GCSE
GEOGRAPHY
8035/1

Paper 1 Living with the physical environment

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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

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Point marked questions marking instructions

The mark scheme will state the correct answer or a range of possible answers, although these may not be exhaustive. It may indicate how a second mark is awarded for a second point or developed idea. It may give an indication of unacceptable answers.

One mark questions will not need ticks or crosses or NC (no credit). 2 and 3 mark questions will require ticks to show where credit is being awarded. The number of ticks must equal the mark awarded. You do not need to use crosses to indicate answers that are incorrect.

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor is linked to the Assessment Objective(s) being addressed. The descriptor for the level shows the average performance for the level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

All levels marked questions will have the level awarded at bottom left of response, which might be on an additional page. Creditworthy parts of an answer can (optionally) be highlighted.

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 descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets 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 descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

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, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which 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 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.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

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

Assessment of spelling, punctuation, grammar and use of specialist terminology (SPaG)

Accuracy of spelling, punctuation, grammar and the use of specialist terminology will be assessed via the indicated 9 mark questions. In each of these questions, three marks are allocated for SPaG as follows:

- **High performance** – 3 marks
- **Intermediate performance** – 2 marks
- **Threshold performance** – 1 mark

Responses with SPaG marks that gain a mark of 0 for the content/skills of the question can still be awarded SPaG marks if the response is judged to be a genuine attempt to answer the question.

Assessing SPaG when students use a scribe or word processor

Students using a scribe or word processor can access some, or all, of the marks available for SPaG provided there is sufficient evidence that it is their work. The JCQ scribe cover sheet attached to their scripts must show what was dictated or which facilities were disabled on the word processor.

Students using a scribe can access marks for SPaG as follows:

Students who dictate their answers are eligible for marks awarded for grammar. This is a third of the total marks awarded for SPaG.

Students who dictate their answers and indicate punctuation are eligible for marks awarded for punctuation and grammar. This is two thirds of the total marks awarded for SPaG. The cover sheet must indicate that both punctuation and grammar were dictated.

Students who dictate their answers, indicate punctuation and spell out every word are eligible for all SPaG marks. The cover sheet must indicate that spelling, punctuation and grammar were dictated.

General guidance

- Mark schemes should be applied positively. Examiners should look for qualities to reward rather than faults to penalise. They are looking to find credit in each response they mark. Unless the mark scheme specifically states, candidates must never lose marks for incorrect answers.
- The full range of marks should be used. Examiners should always award full marks if deserved, ie if the answer matches the mark scheme.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked unless the candidate has replaced it with an alternative response.
- Do NOT add ticks to level-marked questions – use the highlight tool/brackets to signify what is relevant.
- Sometimes there are specific "triggers" in the mark scheme that enable higher level marks to be awarded. For instance, an example or case study may be required for Level 3 if it is stated within the question.
- Where a source, such as a photograph or map, is provided as a stimulus it should be used if requested in the question, but credit can often be given for inferred as well as direct use of the source.
- Always be consistent – accept the guidelines given in the mark scheme and apply them to every script.
- If necessary make comments to support the level awarded and to help clarify a decision you have made.
- Examiners should revisit standardised script answers as they apply the mark scheme in order to confirm that the level and the mark allocated is appropriate to the response provided.
- Mark all answers written on the examination paper.

Section A

Qu	Pt	Marking guidance	Total marks
01	**1**	**Using Figure 1, which month had the highest average number of tropical storms in the North Atlantic?** September/Sep/Sept AO4 – 1 mark	1
01	**2**	**Give one reason why the average number of tropical storms changes during the year in the North Atlantic.** The (surface of the) sea is warmer in late summer/highest in September. The (sea) temperature varies. Moisture in the air varies throughout the year Wind shear varies through the year/lower wind shear in late summer. They can only occur when the atmosphere is unstable/ /more humid unstable air in late summer. Seasonal variation Credit other valid responses. Do not accept: vague statements such as “weather changes” without a reason. Explanations referring to climate change, El Niño or global warming (not seasonal). Human causes. AO1 – 1 mark	1
01	**3**	**Using Figure 2, which part of the USA is most frequently affected by hurricanes and tropical storms?** **B** South east AO4 – 1 mark	1
01	**4**	**Give one reason why some parts of the USA are not affected by hurricanes and tropical storms.** Hurricanes lose strength over land. They may steer away due to prevailing winds/jet stream. Some coastal areas have cooler waters High mountain ranges can disrupt the flow of hurricanes. Dry desert areas/cooler areas lack the warm, moist air needed for hurricanes. Inland from the sea. Far from the equator/some areas are not within the tropics Lower temperatures/too cold/not warm (or moist) enough. Credit other valid responses.	1

		Do not accept Vague statements such as “the weather is different”. Simple description of the map eg fewer in the north and west Human reasons (e.g., “better buildings”). References to tornadoes or other hazards. AO1 – 1 mark	

01	**5**	**Using Figure 3, give one feature of the hurricane at:** **X** Dense cloud Clouds in anticlockwise pattern Rotating (circular, spinning) pattern or system Strong winds Heavy rain Cumulonimbus cloud **Y** Eye/centre of hurricane/eye wall/vortex No clouds/no rain/calm (eye) Strongest winds/heaviest rainfall (eyewall) Credit other valid responses. Do not accept “Low pressure” AO4 – 2 marks	2

01	**6**	**Suggest how tropical storms can have widespread impacts on people and the environment.** **Use Figure 4 and an example you have studied.**	6

Level	Marks	Description
3 (Detailed)	5–6	AO2 – Shows thorough geographical understanding of the impacts of tropical storms on people and the environment and illustrates this with a named example. AO3 – Demonstrates coherent application of knowledge and understanding in analysing how tropical storms can have widespread impacts on people and the environment.
2 (Clear)	3–4	AO2 – Shows clear geographical understanding of the impacts of tropical storms on people and/or the environment and may illustrate this through a named example.

		AO3 – Demonstrates reasonable application of knowledge and understanding in analysing how tropical storms can have widespread impacts on people and/or the environment.
1 (Basic)	1–2	AO2 – Shows limited geographical understanding of the impacts of tropical storms on people and/or the environment. AO3 – Demonstrates limited application of knowledge and understanding in analysing how tropical storms can have widespread impacts on people and/or the environment.
	0	No relevant content.

- **Level 3 (detailed) responses** will be developed. Some geographical terms will be applied. All aspects of the question are answered, including both people and environment, although the two aspects may not be balanced. Uses Figure with elaboration and own understanding. Refers to example, with some specific detail. (This might be Hurricane Helene.)
- **Level 2 (clear) responses** are likely to have linked or elaborated statements and some use of geographical terms. May cover impacts on people or environment only. Uses Figure with some elaboration and/or own understanding. Likely to refer to example studied but with limited development or specificity.
- **Level 1 (basic) responses** may comprise simple/partially inaccurate statements with very limited subject vocabulary. Partial sequence or random points made. May be limited to a single impact on people and/or environment. May rely on direct or lifted use of Figure or own understanding only.

- **Max Level 1** if referring to a natural hazard that is not tropical storms.
- **Max Level 2** for explanation for impacts on people or environment only.
- **Max Level 2** for explanation of impacts without at least implied reference to **Figure 2**.
- **Max Level 2** for explanation of impacts without reference to example.

<u>Indicative content</u>

- The command word is “suggest”, so responses should set out the likely impacts of tropical storms, making use of **Figure 4**. The question may include an assessment of reasons why some storms have widespread impacts on both people and environment. An example is required.

Impacts on people:

- Casualties and Injuries: Hurricanes can lead to loss of life and serious injuries due to strong winds, flying debris, flooding, and storm surges.
- Property Damage: Powerful winds and flooding can destroy homes, businesses, infrastructure, and public services, leading to significant economic losses.
- Displacement: People are often forced to evacuate their homes, sometimes permanently.

