

Markscheme

November 2022

Geography

Higher level and standard level

Paper 1

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Paper 1 markbands

These markbands are to be used for paper 1 at both standard level and higher level.

Marks	Level descriptor					
	<p>AO1: Knowledge and understanding of specified content</p> <p>AO2: Application and analysis of knowledge and understanding</p>	<p>AO3: Synthesis and evaluation</p>	<p>AO4: Selection, use and application of a variety of appropriate skills and techniques</p>			
0	The work does not reach a standard described by the descriptors below.					
1–2	<p>The response is too brief, lists unconnected information, is not focused on the question and lacks structure.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • The response is very brief or descriptive, listing a series of unconnected comments or largely irrelevant information. The knowledge and understanding presented is very general with large gaps or errors in interpretation. Examples or case studies are not included or only listed. • There is no evidence of analysis. • Terminology is missing, not defined, irrelevant or used incorrectly. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • No evidence of evaluation or conclusion is expected at this level. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • Information presented is not grouped logically (in paragraphs or sections). • Maps, graphs or diagrams are not included, are irrelevant or difficult to decipher (only if appropriate to the question). </td> </tr> </table>			<ul style="list-style-type: none"> • The response is very brief or descriptive, listing a series of unconnected comments or largely irrelevant information. The knowledge and understanding presented is very general with large gaps or errors in interpretation. Examples or case studies are not included or only listed. • There is no evidence of analysis. • Terminology is missing, not defined, irrelevant or used incorrectly. 	<ul style="list-style-type: none"> • No evidence of evaluation or conclusion is expected at this level. 	<ul style="list-style-type: none"> • Information presented is not grouped logically (in paragraphs or sections). • Maps, graphs or diagrams are not included, are irrelevant or difficult to decipher (only if appropriate to the question).
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3–4	<p>The response is too general, lacks detail, is not focused on the question and is largely unstructured.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • The response is very general. The knowledge and understanding presented outlines examples, statistics, and facts that are both relevant and irrelevant. Links to the question are listed. • The argument or analysis presented is not relevant to the question. • Basic terminology is defined and used but with errors in understanding or used inconsistently. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • If appropriate to the question, the conclusion is irrelevant. • There is no evidence of critical evaluation of evidence (examples, statistics and case studies). </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • Most of the information is not grouped logically (in paragraphs or sections). • Maps, graphs or diagrams included lack detail, are incorrectly or only partially interpreted without explicit connections to the question (only if appropriate to the question). </td> </tr> </table>			<ul style="list-style-type: none"> • The response is very general. The knowledge and understanding presented outlines examples, statistics, and facts that are both relevant and irrelevant. Links to the question are listed. • The argument or analysis presented is not relevant to the question. • Basic terminology is defined and used but with errors in understanding or used inconsistently. 	<ul style="list-style-type: none"> • If appropriate to the question, the conclusion is irrelevant. • There is no evidence of critical evaluation of evidence (examples, statistics and case studies). 	<ul style="list-style-type: none"> • Most of the information is not grouped logically (in paragraphs or sections). • Maps, graphs or diagrams included lack detail, are incorrectly or only partially interpreted without explicit connections to the question (only if appropriate to the question).
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5–6	<p>The response partially addresses the question, but with a narrow argument, an unsubstantiated conclusion, and limited evaluation.</p>					

Marks	Level descriptor		
	<p>AO1: Knowledge and understanding of specified content</p> <p>AO2: Application and analysis of knowledge and understanding</p>	<p>AO3: Synthesis and evaluation</p>	<p>AO4: Selection, use and application of a variety of appropriate skills and techniques</p>
	<ul style="list-style-type: none"> • The response describes relevant supporting evidence (information, examples, case studies et cetera), outlining appropriate link(s) to the question. • The argument or analysis partially addresses the question or elaborates one point repeatedly. • Relevant terminology is defined and used with only minor errors in understanding or is used inconsistently. 	<ul style="list-style-type: none"> • If appropriate to the question, the conclusions are general, not aligned with the evidence presented and/or based on an incorrect interpretation of the evidence. • Other perspectives on evidence (examples, statistics and case studies) and/or strengths and weaknesses of evidence are listed. 	<ul style="list-style-type: none"> • Logically related information is grouped together (in sections or paragraphs) but not consistently. • Maps, graphs or diagrams included do not follow conventions, and include relevant and irrelevant interpretations in the text (only if appropriate to the question).

<p>7–8</p>	<p>The response addresses the whole question, the analysis is evaluated and the conclusion is relevant but lacks balance.</p>		
<ul style="list-style-type: none"> • The response describes relevant supporting evidence correctly (information, examples and case studies) that covers all the main points of the question, describing appropriate links to the question. • The argument or analysis is clear and relevant to the question but one-sided or unbalanced. • Complex terminology is defined and used correctly but not consistently. 	<ul style="list-style-type: none"> • If appropriate to the question, the conclusion is relevant to the question, aligned with the evidence but unbalanced. • Other perspectives on evidence (examples, statistics and case studies) and/or strengths and weaknesses of evidence are described. 	<ul style="list-style-type: none"> • Logically related information is grouped together (in sections) consistently. • Maps, graphs or diagrams included contribute to/support the argument or analysis (only if appropriate to the question). 	
<p>9–10</p>	<p>The response is in-depth and question-specific (topic and command term); analysis and conclusion are justified through well-developed evaluation of evidence and perspectives.</p>		
<ul style="list-style-type: none"> • The response explains correct and relevant examples, statistics and details that are integrated in the response, explaining the appropriate link to the question. • The argument or analysis is balanced, presenting evidence that is discussed, explaining complexity, exceptions and comparisons. • Complex and relevant terminology is used correctly throughout the response. 	<ul style="list-style-type: none"> • If appropriate to the question, the conclusion is relevant to the question, balanced and aligned with the evidence. • Evaluation includes a systematic and detailed presentation of ideas, cause and effect relations, other perspectives; strengths and weaknesses of evidence are discussed; (if appropriate) includes justification of the argument and conclusion. 	<ul style="list-style-type: none"> • Response is logically structured with discussion (and if appropriate to the question, a conclusion) focusing on the argument or points made, making it easy to follow. • Maps, graphs or diagrams are annotated following conventions and their relevance is explained and support the argument or analysis (only if appropriate to the question). 	

