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# INTERNATIONAL A-LEVEL GEOGRAPHY GG03

Paper 3 Physical Geography 2

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Mark scheme

January 2023

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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.

Further copies of this mark scheme are available from [oxfordaqaexams.org.uk](http://oxfordaqaexams.org.uk)

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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"> <li>• investigate geographical questions and issues</li> <li>• interpret, analyse and evaluate data and evidence</li> <li>• construct arguments and draw conclusions.</li> </ul>

### 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**

<b>Question</b>	<b>Part</b>	<b>Marking guidance</b>	<b>Total marks</b>
<b>01</b>	1	<b>Which of the following all represent natural stores in the water cycle?</b>  Key – D: Soil; vegetation; clouds.	<b>1</b>  <b>AO1=1</b>
<b>01</b>	2	<b>Which of the following all represent natural stores in the carbon cycle?</b>  Key – C: Soil; ocean; biomass.	<b>1</b>  <b>AO1=1</b>
<b>01</b>	3	<b>Use the phrases in the table to match the labels on the flood hydrograph in Figure 1.</b>  Key – A: Base Flow; Lag Time; Peak Flow	<b>1</b>  <b>AO1=1</b>
<b>01</b>	4	<b>Which statement describes photosynthesis?</b>  Key – D: It uses the light from the sun to create food energy for plants and animals.	<b>1</b>  <b>AO1=1</b>
<b>01</b>	5	<b>Which of the following all represent entirely natural contributors of atmospheric carbon dioxide?</b>  Key – D: Volcanic eruptions; respiration; lightning fires.	<b>1</b>  <b>AO1=1</b>

Question	Part	Marking guidance	Total marks
02		<p><b>Figure 2a</b> shows groundwater levels below London in 1900.</p> <p><b>Figure 2b</b> shows how the level of groundwater has changed 100 years later.</p> <p>All figures are given in metres.</p> <p><b>Analyse the information shown in Figure 2a and Figure 2b.</b></p>	<p><b>6</b></p> <p><b>AO3=6</b></p>

Level	Marks	Descriptor
2	4 – 6	<b>AO3</b> – 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	<b>AO3</b> – 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 identify the patterns shown in the groundwater levels over the one hundred years.

### **AO3**

- The overall trend is groundwater levels/water table have decreased across London in the 100 year period.
- The decrease in groundwater has been greater in the NW area where the levels have changed from 0 to as much as -50 metres. Central areas have changed by -15 m within the 100 year period. Some of the areas found in the SE have seen very little change in groundwater levels in the 100 year period.
- The areas around Trafalgar Square have the lowest figures on both maps although the area of lowest groundwater levels is much larger in Figure 2b. This area has increased from a size of approximately 7 km wide to over 16.75 km wide.
- The difference in groundwater levels across London in Figure 2a is 45 m whereas 100 years later in Figure 2b the difference is 60 m.
- In Figure 2b a new area of difference has developed in the NE with groundwater levels here decreasing by between 15 m and 20 m.
- The course of the River Thames does not change.

Question	Part	Marking guidance	Total marks
03		<p><b>To what extent has human activity affected the carbon cycle in an area of tropical rainforest you have studied?</b></p> <p><b>AO1</b> – Knowledge and understanding of the human activity that alters the carbon cycle of the rainforest. Knowledge and understanding of the impact these changes have on the rainforest.</p> <p><b>AO2</b> – Application of knowledge and understanding to assess the relative changes to the carbon cycle caused by human activity in terms of stores and flows. Application of knowledge and understanding to assess the role that each of these human activities play in the changes to the carbon cycle in the tropical rainforest and maybe how this varies in different places.</p>	<p><b>9</b></p> <p><b>AO1=4</b> <b>AO2=5</b></p>