		• Health Risks: Floodwaters can become contaminated, leading to waterborne diseases. Stress and trauma from the disaster can also have long-term mental health effects. • Economic Disruption: Hurricanes can halt economic activities, disrupting industries such as tourism, agriculture, and fishing. The cost of rebuilding and recovery can strain local and national economies. **Impacts on the Environment:** • Coastal erosion and habitat loss: Storm surges and flooding can erode coastlines and destroy habitats such as mangroves, wetlands, and coral reefs, which are crucial for biodiversity. • Water contamination: Flooding can cause sewage, chemicals, and other pollutants to mix with water supplies, affecting health. • Forest damage: High winds can knock down trees, damaging forests and affecting wildlife habitats. • Marine life: Hurricanes can cause changes in sea temperature and salinity, impacting marine life. They can also stir up sediments that affect coral reefs and other underwater ecosystems. • Agricultural losses: Flooding and high winds can destroy crops and livestock, leading to food shortages. • There may be positive impacts such as nutrient redistribution which can benefit ecosystems and the heavy rains which may increase freshwater resources in some areas. • Responses may distinguish between primary and secondary impacts, but this is not essential. • Analysis of **Figure 4**. Allow any reasonable inference from the map and text. Impacts on people include loss of life (240), economic losses, including agricultural, and loss of power. Severe impact on environment caused by flooding and coastal storm surges-destruction of crops and forestry. Storm winds were particularly powerful over Florida (Category 4) on Thursday 8am. Widespread effects extended northwards over Georgia and Tennessee. • Credit reference to named example. **Typhoon Haiyan.** **Impacts to people:** • Over 6,300 people died. Powerful winds and storm surges caused widespread destruction, particularly in Tacloban City. Approximately 4 million people were made homeless. Many survivors were forced to live in temporary shelters and evacuation centres. There was widespread contamination of surface and groundwater, leading to outbreaks of diseases such as cholera and leptospirosis. It caused economic damage – around $12 billion. It damaged over 1 million houses. Many farmers and fishermen lost livelihoods. Destruction of infrastructure, including schools and hospitals. Survivors faced challenges in accessing food, water, and medical supplies, leading to social unrest and looting. **Impacts on environment:** • Severe coastal erosion and destroyed habitats such as mangroves and wetlands. Widespread flooding caused landslides. It also contaminated water sources with seawater, chemicals, and sewage. An oil tanker ran aground during the typhoon, causing an 800 000 litre oil leak that contaminated fishing waters and affected marine life. The typhoon destroyed vast areas of farmland, affecting crops such as rice, coconut, and sugarcane.	

		• Credit reasons why some tropical storms have widespread impacts. This may be linked to: strength of storm-wind speeds, size of storm surge, amount of rain, extent of area flooded, population density in vulnerable areas, wealth of country and money invested in forecasting, warning systems, protection, planning and responses, physical geography of coastal zone, accessibility and communications, quality of infrastructure and building design strength of coastal defences. AO2 – 3 marks AO3 – 3 marks	

01	**7**	**Using Figure 5, give two pieces of evidence for climate change.** 1x2 Two separate points are required, not a developed statement Glaciers have melted/ice has retreated/the level of ice has gone down/thinner ice/less snow (1) Vegetation is growing where there used to be ice/some vegetation (trees and grass) is now growing. (1) More exposed land/rock/ bare ground now visible where ice once was (1). Credit other valid answers. Do NOT accept: Explanations not based on the photographs. References to global warming without evidence from the images. AO4 – 2 marks	2

01	**8**	**Climate change is partly caused by natural factors, such as:** • **orbital changes** • **volcanic activity** • **variations in solar output.** **Explain how one or more natural factors may affect climate change.**	4

Level	Marks	Description
2 (Clear)	3–4	AO1 – Demonstrates accurate knowledge about natural factor(s) affecting climate change. AO2 – Shows a clear understanding of how natural factor(s) help to account for long-term changes in climate. Explanations are developed.
1 (Basic)	1–2	AO1 – Demonstrates limited knowledge about natural factor(s) affecting climate change. AO2 – Demonstrates some understanding of how natural factor(s) help to account for long-term changes in climate. Explanations are partial.
	0	No relevant content

		• **Level 2 (clear) responses** will be developed explanation(s) or linked statements about the natural factor(s) affecting long term climate change, with some accurate use of geographical terms. • **Level 1 (basic) responses** are likely to be simple random statements, with little development, sequence or explanation. Limited subject vocabulary used. • One factor fully explained can be sufficient for top Level 2. Alternatively full credit can be awarded for broader explanation of 2 or more factors. <u>Indicative content</u> • The command word is "explain" which requires an account as to how and why natural factors may contribute to climate change. • Knowledge of long term changes in climate since start of Quaternary period. Patterns of alternating cold periods (glacials) and warm periods (interglacials). Up to 10 glacial periods in past million years. Ice age continued until 12 000 years before present. • Understanding the effects of orbital changes. Changes from a circular to an oval orbit can affect the amount of sunlight the earth receives. It takes 100 000 years for the Earth's orbit to change from being more circular to an ellipse and back again. This eccentricity cycle coincides closely with the alternating cold (glacial) and warm (inter-glacial) periods in the Quaternary period. These changes are called Milankovitch Cycles. The Earth wobbles on its axis leading to changes in its tilt. When the Earth is more upright, it receives a greater amount of energy from the sun and experiences higher temperatures. • Understanding of the effects of volcanic activity. Volcanoes can release large amounts of ash. This can reflect the Sun's rays causing the planet to cool. Sulphur dioxide is also released, which reacts with water vapour to form sulphate aerosols, which also reflect incoming solar radiation and reduce the amount of sunlight reaching Earth's surface. Over time however, eruptions can release large quantities of greenhouse gases, eg carbon dioxide. These gases can trap the Sun's rays causing the planet to warm. • Understanding the effects of variations in solar output. The Sun goes through an 11-year cycle of solar activity, including changes in solar radiation, sunspots, and solar flares. When sunspot activity is high, the sun gives off more heat. Large explosions occur on the surface of the sun, resulting in solar flares. These variations can slightly affect Earth's climate. Credit reference to other natural factors eg ocean currents, rotting vegetation Reject human causes such as the enhanced greenhouse effect/global warming. AO1 – 2 marks AO2 – 2 marks	

01	**9**	**Using Figure 6, where was shaking intensity severe?** **A** Along the East Anatolian fault AO4 – 1 mark	1

01	**10**	**Using Figure 6, which statement describes the movement of tectonic plates that led to the two earthquakes?** **C** Two plates moved side by side in opposite directions AO3 – 1 mark	1

01	**11**	**Name the type of plate margin found close to the location of the two earthquakes shown in Figure 6.** Conservative/passive/transform (1) AO1 – 1 mark	1

01	**12**	**Management of a tectonic hazard includes monitoring, prediction, protection and planning strategies.** **To what extent can management reduce the effects of a tectonic hazard(s)?** **Use Figures 7a and/or 7b and your own understanding.**	9

Level	Marks	Description
3 (Detailed)	7–9	AO1 – Demonstrates detailed knowledge of monitoring, prediction, protection and/or planning strategies. AO2 – Shows thorough geographical understanding of how one or more strategies are used in tectonic hazard management. AO3 – Demonstrates application of knowledge and understanding in a coherent and reasoned way in assessing the extent to which tectonic hazard management is effective.
2 (Clear)	4–6	AO1 – Demonstrates clear knowledge of monitoring, prediction, protection and/or planning strategies. AO2 – Shows clear geographical understanding of how one or more strategies are used in tectonic hazard management. AO3 – Demonstrates clear application of knowledge and understanding in assessing the extent to which tectonic hazard management is effective.
1 (Basic)	1–3	AO1 – Demonstrates limited knowledge of monitoring, prediction, protection and/or planning strategies. AO2 – Shows limited geographical understanding of how one or more strategies are used in tectonic hazard management. AO3 – Demonstrates limited application of knowledge and understanding in a coherent and reasoned way in assessing the extent to which tectonic hazard management is effective.
	0	No relevant content

