

INTERNATIONAL A-LEVEL

GEOGRAPHY

GG03

Paper 3 Physical Geography 2

Mark scheme

June 2026

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same, correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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International A-level Geography mark scheme

How to mark

Aims

When you are marking your allocation of scripts your main aims should be to:

- recognise and identify the achievements of students
- place students in the appropriate mark band and in the appropriate part of that mark band (high, low, middle) for **each** Assessment Objective
- record your judgements with brief notes, annotations and comments that are relevant to the mark scheme and make it clear to other examiners how you have arrived at the numerical mark awarded for each Assessment Objective
- ensure comparability of assessment for all students, regardless of question or examiner.

Approach

It is important to be **open-minded** and **positive** when marking scripts.

The specification recognises the variety of experiences and knowledge that students will have. It encourages them to study geography in a way that is relevant to them. The questions have been designed to give them opportunities to discuss what they have found out about geography. It is important to assess the quality of **what the student offers**.

Do not mark scripts based on the answer **you** would have written. The mark schemes have been composed to assess **quality of response** and not to identify expected items of knowledge.

Assessment Objectives

This component requires students to:

AO1	Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change, at a variety of scales.
AO2	Apply knowledge and understanding in different contexts to interpret, analyse and evaluate geographical information and issues.
AO3	Use a variety of relevant quantitative, qualitative and fieldwork skills to: <ul style="list-style-type: none">• investigate geographical questions and issues• interpret, analyse and evaluate data and evidence• construct arguments and draw conclusions.

The marking grids

Do not think of levels equaling grade boundaries.

Depending on the part of the examination, the levels will have different mark ranges assigned to them. This will reflect the different weighting of Assessment Objectives in particular tasks and across the examination as a whole.

Using the grids

Having familiarised yourself with the descriptors and indicative content, read through the answer and annotate it (as instructed below) to identify the qualities that are being looked for and that it shows. You can now check the levels and award a mark.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptors for that level. The descriptors for the level indicate the different qualities that might be seen in the student's answer for that level. If it meets all the descriptors for the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptors and the answer. With practice and familiarity you will find that for better answers you will be able to skip through the lower levels of the mark scheme quickly.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best-fit approach for defining the level and then use the variability of the response to help decide the mark within the level.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark.

It is often best to start in the middle of the level's mark range and then check and adjust. If there is a lot of indicative content fully identifiable in the work you need to give the highest mark in the level. If only some is identifiable or it is only partially fulfilled, then give the lower mark.

The exemplar materials used during standardisation will also help. There will be an answer in the standardising materials that will correspond with each level of the mark scheme. This answer will have been awarded a mark by the lead examiner. You can compare the student's answer with the example to determine if it is of the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the lead examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

In addition to the levels descriptors, question specific indicative content is provided as a guide for examiners. This is not intended to be exhaustive and you must credit other valid points.

An answer that contains nothing of relevance to the question must be awarded no marks.

Annotating scripts

You should write a summative comment at the end for each Assessment Objective and indicate the marks for each Assessment Objective being tested at the end of the answer in the margin in sequence. It is vital that the way you arrive at a mark should be recorded on the script. This will help you with making accurate judgements and it will help any subsequent markers to identify how you are thinking. Please do not write negative comments about students' work or their alleged aptitudes.

Section A – Water, Carbon and Life on Earth

Total for this section: 40 marks

Question	Part	Marking guidance	Total marks
01	1	What does a flood hydrograph show after a rainfall event? Key – B: How the discharge of water in a river changes over time.	1 AO1=1

Question	Part	Marking guidance	Total marks
01	2	Which of the following is the largest store of carbon? Key – D: Lithosphere	1 AO1=1

Question	Part	Marking guidance	Total marks
01	3	Which of the following best describes evapotranspiration in a drainage basin? Key – D: It is an output and a transfer.	1 AO1=1

Question	Part	Marking guidance	Total marks
01	4	How does hydrocarbon burning change the size of stores in the carbon cycle? Key – B: The atmosphere store becomes larger and the lithosphere store becomes smaller.	1 AO1=1

Question	Part	Marking guidance	Total marks
01	5	Which of the following is a definition of ‘water abstraction’? Key – B: Taking water from natural sources.	1 AO1=1

Question	Part	Marking guidance	Total marks
02		Analyse the data shown in FIGURE 1.	6 AO3=6

Level	Marks	Descriptor
2	4–6	AO3 – Clear selection and analysis of the evidence that has been provided which makes appropriate use of data to support. Clear connections between different aspects of the data.
1	1–3	AO3 – Some basic selection and analysis of the evidence that has been provided which makes limited use of data to support. Basic or limited connections between different aspects of the data.
0	0	No creditable content.

