THE DUSTON SCHOOL

Knowledge Organiser
World Studies

KS4 Geography
Topic 1b – River Landscapes

Name:

Class Teacher:

Enquiry Question:

How does geology affect the UK Landscape?

Big Questions that will help you to answer this enquiry question:

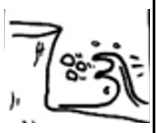
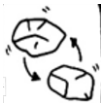
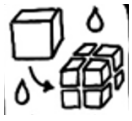
1. What physical processes are involved in changing a river landscape?
2. What are the key characteristics of a river profile? How do these change downstream?
3. How do erosional processes and geology influence the formation of landforms in the upper course of the river?
4. How do processes of erosion and deposition work together to create landforms in the middle and lower course of the river?
5. What physical and human factors cause flooding?
6. What are storm hydrographs and how do we draw them?
7. How do people manage the risk of flooding?
8. Applied Case Study: Lower Wye Valley

Homework

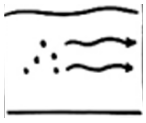
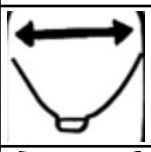
Big Question	Task	Due Date
2	Revise pages 6-8	
4	Revise page 11-13	
6	Revise pages 10-11	
8	Revise for end of unit test	

Key terms found in the glossary on pages 4 – 5 will be tested throughout the unit

GLOSSARY

Key term	Icon	Definition
Abrasion		Material carried by the river is thrown against the river bed and banks.
Attrition		The knocking together of pebbles, making them gradually smaller and smoother.
Biological weathering		Break down of rocks in situ by plants and animals burrowing into and weakening the rock.
Channelisation		Involves deepening or straightening river channels to increase capacity and reduce flood risk.
Chemical Weathering		Break down of rocks in situ by changes in rock mineral composition, often by rain and water.
Confluence		The place where two rivers meet.
Deposition		The dropping of transported sediment and material when river discharge and velocity decreases and lose energy. Heaviest materials are dumped first.
Discharge		The amount of water passing a specific point at a given time, measured in cubic metre per second.
Drainage basin		Area of land drained by a river.
Embankments		Walls or banks built near river channels.
Erosion		Wearing away and transport of materials
Flood		When water levels exceed the bank full level and water covers the surrounding land.

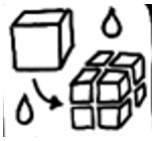
Glossary

Key term	Icon	Definition
Flood plains		Flat land either side of a river formed by erosion and deposition.
Geology		The structure and type of rocks (influences landforms found)
Hydrograph		A graph showing rainfall and river discharge over a specific period of time.
Hydraulic action		The pressure of the water being pushed against the riverbanks. It includes the compression of air into cracks as the water splashes against the riverbanks.
Long profile		A slice through the river from source to mouth that shows changes in height of the river's course.
Mouth		Where the river ends, either when it joins another river or meets the sea.
Saltation		A hopping movement of pebbles along the riverbed.
Solution		The dissolving of rocks such as limestone and chalk.
Traction		Heavy particles rolled along the riverbed.
Valley profile or Cross profile		A slide across a river showing the changes in height across the valley.
Velocity		The speed of the river

BQ1. What physical processes are involved in changing a river landscape?

Weathering is the process of the weakening and breakdown of rocks 'in-situ'

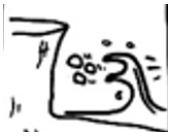
Mechanical – Repeated freezing and thawing of water in a crack. When the water freezes it expands by 10% putting stress on the rock. Repeated cycles, cause the crack to widen and rocks to break off.



Chemical – rainwater is slightly acidic, so when it falls on limestone and chalk a weak chemical reaction occurs causing the rock to break down.

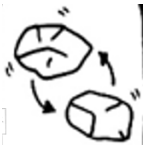
Biological – roots of plants widen cracks in rocks. Burrowing animals cause the rock to weaken/collapse.

Erosion is the wearing away and transport of materials



Abrasion - Material carried by the river is thrown against the river bed and banks.

Hydraulic Action - The pressure of the water being pushed against the riverbanks. It includes the compression of air into cracks as the water splashes against the riverbanks.



