



GEO.PH12 Glacial Landscapes: Erosion Processes and Landforms

AQA 8035 • Calculators not allowed • about 50 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** State what is meant by the process of plucking in a glacial environment, with reference to rock removal from beneath a glacier in upland areas such as Snowdonia.

(Total for Question 1 is 1 mark)

- 2** State what is meant by abrasion in a glacial environment, naming how transported material produces this effect on bedrock in upland valleys.

(Total for Question 2 is 1 mark)

- 3** State what is meant by freeze-thaw weathering in cold upland environments such as Snowdonia, and how it weakens rock.

(Total for Question 3 is 1 mark)

- 4** In the context of Snowdonia uplands, give a concise definition of a corrie or cirque and one typical feature found in its basin.

(a) Define a corrie (cirque) in a glacial upland landscape such as those in Snowdonia. (1)

(b) State one feature commonly found in the basin of a corrie, with a Snowdonia example if you can. (1)

(Total for Question 4 is 2 marks)

- 5 Give a concise definition of an arete in the context of glacially eroded uplands such as the Lake District or Snowdonia.

(Total for Question 5 is 2 marks)

- 6 Table A gives pre glaciation valley depths and post glaciation valley depths for three upland valleys in Snowdonia. Use these figures to calculate the mean depth increase caused by glacial erosion, showing your working.

Valley	Depth before glaciation (m)	Depth after glaciation (m)
Vale A	120	420
Vale B	95	340
Vale C	150	460

(Total for Question 6 is 3 marks)

- 7 Give a concise definition of a pyramidal peak and name a named UK example in Snowdonia or the Lake District.

(Total for Question 7 is 1 mark)

- 8 Look at the labelled diagram of a corrie (not provided here). In words, describe the sequence of processes that form a corrie, using five clear stages that include snow accumulation, nivation, freeze-thaw, plucking and abrasion. Provide brief, ordered points suitable for annotating the diagram.

(Total for Question 8 is 5 marks)

- 9** Describe the sequence of stages that produce a glacial trough (U-shaped valley) from a pre-glacial V-shaped river valley, using five ordered points that could be used to annotate a labelled diagram.

(Total for Question 9 is 5 marks)

- 10** OS map-extract practice, Snowdonia: An OS extract shows Cwm Idwal labelled and a small lake marked within the cirque. Using the description below, identify the named erosional feature shown and explain briefly how the map evidence supports your identification. Prompt: the feature is a bowl-shaped hollow on the mountainside containing Llyn Idwal, with steep contours on three sides and a flatter outlet to the valley below.

(Total for Question 10 is 4 marks)

- 11** Explain how a hanging valley forms, and name why waterfalls might appear where a hanging valley meets the main glacial trough.

(Total for Question 11 is 4 marks)

- 12** Describe briefly how a ribbon lake forms within a glacial trough and give one named UK example if you can.

(Total for Question 12 is 3 marks)

- 13** Give TWO pieces of map or field evidence that would help you distinguish a glacial trough from a river valley when visiting Snowdonia.

(Total for Question 13 is 2 marks)

- 14** Give TWO clear differences between a corrie and a U-shaped glacial trough in terms of form and location.

(Total for Question 14 is 2 marks)

- 15** Use Snowdonia examples where appropriate. Question: 'Explain the formation of a corrie (cirque) in a glacial upland landscape.'

Explain the formation of a corrie (cirque) in a glacial upland landscape.