Level	Marks	Descriptor
3	7 – 9	<p><b>AO1</b> – Demonstrates detailed knowledge and understanding of the importance of the carbon cycle to the tropical rainforest and how a range of human activities affect the carbon cycle. Diagrams might be used and should be credited.</p> <p><b>AO2</b> – Applies detailed knowledge and understanding through their case study to show the relative importance of a range of human activities and their impacts on the carbon cycle.</p>
2	4 – 6	<p><b>AO1</b> – Demonstrates clear knowledge and understanding of the importance of the carbon cycle to the tropical rainforest and how human activities affect the carbon cycle.</p> <p><b>AO2</b> – Applies clear knowledge and understanding possibly with reference to their case study to show the relative importance of some human activities in changing the carbon cycle in the tropical rainforest.</p>
1	1 – 3	<p><b>AO1</b> – Demonstrates basic knowledge and understanding of the importance of the carbon cycle to the tropical rainforest and how human activities affect the carbon cycle.</p> <p><b>AO2</b> – Applies limited knowledge and understanding, without reference to places to show the importance of human activities in affecting the carbon cycle in the tropical rainforest.</p>
0	0	No creditable content.

### Indicative Content

The question requires the candidate to explain how the carbon cycle functions in the tropical rainforest. The candidate could use a diagram to show this. The candidate demonstrates how human activities (eg slash and burn, cattle ranching or climate change) affect the carbon cycle, maybe a diagram could be used. The relative impact of these factors on the carbon cycle is discussed with a possible conclusion as to the activity which creates the greatest change. Their case study should be referred to, eg forest fires triggered by forest clearance for cattle ranching in Amazonia.

#### **AO1**

- The carbon cycle in the tropical rainforest is described either as a diagram or in prose.
- The key processes are mentioned such as photosynthesis and decomposition.
- Human activities such as loss of vegetation through deforestation (logging, slash and burn) or fires caused by lightning or flooding caused by dam construction.
- Rising temperatures and falling rainfall caused by climate change.
- Loss of biodiversity through deforestation, hunting, pet industry, selective logging.

#### **AO2**

- The carbon cycle in a pristine forest (climax vegetation) is compared to the carbon cycle after the human activities, eg deforestation through clear felling by humans removes the biomass and so leaf litter will not fall onto the forest floor for fungi and decomposers to change into the nutrients which are returned to the soil. Consequently the soil will lose its fertility and so the carbon content of the stores will diminish and the flows will reduce so the primary productivity of the forest will decline. This explains why cattle ranching is so ineffective as the nutrients are not recycled anymore because the cattle are removed from the ecosystem when they are slaughtered.
- A natural environmental change may be lightning storms creating fires which decrease the carbon content in the biomass, but increase it in the litter through ash. If the scale of the fire is not too large then the ash can be decomposed and returned to the soil. Also the light reaching the forest floor will allow plants to grow from dormant seeds which will grow towards the light so briefly the primary productivity will be increased as it is lighter and warmer.
- A conclusion will probably imply that the changes caused by humans, such as deforestation, has a greater effect than natural factors owing to the scale and intensity of the changes mean a positive feedback effect. Also a conclusion should differentiate between the impact of the different human activities, eg cattle ranching has a larger impact because of the area affected, however, mining totally destroys the forest soil although over a smaller area.



Question	Part	Marking guidance	Total marks
04		<p><b>‘Natural variations have a greater effect on the water cycle than human impacts.’</b></p> <p><b>To what extent to you agree with this view?</b></p> <p><b>AO1</b> – Knowledge and understanding of the impact of storm events and seasonal changes on the water cycle. Knowledge and understanding of the impact of farming practices, land use change and water abstraction. Knowledge and understanding of the stores and flows of water within a river catchment.</p> <p><b>AO2</b> – Application of knowledge and understanding to critically evaluate the impact of storm events and seasonal changes relative to the human impacts of changing farming practices, land use change and water abstraction. Application of knowledge and understanding to critically evaluate how this balance may vary in different places and at different times.</p>	<p><b>20</b></p> <p><b>AO1=10</b> <b>AO2=10</b></p>

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

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

### Indicative Content

The question brings together the understanding of the water cycle through the year in a local river catchment context. This context will be described. Clearly the candidate will demonstrate they understand the flows and stores which achieve a water balance in the particular drainage basin studied. The candidate will continue to look at the precipitation inputs and the nature of these inputs (intensity and duration) and how these change through the year, eg summer intense storm events of short duration will result in less infiltration and increased run off possibly leading to flooding. This will result in less water storage in the soil and rock.