Attrition - Eroded particles smash against each other in the water breaking up into smaller pieces. Their edges become more rounded forming pebbles.

Solution – This is a chemical reaction between certain rock types i.e. limestone and chalk and the minerals in the river water. Rivers can eat away at the rock and disappear underground.

BQ1. What physical processes are involved in changing a river landscape?

Mass Movement is movements of soil and rock debris down slopes in response to the pull of gravity

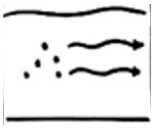
Sliding – downhill movement of large amounts of rock, soil or mud. Occur on steep slopes previously weakened by weathering.

Slumping – Often occurs after long periods of rainfall. The rain seeps through permeable rocks, when this meets an impermeable rock, the saturated soil and weaker rock slumps in a rotational manner along a curved surface.

Transport is the movement of material in the sea and along the coast by waves

Traction – large sediment roll along the river bed

Saltation – small pieces of shingle or large grains of sand are bounced along the river bed



Suspension – Lighter particles carried (suspended) within the water.

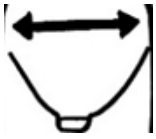
Solution – Some minerals dissolve in sea water and are carried in the river water. Particularly limestone or chalk cliffs.

Deposition takes place where the flow of water slows down with the heaviest material being dropped first..

BQ2. What are the key characteristics of a river?

Width – Becomes wider as the river moves downstream due to **lateral erosion** in the middle course.

Depth – Becomes deeper as the river moves downstream due to **vertical erosion** and increased **discharge** from tributaries.

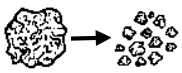


Valley profile – V shaped in the upper course as the river has the potential to erode downwards (vertical erosion), as it is way above sea level.

Gradient – Gradient decreases as the river moves downstream as the river has begun to erode sideways via lateral erosion.

Discharge – Increases as the river moves downstream as width and depth increase and velocity increases

Velocity – Increases as the river moves downstream as more **tributaries** join the main river. Also less water is in contact with the bed and banks as it is deeper and wider.



Sediment size – Decreases as the river moves downstream

Applied Example: River Creedy

- ❑ Flows 16km through Devon
- ❑ Upper course – shallow and narrow with a steep gradient
- ❑ Middle course – meets the River Binneford and river becomes wider and deeper
- ❑ Lower course – Meets the River Yeo creating lateral erosion forming meanders.

	Upper course	Middle course	Lower course
Width	1m	10m	15m
Depth	10cm	50cm	1.2m
Gradient	10%	0.5%	0.1%
Sediment size	10cm	15cm	3cm

Rivers Homework 1: Answer the following

Geography

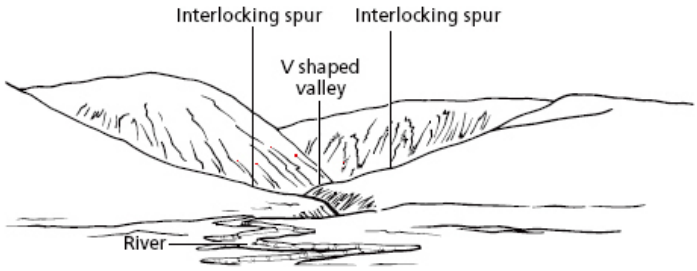
Define the term 'urbanisation'	
Define the term 'tertiary industry'	
Name one key factor has driven the increasing rates of urbanisation in emerging countries?	
Explain the impact of the Enclosures Act (2)	
State one example of Bristol's connectivity	
Why did Cadbury move from Bristol in 2011? (2)	
Explain the process of mechanical weathering	
Explain the process of hydraulic action (2)	
What is the competence of a river load?	
Define the term 'long profile'	
Define the term 'discharge'	
As the river enters the middle course why does the channel become wider?	
Name the source of the River Creedy	
Describe two changes to the River Creedy as it moves downstream (2)	
Why does discharge change with distance downstream?	
	Total out of 19:

