Paper 1: Changing Landscapes: Rivers

Upper course of a river
Near the source, the river flows over steep gradient from the hill/mountains. This gives the river a lot of energy, so it will erode the riverbed vertically to form narrow valleys.
Formation of a Waterfall
1) River flows over alternative types of rocks.
2) River erodes soft rock faster creating a step.
3) Further hydraulic action and abrasion form a plunge pool beneath.
4) Hard rock above is undercut and eventually collapses providing more material for erosion.
5) Waterfall retreats leaving steep sided gorge.
Middle Course of a River
Here the gradient get gentler, so the water has less energy and moves more slowly. The river will begin to erode laterally making the river wider.
Formation of Ox-bow Lakes
Erosion of outer bank forms river cliff (faster flow). Deposition inner bank forms slip off slope.
Further hydraulic action and abrasion of outer banks, neck gets smaller.
Erosion breaks through neck, so river takes the fastest route, redirecting flow
Evaporation and deposition cuts off main channel leaving an oxbow lake.
Lower Course of a River
Near the river's mouth, the river widens and becomes flatter. Material transported is deposited.
Formation of Floodplains and levees
- When a river floods, fine silt/alluvium is deposited on the valley floor. Closer to the river's banks, the heavier materials build up to form natural levees.
- Nutrient rich soil makes it ideal for farming = Flat land for building houses.
Example of a River Basin: The River Tees
Located in the North of England and flows 137km from the Pennines to the North Sea at Red Car.
Geomorphic Processes

Upper	Middle	Lower
Features include V-Shaped valley, rapids and waterfalls. ***Highforce Waterfall*** drops 21m and is made from harder Whinstone and softer limestone rocks.	The meander near Yarm encloses the town.	Greater lateral erosion creates features such as floodplains & levees. Mudflats at the river's estuary.

Water Cycle Key Terms	
Precipitation	Moisture falling from clouds as rain, snow or hail.
Interception	Vegetation prevent water reaching the ground.
Surface Run off	Water flowing over surface of the land into rivers
Infiltration	Water absorbed into the soil from the ground
Transpiration	Water lost through leaves of plants.

Hydrographs and River Discharge	
River discharge is the volume of water that flows in a river. Hydrographs who discharge at a certain point in a river changes over time in relation to rainfall	
Peak discharge	Is the most amount of river in the channel at one time
Lag time	is the delay between peak rainfall and peak discharge.
Rising limb	is the increase in river discharge.
Falling limb	is the decrease in river discharge to normal level.

Influences on the shape of the hydrograph and flooding	
Human	**Physical**
Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.	Tarmac and concrete are impermeable. This prevents infiltration & causes surface runoff.

Ways to reduce river flooding	
Soft Engineering	**Hard Engineering**
Afforestation – plant trees to soak up rainwater, reduces flood risk. **Demountable Flood Barriers** put in place when warning raised. **Managed Flooding** – naturally let areas flood, protect settlements.	**Straightening Channel** – increases velocity to remove flood water. **Artificial Levees** – heightens river so flood water is contained. **Deepening or widening river** to increase capacity for a flood.

River Flooding example– Banbury Floods

Banbury Flood Scheme		
Location: Banbury is a town that is 50km north of Oxford. It is on the floodplain of the River Cherwell which is a tributary of the River Thames		
Why does it need protecting?		
- It has a history of large floods - Floods in the past have shut down the town's railway station and local roads - In 1998 the cost of the flood was £12.5 million - 150 homes and business have been affected		
Flood management in Banbury:		
- The A361 has been raised - Floodwall built around motorsport company Prodrive - New pumping stations to transfer rainwater - A Biodiversity Action Plan (BAP) habitat with ponds, trees and hedgerows - Embankment made from soil and is 4.5m high - The borrow area. It's where the soil for the embankment came from and is now a small reservoir that stores water that otherwise would have caused the river to burst its bank - The scheme was completed in 2012		
Social	**Economic**	**Environmental**
The A361 can continue to be open in a flood so people can still go to school and work etc. Quality of life is improved as there are new footpaths and green areas recued levels of anxiety through fear of flooding Economic impacts of the defences	The cost of the scheme was £18.5 million It protects 441 houses and 73 commercial properties The benefits are estimated to be worth £100 million Property values increase as they are no longer at risk of flooding	Around 100,000 tonnes of earth were required to make the embankment. this created a reservoir habitat. The BAP has created a new habitat of ponds, trees and hedgerows Part of the floodplain will be left to flood if river levels get too high