



GCSE Geography Revision Booklet

Paper 1: Living with the physical environment

Length of exam: 1 hour and 30 minutes



Preparation for Y11 mock exams November 2024

Name:

Paper 1: Living with the physical <u>environment</u>

Section A: The challenge of natural hazards

- Tectonic hazards
- Weather hazards
- Climate change

Section B: The Living World

- Ecosystems
- Tropical Rainforests
- OPTION: COLD ENVIRONMENTS

Section C: Physical landscapes in the UK

- OPTION 1: COASTAL LANDSCAPES
- OPTION 2: RIVER LANDSCAPES

Answer questions: 1, 2, 3 and 4

<u>Don't answer question 5</u>







Section A: The Challenge of Natural Hazards

Natural hazards pose major risks to people and property

- A natural hazard is the threat of a naturally occurring event that will have a negative effect on people and or the environment
- Hazard risk is the chance of being affected by a natural event. People weigh up the advantages and disadvantages of living in an area. Factors that increase hazard risk include:
- Urbanisation built up areas put people at risk
- Poverty people who are poor often build unstable housing
- Climate Change warmer world gives storms more energy
- Farming flooding deposits silt onto flood plains, however, living here can put people at risk

What is a natural hazard?

What is hazard risk?

Earthquakes and volcanic eruptions are the result of physical processes

Label the layers of the earth (crust, mantle, outer core and inner core) on the image below.



continental crust:

The Earth's Crust: Lithosphere

- Outer layer
- 5-100 km thick
- 2 types of crust
- Oceanic (very dense, thinner, made of basalt)





• Continental (less dense, thick, made of granite)

The theory of plate tectonics

The crust is the outer layer of the Earth. It is a thin layer between 0 - 60 km thick. The crust is the solid rock layer upon which we live. It is either *continental* or *oceanic*.

The Earth's crust is broken into tectonic plates The movement of the plates and the activity inside the Earth, is called the theory of plate tectonics.

Slab pull theory

Mechanisms called *slab pull* and ridge push are believed to move the tectonic plates. Ridge push is where the new crust formed at divergent *plate margins* is less dense than the surrounding crust and so it rises to form oceanic ridges. The older seafloor either side of the ridge slides away and this moves the seafloor apart – moving the tectonic plates.

Slab pull occurs where older, denser tectonic plates sink into the mantle at subduction zones. As these older sections of plates sink, newer and less dense sections of plate are pulled along behind. Sinking in one place leads to plates moving apart in other places.

Explain the slab pull theory which explains why tectonic plates move



Types of plate margins

Destructive plate margin

A destructive plate margin forms when an <u>oceanic and continental plate</u> move towards each other. The heavier, denser oceanic plate subducts (goes under) the lighter continental plate (as suggested by the slab pull theory). The oceanic plate melts as it sinks below the continental plate due to friction in the subduction zone and the heat of the mantle. The crust becomes molten magma. This may be forced to the surface of the Earth by the pressure that builds, this causes a violent and explosive volcanic eruption. As the thick magma cools on the surface, steep-sided composite volcanoes are formed. The movement of the oceanic plate is not smooth. Due to friction, the plate gets stuck. Pressure then builds up. The plate will eventually slip causing an earthquake. The continental plate is crumpled by the pressure and forms fold mountains. A famous example of a destructive plate margin, is where the Nazca and South American tectonic plates meet on the west coast of South America.

Constructive plate margins

Constructive plate margins happen where plates move apart (as explained by the ridge push theory). Most of these plate margins are under the oceans. As the plates move apart, magma rises from the mantle to the Earth's surface through the gap that has been created, due to the thinning of the plate. The rising magma forms shield (dome-shaped) volcanoes because the magma is thin and runny, these volcanic eruptions are less explosive than the ones found at destructive margins. Small earthquakes happen at constructive margins either by the movement of the plates over the mantle, or magma rising through the crust. An example of a constructive margin is the Mid-Atlantic ridge, where the Eurasian plate and North American plates are moving apart, this margin has led to the formation of Iceland.

Conservative plate margins

A conservative plate margin involves two tectonic plates sliding past each other, this can either be in different directions, or in the same direction, but at different speeds. The plates do not pass each other smoothly. Friction causes them to get stuck. Over time pressure builds up until the friction is overcome which results in the plates slipping. When the pressure is released it sends out huge amounts of energy causing an <u>earthquake</u>. Earthquakes along conservative plate margins can be very large. Earthquakes at conservative plate boundaries can be very destructive as they occur close to the Earth's surface. Following an earthquake along a conservative plate boundary, there are often aftershocks as the additional stress on other areas along the fault are relieved. One example of a conservative plate margin is the San Andreas fault in California, where the North American and Pacific plates are moving past each other at different speeds.

Collision plate margin

If two continental plates collide, neither can sink and so the land buckles upwards to form fold mountains. This is called a **collision margin**. Earthquakes can occur at collision margins as the plates are pushed together causing them to buckle and tension increases which can lead to earthquakes.

Complete the tasks below to explain how plate margins cause tectonic hazards.



Conservative margin	Collision plate margin
	COLLSION PLATE BOUNDARY
Conservative margin	Continental Crust Continental Crust Continental Crust Continental Crust Fold Mountains produced by upthrust on collision
Explain how conservative plate margins cause earthquakes	Explain how a collision plate margin causes earthquakes to occur

Use the information from to complete this summary table about the 4 types of plate margin.

