THE DUSTON SCHOOL 4-19

Knowledge Organiser World Studies

Coastal processes change and conflict

EQ2: *Processes and human modification*

Name:

Class Teacher:

Big Question	Task	Due Date
1	Landform annotations	
Previous content	Recall quiz	
2-4	Exam style questions	

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Exam structure & Case Studies

Paper 1: Global Geographical Issues (37.5%)

- ❑ Topic 1: Hazardous Earth
- ❑ Topic 2: Development dynamics
- ❑ Topic 3: Challenges of an urbanising world

Written examination: 1 hour and 30 minutes, 94 marks.

Answer all questions

Paper 2: UK Geographical Issues (37.5%)

- ❑ Topic 4: The UK's evolving physical landscape
- ❑ Topic 5: The UK's evolving human landscape
- ❑ Topic 6: Geographical investigations

Written examination: 1 hour and 30 minutes, 94 marks.

Answer all questions in Topic 4 and 5

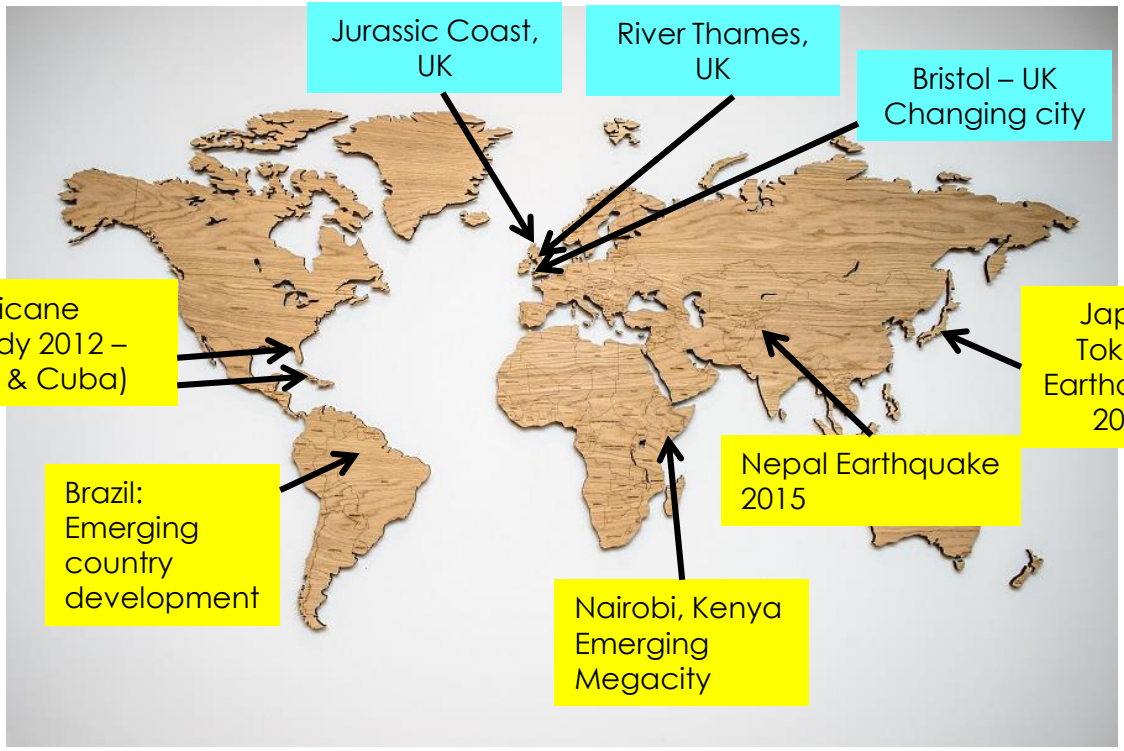
Topic 6: Answer Q 8 & Q10

Paper 3: People and Environment Issues – Making Geographical Decisions (25%)

- ❑ Topic 7: People and the biosphere
- ❑ Topic 8: Forests under threat
- ❑ Topic 9: Consuming energy resources

Written examination, 1 hour and 30 minutes, 64 marks.

Answer all questions



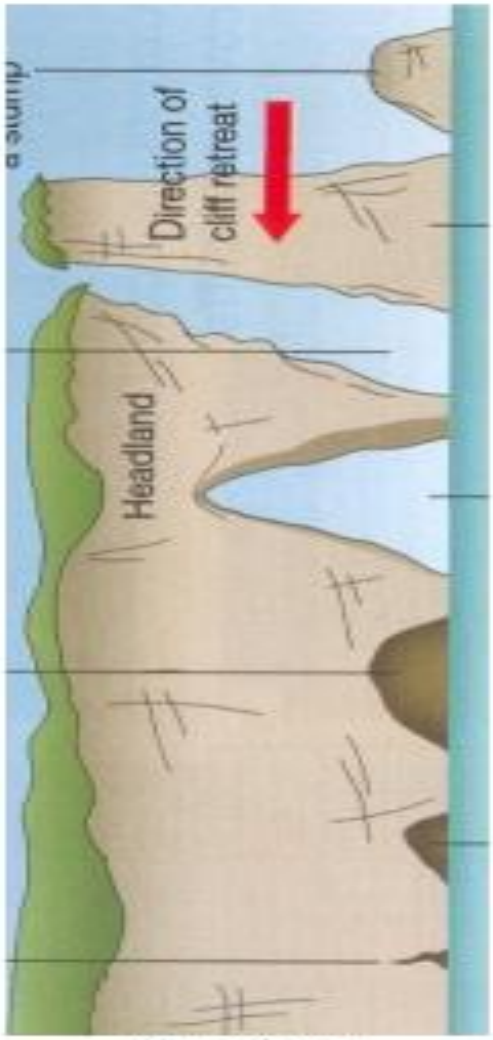
How to answer different types of questions

Command word	Tariff	Meaning	Structure
Assess	8	**Make an informed judgement** Use evidence to determine the relative significance of something. Give consideration to all factors and identify which are the most important	PEECE! **x3** **P**oint **E**xplanation **E**vidence **C**ounter-argue **E**valuation/Link
Compare	2 or 3	Find the similarities and or the difference of two elements	PEE
Describe	2-4	Give an account of the main characteristics of something or the steps in a process	
Define	1	Give the meaning of a term	P
Evaluate	8	Measuring the value or success of something and project a judgement e.g. strengths and weaknesses	PEECE! **x 3**
Explain	2-4	Provide a reasoned response of how or why something occurs **e.g.** *shield volcanoes are less steep* ***because*** *the lava is hot and runny* ***leading to*** *it spreading further,* ***therefore*** *forming shallow sided volcanoes.*	BLT **B**ecause **L**eading to **T**herefore
Identify / State / Name	1	Recall or select one or more pieces of information	P
Select …. And Justify	12	Select one option from those given and justify the choice using the resources provided and own knowledge/ understanding.	**DOTFARTS** (6 to 8) **D**ata (booklet) **O**wn knowledge **T**wo thirds option 1 **F**or (4) Eco/Env/So **A**gainst (1) **R**easons not 2/3 **T**ie (conclusion) **S**PAG
Suggest	2-4	Provide a reasoned response of how or why something occurs with a justification	BLT

Homework 1

Homework 1: Complete the following tasks: (Use pages 9 and 10 to help you)

Annotate around the diagrams to explain how they are formed – remember to add key terms and include which erosion types are present and number each stage



Caves, arches, stacks and stumps

Homework 1

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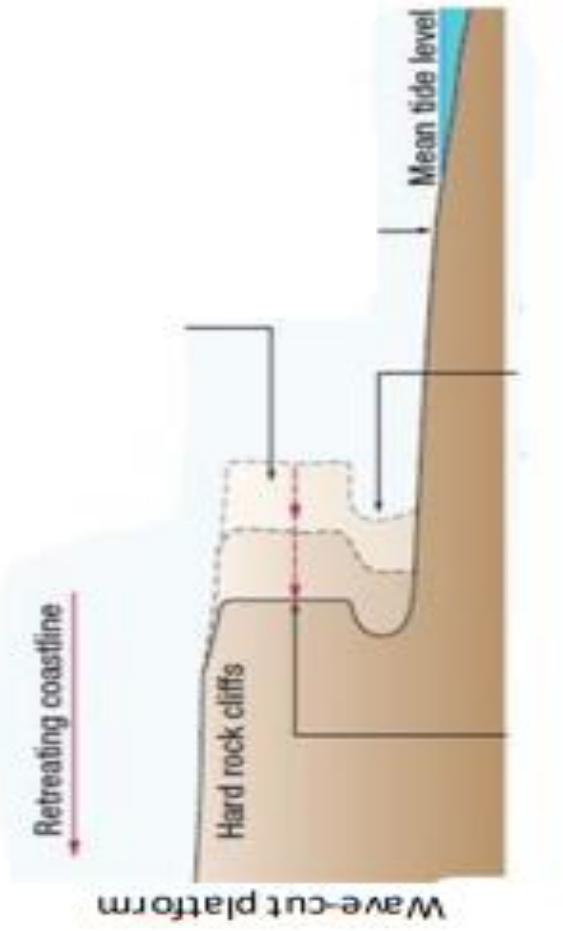

Homework 2

Total: /14

Homework 1: Answer the following questions and revise the answers. Answers are provided at the back of the KO to support you with this task. You will be tested on these in lesson.

