

INTERNATIONAL A-LEVEL GEOGRAPHY GG03

Paper 3 Physical Geography 2

Mark scheme

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2 4 6 X G G 0 3 / M S

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	<p>Which of the following is a definition of weathering?</p> <p>Key – C: Rocks and landscapes break down over time due to exposure to conditions in the atmosphere and biosphere</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
01	2	<p>‘Precipitation does not reach the soil. Instead, it is held up by different forms of vegetation.’</p> <p>Which of the following processes does this describe?</p> <p>Key – C: Interception</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
01	3	<p>Which of the following is a characteristic of a flood hydrograph?</p> <p>Key – C: The discharge line has a rising and falling limb.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
01	4	<p>Which of the following describes the concept of negative feedback?</p> <p>Key – D: Change within a system slows or reverses the initial process.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
01	5	<p>‘Life that exists on, above and below the Earth’s surface and stores carbon.’</p> <p>This describes which major carbon store?</p> <p>Key – B: Biosphere</p>	<p>1</p> <p>AO1=1</p>

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

This question requires analysis of a comparison bar graph showing the amount of carbon stored in different types of trees based on differing diameters of 20, 40 and 60 cm. Analysis could include comparison of the data trends, high and low amounts, key differences and anomalies. There should be specific application of the data from the axis.

AO3

- The 60cm tree diameter has the biggest range of carbon storage across the different species, going from just over 3 Mt in a white pine, to almost 5.25 in a sugar maple.
- The 40 cm tree diameter has a range of nearly 1 Mt, with the white pine the lowest again at just over 3 Mt, going up to sugar maple with nearly 2 Mt.
- There is little variation in different tree types for the 20 cm diameter, with all being less than 0.5 Mt.
- There are three distinct groupings of trees based on their carbon storage. Sugar maple, red oak and beech all have the highest carbon content storage. Red maple, birch and white ash make up the next level down. This is then followed by black cherry basswood and elm. A couple of trees are paired, but red spruce and white pine are anomalies in so far as they are not grouped and have low carbon storage.
- Whilst the amount increase is not as high going from 20 cm to 40 cm in tree varieties compared to 40 cm to 60 cm, the proportional increase is higher. For example, in the sugar maple there is less than 0.5 Mt stored at 20 cm which quadruples to nearly 2 Mt at 40 cm. This then goes up to over 5 Mt at 60 cm which is less than treble the 40 cm amount.

Question	Part	Marking guidance	Total marks
03		<p>Evaluate one or more ways that humans can mitigate against the effects of climate change.</p> <p>AO1 – Knowledge and understanding of human interventions in the carbon cycle designed to influence carbon transfers and mitigate the impacts of climate change. Knowledge and understanding of the key role of the carbon stores and cycles in supporting life on Earth with particular reference to climate. Knowledge and understanding of changes in the carbon cycle over time, to include human impact (including hydrocarbon fuel extraction and burning, farming practices, deforestation, land use changes).</p> <p>AO2 – Application of knowledge and understanding to evaluate one or more ways that humans can mitigate against the effects of climate change. Application of knowledge and understanding to consider a range of interventions and overall judgement.</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 different ways that humans can mitigate against the effects of climate change.</p> <p>AO2 – Applies knowledge and understanding to the novel situation, offering detailed analysis and evaluation, drawn appropriately from the context provided. Connections and relationships between different aspects of study are thorough and relevant.</p>
2	4–6	<p>AO1 – Demonstrates detailed knowledge and understanding of the different ways that humans can mitigate against the effects of climate change.</p> <p>AO2 – Applies knowledge and understanding to the novel situation, offering clear analysis and evaluation, drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident and relevant.</p>
1	1–3	<p>AO1 – Demonstrates detailed knowledge and understanding of the different ways that humans can mitigate against the effects of climate change.</p> <p>AO2 – Applies limited knowledge and understanding to the novel situation, offering some basic analysis and evaluation. Connections and relationships between different aspects of study are basic with limited relevance. Analysis and evaluation are basic and of limited relevance.</p>
0	0	No creditable content.

Indicative Content

This question requires links to be made between different parts of the specification content on Water, Carbon and Life on Earth. Specific focus needs to be on the carbon, climate and life on earth section, especially the human interventions in the carbon cycle designed to influence carbon transfers and mitigate against the effects of climate change. Links may be made to relevant sections of the carbon cycle area of the specification too.

AO1

- Knowledge and understanding of the human interventions in the carbon cycle designed to influence carbon transfers and mitigate the effects of climate change.
- Knowledge and understanding of the key role of the carbon stores and cycles in supporting life on Earth with particular reference to climate.
- Knowledge and understanding of changes in the carbon cycle over time, to include human impact (including hydrocarbon fuel extraction and burning, farming practices, deforestation, land use changes).

