in reporting can account for a perceived increase in tectonic risk – improved technology means that there is greater and more instant awareness of disasters and what constitute as a “disaster” may have also altered over the years. • An increase in vulnerability on a global scale is somewhat counterbalanced by an improvement in capacity to cope with more structures being earthquake-proof and an improved education in many areas about the risks. • The unpredictable nature of many events has resulted in ACs still being “caught out” by tectonic events e.g. Whakaari, New Zealand

			Quality of extended response Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		(2019), therefore global capacity to cope has arguably not changed significantly over time.

Question			Answer	Mark	Guidance
20*			**'Volcanic eruptions at convergent (destructive) plate boundaries are more hazardous than volcanic eruptions elsewhere'. How far do you agree with this statement?** **AO1** **Level 4 (8-10 marks)** Demonstrates **comprehensive** knowledge and understanding of volcanic eruptions at convergent and divergent plate boundaries, and at hot spots. **Level 3 (5-7 marks)** Demonstrates **thorough** knowledge and understanding of volcanic eruptions at convergent and divergent plate boundaries, and	**20** **AO1 x10** **AO2 x10**	**AO1 - 10 marks** Knowledge and understanding of volcanic eruptions at convergent and divergent plate boundaries, and at hot spots could potentially include: • Volcanic eruptions at divergent (constructive) boundaries are often low viscosity and effusive. • Volcanic eruptions at convergent (destructive) boundaries are often high viscosity and explosive. • Volcanic eruptions at hot spot locations such as Hawaii which are often, but not always, low viscosity and effusive. • Hazards from explosive volcanic eruptions include lava flows, pyroclastic flows, tephra,

			at hot spots. **Level 2 (3-4 marks)** Demonstrates **reasonable** knowledge and understanding of volcanic eruptions at convergent and divergent plate boundaries, and at hot spots. **Level 1 (1-2 marks)** Demonstrates **basic** knowledge and understanding of volcanic eruptions at convergent and divergent plate boundaries, and at hot spots. **AO2** **Level 4 (8-10 marks)** Demonstrates **comprehensive** application of knowledge and understanding to provide a clear, developed and convincing analysis that is fully accurate of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere. Demonstrates **comprehensive** application of knowledge and understanding to provide detailed and substantiated evaluation that offers secure judgements leading to rational conclusions that are evidence based as to how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere. **Level 3 (5-7 marks)** Demonstrates **thorough** application of knowledge and understanding to provide a clear and developed analysis of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere.		gases, lahars, floods and tsunamis and specific mention as to how these lead to damage. **AO2 - 10 marks** Application of knowledge and understanding to analyse and evaluate how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere could potentially include: <u>Explosive eruptions associated with convergent (destructive) plate boundaries make them the most hazardous of the volcanic eruption types</u> • No other plate boundary type is home to highly explosive eruptions which therefore raises risk compared to other boundary types. • Pyroclastic flows in particular are often considered to be mainly responsible for loss of life when volcanic eruptions occur due to the rapid speeds that they travel at along with their high temperatures (200m/s and 750ºC). • Pyroclastic flows also cause other hazards such as lahars if water is present. <u>Explosive eruptions associated with convergent (destructive) plate boundaries do not make them the most hazardous of the volcanic eruption types</u> • It is the magnitude of the volcanic eruption which is important as opposed to the type of the eruption (case studies should be used to back up this point). • Explosive eruptions are relatively predictable compared to other tectonic hazards which then enables the damage to be reduced through evacuation efforts.

			Demonstrates **thorough** application of knowledge and understanding to provide a detailed evaluation that offers generally secure judgements, with some link between rational conclusions and evidence of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere. **Level 2 (3-4 marks)** Demonstrates **reasonable** application of knowledge and understanding to provide a sound analysis of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere. Demonstrates **reasonable** application of knowledge and understanding to provide a sound evaluation that offers generalised judgements and conclusions, with limited use of evidence of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere. **Level 1 (1-2 marks)** Demonstrates **basic** application of knowledge and understanding to provide a simple analysis of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere. Demonstrates **basic** application of knowledge and understanding to provide an un-supported evaluation that offers simple conclusions of how far volcanic eruptions at convergent boundaries are more hazardous than volcanic eruptions elsewhere.		• It is the combination of hazards at destructive boundaries that make them the most damaging as opposed to explosive eruptions in particular. • The unpredictable nature of many events has resulted in ACs still being “caught out” by tectonic events e.g. Whakaari, New Zealand (2019), therefore global capacity to cope has arguably not changed significantly over time. • The level of hazard is also very dependent upon the vulnerability of the population and their capacity to cope.

			Quality of extended response Level 4 There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **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. **Level 2** The information has some relevance and is presented with limited structure. The information is supported by limited evidence. **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.		

Assessment Objectives (AO) grid

Candidates answer either question 1, 2, 3, 4 or 5, either question 6, 7, 8, 9 or 10 and one of questions 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20.

Question	AO1	AO2	AO3	Marks
1, 2, 3, 4 or 5 (a)	4			4
1, 2, 3, 4 or 5 (b)	3	3		6
1, 2, 3, 4 or 5 (c)(i)			4	4
1, 2, 3, 4, or 5 (c)(ii)		3	3	6
1, 2, 3, 4 or 5 (d)	6	6		12
6, 7, 8, 9 or 10 (a)	4	4		8
6, 7, 8, 9 or 10 (b)	4	4		8
11, 12, 13, 14, 15, 16, 17, 18, 19 or 20	10	10		20
Total	31	30	7	68

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