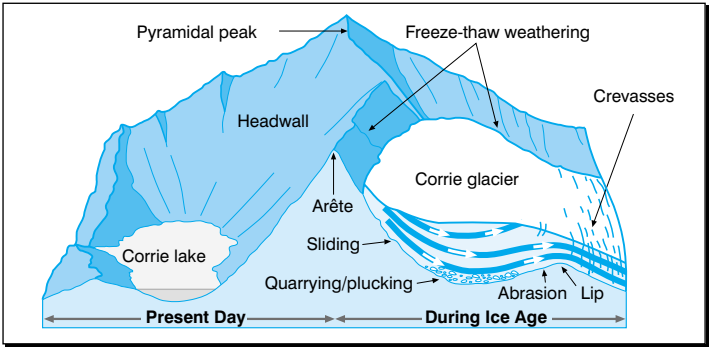
# GLACIATION (1)

- There are two main forms of **glaciation**. **Highland** or **valley glaciation** is where ice forms glaciers which flow along valleys. In **lowland** or **continental glaciation** an ice sheet covers a whole area. Highland glaciation is taking place still in mountainous areas such as the Alps and the Rockies. Antarctica is an area of continental glaciation.
- The Ice Age ended 10,000 years ago. The Lake District and the Scottish Highlands show the effects of highland glaciation. East Anglia's landscape is dominated by lowland glaciation features.
- **Glacial erosion** is the result of a combination of two processes: **frost shattering** and **abrasion**. Water freezes in cracks in the rocks, expands and shatters the rock. Rock fragments stick to the underside of the ice by **plucking**. As the ice moves it acts like a giant file.

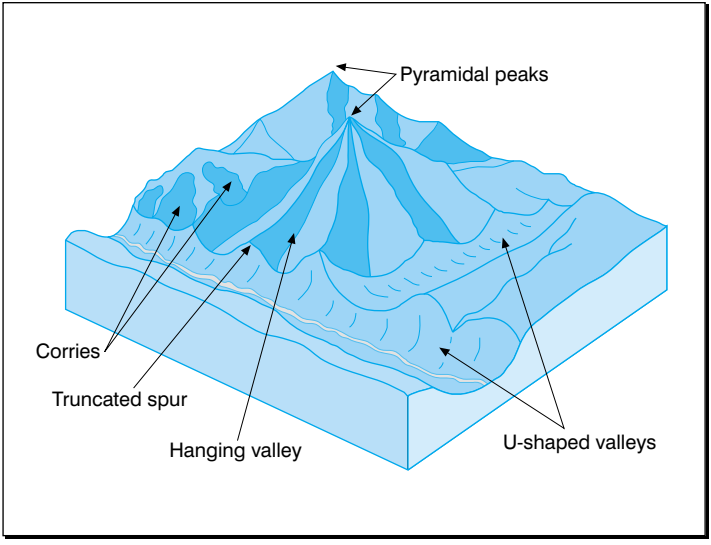
## Glacial landforms

- A **corrie** is an armchair shaped circular depression with steep walls on three sides. At the front a rock lip can dam water to form a **tarn lake**. Semi-rotational movement of the ice has enlarged and deepened an existing depression in the mountain. **Arêtes** and **pyramidal peaks** develop where several corries occur back to back.



# GLACIATION (2)

- Glaciers are ice flows which start in corries and move down existing river valleys. This creates a **U-shaped glacial trough** with **truncated spurs**. The U-shaped valley is straighter and deeper. **Ribbon** or **finger lakes** form in a glacial trough either by a glacier overdeepening part of the valley floor or by **moraine** blocking the end of a valley.

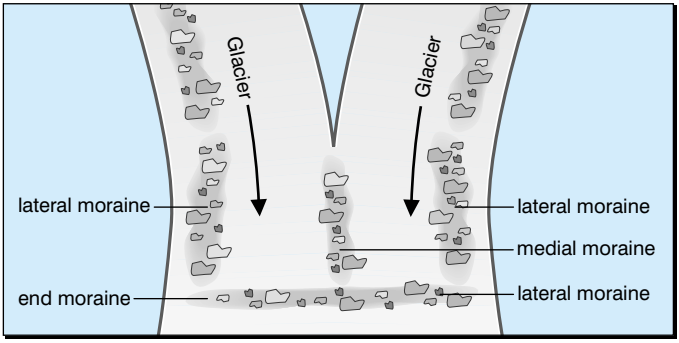



*Glaciated highland*

- Glaciated highlands have a variety of uses. Their spectacular scenery attracts tourists in both summer and winter. U-shaped and hanging valleys are ideal for HEP stations. Ribbon lakes are natural reservoirs. Artificial reservoirs are built by damming the valleys. Sheep farming is the main type of agriculture. In some areas there is conflict between the various landuses which can cause environmental damage.

## Glacial deposits

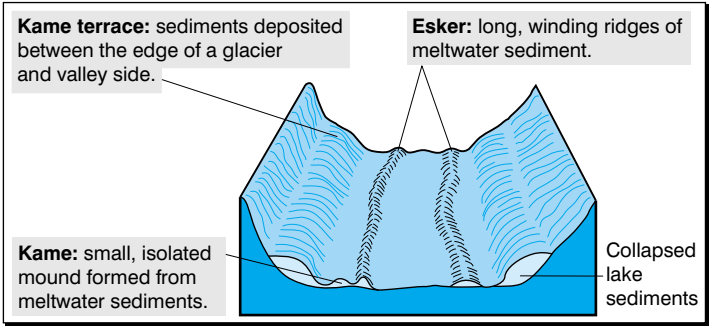
- **Glacial deposition** forms moraines. Unlike river deposits they are unsorted. A moraine will have a mixture of deposits ranging in size from large boulders to the finest rock flour. **Terminal** (end), **lateral** and **medial moraines** are named after the positions they are found in.