Option A — Freshwater

1. (a) Describe the distribution of areas of extreme drought shown on the map. [2]

Award [1] for each correct point, up to [2].

Possibilities include:

- Concentrated between 100–110° W [1]
- West coast [1] (or named west coast states – parts of Colorado, Utah, New Mexico, California, Oregon etc [1])
- Generally between latitude lines 30–40° N [1]
- Large area of extreme drought in central USA [1].

Do not accept right/left, top/bottom/middle etc.

- (b) Outline **one** economic impact of drought on agriculture. [2]

Award [1] for a named impact and [1] for explanation/development.

For example: Farmers receive reduced income / loss of livelihoods [1] as agriculture/growing of crops may be destroyed / produce lower yields [1].

Other possible impacts include:

- More money needed to be spent on irrigation / drilling new wells
- Food prices may increase
- Out-migration (if linked to decline in agriculture)
- Unemployment

- (c) Explain **two** ways in which **local** communities could improve the sustainability of water use. **[3 + 3]**

In each case, award **[1]** for the way and a further **[2]** for development/explanation

Reference to sustainability is not required although it may be implied.

For example: Installation/retrofitting of water-efficient equipment **[1]** for example, rainwater run off tanks / low-pressure household appliances **[1]** in order to reduce consumption of fresh water supplies (in the future) **[1]**.

Other ways include:

- government-imposed restrictions / quotas on water use eg golf courses
- building artificial aquifers
- recycling water
- domestic pricing / water metering
- more efficient irrigation systems
- building dams (national build but managed locally)
- intra basin water transfer
- leakage detection and repair programmes / pressure reduction
- regulation of the efficiency of water using appliances
- reducing water pollution.
- desalinization plants at a local scale.

2. (a) Examine the reasons why the integrated management of water resources within drainage basins is becoming more important. **[10]**

Marks should be allocated according to the markbands.

The effective management of water resources is becoming increasingly important. This is due to factors such as increasing pressures and demands on water, population increase, economic development, climate change, and potential conflicts between different user groups. The drainage basin is a logical geographical unit for the management of water resources. An integrated approach is essential, ensuring close co-operation between users and players, including planners, environmentalists and water companies. Integrated management may not work too well in larger basins, especially where international boundaries are involved.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Increasing pressures and demands on water resources – water scarcity; supply and demand; deterioration of water quality; pollution.
- Integration of policies, decisions and costs across stakeholders – agriculture industry, urban development; navigation, fishery, conservation.
- Integrated approach to ensure close co-operation between users and players, to ensure that management is sustainable and effective.
- Differing views of various stakeholders must be reconciled, with a long-term vision for the river basin, ideally agreed by all major stakeholders.
- Use of water resources for a sustainable and long-term future.
- Protection and long-term sustainable use of water resources (affordability/water quality might be considered).

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) of the statement in a way that reaches evidenced judgment and shows understanding of reasons why management of water resources is becoming increasingly important. The viewpoints and power of different stakeholders; the varying possibilities regarding the extent to which management of water resources may lead to a sustainable future. They may also examine the importance of different spatial scales; that management may be more difficult in larger basins crossing international boundaries. Also possibly compare more than one drainage basin, recognizing that management may be more difficult in larger basins crossing international boundaries.

For 5–6 marks, expect weakly evidenced outlining of drainage basin management.

For 7–8 marks, expect a structured account that includes:

- either an evidenced explanation of reasons why the integrated management of water resources is becoming more important
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

2. (b) To what extent are human factors more important than physical factors in increasing the risk of flooding in different places? [10]

Marks should be allocated according to the markbands.

The focus of the response should be why risk of flooding, including frequency and magnitude, might be increasing in different places, and the relative importance of human and physical factors. Climate change, exacerbated by human action, might be identified as the factor making flooding more likely in most places and is the hardest to mitigate against.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Understanding of flood risk, frequency and magnitude; flood hydrographs.
- Human factors might include changes in agricultural land use, terracing; changes in forest cover, urbanization; building on steep slopes.
- Channel modification might increase, rather than reduce, flood risk in different parts of the drainage basin.
- Physical factors might include climate change, rainfall frequency and intensity.
- Physical characteristics of some places, such as relief and geology might make some places more prone to the risk of flooding.

Good answers may be **well structured** (AO4) and **evaluate** (AO3) the relative importance of physical and human processes as mechanisms for increasing the risk of flooding and **examine** (AO3) how the relative importance of the factors may vary in different places. They might also examine the possibility that human actions might adapt to change and reduce, rather than increase, the risk of flooding in the future.

