Glacial Landscapes in the UK – MARK SCHEME

Question 1a

Using Figure 15, which grid square matches the following description?
'There is a valley with a stream in the north. The land rises steeply southwards. It becomes more gentle towards the summit in the south, reaching a height of almost 1000 metres.'

One mark for the correct answer:
B. 0299
No credit if two or more answers shaded.

Question 1b

Locate Loch Avon centred in grid square 0102. What is the length (between points X and Y) and maximum depth of Loch Avon?

One mark for the correct answer:
A. Length 2.5 km maximum depth over 30 metres
No credit if two or more answers shaded.

Question 1c

Suggest one reason for the shape of Loch Avon.
The answer requires application of knowledge and understanding to map evidence.
Answers must suggest a reason for the shape of Loch Avon. Accept plausible suggestions.
Eg it is long and fairly narrow because it was created by a valley glacier (1).
It occupies the floor of a glacial trough/U shaped valley (1).
It is in a (steep sided) valley (1).
It is a ribbon lake (1)
It represents a river valley enlarged during the ice age (1).
It is uneven in shape because the valley floor is irregular/glacial deposits (1) or moraines were laid down/streams deposit materials along the edge of the lake (1)/different hardness of rock (1)

Question 2

Using Figure 19, describe the extent of ice cover across the British Isles during the last ice age.

Two separate points or one developed idea

Much/Most (60–75%) of the UK and Ireland were covered by ice (1)
The whole of Scotland, Ireland and much of Wales were covered by ice (1)
The ice sheet covered most of northern England (1)
Only the Midlands and south of England were not covered (1)
The ice sheet extended over most of the British Isles (1), including the whole of Scotland and Ireland and all but the extreme south of Wales (d)(1)
Northern England, including the Lake District, was covered by ice(1) but the boundary was uneven, dipping southwards along the east coast (d)(1)

Question 3

Match the following descriptions of glaciated uplands in the UK with the correct letter shown on Figure 20.

Description of glaciated upland area	Letter
A mountainous area which includes the highest point in Wales	D
A large mountainous area in Scotland where the highest point is over 1300m	A

Question 4a

Using Figure 15, what is the difference in height between the spot height at 556577 and the spot height at 532577?

600 metres

Question 4b

Using Figure 15, describe the land use shown in the highlighted grid square 5456.
Credit two separate points or a developed point for 2 marks.

There are some areas of woodland/forestry(1) especially in the south western part of the square/on the steeper valley sides (d) (1)
There are several buildings (1) which are mainly found on the valley floor/located along the main road (d) (1)
An A Road and railway cross the area (1) following the flat valley floor/with a railway station at Plasisaf (d)(1)
A campsite shows evidence of tourism (1)
Part of a small quarry is found here (1)
Accept farming as inferred land use. Allow max 1 mark for list of (at least 2) land uses, eg tourism, forestry, transport, settlement (1)

Question 4c

Using Figure 15 and Figure 16, identify the grid square where point X is located.

One mark for the correct answer:

A. 5555

No credit if two or more answers are circled

Question 4d

Using Figure 16, suggest one piece of evidence that shows this area

was glaciated.

Eg A long narrow/ribbon lake (1).
Steep sided valley/glacial trough (1).
Flat valley floor (1).
Glacial debris/moraine/till deposits (1).

Question 5a

Using Figures 15 and 16, in which direction was the photographer facing when the picture was taken?

One mark for the correct answer:
B. South west
No credit if two or more answers shaded.

Question 5b

Describe one feature of the corrie at Z on Figure 16.

One mark for brief outline or description of the corrie feature that can be seen in the photograph.
Accept any valid description
The land at Z is quite flat/it is waterlogged/ has much surface water/ has a small stream (1).
This appears to be the corrie lip / the edge of a large tarn (1).
It is an area of deposition (1)/ perhaps glacial moraine (1).
It is a short stream separating a large tarn from a smaller lake (1).

Question 6

Explain how a corrie forms and changes over time.

- **Level 2 (3-4 Marks)** (clear) responses are likely to contain linked statements showing understanding of the processes involved and the sequence of formation. Appropriate geographical terminology.

