

Year 9 Geography

Name: _____

Mountains Extreme Environments



Brooke Weston
Trust



Geography

Learn to change the World



Useful websites

- BBC Bitesize: <https://www.bbc.co.uk/bitesize>
- Cool Geography: <http://www.coolgeography.co.uk/>
- National Geographic: <https://www.natgeokids.com/uk/category/kids-club/>

What and where are Extreme Environments?

What is the definition of an extreme environment?

Extreme: characteristics of a place that is on the edge of the range, as far from average as possible.

Environment: a person or animal's natural surroundings.

An extreme environment is a region, place or area that is at the very edge of what people, animals and plants can survive in. This is because of a combination of characteristics that make life a challenge. If you lived in this type of place you would need to ask yourself questions such as: How will I eat? How will I move around this place? How will I cope with the very high or low temperatures? Where will I find shelter? Where will I find fresh, drinkable water?

Extreme environments in the UK: mountains



You do not have to travel to the Andes or the Sahara to experience extreme environments. In the UK we have some quite extreme mountains. They are much smaller in size than in some other parts of the world, but they can still teach us a lot about what makes an environment extreme. The winds can be gale force, the slopes are steep in places, the ground you walk on can be very rocky and sometimes it rains all day. However, if you plan carefully, they can be amazing places to visit – and the weather isn't always bad!

Figure 1. This is a relief map of the British Isles.

Describe the location of the mountain areas in the UK.

Mountain Environments

What are Mountain Environments like?

Mountain ranges are considered to be extreme environments due to their height and the difficulties people face living in them. A mountain is a piece of land that is over 610 m above sea level and is higher than the surrounding land. Some highland areas that are over this height are not mountainous, for example, the Tibetan plateau (an area of high flat land) with an average height of 5000 m above sea level.

In the UK, the highest mountains are Ben Nevis (1334 m) in the Highlands of Scotland, Snowdon (1085 m) in Snowdonia in North Wales, Scafell Pike (978 m) in the Lake District, England, and Slieve Donard (849 m) in Northern Ireland. The highest of all mountains is Mount Everest, located in the Himalaya in Asia, at 8840 m.

The Andes mountain range in South America covers 2 million km², and runs from Santa Marta in Colombia on the Caribbean coast at 11°N down to Tierra del Fuego in Argentina at 55°S. Throughout the mountain range there are many different climates, cultures and terrain that pose challenges for the people that live and visit. The largest mountain is Aconcagua, at 6962 m above sea level, located in Argentina, close to the border with Chile.



Relief Map of the British Isles



The summit of Ben Nevis (1334 m) in Scotland

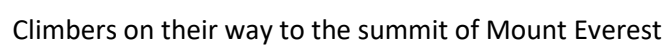


The summit of Aconcagua (6962 m) in South America

Task – Read the information below. Create a title for each paragraph and make two points to summarise the information in each paragraph.

Title	<u>Reason why mountains are extreme</u>	Summary
	Living in mountain environments such as the Andes is difficult and people need to overcome many problems, as with all extreme environments. One of the biggest problems that mountaineers face is the effects of altitude on their bodies. The higher you climb, the less oxygen there is. This is because there is less pressure pushing down on the atmosphere the higher up you go. Your muscles become less efficient and you find it difficult to move. Local people are used to the extreme environment and their bodies have adapted over generations. Visitors, however, can suffer from the effects of altitude – these can be fatal. Travellers must only gain height slowly, in some cases only 600 m per day. Moving around in the Andes is extremely difficult in many areas due to the steep-sided mountain slopes and valley sides. Any roads and rail routes have to be constructed around these steep slopes, but these are costly and difficult to build. There are many areas within this mountain range where walking is the only option, and this has meant that people living in these remote areas have little or no contact with the world outside their village. The snow line in Peru is between 4500 and 5000 m, and at this altitude the snow and ice make travelling even harder. Mountaineers often use specialist pieces of equipment, such as crampons and ice axes, to help them travel in this terrain to stop them slipping and falling. Many mountains are often remote, a long way from specialist help should an emergency happen. Aconcagua, for example, is 113 km away from the nearest city. If an emergency happens, often the only way out is by foot. The weather in the Andes can change very quickly as cumulonimbus clouds gather. This is due to the relief of the mountains. Warm air is pushed up over the mountains. This air cools (remember, it is cooler the higher up you are), it then condenses (turns from a gas to a liquid) and forms clouds that soon turn into storm clouds. This process is called relief rainfall. This process often brings storms to the mountains; people must find shelter quickly. For local residents, this means getting inside their houses. For mountaineers, there is little shelter on the mountain so it means putting up a tent, digging a snow hole or finding a place in the rocks to shelter. These storms could last for a few hours or a few days, during which travel is impossible. Key Terms Relief - the different heights of the land, and how flat or steep it is. Snow line – the altitude at which snow and ice remain on the ground throughout the year	

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



How were the Andes formed?