For 5–6 marks, expect some weakly evidenced outlining of how human and/or physical factors contribute to increasing flood risk.

For 7–8 marks, expect a structured account that includes:

- either an evidenced explanation of how human and physical factors contribute to increasing flood risk
- or a discursive conclusion (or ongoing evaluation) regarding the relative importance of human and physical factors.

For 9–10 marks, expect both of these traits.

Option B — Oceans and coastal margins

3. (a) (i) Identify the year in which the ocean temperatures were 2.5 °C above the average. **[1]**

2016 **or** 2017

- (ii) Estimate the range of temperature change between 1982/83 and 1989/90. **[1]**

–1.5 to +2.25 (*allow +2.2 to 2.3*)
or 3.75 (*allow 3.7 to 3.8*)

- (b) Outline **one** way in which the oceanic conveyor belt causes nutrient transfer. **[2]**

Award **[1]** for the way and **[1]** for development/exemplification.

For example: The OCB helps to move nutrients vertically/horizontally / by upwelling **[1]** eg the upwelling of the cold Antarctic current brings nutrients towards Peru **[1]**.

Other points include

- description of material moved
- references temperatures
- why the OCB is moving.

- (c) Explain **one** positive **and one** negative impact of El Niño on different places. **[3 + 3]**

Award **[1]** for one positive and **[1]** for one negative impact and up to **[2]** in each case for development /explanation/exemplification of the impact.

For example: Decrease in anchovies due to warmer waters off the coast of Peru during an El Niño **[1]** leading to decreased fish stocks / decreased fishing **[1]** and a loss of income for the Peruvian fishing industry **[1]**.

Other impacts include:

- reduced hurricane activity in the Atlantic so less damage to infrastructure (P)
- in some parts of Southern Africa, low rainfall could reduce incidence of malaria/dengue fever reducing healthcare costs (P)
- El Niño events may lead to an increase of rainfall in normally dry areas leading to an increase in agricultural yields (P)
- drought/lack of rainfall – fires / loss of crops/income (N)
- property damage due to wind, rain, flooding (N)
- reduction in certain crops and consequent rise in prices eg sugar, coffee (N).

4. (a) Examine how strategies to manage coastal flooding **or** erosion may result in conflicts that are difficult to resolve. **[10]**

Marks should be allocated according to the markbands

Coastal margins are increasingly under threat from flooding and erosion, which may cause widespread damage to agriculture, industry and settlement; injury, loss of life, and spread of disease. Factors such as global climate change, increased storm and hurricane activity, changing sea levels, and increasing population growth and pressure on coastlines, result in coastal flooding and erosion becoming more hazardous. On the other hand, coastal flooding may be a vital component of the future sustainability of many important coastal wetland ecosystems. Coastal flood and erosion management strategies are increasingly important, but conflicts may arise because of the differing perspectives and relative power of the different stakeholders.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- There is a need for management strategies because coastal margins are under increasing threat from flooding and erosion, and from growing pressure of human activity – such as settlement, agriculture and tourism.
- Different interest groups (stakeholders) include local populations, farmers, tourists, environmentalists and conservationists, planning authorities and governments.
- Strategies for management include: flood defences, hard and soft engineering, marshlands and wetlands as soft defences, land use zoning.
- Management might be at different spatial scales, from local to national.
- Economic, social, political and environmental conflicts should be considered with reference to the varying power of different stakeholders.
- Sources of conflict may occur because of impacts on people and communities, loss of aesthetic quality and tourists, environmental changes and possible impact on wildlife/conservation.
- Some conflicts might be difficult to resolve, resulting in tensions.

Good answers may be **well structured** (AO4) and **evaluate** (AO3) the role and power of different stakeholders in coastal flood/erosion management; recognizing that management of places may be at a variety of scales. The possibilities for future sustainable management of human and environmental systems might also be explored.

For 5–6 marks, expect some weakly evidenced outlining of a coastal flooding or erosion management strategy.

For 7–8 marks, expect a structured account that includes:

- either an evidenced discussion of coastal flood or erosion management strategies, and possible sources of conflict
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

4. (b) To what extent can the geopolitical issues in oceans be resolved? [10]

Marks should be allocated according to the markbands.

The focus of the question is on geopolitical issues in contested ocean areas and how they may be managed. It concerns competing political power linked to geographic space; the sovereignty rights of nations in relation to territorial limits and EEZs; and managing the oceans as a global commons. Management challenges include: the competing political rights and sovereignty of nations over ocean areas; the increasing demand for ocean resources; navigation rights.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Examination of the strategic value of oceans and possible sources of conflict and insecurity.
- Contested ocean areas involve the sovereignty rights of nations in relation to territorial rights and EEZs, and potential sources of conflict, such as in the South China Sea.
- Contested ownership of islands, canals and transit choke points.
- Issues include oil and mineral reserves; ownership of island groups; militarization of islands; trans-boundary pollution, plastic waste; fishing rights; conservation.
- Globalization and oceans as vital communications links; navigation rights and trade routes, eg new routes opening up as the ice melts in the Northern Hemisphere.
- Management includes resolving issues through international treaties; the role of different international/multilateral organizations; political power of stakeholders; future security and political stability.

Good answers may be **well structured** (AO4) and offer a **critical evaluation** (AO3) of the question in a way that examines the perspectives and power of different stakeholders, the varying challenges and future possibilities for management and resolving issues in different places and scales.