	Direction of movement		<u>Earthquakes found</u> <u>here?</u>		<u>Volcanoes found</u> <u>here?</u>		
	Towards	Apart	Slide past	Yes	No	Yes	No
Destructive							
Constructive							
Conservative							
Collision							

In the boxes below, write down as many differences between the different plate margin types.

Destructive and constructive	Destructive and conservative	Constructive and conservative

The effects of, and responses to, a tectonic hazard vary between areas of contrasting levels of wealth (i.e. effects of earthquakes are different in rich and poor countries).

- Primary effects are the direct hazardous effects ground shaking.
- Secondary effects are the indirect hazardous effects, triggered by primary hazards such as landslides and tsunamis.
- Immediate response is the help and aid given straight away after a hazard such as food.
- Long term response is the help and aid given to help a country rebuild and get back to normal, such as rebuilding homes.

Explain the difference between primary and secondary effects

Explain the difference between immediate and long-term responses

Management can reduce the effects of a tectonic hazard

- Earthquakes and volcanic eruptions don't happen very often. They are not seen as a great threat in most people's lives.
- Better building design can withstand earthquakes so people feel less at risk.
- More effective monitoring of volcanoes and tsunami waves enable people to receive warnings and evacuate before events happen.
- Fault lines associated with earthquakes can allow water supplies to reach the surface. This is particularly important in dry desert regions.
- Volcanoes can bring benefits such as fertile soils, rocks for building, rich mineral deposits and hot water.
- Some people may not be aware of the risks of living close to a plate margin.
- Plate margins often coincide with very favourable areas for settlement, such as coastal areas where ports have developed.

Give 4 reasons why people continue to live in areas at risk from a tectonic hazard:

- •
- -----
- -

• _____

Explain the most important reason, in your opinion.

What are some of the benefits of living in Iceland near lots of volcanoes? Which is the biggest benefit and why?





Tropical storms (hurricanes, cyclones, typhoons) develop as a result of particular physical conditions



Describe the distribution of tropical storms. Use lines of latitude and key terms in your answer.

- Tropical storms form over warm oceans (above 27°C)
- They form in the summer and autumn when sea temperatures are at the highest.
- Most storms form between <u>5-15⁰ north</u> and <u>5-15⁰ south</u> of the <u>equator</u>.

Give 2 conditions needed for tropical storms to form:

• ____

Named example of a tropical storm: Typhoon Haiyan, 2013

Describe the path of Typhoon Haiyan.



Complete the tables below with 3 facts in each column – remember to include SPECIFIC FACTS, i.e. facts that could only have happened in Typhoon Haiyan, e.g. numbers, names, etc.

Primary effects	Secondary effects		
6,340 people killed.	14 million people in total were affected		
	by Haiyan		
27,500 people injured.	30,000 fishing boats were destroyed. 6		
	million people lost their source of		
	income.		
920,000 people needed to be	Coconut plantations which are a big		
permanently relocated.	source of foreign currency were said to		
	be 'completely flattened.'		
90% of Tacloban city was destroyed,	1.9 million people left homeless.		
the worst affected area.	Looting broke out.		
Oil and sewerage leaked into local	Landslides due to flooding caused		
ecosystems.	communities to be cut off.		
	2.5 million people were left in need of		
	food aid.		

Primary effects	Secondary effects		

Colour code the effects as either social, economic or environmental

Do you think primary effects or secondary effects were more significant in Typhoon Haiyan? Explain your answer

Immediate and lo	ng term responses	<u></u> +-++++++++++++++++++++++++++++++++
Immediate responses	Long term	
£75 million was donated by the UK government. £75 million was raised by the UK population and donated to victims of Haiyan. Experts in sanitation, water distribution and rescue teams travelled to the Philippines. These teams travelled from all over the World. USA sent their US aircraft carrier the "George Washington" to help with search and rescue operations	The UK, Japanese and Australian governments have pledged support in rebuilding; permanent housing, infrastructure, schools and hospitals. Many cyclone shelters have been built to help with evacuation in future storms. Aid agencies such as Oxfam have supported the replacement of fishing boats.	Choose your top three immediate and long-term responses to write into the table below.
UK government sent shelter kits with many essential items to support families.	Thousands of new homes have been built further away from areas at risk of flooding.	
The Philippines Red Cross delivered basic food aid, canned food, rice, cooking oil, sugar & salt.	Cash for work programmes have been set of where people are paid to clear away debris and rubble.	цр 5
Immediate	responses	Long-term responses

Do you think immediate or long-term responses were more significant in Typhoon Haiyan?

How can you monitor, predict, protect against and prepare for tropical storms? Give some examples of each in the table below:

1. Monitoring and prediction

This involves monitoring the track of tropical cyclones to predict which areas they are going to affect.

2. Protection

This involves protecting people from the strong winds, heavy rainfall and storm surges caused by tropical storms.

<u>3. Planning</u>

This is mostly about raising individual awareness and community awareness of the potential dangers and how they should respond.

Monitor and predict				
Protect	Prepare			

Climate change is the result of natural and human factors and has a range of effects Climate change is the long term, slow change of the weather.

