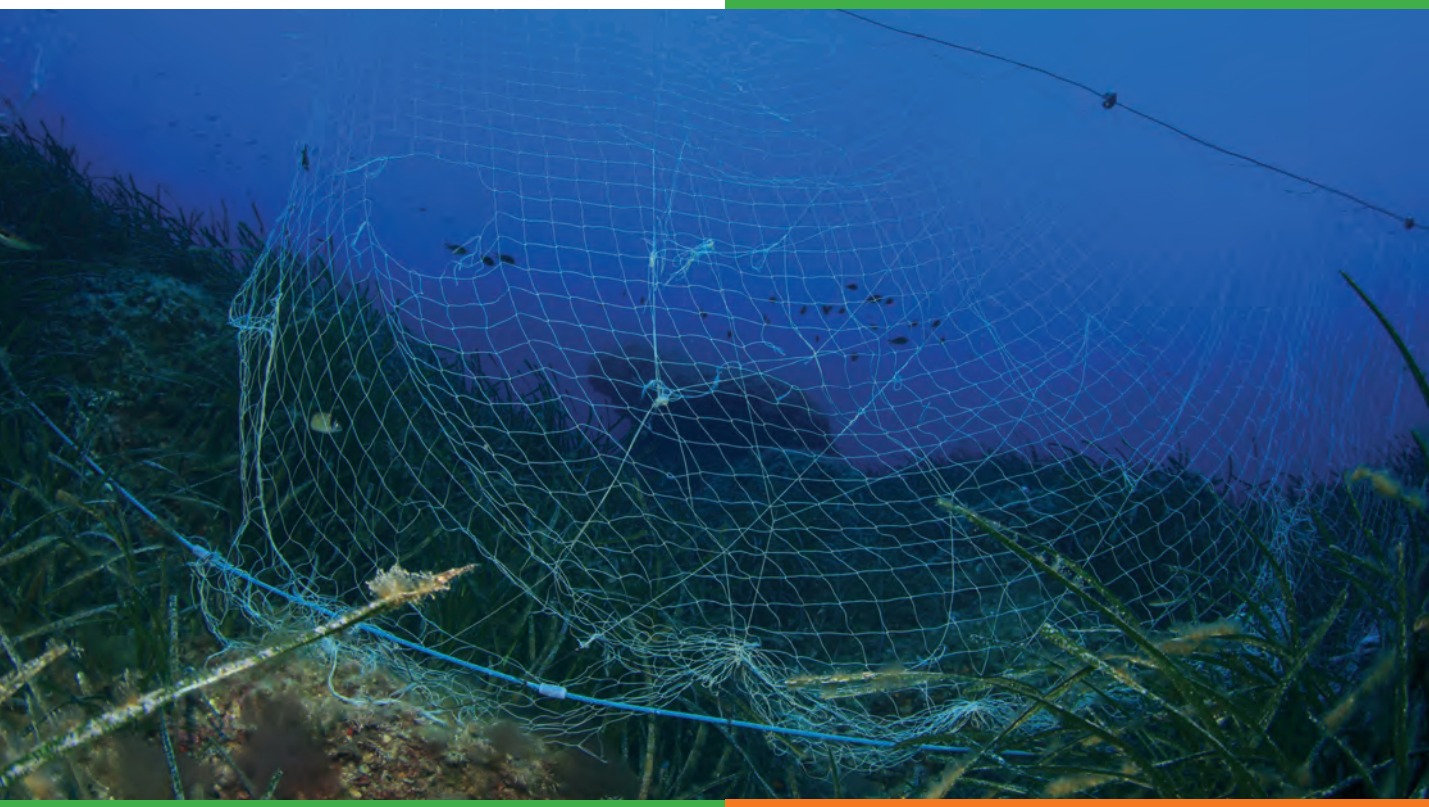
STUDENT GUIDE

For the 2016 specifications



OCR

AS/A-LEVEL

Geography

Landscape systems
Changing spaces; making places

Andy Palmer
Peter Stiff

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An idea that many fail to appreciate is that even when in retreat, the ice in a glacier may move forwards across the firn line under gravity, so it can appear that a retreating glacier is actually advancing.

Glaciated landscape systems are influenced by physical factors

A range of physical factors influence processes which shape the glaciated landscape. They vary in their importance and influence spatially (from place to place) and temporally (over time). These factors can also be interrelated as one factor may influence another.