Indicative Content

The question requires the candidate to analyse the relationship between carbon dioxide emissions per person by both geographic region and wealth. Credit reference that uses both wealth and region data when making links within the resource.

By Wealth Groupings

- In every region of the world the individuals in the high wealth group emit more per capita than the individuals in the middle wealth group, who in turn emit more per capita than the individuals in the low wealth group of that region. In all regions the individuals in the high wealth group emit over double, sometimes up to 5 times more per capita than those in the middle wealth group – and in all cases the individuals in the middle wealth group emit nearly double or more per capita than the individuals in the low wealth group.
- North America's wealthiest people emit approximately 63 tonnes per person more than the individuals in the low wealth group, which is the greatest difference in the world. In contrast Sub-Saharan Africa's wealthiest people only emit approximately 7 tonnes more per capita than the individuals in the low wealth group in the same region.
- Proportionally the greatest inequality exists across the whole world. The wealthiest in the world emit approximately 20 times more carbon dioxide per person than the individuals in the low wealth group. Sub-Saharan Africa, West Asia and North Africa are the joint second most unequal with the high wealth people emitting approximately 15 times more carbon dioxide per person than the low wealth group.
- Proportionally the smallest inequality exists in Europe, with the individuals in the high wealth group emitting approximately 6 times more per person than the individuals in the low wealth group per capita. This is followed by Russia & Central Asia and North America who both show a ratio of approximately 8:1 when comparing emissions per capita of the wealthiest and the individuals in the low wealth group.

By Region

- The regions could be categorised into one top emitter, North America, 5 similar middle emitters, East Asia, Europe, West Asia and North Africa, Russia and Central Asia, World, one low emitter, Central and South America and two very low emitters, South and South-East Asia and Sub-Saharan Africa.

- Sub-Saharan Africa is the lowest-emitting region globally across all wealth categories, for example, the wealthiest people emit a mere 7 tonnes per person per year, which is less than the individuals in the low wealth group emit per person in North America.
- North America emits the most in every wealth category by some margin, for example, the individuals in the high wealth group emit 73 tonnes of carbon dioxide per person per year, compared with the second largest emitter, East Asia at 39 tonnes per person per year, for the same wealth category.
- Europeans in low wealth groups and medium wealth groups are the 2nd highest emissions per capita, second only to North America – yet Europeans in the high wealth group are only ranked 6th in the world for emission per capita. This links to Europe having, proportionally, the least inequality.

Question	Part	Marking guidance	Total marks
03		<p>Examine the role of positive AND negative feedback in the carbon cycle.</p> <p>AO1 – Knowledge and understanding of positive and negative feedback that exists in the carbon cycle.</p> <p>AO2 – Application of knowledge and understanding to examine the role this feedback plays within the carbon cycle.</p>	<p>9</p> <p>AO1=4 AO2=5</p>

Level	Marks	Descriptor
3	7–9	<p>AO1 – Demonstrates detailed knowledge and understanding of positive and negative feedback that exists in the carbon cycle.</p> <p>AO2 – Detailed applied knowledge and understanding to provide a careful, qualified consideration of the role that positive and negative feedback plays in the carbon cycle.</p>
2	4–6	<p>AO1 – Demonstrates clear knowledge and understanding of the positive and negative feedback that exists in the carbon cycle. There may be some imbalance between positive and negative feedback.</p> <p>AO2 – Applied knowledge and understanding to provide a careful consideration of the role positive and negative feedback plays in the carbon cycle. There may be some imbalance in the answer.</p>
1	1–3	<p>AO1 – Demonstrates basic knowledge and understanding of feedback that exists in the carbon cycle. Likely that feedback focuses solely on positive or negative feedback.</p> <p>AO2 – Applies limited knowledge and understanding to consider the role that positive and/or negative feedback plays in the carbon cycle.</p>
0	0	No creditable content.