Rivers Homework 1: Check your answers

Geography

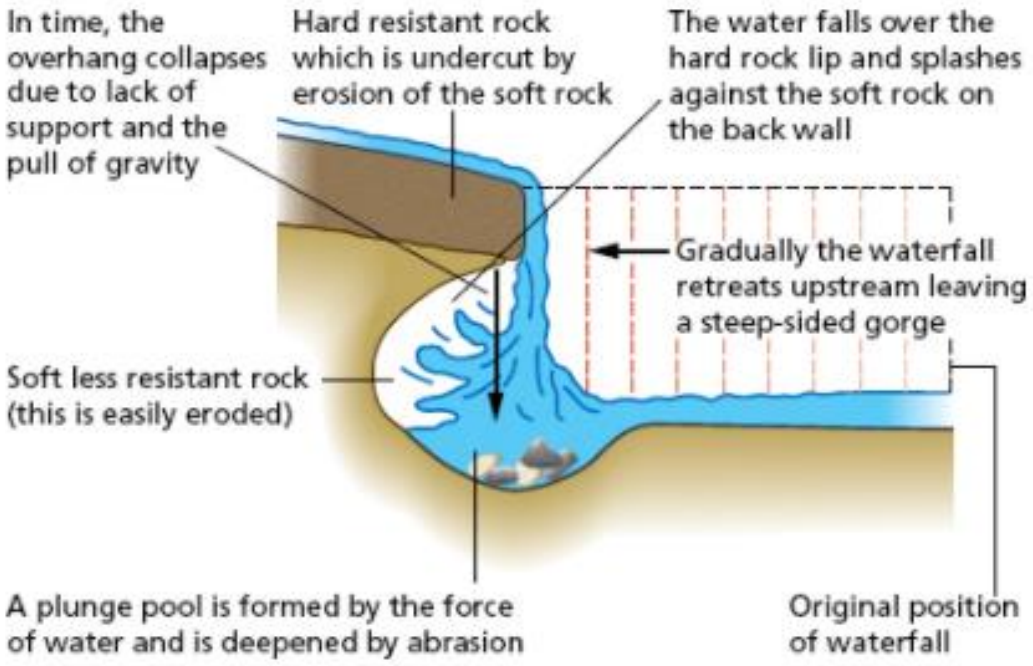
Define the term 'urbanisation'	The increase in the **proportion** of people living in towns and cities compared to living in the countryside
Define the term 'tertiary industry'	Jobs in service industry such as in shops, transport, health and education.
Name one key factor has driven the increasing rates of urbanisation in emerging countries?	Natural increase/rural-urban migration
Explain the impact of the Enclosures Act (2)	Stopped villagers using open fields and commons they would previously have grown crops on. Villagers could not support themselves so were forced to move to towns.
State one example of Bristol's connectivity	❑ 18thcentury –involved in the slave triangle ❑ Railways –Bristol Temple Mead accessing London, Scotland etc. ❑ International airport flying to 112 countries. ❑ Developed into ICTand electronics –linking via TNCs e.g. Orange.
Why did Cadbury move from Bristol in 2011? (2)	Cadbury closed its manufacturing plant in Keynsham because Kraft brought the company. 400 jobs were lost as chocolate is now made in Poland and transported back to the UK to be sold.
Explain the process of mechanical weathering	Water enters cracks and freezes (expands 10%) this increases pressure and causes rock fragments to fall off.
Explain the process of hydraulic action (2)	The pressure of the water being pushed against the riverbanks. It includes the compression of air into cracks as the water splashes against the riverbanks.
What is the competence of a river load?	The maximum size of load that a river can carry
Define the term 'long profile'	A slice through the river from source to mouth
Define the term 'discharge'	Amount of water passing a specific point at a given time, measured in cubic metres per second.
As the river enters the middle course why does the channel become wider?	Due to the lack of gradient the river starts to erode laterally (sideways)
Name the source of the River Creedy	Hills to the North of Crediton
Describe two changes to the River Creedy as it moves downstream (2)	❑ River becomes wider and deeper as it gains water from tributaries ❑ River starts to meander as it has more power to erode laterally creating the bend
Why does discharge change with distance downstream?	Increased discharge due to tributaries confluencing with the main river.
	Total out of 19:

BQ3. What processes and geology create landforms in the upper course?