The Earth is made up of seven main tectonic plates, plus many smaller ones (including the Nazca Plate, for example). There are two types of plate: oceanic (a thin, dense piece of **crust** found under the seas and oceans), and continental (much thicker and less dense, found where the land is). These large plates of the Earth's crust move partly due to the **convection currents** underneath them in the Earth's **mantle**.

Large sections of the Earth's crust join together at plate boundaries. It is on these plate boundaries that volcanoes and earthquake zones are located. There are four types of plate boundaries:

- **Conservative:** plates push past one another.
- **Constructive:** new crust is formed here where plates pull apart.
- **Collision:** two continental plates collide.
- **Destructive:** oceanic crust sinks underneath a continental crust.

Collision boundaries and destructive boundaries are important as these have formed the mountain ranges of the world. The Andes, for example, have been formed at a destructive plate boundary due to the oceanic crust of the Nazca Plate being forced underneath the continental South American Plate at the Chile trench. This has pushed the land up, forming the longest mountain range in the world. These are known as fold mountains.

The Himalaya have been formed at a collision plate boundary where two continental plates, the Eurasian Plate and the Indo-Australian Plate, have collided.

Tectonic activity often produces volcanic activity, and the ten highest volcanoes in the world are found in the Andes, with Chimborazo being the highest. The highest mountain in the Andes, Aconcagua, is an extinct volcano. Earthquakes are also frequent as the two plates continue to move. For example, on 16th August 2007 an earthquake measuring 7.9 on the Richter scale hit Peru. There were 337 confirmed deaths.

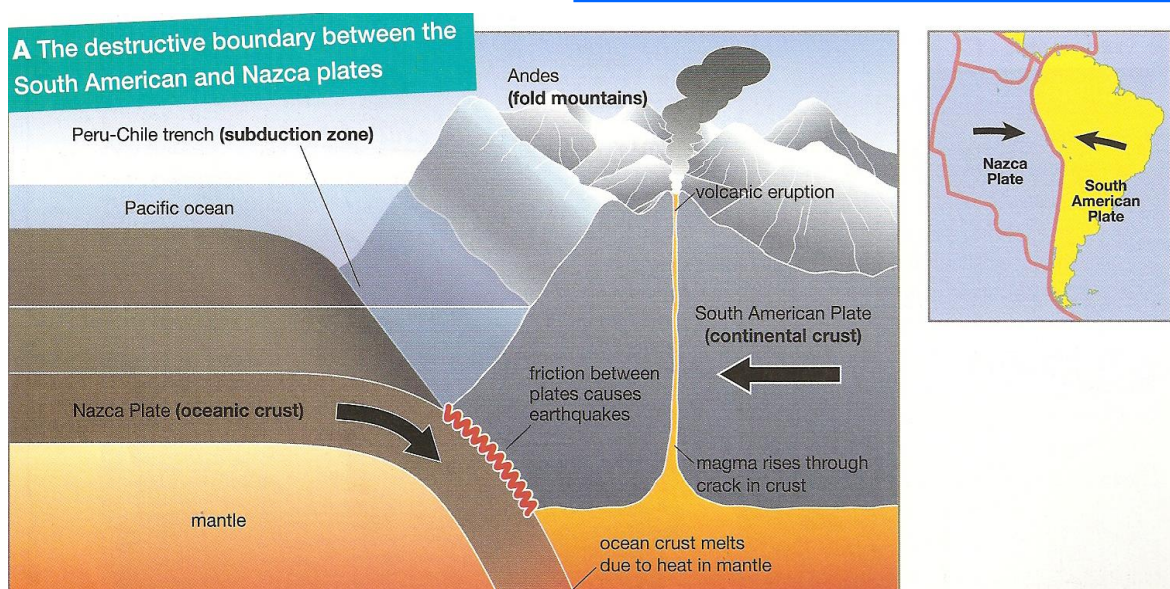
Key Terms

Convection currents – the currents that result in hot rock in the mantle rising to the crust; when the rock cools, the magma sinks towards the core. They are partly responsible for the movement of tectonic plates.

Crust – the solid, outer layer of the Earth sometimes referred to as the lithosphere.

