Zig Zag Education

Geography **AS / A Level | AQA | 7036 / 7037**

Topic Tests for AS and A Level AQA Geography:

Glacial Systems and Landscapes

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Contents

Teacher's Introduction

This resource has six tests on *Section 3.1.4: Glacial systems and landscapes* of the AQA AS (7036) and A Level (7037) Geography specification. Every key aspect of the specification is covered in this resource.

These topic tests are designed to test the students' knowledge and enable the teacher to diagnose the students' strengths and weaknesses in certain areas. Each test covers a range of question types, and there is a wide variety of stimulus material. These tests are not intended to mimic exam papers; answers do not necessarily match AQA's standard command word mark allocation. The resource is designed to be co-teachable with both AS and A Level students.

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Mark schemes for each topic test can be found at the back of this resource. For 'closed' questions, where only one answer is acceptable, a model answer has been provided. For 'open' and extended questions, indicative content has been included.

When to Use This Resource
This resource can be used at the end of a particular topic area, or at the end of the whole unit in order to enable consolidation of knowledge. The students can also use the tests towards the end of the course, to assess knowledge either before or after revision. There is scope to provide your students with one test every two weeks if teaching the A Level course over two years.

How to Use This Resource
The tests can be completed individually in class, or set as homework tasks. The tests can be quickly marked by the student or the teacher, at home or in the classroom, as answers are provided.

These structured tests provide an opportunity to mark and score students in order to monitor progress. The tests are provided in a non-write-on format.

The Benefits to the Students
Students can be confident they have been tested on every key aspect of the specification. After completing a test, they will know which areas they are strong in, and which require further work, and can set their own goals for future learning. The answer sections also provide students with an indication of what a good answer entails.

Differentiation
In order to support lower-ability students while pushing the more able, each test has been written in two sections.

- The first section has approximately 40 marks and has been written to test knowledge of the core elements of the specification.
  - These questions are for all students and the difficulty or complexity of questions generally increases throughout the test.
- The second section has approximately 10–12 further marks of extension questions for higher ability students.
- The final test draws from themes from the whole topic. This test would be ideal as an end-of-topic activity, and to identify gaps in the students' knowledge.
- The final test also contains two long-answer, exam-style questions – one for AS Level and one for A Level.

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Test 1 – Glacial Systems

1. Define the term 'system'.

2. Describe each of the following components of a system:
   - Elements
   - Attributes
   - Relationships

3. Name four common characteristics of systems.

4. Name three types of system that can operate and give a definition for each.

5. What is meant by dynamic equilibrium?

6. Explain what is meant by positive and negative feedback cycles.

7. Give an example of a natural positive feedback cycle and an example of a negative feedback cycle.

8. Explain how the earth can be understood as a cascading system.

9. What kind of system is a glacial system?

10. Give an example of an input, a store and an output in a glacial system.

11. Explain how a glacial system can be a positive feedback cycle.

12. What is meant by the concepts of 'landscape' and 'landform'?

13. Give four common landforms that might be found in a glaciated landscape.

Extension Questions

14. Explain the effects of positive feedback cycles in glacial landscapes.

15. Assess the importance of understanding the systems approach when studying

Test 2 – The Distribution and Charac
Cold Environments

1. a. Name the four types of cold environment.

   b. Describe the current distribution of these en[illegible]nts.

   c. Name the distinguishing cha[illegible]s of each of these four environm

2. Describe and expla[illegible]climate of the polar regions.

3. a. De[illegible]the vegetation that can be found in the tundra.

   b. Describe the type of soil found in the tundra.