Evidence for climate change:

Ice cores

Antarctic ice cores have been crucial in understanding long-term climate change. Antarctica has no permanent residents so many of the layers of snow remain unaltered. They act like time capsules, holding information about climate change as different layers of snow build up over thousands of years.

The ice cores can be drilled so that the information about what the climate was like when the snow fell can be analysed. The deeper the snow that is drilled, the older the snow. Records can go back as far as 400- 800,000 years ago.

Oxygen isotopes in the ice cores are commonly used to estimate what the temperatures would have been. when the ice cores are melted, trapped carbon dioxide and methane are released, which can be compared to present levels to see the differences between the climate then and now.

Proxy Data

We can also collect clues from proxy data. Proxy data is natural recorders for example tree rings and fossil pollen to estimate what the climate was like.

However, these records are not as reliable, because these only indicate climate change rather than providing direct evidence or accurate temperatures.

Each year trees add growth rings, which can indicate what sort of growing season the tree experienced. Interestingly these rings are more than a temperature indicator, they also tell the researcher about moisture and cloudiness as well. Dendrochronology is the study of climate change as recorded by tree growth rings.

<u>Ocean sediments</u>

The same as with ice, the deeper the sediment the older the sediment. There are billions of tonnes of sediment deposited at the bottom of the sea, which acts as a timeline for providing evidence of climate change. Organisms and remains of plankton in the sediment reveal information such as past surface water temperatures, and levels of oxygen and nutrients.

Recent evidence

<u>Seasonal Changes</u>

Studies have shown that the timing of natural seasonal activities is advancing. For example, a study of bird nesting in the mid-1990s discovered that 65 species nested an average of 9 days earlier than in the 1970s. Could this be evidence of a warming world?

<u>Rising Sea Level</u>

According to the IPCC (Intergovernmental Panel on Climate Change), the average global sea level has risen between 10 and 20cm in the past 100 years. There are two reasons why sea levels have risen. When temperatures rise and freshwater ice melts, more water flows to the seas from glaciers and ice caps.

When ocean water warms it expands in volume - this is called thermal expansion.

Shrinking glaciers and melting ice

Throughout the world glaciers are shrinking and retreating. It is estimated that some may disappear totally by 2035. Arctic sea ice has thinned by 65% since 1975 and in 2014 it was at an all-time low.

Complete the table below to briefly explain how each factor provides evidence of climate change:

Long-term evidence	Recent evidence		
Ice cores:	Seasonal changes:		
Tree rings:	Rising sea levels:		

Managing climate change involves both mitigation (reducing causes) and adaptation (responding to change)

Mitigation strategies

Mitigation means to reduce or prevent the effects of something from happening. Mitigation strategies include:



- Alternative energy using alternative energy such as solar, wind or tidal can reduce the use of fossil fuels. This will reduce the amount of carbon dioxide released into the atmosphere.
- **Carbon capture** this is the removal of carbon dioxide from waste gases from power stations and then storing it in old oil and gas fields or coal mines underground. This reduces the amount of emissions into the atmosphere.
- **Planting trees** encouraging afforestation, means that there will be more trees to absorb the carbon dioxide in the atmosphere during the process of photosynthesis.
- International agreements in 2005 the Kyoto Protocol became international law. The countries that signed up to the treaty pledged to reduce their carbon emissions by 5 per cent. However, this ran out in 2012 and its overall impact has been small. The US refused to join and major developing countries like China and India were not required to make any reductions.

Define mitigation _____

Adaptation strategies

Adaptation strategies do not aim to reduce or stop global warming. Instead they aim to respond to climate change by limiting its negative effects. Strategies include:

- **Agriculture** farmers will have to adapt as some crops may not be able to grow in a warmer climate. However, other crops (eg oranges and grapes) will be able to be planted.
- Water supply water transfer schemes could be used. This is where water is transferred from an area of water surplus to an area of water shortage.
- **Reducing risk from sea level rise** areas at risk from sea level rise may use sea defences to protect the land from being eroded away.

Why will farmers have to adapt to climate change?

How will water supply be adapted to deal with climate change?

Name one way that coastal areas can adapt to climate change _____

Explain the most successful way of managing climate change: mitigation or adaptation?

Section B: The Living World

Ecosystems exist at a range of scales and involve the interaction between biotic and abiotic components

What is an ecosystem?

An ecosystem is a natural environment and includes the flora (plants) and fauna (animals) that live and interact within that environment. Flora, fauna and bacteria are the biotic or living components of the ecosystem. Ecosystems are dependent on the following abiotic or non-living components:

- climate the temperature and amount of rainfall are very important in determining which species can survive in the ecosystem
- soil the soil type is important as this provides nutrients that will support different plants
- water the amount of water available in an ecosystem will determine what plants and animals can be supported

The biotic parts of the ecosystem have a complex relationship with the abiotic components - changing one will lead to a change in the other.

Complete the key terms list below by adding the correct definitions:

- Ecosystem: _____
- Biotic components: ______
- Abiotic components: _____
- <u>Producers</u> Convert energy from the environment (mainly sunlight) into sugars (glucose). The most obvious producers are plants that convert energy from the sun by photosynthesis.
- <u>Consumers</u> Get energy from the sugars produced by the producers. A pond snail is a good example of a consumer because it eats plants.
- <u>Food chain</u> This shows the direct links between producers and consumers in the form of a simple line.
- <u>Food web</u> This shows all of the connections between producers and consumers in a rather more complex way.
- <u>Nutrient cycle</u> These foods are used by plants and animals to grow. There are 2 main sources of nutrients:
 - 1. Rainwater washes chemicals out of the atmosphere
 - 2. Weathered rock releases nutrients into the soil.