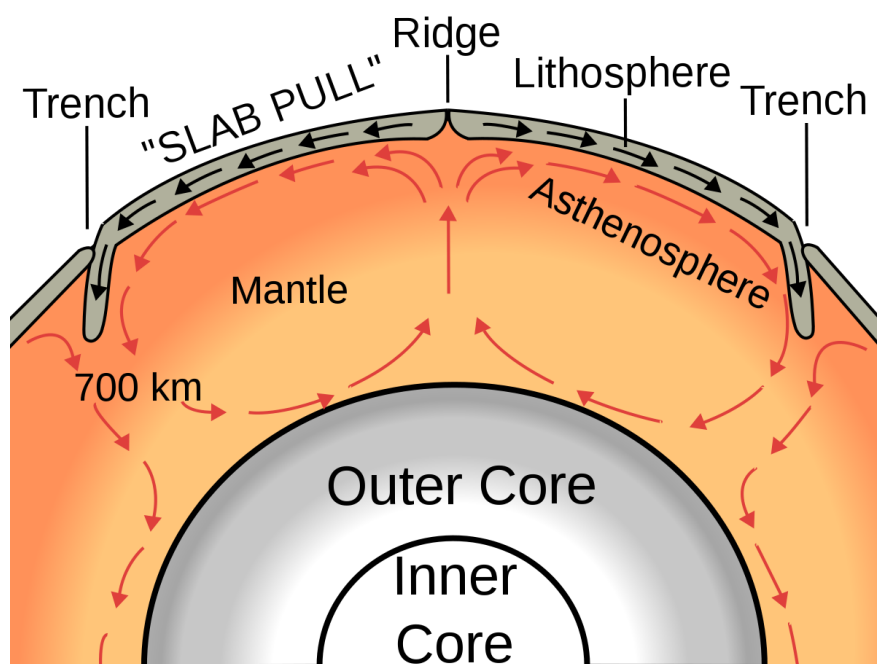
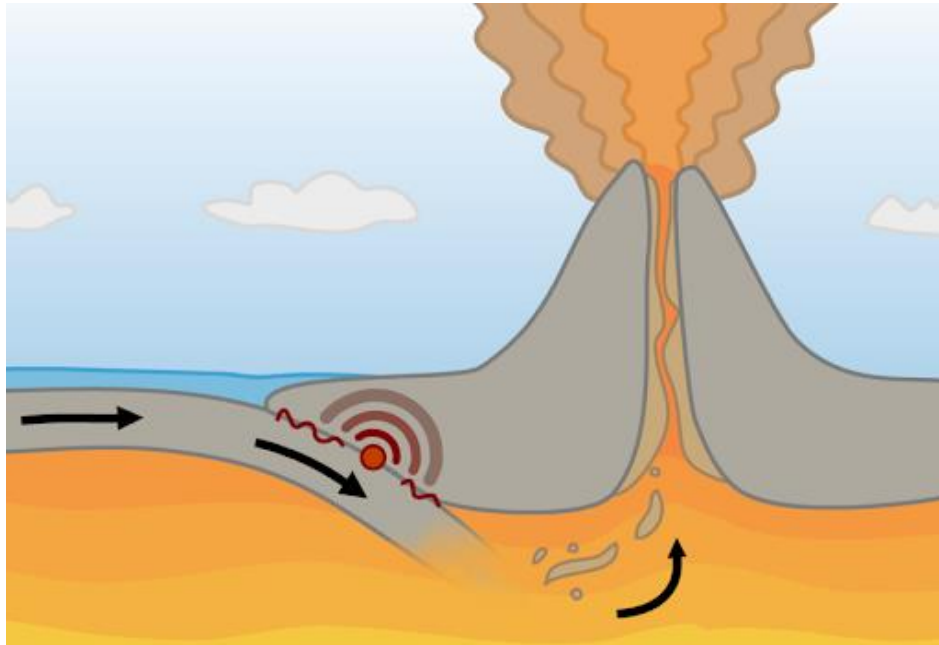
Mantle – the area of molten rock, hot rock under the crust; it is a thick liquid often called magma.

Tectonic activity – the processes that cause the Earth's crust to move and create earthquakes and volcanic activity. These processes cause major landforms.



Task

Annotate the diagrams below to explain how tectonic plates move and create mountains. Include how tectonic plate movements lead to earthquakes and volcanoes.



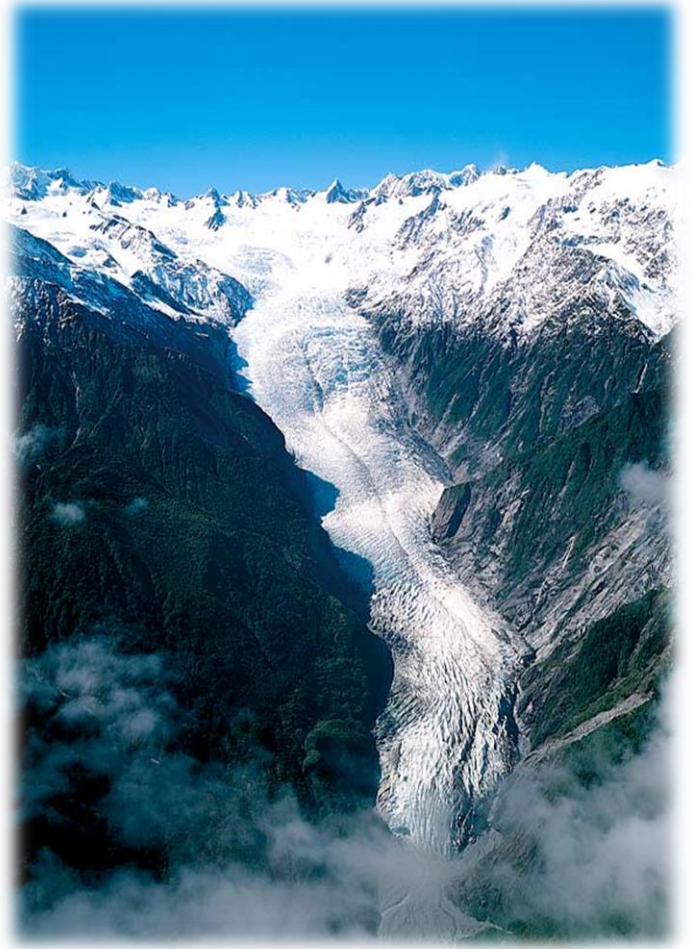
Mountain Processes and Physical Features