   c. Explain how this vegetation has adapted to the climate and soil of the t

4. Describe what is meant by glacial and interglacial periods.

5. Study the map below.

   Compare the distribution of cold environments in the present day to that of

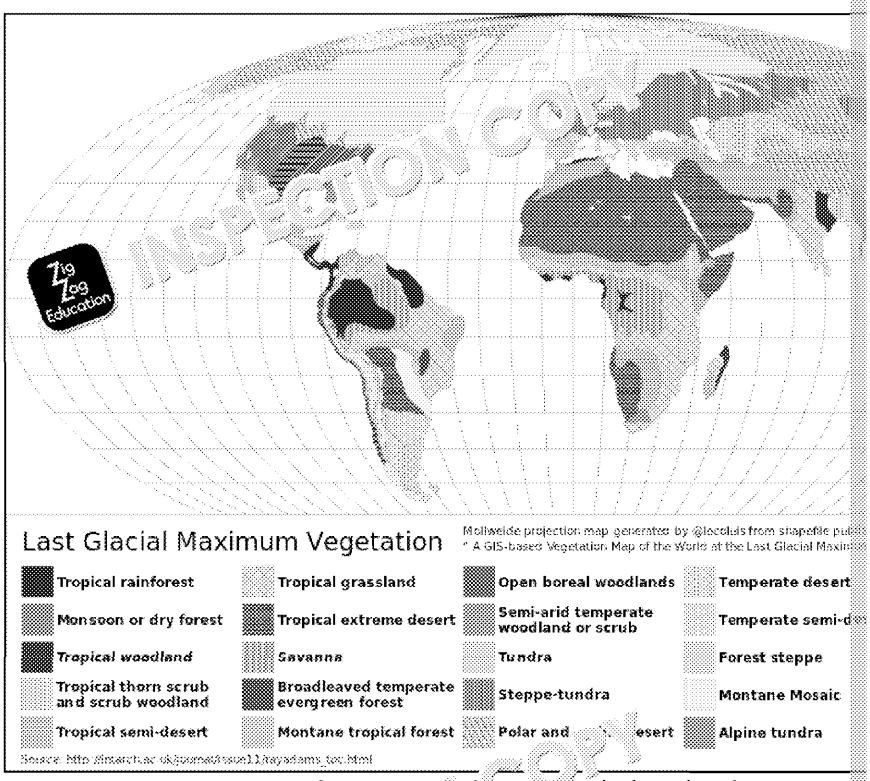

Figure 1 Ve[illegible]ti[illegible]over in the last glacial maximum

Extension Questions

6. Explai[illegible]he climate of cold environments affects the soil and vegetatio

7. Assess the importance of understanding past distribution of cold environme

1. What happens in the ablation zone?

2. Explain what is meant by the glacier budget.

3. How does the glacier budget vary throughout th[illegible]?

4. Study the image below of the Ja[illegible]hav[illegible] glacier in Greenland.

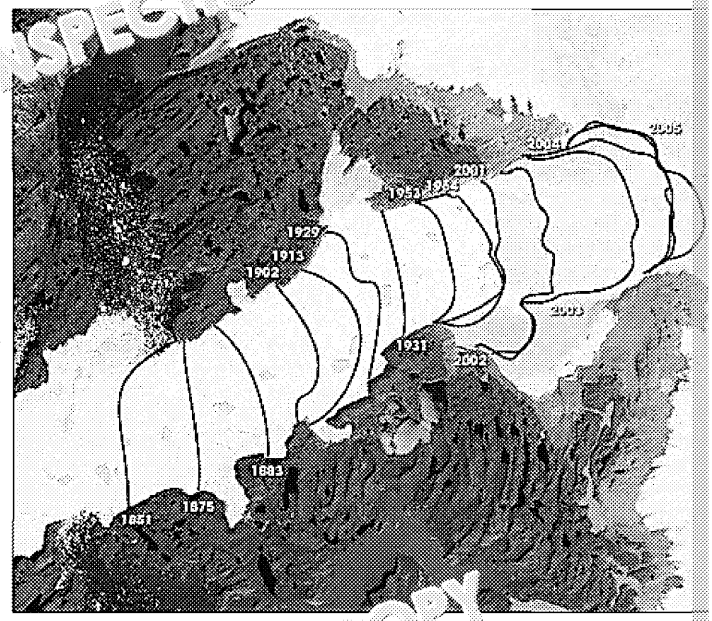

Figure 2 Jakobshavn glacier over time

   a. Suggest what has happen[illegible] the glacier budget of this glacier over tim

   b. Give [illegible] reasons for this.

5. What is [illegible] evidence for past glacial advance and retreat?

6. Outline the characteristics of a warm-based glacier.

7. a. Explain the different ways in which ice moves in a glacial system.

   b. Outline the other geomorphological processes operating in glacial syste

8. What is the role of fluvioglacial processes in glacial systems?

9. a. Describe the features of permafrost found in periglacial landscapes.

   b. Explain the periglacial processes of mass mo[illegible]

Extension Questions

10. Compa[illegible]m-based glaciers with cold-based glaciers.

11. Assess the role of geomorphological processes in glacial systems.

Test 4 – Development of Glacial La

1. Give two examples of erosional landforms found in a glaciated landscape.

2. Explain the processes behind the formation of erosional landforms in a glaci

3. Describe the characteristics of depositional la[illegible] in glacial landscapes.

4. Give examples of landscapes [illegible] haracterised by the erosional and dep of glaciation.

5. a. W[illegible]t of landform is an esker?

   b. Describe and explain the processes that give rise to this landform.