When plants and animals die the decomposers recycle these nutrients making them available for the new plants and animals to grow.

Definition	
	Definition

Complete the table below with the correct definitions

Food web	
Nutrient cycling	



Large-scale ecosystems are known as global ecosystems or biomes (see map below):

Tropical rainforest - found

near the Equator. The climate is hot and humid and many different species

Characteristics of biomes

can be found here.

Complete the table below outlining the

location and characteristics of tropical rainforests:

Global ecosystem	Location	Characteristics
Tropical rainforest		

Tropical rainforest ecosystems have a range of distinctive characteristics

Characteristics of tropical rainforests

Tropical rainforests have distinct characteristics that support a wide variety of different species. This means that they have a high biodiversity. The biotic or living components of the ecosystem and the abiotic or non-living components of the ecosystem depend on one another - a change in one leads to a change in the other.

Deforestation has economic and environmental impacts <u>A case study of a tropical rainforest: Malaysia</u>

Where is Malaysia?

Malaysia is a country in South-East Asia.

It is made up of Peninsular Malaysia and East Malaysia, which is part of the island of Borneo.

Malaysia is located 300km north of the Equator

Basic facts about Malaysia

The natural vegetation in Malaysia is tropical rainforest

67% of Malaysia Malaysia's land is covered by rainforest

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Deforestation in Malaysia

The rate of deforestation is increasing faster than in any tropical country in the world. Between 2000 and 2013, Malaysia's total forest loss was an area larger than Denmark.

As natural rainforest in Malaysia is destroyed, many young orangutans' are killed or orphaned

Describe the location of the Malaysian rainforest:



Threats to the tropical rainforest

Logging Tropical wood is felled to export and sell – Malaysia was the largest exporter in the 1980s. Clear felling – where all the trees are chopped down in an area was common. This led to the destruction of forest habitats.		Mineral extraction Mining tin and smelting is common in peninsular Malaysia. Rainforest has been cleared for mining and construction.		Population pressure Between 1956 and the 1980s, about 15,000 hectares of rainforest was felled for settlers moving from urban areas to the countryside. Many then set up plantations.	
<u>Commercial farming</u> Malaysia is the largest exporter of palm oil. During the 1970s, large areas of land were converted to palm oil plantations		Subsistence faming Tribal people in the rainforest practice subsistence farming. One method used by the tribal people is 'slash and burn'. This involves the use of fire to clear the land – these fires can grow out of control, destroying large areas of forest		Energy development In 2011 the Bakun Dam in Sarewek started to generate electricity – the dam supplies energy for industrialised Peninsular Malaysia. The dams reservoir flooded over 700km2 of farmland and forests.	
	Impacts of deforestation in Malaysia				
Soil erosion The roots of trees and plants bind the soil together. So deforestation means that soil can easily become lose and erode away.	Loss of biodiversity Deforestation destroys the ecosystem and the many habitats that exist on the ground and in the trees. This reduced biodiversity e.g. the Main Range – Peninsular Malaysia has 25% of all plant species found in Malaysia.		Economic development Development of land for mining, farming and energy will create jobs for local people Companies will pay taxes to the government which can be used to make improvements to public services and transport infrastructure.		Contribution to climate change By absorbing carbon dioxide, trees store the carbon and help to reduce the rate of global warming. Deforestation leads to more carbon dioxide in the atmosphere.

Cause	Information
Subsistence and commercial	
farming	
Logging	
Road building	
Mineral extraction	
Energy douglanment	
Energy development	
Settlement and population	
growth	

What are the impacts of deforestation?

Soil erosion

Once the land is cleared of **rainforest vegetation** the soil is left bare. When it rains, the nutrients in the soil are washed away. The nutrient cycle stops because there are no plants or trees shedding leaves to replace the nutrients in the soil. The soil is no longer able to support plant life because it is **not fertile**. The roots of plants and trees no longer hold the soil together so it is easily eroded.





Loss of biodiversity

Many different species of plants and animals die because of deforestation. As plants and animals are closely connected through the food web, deforestation this reduces the biodiversity, or variety of species found in the tropical rainforest.

Climate change



The trees and plants of the Amazon Basin absorb carbon dioxide during the process of photosynthesis. If there are fewer trees and plants, due to deforestation, then less carbon dioxide is removed from the atmosphere. In this way deforestation contributes to global warming and therefore climate change. **Economic development**

The creation of mines, farms and roads - which caused deforestation - has also led to economic development. The money created from these enterprises allows a country to generate foreign income, which can then be used to pay off debts or be invested in further development projects.

Complete the following questions:
Explain how deforestation leads to soil erosion
~ <u></u>
Why does deforestation reduce biodiversity?
Why does deforestation increase climate change?
How does deforestation lead to economic gains?
How does deforestation contribute to climate change?

Tropical rainforests need to be managed to be sustainable

Management of tropical rainforests

Rainforests need to be managed sustainably so that we can still use valuable resources but without causing long-term damage for future generations.