How does ice help to create this landscape?

The higher up you go, the colder it gets. So as tectonic activity pushes mountains up high, ice then starts to have a role in creating the mountain landscape.

Glaciers are 'rivers of ice' (this doesn't mean that they are frozen rivers). Gravity moves the ice slowly downhill through the mountain environment, creating some spectacular landforms along the way. These glaciers have had a major role in shaping the landscape of this extreme environment.

Snow falls at the top of the glacier high in the mountains, and due to the low temperatures does not usually melt. This is known as the **zone of accumulation**. This snow is compacted over thousands of years due to the weight of the snow on top to create blue ice. The ice is blue as all the oxygen has been squeezed out. This ice slides down the side of the mountain at a rate from centimetres per year to metres per year, determined by the amount of Meltwater underneath. As this ice moves, it erodes the valley bottom and sides through **plucking**, where rocks are pulled out from the valley sides and abrasion, where the rock is worn away. The ice eventually reaches the **zone of ablation** (melting).



A glacier

Key Terms

Plucking – as water turns to ice around a rock at the base or side of a glacier, it is pulled or 'plucked' away from the valley side or valley base by the glacier.

Zone of accumulation – the zone near the very top of the mountain where snow falls and is added to the glacier.

Zone of ablation – found at the end of a glacier and is where the ice melts due to an increase in temperature.

Task

Draw a diagram and annotate to explain how glaciers are formed.