6. Study the image below.

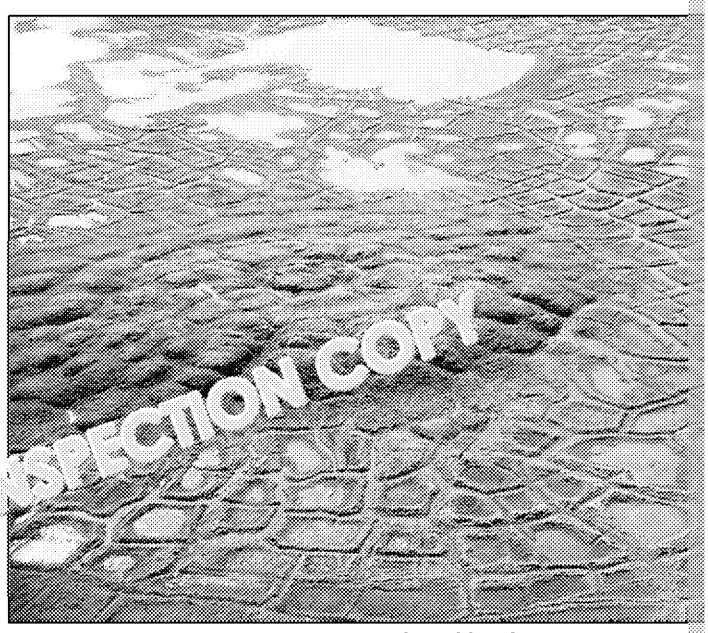

Figure 3 Periglacial landscape

   a. What periglacial landforms can you see in this picture?

   b. Explain how these landforms form.

7. Suggest how time and the different processes acting on the landscape make landscape unique.

[illegible]ension Questions

8. Explain how blo[illegible] form.

9. Assess [illegible]tent to which geomorphological processes create the characte glaciated landscapes.

Test 5 – Cold Environments and Hum

1. Define what is meant by the term 'fragile environment'.
2. Suggest why cold environments may be classed as fragile environments.
3. In what ways have human activities impacted cold environments over tim
4. a. Explain the natural and human causes of climate change.
   b. Explain how climate change affects cold environments.
   c. Suggest the future implications of climate change for cold environments
5. a. Outline how cold environments are currently managed.
   b. Suggest how cold environments may be managed in the future.

Extension Questions

6. Compare the impacts of human activities on cold environments in the past w
7. Assess the importance of management of cold environments.

Test 6 – Synoptic Test

1. Outline how a glacier can be thought of as a system with inputs, stores, flows
2. Describe the global distribution of cold environments
3. Explain how climate affects vegetation that can be found in tundra.
4. Explain how the glacial budget affects the size of the glacier.
5. Describe and explain the features of periglacial landscapes.
6. Outline how human activity has affected cold environments.
7. Explain how a glaciated landscape you have studied offers both challenges and opportunities for humans.

AS Level Question

8. 'Glaciated landscapes are a product of geomorphological processes.'

   To what extent do you agree with this statement?

A Level Question

9. Assess the relative importance of climate change in shaping the characteristics of landscapes in the future.

Answers
Test 1 – Glacial Systems

1. 2 marks
A model of a part of the natural world [1] consisting of st[illegible]s and flows (running
Also allow marks for description of systems, such a[illegible]ers and attributes.

2. 3 marks
Elements = parts that com[illegible] to m[illegible]e the system [1]
Attributes = the su[illegible]racteristics of these elements [1]
Relatio[illegible] = [illegible]nections between elements and attributes, how they inte

3. 4 marks
   - Inputs [1]
   - Outputs [1]
   - Flows [1]
   - Boundaries [1]

4. 6 marks
Isolated system [1]: no inputs or outputs of either material or energy [1]
Closed system [1]: material can't be transferred, but energy can flow in and out
Open system [1]: inputs and outputs of both material and energy [1]

5. 1 mark
When inputs equal outputs [1]

6. 4 marks
Positive feedback cycles:
   - When the equilibrium becomes imbalanced [illegible] an increase in changes [1
   further away from equilibrium [1]

Negative feedback cycles:
   - Occur when [illegible] reduction in changes so the system reduces [1] and m

7. 2 marks
Suitable examples include (but are not limited to):
   - Sea ice melting (+ve)
   - Permafrost melting (+ve)
   - Deforestation and decreased rainfall (+ve)
   - Exponential growth of a population (+ve)
   - CO_2 generation and absorption by the oceans (-ve)
   - Carbon fertilisation of increased forest growth as a result of climate change

8. 4 marks
A cascading system is a series of open subsystems [1] that connect to each other
The earth can be understood in this way as the atmosphere, lithosphere, hydros
connect through energy flows. [1]

9. 1 mark
An open system [1]

10. 3 marks
Examples:
Inputs = [illegible]fa[illegible]t and from rock falls etc.), solar and geothermal energy [1
Store = [illegible]he glacier [1]
Outputs = [illegible]twater, debris, icebergs, water vapour [1]