Indicative content

- The command is “explain”, so responses should provide a reasoned account of how and why a corrie forms and develops over time. This could include post-glacial changes through to the present day.
  Processes should be outlined as well as the sequence of formation.
- Although a landform of glacial erosion, some reference to depositional processes, weathering and mass movement is also relevant. A corrie is a hollow in the mountainside in which ice first collects.
- Initial formation. A corrie is formed when snow begins to build up in a small hollow, often facing North or North-East in the UK so less affected by direct sunshine. The snow turns to ice and a small corrie glacier fills the hollow.
- Development over time. The corrie glacier begins to move downhill by rotational sliding, while freeze-thaw weathering, along with plucking, loosens and removes material from the back of the hollow, producing a steep back-wall. Moraine gets dragged along the base of the glacier, deepening the hollow by abrasion and forming a rock basin.
- Erosion at the front edge of the corrie is not so powerful, so a sill or rock-lip develops, often made higher by deposition of some of the moraine. When the ice begins to melt, the rock lip acts as a natural dam to the meltwater, and a deep, rounded corrie-loch (or tarn) sometimes forms.
- Credit relevant labelled diagrams as part of the explanation of processes and the sequence of corrie formation and change over time.
- Credit reference to **Figures 14** and **15** if linked to formation of a corrie. The corrie in the photograph faces NE which is away from direct sunlight and strong prevailing winds. Snow compacted to ice in the hollow, then moved under gravity towards the north and east. The ice rotated to the lip, shown in the foreground. Processes of abrasion deepened the corrie. Plucking steepened the back and sides, producing an almost vertical backwall in places. After glaciation a corrie tarn, Carn Etchachan, filled the hollow.
- Sequence of formation and some reference to processes involved required to reach top of Level 2

Question 7

'The growing number of visitors to glaciated upland areas in the UK can only bring advantages.'
Do you agree?
Use an example to explain your answer.

- Level 3 (5-6 Marks) (detailed) answers will be developed responses, with supporting evidence for answer. Answers may be balanced or based on definite decision. Appropriate terminology will be used.

Indicative content

- Responses will apply knowledge and understanding of the effects of large number of visitors to glaciated area(s), making a judgement about the advantages and/or challenges identified.
- The command word is 'explain your answer', so answers should support the points made. Credit responses which agree or disagree with the statement. Some will take a balanced approach before reaching a conclusion. There is no "correct" view-both sides can be credited, if supported with evidence, although it is likely that most responses will disagree with the statement.
- Advantages of tourism to glaciated upland areas include: the needs of tourists create new jobs in catering, hotels, outdoor recreation etc; tourists support local shops and products as well as services such as post offices and buses; money from tourists is used to conserve and improve the area; services for tourists benefit local people, for example public transport and roads; tourists mainly come to see the scenery and wildlife, so there is pressure to conserve fragile habitats.
- Disadvantages include: jobs in tourism are often seasonal and wages are low; prices may rise in shops as tourists have more money to spend; shops cater for the requirements of tourists not local people; large numbers of tourists can damage the environment eg footpath erosion; demand for holiday homes pushes up house prices for local people and limits use of local services, including schools; traffic congestion, air and water pollution and parking issues.
  Disadvantages often involve conflicts between tourism and other activities. Eg tourists may leave gates open whilst walking and exploring the area. This can lead to animals escaping and potentially being injured or lost. This would affect profits for the farmer.

- Use of example to support or refute statement. Eg Lake District. Over 15 million visitors per year, money spent supports hotels, shops and restaurants; thousands of people are employed, new businesses such as adventure tourism have grown. However most arrive by car-roads are narrow and congestion is a major issue; house prices are high-much property is holiday rentals; jobs are seasonal and unreliable; walkers damage landscapes and farmland-trampling crops, leaving litter, dogs disturb sheep and cattle. Some conflicts occur between tourists and other tourists eg conflicts between open water swimmers, large sailing boats and water skiers. Speed limit on Windermere introduced in 2005 (10 mph).
- Evaluation of statement. Eg tourism in upland glaciated areas does bring some economic advantages but can also lead to environmental problems and significant conflicts of interest. Many locals prepared to accept developments, and overlook disadvantages, if they bring employment and money to the area.
- Reference to an example is required for access to Level 3.