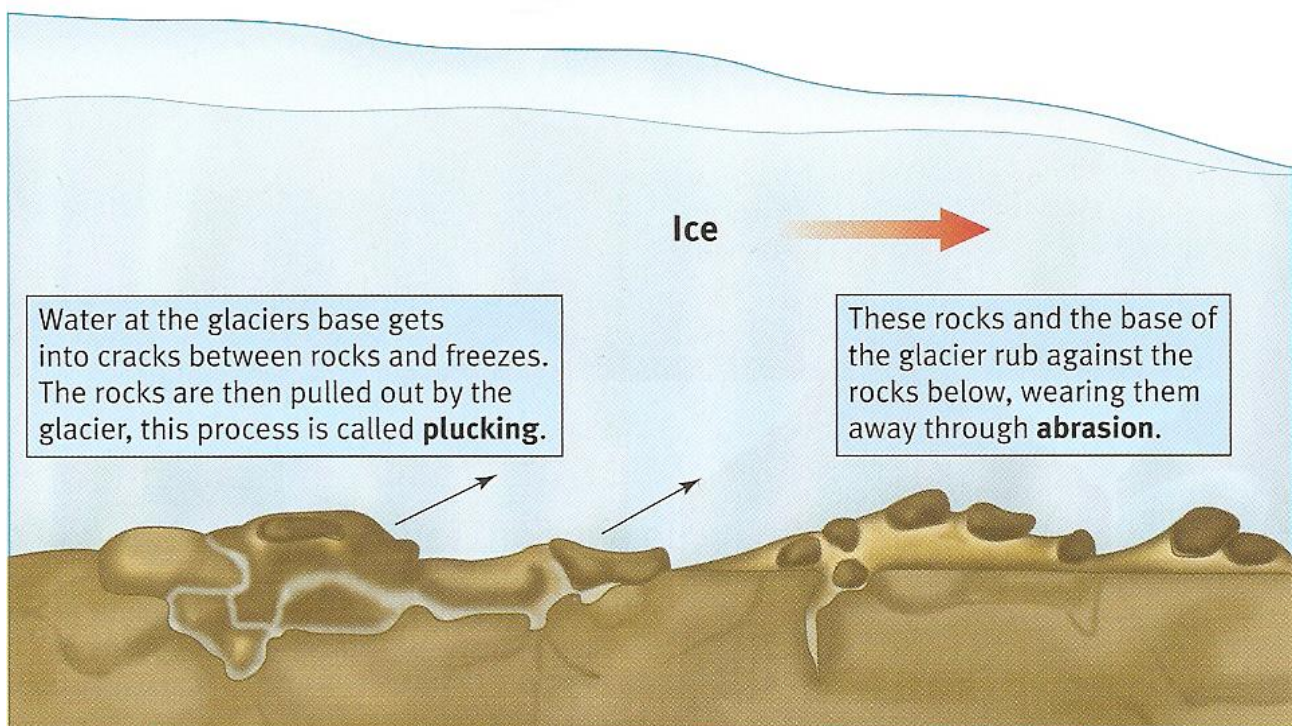
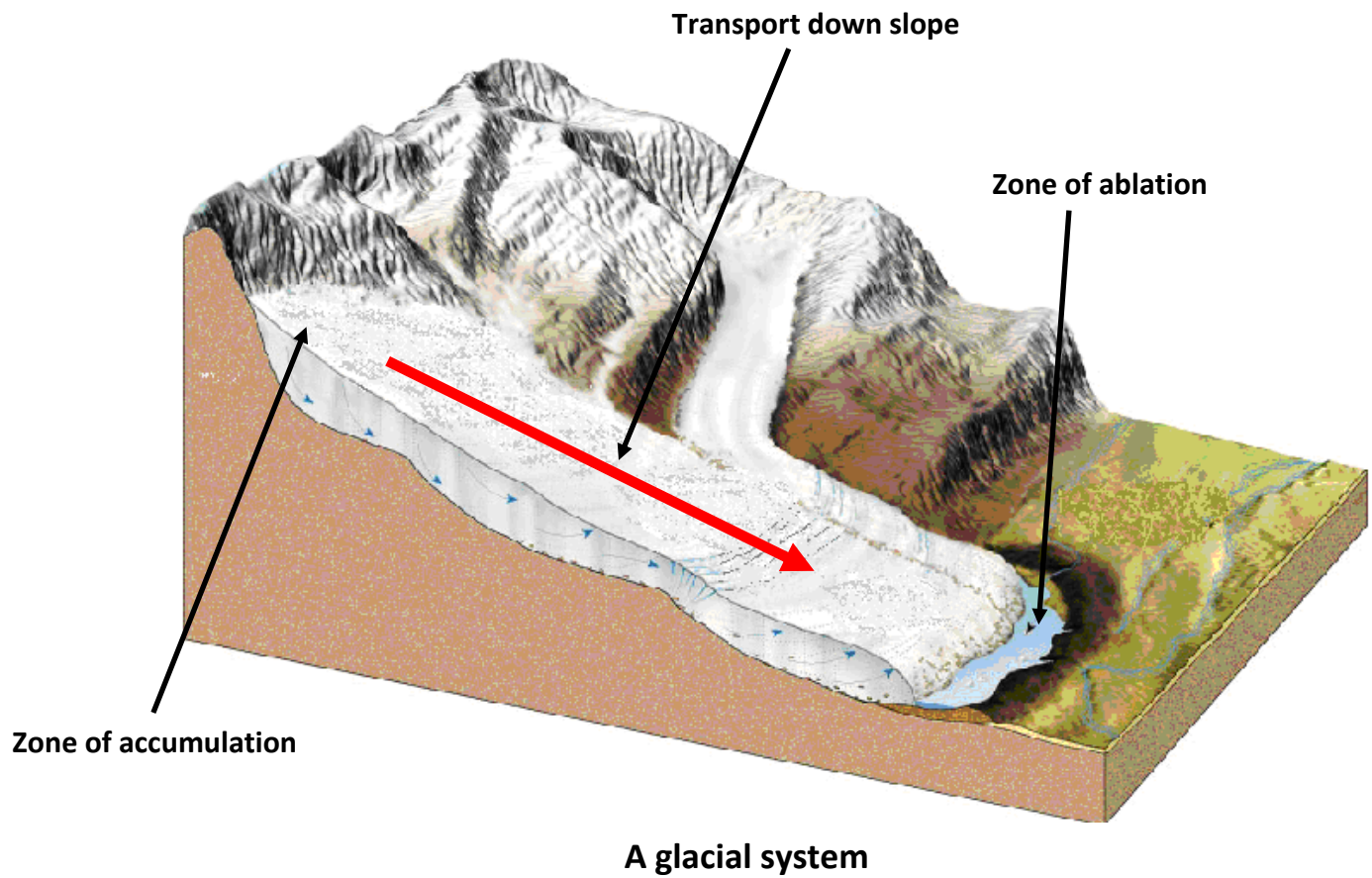


Figure 6 *Plucking and abrasion: two forms of erosion found in glacial areas.*

The Andes were formed by tectonic activity and glaciation!!

Glacial landforms

The Andes have some stunning features which create amazing views. These have been created by weathering and erosion by glaciers over thousands of years. U-shaped valleys, corries and arêtes create steep-sided mountains, all distinctive features of the extreme mountain environment.



A glaciated U-shaped valley in the Andes

How are glacial features formed?

