Knowledge Organiser: Y9 Glaciation

Overview of topic

What is a glacier?
How does a glacier move and erode the landscape?
What are glacials and inter-glacials?
How are upland glacial erosional landforms produced?
How are lowland glacial depositional landforms produced?
Why are glaciers important for people?
How are glaciers changing?
What are some of the consequences of these changes?

Keywords

Glacier – a large mass of slowly moving ice occupying a mountain valley, formed from years of annual snowfall over mountain areas which has not melted but gradually compacted to form ice.
Abrasion and **plucking** – are the two main ways in which glaciers erode
Glacial – a period of time when average global temperature was colder than they are now and glaciers extended further than they do now.
Interglacial – a period of time when average global temperature was like it is now or warmer and glaciers cover less of the landscape than in glacial periods.
Upland erosional landforms include grooves, roche moutonee, U shaped valleys, corries, aretes and pyramidal peaks.
Lowland depositional landforms include erratics, glacial till, terminal and lateral moraines, and drumlins

Key concept #1

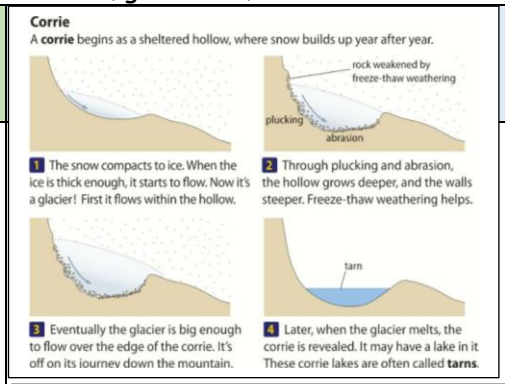
How does a glacier move and erode the landscape.

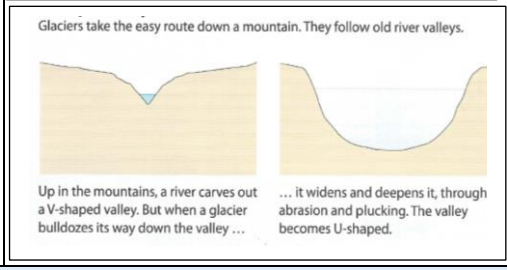
Glaciers move down a slope because of **gravity**. Glaciers in most mountain regions move mostly by **basal slippage**. There is a layer of **meltwater** between the glacier and the bedrock and this lubricates the movement. Glaciers in polar regions move by individual layers of ice sliding over one another (**plastic flow**) as the glacier is frozen onto the bedrock. Basal slippage causes erosion of the bedrock by **abrasion** (sharp rocks stuck in the basal ice grind away the bedrock). Freezing of ice onto fractured bedrock causes erosion by **plucking** out chunks of rock.

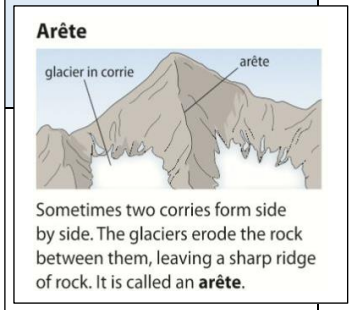
Question #2

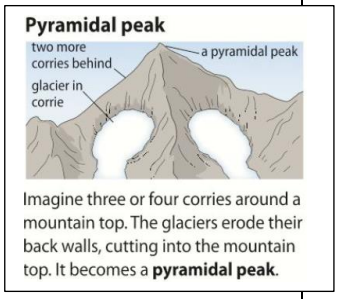
How are upland glacial erosional landforms produced?

Snow collects in hollows on the sides of mountains. If temperatures are cold enough in summer it does not melt but gradually turns into ice and becomes a glacier. The glacier slides out of the hollow and enlarges it creating a **corrie**.
Abrasion produces **grooves** on bedrock under the glacier. Harder areas of bedrock form mounds (**roche moutonee)** by abrasion and plucking. As several corries on a mountain erode bachwards, sharp ridges (**aretes**) form between them. If three or more corries erode backwards the mountain top can become a **pyramidal peak**. Glaciers moving down V shaped river valleys erode them into wider **U shaped valleys** (glacial troughs).









Key concept # 3 *How are lowland depositional landforms produced*

Glaciers eventually move into warmer areas and melt faster than they move down. As the ice melts it deposits the rock debris it is carrying, Large chunks of rock become **erratics**. Finer sediments are deposited as layers of **glacial till** and can be moulded into ridges (**moraines**) and oval shaped hills (**drumlins**).