Indicative Content

AO1

- Knowledge and understanding that negative feedback reduces changes in a system to maintain dynamic equilibrium.
- Knowledge and understanding that positive feedback amplifies changes in a system creating instability, if too great, this can lead to a tipping point.
- Knowledge and understanding of the positive feedback that exists throughout the carbon cycle, for example, arctic permafrost melting, releasing the greenhouse gas methane into the atmosphere, which then causes global warming, resulting in further melting of arctic permafrost.
- Knowledge and understanding of the negative feedback that exists throughout the carbon cycle, for example, an increase in atmospheric carbon can encourage more photosynthesis which utilises atmospheric carbon and thus reduces the amount of atmospheric carbon.

AO2

- Critical understanding that positive and negative feedback has pervading roles as they exist in all aspects of the carbon cycle, including the lithosphere, hydrosphere, cryosphere, biosphere and atmosphere.
- Recognition that positive and negative feedback plays a crucial and significant role as such feedback either enables a dynamic equilibrium to be maintained or enables a tipping point to be reached creating irreversible change in the carbon cycle.
- Appreciation that in the short term, negative feedback can usually counter the impact of positive feedback in the carbon cycles and therefore plays a significant role at regulation.
- Appreciation that in the long term, natural changes like shifts in the Earth's tilt or orbit can trigger positive feedback of such magnitude that negative feedback cannot bring the carbon cycle back into equilibrium. Consequently, the positive feedback plays a vital role in reaching a natural tipping point such as the onset of a glacial or interglacial.
- Locally, human activity can lead to localised feedback. For example, deforestation in tropical rainforests can lead to lower transpiration, reducing regional rainfall, leading to forest drying, leading to increased chance of wildfire, leading to increase in atmospheric carbon, resulting in warming which can lead to further drying out of remaining forest.
- Globally, industrialisation has resulted in a rapid rise of atmospheric carbon. This has triggered significant positive feedback in the carbon cycle. Negative feedback such as ocean carbon sequestration are countering this and show the important role negative feedback can play. However, the scale of change means negative feedback's role has started to diminish showing the significant role positive feedback is currently having on the carbon cycle.

Max Level 2 if only positive or negative feedback is examined

Question	Part	Marking guidance	Total marks
04		<p>‘Human activity significantly affects the water cycle in tropical rainforests.’</p> <p>To what extent do you agree with this statement.</p> <p>Use ONE OR MORE named tropical rainforests to support your answer.</p> <p>AO1 – Knowledge and understanding of the water cycle in tropical rainforests. Knowledge and understanding of processes driving change in the water cycle and the role human activity plays in this. Knowledge and understanding of a specific tropical rainforest case study.</p> <p>AO2 – Application of knowledge and understanding of the water cycle to critically evaluate the degree to which human activity effects the water cycle in tropical rainforests. Application of knowledge and understanding of driving change in the water cycle over differing temporal and spatial scales.</p>	<p>20</p> <p>AO1=10 AO2=10</p>

Level	Marks	Descriptor
4	16–20	<p>AO2 – Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout.</p> <p>AO2 – Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout.</p> <p>AO1 – Full and accurate knowledge and understanding of key concepts and processes throughout.</p> <p>AO1 – Detailed awareness of scale and temporal change which is well integrated where appropriate.</p>
3	11–15	<p>AO2 – Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding.</p> <p>AO2 – Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Generally clear and relevant knowledge and understanding of place(s) and environments.</p>

		<p>AO1 – Generally clear and accurate knowledge and understanding of key concepts and processes.</p> <p>AO1 – Generally clear awareness of scale and temporal change which is integrated where appropriate.</p>
2	6–10	<p>AO2 – Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Some partially relevant analysis and evaluation in the application of knowledge and understanding.</p> <p>AO2 – Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Some relevant knowledge and understanding of place(s) and environments which is partially relevant.</p> <p>AO1 – Some knowledge and understanding of key concepts, processes and interactions and change.</p> <p>AO1 – Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies.</p>
1	1–5	<p>AO2 – Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence.</p> <p>AO2 – Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Very limited relevant knowledge and understanding of place(s) and environments.</p> <p>AO1 – Isolated knowledge and understanding of key concepts and processes.</p> <p>AO1 – Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies.</p>
0	0	No creditable content.