- **Level 3 (detailed) responses** will be well developed and have accurate use of geographical terms. Reasoned assessment of extent to which management can reduce the effects of a tectonic hazard. The answer will apply understanding effectively to **Figure 7**.
- **Level 2 (clear) responses** will have linked or elaborated statements and some accurate use of geographical terms. May start to make an assessment of the extent to which management can reduce the effects of a

		tectonic hazard. Likely to apply understanding to **Figure 7** with some development beyond source. • **Level 1 (basic) responses** are likely to consist of simple statements, with limited use of subject vocabulary. Might be limited to generic statements. May not distinguish between different types of strategies. May be limited to a single type or rely entirely on use of **Figure 7** with little development. • **Max Level 1** for management of non-tectonic hazard • **Max Level 2** if no use is made of **Figure 7**. <u>Indicative content</u> • The command is 'to what extent', so the focus of the question is an assessment of the degree to which management strategies can reduce the effects of a tectonic hazard. There is no direct requirement to examine the extent to which some strategies are more/less significant but responses may weigh up their relative importance or effectiveness. • Credit responses that consider management of both hazards (volcanic eruption and earthquake). However maximum marks can be awarded for one hazard type only. • Allow overlap between monitoring and prediction and between some aspects of protection and planning. **Volcanoes** • Monitoring of volcanoes. Monitoring volcanic hazards is crucial for predicting eruptions and minimising their impact on communities. Seismographic monitoring can detect earthquakes and tremors that often precede eruptions. Ground deformation involves measuring changes in the shape of the volcano. Changes in volcanic gas emissions, such as sulphur dioxide, can be recorded. Remote sensing involves using satellite imagery to detect thermal anomalies and other changes. Geophysical methods involve gravity and magnetic fields to detect subsurface changes. • Thermal imaging entails using infrared cameras to detect heat changes on the volcano's surface. • Prediction of volcanic eruption is linked to monitoring. Eg Fractures in rock in a volcanic cone can cause tiny movements that indicate that an eruption is imminent. GPS and satellites measure this deformation and input data into models that track the probability of whether an eruption will occur. However accurate timings for eruptions are not possible • Protection. Roofs can be strengthened to support weight of falling ash. Buildings cannot be protected against lava or pyroclastic flow. • Planning. Hazard mapping and risk assessment are used to identify areas which are at greater risk – this means people can be moved or building restricted in those areas, particularly essential buildings (hospitals) and transport. Education about what actions to take, including drills. Stockpile of emergency supplies. Training of emergency services. Evacuation and exclusion zones move people out of areas at risk. **Earthquakes** • Monitoring. Seismometers record earth movements and can be used to detect foreshocks. Gas sensors detect increases in radon gas which may be released prior to an earthquake. Changes in groundwater levels have been recorded before earthquakes.	

		• Prediction of earthquakes with precise timing remains challenging. However, forecasting involves estimating the probability of earthquakes occurring in a specific area over a period based on historical data and current seismic activity. Credit seismic gap theory – any large and longstanding gap is considered to be the fault segment most likely to suffer future earthquakes. • Protection involves earthquake resistant building design, such as rubber shock absorbers in the foundations to absorb the Earth tremors, steel frames that can sway during Earth movements, and open areas outside of the buildings where people can assemble during an evacuation. Sea walls may protect against tsunami. Many countries now practice earthquake drills. Automatic switches can turn off electricity and gas pipes to help reduce the chance of fires. • Planning. Some countries have warning systems and evacuation plans. Paramedics, police, and firefighters receive training for dealing with earthquakes or volcanic eruptions. Governments can stockpile supplies like tents, food, and water. Teaching people about evacuation plans can help in a disaster. • Assessment of **Figure 7**. Allow any reasonable inference from the images. • **Figure 7a**. The building has cross bracing (diagonal supports), reinforced concrete and shear walls which help to strengthen the structure. • Seismometers detect and record earthquakes. They measure the motion of the ground, including seismic waves generated by earthquakes and volcanic eruptions. The data helps to predict future seismic activity. • **Figure 7b**. Monitoring volcanoes includes using seismometers to measure the seismic waves occurring before and during an eruption, measurement of sudden changes in gas emissions, GPS satellites and lasers monitor any changes in landscape, since volcanoes tend to swell near an eruption. • Evacuation routes are pre-planned paths that people should take to safely leave an area in response to a volcanic eruption. They help to reduce risks associated with lava flows. They are designed to guide people away from danger zones and toward safe locations. • Assessment of extent to which tectonic hazard management is effective. While these measures greatly reduce the impacts of tectonic hazards, complete management is often not possible due to: o Unpredictability: Despite advancements, the exact time and location of tectonic events can rarely be predicted with precision. o Resource Constraints: Implementing comprehensive mitigation strategies requires significant financial and human resources. Credit differences between low and high income countries. o Geographical Factors: Some regions are more susceptible and face higher risks despite all precautions. • Overall, tectonic hazards can't be prevented, but a combination of technology, engineering, education, and collaboration can significantly reduce their impacts and save lives. AO1 – 3 marks AO2 – 3 marks AO3 – 3 marks	

		Spelling, punctuation and grammar (SPaG) **Responses with SPaG marks that gain a mark of 0 for the content/skills of the question can still be awarded SPaG marks if the response is judged to be a genuine attempt to answer the question.**	
		High performance • Learners spell and punctuate with consistent accuracy • Learners use rules of grammar with effective control of meaning overall • Learners use a wide range of specialist terms as appropriate.	**3**
		Intermediate performance • Learners spell and punctuate with considerable accuracy • Learners use rules of grammar with general control of meaning overall • Learners use a good range of specialist terms as appropriate.	**2**
		Threshold performance • Learners spell and punctuate with reasonable accuracy • Learners use rules of grammar with some control of meaning and any errors do not significantly hinder meaning overall • Learners use a limited range of specialist terms as appropriate.	**1**
		No marks awarded • The learner writes nothing • The learner's response does not relate to the question • The learner's achievement in SPaG does not reach the threshold performance level, for example errors in spelling, punctuation and grammar severely hinder meaning.	**0**

Section B

Qu	Pt	Marking guidance	Total marks
02	**1**	**What is biodiversity?** **D** The variety of plant and animal species in a given area AO1 – 1 mark	1
02	**2**	**In which of the following large scale ecosystems is biodiversity highest?** **C** Tropical rainforest AO2 – 1 mark	1
02	**3**	**Using Figure 8, which phrase describes the climate in the hot desert ecosystem?** **C** Low precipitation and high temperatures AO4 – 1 mark	1
02	**4**	**Using Figure 8, which ecosystem has an average temperature of 0°C and annual precipitation of 100 cm?** Coniferous forest AO4 – 1 mark	1
02	**5**	**Explain why soils in the tropical rainforest are generally infertile and low in nutrients.** Allow 2 separate statements or a single developed statement. 2x1 Two separate statements Leaching of nutrients is rapid / Nutrients are (rapidly) washed away from the soil. (1) High rainfall causes leaching/high rainfall causes nutrients to be washed away/surface runoff causes nutrients to be washed away(1) Deforestation means the soil is unprotected from heavy rain. (1) Rapid nutrient uptake by vegetation (1) Most nutrients stored in biomass (1) The soil itself contains little organic matter/only a thin layer of humus (1) 1x2 Developed statement The high rainfall leads to leaching (1), where nutrients are washed away from the soil. (d) (1)	2

		There is rapid decomposition of dead organic matter (1), and plants absorb most of the nutrients. (d) (1) When deforestation occurs, the litter layer no longer receives organic matter (1), and nutrients are rapidly leached by heavy rainfall. (d) (1) Nutrient loss from soil erosion (1) when rainforest is removed by humans / deforestation (d) (1) Heavy rainfall rapidly leaches nutrients from the thin surface layer (1), leaving latosol soils nutrient-poor (d)(1). Waterlogged/saturated tropical soils are infertile (1) because too much water stops oxygen getting in (d) (1)/ because nutrients aren't released (d) (1). Credit other valid responses AO2 – 2 marks	

02	**6**	**Using Figure 9, during which period was the decrease in world forest area greatest?** **A** 1980–1990 AO4 – 1 mark	1

02	**7**	**Using Figure 9, calculate the approximate percentage decrease in world forest area, 1980–2020?** **B** 6 % AO4 – 1 mark	1

02	**8**	**Give two reasons why there are high rates of deforestation in some tropical rainforest areas.** 2x1 Two separate points are required (Subsistence/commercial) farming/cattle ranching (1) Logging (1) Road building (1) Mineral extraction (1) Energy development (1) Settlement (1) Population growth/population pressures/too many people (1) Building infrastructure (1) Difficult to enforce laws in large rainforest areas/much illegal deforestation (1) Credit other valid responses. AO1 – 2 marks	2