11. 4 marks
Positive feedback cycles:
- Positive feedback cycles can occur in glaciated landscapes through the ice a
- Ice has a high albedo and so reflects energy back to the sun. [1]
- As an area of ice expands, more solar energy is reflected back towards the s
- Temperatures therefore decrease and more ice forms. [1]
- (Opposite of this is also positive feedback cycle)

12. 2 marks
A landscape is all the features of an ar[illegible]. [1]
Landforms are the distinctive [illegible] within a landscape (help us to identify la

13. 4 marks
Examp[illegible]
Arêtes, [illegible], moraines, hanging valleys, truncated spurs

Extension Questions

14. 4 marks
Example points:
- Positive feedback cycles move systems away from equilibrium. [1]
- In terms of glacial systems, this could mean that changes are amplified maki
- The ice albedo effect is an example of a positive feedback cycle that can hav system by reducing the mass of the glacier. [1]
- On the other hand, the ice albedo effect can work the other way by increas could be seen as a positive effect for cold environments. [1]

15. 6 marks
Example points:
- The systems approach is an important model for [illegible]standing how the n
- Understanding glaciers as systems helps [illegible].g glaciated landscapes a
- Understanding the inputs, outputs [illegible]s and flows helps to establish the
- It also helps to understa[illegible]iers change over time and why they m
- However, proce[illegible] also be considered as highly important in unders
- We [illegible]in[illegible], transportation and deposition help us to understand th[illegible] the characteristics of glacial landscapes. [1]

Test 2 – The Distribution and Characteristics of C

1. a. 4 marks
Polar [1]
Alpine [1]
Glacial [1]
Periglacial [1]

b. 4 marks
Polar:
Polar environments a[illegible]ound the north and south poles, the highe[illegible]

Alpi[illegible]
A[illegible]vi[illegible]nments are found at high altitudes, on mountain ranges such a[illegible] an[illegible]ew Zealand Alps. [1]

Glacial:
These are situated in polar or mountainous environments, e.g. Greenland o[illegible]

Periglacial:
Can be found near to glacial regions, high-latitude and dry areas such as Al[illegible] Scandinavia. [1]

c. 4 marks
One mark for each environment.

Example points:
Polar:
- Never reach above 0 °C [1]
- Snow on the ground all year round [1]

Alpine:
- Can be found at any latitude but hav[illegible] to[illegible] a high altitude [1]
- Cold winters, summer temp[illegible]s can be considerably above freezi[illegible]

Glacial:
- Cover[illegible]heets all year round [1]

Pe[illegible]l:
- [illegible]t always covered in snow and ice [1]
- Permafrost always found here [1]

2. 8 marks
Description:
- Temperatures below freezing all year round (Antarctic generally cold[illegible]
- Low levels of precipitation [1] and strong winds [1]

Explanation:
- The reason for the low temperatures is the lack of intense solar energy areas. [1]
- Any areas covered in ice and snow reflect the solar energy back into s[illegible]
- The lack of precipitation is because the environments are in high pres[illegible] precipitation is formed. [1]
- It is also difficult for precipitation to f[illegible]n[illegible] cold air. [1]
- The strong winds are a result o[illegible]l[illegible]k of obstacles in the environme[illegible] significant strong wind[illegible] c[illegible]air flows down them. [1]

3. a. 4 mark[illegible]
- L[illegible]odiversity due to adverse climate conditions [1]
- Mainly grasses, small shrubs, lichens and mosses [1]
- No tall trees [1]
- Any flowering plants are hardy perennials [1]

b. 4 marks
- The cold environment means there is a slow rate of decay. [1]
- This means there are few nutrients in the soil. [1]
- Not far below ground is a layer of impermeable permafrost. [1]
- Soil becomes waterlogged in summer so leaching is restricted. [1]

c. 6 marks
- Plants grow close to the ground as wel[illegible] se together to avoid warmer near the surface. [1]
- They have shallow roo[illegible] id the permafrost. [1]
- Many plants ha[illegible] aves to avoid transpiration. [1]
- Some [illegible] y dormant if there is no light or water then gro[illegible] themselves. [1]
- They also have a very short growing season to make use of the su[illegible] Many of these plants are able to photosynthesise at very low tem[illegible]
- Any other valid point(s).

4. 2 marks
Glacial periods are times when the global temperature is lower and glaciers are [illegible]

Interglacial periods are times when the global temperature is higher and glacier[illegible]

5. 4 marks
Example points:
- The extent of the ice sheets during the last glacial maximum was much gre[illegible]
- They spread across Canada and into northern USA and across northern Eu[illegible]
- Today the only permanent ice sheets are found in Greenland and Antarctic[illegible]
- The areas surrounding the ice sheets were steppe-tundra and polar alpine [illegible] more temperate climates. [1]
- Any other valid point(s).