Climate

Wind is a moving force and as such is able to carry out erosion, transportation and deposition. These **aeolian** processes contribute to the shaping of glaciated landscapes, particularly acting upon fine material previously deposited by ice or meltwater.

Aeolian means wind related.

Precipitation totals and patterns are key factors in determining the mass balance of a glacier, as precipitation provides the main inputs of snow, sleet and rain.

Temperature is also a significant factor. If temperatures rise above 0°C, accumulated snow and ice will start to melt and become an output of the system. High altitude glaciers may experience significant periods in the summer months of above zero temperatures and melting, whereas, in high latitude locations, temperatures may never rise above zero and so no melting occurs. This explains why ice sheets are so thick in polar regions, despite very low precipitation inputs.

Exam tip

Make sure you can comment on the seasonal variations in the climatic factors.

Geology

Lithology refers to the physical and chemical composition of rocks. Some rock types have a weak lithology, with little resistance to erosion, weathering and mass movement. This is because the bonds between the particles that make up the rock are quite weak, as in clay. Others, such as basalt, made of dense interlocking crystals, are very resistant. Some, such as chalk, are largely composed of calcium carbonate, and so are soluble in weak acids making them prone to chemical weathering by carbonation.

Structure concerns the properties of individual rock types such as jointing, bedding and faulting which affects the permeability of rocks. In porous rocks, such as chalk, tiny air spaces separate the mineral particles. These pores can absorb and store water, known as primary permeability. Carboniferous limestone is also permeable, because of its many joints. This is known as secondary permeability.

Exam tip

When explaining the influence of geology on glaciated landscapes, it can be useful to refer to how the shape of the landform, such as the cross-section of a trough, is affected by geology.

Latitude and altitude

Locations at high latitudes, most noticeably beyond the Arctic and Antarctic Circles at 66.5°N and S, tend to have cold dry climates with little seasonal variation. Glaciated landscapes at such latitudes tend to develop under the influence of large, relatively stable ice sheets, such as those of Greenland and Antarctica. These landscapes are quite different to those that develop under

Knowledge check 11

Why is chalk classified as a porous rock?

the influence of dynamic valley glaciers in lower latitude, but higher altitude locations, such as the Rocky Mountains and the Himalayas. These locations tend to have higher precipitation inputs, but more variable temperatures and hence more summer melting.

The decrease in temperature with altitude of approximately 0.6°C/100 m means that glaciers are even found near the Equator in the Andes. High altitude locations may also receive more relief precipitation.

Relief and aspect

Although latitude and altitude are the major controls on climate, relief and **aspect** have an impact on microclimate and the movement of glaciers.

Aspect is the direction a slope faces.

The steeper the relief of the landscape, the greater the resultant force of gravity and the more energy a glacier will have to move downslope.

Where air temperature is close to zero and the melting of snow and ice, aspect can have a significant influence on the behaviour of glacier systems. If the aspect of a slope faces away from the general direction of the sun, temperatures are likely to remain below zero for longer, as less solar energy is received, and so less melting occurs. The mass balance of glaciers in such locations will, therefore, tend to be positive, causing them to advance. The reverse is likely to be true in areas with an aspect facing towards to the sun. These differences not only affect the mass balance, but will, as a result, influence the shaping of the landscape. Glaciers with a positive mass balance are more likely to be larger, with greater erosive power and much more erosive than small ones and those in retreat due to a negative mass balance.

Different types of glacier and glacier movement

The formation of glacier ice

Glaciers form when temperatures are low enough for snow that falls in one year to remain frozen throughout the year. This means that the following year, fresh snow falls on top of the previous year's snow. Fresh snow consists of flakes with an open, feathery structure and a low density. Each new fall of snow compresses and compacts the layer beneath, causing the air to be expelled and converting low density snow into higher density ice. Snow that survives one summer is known as firn and is eventually compacted to a high enough density and a thickness of about 100 m to become glacier ice. This process is known as **diagenesis** and can take many decades or even centuries.

Valley glaciers and ice sheets

Glaciers are large, slow-moving masses of ice.

Ice sheets are the largest accumulations of ice, defined as extending for more than 50,000 km^2. There are currently only two, Antarctica and Greenland, but during the last glacial period huge ice sheets also covered much of Europe. The Antarctic ice sheet is the bigger, with a volume of about 30 million km^3.

Landscape systems

Question 1 Coastal landscapes

(a) **Explain how coastal sediment can be supplied from a variety of sources.** [8 marks]

(b) **Study Table 1, the highest tides experienced at southern England locations (until 2012).**

Table 1: Highest tides experienced at southern England locations (until 2012).

