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Geography A

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REVISE EDEXCEL GCSE (9–1)
Geography A

REVISION GUIDE

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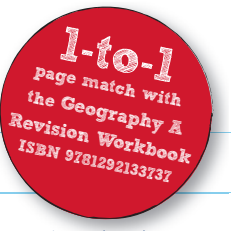
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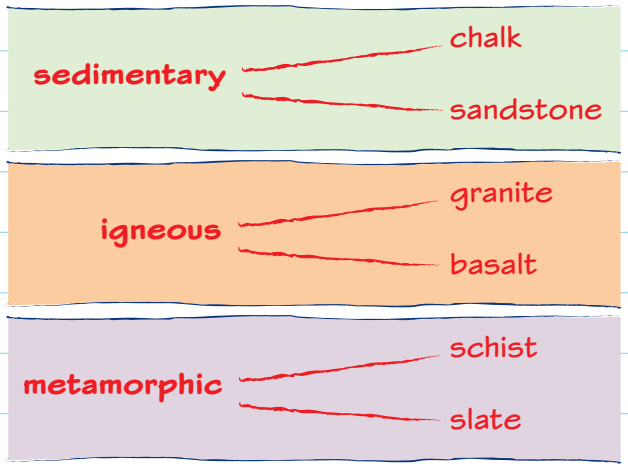
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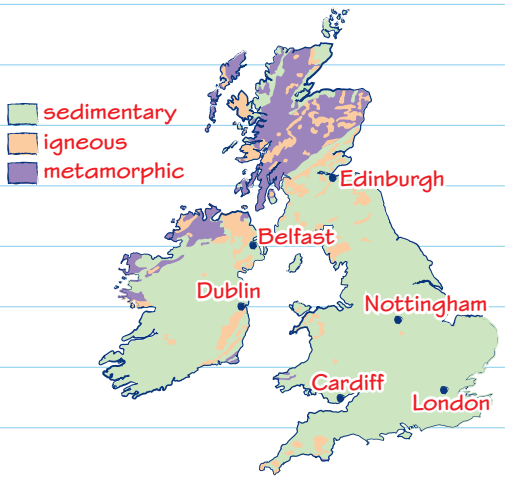
Main UK rock types

The UK is made up of many rock types, but the three main groups are sedimentary, igneous and metamorphic.

Main UK rock types



Distribution of UK rock types



Sedimentary rocks

Sedimentary rocks are formed in layers called beds. They often contain fossils. Examples include chalk and sandstone.

- **Chalk** is made up of calcium carbonate, and is susceptible to chemical weathering.
- **Sandstone** is made of sand-sized grains cemented together. It can be hard and resistant to weathering, but is permeable.

Igneous rocks

Igneous rocks are hard and formed of crystals so are resistant to erosion. They are usually impermeable – water doesn't pass through them. Examples include granite and basalt.

- **Granite** is affected by chemical weathering. Granite landscapes drain badly, so tend to be boggy.
- **Basalt** is a grey rock made from very small crystals. Lava flows cool to form basalt.

Worked example

Study the photograph, which shows slate, a metamorphic rock. Explain how metamorphic rocks form. **(2 marks)**

Metamorphic rocks are formed by great heat and pressure. Examples are schist and slate. Slate is formed from mudstone at convergent plate boundaries. Schist is formed at higher pressure at the same plate boundary.



Slate splits easily into thin layers

When you are asked to explain **how**, remember to include the key points of the process.

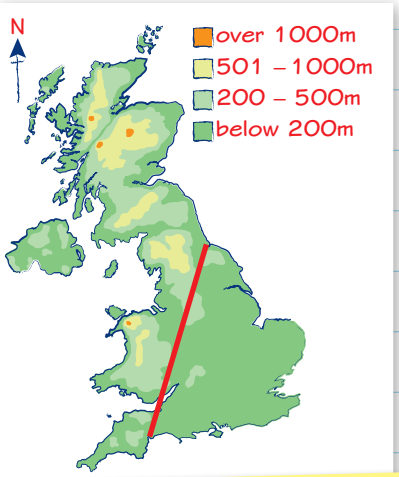
Now try this

Explain **two** differences between igneous and sedimentary rocks. **(2 marks)**

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Upland and lowland landscapes

Geology and **past** tectonic activity have influenced the physical landscapes of the UK.



The imaginary Tees–Exe line divides the UK into uplands (north) and lowlands (south).

Geology

The UK is split into two halves geologically.

- The north-western UK is mainly harder igneous and metamorphic rocks, forming **upland** landscapes.
- The south-eastern UK is mainly softer sedimentary rocks, forming **lowland** landscapes.

Plate tectonics

Millions of years ago the UK was close to plate boundaries. Plate movements caused mountains (huge folds) and faults in the rocks.

520 million years ago two plates converged to form upland mountain landscapes – northern Scotland, the Lake District and North Wales.

50–60 million years ago diverging plate boundaries caused the Atlantic Ocean to open. Rising lava produced the distinctive basalt geology of the Giant's Causeway.

Distinct landscapes

North-west of the Tees–Exe line the UK's geology is largely igneous: rocks formed from magma and lava, associated with tectonic events. Long-extinct volcanoes form hills and mountains.

Basalt can form a very distinct landscape as the lava cools into polygon shapes: for example, the Giant's Causeway in Northern Ireland and Fingal's Cave in Scotland.

Worked example

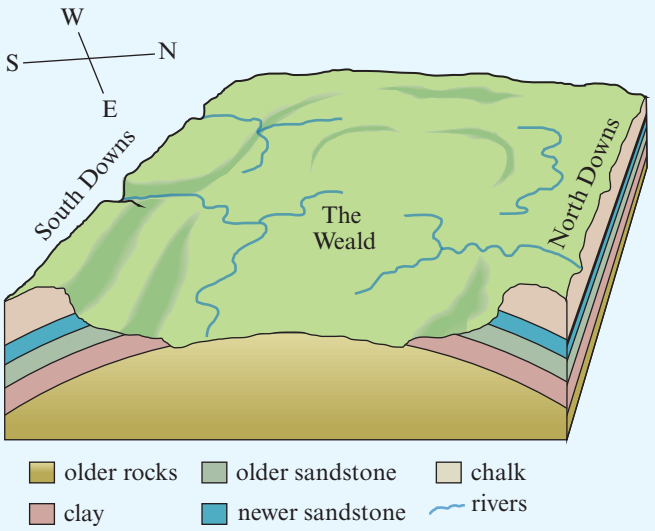
Study the geological cross-section, showing the rocks forming part of south-east England.

a Name the rock group to which these rocks belong. **(1 mark)**

Sedimentary

b Explain why lowland landscapes are usually formed by this rock group. **(2 marks)**

Sedimentary rocks are much softer and more easily eroded than igneous and metamorphic rocks. Therefore sedimentary rocks are worn down rapidly to form low hills and lowland basins.



The distance between the North and South Downs is about 60 km so the geological cross-section shows a large area.

Now try this

Study the map of the UK rock types on page 1. Explain **one** reason why upland Britain is made up of igneous and metamorphic rocks. **(2 marks)**

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Physical processes

Some distinctive upland and lowland UK landscapes result from physical processes working together: glacial erosion and deposition, weathering and climatological processes, and post-glacial river and slope processes.



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This upland landscape is in the Lake District. The OS map extract scale is 1:25 000.

- **Glacial erosion:** Stickle Tarn, in the north, is where a glacier formed during the Ice Age and carved out a corrie.
See page 26 for more on glacial erosion.
- **Weathering:** the crags are exposed rock faces. Weathering leads to rock fragments breaking off and falling to the base of the cliff to form a scree slope.
See page 25 for more on freeze–thaw weathering.
- **Climate:** high precipitation here means there is a lot of surface drainage over the impermeable rocks; there are many streams.
- **Post-glacial river:** the valley floor at the bottom is too wide for the stream to have eroded it. The flat bottom and steep sides shows that it is a U-shaped valley formed by a glacier.