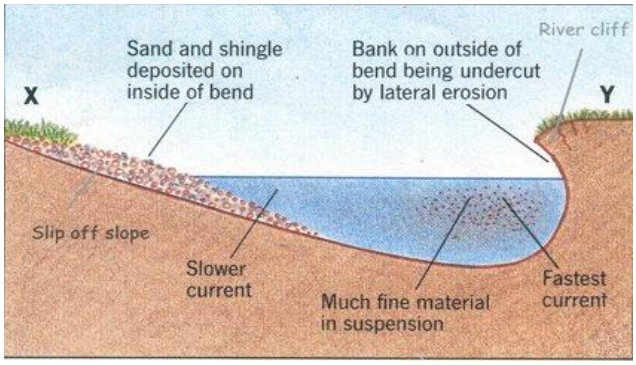
1. The river in the upper course is shallow and a lot of the water is in contact with its bed and banks.
2. There is a lot of friction.
3. The main process occurring in this area is erosion.
4. The gradient is usually steep, the river erodes downwards forming a V shaped valley.
5. The river is forced to wind its way between interlocking spurs of more resistant rock because it does not have the power to go through them.

Waterfalls and gorges



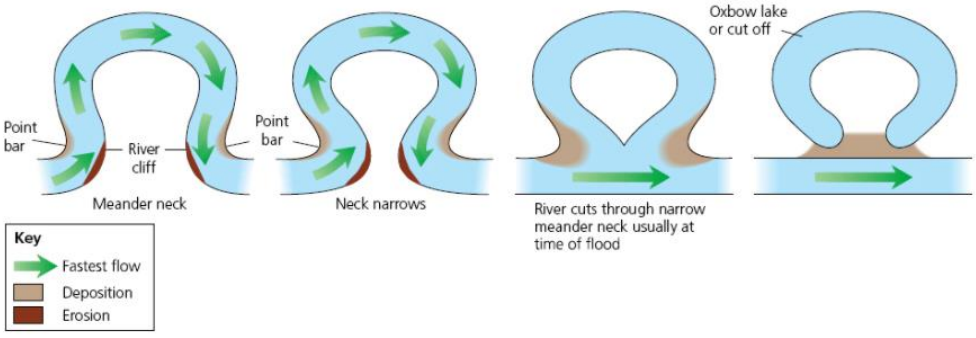
BQ4. What processes and geology create landforms in the middle and lower course?

Meanders



1. The outside of a meander has the deepest water so the greatest erosion creating a **river cliff.**
2. The water is moving fastest on the outside because of the lack of friction with the bed and banks.
3. The outside bank is eroded using abrasion forming a river cliff.
4. On the inside of the end the water is slower and shallower creating deposition.
5. The river is forced to drop material creating a **slip-off slope**

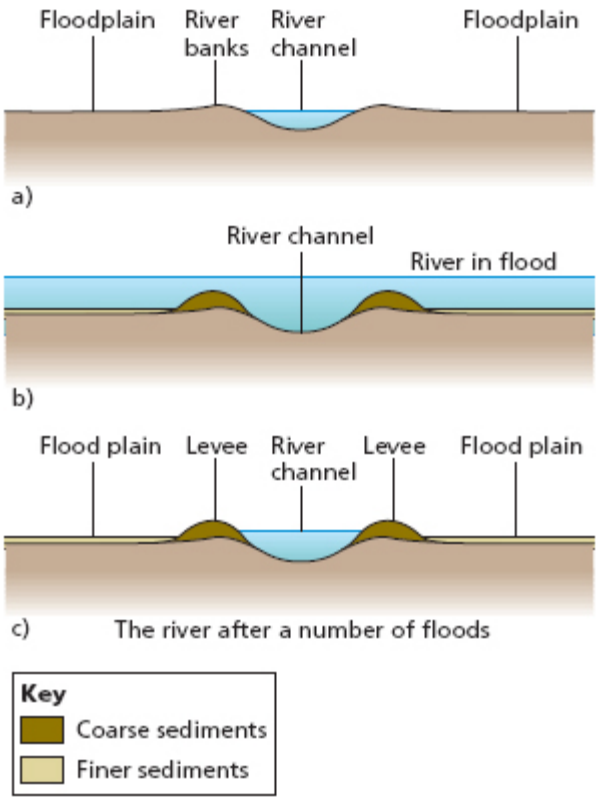
Ox-bow lakes



1. The neck of the meander narrows due to lateral erosion on the opposite sides of the meander
2. During high flow (floods) the meander/swan neck is broken through.
3. The river then takes the shorter route through the old meander neck.
4. Deposition occurs on the edges of the new river channel cutting off the old meander
5. The old meander now forms an ox-bow lake separated from the main river.