(Total for Question 15 is 6 marks)

Mark scheme · GEO.PH12 Glacial Landscapes: Erosion Processes and Landforms

Question 1

- **B1** rock is pulled out of the bedrock as meltwater refreezes in cracks and the moving ice detaches blocks, oe
- **Answer: Plucking is when meltwater refreezes in cracks in bedrock beneath a glacier and the moving ice pulls blocks of rock away.**

Question 2

- **B1** the scraping and grinding of bedrock by rock fragments embedded in the base or sides of a glacier, oe
- **Answer: Abrasion is the scraping and grinding of bedrock by rock fragments carried in the base or sides of a glacier.**

Question 3

- **B1** water enters cracks, freezes and expands, widening cracks and breaking rock into fragments over repeated cycles, oe
- **Answer: Freeze-thaw weathering is when water enters rock cracks, freezes and expands, widening the cracks and causing rock to break into fragments after repeated cycles.**

Question 4

- (a) **B1** a bowl shaped hollow on a mountainside formed by glacier erosion, oe
- (a) **Answer: A corrie is a bowl shaped hollow on a mountainside formed by glacier erosion.**
- (b) **B1** a tarn or small mountain lake occupying the corrie basin (e.g. Llyn Idwal in Cwm Idwal), oe
- (b) **Answer: A tarn, a small mountain lake often occupying the corrie basin (for example Llyn Idwal in Cwm Idwal).**

Question 5

- **B1** a narrow, knife edged ridge formed where two corries or glacial valleys erode back towards each other, oe
- **B1** formed by headward erosion on both sides producing a sharp ridge, oe
- **Answer: An arete is a narrow, knife edged ridge formed where two corries or glacial valleys have eroded back towards each other.**

Question 6

- **M1** calculate individual depth increases: 420-120, 340-95, 460-150 seen, oe
- **M1** sum the increases and divide by 3 seen, oe
- **A1** 285 m cao
- **Answer: 285 m.**

Question 7

- **B1** a sharp peak formed where three or more corries cut back into a mountain, oe; named example earns B1
- **Answer: A pyramidal peak is a sharp mountain summit formed where three or more corries cut back into the massif; an example is Yr Wyddfa (Snowdon) in Snowdonia.**

Question 8

- **B1** stage 1: snow accumulates in a hollow and compacts to form névé and ice, oe
- **B1** stage 2: freeze-thaw and nivation widen the hollow and loosen rock, oe
- **B1** stage 3: rotational movement of the small glacier erodes the basin by abrasion, scouring the hollow, oe
- **B1** stage 4: plucking at the back wall removes blocks of rock, steepening the back wall, oe
- **B1** stage 5: after ice melts a corrie basin often holds a tarn and has a steep back wall and lip formed by deposited rock or reduced erosion at the snout, oe
- **Answer: 1) Snow accumulates in a hollow and compacts into ice. 2) Freeze-thaw and nivation widen and deepen the hollow. 3) Rotational movement and abrasion scour and deepen the basin. 4) Plucking removes blocks from the back wall, steepening it. 5) After ice melts the hollow becomes a corrie, often with a tarn and a steep back wall and a lip at the front.**

Question 9

- **B1** stage 1: a glacier forms in a valley, filling it with ice, oe
- **B1** stage 2: the ice abrades valley sides and floor as it moves, widening and deepening the valley, oe
- **B1** stage 3: plucking steepens valley sides and deepens the floor, oe
- **B1** stage 4: tributary valleys are less deeply eroded, leaving hanging valleys above the main trough, oe
- **B1** stage 5: after ice retreats the valley has a characteristic U shape with steep sides and a flat bottom, and may contain ribbon lakes in overdeepened sections, oe
- **Answer: 1) A glacier fills a pre-existing V-shaped river valley. 2) The moving ice abrades and deepens the valley floor and widens the sides. 3) Plucking steepens the valley sides and assists deepening. 4) Tributary valleys are eroded less, becoming hanging valleys above the trough. 5) When the ice retreats the valley is U-shaped with steep sides and a flat floor and may include ribbon lakes where the glacier overdeepened parts of the floor.**

Question 10

- **B1** identification of the feature as a corrie or cirque (Cwm Idwal) or corrie occupied by a tarn, oe
- **B1** evidence: bowl-shaped contours and steep back wall shown by close contour spacing, oe
- **B1** evidence: lake within the hollow (Llyn Idwal) indicates a corrie basin, oe
- **B1** evidence: a flatter outlet or lip at the front leading down to the valley supports corrie formation, oe
- **Answer: The feature is a corrie (cirque), specifically Cwm Idwal with Llyn Idwal; map evidence includes a bowl-shaped set of contours with steep back wall indicated by close contour spacing, a small lake in the basin, and a flatter outlet or lip leading down to the valley.**