On what type of coastline do headlands and bays form? (1)

……

What type of headland does the geology run parallel to the coast? (1)

……

What type of climate does the UK have? (1)

……

How does the UK's weather affect rates of erosion? (1)

……

Give two examples of igneous rocks (2)

……

Give two examples of metamorphic rocks (2)

……

Explain how sedimentary rocks are formed (2)

……

……

……

……

Name the term - the movement of material downslope due to gravity (1)

……

Name the term - the process of wearing away rock through the movement of water (1)

……

Name the term - the process of breaking/wearing away rocks through chemical, mechanical and biological activity (1)

……

What type of valley is shaped by a river? (1)

……

Homework 3

Homework 2: Exam Questions

Explain the difference between concordant and discordant coastlines. You may use a diagram to help your answer. (4)

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Explain the process of longshore drift (4)

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Explain one reason why some coastlines are protected whilst others are not (4)

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Lesson 1 Big Question: How do coastal processes and geology interact to form distinctive coastal landscapes?

Geological Structure & Rock Type

The coast can be defined as the meeting point between the land and sea
Coastal processes are divided into two parts:

- **Marine** processes: **Offshore** (water-based)
- **Terrestrial** processes: **Onshore** (land-based)

These processes are further divided into:

- Wave action
- Erosion
- Transportation
- Weathering
- Mass movement

Together with the local geology, these processes produce distinctive landforms around the coastline
A coastline made up of softer rocks such as sands and clays will be easily eroded by destructive waves to form low, flat landscapes such as bays and beaches
Coastlines of more resistant, harder rock will take longer to erode and produce rugged landscapes such as headlands
Joints and **faults** expose rock to erosion and weathering
The differences between hard and soft rocks will also impact the shape and characteristics of cliffs

The Effects of Rock Type on the Coastline

	Hard Rock	Soft Rock
Shape of cliff	High and steep	Generally lower and less steep
Cliff face	Bare rock and rugged	Smoother; evidence of slumping
Foot of cliff	Boulders and rocks	Few rocks; some sand and mud

Concordant coastlines are made up of the **same rock type, running parallel** to the sea, these coastlines produce coves
Discordant coastlines have **alternating bands** of **rock perpendicular** to the sea, these types of coastlines form headlands and bays
Geology, therefore, shapes the coastline vertically through the height and profile of a cliff and horizontally with bays and headlands

Lesson 1 Big Question: How do coastal processes and geology interact to form distinctive coastal landscapes?

Exam Tip
Make sure you know the difference between the four types of erosion, particularly between abrasion (corrasion) and attrition. So many students confuse these two terms. A tip for you, is to think of abrasion as rubbing with sandpaper or maybe you have grazed your knees or elbows when you fell off your bike/skateboard? Those grazes were abrasions on your knees/elbows etc.

Erosional Landforms

Types of erosion
Destructive waves are responsible for the majority of erosion that happens along a coast
They cut into the coastline in four ways:

- **Hydraulic Action**
- **Attrition**
- **Corrosion**
- **Abrasion**

The effects of attrition are enhanced when the waves move sediment further and longer

A large, rough bolder is eventually eroded into round sand grains (quartz) the longer it stays in the water and the further it travels along the coast
Rounded pebbles on a beach are known as a shingle

Headlands and bays

Occur where there are alternating bands of hard and soft rocks
run **perpendicular** to oncoming waves (**discordant** coastline). At first, the soft rock (e.g. clay) is eroded backward, forming an inlet. As the inlet continues to erode it curves inwards, and a **bay** is formed, usually with a beach The hard rock (e.g. limestone) is left protruding out to sea as a **headland**

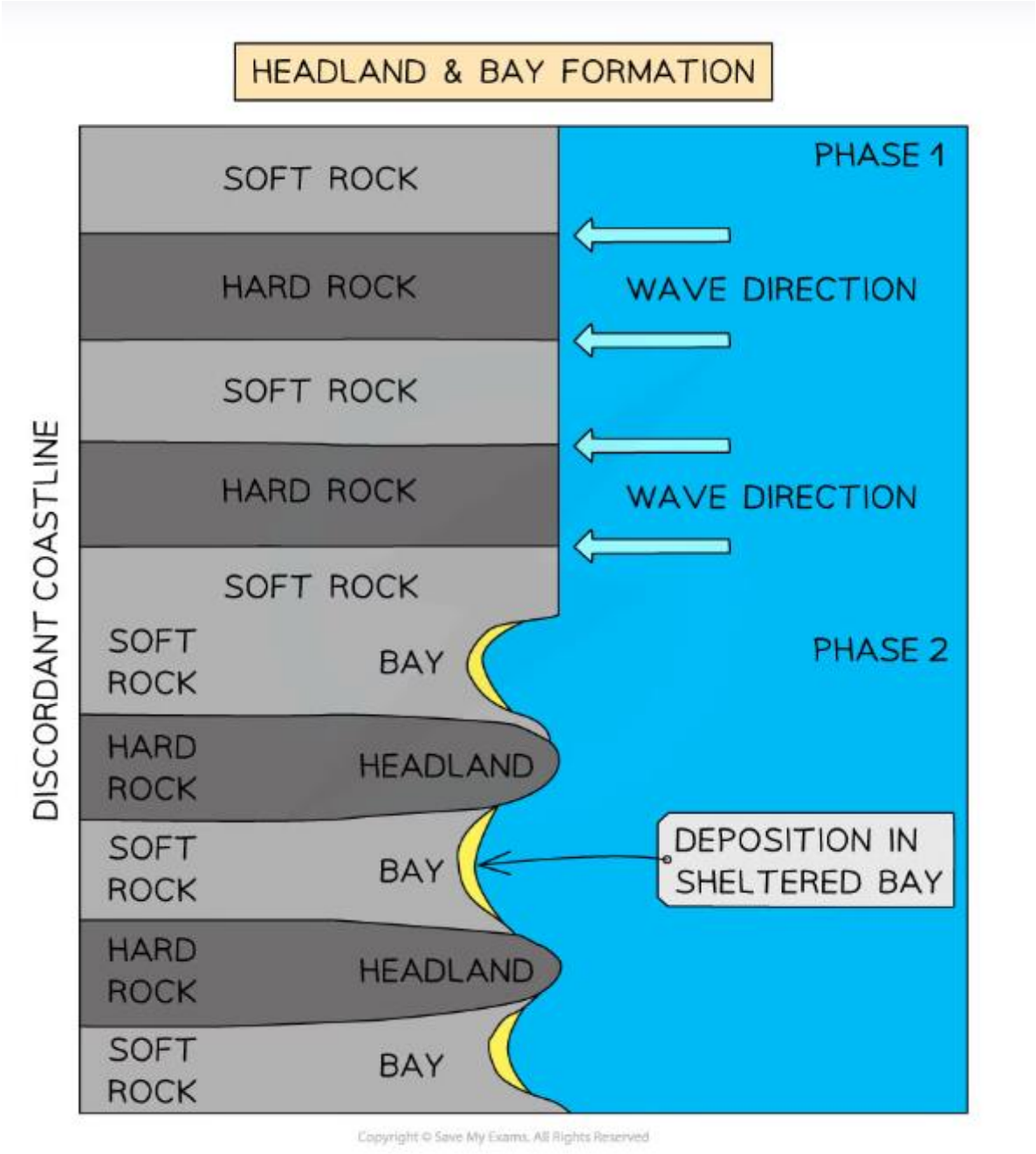
A headland usually features:

- Cliffs along its sides
- Projects out to sea
- Usually longer than it is wide
- Geology is of resistant rock

A bay usually has:

- A wide, open entrance from the sea
- A roughly, semi-circular shape extending into the coastline
- Land that is lower than the headlands surrounding it
- A bay may or may not have a beach

Lesson 1 Big Question: How do coastal processes and geology interact to form distinctive coastal landscapes?



The formation of headlands and bays on discordant coastlines

Lesson 1 Big Question: How do coastal processes and geology interact to form distinctive coastal landscapes?