BQ4. What processes and geology create landforms in the middle and lower course?

Floodplain



1. During a flood, water containing large amounts of alluvium (river silt) empties onto the valley floor.
2. The water soaks away leaving the deposited sediment
3. Over time repeated flooding forms thick alluvial which is fertile and good for farming.
4. The flood plains widen as meanders migrate across the flood plain eroding the valley sides by lateral erosion.

Levee

1. During a flood, water containing large amounts of alluvium (river silt) empties onto the valley floor.
2. As it moves away from the channel it is shallower and friction increases.
3. The river has less energy so must drop the load it is carrying.
4. It drops the largest material close to the river channel and this builds up over a number of floods to create a levee.

Rivers Homework 2: Answer the following

Geography

When was the Enclosures Act implemented?	
Name 1 feature of Sao Paulo's site	
Outline 2 impacts of migration on Bristol's population	
Name two areas in Bristol that are deprived	
Name two strategies for improving quality of life in Bristol	
Outline two characteristics of destructive waves	
Name two types of coastal transportation	
State one reason why sediment is deposited at the coast	
Name two processes involved in the formation of an arch	
There are 4 sources of coastal sediment – Name 2	
Why are interlocking spurs found in the upper course? (2)	
Name the landform created as a waterfall retreats upstream	
Which part of the meander bend will have the strongest current?	
What feature is found on the inside of a meander?	
What is the name of the sediment deposited onto a floodplain during a river flood?	
	Total out of 23:

Rivers Homework 2: Check your answers

Geography

When was the Enclosures Act implemented?	1750 and 1860
Name 1 feature of Sao Paulo's site	Hilly plateau/ Divided in two by the River Anghangabau/ 820m above sea level
Outline 2 impacts of migration on Bristol's population	• 38% increase in population in inner areas • 30% increase in ages 16-49 • 2.5% increase in Eastern European
Name two areas in Bristol that are deprived	Lawrence Hill and Cabot
Name two strategies for improving quality of life in Bristol	Recycling/ employment/ transport ie. Walking, car share/ grants for insulation
Outline two characteristics of destructive waves	▪ The backwash is much stronger than the swash and is therefore able to carry sand and pebbles away from the shore. ▪ They break frequently; there are between 10 and 15 every minute ▪ They are high in proportion to their length ▪ They are generally found on steep beaches
Name two types of coastal transportation	Traction/ Saltation/ Suspension/ solution
State one reason why sediment is deposited at the coast	• Waves lose energy in sheltered bays • Where water is protected by **spits** or **bars** it becomes calm and sediment is deposited. • **Constructive waves** build beaches by depositing sand high up the beach
Name two processes involved in the formation of an arch	Abrasion and undercutting
There are 4 sources of coastal sediment – Name 2	Rivers/ Cliff erosion/ constructive waves/ longshore drift
Why are interlocking spurs found in the upper course?	The river is forced to wind its way between interlocking spurs of more resistant rock because it doesn't have the power to go through them.
Name the landform created as a waterfall retreats upstream	Gorge
Which part of the meander bend will have the strongest current?	Outside
What feature is found on the inside of a meander?	Slip off slope
What is the name of the sediment deposited onto a floodplain during a river flood?	Alluvium
	Total out of 23:

BQ5. What are the physical and human causes of flooding?

Physical causes of flooding

Intense rainfall – During periods of heavy rainfall, the soil and rocks quickly become saturated. As infiltration is reduced, water flows over the surface and into the river at a faster rate.

Duration of rainfall – Long periods of rainfall cause the soil to become saturated and prevent further infiltration of rainwater, leading to increased surface run off.