Question 11

- **B1** tributary valleys are occupied by smaller glaciers that erode less deeply than the main glacier in the trunk valley, oe
- **B1** after ice retreats the tributary valley floor is left higher than the main valley floor, forming a hanging valley, oe
- **B1** a stream from the hanging valley falls down to the lower main valley, creating a waterfall, oe
- **B1** the waterfall exists because of the difference in elevation between the less-eroded tributary and the overdeepened main trough, oe
- **Answer: Hanging valleys form because smaller tributary glaciers erode their valleys less deeply than the main glacier, so when the ice retreats the tributary valley floor is left higher than the main trough; a stream from the hanging valley then falls to the lower main valley creating a waterfall due to the difference in elevation.**

Question 12

- **B1** a ribbon lake forms where a glacier overdeepens parts of the valley floor, often where softer rock is eroded more, oe
- **B1** after ice retreats water fills the overdeepened section forming a long narrow lake, oe
- **B1** named example: Wastwater in the Lake District, oe
- **Answer: A ribbon lake forms where a glacier overdeepens sections of the valley floor, often over softer rock, and after the ice retreats these overdeepened parts fill with water; an example is Wastwater in the Lake District.**

Question 13

- **B1** evidence 1: U-shaped cross section indicated by steep sides and a flat valley floor on contours or in a cross-section, oe
- **B1** evidence 2: presence of hanging valleys, corries or ribbon lakes that indicate glacial modification, oe
- **Answer: For example: (1) steep valley sides and a flat floor or U-shaped cross-section on contours, and (2) features such as hanging valleys, corries or ribbon lakes which show glacial modification rather than river-only erosion.**

Question 14

- **B1** difference 1: a corrie is a bowl-shaped hollow on a mountainside, whereas a glacial trough is a long valley with steep sides and a flat floor, oe
- **B1** difference 2: corries are located at the head of glacial valleys and often contain a tarn, whereas troughs run down the valley and may contain ribbon lakes, oe
- **Answer: A corrie is a bowl-shaped hollow on a mountainside, while a U-shaped glacial trough is a long valley with steep sides and a flat floor; corries occur at valley heads often with a tarn, whereas troughs run down-valley and may contain ribbon lakes.**

Question 15

- **Level 3** (5-6): Detailed explanation that describes the full sequence of processes (accumulation, nivation/freezing-thaw, rotational movement, abrasion, plucking and post-glacial modification), uses accurate specialist terms and links processes to resulting corrie features. May use a named example such as Cwm Idwal.
- **Level 2** (3-4): A clear explanation covering several relevant processes (for example freezing-thaw, plucking and abrasion) with some linkage to corrie features, but with less detail or fewer stages.
- **Level 1** (1-2): Simple statements about one or two processes or features with limited development, for example stating that ice erodes hollows to form corries.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - Snow accumulates in a hollow and compacts to form névé and glacier ice, especially on north-facing hollows in Snowdonia such as Cwm Idwal.
 - Freezing-thaw weathering widens cracks in the back wall, producing loose material and assisting headward erosion.
 - Nivation (the combined action of freezing-thaw and meltwater) and gravity help enlarge the hollow before permanent ice develops.
 - Rotational movement of the small corrie glacier causes abrasion of the basin floor, scouring and deepening the hollow.
 - Plucking at the back wall occurs when meltwater freezes in joints and is pulled away by moving ice, steepening the back wall.
 - A rock lip or threshold may form at the corrie mouth due to reduced erosion at the glacier snout or deposition of rock, allowing a tarn to persist after ice retreats.
 - Reference to a named example such as Cwm Idwal or Llyn Idwal supports answers that place processes in a UK context.