The farming practices, such as irrigation, land use (types of crop or even housing) and water abstraction (through wells) will affect the water cycle of the drainage basin through changes to stores and flows, eg water abstraction will lower the water table.

The candidate should balance these physical and human impacts with reference to the example(s) they have studied.

### **AO1**

- Knowledge and understanding of the changes in the water cycle brought about by storm events (intensity and duration will affect infiltration rates and runoff rates).
- Knowledge and understanding of the changes in the water cycle brought about by seasonal changes (evaporation rates will change). These could include precipitation in the form of snow and frozen soils.
- Knowledge and understanding of the changes in the water cycle brought about by farming practices (irrigation will increase water availability for crops so holding water in the ecosystem for longer as it is stored in the vegetation).
- Knowledge and understanding of the changes in the water cycle brought about by land use change (the type of crops will affect interception, houses and roads will increase runoff through impermeable surfaces).
- Knowledge and understanding of the changes in the water cycle brought about by water abstraction (this will reduce groundwater and lower the water table making abstraction more difficult in the future.)
- Knowledge and understanding of the impact these changes bring about in the water cycle. Look at the impacts in space and time and the positive and negative feedback loops.

### **AO2**

- Evaluation of the different physical and human changes in terms of how they may increase or decrease flows or stores to affect the water balance, eg reservoirs storing water from winter rainfall to provide a water supply in the summer.
- Evaluation of the importance of land use in determining run off into the rivers and the ways in which that affects the water balance, eg the impact of urbanisation and impermeable surfaces.
- Evaluation of the relative importance of the physical and human factors locally such as sustainable management methods.
- Evaluation of the relative importance of the physical and human factors globally such as climate change or changes in crop requirements as product demand changes, eg production of dates.
- A conclusion will depend on the type of catchment basin and will recognise the importance of local characteristics in affecting the physical and human impacts, but that the water cycle is an open system and the changes in rainfall may be controlled by influences outside the catchment basin.

**Section B – Ecosystems under stress**

**Total for this section: 40 marks**

<b>Question</b>	<b>Part</b>	<b>Marking guidance</b>	<b>Total marks</b>
<b>05</b>	1	<b>Which of the following defines the concept of a biome?</b>  Key – A: A large-scale ecosystem unit.	<b>1</b>  <b>AO1=1</b>
<b>05</b>	2	<b>Which of the following describes net primary production in an ecosystem?</b>  Key – A: The amount of energy fixed by plants through photosynthesis minus the energy used in respiration.	<b>1</b>  <b>AO1=1</b>
<b>05</b>	3	<b>Which of the following all increase litter and soil mineral storage in the mineral nutrient recycling process?</b>  Key – C: Leaf fall; weathering; dead animals.	<b>1</b>  <b>AO1=1</b>
<b>05</b>	4	<b>Which of the following describes the distribution of the tropical rainforest?</b>  Key – A: Between the Tropic of Cancer and the Tropic of Capricorn.	<b>1</b>  <b>AO1=1</b>
<b>05</b>	5	<b>A plagioclimax is defined as:</b>  Key – D: the vegetation succession that results from human influence.	<b>1</b>  <b>AO1=1</b>

Question	Part	Marking guidance	Total marks
06		Study the nutrient cycle diagrams and climate graphs for a taiga (coniferous forest) and hot desert biome ( <b>Figure 3</b> ).  <b>Analyse the data shown in Figure 3.</b>	6  AO3=6

Level	Marks	Descriptor
2	4 – 6	<b>AO3</b> – Clear description and assessment 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	<b>AO3</b> – Some basic description and assessment 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 candidates to compare both the stores and flows of the nutrient cycle diagrams with the climate graphs of the two biomes and then establish patterns.