For 5–6 marks, expect weakly evidenced outlining of at least one geopolitical issue in ocean areas.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the extent to which geopolitical issues in ocean areas can be resolved
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

Option C — Extreme environments

5. (a) (i) Estimate the thickness, in km, of the ice sheet at point **A**. **[1]**

Accept answers between 2.9 and 3.3 (*units not required*)

- (ii) Estimate the width, in km, of the ice sheet (the distance between point **X** and point **Y**). **[1]**

4250 (*accept 4100–4400*) (*units not required*)

- (b) Outline **one** challenge that remoteness causes for resource development in cold extreme environments. **[2]**

Award **[1]** for the challenge (related to remoteness) and **[1]** for development/explanation.

For example: High transport costs **[1]** as specialist equipment (eg to cut through ice) needs to be brought a long distance **[1]**.

Other challenges include:

- distance from roads/airports
- having to pay high wages to a workforce
- isolation / attracting a workforce.

(c) Explain how increasing tourism in cold extreme environments may lead to:

(i) **one** positive social **or** economic impact; **[3]**

Award **[1]** for the positive social or economic impact and up to **[2]** for development / explanation / exemplification.

For example: Local populations see tourism as a way to increase income **[1]** as tourists employ guides, stay in local accommodations etc **[1]**, thereby reducing their dependence on primary activities / finite natural resources **[1]**.

Other positive impacts include:

- educational value - promote conservation activities and organizers
- heritage tourism – support for language preservation, traditional customs and art forms.

(ii) **one** negative environmental impact. **[3]**

Award **[1]** for the negative environmental impact and up to **[2]** for development / explanation / exemplification.

For example:

Breeding cycle of seabirds interrupted **[1]** due to the concentration of tourists at certain places **[1]** who trample vegetation and cause disturbance to the seabirds/mammals **[1]**.

Other negative impacts include:

- increased risk of oil spills and environmental consequences
- garbage, waste and pollution – slow decomposition/waste remains visible
- increased greenhouse gas emissions from planes and ships – ice melting

6. (a) Examine the challenges of managing the impacts of global climate change on communities in hot, arid environments. **[10]**

Marks should be allocated according to the markbands.

The focus of the question should be on the management challenges caused by climatic change in hot, arid extreme environments. The nature and severity of climate change are not fully understood, but mainly concerns changes in the amount, distribution and variability of rainfall. These will impact upon vegetation and wildlife, water resources, and the economy and ways of life of local communities.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

Possible impacts of climate change, including changes in rainfall amounts, distribution and variability; possible increase in severity of drought, and of increased flooding in some areas.

- Changes to vegetation, soils and wildlife; including soil erosion and desertification, increase in bush fires.
- Challenges/impacts on communities include: threats to water supply, groundwater and irrigation; loss of grazing land; changes to agriculture, possible crop failures.
- Need for education, and research into new crops; water management strategies at various scales.
- Difficulties in co-operation between communities, NGOs, TNCs and national governments.
- Changing nature of the challenge may mean that some communities find it difficult to adapt.

Good answers may be **well structured** (AO4) and may offer a **critical evaluation** (AO3) of the statement that examines the way that examines the effects of climate change and possibilities of future management strategies, including the power of stakeholders. Another approach might be to compare places and management strategies at different scales.

For 5–6 marks, expect a weakly-evidenced outlining of at least one impact of climate change on communities.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the impacts of climate change and management challenges
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

6. (b) To what extent are freeze-thaw processes the most important factor in the formation of periglacial landscape features? **[10]**

Marks should be allocated according to the markbands.

Periglacial activity is characteristic in high-latitude and mountain regions and on the margins of glaciers and ice sheets. Permanently frozen ground, permafrost, is overlain by an active zone where repeated freezing and thawing, and frost action are important processes. Freeze-thaw is a powerful physical weathering process, fracturing rock, forming talus and felsenmeer. Frost heaving and ice segregation may form patterned ground and thermokarst. Other processes are also important, especially solifluction, aeolian and fluvial action. Periglacial landscapes were also a feature of past ice ages, and are relic features at lower altitudes and latitudes.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Freeze-thaw is an important physical weathering process in periglacial environments, in present-day high altitude and latitude regions. Periglacial activity was also important during past ice ages, at much lower altitudes and latitudes.
- Repeated cycles of freeze-thaw of exposed rock faces results in the formation of scree deposits and blockfields/felsenmeer; extensive areas of angular rocks.
- Freeze-thaw is also important in the active layer above permafrost. Formation of patterned ground (stone polygons, circles and stripes) is caused by freeze-thaw action selectively moving larger particles to the edge of a circle.
- Other features include thermokarst and patterned ground, and ice wedges, caused by repeated temperature changes and freeze-thaw in the active layer.
- Other processes might also be considered, including solifluction as a transportation process, forming solifluction terraces and lobes; and ice segregation and the formation of ice lenses and pingos. Also, aeolian and fluvial processes at the glacier margins.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) examining the importance of freeze-thaw processes in the formation of periglacial landscapes. Periglacial landscapes may be affected by the power and scale of freeze-thaw processes in different places, and how these may change over time, including their importance during past ice ages.

For 5–6 marks, expect a weakly evidenced outlining of the formation of at least one periglacial landscape feature by freeze-thaw processes.