*Types of moraine*

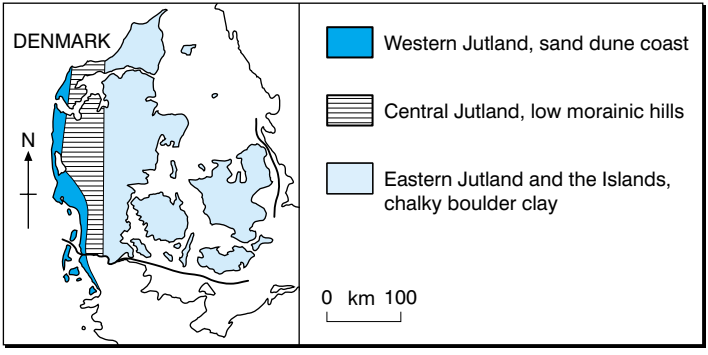
- Material carried underneath the ice is left as ground moraine. The weight of the ice crushes the material to form **boulder clay**. This is deposited as a continuous **till plain** or as a series of egg shaped **drumlins**.
- **Erratics** are rocks that have been transported by ice and deposited in an area of very different geology. **Roches mountonnées** have a gentle up-valley slope formed by abrasion. Plucking causes the down-valley side to be steeper. A **crag and tail** forms when a resistant plug, e.g. a volcanic cone, protects the material being eroded behind by the ice. In this case the gentler slope is on the down-valley side.
- **Meltwater streams** flow within, below and in front of the ice. These transport material and deposit them as fluvial–glacial deposits. These form **kames**, **kame terraces**, **eskers** and **outwash plains**.

# GLACIATION (4)




*Meltwater deposits*

- The effects of lowland glaciation are seen in the three physical divisions of Denmark.




*Physical geography of Denmark*

- Boulder clay or till plains in Denmark and East Anglia are important arable farming areas. The glacial deposits are not too sticky when wet and are good for growing crops. Other moraines do not produce particularly fertile conditions because of their unsorted nature.

## Glaciation (1–4)

**1** Why is a glacier able to move despite being made of solid ice? (1)

**2** What is the main difference between a tarn and a ribbon lake? (1)

**3** How could you tell if material had been deposited by water or by ice? (1)

**4** What glacial feature can be described as a 'narrow steep-sided ridge'? (1)

**5** Name an example of a pyramidal peak. (1)

**6** What landform marks the furthest point reached by the ice? (1)

**7** How did the 'hanging valley' get its name? (1)

**8** What are hanging valleys suitable for the production of HEP? (1)

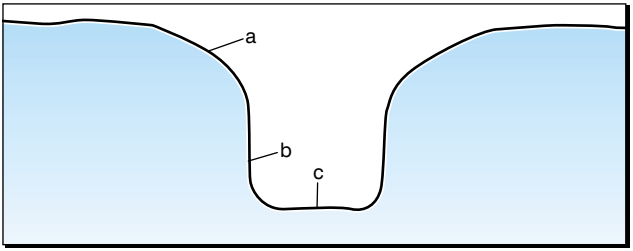
**9** Why does the relief of boulder clay or till plain favour the growth of cereals? (1)

**10** Why is frost shattering an important process in glacial erosion? (2)

**11** Why is there meltwater underneath a glacier or ice sheet? (1)
What is the importance of this meltwater? (1)

**12** What evidence is there in the landscape to show the direction of ice movement? (4)

**13** Explain the following features in the cross section of a glacial trough. (3)



**1** Individual ice crystals within the ice slide across one another. (1) Different parts of the glacier move at different speeds producing tunnels within the ice and crevasses on the surface.

**2** Their shape. (1) A tarn adopts the circular shape of a corrie. A ribbon lake is long and thin.

**3** Glacial deposits or moraines are unsorted. (1)

**4** An arrête. (1)
For example, Striding Edge in the Lake District.

**5** The Matterhorn on the Swiss–Italian border. (1)
Horn is an alternative name for a pyramidal peak.

**6** Terminal or end moraine. (1)

**7** The floor of the hanging valley 'hangs' above the floor of the main valley. (1) The hanging valley is cut by a smaller tributary glacier.

**8** They produce a high 'head' of water. (1)
This can turn electricity turbines.

**9** It is flat and suited to the use of machinery. (1)
This makes arable agriculture capital intensive.

**10** The rocks broken up by frost shattering are plucked by the ice. (1) The rock fragments in the ice are abrasive against the underlying rocks. (1) This question is asking how ice erodes rather than asking for the results of ice erosion.

**11** Friction between the moving ice and rock causes heat to melt the ice. (1) The meltwater lubricates the ice helping it to slide. (1) As the ice moves away from the frictional zone it freezes again, expands and shatters more rock.

**12** The way drumlins are positioned. (1) Erratics can show the origin of the ice flow. (1) The gentle side of a roche mountonnée faces the direction that the ice has come from. (1) The tail of a crag and tail points in the direction that the ice moving. (1)

**13** **a** The 'shoulders' are the remnants of the former river valley. (1)

**b** The truncated spurs result in steep sides. They are the remains of interlocking spurs. (1)

**c** The U-shaped cross section reflects the shape of the glacier. (1)

TOTAL