02	**9**	**Suggest how deforestation in tropical rainforests can have major effects on the environment.** **Use Figure 10 and a case study.**	6

Level	Marks	Description
3 (Detailed)	5–6	AO2 – Shows thorough geographical understanding of the environmental impacts of deforestation. AO3 – Demonstrates thorough application of knowledge and understanding in suggesting how tropical forest deforestation has major environmental impacts.
2 (Clear)	3–4	AO2 – Shows clear geographical understanding of the environmental impact(s) of deforestation. AO3 – Demonstrates clear application of knowledge and understanding in suggesting how tropical forest deforestation has major environmental impact(s).
1 (Basic)	1–2	AO2 – Shows limited geographical understanding of the environmental impact(s) of deforestation. AO3 – Demonstrates limited application of knowledge and understanding in suggesting how tropical forest deforestation has major environmental impact(s).
	0	No relevant content

- **Level 3 (detailed) responses** will be developed with accurate use of geographical terms. Reasoned suggestions of the severity of environmental impacts caused by deforestation. Likely to make full use of **Figure 10** and include reference to case study.
- **Level 2 (clear) responses** will have linked or elaborated statements and some accurate use of geographical terms. May outline some environmental impacts of deforestation. May start to recognise the severity of impacts. May make clear use of **Figure 10** and some reference to case study.
- **Level 1 (basic) responses** are likely to consist of simple statements, with limited use of subject vocabulary. Might be limited to generic statements. May be limited to a single environmental impact of deforestation. Answer likely to be reliant on **Figure 10**.

- **Maximum Level 2** for responses that make no reference to case study
- Credit for economic effects of deforestation where there is a link to environmental impacts.

<u>Indicative content</u>

- Application of understanding to **Figure 10**. Answers should show a grasp of environmental impacts and may classify impacts into local and global.

		• **Loss of biodiversity**. Clearing tropical rainforests means that biodiversity will be reduced, and individual species will become endangered and then possibly extinct. Plants that could bring huge medical benefits and high profits may be lost. • **Soil erosion**. When forests are cut down, exposed soil is left vulnerable to erosion from wind and rain. This can lead to the loss of fertile topsoil, which is essential for plant growth and agriculture. Soil erosion can also cause sediment to accumulate in rivers and streams, impacting aquatic ecosystems and water quality. • **Flooding**. Forests act as a sponge, absorbing rainwater and slowly releasing it. When forests are removed, there is less vegetation to absorb rainfall. This means increased flooding as faster surface run-off with more soil content adds to river levels in a shorter lag-time. This can have devastating impacts for affected people and places. Other impacts of deforestation which might be discussed include: • **River pollution**. Gold mining involves the use of mercury to separate the gold from the ground, which is allowed to enter the rivers. Fish are poisoned, as well as people living nearby. • **Disruption of Water Cycles**. Rainforests play an essential role in maintaining the Earth's water cycle. When forests are cleared, this is disrupted, which can lead to reduced rainfall and increased risk of droughts. This also impacts nearby water sources. • **Climate change**. Trees remove CO_2 from the atmosphere. Also, burning vegetation to clear forest produces CO_2. So, deforestation means more CO_2 in the atmosphere, which adds to the greenhouse effect. • **Fires** can cause harmful pollution. They can burn out of control, destroying vast areas of valuable forest. • **HEP dams** have caused huge environmental devastation in some areas of tropical rainforest. Often they have a short lifespan and they may become blocked with soil washed down deforested slopes. • Credit examples of environmental impacts, eg In Malaysia and Indonesia where rainforests are removed to make way for industrial palm oil plantations, deforestation is responsible for 80% of the CO_2 emissions. This makes Indonesia the third largest emitter of greenhouse gases. Loss of biodiversity is severe. Habitats are destroyed. Oil Palm plantations have led to a 35% reduction in species. Orangutans, pygmy elephants, Sumatran Rhino and Malayan tigers are all endangered. • Assessment. Most will agree with the idea that deforestation has significant environmental consequences. Clearing rainforest threatens the survival of many plant and animal species and can lead to serious environmental degradation. Widespread deforestation damages the whole biosphere with severe long-term impacts. AO2 – 3 marks AO3 – 3 marks	

<table>
<tr>
<td>02</td>
<td>10</td>
<td>
Discuss the causes of desertification and what can be done to reduce the growth of hot deserts.
<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>3
(Detailed)</td><td>7–9</td><td>AO1 – Demonstrates detailed knowledge of the causes of desertification and strategies used to manage desertification.

AO2 – Shows thorough geographical understanding of the causes of desertification and what can be done to reduce further desert growth.

AO3 – Demonstrates thorough application of knowledge and understanding in discussing the causes of desertification and whether further growth can be reduced.</td></tr>
<tr><td>2
(Clear)</td><td>4–6</td><td>AO1 – Demonstrates clear knowledge of the causes of desertification and/or strategies used to manage desertification.

AO2 – Shows clear geographical understanding of the causes of desertification and/or what can be done to reduce further desert growth.

AO3 – Demonstrates clear application of knowledge and understanding in discussing the causes of desertification and/or whether further growth can be reduced.</td></tr>
<tr><td>1
(Basic)</td><td>1–3</td><td>AO1 – Demonstrates limited knowledge of the causes of desertification and/or strategies used to manage desertification.

AO2 – Shows limited geographical understanding of the causes of desertification and/or what can be done to reduce further desert growth.

AO3 – Demonstrates basic application of knowledge and understanding in discussing the causes of desertification and/or whether further growth can be reduced.</td></tr>
<tr><td></td><td>0</td><td>No relevant content</td></tr>
</table>

Level 3 (detailed) responses will be well developed with accurate use of geographical terms. Reasoned discussion of both causes and management of areas affected by desertification.
Level 2 (clear) responses will have linked or elaborated statements and some use of geographical terms. May outline some causes and/or what can be done to reduce the risk of further desertification. Discussion may be missing or limited.
Level 1 (basic) responses are likely to consist of simple statements, with limited use of subject vocabulary. Might be limited to generic statements. May be limited to a single cause and/or management strategy. Little or no discussion.

</td>
<td>9</td>
</tr>
</table>

		• An answer that discusses only causes or management strategies is limited to Level 2. • Allow reference to a case study if relevant. Credit detail about different areas affected by desertification to illustrate causes and possible remedies. <u>Indicative content</u> • Understanding of how desertification occurs – the process of fertile land transforming into desert typically as a result of deforestation, drought, or improper/inappropriate agriculture. • Natural causes include changes in climate, such as prolonged droughts and temperature increases, which can reduce soil moisture and affect vegetation cover. • Natural Disasters: Events like wildfires, floods, and landslides can strip the land of vegetation, leading to desertification. Causes which link to human activity include: • Population growth – more people need more food which puts pressure on the land. • Migration brings even greater population pressure. Drought and desertification in one region will displace people to another fragile environment. • Overgrazing – too many goats, sheep, cattle can destroy the vegetation. Nomadic groups used to wander freely, following the rain wherever it fell. Now they are restricted in movement and this places more pressure on land resources. The soil may turn to dust and become infertile. • Over cultivation – growing too much without replenishing the soil and it becomes exhausted. • Deforestation – trees are cut down for fuel and building. The loss of roots to hold the soil down makes the soils more fragile. Once the soil has eroded, it becomes impossible for the vegetation to grow back. • Water management – excessive irrigation in some places has led to waterlogging of the ground. Where this has happened, salts, poisonous to plants, have been deposited on the ground surface (salinisation). • War – some sub-Saharan countries have suffered for years from civil war, where crops and animals have been destroyed, leading to famine. Some become refugees. The environmental resources in and around the cities and camps where these people settle come under severe pressure. • Enhanced greenhouse effect, partially caused by human activity globally, may contribute to increased risks of drought, higher temperatures etc in areas on fringe of hot deserts. • Credit examples of desertification. In Darfur region, 250 000 people have been killed and around three million made homeless by conflict since 2003. Drought, crop failure and livestock loss are major problems. Millions have fled their land and homes. They were housed in refugee camps, with help from the UN. But refugee camps create new environmental stress wherever they are located and cause desertification to spread. • In Kenya, nomadic Masai farmers have been forced onto marginal land. Traditional pastoral migration patterns have been disrupted and they have been compelled to use smaller areas of land for their cattle. Overgrazing has resulted from this, leading to land degradation and soil erosion by wind and water.	