For 7–8 marks, expect a structured account that includes:

- either an evidenced explanation of the importance of freeze-thaw processes in the formation of a variety of different landscape features
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts, including a consideration of other important periglacial processes in landscape development.

For 9–10 marks, expect both of these traits.

Option D — Geophysical hazards

7. (a) (i) State the score for the magnitude of the Haiti earthquake. **[1]**

7

(ii) Identify the criterion in which there is a difference of 2 between the scores for the earthquakes. **[1]**

Frequency

(b) Outline **one** reason why people may underestimate the risk of a geophysical hazard occurring in their local area. **[2]**

Award **[1]** for a valid reason and **[1]** for development/explanation.

For example: Lack of data about previous events **[1]** may mean that it is impossible to predict the likely return interval of the hazard **[1]**.

Other reasons include:

- poor education/ignorance of the risk
- lack of access to information systems
- level of economic development
- hazards as “acts of God” or “fate”
- low impact of previous hazard events
- no previous experience of a hazard in their lifetime.

(c) Explain how human vulnerability to an earthquake hazard can be reduced by:

(i) **one** pre-event strategy; **[3]**

Award **[1]** for a valid strategy and up to **[2]** for development / explanation / exemplification.

For example: Having metal framed buildings with cross-bracing **[1]** to reduce the effects of shaking **[1]** in order to prevent collapse of the buildings **[1]**.

Other strategies include:

- any building design eg shock absorbers, counterweights, prefabricated sectioned homes, concrete foundations
- land use zoning eg reforestation, exclusion zones
- clear evacuation routes
- building height restrictions.

(ii) **one** post-event strategy. **[3]**

Award **[1]** for a valid strategy and up to **[2]** for development / explanation / exemplification.

For example: Coordinated search and rescue plan **[1]** using lifting equipment to improve access to survivors **[1]** to reduce death and injury **[1]**.

Other strategies include:

- hazard mapping updated
- use of communication technologies
- rehabilitation
- reconstruction/retrofitting.

8. (a) Examine the relationship between processes at contrasting plate margins and the characteristics of volcanoes. **[10]**

Marks should be allocated according to the markbands.

Processes operating at different types of plate margin give rise to contrasting volcanic activity and landscapes. There is a significant difference between volcanoes formed at constructive and destructive plate margins; limited volcanic activity at passive margins.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Different types of plate margin are associated with distinctive geological processes, such as subduction, plumes and rifting.
- These processes are associated with different types of volcanic activity – lava types, explosiveness and magnitude, which result in distinctive volcanic landscapes.
- Constructive margins – plate separation, usually oceanic plates; oceanic ridges; basaltic lavas; shield volcanoes; extensive lava flows/plateau; less explosive activity.
- Destructive margins – subduction between oceanic and continental plates; explosive activity, often violent; andesitic lavas; composite/strato volcanoes and cinder cones; widespread ash deposits, pyroclastic flows and lahars.
- Passive plate margins, such as the San Andreas Fault, exhibit limited volcanic activity.
- Volcanic activity may also take place away from plate margins, at hotspots – eg Hawaii.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) examining the relationship between processes and volcanic activity at places on different types of plate margin. The relationship is complicated, as some plate margins have little or no volcanic activity; and, in some places, volcanic activity occurs away from plate margins. Another approach might be to examine the varying scale of volcanic activity, or how the processes may change over time.

For 5–6 marks, expect a weakly evidenced outlining of the relationship between one type of plate margin and the characteristics of volcanoes.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the relationship between the processes at different plate margins and varying volcanic characteristics
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives, including an understanding that not all volcanic activity occurs at plate margins.

For 9–10 marks, expect both of these traits.

8. (b) To what extent will the impacts associated with mass movement hazards in different places increase in the future? **[10]**

Marks should be allocated according to the markbands.

The world's exposure to natural hazards, such as mass movement, is increasing, and the number of disasters has increased significantly. Complex reasons include a rapidly growing population, increased population pressure in environmentally sensitive areas, and possible physical consequences of global climate change. However, human vulnerability to mass movement may be reduced in some places by effective management strategies, planning policies and personal resilience.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Mass movement hazards include landslides, rockslides, mudflows and avalanches.
- There may be an increase in event frequency and magnitude, leading to potentially disastrous socio-economic impacts on populations.
- They are associated with other hazards – (earthquakes, hurricanes/monsoons, volcanoes); especially in areas of steep relief.
- Impacts are increasing, with future possibilities of increasing destruction, loss of life, and injury.
- Climate change might result in heavy rainfall leading to more frequent hazards of larger magnitude. Slope loading and stress overwhelms the shear strength of the rock, leading to slide.
- Increased concentration of people in large urban areas; vulnerable locations; increased poverty; rapid population growth; Increased human pressure on fragile environments.
- “In different places” likely to be explored by some, so could explore the extent to which some places can manage/limit the effects of mass movement through pre- and post-event management, thus reducing vulnerability to mass movement hazards.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) examining the complex relationships between changing physical and human processes which may result in an increase in mass movement hazards in different places. They may also examine possibilities of devising strategies to reduce vulnerability to these hazards by the power vested in people and governments.