A corrie or cirque is a bowl shape that has been carved out of the side of a mountain by a glacier. Ice starts to form high on the mountain side in the zone of accumulation. Over many years, this ice gets thicker and heavier and begins to move down the mountain. The ice will be thicker where there is a hollow. This part of the mountain will be subject to a greater amount of erosion through abrasion and plucking; this will remove the rock underneath the ice. Over thousands of years, the rock is scooped away by the glacier and two or more corries are formed side by side on a mountain; in between is a steep, knife-shaped ridge of rock which is called an arête. Where three corries form on a mountain side a pyramidal peak is created.

A U-shaped valley is created as the glacier moves down a V-shaped valley. V-shaped valleys are caused by water erosion: the flow of rivers. However, ice has ten times the erosive power of water and the weight of the glacier acts like a giant bulldozer, removing much more of the valley sides and floor through plucking and abrasion. This leaves a steep-sided flat floor valley – only visible once the glacier has **receded**. It also leaves many other features such as truncated spurs. These are the remains of the V-shaped valley that have been cut off. There are also hanging valleys, where river tributaries have been cut off to leave spectacular waterfalls along the steep sided valley sides.

Key Terms

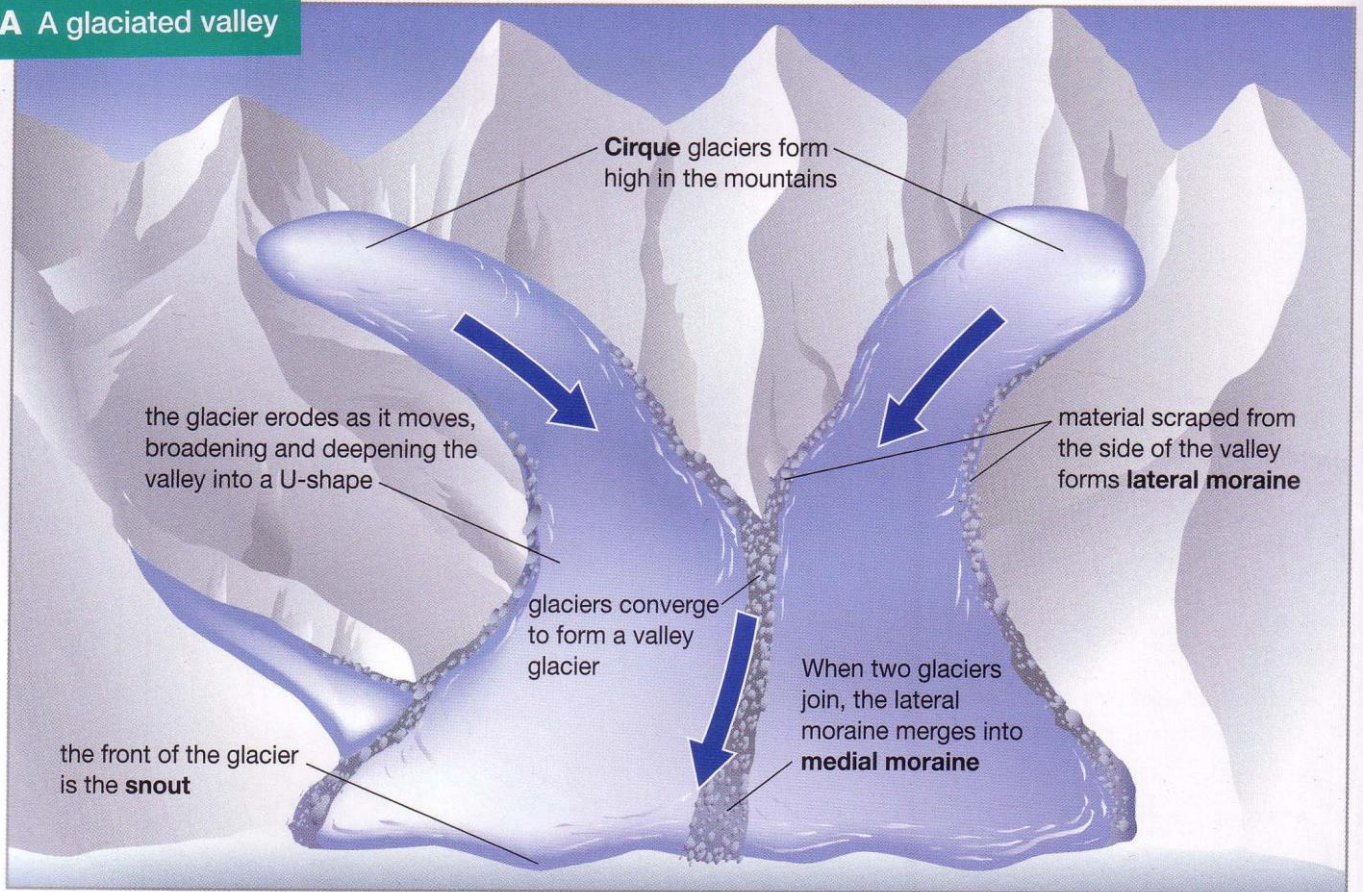
Receded – when the glacier melts and gets smaller, leaving the glacier further up the mountain.