		• Other threats to the environment linked to human activity include exploitation for mineral resources and fossil fuels and high impact tourism in vulnerable areas such as the edge of the Thar desert and in East Africa. • Evaluation of extent to which human activities pose a risk. Although natural climate change, as part of a natural cycle, may contribute to desertification, there is little doubt that human misuse and mismanagement of the land poses a significant threat. What can be done to reduce the risk of desertification?: • Planting trees. Eg The Great Green wall planting strategy. A scheme launched to plant trees across the southern edge of the Sahara Desert to reduce desertification. The trees counter soil erosion, slow wind speeds and stop the spread of deserts. By 2030, the aim is to have restored 100 million hectares of currently degraded land. It has already seen positive results with 15 million hectares of degraded land restored in Ethiopia and 11.4 million trees planted in Senegal. • Building rock walls (bunds). Low rock walls are constructed to follow the contour of the land and therefore capture the downward flow of water. This stops sediment from being washed off the slopes as it will be trapped by the bunds and can therefore create a good depth of soil for cultivation. • Planting grass on slopes to help stabilise the topsoil. • The use of intermediate or appropriate technology such as solar cookers and more efficient stoves which reduce the need for fuelwood and thus a cause of soil erosion/desertification. Rainwater can be collected on roofs to be used for irrigation. • Water management. Implementing efficient irrigation techniques like drip irrigation and planting drought-resistant crops (eg olives and millet) can help conserve water. • Soil management: Practices such as crop rotation, allowing land to rest between uses, and using organic compost can help maintain soil health and prevent nutrient depletion. • Measures to limit climate change, such as reducing greenhouse gas emissions and increasing renewable energy use, can slow global warming. This helps stabilise rainfall patterns and reduce extreme droughts, which in turn lowers the risk of desertification. • Discussion of whether the risk of desertification can be reduced. Credit the idea that it can be limited or even reversed with the right interventions and sustainable practices. The process involves restoring soil fertility, preventing land degradation, and improving water retention. • Alternatively, reducing the risk of desertification is challenging due to climate change, including rising temperatures and reduced rainfall, making it hard to restore arid areas. Once fertile soil becomes barren and loses its nutrients, it's challenging to restore its health. The cost of reversing desertification is high, and poor communities may lack the resources and technology needed for effective intervention. AO1 – 3 marks AO2 – 3 marks AO3 – 3 marks	

02	**10**	**Discuss the value of cold environments as wilderness areas and what can be done to protect these fragile environments.**	9

Level	Marks	Description
3 (Detailed)	7–9	AO1 – Demonstrates detailed knowledge of cold environments as wilderness areas and strategies used to protect them. AO2 – Shows thorough geographical understanding of the value of cold environments as wilderness areas and the strategies used to protect these fragile environments. AO3 – Demonstrates thorough application of knowledge and understanding in discussing the value of cold environments as wilderness areas and whether these environments can be protected.
2 (Clear)	4–6	AO1 – Demonstrates clear knowledge of cold environments as wilderness areas and/or strategies used to protect them. AO2 – Shows clear geographical understanding of the value of cold environments as wilderness areas and/or the strategies used to protect these fragile environments. AO3 – Demonstrates clear application of knowledge and understanding in discussing the value of cold environments as wilderness areas and/or whether these environments can be protected.
1 (Basic)	1–3	AO1 – Demonstrates limited knowledge of cold environments as wilderness areas and/or strategies used to protect them. AO2 – Shows limited geographical understanding of the value of cold environments as wilderness areas and/or the strategies used to protect these fragile environments. AO3 – Demonstrates basic application of knowledge and understanding in discussing the value of cold environments as wilderness areas and/or whether these environments can be protected.
	0	No relevant content

- **Level 3 (detailed) responses** will be well developed with accurate use of geographical terms. Reasoned discussion of both the value of cold environments and ways of protecting them.
- **Level 2 (clear**) **responses** will have linked or elaborated statements and some use of geographical terms. May outline the value of wilderness areas

		and/or what can be done to protect them. Discussion may be missing or limited. • **Level 1 (basic) responses** are likely to consist of simple statements, with limited use of subject vocabulary. Might be limited to generic statements. May be limited to a single reason for valuing cold environments and/or one management strategy. Little or no discussion: • An answer that discusses only the value of cold environments or the management strategies involved is limited to Level 2. • Allow reference to a case study if relevant. Credit detail about different cold environments to illustrate the value of wilderness areas and possible ways of protecting them. <u>Indicative content</u> • Wilderness areas are typically unspoilt by human development and remain natural. • Many cold environments are considered wilderness areas. This is due to their remoteness and hostile physical conditions. Cold environments considered cold environments include Antarctica as well as areas of Greenland, Alaska, Svalbard, Iceland and Siberia. The value of cold environments as wilderness areas: • Biodiversity: Despite the harsh conditions, these regions support unique species that have adapted to the cold, such as polar bears, penguins, and various seals. • Climate Regulation: Cold environments play a crucial role in regulating the Earth's climate. Ice sheets and glaciers reflect sunlight, helping to cool the planet. Additionally, permafrost regions store vast amounts of carbon, preventing it from being released into the atmosphere as greenhouse gases. • Scientific Research: These regions are vital for scientific study. They provide unique insights into climate change, glaciology, and biology. The ice cores extracted from glaciers hold records of past climates, allowing scientists to understand historical climate patterns and predict future changes. • Water Resources: Glaciers and ice caps are significant freshwater reservoirs. As they melt, they contribute to the global water cycle, affecting sea levels and water availability in different regions. • Cultural Significance: Indigenous communities have lived in cold environments for thousands of years, developing unique cultures and traditions. Protecting these areas helps preserve their way of life and knowledge. • Understanding the fragility of cold environments. Cold environments take a long time to recover if damaged. Climate change is one of the main threats. Plant growth is already very slow: If plants are damaged (eg by vehicle tyres) they take even longer to regrow, if at all. As species are already highly specialised, they would find it difficult to adapt to further change: eg polar bears are adapted to hunt on sea ice and their number are decreasing as sea ice melts earlier each year. Oil spills, such as the Exxon Valdez, have caused environmental catastrophes in the past. Permafrost melting due to buildings heating up land, especially around big urban centres. Protecting cold environments: • Reducing greenhouse gas emissions through renewable energy sources, energy efficiency, and sustainable practices.	

		• Conservation Efforts. Establishing and maintaining protected areas, such as national parks and nature reserves, can safeguard habitats • Sustainable Tourism. Promoting responsible tourism practices that minimize environmental footprints, such as limiting visitor numbers, ensuring proper waste management, and educating tourists on environmental preservation. • Technology can provide environmentally friendly solutions to some of the challenges faced by developing cold environments. Eg the use of stilts to raise the Trans-Alaskan pipeline above the ground and insulation of the pipe to reduce the risk of thawing permafrost. • International Agreements eg 1959 Antarctic Treaty only allows the use of Antarctica for peaceful purposes, and military activities are forbidden. Promotes co-operation among international scientists. Bans the disposal of nuclear waste. Has enforced strict controls on tourism and landing sites to reduce the impact of tourists. • Discussion of whether it is possible to protect cold environments. Their remoteness makes it harder to monitor and enforce environmental protection measures effectively. The harsh weather and extreme temperatures in these regions can limit the time and resources that can be dedicated to protection efforts. Recovery from disruption can take a very long time due to the slow-growing nature of flora and fauna in these regions. Pressure to exploit resources can create pressure for development, often overshadowing environmental concerns. In some cold regions, governance and regulation to protect the environment. • Credit the view that small and large-scale policies can make a big difference in safeguarding these environments. It's a delicate balance that requires global cooperation and continued monitoring AO1 – 3 marks AO2 – 3 marks AO3 – 3 marks	

Section C

<table>
<tr><th>Qu</th><th>Pt</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>03</td><td>1</td><td>Identify the process of erosion where rocks and sediment are thrown by waves at the cliff face.

A Abrasion

AO1 – 1 mark</td><td>1</td></tr>
<tr><td>03</td><td>2</td><td>Using Figure 11, identify the landform labelled X.

B Beach

AO4 – 1 mark</td><td>1</td></tr>
<tr><td>03</td><td>3</td><td>Using the following data, calculate the median width of the wave cut platform.