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This lowland landscape is in Herefordshire. The OS map extract scale is 1:50 000. The landscape has been formed by the actions of two rivers: the River Lugg and the River Wye.

- **River erosion:** as the rivers meander, they have eroded a wide valley between low hills. The rivers transport silt eroded from the river channel.
See page 15 for more on transport and deposition.
- **River deposition:** prolonged heavy rain can cause the rivers to flood. Water spreads out all over the valley floor, depositing the silt to form a wide, flat floodplain.
See page 19 for more on floodplain formation.

Worked example

Study the photograph of Bowerman's Nose, Dartmoor, a tor made of granite. Explain how it has formed from the interaction of physical processes. **(4 marks)**

Dartmoor formed when a dome of magma (batholith) developed underground 290 million years ago. The magma cooled and contracted to form granite, with cooling joints. Chemical weathering caused the joints to widen. Granite was exposed on the surface. Freeze–thaw weathering, erosion and mass movement removed the broken granite. Outcrops of rock less affected by weathering and erosion are left behind, forming tors.



This answer clearly explains how several processes working together formed granite landscapes.

Now try this

Which of the following rocks is **not** formed of crystals? **(1 mark)**

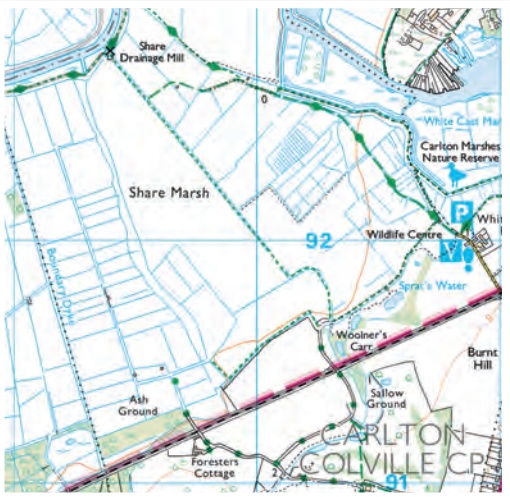
☐ **A** Granite ☐ **B** Chalk ☐ **C** Schist ☐ **D** Basalt

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Had a look ☐ Nearly there ☐ Nailed it! ☐

Human activity

The UK has been settled by humans for many thousands of years and all its landscapes have been heavily influenced by human activity.



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Agriculture

This OS map extract is at 1:25 000 scale.
It shows a region of Suffolk in the east of the UK.

- The blue lines are drainage ditches, built to drain water away from low-lying agricultural land to allow crops to grow.
- Straight drainage ditches are not produced by natural physical processes so they are a good indication of human activity.

Humans have altered almost all the landscapes of the UK through farming. Different farming types are suited to different landscapes: for example, sheep farming in upland areas and arable farming in fertile lowland valleys.

Forestry

Forestry is managing woodland for timber.

- Many UK upland landscapes have been planted with trees for forestry. Sometimes they are in straight rows to make them easy to manage.
- The UK would naturally be covered by deciduous woodland. However, some UK landscapes feature conifer plantations, which are very distinctive.



When trees are felled for timber, a section of the plantation may be cleared. This aerial photo shows a cleared area in the Strathyre Forest, Scotland.

Worked example

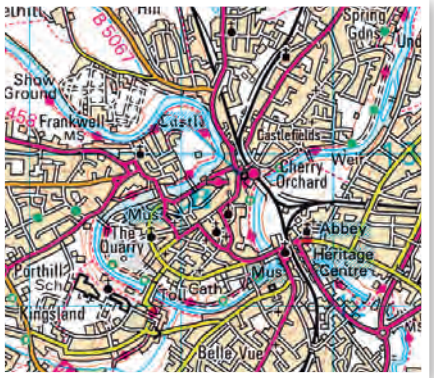
Explain why lowland landscapes have been more altered by human settlement than upland landscapes. **(4 marks)**

Settlements grew up where the landscape offered advantages, such as flat land that is easier to build on. Lowland landscapes also provided river meander loops where it was easy to defend towns, coastal plains and natural harbours for fishing villages and shallow points on rivers where fords could be made (for example, Oxford). Over time, the settlements spread over the landscape. In big cities, many streams and small rivers now run in underground tunnels, so cannot be seen on maps. Upland landscapes of hills and mountains make it more difficult to construct settlements so are less built up.

The question asks about **both** lowland **and** upland landscapes – make sure you include both in your answer.

Now try this

The map below shows the Shropshire town of Shrewsbury. Suggest **one** reason why the site of Shrewsbury was chosen for a settlement. **(2 marks)**



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Physical processes 1

The coastline is shaped by the interaction of the different physical processes of weathering, mass movement and erosion. You need to understand how each process causes change along coastlines.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Weathering on the coast

Weathering helps wear away rocks but leaves weathered material **in situ**. There are three types of weathering.

Chemical – rocks reacting with slightly acidic water, e.g. limestone dissolved by **carbonation**

Biological – action of plants and animals (e.g. tree roots widen in cracks in rocks), causing the rock to split apart

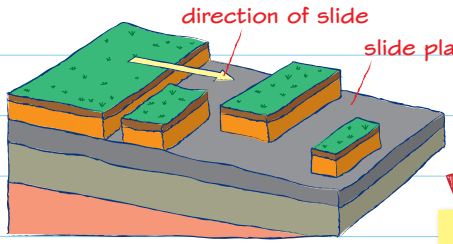
Weathering

Mechanical – water falls into the cracks in rocks and freezes, causing it to expand; over time the repeated thawing and freezing causes the rock to break apart

Mass movement on the coast

Mass movement is the downhill movement of material under the influence of gravity. Types of mass movement vary according to:

- material involved
- amount of water in the material
- type of movement, e.g. sliding, slumping.



Sliding happens when loosened rocks and soil suddenly slide down the slope. Blocks of material may all slide at once.

How waves erode the coast

Abrasion: breaking waves throw sand, pebbles and boulders against the coast during storms.

Hydraulic action: the sheer weight and impact of water against the coastline, particularly during a storm, erodes the coast. Also waves compress air in joints in rocks, forcing them apart.

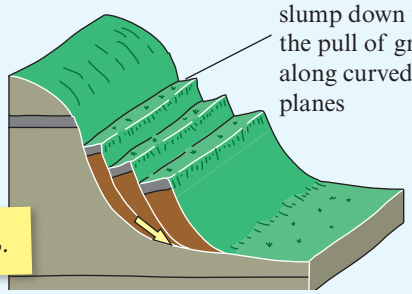
Attrition: rocks and pebbles carried by waves rub together and break into smaller pieces.

Solution: the chemical action of seawater dissolves some rocks.

Worked example

Study the diagram opposite. Explain how slumping occurs. **(2 marks)**

Slumping happens when the rock is saturated. Loose, wet rocks slump down under the pull of gravity along curved slip planes.



Slumping often happens on clay coasts.

Now try this

Explain how sliding can cause downhill movement of material. **(3 marks)**

Remember to read questions like this carefully, and don't mix up sliding and slumping.