Tropical rainforests can be managed in the following ways to reduce deforestation:

- Logging and replanting selective logging of mature trees ensures that the rainforest canopy is preserved. This method allows the forest to recover because the younger trees gain more space and sunlight to grow. Planned and controlled logging ensures that for every tree logged another is planted.
- Education It is important that local people, businesses and politicians understand the true value of the tropical rainforest. Once they understand the value of biodiversity, particularly in terms of tourism, they will be more likely to want to protect it from deforestation.
- **Ecotourism** this encourages sustainable tourism that creates jobs for local people whilst ensuring that the money generated is used to protect and conserve the tropical rainforest for future generations to enjoy.
- **International agreements** agreements to protect tropical rainforests have been made between different countries through debt-for-nature swaps. This is when a country which is owed money by another country cancels part of the debt if an agreement is made by the debtor country to ensure the conservation of its tropical rainforests.

Complete the table below outlining how rainforests can be managed sustainably - include specific facts where possible:

Sustainable strategies	How do they work?
Selective logging and replanting	
Conservation and education	
Ecotourism	
International agreements	

Cold environments (polar and tundra) have a range of distinctive characteristics

Cold environments experience temperatures that are at or below zero degrees Celsius for long periods of time. Two types of cold environment are polar and tundra.

Polar

Characteristics of polar areas include:

- **Climate** long cold winters, with annual temperatures mostly below freezing. Polar areas are often windy, with very little precipitation. Permanent ice caps cover polar landscapes.
- Soil the soil is covered in ice throughout the year.
- **Plants** hundreds of species of moss, algae and lichen survive the harsh conditions of the Polar biome. Few other plants can survive.
- Animals Polar bears live in the Arctic and penguins live in the Antarctic. Whales, seals and snowy owls are also found in Polar Regions.

Tundra

Characteristics of the tundra include:

• Climate - cold, windy and little rainfall. Snow covers the ground for much of the year. Average temperature in the Arctic tundra is between -12°C and -6°C. The summer season lasts for 50-60 days each year during which there is permanent daylight.

- Permafrost this is the layer of frozen soil under the Earth's surface. The frozen ground may extend as deep as 450 m. In the highest latitudes the ground remains frozen all year round. In the most southern parts of the Arctic, the surface layer of the permafrost melts in the summer.
- Soil this is high in organic material because it is too cold for dead organisms to decompose.
- **Plants** trees do not grow in the tundra. When the snow melts, small plants flower. In mountainous areas, cushion plants grow between the rocks.

Animals - arctic foxes, polar bears, grey wolves, caribou, snow geese and musk-oxen are found here. In mountainous areas, goats, sheep and marmots can be found. When the surface layer of the permafrost melts in the summer, shallow lakes and bogs appear which attract insects, birds and other wildlife.

Complete the table below with the main characteristics of polar and tundra environments:

Characteristic	Polar	Tundra
Climate		
Permafrost		
Soil		
Plants		
Animals		

Polar bears have adapted to live in polar environments in the following ways:	Caribou have adapted to live in tundra environments in the following ways:
 They have thick fur and a layer of blubber to keep them warm Their fur is hollow and transparent. It reflects visible light and looks white, reflecting the snow. Their skin is black, this helps absorb heat They have small ears to reduce heat loss They have a layer of blubber which forms over the summer and use it as an energy store in the winter 	 They have 2 layers of fur to help them with the cold. They have the behavioural adaptation of migrating to escape the worst of the winter cold. They have a compact, stocky body with a short tail and ears to avoid losing body heat. Their legs even have veins and arteries that run side by side, so that the heat of the arterial blood coming from the body warms the cooler venous blood returning from the lower legs. They have split-hooves, like a cow. They walk on the middle two toes of each foot, which are covered with hooves.
	covered with houses. Because there are two

 They have stift hairs on their paws to help with swimming, traction and insulation They have front paws that are webbed to help with swimming They have a small surface area to volume ratio - to minimise heat loss They have a greasy coat that sheds water after swimming - to help reduce heat loss They have large feet with bumps on called papillae to distribute their load and increase arin on the 	 Nooves instead of one as in the horse, they can spread apart to bear more weight without sinking into snow or wet ground, and also act as paddles when swimming. Even the caribou's digestion has adapted to their environment. During the summer they browse and graze like other plant-eaters, but come winter, they eat lichen. Caribou can smell lichen under deep snow and use their scoopshaped hooves to dig down to it. They have developed special bacteria in their gut that help them digest lichen, and their ability to use this abundant but low-nutrition food helps them survive when there is nothing.
their load and increase grip on the ice	food helps them survive when there is nothing else to eat.

How have animals adapted to the physical conditions of these cold environments? Give four examples in the table below:

Animal	Adaptation	How does it help it to survive?
Polar bear		
Polar bear		
Caribou		
Caribou		

Plant adaptations in cold environments

- **Cushion plants** these are compact, low growing plants. These characteristics help them to survive in cold and windy conditions. They trap airborne dust and use it as a source of nutrients.
- Arctic poppy this has a hairy stem to retain heat. The flower can track the sun in the sky to maximise the amount of sunlight it receives so that it can increase photosynthesis.
- Cotton grass this grass has small seeds that can easily be dispersed by the wind to ensure its survival. It is low lying to protect it from cold winds and has thin leaves to reduce water loss by transpiration. It grows and produces seeds quickly as soon as the temperature increases.