### **AO3**

- (**Figure 3**) The largest store in the desert is the soil, whereas this is small in the taiga and the largest store in the taiga is the litter, whereas this is small in the desert.
- The climate graph of the taiga shows colder temperatures (below 0°C for five months of the year whereas the desert temperature is always above 12°C).
- The flows are similar in size except the absorption from the soil to the biomass is larger in the desert than the taiga. Also the desert does not show a weathering or leaching arrow. The loss of litter from runoff is higher in the taiga.
- The precipitation in the taiga is always higher than that of the desert, the total is nearly six times higher.
- Both temperature graphs peak in July/August suggesting they are in the Northern Hemisphere.
- The flows in the taiga are generally larger than in the desert. The rainfall is always lower in the desert.
- Other valid points may well be made.

Question	Part	Marking guidance	Total marks
07		<p><b>‘Human activity threatens the flora and fauna of savanna grasslands more than in tropical rainforests.’</b></p> <p><b>Assess the extent to which you agree with this view.</b></p> <p><b>AO1</b> – Knowledge and understanding of the types of human activity and how these alter the flora and fauna from their climax positions in both the Savanna and the rainforest.</p> <p><b>AO2</b> – Application of knowledge and understanding to compare the dynamic equilibrium of the tropical rainforest and the savanna grassland. Application of knowledge and understanding to show how each biome is affected by human activity and how its sustainability and biodiversity could be compromised. Case studies might be used to exemplify points, but are not required.</p>	<p><b>9</b></p> <p><b>AO1=4</b> <b>AO2=5</b></p>

Level	Marks	Descriptor
3	7 – 9	<p><b>AO1</b> – Demonstrates detailed knowledge and understanding of the flora and fauna of the savanna grasslands and the tropical rainforest. Demonstrates detailed knowledge and understanding of the human activity that threatens these biomes.</p> <p><b>AO2</b> – Applies detailed knowledge and understanding to critically assess the relative importance of a range of human activity that affect the flora and fauna of the savanna grasslands and the tropical rainforest. Connections and relationships between these different factors are thorough and relevant and applied to a place context.</p>
2	4 – 6	<p><b>AO1</b> – Demonstrates clear knowledge and understanding of the flora and fauna of the savanna grasslands and the tropical rainforest. Demonstrates clear knowledge and understanding of the human activity that threatens these biomes.</p> <p><b>AO2</b> – Applies clear knowledge and understanding to assess the relative importance of a range of human activity that affect the flora and fauna of the savanna grasslands and the tropical rainforest. Connections and relationships between these different factors are sound and relevant and applied to a place context.</p>
1	1 – 3	<p><b>AO1</b> – Demonstrates basic knowledge and understanding of the flora and/or fauna of the savanna grasslands and the tropical rainforest. Demonstrates basic knowledge and understanding of the human activity that threatens these biomes. Mainly generic points with little or no place context.</p> <p><b>AO2</b> – Applies limited knowledge and understanding to state the importance of human activity that affects the flora and/or fauna of the savanna grasslands and the tropical rainforest. The factors will probably be treated in isolation or their connections vaguely alluded to with weak or no place context.</p>
0	0	No creditable content.

### Indicative Content

The essence of this question is a comparative study of the tropical rainforest and the savanna grassland to determine which is most robust at coping with the pressures that human activity puts on their structure and functioning. The focus is on the flora and fauna. A conclusion would be expected from the extended writing.

#### **AO1**

- Knowledge and understanding of the locational context of the biomes and the resultant seasonality in the savanna grasslands. Countries and places may be referred to here.
- Knowledge and understanding of the structure and functioning of these different biomes in terms of climate, soil and flora and fauna.
- Knowledge and understanding of the successional climax of each biome.
- Knowledge and understanding of the ways in which human activity such as agricultural practices or tourism have an impact on the structure and functioning of these biomes such as the impact on tribal groups in the rainforest and the impact of tourists on animal reproduction and soil erosion in the savanna.
- Knowledge and understanding of the sustainability and biodiversity of these biomes.