Extension Questions

6. 4 marks
Example points:
- L[illegible]e[illegible]ures and lack of precipitation make it difficult for vegetation [illegible]
- Th[illegible]emperatures mean that the soil is mainly frozen and, therefore, v[illegible]
- The slow decay of plants also means the soil lacks nutrients which, in turn, ma[illegible]
- This means that in these environments only specific vegetation that is well [illegible] can grow. [1]
- Any other valid point(s).

7. 6 marks
Example points:
- Past distributions help us understand the extent of cold environments in th[illegible]
- This can then help us to understand past climates which can help predict h[illegible] future. [1]
- It also highlights the impact of anthropogenic climate change. [1]
- In terms of landscape, it helps us to understand how each glaciated landsca[illegible]
- For example, it helps to indicate what the landscape was like before it was [illegible]
- It also helps to explain why the non-glaciated land[illegible]s that exist today m[illegible] landscapes. [1]
- Any other valid point(s).

1. 2 marks
This is where the outputs of the glacier (melt water, water vapour, icebergs, etc.) [1]

2. 1 mark
The glacier budget is the difference between the inputs and the outputs. [1]

3. 4 marks
During the warmer summer months, th[illegible] r[illegible]eats [1] as ablation happens at
In the colder months, there is [illegible] accumulation than ablation [1] and the gla

4. a. 2 marks
Th[illegible]ier [illegible]retreat [1]; therefore, there must have been a continued p
gr[illegible]an the rate of accumulation. [1]

   b. 2 marks
   - Climate change [1]
   - Localised reasons, e.g. less snowfall [1]

5. 1 mark
Glacial erosional and depositional landforms are evident in the landscapes. [1]

6. 4 marks
   - Found in temperate conditions, with cold winters but warm summers [1]
   - This creates plenty of meltwater in the spring and summer [1]
   - In turn, this creates a lubricant base that allows the glacier to move easily [1]
   - Therefore, erosion, transportation and deposition take place [1]

7. a. 6 marks
Example points:
   - Glacial ice moves due to the force of gravity [1]
   - The build-up of pressure pulls the ice crystals downhill making the gla
obstacle in the way. This is known as internal deformation. [1]
   - Rotational flow is known to occur at the source of the glacier (corrie)
   - Dependin[illegible] gradient of the valley, compressional and extension
   - [illegible]p[illegible]al flow occurs when the gradient of the valley is shallow
[illegible]n the valley has a steeper gradient. [1]
   - Basal sliding occurs as the ice on the bedrock melts due to pressure, l
and allowing it to move. [1]

   b. 8 marks
Example points:
   - Weathering occurs through frost action [1], which shatters the rock d
thawing. [1]
   - Erosional processes occur through abrasion and plucking. [1]
   - Abrasion is where the material carried by the glacier rubs along the b
   - Plucking occurs as the ice moves down the mountain and pulls away r
   - The glacier can then carry this material through transportation [1], ei
within the glacier or at the base of the glacier. [1]
   - The glacier then deposits this material as till at its snout or in areas wh

8. 2 marks
The erosion, transportation and depo[illegible]f m[illegible]erial in the meltwater stream
This can occur in the melted w[illegible]th[illegible]surface, within or underneath the gla

9. a. 4 mark
E[illegible]po[illegible]s:
   - [illegible]hanently frozen ground [1]
   - Temperatures below the ground must be below freezing [1]
   - The frozen water in the ground sticks the minerals and nutrients toge
   - In the summer the very top layer of soil becomes the active layer as it
   - Unfrozen ground that remains unfrozen all year round is known as ta

b. 4 marks
- Mass movement in periglacial landscapes occurs during the summer m
- Solifluction occurs because the meltwater cannot go into the frozen in
moves the top layer of soil down a gradient. [1]
- Frost creep is the slow movement of the soil and sediment downhill a
thaw cycles of the frost. [1]
- Large rockfalls can also occur due to the weathering process of freeze

Extension Questions

10. 6 marks
Example points:
- Warm-based glaciers are found in more temperate climates where the sum
al ezing [1] and there are high rates of snowfall. [1]
- Th ns that there is plenty of meltwater [1] that causes the ice to be m
occur. [1]
- This faster rate of movement in the warm-based glaciers leads to more ero
deposition of material. [1]
- Cold-based glaciers occur in very cold climates [1] where there is little sno
- This means that there is little meltwater and the ice is frozen to the bedroc
- Cold-based glaciers therefore move very slowly over time usually through
deformation. [1]
- Any other valid point(s).