<table><tr><td>Site</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>Width (m)</td><td>220</td><td>245</td><td>190</td><td>152</td><td>270</td><td>143</td><td>245</td></tr></table>
220 (metres)

AO4 – 1 mark</td><td>1</td></tr>
<tr><td>03</td><td>4</td><td>Suggest one reason why the wave cut platform is wider at some sites.

C More rapid erosion as the cliffs are undercut and worn back

AO3 – 1 mark</td><td>1</td></tr>
<tr><td>03</td><td>5</td><td>Suggest why there is a headland at Z.

Rocks may be more resistant/harder at Z (than areas to the north and south). (1)

AO1 – 1 mark</td><td>1</td></tr>
</table>

03	**6**	**Explain how coastal sand dunes are formed.** **Use Figure 12 and your own knowledge.**	4

Level	Marks	Description
2 (Clear)	3–4	AO2 – Demonstrates clear understanding of sand dune formation. Explanations are developed. AO4 – Uses the source effectively to show the interrelationships between coastal environments and processes.
1 (Basic)	1–2	AO2 – Demonstrates limited understanding of sand dune formation. Explanations are partial. AO4 – Basic use of source to show the interrelationships between coastal environments and processes.
	0	No relevant content

- **Level 2 (clear) responses** are likely to contain linked statements showing understanding of the processes involved and the sequence of development. Diagram and photograph will be interpreted accurately. Appropriate geographical terminology.
- **Level 1 (basic) responses** will comprise simple ideas with limited or partial sequence and little reference to the processes involved. Limited understanding of the diagram and photograph. Limited geographical terminology

Indicative content

- The command is 'explain', so responses should provide a reasoned account of how and why coastal sand dunes are formed.
- Conditions of formation include a large wide flat beach, plenty of sand, a big tidal range, so there is enough time for the sand to dry before the tide comes in again, onshore winds so sediment can be moved to the back of the beach, obstacles on the beach that dunes can use to aid formation, such as tree roots or drift wood.
- Sand is transported by Saltation, where grains of sand bounce along as the wind picks them up and drops them again (95% of movement), Suspension, where the wind picks up and carries grains of sand (4%), and Creep, where grains of sand collide and push other grains along (1%).
- Windblown sand is deposited against an obstruction – pebble or driftwood. Over time, vegetation such as marram grass stabilises the sand dunes forming foredunes. As the vegetation around the foredunes decomposes, nutrients are released, and soil begins to form. A wider range of plants are then able to colonise the dunes (vegetation succession). As more sand particles are caught, the dunes grow in size, forming rows at right angles to the prevailing wind. Dunes become taller further inland. Dunes closer to the beach are more yellow, whereas further away, they are grey due to humus and bacteria from plants and animals being added.
- The diagram shows an obstacle for the dune to form against, eg pebble or driftwood. The vegetation becomes denser and more diverse inland. Embryo dunes (youngest sand dunes) are only a few metres high whereas

		mature dunes are up to 15m high. This is because vegetation colonises the sand dune and holds it together with long roots, stopping the migration of the dune. • The photograph shows an exposed stretch of coast with wide beach and wide tidal range. Embryo dunes are shown close to the sea with patchy vegetation, and mature dunes with more continuous vegetation inland. The roots bind the sand particles together, reducing erosion and allowing more sand to collect. AO2 – 2 marks AO4 – 2 marks	

03	**7**	**'Hard engineering strategies are more effective than soft engineering strategies in protecting coasts from erosion.'** **Do you agree?** **Explain your answer.** **Use Figures 13a and 13b and your own understanding.**	6

Level	Marks	Description
3 (Detailed)	5–6	AO2 – Shows thorough geographical understanding of hard and soft engineering strategies used to protect coastlines against erosion. AO3 – Demonstrates thorough application of knowledge and understanding by making reasoned assessment of coastal management strategies.
2 (Clear)	3–4	AO2 – Shows clear geographical understanding of hard and soft engineering strategies used to protect coastlines against erosion. AO3 – Demonstrates reasonable application of knowledge and understanding by making clear assessment of coastal management strategy(ies).
1 (Basic)	1–2	AO2 – Shows limited geographical understanding of hard and soft engineering strategies used to protect coastlines against erosion. AO3 – Demonstrates limited application of knowledge and understanding by making basic assessment of coastal management strategy(ies).
	0	No relevant content.

- **Level 3 (detailed) responses** will be developed responses fully assessing the effectiveness of coastal management strategies. Appropriate terminology will be used. Appropriate use of **Figure 13**.
- **Level 2 (clear) responses** are likely to show clear understanding of coastal management strategy(ies) and their effectiveness. Some assessment and some geographical terminology may be evident. Likely to use **Figure 13**.

		• **Level 1 (basic) responses** will be simple statements with limited understanding or development. May consist of listed points or random statements about coastal management strategies in general. Answer may be largely reliant on **Figure 13**. • **Max Level 2** for answers that fail to make use of **Figure 13**. <u>Indicative content</u> • Understanding of hard engineering schemes, which involve using artificial structures to control natural processes. These are designed to reduce wave energy or create a barrier between the land and sea, so storm waves can't reach the cliffs. • Understanding of soft engineering strategies. Beach nourishment, reprofiling and dune regeneration are listed in the specification. Soft engineering does not involve building artificial structures but takes a more sustainable and natural approach to managing the coast. **Hard engineering** • Application of understanding to **Figure 13a**, showing coastal management in the form of rock groynes and sea wall. Expect some assessment of the costs and benefits/effectiveness of these approaches. Other types of hard engineering may also be credited. • **Figure 13a** shows several groynes or barriers that are built down the beach at right angles to the coastline. They are designed to stop material being moved along the beach by longshore drift. They work by building up the amount of sand and shingle on the updrift side. They act as a buffer against wave attack, helping to protect the cliffs. The groynes appear to be trapping beach material, providing protection to the cliffs and coastal settlement. However, sometimes immediately downdrift of the last groyne, cliffs more rapidly eroded, as this part of the coast is starved of beach sediment and much more exposed to wave attack. • Groynes create a wider beach, which can be popular with tourists and boost local economy. They reduce the risk of damage, making residents and local business feel more secure. Not too expensive. If well maintained, can last up to 40 years. • Sea walls, also depicted in **Figure 13a**, aim to protect the coast using concrete, steel and/or stone. Benefits. Effective in protecting cliffs from erosion and also act as a barrier to prevent flooding. Deflect wave energy back to sea. Give people a sense of security. If well maintained, sea walls can last for many years, but they can be undercut by wave scour over time. Sea walls do not impede the movement of sediment downdrift, so they do not disadvantage other areas. • Rip rap/rock armour consists of massive blocks of natural rock piled up at the base of a cliff. These can be seen downdrift of the south groyne and between the two groynes. The rocks are dumped on top of each other leaving gaps between them that allow water through. The rock armour protects the base of the cliffs from erosion. • Benefits of rock armour. It disperses the energy of the waves and reduces their erosional power. Structure is quick to build and easy to maintain. Much cheaper than a sea wall. If well maintained, rock armour lasts a long time. It is versatile, as it can be placed in front of a sea wall to lengthen its lifespan or be used to stabilise slopes on sand dunes. • Credit other hard engineering strategies. Gabions are wire cages filled with rocks that can be built up to support a cliff or provide a buffer against the	