For 5–6 marks, expect a weakly evidenced outlining why the impacts of mass movement hazards will increase in the future.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the increasing impacts of mass movement hazards in different places
- or a discursive conclusion (or ongoing evaluation) addressing to what extent impacts will increase in the future, grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

Option E — Leisure, tourism and sport

9. (a) (i) State the direction of Las Vegas from Flagstaff. **[1]**

WNW (*accept NW*)

(ii) Calculate the length, in km, of the Colorado River between point **A** and point **B**. **[1]**

Accept answers between 72 and 80 (units not required)

(b) Outline **one** factor that could lead to a decline of international tourism in a low-income country. **[2]**

Award **[1]** for a valid factor and **[1]** for development / explanation.

For example: Civil wars/riots/unrest **[1]** could mean less visitors due to safety concerns **[1]**.

Other factors include:

- outbreak of disease / fear of infection from a virus
- negative reviews on social media
- natural disaster
- financial factors, such as a change in the exchange rate, making it more expensive.

(c) Explain how unsustainable tourism growth in rural hotspots will result in:

(i) **one** environmental consequence; **[3]**

Award **[1]** for a consequence and **[2]** for development / explanation / exemplification.

For example: disruption of breeding patterns for birds **[1]** due to noise pollution from increased tourist activities **[1]** leads to a decline in biodiversity **[1]**.

Other possibilities include:

- generation of waste
- pollution of water/air
- trampling of footpaths
- loss of habitat.

(ii) **one** social consequence. **[3]**

Award **[1]** for a consequence and **[2]** for development / explanation / exemplification.

For example: People purchasing second homes **[1]** leads to price rises in local area **[1]** meaning local people can no longer afford to buy houses **[1]**.

Other possibilities include:

- loss of traditional culture
- out-migration of local people.

Do not credit the repeat of the same consequence in both parts eg pollution.

Do not credit the use of an urban area eg Venice.

10. (a) To what extent does tourism as a national development strategy bring economic **and** social benefits to destination countries? **[10]**

Marks should be allocated according to the markbands.

The promotion of tourism is an important strategy for many governments, especially in low-income countries, as a means of stimulating economic development. While there has been significant economic success in many countries, the policy is often accompanied by a variety of negative social and economic impacts, at both national and local scales.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

Benefits:

- Inward investment in infrastructure development (eg airports/roads).
- Job creation including skills training, opportunity for entrepreneurship.
- Increase in living standards – multiplier effects eg children’s fees for schools can be afforded.
- Stimulation of agriculture due to an increased market in foodstuffs.
- Investment in biodiversity for visitors to enjoy (eg creation of national parks / ecotourism).
- health – life expectancy increases caused by investment in sanitation and health infrastructure.

Costs:

- Dominance by foreign TNCs; overseas ownership; leakage of profits; limited economic benefit/skills development to local peoples.
- Employment may be low-skilled, poorly paid and seasonal.
- Development of a dual economy, with “islands of development” surrounded by “seas of poverty”. Tourist niches with limited interaction with surrounding areas.
- Uneven development of communications.
- Rural-urban migration; decline of rural economies.
- Increase in crime and social disorder; increasing social inequality.
- Exploitation of local cultures; loss of cultural identity.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) examining the statement in a way that reaches evidenced judgement of the social and economic costs/benefits of tourism as a national development strategy. The power and viewpoints of different stakeholders in different places, and the processes operating at a variety of scales.

For 5–6 marks, expect a weakly evidenced outlining of at least one economic and/or social benefit of tourism to destination countries.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the varied economic and social benefits and costs of tourism as a national development strategy
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

10. (b) Examine the factors affecting the hierarchy of teams in **one** national sports league **and** the location of its supporters. **[10]**

Marks should be allocated according to the markbands.

There is a general relationship between the hierarchy of sports teams, the size of urban areas in which they are located, and the location of their supporters. At the top of the hierarchy, large urban areas may have more than one top team. These may have a large sphere of influence, drawing supporters from a wide area, including other major urban centres and overseas. Globalization, the media and internet also affect the sphere of influence of teams (both players and supporters).

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- The hierarchy of teams is interpreted as: relative position in league tables, economic wealth, importance of players and numbers of supporters; all of which are inter-related.
- Teams at the top of the hierarchy are often located in major urban areas, with a large number of supporters from a wide sphere of influence: local, national and international.
- The top clubs are wealthy, employ important players who have a wide national and international following. They receive the bulk of TV rights/advertising revenue, so have the funds to be able to maintain their position in the hierarchy.
- Supporters may travel long distances in order to support their clubs; large sphere of influence.
- Teams lower in the hierarchy tend to be much smaller clubs with less wealth and power, with fewer supporters, mainly resident in the local area. As they gain in success, they are promoted up the league, so the sphere of influence of supporters increases.
- Sphere of influence of supporters is also affected by the media and internet, sponsorship, advertising, foreign tours by the club, and celebrity status of certain players. Supporters may follow “star” players, rather than the team.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) examining the statement, reaching evidenced judgement of the relationship between the hierarchy of teams and residence of supporters. Recognizing that the power of stakeholders in the top teams gives rise to a global scale sphere of influence. Another approach would be to question how the relationship changes over time.

For 5–6 marks, expect a weakly evidenced outlining of the factors affecting the hierarchy of teams and/or location of supporters.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the factors that affect team hierarchy and the location of supporters
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives.

For 9–10 marks, expect both of these traits.

Award a maximum of [4] if the sports league used in the response is not at a national level.

Option F — Food and health

11. (a) (i) Identify the **two** countries with the highest increase in children sleeping under mosquito nets between 2003 and 2016. **[1]**

Tanzania and Rwanda

Must have both for [1].