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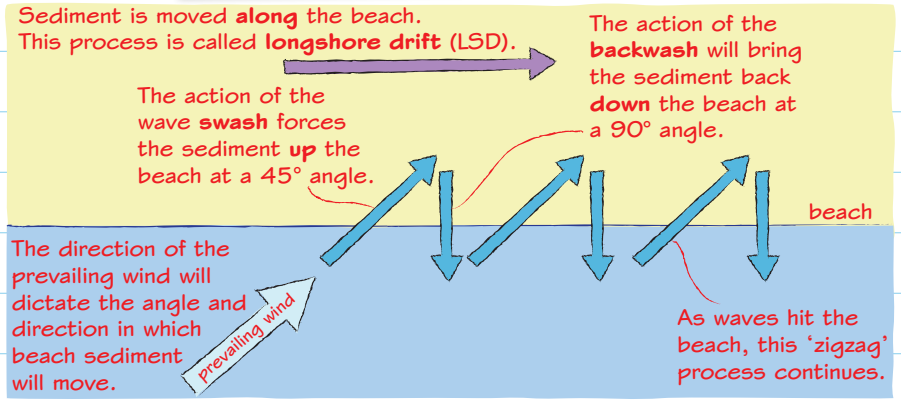
Physical processes 2

Waves transport eroded material along the coast and deposit it when they lose the energy to carry it further.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

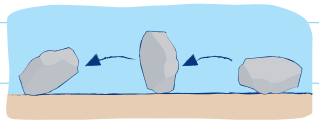
Longshore drift

This is the process by which beach sediment can be **transported** along the coast by waves.

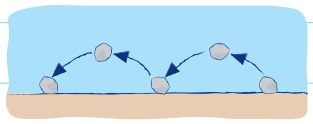


Transport

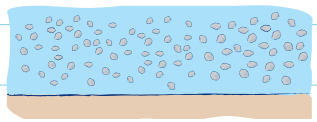
Waves **transport** material by:



Traction – large boulders are rolled along the seabed by waves



Saltation – smaller stones are bounced along the seabed

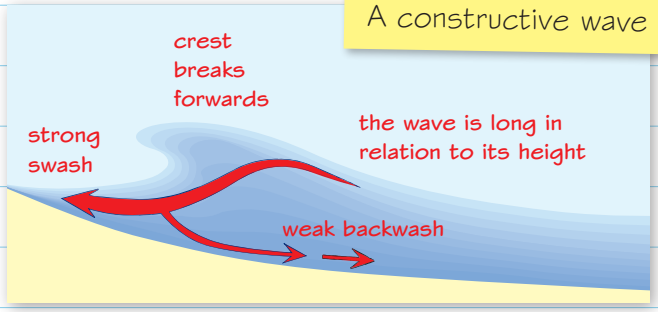


Suspension – sand and small particles are carried along in the flow



Solution – some minerals are dissolved in seawater and carried along in the flow

Deposition



The load carried by waves is deposited by constructive waves. Different factors influence deposition, for example:

- sheltered spots (e.g. bays)
- calm conditions
- gentle gradient offshore causing friction.

All reduce the wave's energy.

Worked example

The command word here is **explain**, so you need to say **how** the process happens.

Explain how longshore drift transports material along the coastline. **(4 marks)**

The direction of material movement is determined by the prevailing wind direction. Waves approach the coastline at an acute angle, bringing sediment onto the beach in the swash. Sediment is then dragged back to sea in the backwash, under the force of gravity at a right angle. This process continues in a zigzag pattern, moving sediment along the beach.

Now try this

Remember to name at least two processes here and explain how material is transported.

Explain how waves can transport material. **(4 marks)**

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Influence of geology

The geological structure of coasts, rock type and wave action all influence coastal landforms.

Only revise this section if you studied Coastal landscapes.

Geological structure

Geology affects how fast coastal erosion occurs. Soft rock is eroded much faster than hard rock. Particular landforms are created when soft rocks and hard rocks occur together.

Soft rock, such as clay

- ✓ Soft rock is easily eroded by the sea.
- ✓ Cliffs will be less rugged and less steep than hard rock coasts.
- ✓ Soft rock landscapes include bays.

Hard rock, such as granite

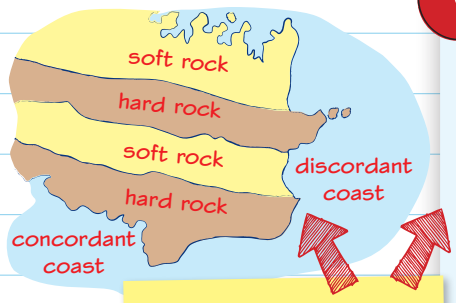
- ✓ Hard rock is resistant to all types of erosion.
- ✓ Cliffs will be high, steep and rugged.
- ✓ Hard rock landscapes include wave-cut platforms and headlands where caves, arches and stacks are formed.

Read more about erosional landforms on page 9.

Concordant and discordant coasts

Concordant coasts are made up of the same rock type. On discordant coasts, the rock type alternates, forming headlands and bays.

Revise these on page 9.

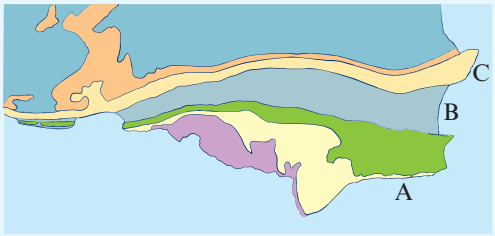


These two maps show the same coastline. The hard rocks are chalk and limestone; the soft rocks are mudstone, sands and clays.

Joints and faults

- Joints are smaller cracks; faults are larger.
- Both make rock more prone to erosion.
- Rocks with more joints and faults are eroded more quickly.

Worked example



Study the geological map above. State which point marks the location of a chalk headland and stacks.

(1 mark)

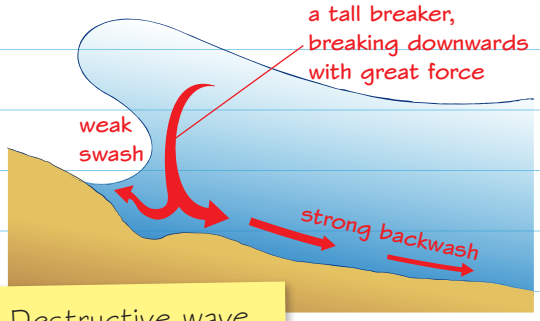
C

Destructive and constructive waves

- In a **destructive wave**, the swash is weak and the backwash strong. Material is dragged into the sea, eroding the coast. Destructive waves have high energy, and occur in stormy conditions.
- In a **constructive wave**, material is deposited, building up the coast.

See the diagram on page 6.

Constructive waves have lower energy and occur in calm conditions.



Destructive wave

Now try this

Identify **two** landforms found along a discordant coast. **(2 marks)**

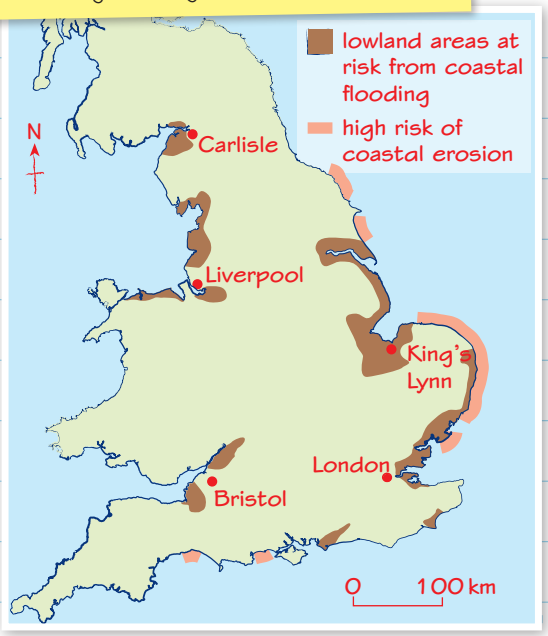
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UK weather and climate

The unpredictability of the UK's weather and climate affects rates of coastal erosion and coastal retreat, impacting on landforms and landscapes.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Places most at risk from coastal flooding in England and Wales.