Indicative Content

The question requires candidates to make clear links between how specific human activity alters and effects the water cycle in tropical rainforests. Therefore, expect reference to named inputs, stores, flows and outputs and their change in magnitude over time and space. Whilst most candidates are likely to focus on human activity within a rainforest, discussion around the impact of human induced global warming on tropical rainforest water cycles is also within the scope of this question.

AO1

- Knowledge and understanding that the water cycle in a tropical rainforest is an open system of inputs, outputs, stores and flows.
- Knowledge and understanding of processes driving change in all parts of this open system.
- Knowledge and understanding of human activities in tropical rainforests, these could include:
 - deforestation for purposes of logging, mining, settlement building, cattle ranching, palm oil plantations and hydroelectric dams
 - selective logging
 - afforestation
 - infrastructure building
 - agroforestry
 - indigenous settlements and shifting-cultivations
 - eco-tourism
 - conservation and scientific research.
- Knowledge and understanding of human activities beyond the tropical rainforest setting that could affect the water cycle in tropical rainforests.
- Knowledge and understanding of specific named tropical rainforest settings.

AO2

- Critical understanding of how various human activities may affect different aspects of the water cycle in tropical rainforests, these will include inputs, outputs, stores and transfers.
- Critical understanding that different human activities are likely to affect the water cycle in tropical rainforests to differing degrees.
- Critical appreciation of the different spatial scales these human activities operate at and critical awareness of the temporal nature of these human activities, for example, creation of HEP dams may result in permanent, regional changes to surface storage, whereas shifting-cultivation is likely to see very localised changes over the short term.
- Appreciation that affects to the water cycle may be immediate, such as reduction in transpiration of logged areas and sometimes delayed, such as a decline in infiltration due to the development of hard pan soil following deforestation and cattle ranching.
- Critical understanding that some human activities may initially affect the water cycle, but negative feedback loops will bring the water cycle in the forest back into equilibrium. Conversely, human activities may affect the water cycle causing a positive feedback loop amplifying the impact on the forest's water cycle.
- Recognition that some human activities can be wholly or partly mitigated by other human activities. A simple example is afforestation and selective logging.
- Critical evaluation of the significance of changes in the water cycle resultant from human activity.
- A conclusion may appreciate the complexity of such an evaluation especially when considering how the nature of human activity varies so greatly in type, spatial extent and temporal scale. It should, however, be reasoned and based on the evidence given in the answer.

Section B – Ecosystems Under Stress

Total for this section: 40 marks

Question	Part	Marking guidance	Total marks
05	1	<p>‘A community of species that will not develop into a natural climax community because of human activity.’</p> <p>What is this a definition of?</p> <p>Key – B: Plagioclimax</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	2	<p>Which of the following is a definition of ‘soil moisture budget’?</p> <p>Key – B: The relationship between water inputs and outputs of a soil store over a year.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	3	<p>Where are most tropical rainforests located?</p> <p>Key – A: Between 23° latitude north and south of the equator.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	4	<p>Which of the following is an example of a planned introduction of a new species to an ecosystem at a local scale?</p> <p>Key – A: A farmer replaces fences with bushes to help lower wind speed on the farm.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	5	<p>Which of the following is a definition of ‘agricultural intensification’?</p> <p>Key – A: Using better methods to grow more food on the same amount of land.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
06		Analyse the data shown in FIGURE 2.	6 AO3=6

Level	Marks	Descriptor
2	4–6	AO3 – Clear selection and analysis of the evidence that has been provided which makes appropriate use of data to support. Clear connections between different aspects of the data.
1	1–3	AO3 – Some basic selection and analysis of the evidence that has been provided which makes limited use of data to support. Basic or limited connections between different aspects of the data.
0	0	No creditable content.