Question 8a

Complete the table in Figure 20 by calculating the range of sediment size, in cm, at location B.

6.6 (cm)

Question 8b

Suggest one reason for the difference in the range of sediment size between location A and location B.

E.g. Till has a wider range as it consists of materials moved by solid ice so everything is picked up (1)
Outwash has a smaller range because it has been moved by water (1)
Water sorts out the materials moved, leaving behind the largest (1)
Glaciers shift everything in their path including large boulders and small debris whereas water can only pick up some materials (1)
Till consists of unsorted materials (of all sizes) whereas outwash comprises sorted materials (with a smaller range) (1)

Question 9

Which of these is a process of glacial erosion?

B. Plucking

No credit if two or more answers shaded.

Question 10

Explain why there may be land use conflicts in glaciated upland areas.
Use Figure 21 and your own understanding.

- **Level 2 (3-4 Marks)** will have linked statements showing understanding of land use conflict(s). Some geographical terminology evident.

Indicative content

- Responses should show understanding of land use conflicts in glaciated areas in the UK, applying understanding to the photograph.
- Economic activities listed in the specification are tourism, farming, forestry and quarrying. Others might include hydro-electric power/wind/renewable energy, water supply, military training.
- The photograph depicts walkers on wide footpaths where erosion is extensive, with forestry and lake (water supply) in background. There are possible conflicts between tourists and farmers or conservationists, between forestry and tourism/faming etc.

- Conflicts between tourism and other activities. Some people fear interference with their livelihoods (e.g. farmers), or congestion and pollution from cars and litter. Too much recreational activity may damage fragile environments (e.g. soil erosion). Tourists could leave gates open whilst walking and exploring the area. This can lead to animals escaping and potentially being injured or lost. This would affect profits for the farmer. Purchase of second homes reduces chances of property availability for locals and limits use of local services.
- Conflicts between forestry and other land uses. Heavy trucks used to transport the logs can cause traffic congestion on roads. Logging can cause noise pollution which disrupts the peace and quiet of the area and can scare away wildlife. It can scar the landscape and make it look unsightly. Growing trees in rows or lines looks out of place and destroys the natural beauty of the area. After the forest has been cut down, there is no vegetation left to intercept rainfall. Machinery used by the loggers compacts the soil so water cannot soak in. This can result in flooding.
- Conflicts between quarrying and other land uses. Quarrying may lead to pollution of land and rivers and spoil the landscape.
- Wind farms may spoil landscape, which affects number of tourists staying in hotels/visiting area. House prices may fall if views spoilt. Much local opposition.
- Credit named examples of land use conflicts e.g. Glenridding zip wire proposal (dropped after opposition).
- Economic development in upland glaciated areas can lead to many land use conflicts, particularly between tourism and other land users, and forestry and other land users. Many locals may be prepared to accept developments,
  and overlook disadvantages, if they bring employment and money to the area.

Question 11

Explain the formation of different landforms of glacial deposition.
Use Figure 22 and your own understanding.

- **Level 3 (detailed)(5-6 Marks)** will be developed responses with supporting detail of the processes involved and the sequence of formation. Appropriate terminology will be used.