Seasonality

The four seasons have different impacts on coastal erosion. For example, cold temperatures in winter lead to freeze–thaw weathering (see page 5) in cliffs.

The effects of stormy weather

Storm frequency is high in many parts of the UK.

- ✓ Coasts are often subject to strong winds, increasing the eroding power of the waves, and heavy rainfall contributes to mass movement (see page 5).
- ✓ Frequent storms can damage coastal landforms like spits. Spurn Head along the Holderness coast (see page 13) is at risk of being cut off from the mainland.
- ✓ Beach sediment can be removed from a section of coastline.
- ✓ Sand dunes can be removed by storms.

Prevailing winds

Prevailing winds in the UK are from the south-west. This brings warm, moist air from the Atlantic and frequent rainfall, which contributes to weathering and mass movement (see page 5) on the coast.



Definitions

Coastal erosion – the breaking down and removal of material along the coast

Coastal retreat – when coastal erosion causes the coastline to move further inland

Worked example

Explain how the UK climate contributes to coastal erosion. **(4 marks)**

The UK's climate is temperate maritime, which means winters are mild and wet and summers are warm and wet. The prevailing winds from the south-west often bring rainfall to the country. The large amount of rainfall causes coastlines to be eroded through weathering, and can lead to mass movement and cliff collapse, which lead to coastal retreat. Storm frequency is high, which brings heavy rainfall and strong winds that increase the erosional power of waves. The seasonal nature of the climate means that rocks on the coast are subject to freeze–thaw weathering in winter, which adds to erosion.

This is a good answer which uses accurate specialist terminology on how the UK climate contributes to coastal erosion.

Now try this

Explain **one** way in which UK storms can impact on coastal landforms. **(2 marks)**

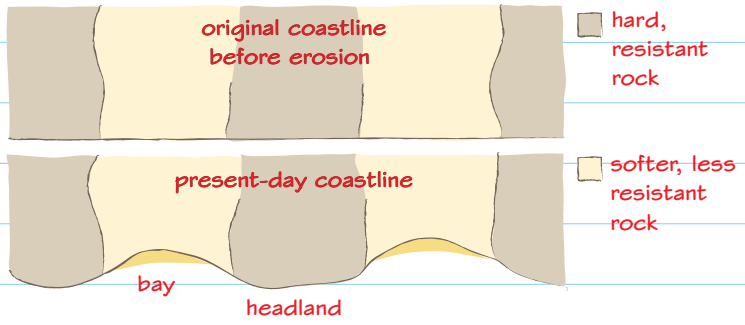
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Erosional landforms

There are distinctive landforms caused by coastal erosion, including headlands and bays, headland features and wave-cut platforms.

Headlands and bays

These develop on coastlines with a mix of hard and soft rock. They often occur where cliffs have fault lines or joints.



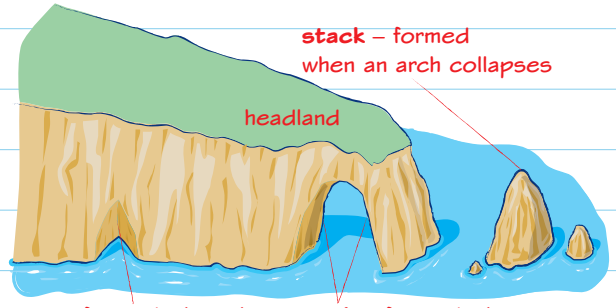
Hard rocks like chalk are often left jutting out in the sea, forming **headlands**. Soft rocks such as sands are eroded more quickly, forming **bays**.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Cliffs

Cliffs are common coastal features. Cliffs are shaped through **weathering** and **erosion**. Soft rock erodes easily to create gently sloping cliffs. Hard rock erodes more slowly to create steep cliffs.

Caves, arches and stacks

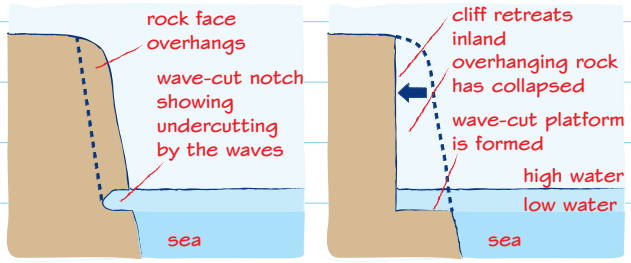


cave – formed when the waves erode a weakness in the rock such as a joint or a fault

arch – formed when two caves erode back from either side of a headland and meet in the middle

Wave-cut platforms

The erosion of cliffs can create wave-cut platforms – areas of flat rock at the base of the cliff.



Worked example

Study the OS map of Swanage to the right.

Identify a headland. **(1 mark)**

Peveril Point

When identifying a feature on an OS map, remember to look for name evidence – the word 'point' refers to a headland.



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Now try this

When explaining the formation of a coastal landform remember to include at least one named coastal process in your answer.

Explain how a stack is formed. **(4 marks)**

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Depositional landforms

The process of deposition causes the formation of distinctive landforms including beaches, spits and bars.

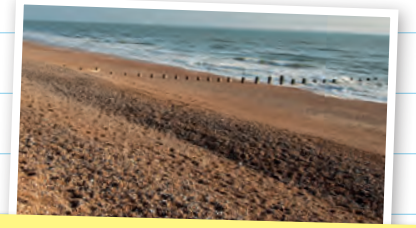
In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Beaches

Beaches are accumulations of sand and shingle formed by deposition and shaped by erosion, transportation and deposition.

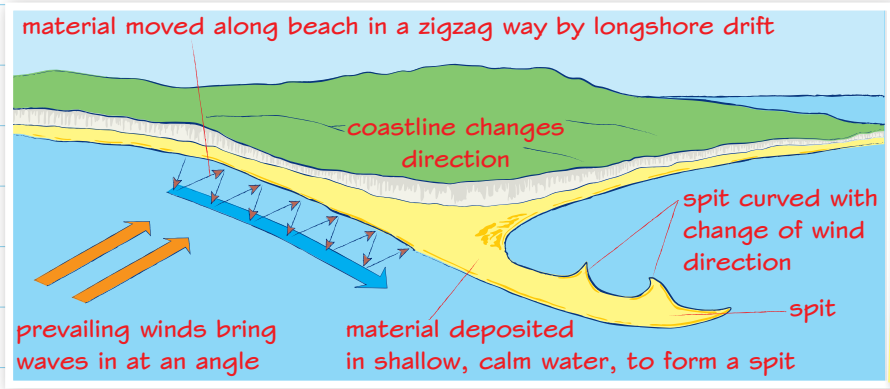


Beaches can be straight or curved. Curved beaches are formed by waves refracting, or bending, as they enter a bay.



Beaches can be sandy or pebbly (shingle). Shingle beaches are usually found where cliffs are being eroded and where waves are powerful. Ridges in a beach parallel to the sea are called berms and the one highest up the beach shows where the highest tide reaches.

Spits



Spits are narrow beaches of sand or shingle that are attached to the land at one end. They extend across a bay or estuary or where the coastline changes direction. They are formed by longshore drift powered by a strong prevailing wind.

On an OS map spits are shown by a stretch of beach that carries on past the main coastline. They are thin and normally curved in shape.

Worked example

Explain how a bar is formed. **(4 marks)**

A bar forms in the same way as a spit, with longshore drift depositing material away from the coast, until a long ridge is built up. But, unlike a spit, a bar then grows all the way across a bay, so that a stretch of water is cut off and dammed to form a lagoon.



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Now try this

Your answer should include both **how** and **why** beach material is transported and deposited.