Geographical Skills

- Identify and describe glacial erosional and deposition features on photos and OS maps
- Annotate diagrams of glacial features to explain their formation
- Explain the formation of several different erosional and depositional features

Case study #1 The UK

Mountain areas in the UK were repeatedly eroded by glaciers during glacial periods over the last 1.6 million years. When the last glacial ended 10,000 years ago this left many erosional and depositional features in these areas. Examples are the Lake District (NW England), Snowdonia (N Wales), Carngorms (Scotland) and the North-West Highlands (Scotland). Tourism is an important economic activity in these areas because of the landscape features. **Snowdon** is a pyramidal peak surrounded by corries and aretes with several U shaped valleys nearby. On the mountain sides there are lots of examples of rocks with grooves, of glacially eroded mounds called roche moutonee, and erratic boulders.

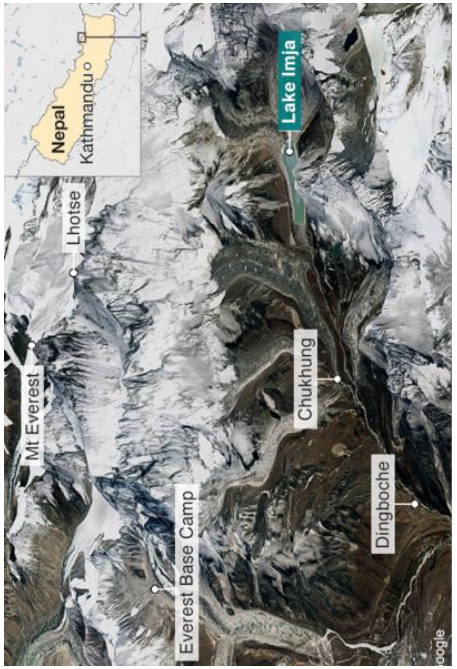



Case study#2 Nepal

Glaciers provide important resources for people:

- Slowly melting glaciers feed some the world's largest rivers (e.g. Ganges in India) and provide millions of people with freshwater for domestic use and crop irrigation
- Glacial deposits are used as a source of gravel for making concrete in construction
- Glaciated landscapes create opportunities for outdoor recreation and tourism (climbing, hiking, skiing etc)

Climate change is causing rapid melting of glaciers. In the Himalayas in Nepal near to Mt Everest, rapidly melting glaciers are forming huge meltwater lakes held in place by unstable natural debris dams. Eventually the dams break and release catastrophic floods (glacial lake outburst floods) down the valleys destroying homes, crops, roads, bridges and killing people. A dangerous glacial lake was drained to a safe level in 2016. The Imja glacial lake, at nearly 5,000m high, was in danger of flooding downstream settlements, trekking trails and bridges. The lake, which was originally 149m deep in places, has had its water levels lowered by 3.4m by engineers cutting a drainage channel to release some of the water slowly.



Homework and enrichment opportunities

- Create an information leaflet for visitors to either Snowdonia or the Lake District describing and explaining some of the glacial erosional and depositional features they can see as they walk, climb and cycle in the area. Include photos, maps and diagrams.
- Choose a named glacier and research what is happening to it, how it is changing and the impacts this is having on the surrounding area and people. For example:

https://www.aletscharena.ch/nature-en/the-great-aletsch-glacier/
https://www.banffjaspercollection.com/attractions/columbia-icefield/
https://www.chamonix.com/glacier-d-argentiere,47-53987,en.html

8 marker example (WAGOLL)

Using examples of places you have studied explain how glaciated landscapes are used and managed by people

Snowdonia National Park in North Wales contains many glacial erosional and depositional features. Apart from farming, tourism is the most important economic activity because visitors come to see the landscape features and do outdoor recreational activities such as hiking, climbing, mountain biking and nature watching. Snowdon is a pyramidal peak and is the most visited mountain summit in the UK either by walking (410,000 people per year) or mountain railway. There are 8 million day visits to the area each year creating 4000 jobs and bringing in £60 million per year. The national park is a protected landscape where the needs of visitors and local people are balanced with conservation of the land and wildlife. Rapidly melting glaciers in mountain regions such as the Himalayas are creating an increasingly high risk of glacial lake outburst floods. In 2016 Lake Imja in Nepal was drained to a safer level by engineers cutting a drainage channel through the unstable rock debris dam to slowly release some of the water before a catastrophic flood happened. Thousands of these lakes are now forming in the Himalayas and Andes mountains as glaciers are melting rapidly due to climate change, creating danger.