Indicative content

- The question implies knowledge of the processes of transport and deposition as well as landforms associated with glacial deposition.
- Landforms of glacial deposition shown in the diagram include terminal moraine, recessional moraine, drumlins, till plain, outwash plain. Allow reference to other depositional landforms.
- Understanding of relevant processes. As ice descends into lowland areas the snout bulldozes soil, rocks and boulders. Ice stagnates and melts. Processes include freeze-thaw on mountain slopes, various forms of mass movement, and erosional processes of plucking and abrasion, all of which contribute to the creation of morainic debris and glacial till. Transport processes are relevant as are processes of deposition under the ice (subglacial), on top of the ice (supraglacial), and ahead of the glacier snout (proglacial).
- Moraine refers to rocks carried on top, within and beneath the ice. Till consists of all the eroded and weathered material deposited by the ice.
- Drumlins are made up of glacial material eroded by the glacier further up-valley. They are smooth egg shaped hills around 10–20 metres high, often found in clusters. Drumlins are formed underneath the glacier so are found behind the terminal moraine. Melting ice at the base of the glacier causes material to be deposited as ground moraine, as there is too much to be carried. This ground moraine is then sculpted to form drumlin shapes by further ice movements. They build up over time, comprising layers of glacial till and rock. The long axis of drumlins aligns with the flow of glacial ice. They usually have a blunt end that faces up the valley and a more pointed end facing down-valley. Accept other theories of drumlin formation eg core of rock with boulder clay deposited in layers as ice advanced.
- Terminal moraines mark the maximum extent of the glacier. Huge amounts of material build up at the snout to form a high ridge across the valley. The longer the snout stays in one place, the greater the amount of material that is deposited.
- Ground moraines consist of material dragged underneath the glacier and left behind when the ice melts. It often forms an uneven hilly surface.
- Recessional moraines are small ridges of debris which tend to be deposited at a temporary pause when the glacier is retreating.

Question 12a

Describe the shape of the drumlins shown in Figure 21.

Elongated (1), egg shaped (1), oblong (1) oval (1).
Low/rounded hill with one side steeper than the other (1).

Allow other valid description

Question 12b

Using Figure 21, calculate the mean maximum height of the 6 drumlins.

31.3 metres Allow 31 metres, 31.33 metres

Question 12c

Using evidence from Figure 21, suggest the general direction of movement of ice when the drumlins were formed.

From south east to north west (1).
From south south east to north north west (1).
Towards the north west/NNW (1).
From the south east/SSE (1).

Question 13

Explain how glaciated areas in the UK provide economic opportunities.

- **Level 2 (3-4 Marks)** (clear) will have linked statements showing understanding of land use opportunities. Some geographical terminology evident.

Indicative content

- **Economic** activities listed in the specification are tourism, farming, forestry and quarrying. Others might include hydro-electric power/wind/renewable energy, water supply, military training.
- Opportunities for economic activity are limited. Glaciated upland areas can be extreme environments. For rural landowners, there are few ways to earn a living from the land due to steep slopes, thin soils, low temperatures and heavy relief rainfall. Many farmers have diversified into other economic activities.
- **Farming**. In upland areas, soils in these are thin and acidic. Land is mainly used for grazing. Sheep can tolerate cold, wet and windy conditions, and poor vegetation. Some highland areas also farm cattle and deer for venison meat. Soils in valleys are thicker due to deposition. Flat-bottomed glacial troughs are ideal for using machinery and farming can be more productive. Typical crops include cereals and potatoes, and grass for winter feed.
- **Lowland** glaciated areas may be covered by a thick layer of till, which is very fertile. Much of central and eastern Britain has productive farmland growing wheat, barley, potatoes and other crops.
- **Tourism** is a major source of income in Wales, Scotland and the Lake District. People visit these places to enjoy the mountainous landscape created by glaciation. This environment is popular with tourists because it provides opportunities for walking, cycling, sailing and kayaking.
- **Forestry**. Some glaciated areas are covered in woodland and coniferous forest. Conifer trees are well adapted to cope with acidic soils. They are one of the few economic ways of using steep slopes. These forests may be logged to provide materials. Conifers produce ‘soft’ wood used for timber in the construction industry or for making paper. Forestry provides employment and contributes significantly to the economy.

- Quarrying. Upland glaciated areas are made of hard, resistant rock. This can be quarried and crushed to provide stone used in the construction industry and for building roads. Eg Limestone makes up much of the Pennine Hills, a valuable resource used in the chemical industry, fertilisers and cement industry. Lowland areas–meltwater stream gravels and sands also used for construction.
- Credit named examples where relevant.

Question 14

Explain the formation of a hanging valley.

- **Level 2 (3-4)(clear)** will have linked statements showing understanding of the processes involved and the sequence of formation. Appropriate geographical terminology.