Explain how beaches are formed. **(4 marks)**

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Human activity

The ways in which humans use coastal environments can change landscapes, affecting people and the environment.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Urbanisation

- Weight of buildings makes cliffs more vulnerable
- Changes to drainage increase soil saturation
- Raises interest in protecting coastal landscapes

Agriculture

- Increases soil erosion
- Increases sedimentation
- Creates wildlife habitats

Industry

- Increases air, noise and visual pollution
- Can destroy habitats for birds, animals and sealife
- Brings wealth and jobs to an area

Coastal recession and flooding



Coastal recession is another term for **coastal retreat.**

Worked example

Explain how coastal recession and flooding can affect people. **(4 marks)**

One of the ways coastal recession can affect people is through the loss of homes. Many of the villages on the edge of the UK coastline are disappearing, losing homes to the power of the sea. Transport systems can be disrupted and damaged, especially important railways that run along coastlines. This prevents people from making journeys or means long detours are needed, which cost time and money. Farmers lose valuable farmland due to coastal recession, which means they lose income. In areas where homes have been flooded, people may have to pay more for home insurance, making it more expensive to live there.

When you are asked to explain, make sure you don't just describe. Here, the student has said **how** coastal recession and flooding can affect people.

Now try this

Explain how industry has affected the coastal environment. **(4 marks)**

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Coastal management

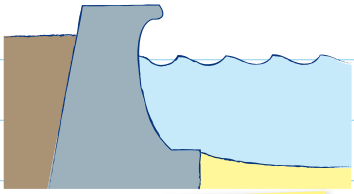
There are advantages and disadvantages to different coastal management techniques and these need to be given careful consideration because of the changes that can happen to the landscape.

Soft or hard techniques can alter wave patterns, resulting in increased erosion further along the coast.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

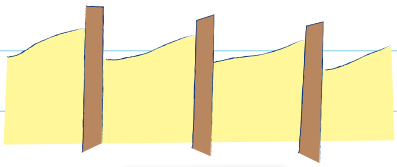
Hard engineering

Many hard engineering techniques can spoil the visual landscape.



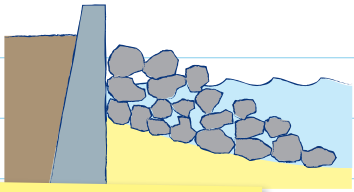
Sea wall

- Protects cliffs and buildings
- More expensive – £5000 – £10 000/m



Groynes

- Prevent sea removing sand
- Exposes other coastal areas
- Cheaper – £2000/m of timber

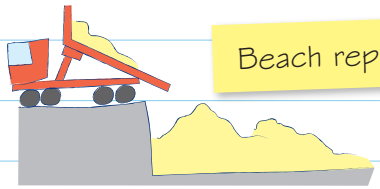


Rip rap defences

- Rocks absorb wave energy
- Cheaper – £1000 – £3000/m

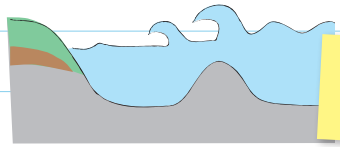
Soft engineering

This approach aims to work with nature to help maintain the coastline.



Beach replenishment

- Sand reduces wave energy
- Maintains tourism
- Cheaper – £2000/m



Offshore reef e.g. Bournemouth

- Waves break on reef and lose power
- May interfere with fishing
- More expensive – £5000/m

Worked example

Look at the marks. Part (a) just says 'identify' for 1 mark, but part (b) asks you to 'explain' for 2 marks.

This photo shows coastal management at Hornsea in Yorkshire.



a Identify the coastal management feature at A. **(1 mark)**

Groyne

b Explain how coastal management feature B protects the coastline. **(2 marks)**

Feature B is rip rap. The rocks prevent damage to the sea wall by absorbing wave power and trapping beach sand.

Now try this

This question is asking for only one advantage and one disadvantage of the technique. Make sure you explain your choices clearly.

Explain **one** advantage and **one** disadvantage of using groynes as a form of coastal management. **(4 marks)**

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Holderness coast

Located example

You need to know how the interaction of physical and human processes is causing change on one named coastal landscape, including the significance of its location.

Holderness coast, East Yorkshire coastline

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Significance of location

- Soft boulder clay is easily eroded, susceptible to slumping after heavy rainfall; chalk is more resistant (Flamborough Head).
- Exposed to strong waves (fetch) from North Sea.

Physical processes at work

- **Coastal erosion** – a combination of strong waves (especially during storms) and rock type ensure the coast is eroded rapidly.
- **Mass movement** – clay frequently slumps from the cliffs after rainfall.
- **Transport** – strong waves move the eroded material away from the coastline; **deposition** happens further south (Spurn Head).

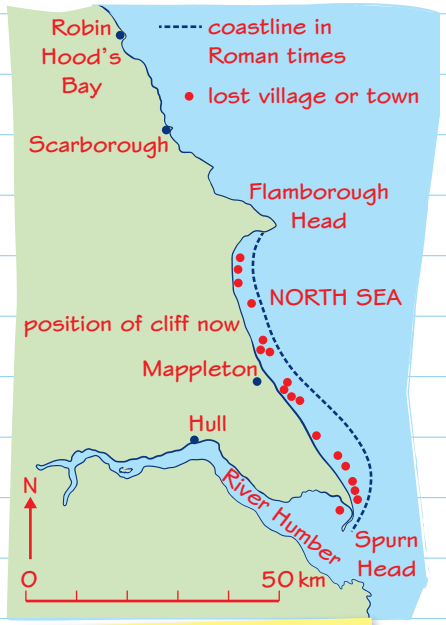
Human processes at work

- Hard engineering on parts of coast (e.g. rip rap and groynes at Mappleton) have protected areas from **erosion** and cliff collapse.
- Hard engineering in some places has prevented **transport**, making erosion worse in other places.

Changes caused

- Some parts are undergoing **coastal retreat** at a rate of nearly 2 m/year.
- Farmland, property and settlements have been lost to the sea, changing the landscape permanently.

Is the coastal landscape you have studied concordant or discordant? (See page 7 for definitions.)



The Holderness coast

Worked example

Using **one** named example, explain **two** ways in which human processes and physical processes have worked together to change a coastal landscape. **(4 marks)**

On the Holderness coast in East Yorkshire, hard engineering methods including rip rap and groynes have slowed down the rate of coastal erosion and cliff collapse, which would otherwise have been fairly rapid. However, the rip rap and groynes in some places, such as Mappleton, have prevented the transport of material further along the coast, leaving other areas more exposed to erosion by the sea than they would have been and therefore speeding up the rate of coastal retreat.

This is a good answer because it refers to **both** coastal erosion **and** the way people have tried to prevent it happening.

Now try this

Explain the most important factors that have changed a named coastal landscape. **(4 marks)**

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Physical processes 1

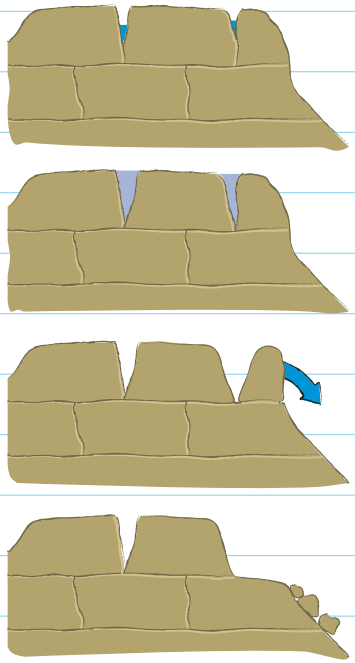
Two of the physical processes that shape a river landscape are weathering and mass movement.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Weathering processes

Weathering is the wearing away in situ of the river valley sides. There are three weathering processes common to river valleys.