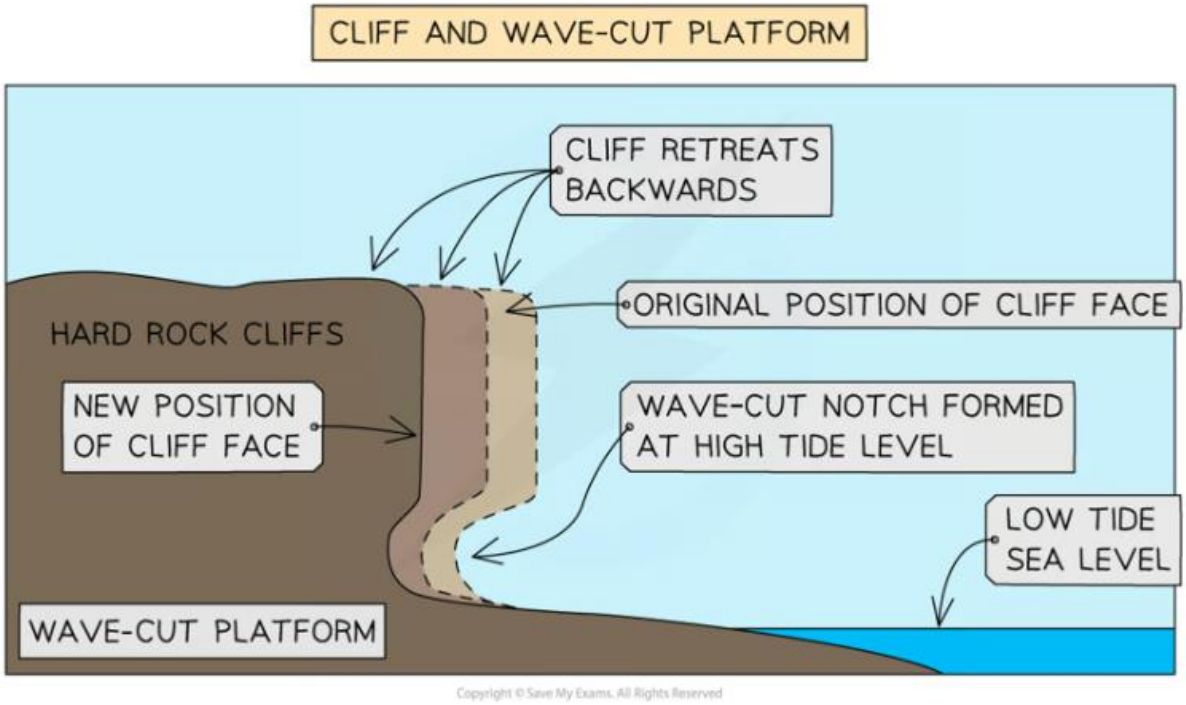
The formation of headlands and bays on discordant coastlines

Cliffs and wave-cut platforms

- Cliffs are shaped through erosion and weathering processes
- Soft rock erodes quickly and will form sloping cliff faces
- Steep cliffs are formed where there is hard rock facing the sea

A wave-cut platform is a wide gently sloped surface found at the foot of a cliff:

- As the sea attacks the base of a cliff between the high and low water mark, a **wave-cut notch** is formed
- Abrasion, corrosion and hydraulic action further extend the notch back into the cliff
- The undercutting of the cliff leads to instability and collapse of the cliff
- The backwash of the waves, carries away the eroded material, leaving behind a **wave-cut platform**
- The process repeats and the cliff continues to retreat, leading to a coastal retreat

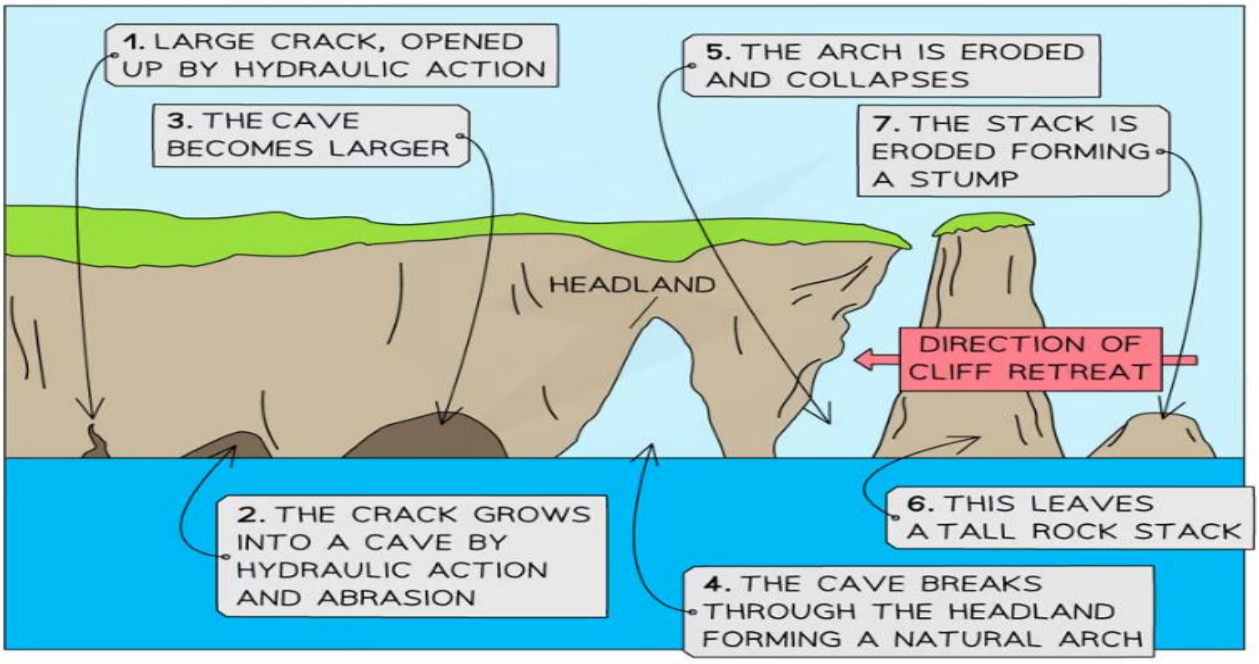


The process of cliff retreat and wave-cut platform formation

Lesson 1 Big Question: How do coastal processes and geology interact to form distinctive coastal landscapes?

Caves, arches, and stacks

1. These form in a headland because of wave action and sub-aerial weathering
2. As waves approach the shore, their speed is reduced as they move along the sea floor
3. This changes the angle of the waves, and they will turn so the crest becomes parallel to the coast - known as **wave refraction**
4. This refraction concentrates erosive action on all sides of the headland
5. The erosional processes of hydraulic power, abrasion and some corrosion begin to attack any weaknesses in the headland
6. As the **crack** begins to widen, abrasion will begin to wear away at the forming **cave**
7. The cave will become larger and eventually breaks through the headland to form an **arch**
8. The base of the arch continually becomes wider and thinner through erosion below and weathering from above
9. Eventually, the roof of the arch collapses, leaving behind an isolated column of rock called a **stack**
10. The stack is **undercut** at the base by wave action and sub-aerial weathering above, until it collapses to form a **stump**

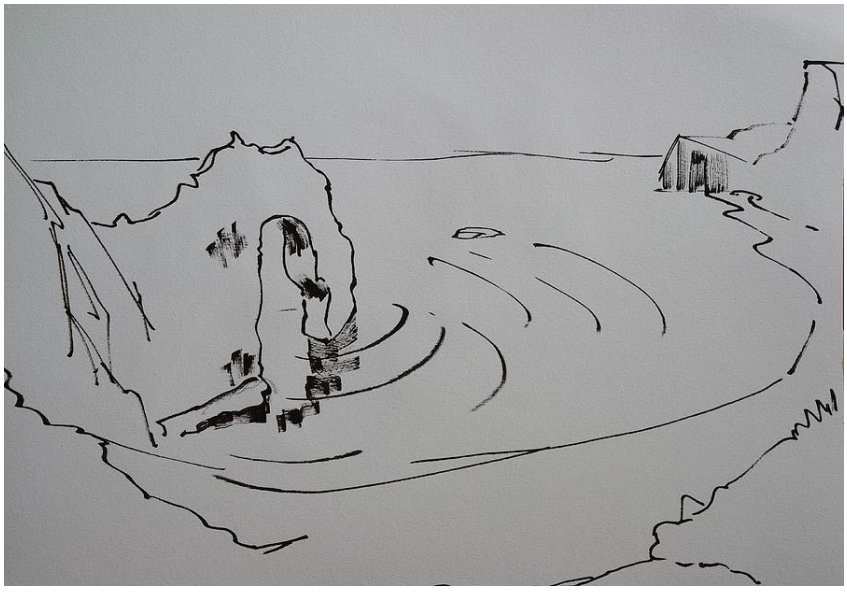


The formation of a cave, arch, stack and stump

Lesson 1 Big Question: How do coastal processes and geology interact to form distinctive coastal landscapes?

Exam Tip

1. Make sure that you can draw and annotate the formation of a cave, arch, stack and stump as it is a popular question in the exams.
2. Remember that attrition is **not** part of the formation of this feature; attrition is the knocking together of rocks to smooth and round them.
3. Solution is an active part of the formation of these features, as all salt water is slightly acidic and most rock contains some soluble minerals that will react with the salt water.
4. Sub-aerial weathering (from above) also contributes to the collapse of the arch and stack.