#### **AO2**

- Application of knowledge and understanding to demonstrate how the biomes are preserved, eg in the rainforest to talk about the importance of the trees in nutrient recycling because the soil is relatively poor and so rapid decomposition is critical. In the savanna to refer to the importance of animal migration so that the large animals can eat enough food to survive in the dry season by following the rains, this leads to the wildebeest migration in Kenya and Tanzania.
- Application of knowledge and understanding to explain the importance of the climate and how, through global warming, increased temperatures and failure of the wet season in the savanna can lead to starvation and death jeopardising elephants and rhino in particular who are also under threat from poaching.
- Application of knowledge and understanding to show the impact of human activity such as cattle ranching in the rainforest of Rondonia in the Amazon Basin leading to rapid deforestation as soil fertility declines. In the savanna tourism disrupts animal breeding and causes soil erosion and loss of vegetation that the herbivores feed on.
- Application of knowledge and understanding to show how some human activity such as the creation of biospheres and National Parks can help preserve the biomes.
- Application of knowledge and understanding to show how human activity in the form of tracking technology using GIS remote sensing can monitor the impacts of human activity and encourage campaigns such as the 'United for Wildlife' campaign by Prince William.

Question	Part	Marking guidance	Total marks
08		<p><b>Critically evaluate the factors causing the world’s coral reefs to be an ecosystem under stress.</b></p> <p><b>AO1</b> – Knowledge and understanding of how a coral reef forms and functions and what will put it under stress. Knowledge and understanding of all the factors that can change a coral reef and in particular bleach the coral.</p> <p><b>AO2</b> – Application of knowledge and understanding to assess the stability of the dynamic equilibrium that makes up coral reefs with reference to a particular reef. Application of knowledge and understanding to assess the relative importance of the factors that affect reef health. Application of knowledge and understanding to show an appreciation of the interaction of these factors and how complicated the effects can be eg global warming.</p>	<p><b>20</b></p> <p><b>AO1=10</b> <b>AO2=10</b></p>

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



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

### Indicative Content

The question requires a knowledge of coral reefs and an awareness of the natural and human factors that affect them and then the way these factors interact to affect the health of the reef. How these factors stress coral reefs will be understood. It is likely that the candidates will structure this work with a conclusion maybe considering the future scenario.

#### **AO1**

- Knowledge and understanding of how a coral reef formed and developed its biodiversity.
- Knowledge and understanding of the natural factors that affect coral reefs such as the acidity of the water, the depth of the water, ocean currents, etc.
- Knowledge and understanding of the human factors that affect coral reefs such as ocean temperature change from global warming, water pollution from sewage or waste reducing light intensity, chemical pollution affecting acidity, physical damage from tourists removing coral or striking it with boats, etc.
- Knowledge and understanding of what stresses coral and how its symbiotic relationship can be disrupted.
- Knowledge and understanding of a coral reef case study and how and why its unique character developed.
- Knowledge and understanding of the way these factors interact such as warm water ocean temperatures reduce plankton and sewage affects the light intensity for photosynthesis of the algae.
- Knowledge and understanding of the process of bleaching and how it has changed in recent years.

#### **AO2**

- Critical assessment of the condition of coral reefs and why some are bleaching and some are not.
- Critical assessment of the relative importance of the different factors and the causes of the changes to these factors.
- Critical assessment of the interaction of these factors in an example.
- Critical assessment of the role of the management of coral reefs to reduce the stress and to preserve them both locally and internationally.
- Critical assessment of the future changes that may occur in coral reefs with justification.

**Assessment Objective grid**

	AO1	AO2	AO3	Total
<b>Section A</b>				
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
<b>Section B</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