Indicative content

- The command is “explain”, so responses should provide a reasoned account of how and why a hanging valley forms. This could include post-glacial changes through to the present day.
- The question implies knowledge of the processes of erosion as well as a landform of glacial erosion. Processes may be outlined as well as the sequence of formation.
- Processes include abrasion – where moraine within the ice to the sides has a sandpapering effect on both sides and base; and plucking – where the ice following melting under pressure, freezes to the rock and tears part of it away when it moves.
- Ice occupies a former river valley, often V shaped. The glacier is fed by several tributary glaciers that start in corries. These join together and cause the ice to erode powerfully by plucking and abrasion. The main valley is widened by lateral erosion and deepened by vertical erosion forming a glacial trough/u-shaped valley.

- Small glaciers can erode only shallow valleys while large glaciers can erode much deeper valleys. A hanging valley is a shallow valley carved by a small tributary glacier and so when the ice melts the height of the valley floor is left "hanging" high above the valley floor eroded by the larger trunk glacier.
- If a river occupies a hanging valley it plunges as a waterfall to the floor of the main valley and sometimes builds up an alluvial fan of coarse materials.
- Credit relevant labelled diagrams as part of the explanation of processes and the sequence of hanging valley formation.
- Sequence of formation and some reference to processes involved required to reach top of Level 2.

Question 15

Discuss the success of strategies used to manage the impacts of tourism in glaciated upland areas. Use Figure 17 and an example you have studied.

- **Level 3 (5-6)(detailed)** will be developed responses, with supporting evidence for answer, referring to a named example of a glaciated upland area and use of Figure 17. Answers will discuss the success or otherwise of strategies. Appropriate terminology will be used.

Indicative content

- Responses should apply knowledge and understanding of the strategies used to manage tourism, making an assessment of the success of these strategies. Some will take a balanced approach before reaching a conclusion.
- Understanding of the strategies used to manage tourism. Credit any strategy that can feasibly be used in glaciated upland areas.
- Managing footpath erosion includes: resurfacing paths with hard-wearing materials, eg rocks, plastic mesh, slabs, etc.; reseeding vegetation to reduce the visual impact of the erosion; encouraging visitors to use alternative routes by providing signposting or fencing.

- Managing traffic congestion includes increasing public transport in the tourist season, improving the road network, eg by providing designated passing places on single-track roads, encouraging people to use bikes, buses, boats and trains, eg by providing discounts.
- Protecting wildlife and farmland includes: using signs to remind people to take their litter home and provide covered bins at the most popular sites; encouraging visitors to enjoy the countryside responsibly eg by closing gates and keeping dogs on leads.
- Use of example to support answer, eg Lake District.
  Traffic issues. The Go Lakes Travel scheme aims to reduce car use, eg by introducing pay-as-you-go bikes. Ambleside has Controlled Parking Zones within the town centre where people can only park for 1 hour. High property prices. Permission granted for 270 affordable homes that only local people can buy.
  Erosion of footpaths. At Tarn Hows, severely eroded paths have been covered with soil and reseeded, and the main route has been gravelled to protect it.Noise, erosion and pollution from water sports. Zoning schemes mean that some water sports are only allowed in certain areas of some lakes. Windermere has a 10 knot speed limit for all boats,
- Application of knowledge and understanding to Figure... Public transport is being encouraged, with special bus services serving tourists including cyclists and hikers. By connecting up the main settlements drivers can park their cars, which reduces traffic congestion and delays, reduces carbon emissions and lessens the effects of air pollution. It is convenient for those who wish to rejoin at a different point. The bus service connects local communities, and helps to achieve sustainable use of the area and protect its environment.
- Assessing the success of strategies to manage tourism. Answers may indicate that strategies have been completely, partially or not successful, supported by evidence. Eg several projects have successfully repaired footpaths, created steps, re-surfaced paths with local stone and re-planted native species. However, there are still hundreds of kilometres of footpath in need of constant attention, and their maintenance is very difficult. The use of public transport has been generally successful, but the increasing number of vehicles still means huge congestion problems, particularly in the summer.