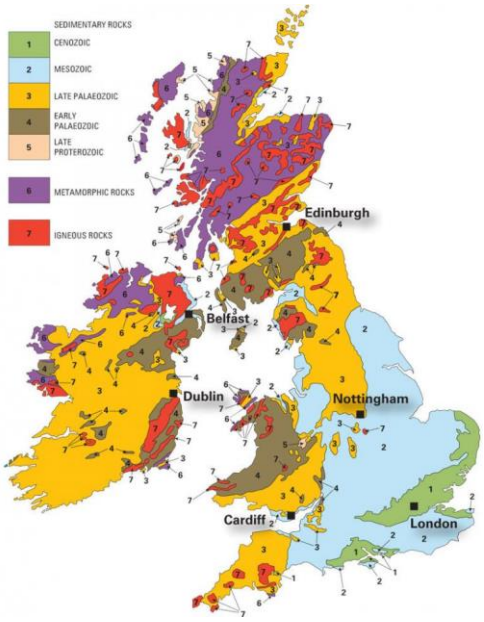


Lesson 2 Big Question: How do coastal and marine processes interact and contribute towards coastal retreat ?

Coastal retreat

Various factors affect how quickly coastlines retreat. Coastal retreat describes how quickly a coastline is moving inland. Geology has a particularly significant effect on how coastlines change.

Geology – rock type, characteristics and structure (e.g. Concordant and discordant coastlines)



The British Geological Survey map shows the geology of the UK. The geology of the UK is renowned for its diversity.

1. Igneous rocks can be found mainly in upland areas in Scotland, in the Lake District in North West England and Snowdonia in North Wales and Northern Ireland.

2. Metamorphic rocks are found in Northern Ireland and Scotland.

3. Sedimentary rocks are widely found across lowland areas of England.

Retreat is also a consequence of human, physical, and sub-aerial factors, further influenced by short and long-term factors. It is important to understand coastal retreat and the factors that influence it, then we can see how coastal retreat can be managed to avoid adverse effects on both society and the environment.

Coastal retreat describes how quickly a coastline is moving inland.

Lesson 2 Big Question: How do coastal and marine processes interact and contribute towards coastal retreat ?

Impact of UK climate on coastal erosion

The UK's climate impacts coastal erosion in the following ways:
- The UK **seasons** affect the rate of weathering and erosion
- Cold temperatures lead to freeze-thaw weathering on cliff faces, increasing rock falls
- Winds are stronger in winter than in summer and stronger winds give energy to waves

Prevailing winds in the UK are from the south-west
- This brings frequent rainfall and increases the rate of weathering

Storm frequency is high in many areas of the UK
- Coasts are exposed to strong winds which increases destructive wave power
- Rainfall is heavily leading to flooding and increases in the mass movement

Wave Types & Characteristics

Wave action

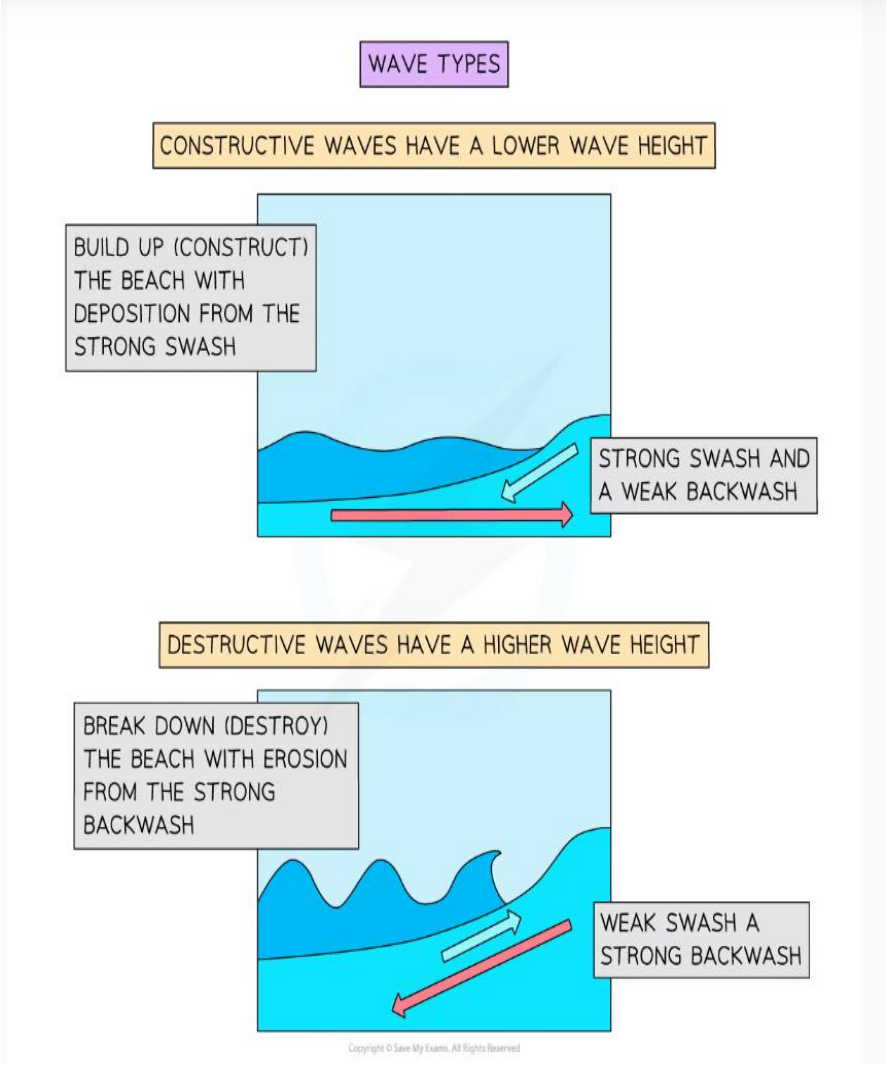
Waves are marine processes that erode, transport and deposit material. Waves are formed as winds blow over the surface of the sea. The height and strength of a wave is dependent on 3 factors:

❑ The fetch
❑ The amount of time the wind blows
❑ The strength of the wind

The greater the strength, time and fetch of the wind, the larger the wave. As a wave enters the shallow water of the coast, friction from the seabed causes the wave to lean forward and eventually will crest and break onto the beach
The movement of water up the beach is called the **swash**, and the return movement is the **backwash**.

Destructive waves erode the beach:
- They have a short wavelength, high-frequency rate and a steep wave gradient
- Their backwash is stronger than their swash, which scours the beach, dragging material out to sea.

Lesson 2 Big Question: How do coastal and marine processes interact and contribute towards coastal retreat ?



Weathering

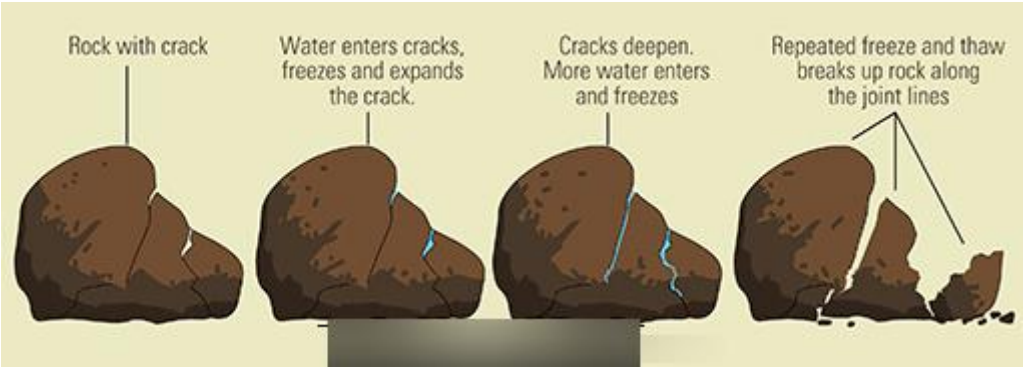
Weathering is best defined as: **The break-down of rock in-situ**

- Weathering **does not** involve the movement of the material; this is what makes it different from erosion
- **Sub-aerial** weathering describes coastal processes that are not linked to the action of the sea
- It includes freeze-thaw weathering (mechanical) and chemical weathering
- Weathering weakens cliffs and makes them more vulnerable to erosion

Lesson 2 Big Question: How do coastal and marine processes interact and contribute towards coastal retreat ?