		sea. Often constructed on site using local pebbles. Benefits. Cheap to produce and flexible in the final design. Can improve drainage of cliffs. Will eventually become vegetated and merge into the landscape. Much cheaper than sea walls, rock armour or groynes. Ideal as a quick-fix solution. For the cost, they are good value for money, as they may last 20–25 years. • Other hard engineering strategies include revetments, offshore barriers and reefs. **Soft engineering** • **Figure 13b** shows beach nourishment so there should be some discussion of the effectiveness of this approach. Beach nourishment replaces beach or cliff material that has been removed by erosion or longshore drift. The main advantage is that beaches are a natural defence against erosion and coastal flooding. It usually looks natural and can improve the attractiveness of a stretch of coast. It creates a useful amenity for tourism, it is a relatively cheap option and easy to maintain. • However, it does require constant maintenance to replace the beach material as it is washed away. This is particularly the case after winter storms. People may be prevented from using the beach for several weeks during maintenance. Costs up to £500 000 per 100 metres (but cost can vary greatly depending on transport costs and quantity). • Dune regeneration is the artificial creation of new sand dunes or the restoration of existing dunes using strategies such as marram grass planting or fencing them off from human impact. Sand dunes act as a physical barrier between the sea and the land. They absorb wave energy and water and in doing so protect the land from the sea. This strategy is considered natural by most people and can produce an attractive amenity for tourists. They may also increase biodiversity, providing a greater range of natural habitats for plants, animals and birds. However, they can be easily damaged by storms, and it can be time-consuming to plant the grass and maintain the area/it can also deter tourists at this time. Costs £400–£2000 per 100 metres. • Beach reprofiling is the artificial re-shaping of a beach using existing beach material. For example, after winter storms, bulldozers may move shingle back up the beach. The costs and benefits are similar to those for beach nourishment. The disruption caused by reprofiling may have negative impacts on beach habitats. • Overall assessment of hard engineering strategies. The groynes and sea wall are effective solutions which help reassure the coastal community. However, they are expensive to install and maintain. In addition to this by installing hard engineering solutions in one place this can have a detrimental effect further along the coast. • Soft engineering works with nature rather than against it, blends in with the environment and can improve it eg adding sand to beaches, doesn't interfere with processes elsewhere and affect other areas. Soft engineering is less expensive to implement and maintain, and creates more long-term, sustainable solutions than hard engineering projects. However, areas can just be left at the mercy of the sea, more gentle intervention may not be effective, and people can lose homes and livelihoods. AO2 – 3 marks AO3 – 3 marks	

Qu	Pt	Marking guidance	Total marks
04	**1**	**Identify the process of transportation where large rocks are rolled along the riverbed.** **D** Traction No credit if two or more answers are circled. AO1 – 1 mark	1
04	**2**	**Using Figure 14, state one difference in the shape of the River Coquet between grid square A and grid square B.** In A the river is more meandering/winding (than B) In B the river is straighter (than A) In A the river is narrower (than B) In B the river is wider/larger (than A) No credit for single statement about A or B eg In A the river meanders AO4 – 1 mark	1
04	**3**	**Using Figure 14, identify which grid square shows a sloping wooded river valley with a small tributary entering from the north.** **B** 2306 No credit if two or more answers are circled. AO1 – 1 mark	1
04	**4**	**Using Figure 15, what is the difference in mean discharge between 15th October and 17th October 2024?** 94 (cumecs) AO4 – 1 mark	1
04	**5**	**Which one of the following factors might explain a rapid increase in river discharge after a period of heavy rainfall?** **D** Impermeable rock in the drainage basin No credit if two or more answers are circled. AO3 – 1 mark	1

04	**6**	**Explain how one or more river landforms are formed by deposition.** **Use Figure 16 and your own knowledge.**	4

Level	Marks	Description
2 (Clear)	3–4	AO2 – Shows a clear geographical understanding of the sequence and processes involved in the formation of depositional landform(s). Explanations are developed. AO4 – Uses the source effectively to show the formation of depositional landform(s).
1 (Basic)	1–2	AO2 – Shows a limited geographical understanding of the sequence and processes involved in the formation of depositional landform(s). Explanations are partial. AO4 – Basic use of source to show the formation of depositional landform(s).
	0	No relevant content.

- **Level 2 (clear) responses** are likely to contain linked statements showing some understanding of the processes involved and the sequence of formation. Appropriate geographical terminology.
- **Level 1 (basic) responses** will comprise simple ideas with limited or partial sequence and little reference to the processes involved. Geographical terminology will be limited.
- It is possible to gain 4 marks for explanation of one landform. Alternatively full credit can be awarded for broader explanation of 2 or more landforms

<u>Indicative content</u>

- The command is 'explain', so responses should provide a reasoned account of how and why depositional landforms are created. Estuaries, levées and flood plains are the depositional landforms listed in the specification but credit other relevant landforms eg meanders, oxbow lakes.
- **Estuaries** are found at the mouth of a river where freshwater from the river merges with salt water from the sea. The estuary is tidal and so fluvial and marine processes can operate here. During a rising tide, water is not able to discharge into the sea and so velocity is reduced, and deposition occurs. This builds up layers of sediment called mudflats which may be covered at high tide but exposed at low tide.
- **Levées** are raised riverbanks composed of gravel, stones and alluvium and found on the sides of rivers prone to flooding. They are formed by flooding over a longer period of time. When a river bursts its banks, friction with the land reduces velocity and causes deposition. Coarser heavier material is deposited closer to the river and the size of sediment decreases with distance away from the river. The banks become higher with each successive flood.
- **Flood plains** are areas of flat land found either side of a river in the middle and lower course. They are made of alluvium which forms over years as successive layers of silt are deposited by the river in flood. Floodplains can also be formed by meander migration where meanders migrate across the floodplain due to lateral erosion.

AO2 – 2 marks
AO4 – 2 marks

04 **7** **'Flood management strategies can have both positive and negative impacts.'**

Do you agree? Explain your answer.

Use Figure 17 and your own understanding.

Level	Marks	Description
3 (Detailed)	5–6	AO2 – Shows thorough geographical understanding of the positive and negative impacts of different flood management strategies. AO3 – Demonstrates thorough application of knowledge and understanding in analysing the positive and negative impacts of flood management.
2 (Clear)	3–4	AO2 – Shows clear geographical understanding of the positive and/or negative impacts of different flood management strategies. AO3 – Demonstrates reasonable application of knowledge and understanding in analysing the positive and/or negative impacts of flood management.
1 (Basic)	1–2	AO2 – Shows limited geographical understanding of the impacts of different flood management strategies. AO3 – Demonstrates limited application of knowledge and understanding in analysing the impacts of flood management.
	0	No relevant content.

- **Level 3 (detailed) responses** will be developed with reference to and understanding of the positive and negative impacts of flood management.
- **Level 2 (clear) responses** are likely to contain linked statements showing some understanding of the positive and negative impacts of flood management.
- **Level 1 (basic) responses** will comprise simple ideas or random statements with limited or partial understanding of the positive and negative impacts of flood management.

- **Max Level 2** for answers that refer to a single flood management strategy.
- **Max Level 2** for answers that fail to make use of **Figure 17**.
- It is possible to gain 6 marks by focusing on two flood management strategies. Alternatively full credit can be awarded for broader assessment of a wide range of strategies

6

		Indicative content • Flood management strategies named in **Figure 17** are dams and reservoirs, planting trees, flood relief channels and flood plain zoning. However, credit can be awarded to other flood management strategies such as embankments, channel straightening, flood warnings and river restoration. • **Dams and reservoirs** can have negative impacts on wildlife and habitats but reduce flood risk and provide greater reassurance for people in the surrounding area. Dams cost huge amounts of money, and the reservoirs often flood large areas of land displacing people from their homes. They interfere with the path of migrating fish and can disturb fish spawning grounds. Algae can also build up behind the dam and deoxygenate the water. The environmental impacts are largely negative. • Dams and reservoirs can have more positive impacts for people. For example, as well as reducing the risk of flooding, reservoirs can create opportunities for tourism and recreation, provide HEP and a source of drinking water. • **Planting trees** increases interception of water in the catchment area and reduces the amount of water reaching the river therefore reducing the risk of flooding for people and the environment. Other advantages of tree planting include the fact that trees absorb carbon, can manage and reduce soil erosion, can reduce pollution, improve the aesthetics of an area and provide habitats for wildlife. However, (productive) land may be lost to planting trees and it can take a number of years for trees to mature and reduce flood risk. • **Flood relief channels,** though artificial, can lead to positive environmental impacts such as new aquatic habitats and new habitats on the riverbank. However, where harder materials are used such as concrete and gabions to stabilise the embankments, habitats are more likely to be disturbed and the aesthetic appearance of the environment declines. If roads need to be closed, it can affect the local community and farmers may lose land where the new channel is built. • **Flood plain zoning** comprises a range of potential strategies including construction of wetland areas and water meadows and land put aside for grazing. It can include restriction of building and economic development on the floodplain which some argue puts a greater pressure on other areas. It can reduce insurance costs when properties are flooded. • **Embankments** are raised riverbeds that allow the river channel to hold more water before flooding occurs. They are relatively cheap and can be planted with vegetation to look more natural and attractive. However, in urban areas, they can be expensive to build and maintain, they can reduce biodiversity and obscure views. • **Channel straightening** involves cutting through meanders to create a straight channel which speeds up the flow of water. This may reduce the risk of flooding in one area but increase it downstream. Furthermore, artificial channels can reduce the range of aquatic animals and look unattractive. • **Flood warnings and preparation** are a cheap way of protecting people and their property by providing flood maps, forecasts and warnings to residents in advance of potential flooding. However, they are only effective if people listen and cannot actually prevent flooding. • **River restoration** is when a river that had previously been hard engineered is restored to its natural channel. Positive impacts include creating new wetland habitats, increasing biodiversity and improving the natural look of	

		the area. It also increases water storage. However, it can be expensive and involve loss of land. AO2 – 3 marks AO3 – 3 marks	