Indicative Content

By transfer and stores

- In all biomes, their respective biomass stores are greater than their leaf litter stores, though the extent varies greatly. For example, there is a 10 903 kg/ha difference in tropical rainforests, whereas there is only a 122 kg/ha difference in tundra.
- In all biomes the nutrient transfer from soil is greater than nutrient transfer from biomass, though this varies from 488 kg/ha/yr difference in tropical rainforests to only 1 kg/ha/yr for the two grassland biomes. Tundra is the anomaly with 242 kg/ha/yr more nutrient transferred from biomass compared to transfer from soil.
- In all biomes the total amount of nutrients found in stores outweigh the total amount of nutrients that are being transported. In the case of the forests, these differences exceed 5000 kg/ha. Tundra is the anomaly with more 122 kg/ha being transferred than stored.
- Whilst biomass is recorded as the greatest store or transfer for all biomes (except tundra) there is not a clear pattern as to which store or transfer holds the second, third or fourth most nutrients.

By biome

- There is a vast difference between biomes in terms of the quantities of nutrients being stored and transferred.
- Tropical rainforest has by far the largest biomass at 11 081 kg/ha with the second largest, deciduous forest, having 5281 kg/ha less stored per year. Tropical rainforests have the highest nutrient transfer from biomass, which is over double that of the second highest biome, wet grass. In an even starker contrast, tropical rainforest nutrient transfer from soil is over 3 times the second largest transfer, wet grass, and over 50 times greater than tundra, the smallest nutrient transfer from soil. However, the anomaly is that leaf litter store in the tropical rainforest is one of the lowest transfers.
- Tundra is set in direct contrast to the tropical rainforest biome with the lowest stores in biomass and leaf litter and lowest transfer from soil in any biome. Dry grassland is more consistent, being the second smallest nutrient store in all transfers and stores.
- Conversely wet grassland has the second highest quantities of nutrient transfers and leaf litter store, meaning wet grasslands have far greater nutrient transfers and stores than dry grassland. With 521 kg/ha/yr more being transferred from both soil and biomass and approximately 700–800 kg/ha more being stored in both biomass and leaf litter. Although different in size for wet and dry grassland, the amount of nutrients transferred into and out of their respective biomass stores are almost equal.

Question	Part	Marking guidance	Total marks
07		<p>Assess the potential impacts of a decline in global biodiversity.</p> <p>AO1 – Knowledge and understanding of the concept of biodiversity. Knowledge and understanding of the potential impacts of declining biodiversity. Knowledge and understanding of ecosystems and their importance for human populations.</p> <p>AO2 – Application of knowledge and understanding of the concept of biodiversity to understand the scale and breadth of the potential impacts resulting from declining biodiversity. Application of knowledge and understanding to assess of potential impacts on human populations and ecosystems.</p>	<p>9</p> <p>AO1=4 AO2=5</p>

Level	Marks	Descriptor
3	7–9	<p>AO1 – Demonstrates detailed knowledge and understanding of the concept of biodiversity and the potential impacts of declining biodiversity. A case study may be referred to for clarity and exemplification. Demonstrates detailed knowledge and understanding of ecosystems and their importance for human populations.</p> <p>AO2 – Applies knowledge and understanding appropriately with detail. A wide range of impacts are considered for a critical evaluation to be made. Connections and relationships between declining biodiversity and potential impacts are thorough, relevant and ideally are exemplified throughout.</p>
2	4–6	<p>AO1 – Demonstrates clear knowledge and understanding of the concept of biodiversity and the potential impacts of declining biodiversity. A case study may be referred to. Demonstrates clear knowledge and understanding of ecosystems and their importance for human populations.</p> <p>AO2 – Applies clear knowledge and understanding appropriately. A range of impacts are considered and evaluated. Some connections and relationships between declining biodiversity and potential impacts are thorough and/or relevant with some exemplification.</p>
1	1–3	<p>AO1 – Demonstrates basic knowledge and understanding of the concept of biodiversity and the potential impacts of declining biodiversity. Case study or exemplification unlikely. Demonstrates basic knowledge and understanding of ecosystems and their impacts for human populations. Mainly generic points.</p> <p>AO2 – Applies limited knowledge and understanding. Some impacts are considered and superficially evaluated. Connections and relationships between declining biodiversity and potential impacts are treated in isolation or connections are vague. Minimal/no exemplification using place.</p>
0	0	No creditable content.