Mechanical weathering physically breaks up rock. **Freeze-thaw or frost shattering** is where:

- Water gets into cracks and joints in the rock
- When the water freezes it expands and the cracks open a little wider
- When the water thaws, the crack contracts, releasing pressure on the crack
- Over time, repeated freezing and thawing, widens the crack until pieces of rock split off the rock face, whilst big boulders are broken into smaller rocks and gravel



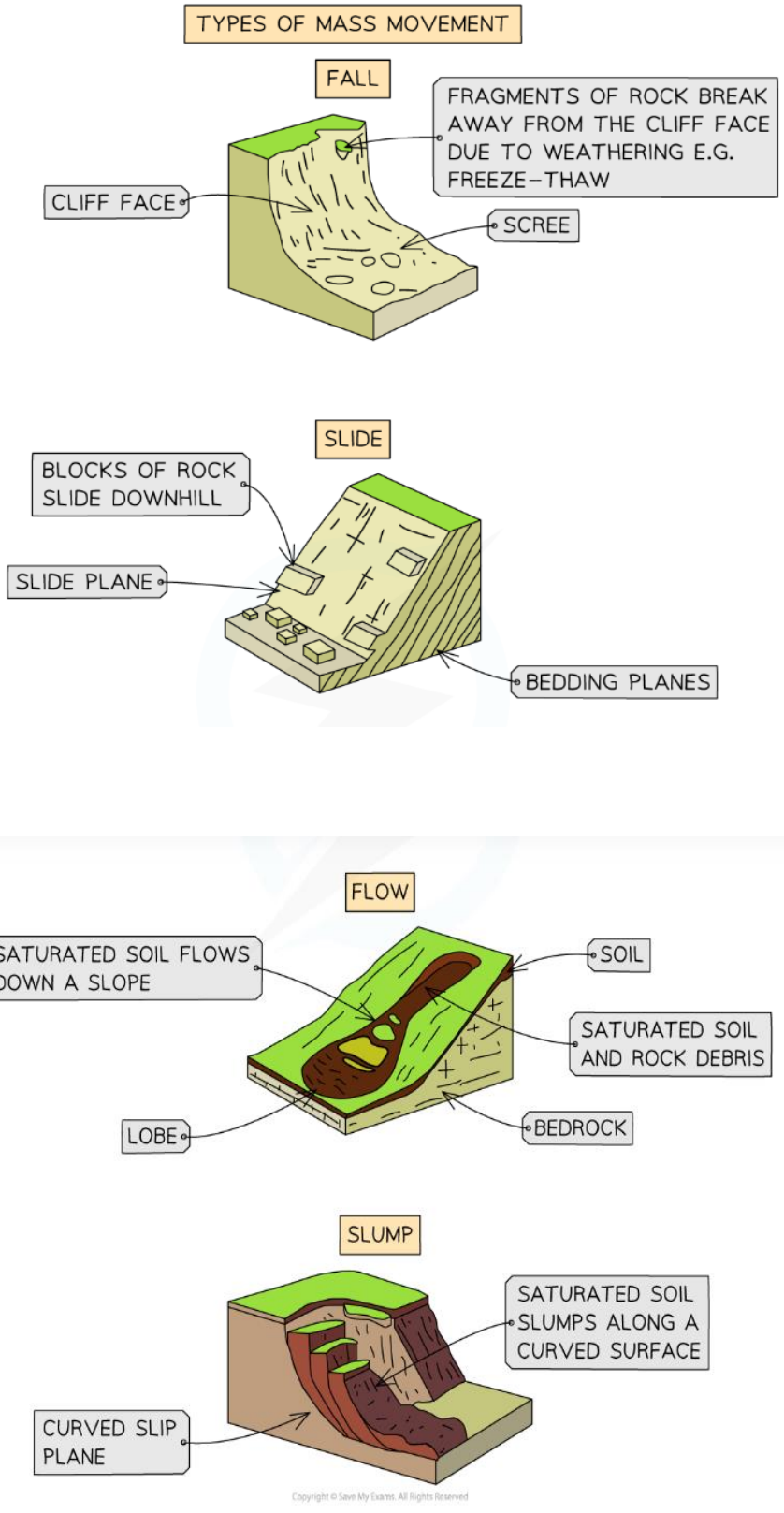
Chemical weathering occurs when rocks are broken down by a chemical process:

- Rainwater is slightly acidic through absorbing carbon dioxide from the atmosphere
- This reacts with minerals in the rock creating new material
- Rock-type affects the rate of weathering e.g. limestone chemically weathers faster than granite
- The warmer the temperature, the faster the chemical reaction

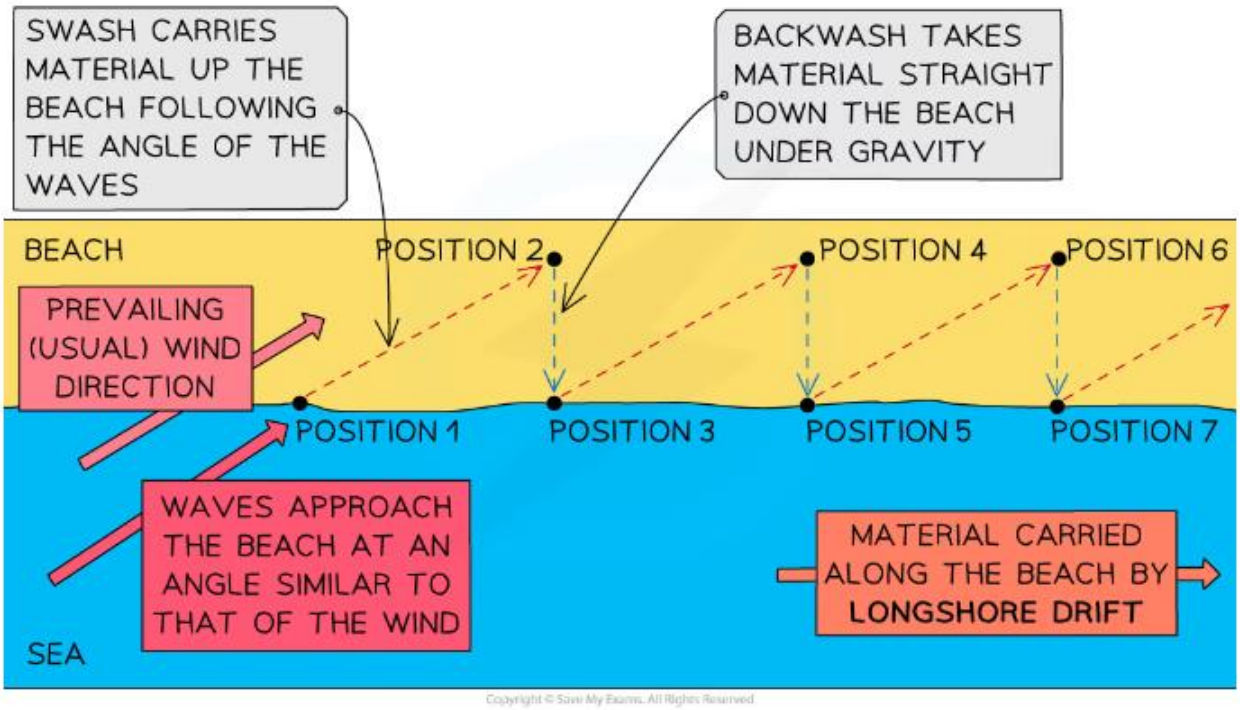
Biological weathering takes place when rocks are worn away by living organisms:

- Trees and other plants can grow within the cracks in a rock formation
    - As the roots grow bigger, they push open cracks in the rocks making them wider and deeper
    - Over time the growing tree eventually prizes the rock apart
- Burrowing animals, such as rabbits, disturb the ground above the burrow, which puts pressure on any cracks, eventually leading to pieces falling off the rock

Lesson 2 Big Question: How do coastal and marine processes interact and contribute towards coastal retreat ?



Lesson 3 Big Question: How does sediment transportation and deposition combine to form coastal landforms of deposition?



The process of longshore drift

Depositional Landforms

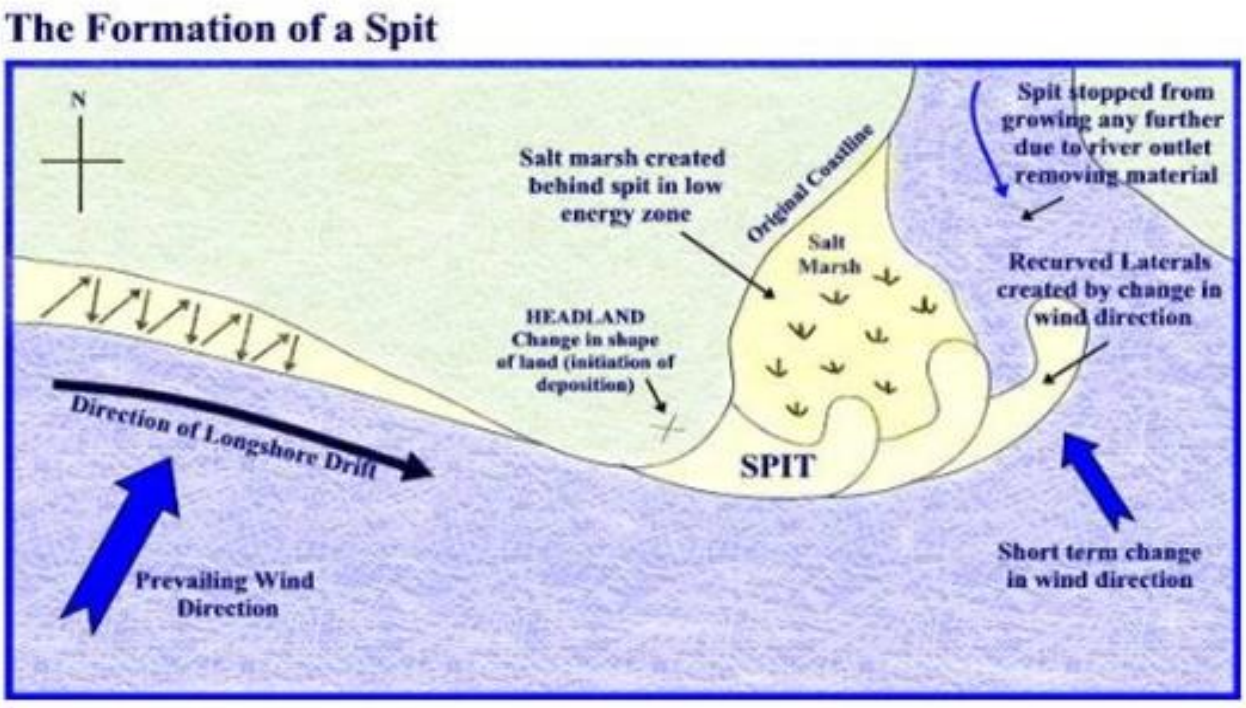
Deposition will happen when transported material is dropped from the sea water This occurs when the velocity (speed) of the water flow slows down. This means there is not enough force to hold/suspend the material in the water anymore, and it is dropped onto the ground