11. 6 marks
Example points:
- Geomorphological processes play a variety of roles in glacial systems. [1]
- They help to form the landforms and, therefore, the landscape of glaciation
- The process of weathering provides material that can be transported by er
and plucking. [1]
- This material is then transported by the glacier and deposited at the snout
- Different rates of these processes occur depending on the type of glacier (w
as the location and topography of the landscape. [1]
- The geomorphological processes play a role in helping scientists understan
- The data associated with the understanding of past glaciated landscapes thr
landforms and evidence of geomorphological change. [1]

Test 4 – Development of Glacial Lan

1. 2 marks
   Any two erosional landforms:
   - Corries
   - Arêtes
   - Hanging valleys
   - Any other valid landform(s)

2. 8 marks
   Example points:
   - Corries orig[illegible] through the process of nivation which erodes the ground [illegible] sm[illegible]lo[illegible] [1]
   - Th[illegible]w is then enlarged by the weight of the ice on top of it. [1]
   - Plucking erodes the backwall and abrasion erodes the floor, both of which d
   - Two corries back to back create a steep ridge between them known as an ar
   - As the glacier flows down the valley, the weight and pressure of the ice car u-shaped valley or glacial trough. [1]
   - As the glacier erodes the valley it erodes the old interlocking spurs to form
   - Hanging valleys are also created. [1]
   - Roches moutonnées are protruding sections of rock on the valley floor tha the surrounding rock. [1]
   - The rock gets smoothed down by erosion on the upstream side but made ja through plucking and abrasion. [1]

3. 6 marks
   Example points:
   - Drumlins are egg-shaped domes [1]. The upstream end is steep and rough streamlined and smooth. [1]
   - Erratics are large rocks and boulders that [illegible]pletely different origin
   - Moraines are the build-up of rock de[illegible] t[illegible]has been deposited by the gla e.g. ground, terminal, latera[illegible]e[illegible] [1]
   - Till plains are broa[illegible] of flat land that contain till deposits of silt, sand a

4. 2 mark[illegible]
   Studen[illegible]answer with any area they have studied.

   Examples:
   Erosional: Buttermere Valley, Lake District. Lauterbrunnen, Switzerland.
   Depositional: Glacial till plains in Ohio, USA. Vale of Eden, Cumbria.

5. a. 2 marks
   A depositional [1], fluvioglacial landform [1]

   b. 6 marks
   - Eskers are lengthy, winding ridges of glacial sediment [1] that run in th
   - Usually, they are several kilometres long and can reach heights of 20 t
   - Eskers are made from the gravel, silt and other sediments from a subgl
   - Subglacial streams flow through the glacier and are able to carry a larg hydrostatic pressure. [1]
   - This load builds the bed of the river h[illegible]t[illegible]n the surrounding land s ridge is created. [1]

6. a. 2 marks
   - Ice wed[illegible]ions
   - [illegible]ng

b. 8 marks
Ice wedge polygons:
- During the winter the soil contracts and forms cracks. [1]
- In the springtime these cracks widen and fill with meltwater which co
the cracks further. [1]
- Each year this freeze-thaw process continues, widening the cracks ye
upwards and forms ridges. [1]
- This creates a polygon pattern on the grou

Pingos:
- Can form as closed-syst / open-system. [1]
- Start formation when form underneath a lake bed or where there is thin pe
frozen. [1]
- Water is trapped in the unfrozen ground and then freezes. [1]
- This causes it to expand. This expansion and the hydrostatic pressure
shape on the land. [1]

7. 4 marks
Example points:
- Over time the climate has changed and, therefore, the extent of cold enviro
- This has meant that each glaciated landscape has a different past environm
- Depending on the location of the glaciated landscape, different processes v
shaping the landscape. [1]
- For example, cold-based glaciers experience much less erosion and deposi

Extension Questions

8. 4 marks
Example points:
- Periglacial landforms of mass movement [1]
- Formed through frost-action weathering, where the water in the rock cycle
states [1]
- This causes the top layer of rock to crack [1]
- As a result, a number of jagged boulders are formed across an area [1]

9. 6 marks
Example points:
- They play a significant role in characterising glaciated landscapes through
erosion, transport and deposition. [1]
- These processes are what form the landforms that are unique to glaciated l
- For example, corries and hanging valleys are formed by ice movement and
- However, not all glaciated landscapes experience these processes to the sa
glacial landscapes contain considerably fewer erosional and depositional l
- Despite this, cold-based landscapes still contain characteristic features. [1]
- Must also consider the other processes at play such as fluvioglacial and pe

1. 2 marks
Landscapes or areas that are sensitive to the impacts of human activity [1] and c

2. 4 marks
- Plant growth is slow in cold environments and, the[illegible]e, they would take
damage. [1]
- There is also only a short growing s[illegible]n, which also increases the length o
environment to recover. [1]
- The harsh environm[illegible]nd climate mean that plants are very specialised a
changes. [1]
- Th[illegible]of biodiversity in the tundra also means that the amount of energy
lev[illegible] fluctuate and is, therefore, fragile. [1]