Frost shattering – the process where rocks break due to water freezing in cracks (sometimes known as freeze-thaw).

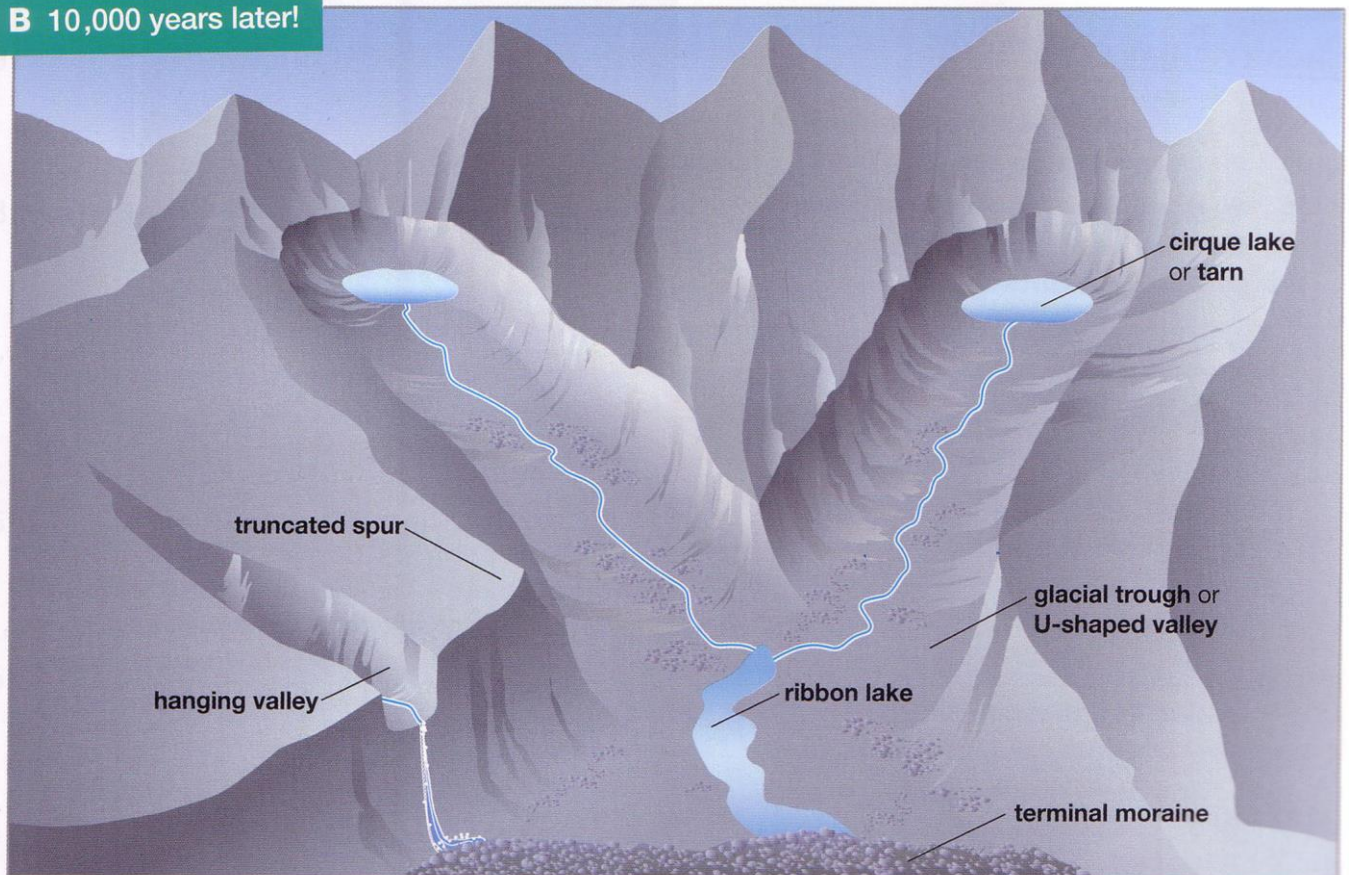
Terminal moraine – material deposited at the end of a glacier.

Moraine – material transported by a glacier and deposited at the sides, middle or end.