Qu	Pt	Marking guidance	Total marks
05	**1**	**Identify the process where meltwater freezes to the rock beneath the ice and tears away pieces of loose rock as a glacier moves through a valley.** **C** Plucking No credit if two or more answers are circled. AO1 – 1 mark	1
05	**2**	**Using Figure 18, suggest one piece of evidence from the highlighted grid square that shows this area was glaciated.** Corrie, tarn/corrie lake, arêtes/knife-edged ridges (might name Striding Edge and Swirral Edge but needs to link to these being an arête/knife-edged ridge), pyramidal peak. Any one landform credited. AO3 – 1 mark	1
05	**3**	**Using Figure 18, what is the difference in height between point A near the lake and point B at the top of Helvellyn?** 803 metres (950−147) Units not required. AO4 – 1 mark	1
05	**4**	**Using Figure 18, identify which grid square contains a glacial trough (U-shaped valley).** **C** 3715 No credit if two or more answers are circled. AO1 – 1 mark	1
05	**5**	**Using Figures 18 and 19, in which direction was the photographer facing when the picture was taken from near the top of Helvellyn?** East Allow South-East AO4 – 1 mark	1

05 **6** **Explain the formation of arêtes and pyramidal peaks.**
Use Figure 20 and your own knowledge. 4

Level	Marks	Description
2 (Clear)	3–4	AO2 – Shows a clear geographical understanding of the sequence and processes involved in the formation of arêtes and pyramidal peaks. Explanations are developed. AO4 – Uses the source effectively to show the formation of arêtes and pyramidal peaks.
1 (Basic)	1–2	AO2 – Demonstrates limited geographical understanding of the sequence and processes involved in the formation of arêtes and/or pyramidal peaks. AO4 – Basic use of source to show the formation of arêtes and/or pyramidal peaks.
	0	No relevant content.

- **Level 2 (clear) responses** will show linked statements and clear understanding of the processes involved and the sequence of formation of arêtes and pyramidal peaks. Appropriate geographical terminology used.
- **Level 1 (basic) responses** will be simple statements with limited or partial sequence and little reference to the processes involved.
- Both landforms need to be explained to reach the top of Level 2.

<u>Indicative content</u>

- The command is 'explain' so responses should provide a reasoned account of how and why arêtes and pyramidal peaks form.
- An arête is a steep, sharp ridge that develops between two back-to-back corries.
- Students are likely to explain the formation of a corrie in explaining the formation of an arête.
- A corrie is a hollow in the mountainside in which snow first collects and eventually forms glacier ice as the snow is compressed and the air is squeezed out. In the UK, this occurred in hollows facing North or North-East so less affected by direct sunshine.
- Freeze-thaw weathering, along with plucking, loosens and removes material from the back of the hollow, producing a steep back-wall. As the mass of ice increases, the ice pulls away from the wall due to gravity and rotational slip. The plucked debris from the back wall causes further erosion through abrasion which deepens the corrie and forms a rock basin.
- Over time, the back wall retreats backwards and when two corries develop back-to-back or side to side, an arête develops between them.
- When three or more corries grow in hollows on all sides of a mountain, a pyramidal peak is formed and as the corries erode the mountains behind them, this rock is weathered into a sharp point.
- Sequence of formation and some reference to processes involved required to reach top of Level 2.

AO2 – 2 marks
AO4 – 2 marks

<table>
<tr>
<td>05</td>
<td>7</td>
<td>
‘There can be conflict between different land uses in glaciated upland areas.’

Do you agree?

Use Figure 21 and your own understanding.

<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>3
(Detailed)</td><td>5–6</td><td>AO2 – Shows thorough geographical understanding of the potential conflict between different land uses in glaciated upland areas.

AO3 – Demonstrates thorough application of knowledge and understanding in a reasoned way to discuss the potential conflict between different land uses in glaciated upland areas.</td></tr>
<tr><td>2
(Clear)</td><td>3–4</td><td>AO2 – Shows clear geographical understanding of the potential conflict between different land uses in glaciated upland areas.

AO3 – Demonstrates reasonable application of knowledge and understanding to discuss the potential conflict between different land uses in glaciated upland areas.</td></tr>
<tr><td>1
(Basic)</td><td>1–2</td><td>AO2 – Shows limited geographical understanding of the conflict between different land uses in glaciated upland areas.

AO3 – Demonstrates limited application of knowledge and understanding in discussing potential conflict between different land uses in glaciated upland areas.</td></tr>
<tr><td></td><td>0</td><td>No relevant content.</td></tr>
</table>

Level 3 (detailed) responses will be developed showing understanding of one or more land uses and their potential for conflict in glaciated areas. Appropriate geographical terminology will be used. Appropriate reference to Figure 21.
Level 2 (clear) responses are likely to contain linked statements showing some understanding of one or more land uses and their potential for conflict in glaciated areas. Some geographical terminology evident. Reference likely to be made to Figure 21.
Level 1 (basic) responses will comprise simple ideas or random statement with limited understanding of land use conflicts. Geographical terminology will be limited. Answer may be largely reliant on Figure 21.
Max Level 2 for answers that fail to make use of Figure 21.

<u>Indicative content</u>
</td>
<td>6</td>
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</table>

		• **Figure 21** comprises three photographs showing forestry machinery, quarrying and a busy car park in the Lake District. The different land use options outlined in the specification are tourism, farming, forestry and quarrying and there could be discussion of any of these. • Tourism is a major source of employment and income in rural mountainous areas but there are potential conflicts between tourism and other activities. Some people fear interference with their livelihoods (eg farmers), or congestion and pollution from cars and litter. Too much recreational activity may damage fragile environments (eg soil erosion). Tourists could leave gates open whilst walking and exploring the area. This can lead to animals escaping and potentially being injured or lost. This would affect profits for the farmer. Purchase of second homes reduces chances of property availability for locals and limits use of local services. Many locals may be prepared to accept developments, and overlook disadvantages, if they bring employment and money to the area. • Farming and forestry provide much needed employment in rural areas and boost the local economy. However, some people feel that farming and logging can destroy natural habitats and reduce biodiversity. This can have a negative knock-on impact on tourism. • Heavy trucks used to transport the logs can cause traffic congestion on roads. Logging can cause noise pollution which disrupts the peace and quiet of the area and can scare away wildlife. It can scar the landscape and make it look unsightly. Growing trees in rows or lines looks out of place and destroys the natural beauty of the area. After the forest has been cut down, there is no vegetation left to intercept rainfall. Machinery used by the loggers compacts the soil so water cannot soak in. This can result in flooding. • Quarrying for rocks like sandstone, granite and slate creates lots of jobs, which is good for the local economy. However, it also brings noise, heavy traffic and dust which can destroy natural habitats and reduce biodiversity. Quarrying can also be an eyesore so tourist sites may be badly affected. Quarrying may lead to pollution of land and rivers and spoil the landscape. • Other potential (and valid) development land uses include military training, reservoirs, energy production such as wind turbines and hunting. Each of these land uses could be judged as having negative impacts on the landscape and wildlife. • It could be argued that different land uses, and economic activities bring in valuable economic revenue which can be put towards conservation strategies. This is particularly the case for tourism where money can be invested in sustainable management of glaciated areas. • Answers could make reference to specific examples of glaciated landscapes in the UK where there is potential conflict between different land uses. AO2 – 3 marks AO3 – 3 marks	