3. 8 marks
Example points:
- Less impact on the environment in the past as the only human activities we
populations. [1]
- Often the impact of these communities, such as fishing and whaling, was or
- As industrialisation and globalisation have developed, human activities ha
exploitative. [1]
- For example, fishing and whaling have both become more industrialised an
- This has led to overfishing which, in turn, threatens the biodiversity of cold
- As countries have developed and other resources have depleted, cold envir
for mining for oil, gas and gold. [1]
- The large scale of these industrial mines has caused damage to the cold env
- Tourism is another human impact that has increased in recent years. Some
to protect the cold environments whereas other ty[illegible]an be more harmfu

4. a. 6 marks
Natural causes:
- Changes in sola[illegible]vity e.g. more sun spots [1]
- The Mila[illegible]ch cycles – the way the orbit and tilt of the earth chang
- [illegible]an circulation changes [1]
- [illegible]anoes [1]

Human causes:
- Burning of fossil fuels [1]
- Agriculture and industry [1]
- Deforestation and loss of carbon stores [1]

b. 4 marks
Example points:
- Ice melting – sea ice, glaciers and ice sheets [1]
- This, in turn, makes sea levels rise, which encroaches on cold environ
- Warmer climate leads to different plant species growth [1]
- Length of summer can increase, changing the growing season for plan
- Any other valid point(s)

c. 4 marks
Example points:
- If the ice continues t[illegible], [illegible] could be a significant reduction in the a
- Permafrost m[illegible]ment, causing problems not only for the ecosyste
but al[illegible] communities living on them. [1]
- [illegible] co[illegible]d then lead to further sea level rises, which could have globa
- [illegible]peratures of the cold environments could continue to increase wh
changes in season length and, therefore, the flora and fauna. [1]
- There could be a loss of habitats and, therefore, species. [1]
- Any other valid point(s).

5. a. 4 marks

Example points:

- Measures have been taken to manage cold environments; these have b
and a global scale. [1]
- Antarctica, for example, is part of the global commons and the land be
- It is also part of a treaty that protects the land for peace and scientific
- Small-scale management of these cold environments is also taking pla
tourism. [1]
- Any other valid point(s).

b. 8 marks

Example points:

- There is ... over whether cold environments should be managed fo
- ... th... resources deplete in the future, there is an argument for expl
...nd gas. [1]
- This would help to allow countries to continue to industrialise and us
- However, others argue that they need to be managed sustainably and p
- Cold environments being such fragile and rare locations means their c
planet's health. [1]
- The threat of climate change and its future impacts presents another a
cold environments. [1]
- There is also an argument for utilising these environments for more s
- It could be the case that they may hold key ingredients for medicines
- Any other valid point(s).

Extension Questions

6. 6 marks

Example points:

- The impacts of human activity on cold environ... were minimal in the p
- It was mainly only indigenous population ... wh... ould utilise the resources
fishing and whaling. [1]
- Today the level of impa... has ... ased significantly, both directly and ind
- This has happe... ... an increase in commercial fishing and the explo
but ... th... limate change, which has indirectly impacted on cold env
oi... ets and ice caps, and the longer summer [1]. Both of these have, i
the ... environment. [1]
- On the other hand, vast regions of cold environments remain untouched [1]
activities will impact on them in the future. [1]

7. 6 marks

Example points:

- Management is key to helping protect and regulate the use of cold environ
- The Antarctic Treaty has been key in protecting the continent from develo
instead helping research. [1]
- Management through more small-scale operations such as ecotourism high
areas as places to protect. [1]
- On the other hand, this form of management may not always be effective. [1
- Increasing pressure for the development of Antarctica has undermined the
- The management of these areas may need to be re... dered in the future
whether cold environments should be util... fo... ein resources or protec
ecological sites. [1]

1. 4 marks
   - A glacier has inputs of snowfall and avalanches as well as solar energy. [1]
   - The store is the ice in the glacier. [1]
   - The flow is through ice movement, such as internal deformation and basal
   - The outputs are in meltwater, debris, icebergs and water vapour. [1]

2. 4 marks
   - Polar environments are found around the north and south poles, the highe
   - Alpine environments are found at high altitudes, on mountain ranges such a and the New Zealand Alps. [1]
   - Glacial environments are situated in polar or mountainous environments, e
   - Periglacial environments can be found near glacial regions, high-latitude a Canada and parts of Scandinavia. [1]

3. 4 marks
   Example points:
   - Low temperatures and lack of precipitation make it difficult for vegetation
   - The cold temperatures mean that the soil is mainly frozen and, therefore, w
   - The slow decay of plants also means the soil lacks nutrients, which, in turn grow. [1]
   - This means that in these environments only specific vegetation that is well can grow. [1]
   - Any other valid point(s).