• Lichen - this organism does not need soil to grow. It grows very slowly, can withstand very cold temperatures and survives beneath snow.

Some general adaptations of plants in cold environments include;

- The plants grow close together, low to the ground and they remain small.
- Soils are often waterlogged because of the permafrost underneath, hardy plants like moss can cope with seasonal drought and waterlogging.
- Some plants in the biome have a wax type of fuzzy, hairy coating on them which helps to shield them from the cold and the wind. This coating also helps them to retain heat and moisture and it protects he plant seeds to allow for reproduction.
- They have small leaves which helps the plants to retain moisture. Only the top layer of soil thaws out in the Tundra, below that is the permafrost, therefore the plants have very shallow root systems.
- Plants like lichens and moss can survive on bare rock with a bit of moisture.
- The low amounts of light pose problems for plants. Most of the plants in the Tundra Biome are perennials and don't die off in the winter, they have long life cycles to help with the short growing season. This means photosynthesis can begin immediately once the sunlight is strong enough as plants don't need to regrow leaves. Some plants like arctic poppy flower quickly, even whilst the snow is still melting. They also have cup shaped flowers that face the sun to capture as much insolation as possible.

Plant	Adaptation	How does it help it to survive?
Cushion plants		
Arctic poppy		
Cotton grass		
Lichen		

Section 3: Coastal Landscapes in the UK

Erosion

Erosion is the wearing away of rock along the coastline. Destructive waves are responsible for erosion on the coastline. There are four types of erosion:

- Hydraulic action this is the sheer power of the waves as they smash against the cliff. Air becomes trapped in the cracks in the rock and causes the rock to break apart.
- Abrasion this is when pebbles grind along a rock platform, much like sandpaper. Over time the rock becomes smooth.
- Attrition this is when rocks that the sea is carrying knock against each other. They break apart to become smaller and more rounded.
- Solution this is when sea water dissolves certain types of rocks. In the UK, chalk and limestone cliffs are prone to this type of erosion.

Complete the table below describing the four types of erosion found at the coast:

Hydraulic action	<u>Abrasion</u>
A + + + - + + + + + + + + + + + + + + +	C L L
ATTrition	Solution

Transportation

Beach material can be moved in four different ways. These are:

- Solution when minerals in rocks like chalk and limestone are dissolved in sea water and then carried in solution. The load is not visible.
- Suspension small particles such as silts and clays are suspended in the flow of the water.
- Saltation where small pieces of shingle or large sand grains are bounced along the sea bed.
- Traction where pebbles and larger material are rolled along the sea bed.

Do the same in the table below to describe the four types of transportation found at the coast:

Traction	Saltation

Suspension	Solution

Landforms resulting from erosion

Erosional landforms

The process of erosion can create different landforms along the coastline.



Headlands and bays

- Cliffs along the coastline do not erode at the same pace. When a stretch of coastline is formed from different types of rock, headlands and bays can form.
- Bands of soft rock such as clay and sand are weaker therefore, they can be eroded quickly. This process forms bays. A bay is an inlet of the sea where the land curves inwards, usually with a beach. Hard rock such as chalk is more resistant to the processes of erosion. When the softer rock is eroded inwards, the hard rock sticks out into the sea, forming a headland.
- Erosional features such as wave-cut platforms and cliffs can be found on headlands, since they are more open to the waves. Bays are more sheltered with constructive waves which deposit sediment to form a beach.



Cliffs and wave-cut platforms

Cliffs are shaped through **erosion** and weathering. Soft rock erodes quickly and forms gentle sloping cliffs, whereas hard rock is more resistant and forms steep cliffs. A wave-cut platform is a wide gently-sloping surface found at the foot of a cliff.



A wave-cut platform is formed when the following occurs:

 The sea attacks the base of the cliff between the high and low water mark.
 A wave-cut notch is formed by erosional processes such as abrasion and hydraulic action - this is a dent in the cliff usually at the level of high tide.

As the notch increases

3.

in size, the cliff becomes unstable and collapses, leading to the retreat of the cliff face.

- 4. The backwash carries away the eroded material, leaving a wave-cut platform.
- 5. The process repeats. The cliff continues to retreat.

Caves, arches, stacks and stumps

Caves, arches, stacks and stumps are erosional features that are commonly found on a headland.



- 1. **Cracks** are widened in the headland through the erosional processes of hydraulic action and abrasion.
- 2. As the waves continue to grind away at the crack, it begins to open up to form a **cave**.
- 3. The cave becomes larger and eventually breaks through the headland to form an **arch**.
- 4. The base of the arch continually becomes wider through further erosion, until its roof becomes too heavy and collapses into the sea. This leaves a stack (an isolated column of rock).
- 5. The stack is undercut at the base until it collapses to form a **stump**.

	Diagram	Explanation
leadlands nd bays		
'ave cut atforms		
ives. Tches, Tacks and Tumps		

Landforms resulting from erosion

Erosional landforms

The process of erosion can create different landforms along the coastline.

Caves, arches, stacks and stumps

Caves, arches, stacks and stumps are erosional features that are commonly found on a headland.