- (ii) Identify the mode (modal) percentage for the figures for 2016. **[1]**

41 (*only answer*)

- (b) Outline **one** reason why maternal mortality rates are high in low-income countries. **[2]**

Award **[1]** for a valid reason and **[1]** for development / explanation relating this to maternal mortality.

For example: Lack of access to medical care for pregnant women **[1]** means complications go untreated **[1]**.

Other reasons include:

- poor diet
- lack of access to clean water
- remoteness of communities.

- (c) Explain **one** human factor **and one** physical factor affecting the diffusion (spread) of **one named** vector-borne disease. **[3 + 3]**

Award **[1]** for the factor and **[2]** for development / explanation. Acceptable vector-borne diseases include: Malaria / Zika / Dengue.

If no vector-borne disease named then award maximum [5] (if factors are obviously vector diffusion ones).

For example: A person infected with Malaria travels to another region **[1]** and is bitten by a mosquito that subsequently bites another person **[1]** and therefore infects that person **[1]**.

For example: Climate change **[1]** has led to certain areas being warmer/wetter than previously **[1]** which has allowed the vector to move to / breed in areas previously not suitable **[1]**.

Human factors include:

- increased migration of people / travel for tourism / trade
- poverty, quality of housing
- health checks, border controls and quarantine
- elimination of vectors, eg by spraying
- draining of stagnant water etc not taking place
- inadequate drainage eg sewers – ideal breeding grounds.

Physical factors include:

- physical barriers such as climate / desert / mountains not allowing spread
- standing water
- higher rainfall / temperatures which encourages breeding (mosquitoes).

12. (a) To what extent is a systems approach useful in comparing the sustainability of agriculture in different places? [10]

Marks should be allocated according to the markbands.

The sustainability of agriculture can be measured in a variety of ways, including energy efficiency, minimizing the environmental impacts, stewardship of natural and human resources, as well as economic gain. Three core concerns are economy, environment and society. A systems approach can be used to measure the efficiency of farming, and water footprint. However, to what extent can social issues, such as working and living conditions of workers, needs of rural communities and health and safety, be measured using a systems approach?

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Sustainable agriculture may be defined in a variety of ways, but essentially it concerns long-term stewardship of the environment and society as well as short-term economic gain.
- A systems approach can be used to measure and compare the energy efficiency and water footprints of different types of agriculture.
- The inputs are compared to the outputs as measures of sustainability. A system with high inputs and low outputs can be regarded as inefficient and unsustainable.
- Inputs include labour, machinery, fertilizers and water. Stores include soils, water, and capital such as buildings. Outputs refer to the quantity/yield of crops and livestock, pollution, and profits.
- A systems approach neglects the long-term social and environmental impacts on sustainability of farming, including destruction of ecosystems, degradation of water supplies, and negative impacts on labourers and the wider needs of the rural community.
- Recycling of waste and water within the agricultural system can increase sustainability.

Good answers may be **well-structured** (AO4) and may additionally offer a **critical evaluation** (AO3) of the statement in a way that shows understanding of the usefulness of a systems approach to compare the sustainability of agricultural processes and systems in different places and at different scales. The power and perspectives of different stakeholders, such as economists, environmentalists and local communities, might also be considered.

For 5–6 marks, expect a weakly evidenced outline of at least one way a systems approach may be used in agriculture.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the usefulness of a systems approach to compare sustainability in different places
- or a discursive conclusion (or ongoing evaluation), grounded in geographical concepts and perspectives, discussing its limitations.

For 9–10 marks, expect both of these traits.

12. (b) Examine the roles of international organizations and non-governmental organizations (NGOs) in reducing food insecurity. [10]

Marks should be allocated according to the markbands.

Food security means that people have physical and economic access to a sufficient quantity of safe, affordable and nutritious food for an active and healthy life. The main causes of food insecurity are economic, social and political. These include low agricultural productivity (especially food crops), poor communications, disruption of trade due conflict and war. Environmental issues such as land degradation (soil erosion and deforestation), and water availability; and social issues such as poverty, unemployment, discrimination and marginalization are also significant causes. Food insecurity mainly affects people in low-income countries, but also low-income groups in higher income countries.

Possible **applied themes** (AO2) **demonstrating knowledge and understanding** (AO1):

- Food insecurity is a condition where households lack access to adequate food. A major issue is the unaffordability of food, alongside the unavailability of food. It is an economic, social and political issue linked to poverty and inequality.
- International organizations include the World Food Programme (WFP), the WHO and the FAO. NGOs include Oxfam and ActionAid, or local organizations (eg food banks).
- Solutions to food insecurity include improving agricultural productivity, trade policies, infrastructure and reducing inequalities.
- Organizations might also reduce food insecurity through promotion of sustainable farming technologies and reducing food waste.
- International organizations might facilitate trade and aid agreements.
- Other ways of increasing security include improvement in storage facilities and transportation infrastructure, to reduce food loss.
- Food waste reduction by consumers/supermarkets.
- Other factors also affect food insecurity, for example war, locusts, flooding, and population growth. IOs and NGOs may also have a role here.
- Tackling food insecurity will involve a multi-dimensional approach.

Good answers may be **well-structured** (AO4) and may additionally offer a **critical evaluation** (AO3) of the statement in a way that shows understanding of the power of international organizations and NGOs and other players, and the possibilities of various ways of tackling food insecurity, in different places. The issues might also be examined at differing spatial scales (eg local, national and international).