1 Mechanical (freeze–thaw)



Water fills a crack or joint in the rock.

Water freezes and the crack is widened.

Repeated freeze–thaw action increases the size of the crack until the block of rock breaks off.

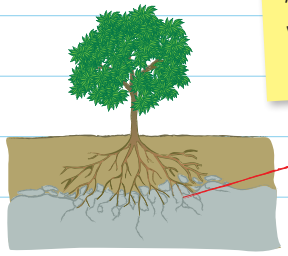
Loose blocks of rock are called **scree**.

2 Chemical (acid rain)

Rainwater is slightly acidic. The acid reacts with minerals in the rocks and dissolves them. For example, granite contains feldspar, which is converted into soft clay minerals as a result of a chemical reaction with water.

3 Biological

Acids released by vegetation speed up chemical weathering.



Roots grow into cracks and split rocks apart.

Mass movement

Over time the sides of a river valley become less steep as material is moved from the top to the bottom.

1 Sliding – where rock, weathered or eroded material or earth moves down a slope. Gravity pulls the weakened material quickly downwards.

2 Slumping – where the river erodes the bottom of the valley slope, making it steeper. Material above slides downwards, particularly if it is saturated with rainwater.

Worked example

Explain how mechanical weathering can affect river valleys. **(3 marks)**

When it rains, water falls into cracks in the rock and freezes when the temperature drops below zero. This causes the water to expand and put pressure on the surrounding rock. The repeated process of freezing and melting over time causes fragments of rock to break off and can lead to rock falls, steepening the valley sides and forming scree slopes.

The command word here is **explain**. Make sure that you give the **reasons** for how the process will cause change.

Now try this

Mass movement can occur in river valleys. Explain **one** process of mass movement. **(3 marks)**

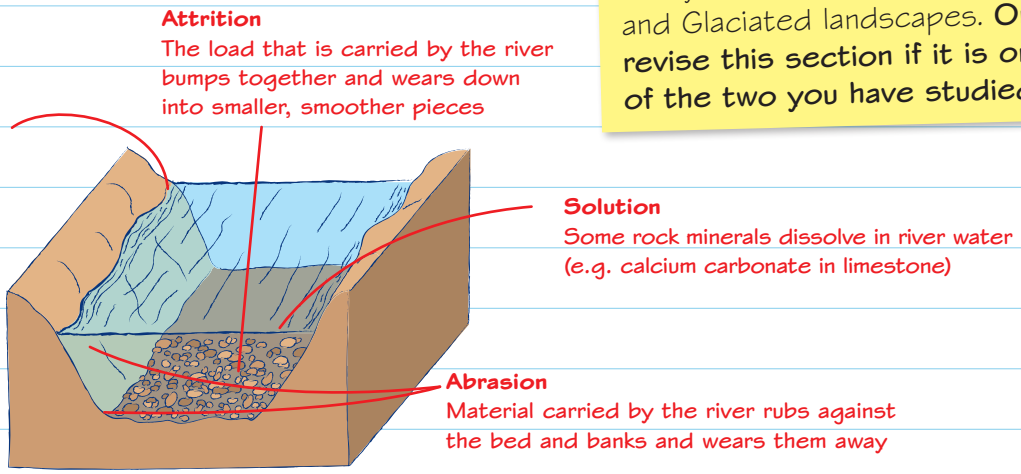
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Physical processes 2

Erosion, transport and deposition are also physical processes that shape a river landscape.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Erosion



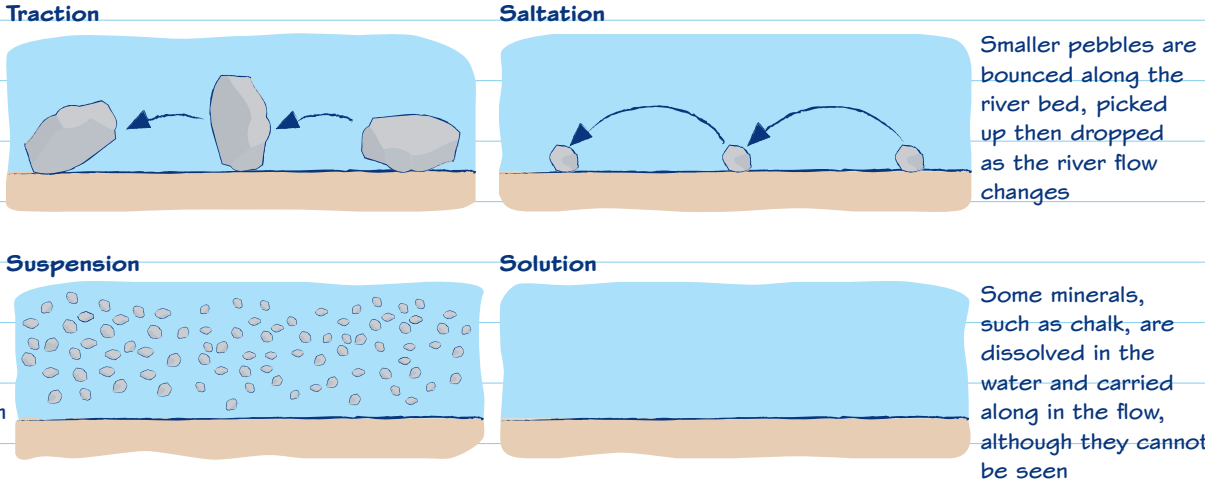
Transport and deposition

Transport is the way in which the river carries eroded material or load.

There are four main types of transportation: **traction**, **saltation**, **suspension** and **solution**.

When the river slows down it loses energy and may drop some of its load. This is called **deposition**.

See page 19 for depositional features.



Worked example

Explain how a river will transport eroded material. **(2 marks)**

One way a river can transport eroded material is through traction. This is where the river's flow rolls large boulders along the river bed.

When you are asked about a specific process, remember to give the name of the process.

Now try this

Compare the processes of hydraulic action and attrition. **(4 marks)**

When **comparing**, make sure you include both similarities and differences between your key words. You can use the word 'whereas' to make it clear you are answering the question.

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River valley changes

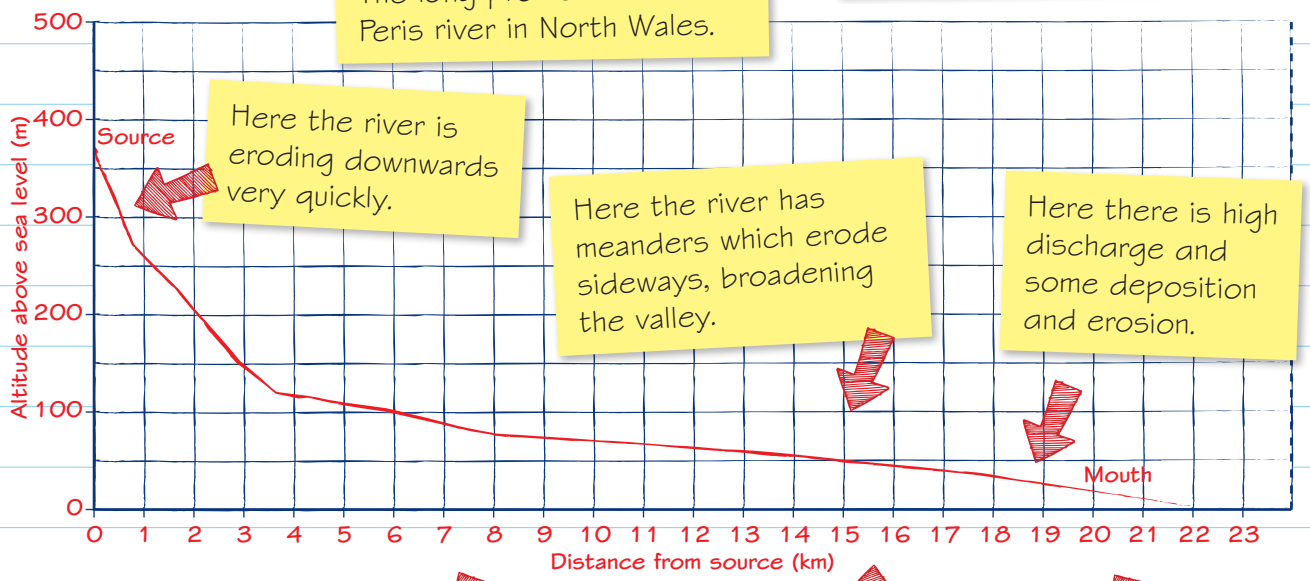
Rivers, and the valleys they flow in, change in different ways between their source (where they start) and their mouth (where they join the sea).