- Cracks are widened in the headland through the erosional processes of hydraulic action and abrasion.
- 7. As the waves continue to grind away at the crack, it begins to open up to form a **cave**.
- 8. The cave becomes larger and eventually breaks through the headland to form an **arch**.
- 9. The base of the arch continually becomes wider through further erosion, until its roof becomes too heavy and collapses into the sea. This leaves a stack (an isolated column of rock).
- 10. The stack is undercut at the base until it collapses to form a **stump**.

Complete the table to explain the formation of different erosional landforms

	Diagram	Explanation
Cavs, arches, stacks and stumps		

Different management strategies can be used to protect coastlines from the effects of physical processes

Hard engineering

Erosion is a natural process which shapes cliffs. Over time, erosion can cause cliff collapse therefore the coastline needs to be managed. Hard engineering involves building artificial structures which try to control natural processes. Each engineering strategy has its advantages and disadvantages.

Soft engineering

Soft engineering does not involve building artificial structures, but takes a more sustainable and natural approach to managing the coast. Each strategy has its advantages and disadvantages for use.

Managed retreat

Managed retreat is the controlled flooding of low-lying coastal areas. If an area is at high risk of erosion, managed retreat could be an option. It usually occurs where the land is of low value, for example farm land.

Complete a definition of the types of coastal management:

Hard engineering: _____

Soft engineering: ____

Managed retreat: ____

An example of a coastal management scheme in the UK: Holderness Coast

Coastal management case study: Holderness coastline

The Holderness coastline is located on the east coast of England. It is the fastest eroding coastline in Europe.



Reasons for management

The coastline is rapidly eroding at an average of 1.8 metres a year. There are several reasons why the coast at Holderness is eroding so quickly:

Rock type - the cliffs are made from less-resistant boulder clay (made from sands and clays) which slumps when wet.

Naturally narrow beaches - these beaches give less protection to the coast as it doesn't reduce the power of the waves.

Man-made structures - groynes have been installed to stop long-shore drift. This narrows unprotected beaches elsewhere even more.

Powerful waves - waves at Holderness travel long distances over the North Sea (so have a long fetch) which means they will increase in energy.

Management strategies



• Bridlington is protected by a 4.7 km long sea wall.

• Hornsea is protected by a sea wall, groynes and rock armour.

• Coastal management at Withersea has tried to make the beach wider by using groynes, and also uses a seawall to protect the coast.

• Mappleton is protected by rock groynes.

• Spurn Head is protected with groynes and rock armour.

Conflicts

There has been an

increase in erosion at Great Cowden because of the groynes used in Mappleton. This has led to farms being destroyed by the erosion and the loss of 100 chalets at the Golden Sands Holiday Park. Some people disagree with where the sea defences are located, especially if it means the land in their community is not protected.

Some sea defences negatively impact tourism and reduce the amount of money coming in to the area.

Complete the following questions about the management of the Holderness Coast:

Where is the Holderness Coast?

Name three settlements along the Holderness Coast

Give two reasons why the Holderness Coast need protecting:	
vive two ways the Holderness Coast is managed:	
ive two conflicts that have been created as a result of the coastal management strat	egies:





Erosion is the process that wears away the river bed and banks. Erosion also breaks up the rocks that are carried by the river.

There are four types of erosion:

• Hydraulic action - This is the sheer power of the water as it smashes against the river banks. Air becomes trapped in the cracks of the river bank and bed, and causes the rock to break apart.

- Abrasion When pebbles grind along the river bank and bed in a sand-papering effect.
- Attrition When rocks that the river is carrying knock against each other. They break apart to become smaller and more rounded.
- Solution When the water dissolves certain types of rocks, eg limestone.

Complete the table below by drawing and describing the four types of erosion found in a river:

Hydraulic action	Abrasion
riyar dune derion	7101 031011
Attrition	Solution
	Solution

Types of transportation

The river picks up sediment and carries it downstream in different ways.

There are four types of transportation:

- **Traction** large, heavy pebbles are rolled along the river bed. This is most common near the source of a river, as here the load is larger.
- Saltation pebbles are bounced along the river bed, most commonly near the source.
- **Suspension** lighter sediment is suspended (carried) within the water, most commonly near the mouth of the river.
- Solution the transport of dissolved chemicals. This varies along the river depending on the presence of soluble rocks.



Do the same in the table below to draw and describe the four types of transportation in a river:

Traction	Saltation
Truction	Juliunon
Suspension	Solution

Deposition

When the river loses energy, it drops any of the material it has been carrying. This is known as **<u>deposition</u>**.

Factors leading to deposition:

- shallow water
- at the end of the river's journey, at the river's mouth
- when the volume of the water decreases

Give 3 reasons why a river would deposit sediment (put material down):

- _____
- •
- _____



Features formed by erosion and deposition in the middle course of a river

Meanders

As the river makes its way to the middle course, it gains more water and therefore more energy. Lateral erosion starts to widen the river. When the river flows over flatter land they develop large bends called meanders.



As a river goes around a bend, most of the water is pushed towards the **outside**. This causes increased speed and therefore increased erosion (through hydraulic action and abrasion).

• The lateral erosion on the outside bend causes undercutting of the bank to form a river cliff.

- Water on the inner bend is slower, causing the water to slow down and deposit the eroded material, creating a gentle slope of sand and shingle.
- The build-up of deposited sediment is known as a slip-off slope (or sometimes river beach).