4. 4 marks
   - The glacier budget is the difference between accumulation and ablation. [1]
   - If the glacier budget is negative it means that it is retreating [1] as ablation
   - If the glacier budget is positive then the glacier is advancing, [1] and accun

5. 8 marks
   Example points:
   - Periglacial landscapes are characterised by areas of permafrost. [1]
   - The freeze-thaw temperatures throughout the year generate excess meltwate consistently creates interesting features and processes of mass movement
   - Features such as patterned ground, ice wedges and pingos [1] are formed t over years which changes the shape of the land. [1]
   - Mass movement such as solifluction occurs because the meltwater cannot g ground and, therefore, moves the top layer of soil down a gradient. [1]
   - Frost creep is the slow movement of the soil and sediment downhill and oc cycles of the frost [1]. This also helps to create terracettes. [1]
   - Large rockfalls can also occur due to the weathering process of freeze-thaw

6. 8 marks
   Example points:
   - There was less impact on the environment in the past as the only human a indigenous populations [1]
   - Often the impact of these communities, such as on fishing and whaling, wa
   - As industrialisation and globalisation have developed, human activities ha exploitative. [1]
   - For example, fishing and whaling have both become more industrialised an
   - This has led to overfishing which, in turn, threatens the biodiversity of cold
   - As countries have developed and other resources have depleted, cold envir for mining coal, gas and gold. The large scale of these industrial mines ha environments. [1]
   - Anthropogenic climate change has also affected cold environments by incr which has adverse effects on the ice and sea level. [1]
   - Tourism is another human impact that has increased in recent years. Som to protect the cold environments whereas other types can be more harmfu

7. 8 marks
Answer will depend on the case study chosen. Students must draw on both the c
chosen environment.

Answers may include ideas around the following points:

- Environment is challenging to live in due to the climate, the lack of certainty
available) and its fragility.
- Many communities have adapted to be able to live in these hostile environm
using animal skins to make clothes, ice for igloos, etc.
- The landscapes often hold many opportunities for development such as mi
however, this can cause damage to the environment.
- Conflict between different groups of people who want to use the landscapes
businesses.

AS Level Question

8. 20 marks
Students must show a good understanding of what is meant by the term glaciate
They must also understand the processes that shape these landscapes, including
Students must demonstrate a balanced view for and against the statement.
Students must make a judgement of their own opinion on the statement.

Answers may relate to, but are not restricted to, the following points:

- Glaciated landscapes as:
  - Distinctive landscapes with all the features of glaciation
  - Cold environment
- Geomorphological processes play an important role in forming glaciated la
  - Weathering, frost action and nivation
  - Erosion forms certain landforms such as corries, arêtes and hanging v
  - Deposition also forms other landforms such as drumlins, erratics and m
  - The movement of the ice also carves out the land through internal defo
  extensional flow, and basal slidi
- Other processes and factors:
  - Fluvioglacial processes such as meltwater erosion, transportation and
  landscape
  - Climate also plays a key role
  - Climate affects where glaciated landscapes are able to form and past cl
  has changed many times over millions of years
  - Climate also can have an impact on geomorphological processes them
  - For example, warm-based glaciers that are found in more temperate cl
  erode and transport and deposit material than cold based-glaciers

A Level Question

9. 20 marks

Students must show a good understanding of both human and natural causes of c
Students must demonstrate a balanced view for and against the importance of c
glaciated landscapes.
Students must make a judgement of how important climate change will be in sh
in the future.

Answers may relate to, but are not restricted to th following points:

- Causes of climate change:
  - The global climate alw changes over the course of time.
  - This can relate t sp , Milankovitch cycles, volcanoes and ocean
  - Recentl anthropogenic climate change has become more prominent
  il agriculture and industry and through deforestation and
  - or these things have had an impact on the distribution and the sh
- Effects of climate change on shaping glaciated landscapes:
  - Climate has always been changing and this has always had an impact o landscapes.
  - This means that the characteristics of glaciated landscapes have been the landscapes have changed from fluvial to glacial and back to fluvial
  - The current impact of climate change has been accelerated by human
  - Temperature is rising, ice is melting and sea levels are rising at a muc
  - This is consequently changing the shape and characteristics of glaciat
  - However, glaciated landscapes are dynamic landscapes and are, there despite climate change.
  - Processes such as weathering, erosion and deposition are constantly s landscapes.
- Future effects of climate change:
  - If climate change continues at the rate that it cur ntly is then it may l characteristics of glaciated landscapes
  - As the ice melts, a positive feedback cycle may begin that will drastica from equilibrium, so it will los mass and, therefore, its ecosystem
  - This could drastic ly ch ge the landforms and biodiversity that you