Only revise this section if you studied River landscapes.

River profile

A river's long profile shows the height and distance downstream from the river's source to its mouth. It is a curved shape, steeper near the source and flatter near the mouth.

You will need to know how one named UK river changes between its upper, middle and lower course.



	Upper course	Middle course	Lower course
Gradient	steep	less steep	shallow gradient
Discharge	small	large	very large
Depth	shallow	deeper	deep
Channel shape	narrow, steep sides	flat, steep sides	flat floor, gently sloping sides
Velocity	quite fast	fast	very fast
Valley profile	steep sides	flat with steep sides	flat with gently sloping sides
Features	waterfalls, interlocking spurs	meanders, floodplain	meanders, floodplain, levées, ox-bow lakes
Sediment size and shape	angular boulders	more rounded rocks	smooth, rounded pebbles

Worked example

Explain **one** difference between the shape of a river valley in its upper and lower course. **(2 marks)**

In the upper course the river valley has steep sides due to the river eroding downwards, whereas in the lower course the valley is flatter, with gently sloping sides, as the river erodes horizontally.

Now try this

When a question asks for a named river, write about the river you have studied.

For a named UK river, explain how the characteristics change from its upper to its lower course. **(6 marks)**

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Weather and climate challenges

The UK's weather and climate have an effect on river processes, causing changes to landforms and landscapes.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Impact of climate on rivers

Impact of climate on river landforms and landscapes

Erosion rate will be higher with greater discharge, so rivers in wet climates will erode more material than those in dry climates, widening and deepening river valleys and increasing the amount of eroded sediment.

Transport rate will be greater where the energy of the water is greater, so rivers in wet climates will transport more material than those in dry climates.

Amount of discharge is affected by climate. Wetter climates mean greater discharge. Hotter temperatures mean greater evaporation so less discharge. The greater the discharge, the higher the velocity of the river.

Weathering of rocks will be greater in some climates: for example, freeze–thaw weathering increases where temperatures range from just above to just below freezing.

Changing weather

The UK has experienced some extreme weather in recent years. This can increase the risk of river flooding due to:

- **increasing frequency of storms** – more periods of heavy, intense rainfall meaning more water flowing into rivers, which then overflow
- **increasing periods of hot, dry weather** – bakes the upper soil so when it does rain the water runs off the surface, it can't soak in, reaching rivers and rapidly increasing discharge
- **soil becoming impermeable during cold conditions** – snowmelt cannot infiltrate and flows rapidly into rivers, increasing flood risk.

Worked example

Remember for an **explain** question you need to say **why** something occurs.

Explain the impact that storms can have on river landforms. **(4 marks)**

Storms can cause a sudden increase in river discharge and velocity. This increases the rate of erosion and sediment transport and means that landforms (for example, river valleys) will be widened and deepened by increased hydraulic action and abrasion. The river can flood and sediment is deposited on the floodplain. This raises the height of the floodplain and the levées, which are immediately parallel to the river.

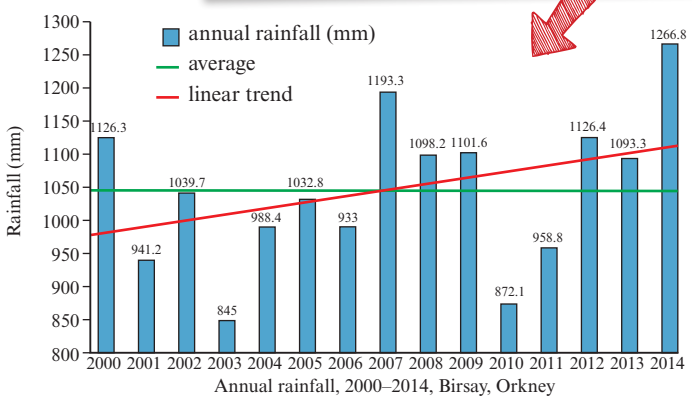
Now try this

Remember to be very accurate when reading information from graphs.

Study the annual rainfall graph for Birsay.

1 Which year had the highest rainfall? **(1 mark)**

2 Suggest **one** impact this high rainfall might have on the discharge of rivers in the area. **(2 marks)**



Annual rainfall, 2000–2014, Birsay, Orkney

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Upper course landscape

Interlocking spurs, waterfalls, gorges and river cliffs are formed by erosion processes and the influence of geology in the upper course of the river.

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Landforms

In the upper course, the river erodes vertically (downwards). The **gradient** is steep and the **channel** is narrow.

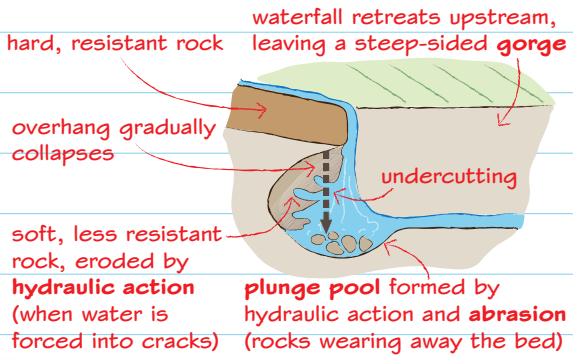
Interlocking spurs

The river at its source is small and has limited energy. It flows naturally from side to side, around ridges in the valley sides, called spurs. The spurs become interlocking with those on the other side of the valley.



Waterfalls

Waterfalls are a common feature in the upper course of a river, where there is an increase in vertical erosion. They form where there is a layer of hard, resistant rock (the cap rock) overlying a softer, less resistant rock.



Gorges

Over a long time, the process of undercutting and collapse is repeated, and the waterfall retreats, forming a steep-sided gorge.

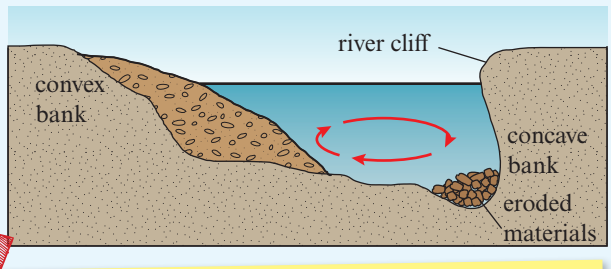


Avon Gorge

Worked example

Look at the diagram opposite.
Explain how river cliffs form. **(2 marks)**

River cliffs form on the outer side of the meander, when the faster water velocity laterally erodes the riverbank. They are usually almost vertical.



Look carefully at any resource that you are given.

Now try this

Examine how physical processes work together to form the waterfalls shown on the map extract. **(8 marks)**

Remember to provide a well-balanced answer with explanations of physical processes and use relevant geographical terms.