Location	Highest tide (m)
Avonmouth	15.0
Bournemouth	3.1
Dover	8.0
Ilfracombe	10.5
Newhaven	7.7
Newlyn	6.4
Plymouth	6.4
Portsmouth	5.5
Weymouth	3.0

(i) **Calculate the median value of the data in Table 1. You must show your working.** [2 marks]

(ii) **Calculate the range of data values shown in Table 1. You must show your working.** [2 marks]

(iii) **Suggest why the highest tides vary between the different locations.** [2 marks]

(c) **Study Figure 1, a coastal landscape in North Devon.**

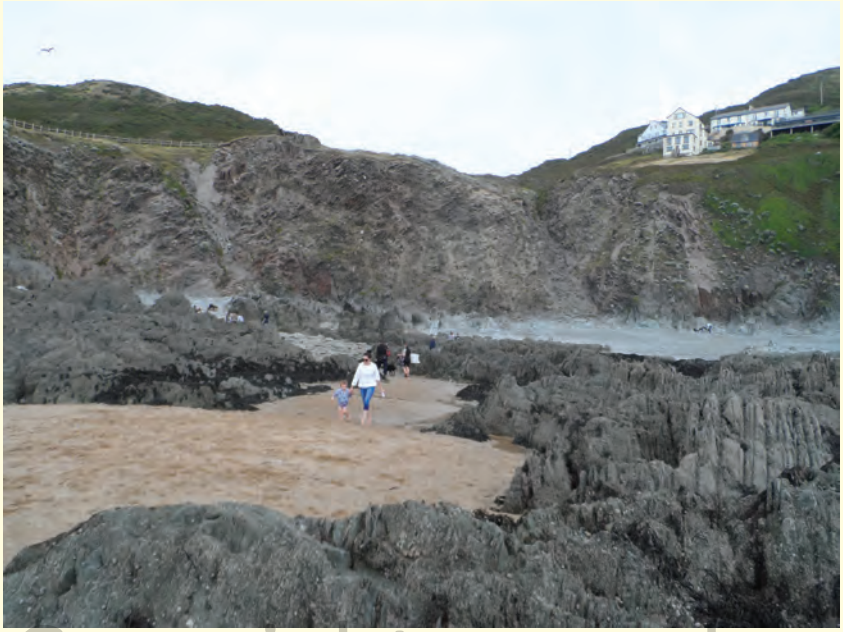

Figure 1 A coastal landscape in North Devon

Explain how waves have developed the cliffs in this landscape. **[3 marks]**

(d)* Assess the relative importance of past, present and future sea-level rise in influencing coastal landforms. **[16 marks]**

Total = 33 marks

e

(a) This question requires an explanation, but the focus should be on the **variety** of sources, rather than separate explanations of each source.

(b) This is a skills-based question and both median and range are explicitly mentioned in the specification. Remember to show your working. In (iii) you are not expected to know anything about the specific locations; you just need to suggest appropriate, possible reasons.

(c) There are only 3 marks available here, so keep a clear focus on erosion; no need to mention weathering, for instance.

(d) The command word here is 'assess' and so you must ultimately decide which of the three sea-level rises you believe to be the most/least important. The * means that the quality of your extended response will be assessed in this question. You should use full sentences, spell and punctuate correctly and make appropriate use of technical terminology.

Student answer

(a) Coastal sediment can be derived from a number of sources. Geomorphic processes transport sediment to the coast and then deposit it. This includes a variety of moving forces, including wind, rivers and waves. Wind blows fine sediment and deposits it when it loses energy due to friction from the land. Waves carry sediment and deposit it after they break and move it up the beach in the swash. Rivers bring sediment from inland and deposit it at their mouth when they lose energy when they enter the sea.

Sediment also comes from weathering and mass movement on cliffs behind beaches. Even if they are not always being directly eroded by waves, the cliff face will be weathered by processes such as salt crystallisation. Sea spray lands on the cliff face and then the water evaporates leaving the salts behind. Crystals grow in pores and cracks and as they get bigger they exert an outward force which causes the rock to break up. Weathered fragments then drop under gravity as rocks fall down onto the beach adding to the sediment that is there.

e **6/8 marks awarded.** This is a competent answer and the student has provided some focus on **variety** by commenting on the different moving forces. However, they could have noted that weathering and mass movement do not require a moving force, and so are different. Also, they haven't referred to human sources such as beach nourishment.