AO2

- Understanding of the effects of climate change through the changing carbon cycle, such as increased warming, and that a reduction of carbon in the atmosphere will thereby reduce these impacts.
- Evaluation of the different ways that human interventions in the carbon cycle can mitigate against the effects of climate change, such as the following:
 - Afforestation and reforestation can help to sequester carbon and stimulate new ecosystems, thus helping to remove carbon dioxide over time from the atmosphere. However, this can take a long time and needs effective management to be successful.
 - Carbon capture and storage can capture carbon dioxide emissions and store them so that they do not contribute to climate change. Some processes can even remove carbon from the atmosphere too. However, this is new technology which has not yet been developed at a large scale and some storage methods are still being questioned.
 - Renewable energy use stops fossil fuel combustion from affecting carbon stores and flows, thereby reducing the atmospheric store. However, the climatic or location specific requirements for this means that they are not always fully reliable as an energy source and battery storage is not developed enough to store excess energy generation for later use.
 - Carbon farming can be applied to store carbon within soils more effectively and link this to better farm production and yields. However, there are limits to storage levels within the soil and they will need careful management and protection over time to be successful.
 - Carbon taxation can be an effective way to limit industrial output of carbon emissions, but only if well regulated and monitored, and even then there is the potential for wealthier companies to simply pay to emit more, rather than reduce emissions.

Question	Part	Marking guidance	Total marks
04		<p>Over time, natural variations in water cycles have a greater effect than human changes.</p> <p>To what extent do you agree with this statement?</p> <p>AO1 – Knowledge and understanding of changes in the water cycle over time – natural variations including storm events, seasonal changes and human impact including farming practices, land use change and water abstraction. Knowledge and understanding of systems in physical geography. Knowledge and understanding of key features of the water cycle.</p> <p>AO2 – Application of knowledge and understanding to assess the natural and human changes to water cycles. Application of knowledge and understanding to assess the extent to which there is agreement with the statement.</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 links different parts of the Water, Carbon and Life on Earth part of the specification. The main focus is the water cycle section, especially the changes in the water cycle over time, including natural and human factors. The question requires candidates to decide on an extent to which there is agreement with the statement or not. Answers should consider both natural changes and human changes to water cycles and will be limited to a maximum of level 2 if only natural changes **or** human changes are considered in the answer.

AO1

- Knowledge and understanding of changes in the water cycle over time – natural variations including storm events, seasonal changes and human impact including farming practices, land use change and water abstraction.
- Knowledge and understanding of systems in physical geography.
- Knowledge and understanding of key features of the water cycle.

AO2

- Discussion of natural variations that can affect water cycles, and their relative importance, such as the following:
 - Storm events can cause rapid and prolonged rainfall which can saturate soils and landscapes, leading to increased runoff and flooding. These can also help to replenish water stores.
 - Seasonal changes, such as monsoon cycles and El Nino events, can cause large-scale changes in rainfall patterns across whole regions, with increased rainfall in some areas, leading to flooding and replenished water stores, and decreased rainfall in other areas, leading to drought and declining water stores.
 - Geological and landscape factors can also play a significant role in affecting water cycles over longer time periods. For instance, lava flows can create impermeable surfaces if they cover other rock types, which will affect infiltration and runoff. Landslides can change the appearance of valleys, and even rock types, which can alter the flow of river systems and the shape of drainage basins.
- Discussion of human changes that can affect water cycles, and their relative importance, such as the following:
 - Deforestation can disrupt transpiration, stemflow, evapotranspiration and storage of water within vegetation. This can have an impact on the circulation of water within forest ecosystems, as well as changes to lag times within river basins and increased runoff from rainfall in previously forested areas.
 - The development of urban areas will create impermeable surfaces which affect infiltration and increase runoff. This will cause more flooding and impact on the natural balance of the water cycle.
 - Agricultural processes can affect water cycles in a number of ways. Water may be diverted from river systems, or over-abstracted from groundwater supplies for use on cropland. Deforestation to create farmland will link to increased runoff which, when linked to increased fertiliser use, impacts on the amount and nature of water that then flows back into river systems.
- Clear extent to which there is agreement with the statement or not based on the preceding discussion and argument of relative importance.