Oxbow lakes

Due to erosion on the outside of a bend and deposition on the inside, the shape of a meander will change over a period of time. Erosion narrows the neck of the land within the meander and as the process continues, the meanders move closer together. When there is a very high discharge (usually during a flood), the river cuts across the neck, taking a new, straighter and shorter route. Deposition will occur to cut off the original meander, leaving a horseshoe-shaped oxbow lake.



Draw annotated diagrams below to explain the formation of meanders and ox-bow lakes:

The fastest flow of the river occurs on the outside of a meander causing erosion. Deposition occurs on the inside of the bend.	

Different management strategies can be used to protect river landscapes from the effects of flooding

Flood risk factors

Flooding occurs when a river bursts its banks and overflows onto the surrounding land. There are many factors which can cause a flood - often the natural landscape can influence flooding and also human interactions can increase the risk.

Causes of flooding

- **Prolonged rainfall** if it rains for a long time, the land around a river can become saturated (it's holding as much water or moisture as can be absorbed). If there is more rainfall it cannot be soaked up, so it runs along the surface this is known as surface run-off.
- Heavy rainfall if there is heavy rainfall there is less chance of it being soaked up by the soil (infiltration) so it runs off into the river. The faster the water reaches the river, the more likely it will flood.
- **Relief** a steep valley is more likely to flood than a flatter valley because the rainfall will run off into the river more quickly.
- **Geology** permeable rocks allow water to pass through pores and cracks, whereas impermeable rocks do not. If a valley is made up of impermeable rocks, there is a higher chance of flooding as there is an increase in surface run-off.

- Vegetation trees and plants absorb water, this is known as interception. Lots of vegetation reduces flood risk. Sometimes people cut down trees (deforestation). This will increase the flood risk, as the water will not be intercepted and flow into the river.
- Urban land use when an area surrounding a river is built on, there is an increase in the amount of tarmac and concrete, which are impermeable surfaces. Drains and sewers take water directly to the river which increases flood risk.

List some physical and human causes of flooding - make sure you can explain how each leads to flooding:

Physical/Natural	Human

What is hard and soft engineering?

Hard engineering management involves using artificial structures, such as dams and embankments. Soft engineering management is a more natural approach to manage flooding, such as floodplain zoning.

Hard engineering is _____

Soft engineering is _____

Flood relief channels

The floodwater flows into the relief channel and is taken either to an area where it can be absorbed, or re-enters the river further down its course.

Advantages

- Removes excess water from the river channel to reduce flooding. Disadvantages
- Expensive to build.
- If water levels continue to rise, the relief channel may also flood.

There are more advantages than disadvantages of flood relief channels. To what extent do you agree?

An example of a flood management scheme in the UK: Sheffield, South Yorkshire

There was a long period of heavy rain in Sheffield on Monday 25th June. This meant that the ground became saturated and so water could not infiltrate and increased overland flow leading to flooding.

There are 3 big rivers that run through Sheffield. This means that there is more water flowing into rivers in the city and so increases the risk of flooding.

One effect on people (social) was that people's homes were flooded damaging their personal belongings. This led to 84% of people being affected by stress and depression as some people had lost everything in the floods.

One economic effect was that Meadowhall was damaged by the floods and was closed for five days. This meant businesses would lose out on revenue they could have earnt during this time.

Summary of Sheffield river management strategies In the city centre the council have...

- Removed vegetation and debris from rivers
- Cut down trees
- In the Lower Don Valley the council have...
- Built concrete raised river walls
- Improved grates over drains to trap vegetation and to stop drains filling
- Proposed that businesses to pay for river defences

Briefly outline why Sheffield needed to improve its flood management project:





List 4 of the strategies used in Sheffield to reduce the risk of flooding:

- •
- •
- -----
- _____

Geography Guide to Writing Successful Answers

Know the command words

Assess	Make an informed judgement
Calculate	Work out the value of something
Compare	Identify similarities and differences
Complete	Finish the task by adding to given information
Describe	Set out characteristics
Discuss	Present key points about different ideas or strengths and weaknesses of an idea
Evaluate	Judge from available evidence (e.g. advantages and disadvantages)
Explain	Set out purposes or reasons
Give	Produce an answer from recall
Identify	Name or otherwise characterise
Justify	Support a case with evidence
Outline	Set out main characteristics
State	Express in clear terms
Suggest	Present a possible case
To what extent	Judge the importance or success of (strategy, scheme, project, etc)

When answering questions worth **9 marks** include:

- Three fully explained ideas showing thorough geographical understanding and demonstrating detailed knowledge (A02). Refer back to the question at the end of each paragraph (A03).
- A range of examples / evidence to support your ideas (A01)
- A conclusion explaining your overall judgement and which addresses the command word (A03)

When answering questions worth 6 marks include:

- **Two** fully explained ideas showing thorough geographical understanding and demonstrating detailed knowledge (A02)
- A range of examples / evidence (this could be from a figure) to support your ideas (A01 and A03)

When answering questions worth 4 marks include:

- Two explained ideas showing clear geographical understanding (A02)
- Supporting evidence (this could be from a figure) / example (A01 and A03)

Assessment objectives:

AO1 - Knowledge (facts)

- AO2 Understanding (explanation)
- AO3 Evaluation (judgement)
- AO4 Communicate findings (skills)