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Lower course landscape 1

Depositional processes in the lower course of the river produce distinctive landforms – **floodplains, levées** and **point bars.**

In this component you must study **two** of Coastal, River and Glaciated landscapes. **Only revise this section if it is one of the two you have studied.**

Floodplains

A floodplain is the wide, flat area of land either side of a river and experiences floods when the river tops its banks.

In the lower course, the river is nearing the sea and carries a huge amount of sediment (**alluvium**).

↓

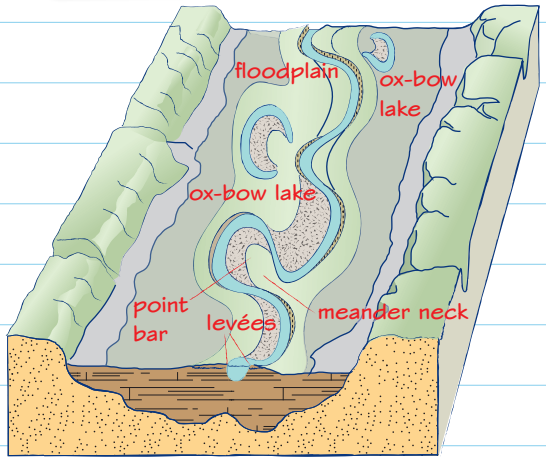
When the river floods, excess water spills over the surrounding area.

↓

During flooding, the **velocity** of the river is reduced, it loses energy, and deposits sediment, forming the floodplain.

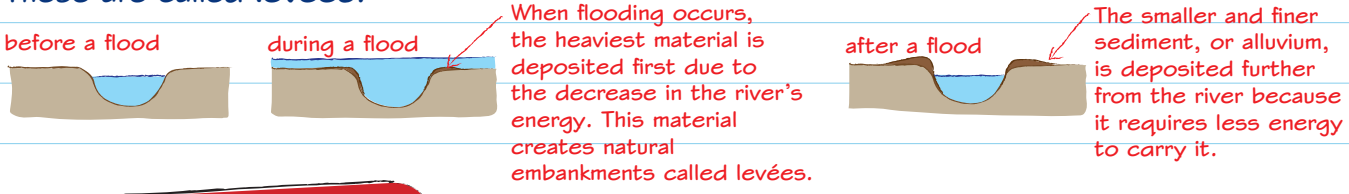
↓

The floodplain is shaped by the **lateral** erosion of meanders as they gradually migrate downstream and by deposition of material on the inner bends.



How levées develop

The **deposition** process, which takes place during flooding, continues until eventually embankments, made of larger, heavier sediment, are created beside the river. These are called **levées.**



Worked example

Study the photo opposite.

a Name the landform X. **(1 mark)**

Point bar

b Explain how this landform formed. **(3 marks)**

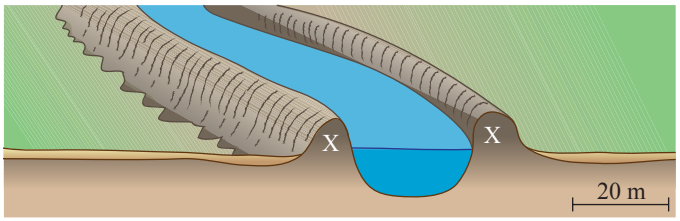
Point bars are formed by deposition. On the inside bends of meanders, the river current is relatively slow and therefore low energy. This means that the river is not able to transport its load due to low velocity and the load is deposited on the inside bend. Over time the deposits of sand, silt and pebbles build up to form a point bar.



Sketching river landforms from photographs will help you to recognise them.

Now try this

Study the cross-section diagram, which shows a river landform. Explain how landform X formed. **(3 marks)**



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Lower course landscape 2

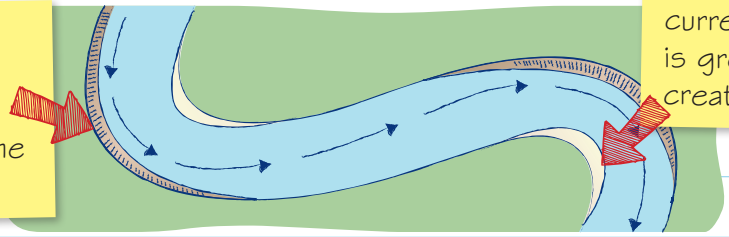
Meanders and ox-bow lakes are landforms created by the interaction of deposition and erosion processes in the middle and lower courses of a river.

Only revise this section if you studied River landscapes.

Meanders

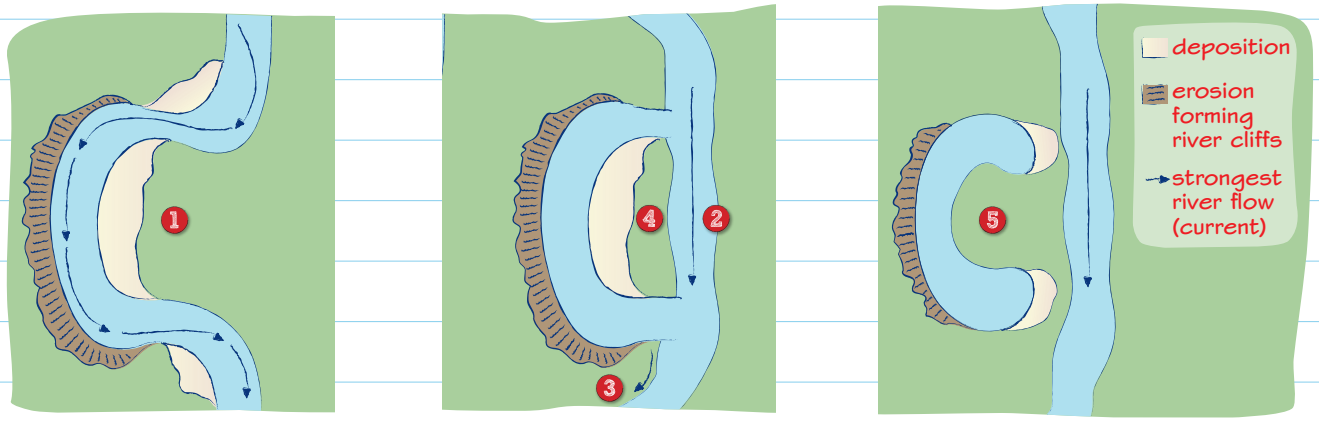
In the middle course, the **width**, **depth** and **velocity** of the river all increase. The river erodes laterally (sideways) and starts to form large bends. The bends get bigger and wider, and eventually develop into a horseshoe shape called a **meander**.

On the outer bend of a meander, where the current is faster, there is greater **erosion**. This wears away the bank creating a **river cliff**.



On the inner bend of a meander, where the current is slower, there is greater deposition, creating a **point bar**.

Ox-bow lakes



1. Narrow neck of meander is gradually being eroded.
2. Water now takes the quickest route.
3. Deposition takes place, sealing off the old meander.
4. Meander neck has been cut through completely.
5. **Ox-bow lake** left behind when meander completely cut off.

Worked example

Identify the river landform shown at grid square 3109 on the map.

- ☐ **A** Waterfall
- ☐ **B** Ox-bow lake
- ☒ **C** Meander
- ☐ **D** Levée

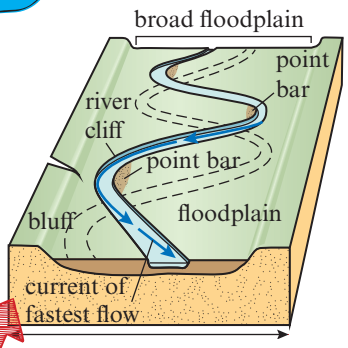
(1 mark)



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Now try this

Using this floodplain diagram, examine how the interaction of processes causes the formation of a meander. **(8 marks)**



Make sure you don't just describe the processes, but say how they **interact**.