Section B – Ecosystems Under Stress**Total for this section: 40 marks**

Question	Part	Marking guidance	Total marks
05	1	<p>Which of the following is a description of a food web?</p> <p>Key – D: The transfer of energy through consumption within an ecological community</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	2	<p>‘An ecosystem reaches a balanced and stable state after organisms have developed in the area over time.’</p> <p>This describes which of the following terms?</p> <p>Key – A: Climatic climax</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	3	<p>Which of the following is an example of a conservation strategy?</p> <p>Key – D: Putting a ban in place to stop deforestation in a woodland area</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	4	<p>Which of the following are BOTH conditions that encourage algal blooms, affecting coral reefs?</p> <p>Key – D: Warm seas and high nutrient levels</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
05	5	<p>Which of the following describes a planned introduction of a new species to an ecosystem?</p> <p>Key – C: Scientists release beavers into a river catchment area to help create natural flood barriers.</p>	<p>1</p> <p>AO1=1</p>

Question	Part	Marking guidance	Total marks
06		Analyse the data shown in FIGURE 2 and FIGURE 3.	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

This question requires analysis of two choropleth maps, one showing the number of species lost in different regions of mainland China between 1981 and 2005, the other showing the number of species lost in different regions of mainland China between 2006 and 2018. Analysis could include comparison of the data trends, high and low amounts, key differences and anomalies. There should be specific application of the data from the key.

AO3

- The largest amount of species lost (more than 130) is clustered in the south centre in both maps, which includes five provinces in 1981–2005, dropping to only four provinces in 2006–2018. But whilst there were no provinces in the second lowest category (106–130) in 1981–2005, this had increased to two provinces in 2006–2018, both adjacent to the cluster of provinces with the highest amounts.
- In both maps there is a decrease in number of species lost as you travel north. In 1981–2005 there is a clear stretch of provinces with less than 30 species lost across the north of China, only broken up by a strip of Gansu. However, in 2006–2018 there are more differences between the provinces, and many have higher amounts of species lost, going up to 46–60 in some cases.
- There has been a distinct decrease in the amount of provinces with 61–75 species lost over time. In the 1981–2005 map this category included five provinces, but only Chongqing has remained in this category in 2006–2018. Tibet and Shaanxi have decreased whereas Fujian and Zhejiang have increased in numbers of species lost.
- On the whole, most provinces seem to have either had the same amount of species lost in 2006–2018 compared to 1981–2005 or have increased to the next category. Apart from Fujian and Zhejiang mentioned above the other notable exceptions of decreases in 2006–2018 compared to 1981–2005 are Hainan and Guangdong in the south that have dropped to the next lower category.

Question	Part	Marking guidance	Total marks
07		<p>Assess the ways in which flora and fauna have adapted to changes in an ecosystem at a local scale that you have studied.</p> <p>AO1 – Knowledge and understanding of the main characteristics of a distinctive local ecosystem (such as an area of forest conservation, mangrove conservation, managed parkland, pond, dune system); ecological responses to the climate, soil and soil moisture budget – adaptations by flora and fauna. Knowledge and understanding of local factors in ecological development and change (such as agriculture, urban change, the planned and unplanned introduction of new species). Knowledge and understanding of the impacts of change and measures to manage these impacts; conservation strategies and their implementation in specific settings.</p> <p>AO2 – Application of knowledge and understanding to assess the ways in which flora and fauna have adapted to changes in a local ecosystem that has been studied.</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 main characteristics of a distinctive ecosystem at a local scale (such as an area of forest conservation, mangrove conservation, managed parkland, pond, dune system); ecological responses to the climate, soil and soil moisture budget – adaptations by flora and fauna.</p> <p>AO2 – Applies knowledge and understanding to the novel situation, offering detailed analysis and evaluation, drawn appropriately from the context provided. Connections and relationships between different aspects of study are thorough and relevant.</p>
2	4–6	<p>AO1 – Demonstrates clear knowledge and understanding of the main characteristics of a distinctive ecosystem at a local scale (such as an area of forest conservation, mangrove conservation, managed parkland, pond, dune system); ecological responses to the climate, soil and soil moisture budget – adaptations by flora and fauna.</p> <p>AO2 – Applies knowledge and understanding to the novel situation, offering clear analysis and evaluation, drawn appropriately from the context provided. Connections and relationships between different aspects of study are evident with and relevant.</p>
1	1–3	<p>AO1 – Demonstrates basic knowledge and understanding of the main characteristics of a distinctive ecosystem at a local scale (such as an area of forest conservation, mangrove conservation, managed parkland, pond, dune system); ecological responses to the climate, soil and soil moisture budget – adaptations by flora and fauna.</p> <p>AO2 – Applies limited knowledge and understanding to the novel situation, offering some basic analysis and evaluation. Connections and relationships</p>

		between different aspects of study are basic with limited relevance. Analysis and evaluation are basic and of limited relevance.
0	0	No creditable content.

Indicative Content

This question requires links to be made between different parts of the specification content on Ecosystems Under Stress, specifically the local ecosystems section. Knowledge and understanding must be applied to assess the ways in which flora and fauna have adapted to changes over time in an ecosystem at a local scale that has been studied. Answers will be limited to a maximum of level 2 if only flora **or** fauna **or** a biome scale are considered in the answer.