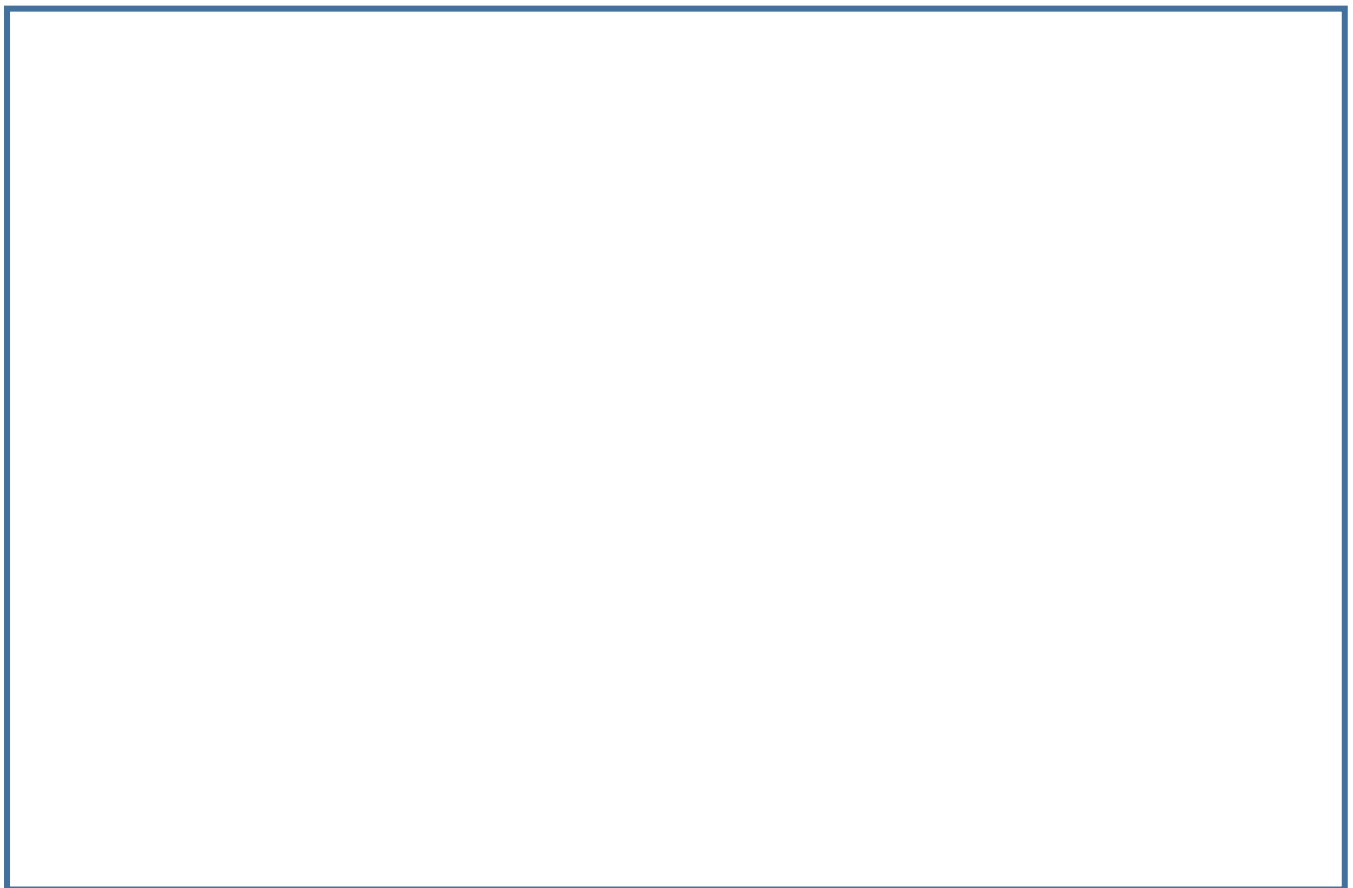
A A glaciated valley



B 10,000 years later!



Using a diagram to help, explain how U shaped valleys are formed.



How do people survive in Mountain Environments?

Climbing and surviving

The Andes region has many hostile environments to which people have had to adapt in order to survive. This ranges from providing themselves with a water supply, to growing crops on the side of steep-sided valleys. The people that live in these areas have learnt to cope with challenges that the terrain and weather bring. Despite such challenges, many people visit the region every year to climb the numerous mountains. These mountaineers face frostbite, injury and in some cases death to reach the top of these peaks.

To enable mountaineers to reach the summits of mountains, they use modern climbing equipment to help them overcome the geographical obstacles that they face.

People are attracted to the mountains due to the way they are represented; there are many stories about the Andes that have inspired awe and wonder in people. Some books show the Andes as being a place of beauty, which makes some people want to visit them. Stories have been written that tell of the difficulties that people have had to overcome just to be able to survive (like Joe Simpson in *Touching the Void*). These stories remind us of how harsh the environment of the Andean region is.

Task – Annotate the images to explain how these pieces of equipment help people to survive in the mountains.



Ice axe

Jackets filled with feathers



Oxygen mask



Crampons – spikes that you attach to shoes

Camping stove



A climber's diary

Write a diary entry for someone climbing a mountain. Include information about the challenges of climbing in the high mountains and the sights that you would see.

[illegible]