- Beaches are formed of sediment deposited in bays
- Saltmarshes and mudflats are formed in sheltered estuaries, usually behind spits

Beaches

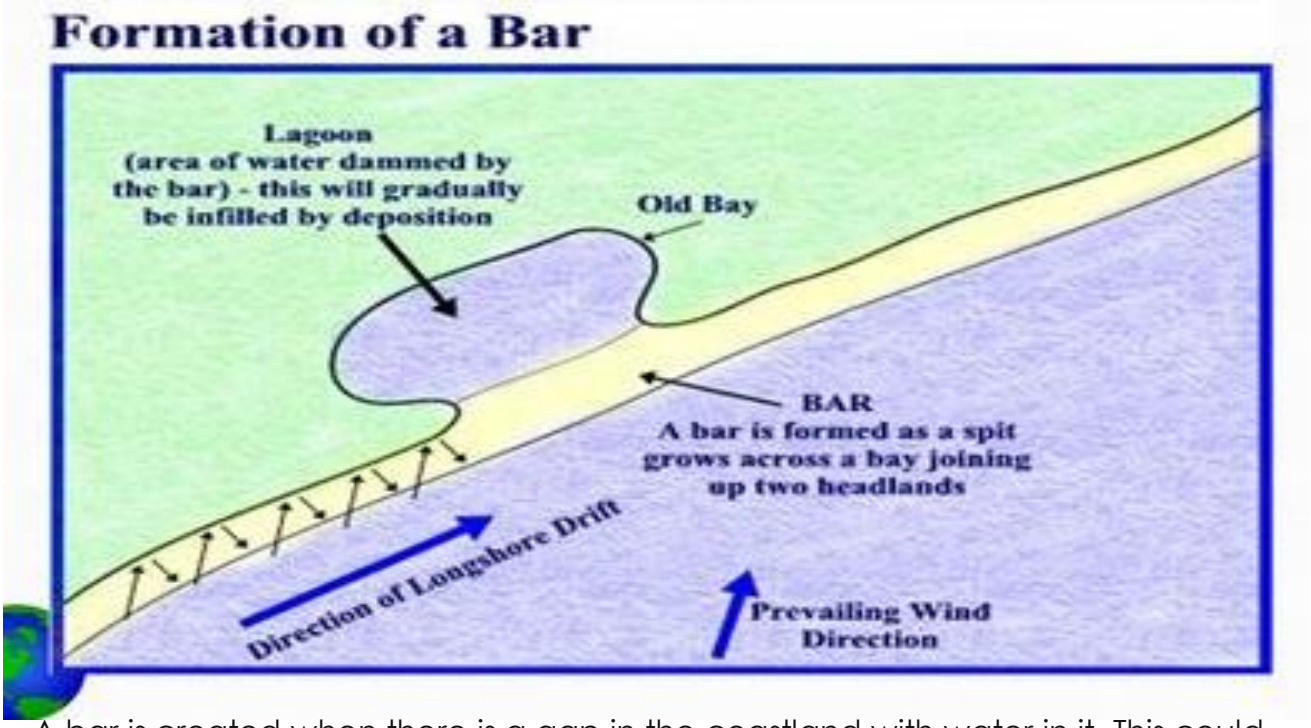
1. Beach formation usually occurs in the summer months when the weather is calmer
2. Form in sheltered areas such as bays through deposition via constructive wave movement, where the **swash** is stronger than the **backwash**
3. Blown sand can create sand dunes at the **backshore** of a beach
4. When a constructive wave carries sediment up the beach, the largest material is deposited along the upper reach of the swash
5. As the backwash moves back down the beach, it loses water and therefore energy as it travels due to the porosity of the sand
6. Consequently, the deposition of sediment gets progressively smaller, and the beach is therefore, sorted by wave deposition, with the smallest mud particles settling in the low-energy environment offshore
7. If a destructive wave forms due to a storm, then large shingle is thrown above the usual high tide level to form a ridge at the top of the beach called a **berm**

Lesson 3 Big Question: How does sediment transportation and deposition combine to form coastal landforms of deposition?



Spits are long ridges of sand and shingle with one end attached to the land and the other ending in the open sea. For example – Spurn Head on the Yorkshire coast. A spit will form when sand and shingle are carried along a coast by **longshore drift**. This is when waves approach a beach at an oblique angle, break and transport material up the beach but the backwash returns to sea at a right angle to the coast. Material is therefore gradually transported along the beach in the direction of the dominant wind. If there is a bay or a bend in the coastline, deposition of sand and shingle will continue to be deposited away from the coast in the open sea. This will build up in time to form a long ridge, a spit; sometimes winds and currents may curve the spit.

Lesson 3 Big Question: How does sediment transportation and deposition combine to form coastal landforms of deposition?



A bar is created when there is a gap in the coastland with water in it. This could be a bay or a natural hollow in the coastland. The process of longshore drift occurs and this carries material across the front of the bay.

Material is pushed up onto beaches at an 45 degree angle when the swash brings it onto the coastline. The backwash takes it back out towards the sea at a right angle to the coast. Through this process material is constantly moved along the coastline.

The deposited material eventually joins up with the other side of the bay and a strip of deposited material blocks off the water in the bay. The area behind the newly formed bar is known as a lagoon.

Lesson 4 Big Question: How do human activities affect coastal landscapes?

Human Activity & Coastal Landscapes

Many human activities take place on the coast. The effects of these may be:

- Direct or indirect
- Positive or negative

Activity	• Impact

Development	• Buildings on the coasts increase the weight pressure on cliffs
	• Coastal location increases the demand for housing
	• Buildings and tarmac affect the drainage patterns
	• Tourism leads to increased:
	  • Numbers of buildings: hotels, campsites, attractions
	  • Pollution as a result of more traffic, litter and waste
	  • Income for the local area
	  • Jobs

Agriculture	• Increased soil erosion • Clearance of trees and vegetation can lead to more surface run off and reduced coastal habitats • Farmland may be lost due to rising sea levels and coastal erosion
Industry	• It is uncommon for the industry to locate directly by the sea so the impact is less than for other activities and tends to be indirect • Nuclear power stations such as Sellafield and Hinkley Point are located by the coast • Concerns regarding radiation leaks such as at Fukushima in Japan • Gas terminals such as Easington in East Yorkshire can be vulnerable to coastal erosion

Coastal Management	• Humans manage coasts to reduce erosion and protect development/industry
	• Hard engineering includes groynes, sea walls, rip rap
	  • May reduce erosion at the site but may increase it down the coast
	  • Are often unattractive causing visual pollution
	• Soft engineering includes beach replenishment, cliff drainage, planting vegetation
	  • May reduce erosion
	  • Works with the environment

Lesson 4 Big Question: How do human activities affect coastal landscapes?

1. The effects of development

- ❑ **Housing:** Many people who work in London can no longer afford housing there, so many coastal towns and cities offer good alternatives for people who commute each day.
- ❑ **Office development:** High cost of city property- pushes companies to move out e.g. JP Morgan (investment bank) moved to Bournemouth.
- ❑ **Universities:** Both Brighton and Bournemouth are popular locations with younger populations as universities and companies expand there.

2. The effects of agriculture

Romney Marsh, Kent

- The price of farmland has risen sharply, from £2400 per hectare in 1995 to £30,000 in 2015.
- Farmers have to maximise their income by using whatever land they can.
- Climate change and rising sea levels are likely to lead to flooding by salt water during winter tides, which could threaten pastures.

3. The effects of industry

Bacton, Norfolk

- North sea gas is piped onshore at the terminal.
- It has created conflict between industry owners, residents, tourists and environmentalists.