Snowmelt – In some places a lot of snow falls during the winter months. When the temperatures rise above zero in the spring, all the snow that has built up melts, releasing large volumes of meltwater.

Geology – Different rock types in the catchment can affect flooding. Permeable rocks such as chalk allow water to soak in, so reducing surface run off. Impermeable rocks such as clay do not allow water to pass through them, so rainwater will run off the surface and straight into the river channel.

Relief – Water reaches the river channel much faster where slopes are steeper. Increasing surface runoff.

Human causes of flooding

Urbanisation

- In towns and cities, rainwater will not infiltrate the hard, impermeable surfaces of concrete and tarmac. This causes the water to run off immediately into drains and river channels.

- If settlements are built on a floodplain the drains allow water to move to the channel more quickly, making flooding more likely.

Industry

- Quarrying – the sides of gorges may be quarried for limestone for building materials. This increases the slopes of the gorge.

Deforestation

- Vegetation collects, stores, and uses water from rainfall: this is called interception. Plant roots also encourage water to pass into soil and rock, so vegetation reduces runoff: if it is removed, more water can reach the river channel more quikly.

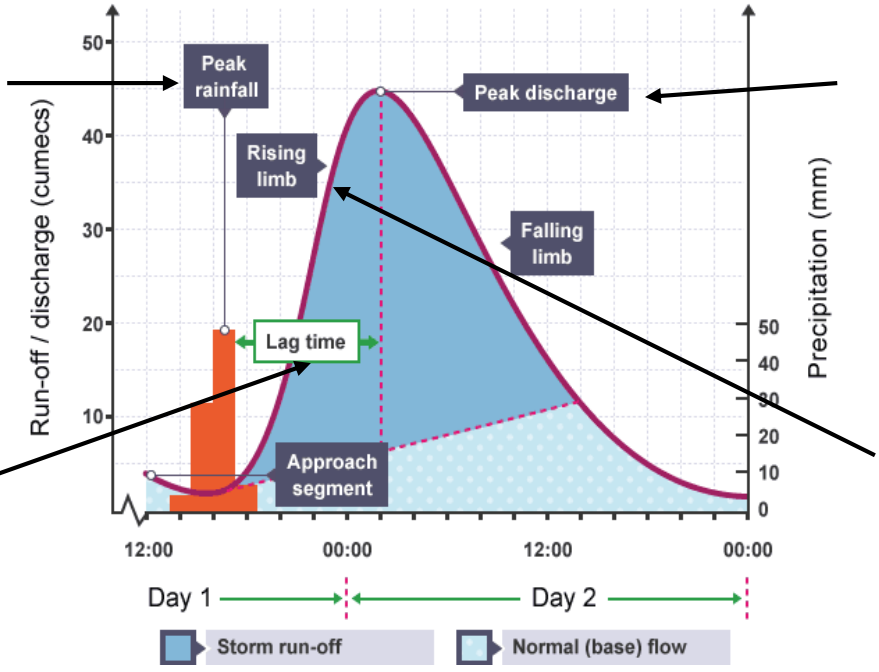
Dams

- Dams may burst: which causes excess water in river channels and flooding of large areas.

BQ6. How can we use storm hydrographs to understand the risks posed by flooding?

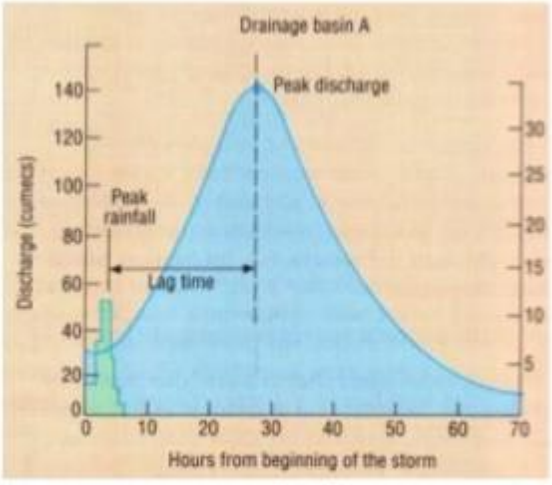
Peak rainfall
The hour of greatest rainfall during a storm