AO1

- Knowledge and understanding of the main characteristics of a distinctive ecosystem at a local scale (such as an area of forest conservation, mangrove conservation, managed parkland, pond, dune system); ecological responses to the climate, soil and soil moisture budget – adaptations by flora and fauna.
- Knowledge and understanding of local factors in ecological development and change (such as agriculture, urban change, the planned and unplanned introduction of new species).
- Knowledge and understanding of the impacts of change and measures to manage these impacts; conservation strategies and their implementation in specific settings.

AO2

- Assessment of some of the ways in which flora have adapted to changes in an ecosystem at a local scale studied, such as the following within the Kampot mangrove in Cambodia:
 - The Mangrove Apple has adapted to tidal sea level changes by developing pneumatophores or aerial roots which allow the trees to obtain oxygen even when the roots are submerged in water during high tide, ensuring their survival in the varying water levels.
 - The Black Mangrove has developed specific adaptations to cope with high salinity levels with salt glands that excrete excess salt to prevent salt accumulation in their tissue.
 - The stilt roots of the Rhizophora provide stability in the muddy substrates that can be soft and unstable. These stilt roots help to anchor the trees in place.
- Assessment of some of the ways in which fauna have adapted to changes in an ecosystem at a local scale studied, such as the following within the Malaysian rainforest:
 - The Mudskipper has adapted to regular tidal sea-level changes by developing the ability to breathe air. They can therefore survive out of water for extended periods by extracting oxygen through their skin and the lining of their mouth and throat.
 - The Mangrove Crab has adapted to the salinity levels by having specialised gills that allow it to regulate its internal salt concentration efficiently allowing survival within the environment.
 - Many bird species time their breeding and feeding patterns to coincide with the seasonal cycles of fish and crustaceans that thrive in the mangrove. This adaptation ensures a steady supply of food during critical times, contributing to the success of their reproductive efforts.
- Assessment could develop in terms of the effectiveness of different adaptations, as well as comparison of the flora and fauna to the different conditions eg which adapts better to the tidal changes, the Mangrove Apple or Mudskipper?

Question	Part	Marking guidance	Total marks
08		<p>‘As populations and economies continue to develop, ecosystems are more important than ever to humans.’</p> <p>To what extent do you agree with this viewpoint?</p> <p>AO1 – Knowledge and understanding of ecosystems and their importance for human populations in the light of continuing population growth and economic development; human populations in ecosystem development and sustainability. Knowledge and understanding of factors influencing the changing of ecosystems, including climate change and human exploitation of the global environment. Knowledge and understanding from other areas of the specification if accurate and relevant to the question.</p> <p>AO2 – Application of knowledge and understanding to assess the importance of ecosystems to humans. Application of knowledge and understanding to assess the extent to which there is agreement with the statement.</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 links different parts of the Ecosystems Under Stress part of the specification, with specific reference to ecosystems and their importance for human populations in the light of continuing population growth and economic development; human populations in ecosystem development and sustainability. Candidates need to use evidence to assess the importance of ecosystems to humans and form an extent to which there is agreement with the overall statement.

AO1

- Knowledge and understanding of ecosystems and their importance for human populations in the light of continuing population growth and economic development; human populations in ecosystem development and sustainability.
- Knowledge and understanding of factors influencing the changing of ecosystems, including climate change and human exploitation of the global environment.
- Knowledge and understanding from other areas of the specification if accurate and relevant to the question.

AO2

- Assessment of the ways that ecosystems are more important than ever to humans, such as the following:
 - As global population and economic activities grow there is more demand for energy and increases in carbon emissions. Ecosystems play a vital role in mitigating climate change by taking in carbon dioxide.
 - With an increase in population there is more demand for food and medicines than ever before. Ecosystems are essential in providing most food requirements and are a base for many medicines.
 - Ecosystems can be incredibly important in reducing the impact of natural disasters on urban areas, such as mangroves protecting from tsunamis and sea-level rise, or forests increasing lag time and reducing flooding.
 - Developed ecosystems, such as farmland and parklands, are very important for food production and wellbeing respectively, which is more important than ever with today's growing population and stressful lifestyles.
- Assessment of the ways that ecosystems are less important than ever to humans, such as the following:
 - Due to economic development machinery and technology can replace a number of ecosystem features. Processes such as lab grown meat, hybrid crop varieties and vertical farming place less reliance on ecosystems and can create food at a faster pace for growing populations.
 - Population and economic development issues, including urban growth, resource and energy mining, are often seen as more important than protection of ecosystems, so ecosystems are destroyed or fragmented to make way.
 - Industrial processes are now able to re-create a number of natural systems for human functions, such as medicine creation, water treatment and flood barriers.
 - As developed ecosystems, such as farmland and parklands, can be created and controlled by humans, there is an argument that natural ecosystems are far less important, despite these developed examples still being types of ecosystem.
- An overall judgement of whether there is agreement with the statement or not.

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