Thames estuary

- Important for shipping and power stations supplying London
- Port Talbot steel works - crucial local employer

4. The effects of coastal management

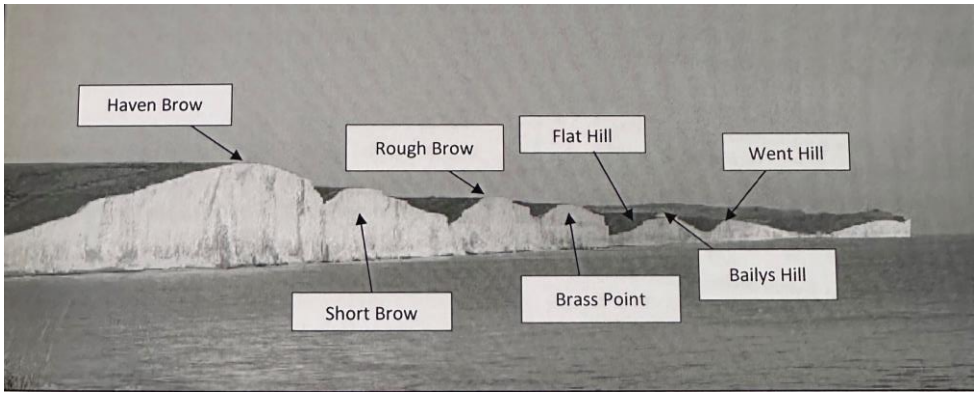
Locations have suffered greatly from erosion and unfortunately, coastal management is causing further problems.

Lesson 5 Big Question: How Does the interaction of physical and human processes cause change on a named coastal landscape?

Case study: The Jurassic Coast in Dorset

The Seven Sisters

The Seven Sisters is a distinctive section of coastline located in the South East of the UK between the towns of Eastbourne and Seaford in East Sussex. It consists of 280 hectares of white chalk cliffs that rise 80 meters above sea level. The coastline is particularly special due to its unique geology, biology and history of human settlement. The cliffs are called the Severn Sisters because there are seven cliffs. Each has a different name:



The cliffs were formed millions of years ago. At this time, sea levels were around 200 metres higher and the chalk rock was formed underwater through the build up of sea creature skeletons on the ocean floor. The wave like shape of the cliffs show that they are the remains of a dry valley which would have formed when the glaciers were melted at the end of the ice age.

The Seven sisters coastline is home to several landforms and is retreating at a rate of 50-60 centimetres a year. Landforms found along this stretch of coastline include wave cut platforms, as well as cave, arches, stacks and stumps.

Human influences on the Jurassic Coast

Humans are influencing and changing the shape of the Jurassic Coast all the time. The history and attractiveness of the coastline has made it both a popular place to live and a popular tourist destination. The main way that humans influence the Jurassic Coast and the geomorphic processes that affect it, is through coastal management.

Lesson 5 Big Question: How Does the interaction of physical and human processes cause change on a named coastal landscape?

Why would humans want to manage the Jurassic Coast?

- To preserve the unique coastline«
- To protect the infrastructure of the towns and villages near the coast
- To protect human life from the risks that coastal erosion brings

There are many different types of management that have been used along the Jurassic Coast, from soft engineering in the form of beach replenishment to hard engineering in the form of sea walls and rock armour. Sometimes the management strategy is simply to-do nothing!

All of these types of management have helped to shape the Jurassic Coast to what we see today. Lyme Regis is a prime example where all types of management have taken place.

Lyme Regis is a town along the Jurassic Coast that lies on the border between Devon and Dorset. It is home to around 3,700 people. It is also a popular tourist destination with thousands descending on the town each year. They come to enjoy the iconic harbour, Cobb and beach. Due to its location, it is also a top site for fossil hunters and people have been coming to Lyme in search of fossils since around the 1800s.

The town has also been in a battle with the sea and its erosional power for many years. The area of land that the town sits on is highly prone to landslides which can be triggered by the sea. Over the last twenty years the town has been subject to various stages of coastal management to try and reduce the effects of these issues.

Lesson 6 Big Question: What are the increasing risks from coastal flooding and how does it threaten people and the environment?

Coastal flooding results from a number of factors:

- **Storm surges:** a rapid rise in sea level caused by really low-pressure storms (e.g. tropical storm)

- **Storm tides:** occur when there is a combination of high tide and low-pressure storm

- **Tsunamis:** large sea waves due to underwater earthquakes. The closer to the coast, the bigger the impact

- **Sea level rise** due to sea temperatures increase from global warming, putting low-lying coastal land at increased risk of flooding
- **High river discharge** after a storm: when combined with a **spring tide**, water in the estuary cannot discharge into the sea causing a backflow of water and flooding

- **Global warming and climate change** is increasing the frequency and intensity of storms through increased evaporation and rainfall

Coastal flooding increases the height and strength of waves and increases weathering, erosion and mass movement. Erosion may increase which adds to coastal retreat and risk of further cliff collapse.

Depositional features such as spits and bars can be destroyed and the Impacts are varied. This could include moving people from towns and villages to adding more defences against storm surges and rising tides. Flooding of roads and damage to railways make travel difficult and are expensive to repair.

The worst flooding arises from a combination of any of these. The biggest impacts are felt by emerging countries, although the biggest economic cost is are to developed countries

Rising sea levels

- Sea levels with rise between 30 cm and 1metre by the year 2100
- Sea levels are rising today –
    1. The oceans are warming up and expanding
    2. Melting ice sheets are likely to speed this up

Lesson 6 Big Question: What are the increasing risks from coastal flooding and how does it threaten people and the environment?

Storm Surge 2013

On Thursday 5th December 2013 large areas of the east coast of England were affected by coastal flooding on a scale not seen since the Great floods of 1953. A combination of factors led to the storm surge that was responsible for flooding. This included a high spring tide, an area of low pressure and high northerly winds.

Background:

- ❑ December 2013
- ❑ Succession of major storms.
- ❑ Strong winds
- ❑ Flood risk increased
- ❑ High winds and a 7m surge caused the worst flooding since 1953.

What were the impacts?

Thousands of people were evacuated from Britain's east coast of England. Victims of the most serious tidal surge in 60 years have been warned to avoid direct contact with floodwater and beware of rats moving into homes.

Lesson 6 Big Question: What are the increasing risks from coastal flooding and how does it threaten people and the environment?

Many climate scientists fear that global warming is estimated to increase sea levels between 30cm and 1 metre by the year 2100. For people who live on very low lying land next to the sea, this could be very worrying and result in loss of life and property. This includes locations such as the UK, Bangladesh and many small coral islands in the Pacific and Indian Oceans like the Maldives.

People	Property
• Higher sea levels would require more spending on sea defences so people would have to pay more money in taxes to fund the protection of coastal areas). • People would have to migrate due to the loss of their homes, therefore conflict and social problems could arise within the community. • When homes are lost to the sea it will destroy personal possessions, some of which cannot be replaced • Some families will be living in temporary accommodation for months after the event, this could lead to mental health issues. • With the reduced cost of property it would mean people would find it difficult to sell their homes for the asking prices and therefore they will make a loss on their income.	• Sea level rise would lead to an increased rate of erosion in some areas which would mean businesses were destroyed as they fell into the sea. This would lead to job losses; therefore this would reduce the quality of life and lead to people moving out of the area). • Some countries, such as The Maldives and Bangladesh, could have their shores eroded and eventually disappear this would mean that people lost their homes. • Higher sea levels would mean erosion affected more properties in low lying UK counties like Norfolk and Suffolk. • Homes that are lost to coastal erosion will need to be replaced further inland • People may struggle to get their properties insured if they are in the path of coastal erosion.

Lesson 7 Big Question: What are the costs and benefits to managing coastal processes?

Cost-benefit analysis

The decision to use a method often depends on cost benefit analysis – that is, its costs (environmental and economic) versus the benefits of what is saved.

There are two types of coastal engineering methods that can be used to protect the coastline:

- Hard Engineering: uses concrete and steel structures such as sea walls, to stop waves.
- Soft Engineering: using smaller structures, often built from natural materials, to reduce wave energy.

Strategy	Description	Advantages	Disadvantages
Sea Wall	A wall, usually concrete, and curved outwards to reflect the power of the waves back out to sea	Most effective at preventing both erosion and flooding (if the wall is high enough)	Very expensive to build and maintain It can be damaged if the material is not maintained in front of the wall Restricts access to the beach Unsightly to look at
Groynes	Wood, rock or steel piling built at right angles to the shore, which traps beach material being moved by longshore drift	Slows down beach erosion Creates wider beaches	Stops material moving down the coast where the material may have been building up and protecting the base of a cliff elsewhere Starves other beaches of sand. Wood groynes need maintenance to prevent wood rot Makes walking along the shoreline difficult

Lesson 7 Big Question: What are the costs and benefits to managing coastal processes?