Lag time
The period of time between peak rainfall and peak discharge



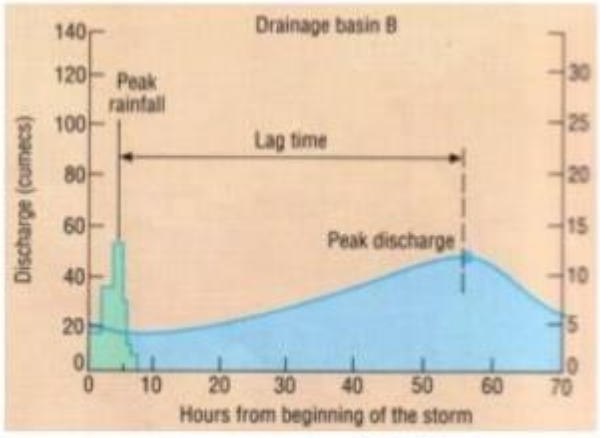
Peak discharge
The time of maximum discharge by the river

Rising limb
The period of rising river discharge following a period of rainfall



Flashy Hydrography

- Steep slopes so rapid run-off
- Impermeable rocks encouraging rapid overland flow
- Heavy or prolonged rainfall
- Saturated or frozen soils
- Deforestation encourages rapid transfer of water to rivers
- Urbanisation encouraging rapid overland flow



Steady Hydrography

- Gentle slopes slow down water transfer
- Permeable rocks allow water to soak into rocks where transfer is slow
- Drizzle
- Deep, dry soils able to absorb water
- Afforestation resulting in water being intercepted and evaporated.

Rivers Homework 3: Answer the following

Geography

Name two push factors for migration to Sao Paulo	
Name two places that international migrants to SP have come from	
When was the Chingapura project established?	
Explain how lowland areas such as the North & South Downs have been formed (2)	
Explain the process of slumping (2)	
Explain the formation of caves (2)	
Define the term 'discharge'	
Name the source of the River Creedy	
Name three physical causes of flooding	
Explain one human cause of flooding	
Name the period of a storm hydrograph showing river discharge increasing	
Name the period of time between peak rainfall and peak discharge	
Describe two factors leading to a flashy hydrography	
Draw the shape of a steady hydrograph	
	Total out of 22:

Rivers Homework 3: Check your answers

Geography

Name two push factors for migration to Sao Paulo	31% of rural households have no land. /Farms become more mechanised so unemployment rates are high./Regions suffer from drought = chronic malnutrition.
Name two places that international migrants to SP have come from	Italy/ Portugal and Africa
When was the Chingapura project established?	1995- 2001
Explain how lowland areas such as the North & South Downs have been formed	75 million years ago, Britain covered in warm, tropical seas./ Marine deposits created chalk in the North and South Downs./ 30 million years ago, compacted layers of sediment were forced upwards = dome.
Explain the process of slumping	Often occurs after long periods of rainfall. The rain seeps through permeable rocks, when this meets an impermeable rock, the saturated soil and weaker rock slumps in a rotational manner along a curved surface.
Explain the formation of caves	A line of weakness, fault or crack in the rock makes the cliff vulnerable to hydraulic action. The hydraulic action forces the crack apart to eventually form a cave.
Define the term 'discharge'	Amount of water passing a specific point at a given time, measured in cubic metres per second.
Name the source of the River Creedy	Hills to the North of Crediton
Name three physical causes of flooding	Intense rainfall/ duration of rainfall/ snowmelt/ geology/ relief
Explain one human cause of flooding	Urbanisation – rainwater can't infiltrate impermeable surfaces/drains allow water to enter the river more quickly. Deforestation – interception is reduced so runoff increases
Name the period of a storm hydrograph showing river discharge increasing	Rising limb
Name the period of time between peak rainfall and peak discharge	Lag time
Describe two factors leading to a flashy hydrography	Steep slopes so rapid run-off/ Impermeable rocks encouraging rapid overland flow/ Heavy or prolonged rainfall/ Saturated or frozen soils/ Deforestation encourages rapid transfer of water to rivers/ Urbanisation encouraging rapid overland flow
Draw the shape of a steady hydrograph	
	Total out of 22:

BQ7. River Management: Hard

Hard engineering – controlling flooding risk through manmade structures that work against natural processes.