Indicative Content

AO1

- Knowledge and understanding of the concept of biodiversity, often understood in terms of species diversity.
- Knowledge and understanding of the importance of ecosystems, particularly in reference to human populations. This could include their importance for direct use, indirect use and non-use values.
- Knowledge and understanding of the global trends in biodiversity.
- Knowledge and understanding of the potential impacts of declining biodiversity. These can be far reaching and categorised in different ways. Impacts could include:
 - disruption of ecosystems and food webs leading to reduced resilience
 - extinction of species
 - reduction in pollination, water quality and soil fertility
 - weakened ability to regulate the climate due to fewer carbon sinks
 - increase in coastal erosion where mangroves and coral reefs are degraded
 - reduced economic stability; lower crop and fishing yields cause food insecurity; decline in natural resources and increase in cost for technology to fulfil natural processes such as pollination; decline in eco-tourism
 - reduced social resilience; decline in nutritious and varied food, rise in pests and possible zoonotic diseases; reduced access to clean water; loss of traditional medicine sources; decline in quality of life for indigenous people groups
 - loss of cultural heritage.

AO2

- Critical understanding that human populations are extremely dependent on the health and diversity of species in ecosystems.
- Application of knowledge and understanding to show how decline of biodiversity results a range of potential impacts, which could be classified into categories such as environmental, social, economic, political and cultural.
- Critical appreciation that these potential impacts can be both local and globally significant. Loss of soil fertility reduces crop yield locally, but if this pattern is occurring globally then total biomass is reduced, which reduces the carbon sink leading to more global warming.
- Critical understanding that potential impacts are far reaching, interconnected and often result in further unintended impacts, for example, reduced soil fertility can lead to declining crop yields which can lead to food scarcity.
- Acknowledgement that the significance of individual impacts varies according to stakeholder, for example, livelihoods dependent on natural resource gathering may be affected more than those less connected to the ecosystem.
- Candidates are free to form their own conclusions based upon valid content. However, it is likely that candidates will conclude that declining biodiversity has a profound potential impact on ecosystems and humanity.

Question	Part	Marking guidance	Total marks
08		<p>To what extent is climate change a significant threat to the health and survival of coral reefs?</p> <p>AO1 – Knowledge and understanding of the various threats to the health and survival of coral reefs. Knowledge and understanding how climate change can negatively impact the health and survival of coral reefs.</p> <p>AO2 – Application of knowledge and understanding to assess the relative significance of these threats through time and space. Application of knowledge and understanding to determine which threats to the health and survival of coral reefs are linked to climate change and from this determine the extent that climate change is the most significant threat.</p>	<p>20</p> <p>AO1=10 AO2=10</p>

Level	Marks	Descriptor
4	16–20	<p>AO2 – Detailed evaluative conclusion that is rational and firmly based on knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Detailed, coherent and relevant analysis and evaluation in the application of knowledge and understanding throughout.</p> <p>AO2 – Full evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Detailed, highly relevant and appropriate knowledge and understanding of place(s) and environments used throughout.</p> <p>AO1 – Full and accurate knowledge and understanding of key concepts and processes throughout.</p> <p>AO1 – Detailed awareness of scale and temporal change which is well integrated where appropriate.</p>
3	11–15	<p>AO2 – Clear evaluative conclusion that is based on knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Generally clear, coherent and relevant analysis and evaluation in the application of knowledge and understanding.</p> <p>AO2 – Generally clear evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Generally clear and relevant knowledge and understanding of place(s) and environments.</p> <p>AO1 – Generally clear and accurate knowledge and understanding of key concepts and processes.</p>