For 5–6 marks, expect a weakly evidenced outline of the way in which at least one international organization and/or NGO might reduce food insecurity.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the roles of international organizations and NGOs in reducing food insecurity
- or a discursive conclusion (or ongoing evaluation), grounded in geographical concepts and perspectives, discussing its limitations.

For 9–10 marks, expect both of these traits.

Option G — Urban environments

13. (a) (i) State the time on Wednesday when the traffic congestion index was 60. **[1]**

6 am (*allow 5–7 am*)

- (ii) State the difference between the peaks of the traffic congestion index on Friday and Saturday. **[1]**

32 (*allow answers between 30–34*)

- (b) Outline **one** reason for high levels of crime in the socially deprived areas of cities. **[2]**

Award **[1]** for a valid reason and **[1]** for development / explanation.

For example: Lack of job opportunities for young people **[1]** who turn to crime to earn money **[1]**.

Other possible reasons include:

- insufficient street lighting
- lack of investment so there are fewer police / CCTV
- low incomes, so people can't afford security cameras for their property.

- (c) Explain **one** environmental impact **and one** social impact of reducing traffic in an urban area. **[3 + 3]**

Award **[1]** for each valid impact and up to **[2]** for development and/or explanation.

For example (environmental): Less air pollution **[1]**, due to reduced emissions of toxic gases **[1]**, resulting in less smog **[1]**.

Other **environmental impacts** include:

- more birds, animals and insects found in city areas
- reduced noise pollution

Social impacts include:

- fewer car accidents
- less time wasted in traffic jams
- less asthma/lead poisoning/breathing problems
- safer streets leading to more bike use.

Do not credit the same impact in both parts eg reducing air pollution; although relevant details are acceptable eg respiratory diseases.

14. (a) To what extent has deindustrialization brought economic **and** social benefits to urban areas? [10]

Marks should be allocated according to the markbands.

The response should show an understanding of the meaning (rather than causes) of deindustrialization, and its economic and social benefits for urban areas.

Deindustrialization refers to a decline in heavy and manufacturing activity, bringing about significant economic and social changes to places and communities. Economic and social benefits will vary between different places and peoples, and at different scales (spatial and temporal).

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Deindustrialization refers to a structural change in the economy, involving the decline of manufacturing industry in urban areas.
- Benefits include: in-migration, urban renewal, inward investment, especially by service industries, improvements in transport, housing and infrastructure, re-training schemes – these help reduce unemployment and raise living standards in deprived areas.
- Environmental improvements such as land restoration, reducing pollution of land, water and air, “greening” of urban areas – also bring social/health benefits to communities.
- Possible development of “eco-city” design principles.
- There will also be some negative consequences, affecting different parts of urban areas (eg inner city and urban fringe) such as unemployment, loss of identity of the place, increasing inequality.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) of the statement in a way that examines benefits linked with economic and social aspects of the process of deindustrialization. The effects on different places, at a variety of time scales, may be compared. Another approach might be to examine the power of different stakeholders to deliver positive change.

For 5–6 marks, expect a weakly evidenced outline of at least one economic and/or social benefit linked to deindustrialization.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the positive economic and social benefits of deindustrialization to urban area(s)
- or a discursive conclusion (or ongoing evaluation), grounded in geographical concepts and perspectives, exploring the extent to which changes have been positive.

For 9–10 marks, expect both of these traits.

14. (b) Examine the effectiveness of strategies used to reduce urban ecological footprints. [10]

Marks should be allocated according to the markbands.

The increasing concentration of people into large urban areas poses considerable challenges for managing the future sustainability of urban systems. Reducing ecological footprints is an important strategy contributing to the sustainable management of urban systems. The urban ecological footprint is the area of land needed to provide the resources to support a city's level of consumption and absorb its waste products. The size of a footprint varies with resource consumption, lifestyle, incomes and levels of technology.

Possible **applied** themes (AO2) demonstrating **knowledge and understanding** (AO1):

- Urban ecological footprint refers to the total amount of the earth's surface needed for the resources to support a city's level of consumption and absorb its waste products. It is an important measure of the sustainability of a city.
- Ecological footprints may be reduced by promoting conservation and sustainable use strategies, recycling and waste reduction. Reduction of waste in food consumption and conservation of water supplies
- Also, reduced consumption of fossil fuels and elimination of carbon waste and pollution; encouragement of investment in renewable energy; resource conservation.
- Promoting green economies to reduce negative environmental impacts/pollution.
- Strategies might also include eco-city design, the development of eco-cities and eco-communities.

Good answers may be **well structured** (AO4) and may additionally offer a **critical evaluation** (AO3) of possibilities and limitations of strategies to reduce ecological footprints, examining the power and perspectives of stakeholders at different spatial and temporal scales. Another approach might be to examine how far strategies can be delivered in different places (*ie* established cities compared with newly planned cities or eco-cities).

For 5–6 marks, expect weakly evidenced outlining of at least one strategy to reduce an urban ecological footprint.

For 7–8 marks, expect a structured account that includes:

- either an evidenced examination of the effectiveness of various different strategies to reduce urban ecological footprints
- or a discursive conclusion (or ongoing evaluation) grounded in geographical concepts and/or perspectives which examines how far the ecological footprint can be reduced by the strategies.

For 9–10 marks, expect both of these traits.