Soft engineering works with natural processes rather than against them
- Usually cheaper and does not damage the appearance of the coast
- Considered to be a more sustainable approach to coastal protection
- However, they are not as effective as hard engineering methods

Strategy	Description	Advantages	Disadvantages
Beach replenishment	Pumping or dumping sand and shingle back onto a beach to replace eroded material	Beaches absorb wave energy Widens beach front	Has be repeated regularly which is expensive Can impact sediment transportation down the coast Removing material from the seabed damages fragile ecosystems such as corals and sponges
Cliff/slope stabilisation	The angle of a cliff is reduced to reduce mass movement	Prevents sudden loss of large sections of cliff Regrading can also slow down wave cut notching at base of cliffs as wave energy is slowed	Does not stop cliff erosion

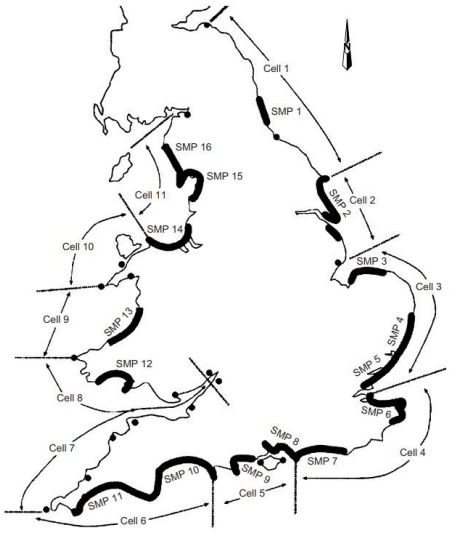
Coastal strategies

Management of coastal regions is done through identifying **coastal cells.** This breaks a long coastline into manageable sections and helps identify two related risks:

- ❑ The risk of erosion and land retreat
- ❑ The risk of flooding

Identification allows resources to be allocated
effectively to reduce the impacts of these risks.

The '**cost to benefit**' is easier to calculate using
coastal cells



Lesson 7 Big Question: What are the costs and benefits to managing coastal processes?

Shoreline management plans

Shoreline Management Plans (SMP) set out an approach to managing a coastline from flooding and erosional risk
The plans aim to reduce the risk to people, settlements, agricultural land and natural environments (salt marshes etc.)
There are **four** approaches available for coastal management, with differing costs and consequences:

Hold the line

- Long term approach and the most costly
- Build and maintain coastal defences so the current position of the shoreline remains the same
- Hard engineering is the most dominant method used with soft engineering used to support

Advance the line

- Build new defences to extend the existing shoreline
- Involves land reclamation
- Hard and soft engineering is used

Managed realignment or retreat

- Some or all coastal defences are removed, allowing the coastline to move naturally
- Over time the land becomes flooded marshes, effectively protecting the land behind
- Most natural approach to coastal defence as it doesn't need maintenance and creates new habitats for animals and plants
- However, the land is lost to the sea, which brings conflict, loss of livelihood and saltwater damages existing ecosystems
- Mostly soft engineering with some hard engineering to support

Do nothing

- Cheapest method, but most controversial of the options
- The coast is allowed to erode and retreat landward
- No investment is made in protecting the coastline or defending against flooding, regardless of any previous intervention

Lesson 7 Big Question: What are the costs and benefits to managing coastal processes?

Jurassic Coastline - Seven Sisters

Since 2005, the National Trust have championed the idea that we should adapt to our changing coastlines. They suggest that spending money on infrastructure only provides a temporary fix and often hard engineering needs repairing or replacing regularly, On top of this, the National Trust are thinking ahead to the future and the unpredictable effects of climate change.

For these reasons, they have implemented a managed retreat scheme. This means letting the coast erode naturally and moving coastal buildings and infrastructure back as the coast retreats. There are several advantages and disadvantages of the Seven Sisters manage retreat scheme.

Jurassic coastline – Effects of coastal management schemes at Lyme Regis

Positive impacts

- There has been a significant improvement in the attractiveness of the seafront and beach due to nourishment and the wide promenade. This has led to increased visitor numbers, and seafront businesses are thriving.
- The new defences have withstood recent stormy winters.
- The harbour is better protected, benefiting the fishing industry and boat owners.

Negative impacts

- Conflicts have increased as visitor numbers have increased. For example, local people have experienced increased traffic congestion and litter due to increased tourism.
- Some feel the new coastal defences have spoilt the natural coastal landscape.
- The new defences may interfere with natural coastal processes affecting neighbouring stretches of coastline, causing conflicts elsewhere.
- Stabilising cliffs that prevent landslides will reduce the number of fossils found in the area.

Conflicting ideas

The UK faces many difficult decisions about how best to protect the coast:

- At present, the Government thinks it is too expensive to protect farmland and isolated houses.
- Residents, councils and businesses often disagree.
- It is very hard to persuade people who have lived by the coast all their lives that protecting their property is not sustainable.
- Planning defences is difficult if we do not know exactly what the impact of rising sea levels will be.

Lesson 8 Big Question: How do I tackle an 8 mark question on coasts?

Investigating a geographical issue (8 markers)

They are 8 mark questions with a data resource.

•They start with the instruction to 'analyse', then the command 'assess'. So **assess** is the command word – analyse in this case simply means '*study the data*'.

- An 8 mark answer generally comes from **3 well developed and argued points** from the resource not lists of what the student knows from case studies.
- So candidates need to select three points from the resource and develop their explanations around an argument.

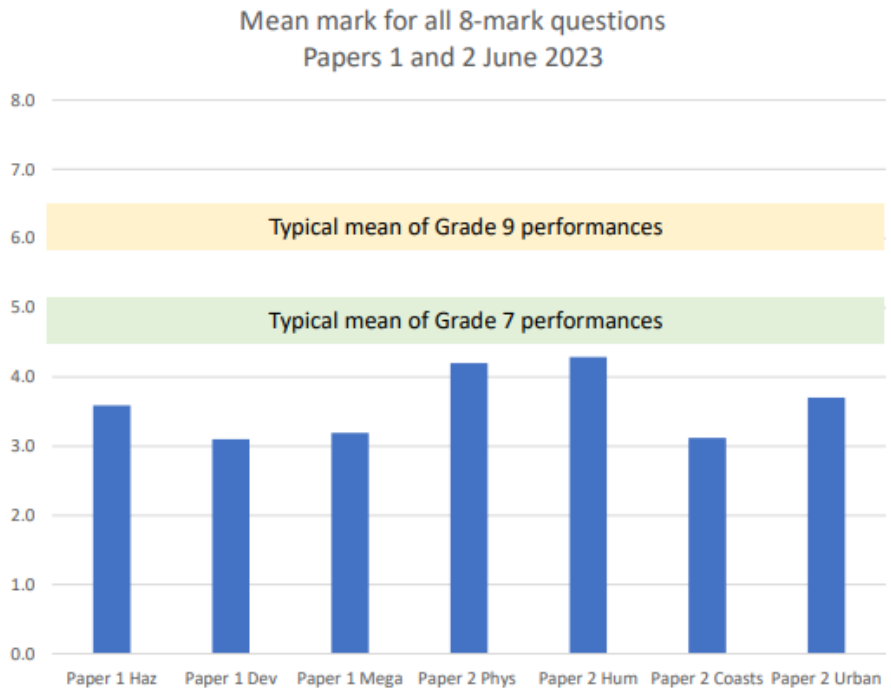
DLATPEC

1 Data stimulus: Use / quote the data, e.g. data or map evidence	✓
2 Make links Look for, and explain, **patterns / links / correlations**	✓
3 Anomalies Look for, and explain, things that don't seem to fit	✓
4 Topic Focus on the **topic stated in the question**, but think "**what else** might be relevant?" So – what **are** the causes of internal migration?	✓
5 Refer to places: Both on the Figure (s) and other examples if relevant	✓
6 Use **evaluative language** (*'But …', 'However, …', 'On the other hand …'* etc)	✓
7 Reach a mini **conclusion**: "Overall..." (*how far, how much, how strong etc*)	✓

The Assessment Objective balance is:

AO3 = 4
(interpret, analyse and evaluate, make judgements)

AO4 =4
(Select, adapt and use a skills to investigate questions)



HOMEWORK 2 – ANSWERS

Total: /14

On what type of coastline do headlands and bays form? (1)

Discordant coastlines.

What type of headland does the geology run parallel to the coast? (1)

Concordant coastline

What type of climate does the UK have? (1)

Temperate climate – seasonal change

How does the UK's weather affect rates of erosion? (1)

- Cold temperatures lead to freeze-thaw weathering on cliff faces, increasing rock falls
- Winds are stronger in winter than in summer and stronger winds give energy to waves

Give two examples of igneous rocks (2)

Granite and basalt

Give two examples of metamorphic rocks (2)

Marble and slate

Explain how sedimentary rocks are formed (2)

Sedimentary rocks are formed from sediments that have settled at the bottom of a lake, sea or ocean, and have been compressed over millions of years. The sediment comes from eroded rocks carried there by rivers or ice, and from the skeletons of sea creatures.

Name the term - the movement of material downslope due to gravity (1)

Mass movement

Name the term - the process of wearing away rock through the movement of water (1)

Erosion

Name the term - the process of breaking/wearing away rocks through chemical, mechanical and biological activity (1)

Weathering

What type of valley is shaped by a river? (1)

V shaped valley