		AO1 – Generally clear awareness of scale and temporal change which is integrated where appropriate.
2	6–10	<p>AO2 – Some sense of an evaluative conclusion partially based upon knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Some partially relevant analysis and evaluation in the application of knowledge and understanding.</p> <p>AO2 – Some evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Some relevant knowledge and understanding of place(s) and environments which is partially relevant.</p> <p>AO1 – Some knowledge and understanding of key concepts, processes and interactions and change.</p> <p>AO1 – Some awareness of scale and temporal change which is sometimes integrated where appropriate. There may be a few inaccuracies.</p>
1	1–5	<p>AO2 – Very limited and/or unsupported evaluative conclusion that is loosely based upon knowledge and understanding which is applied to the context of the question.</p> <p>AO2 – Very limited analysis and evaluation in the application of knowledge and understanding. This lacks clarity and coherence.</p> <p>AO2 – Very limited and rarely logical evidence of links between knowledge and understanding to the application of knowledge and understanding in different contexts.</p> <p>AO1 – Very limited relevant knowledge and understanding of place(s) and environments.</p> <p>AO1 – Isolated knowledge and understanding of key concepts and processes.</p> <p>AO1 – Very limited awareness of scale and temporal change which is rarely integrated where appropriate. There may be a number of inaccuracies.</p>
0	0	No creditable content.

Indicative Content

The response requires candidates to understand the range of threats facing coral reef health and survival, determine which of those threats result from climate change and then finally evaluate if these threats combined show that climate change is the greatest threat to coral reef health and survival.

AO1

- Knowledge and understanding of the specific environmental conditions associated with reef development and their continued health.
- Knowledge and understanding of the factors that influence the change of ecosystems including climate change and human exploitation of the global environment.
- Knowledge and understanding of the prospects for coral reefs
- Knowledge and understanding of the current threats that impact the health and survival of coral reefs. These could include, but not limited to:
 - algal blooms
 - changes in ocean salinity
 - disease
 - invasive species
 - ocean acidification
 - ocean warming
 - onshore development including deforestation, increased run off and sedimentation
 - overfishing of key species
 - physical damage from
 - tourism, for example, scuba diving, anchor damage and curio trade
 - fishing, for example, blast fishing, trawling and anchor damage
 - tsunamis
 - dredging
 - extraction for construction industry
 - pollution
 - land-based activities, such as sewage, industrial chemicals and agricultural runoff
 - oily discharges from boats from fishing, tourism or commerce
 - sea level rise.
- Knowledge and understanding of the prospective threats that may impact the future health and survival of coral reefs.
- Knowledge and understanding of how climate change may threaten the health and survival of coral reefs.

AO2

- Application of knowledge and understanding to determine the spatial extent of specific threats. Some threats are localised whereas, others are global, for example, overfishing can lead to localised or regionalised decline in coral reef health whereas, eustatic sea level rise will impact all corals globally.
- Application of knowledge and understanding to determine the temporal extent of specific threats. Some threats are continuous while others are discrete in nature, for example, an oil spill will cause immediate devastation, but its impact will decrease as the oil dissipates allowing coral to be restored over decades. In contrast, without a reverse of global warming, ocean acidification will continue to bleach coral and based on future projections of atmospheric carbon emissions this will worsen over time.
- Application of knowledge and understanding to determine the efficacy of mitigation for specific threats. Some threats, such as physical damage can be avoided through careful implementation and enforcement of MPAs. Similarly, invasive species can be removed, such as the crown of thorns star fish in the Great Barrier Reef. However, some threats, like ocean warming, require international commitment to

reduce atmospheric carbon through expensive carbon sequestration schemes and drastic behavioural changes in the global population.

- Critical understanding of which threats are directly or indirectly a result of climate change. These could include ocean acidification, changing ocean salinity, ocean warming and sea level rise.
- Critical evaluation of the significance of climate change's threat compared to all other threats to the health and survival of coral reefs. Scientific community predict that unless Paris Agreement is held, then a 1–2 °C will result in the 'functional degradation' of 90% of the world's coral by 2050. Therefore, expect candidates to recognise the significance of the climate change threat.
- Candidates are free to form their own conclusions based upon valid content. However, it is likely that most will agree with the statement as posed.

Assessment Objective grid

	AO1	AO2	AO3	Total
Section A				
01.1	1			1
01.2	1			1
01.3	1			1
01.4	1			1
01.5	1			1
02			6	6
03	4	5		9
04	10	10		20
Section B				
05.1	1			1
05.2	1			1
05.3	1			1
05.4	1			1
05.5	1			1
06			6	6
07	4	5		9
08	10	10		20
Unit total	38	30	12	80