- ○ A large, usually concrete structure built across a river valley to hold back water.
- ✓ Stores water behind the dam which can be released through the dam to create hydroelectric power (HEP)
- × Sediments can be trapped behind the dam causing a lack of deposition further downstream.
- × Can cause problems with salmon trying to migrate upstream.

- ○ The river channel is made deeper, wider and straighter
- ✓ River channel can hold more water, so less likely to flood
- × The water can travel faster to places downstream and possible cause flooding
- × Disrupts the natural processes at work in the river channel.

- ○ River banks are artificially raised with earth or concrete
- ✓ River channel has an increased capacity for carrying water, reducing the flood risk.
- × Can lead to more serious flooding if the embankment fails
- × Look artificial and unattractive.

Soft engineering – managing floodwater by working with natural processes. This approach aims to create space for floodwater in the landscape, which also reduces the risk of flooding in other areas.

- ○ Land that is close to the river is seen as low value because of flood risk, so is used for recreation.
- ✓ River landscapes are left relatively unchanged
- ✓ Very cheap as no defences need to be built
- × Flooding takes the land out of action regularly which can anger people who use it for recreation.

BQ8. Named Example: Lower Wye Valley

- ❑ Forms part of the border between England and Wales
- ❑ Flows over Old Red Sandstone to Tintern
- ❑ From Tintern to Chepstow it flows through a gorge cut through limestone

Physical or human process	Impact on (change to) the river landscape
Industry	Quarrying – the sides of the gorge have been extensively quarried for limestone for building materials and limekilns. This has increased the slopes of the gorge. Iron ore smelting – the valley had a plentiful supply of water, iron ore and wood for charcoal; it was the perfect setting for early iron smelting in Britain.
River erosion	The river erodes and deposits material forming meanders and floodplains. See pages 33–35 for detail on these processes.
Weathering	The processes of mechanical, chemical and biological weathering are all present in the area, providing material for the river to use in erosion and deposition processes.
Forestry	Many trees were felled in the eighteenth and nineteenth centuries for shipbuilding and other industrial uses, such as making charcoal. Up to the Second World War the woodlands were mainly deciduous. After this time extensive planting led to the area having 40 per cent of its woods either dominated by conifers or a substantial amount of conifers and a few broadleaf trees. Since the 1980s this planting has stopped and broad-leaved trees are now the main type being planted. Some woodlands were destroyed completely; others have appeared, such as on Coppet Hill where a wood has replaced previous open common pasture.
Human development	A road was built along the valley in the early nineteenth century and the railway followed in 1876. Before this the river was the economic backbone of the area allowing access for industry and tourists. Settlement in the valley goes back 12,000 years. Offa's Dyke, on the east bank of the river, was built in the eighth century.
Tourism	The Wye Valley was one of the earliest tourist honeypots with visitors flocking to the area in the 1700s. The cliff ascent and walks at Piercefield Park were landscaped at this time. Tourists still flock to the area. There are many lookout points, walks, a number of castles and Tintern Abbey, which dates back to the eleventh century.

Figure 3.23 Physical and human processes that have shaped the landscape of the Lower Wye Valley.

Sample Assessment Material

3 River landscapes are constantly being changed by different processes.

(a) Study Figure 3 in the Resource Booklet.

(i) Identify landform **Y** shown in this river landscape.

(1)

.....

(ii) Transport is a physical process that takes place along this river.

Name **one** transport process that might take place in this river.

(1)

.....

(iii) The UK's weather and climate affects river processes in river landscapes.

Explain **one** way the weather and climate can affect river erosion.

(2)

.....

.....

.....

.....

Figure 3

A river landscape in Teesdale, North England

Revision Support

SENECA

Login using the joining instructions below and select **Topic 1.3: River landscapes and processes.**

Successful completion of each sub unit i.e. 5.1.1 Ways of defining Development will be awarded 2 house points.

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Wider Reading