GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Geography B
(GGB2)

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OPTION P: GLACIAL ENVIRONMENTS

Question 1

(a) (i) Generally, the limit of the maximum advance is further south than the most recent. The difference is least in SW Ireland/Wales/Somerset. The maximum is to the east of Moscow The general trend is that the difference increases eastwards to a maximum of 1000 to 1200km+. .

Point mark.

Simple identification of differences or differences in trends. Accurate locational information, use of scale. At least one difference must be explicit for full marks **(0-4 marks)**

(ii) Evidence could include any ice marginal landform or deposit. These could include terminal moraine, limit of till(ground moraine) kames,delta kame eskers, proglacial lake deposits, outwash plains. Evidence could also be dating evidence.

(0-2 marks)

1 mark for each correctly identified piece of evidence.

(b) (i) Plucking occurs in areas where there is weathered rock in contact with the ice. Meltwater from the glacier trickles into the weathered rock and re-freezes. Ice freezes (not sticks) onto the rock. This weakens the rock further, and when the ice moves it pulls the rock with it.

1 mark for each valid comment. If a complex link is made then credit both sides of the link. **(0-4 marks)**

(ii) Abrasion is the 'sand-papering' effect that occurs at the base of a glacier. Rocks embedded in the base of the ice are dragged across the rock surface wearing away the rock. Abrasion is most effective in temperate glaciers where there is some meltwater at the base of the ice, which enables the ice to move. Also, the thicker the ice the more effective the process.

1 mark for each valid comment. If a complex link is made then credit both sides of the link. **(0-4 marks)**

(iii) Depends on the landform chosen.

Corrie: Armchair shaped hollow with a steep backwall. Hollow is overdeepened and could have a rock lip. Diameter 0.5km – 1km; backwall/depth 100m – 400m. Backwall angle 60º, only vertical in parts.

Arete: Steep, knife-edged ridge, separates two corries or troughs. Length 2km max; height 700m max.

Glacial trough: Steep sided (rarely vertical) often straight, deep valley with a flat floor. Length 1km – 50km?, width 0.5km – 3km. Can include ribbon lake and hanging valley

Roche moutonee: lump of resistant rock that is found on the floor of glacial valleys. It is asymmetrical with the steep side pointing downstream. Upstream side can be polished and striated. Lee side is very

jagged. Height 1m – 10m; length 3m – 30m.

Crag and tail: large feature. Length 1km – 7km, height 20m – 50m. Steep bare rock upstream side, with gentle downstream side made of till.

Level 1 Simple description of the chosen feature, using generalisations (e.g. steep, high, deep etc.), named/located example. **(0-3 marks)**

Level 2: Detailed description of the chosen feature.
2 level 2 quantification max. **(4-6 marks)**

(c) (i) The maximum velocity is in the centre of the ice. This reduces towards the valley wall. The change in velocity from the centre is slow at first. It is still at 75% of maximum velocity, two thirds of the way from the centre to the wall, and 50% at 5/6 of the way. There is some side-slip which makes approx 5% of the movement .Symmetrical reduction.

1 mark for each relevant description **(0-4 marks)**

(ii) The maximum velocity is at the surface (28/29m per year) and reduces towards the base. The fall-off in velocity is slow and virtually linear until between 100-150m deep.(Down to 50m it is virtually nil .1 – 2m it is 5m The min velocity is at the base with basal slip of 3 or 4m per year.

(0-4 marks)

1 mark for each relevant description

(d) Depends on the feature chosen by the candidate.

Outwash plain deposits are those brought out of the glacier by meltwater streams. The streams are highly energetic and so are able to carry a large amount of material in them. Their competence is high and so there is a range of sizes. As the streams emerge from or off the ice they encounter increased friction and so slow down. Their competence is reduced and the largest material is deposited first, the finer being taken a long way down the stream. This produces well sorted deposits. The stream usually becomes braided. The discharge of water is seasonal and so there are also graded deposits. Length 5km – 80km; depth 1m – 75m; gradient 0.5□ - 4□.

Kettle holes are formed when a glacier is melting and a piece of ice is isolated from the rest of the glacier. It is buried by outwash debris. It subsequently melts and the resulting subsidence causes a small hollow in the outwash plain. Diameter 5m – 100m; depth 1m – 5m.

Esker is a sinuous ridge that is found running parallel to the flow of pre-existing glacier. Height 5m – 20m, width 10m – 50m. It is composed of sorted sands and gravels that are subrounded to rounded. It can be stratified though post-glacial slumping can disturb this. Formed from the deposits of subglacial streams. Can be beaded.

Kame: mounds of sorted sands and gravels. Max width 50m, height 3m – 5m. Formed either along the front of a stationary glacier where a stream emerges from under the ice and rapidly loses energy, or by deposition in a cavity in a glacier.

Varve: 1mm – 20cm. Alternating layers of sediment deposited in a proglacial lake. Coarser sediment deposited in late spring and summer, finer sediment in winter when there is a low supply of meltwater.

Level 1 Simple description of the chosen landform with detail of the morphology, scale, field relationships or deposits. (i.e. simple = 1 adjective). Simple explanation. Name and/or location **(0-3 marks)**

Level 2 Description of the feature with more than one aspect of the above or a detailed description of the feature. Simple explanation for the shape, size or location of the landform. Max 2 Quantitative points. There must be at least one LII explanation to get to the top of this level. (Annotate E) **(4-8 marks)**

(e) (i) Frost Heave: Occurs in the active layer above permafrost. The ground under stones is colder than the surrounding sediments and ice lenses develop. They increase in size by migration of water to the lens. As the lens grows it forces the stone above to move upwards. If the lens melts the void is filled with sediment and stops the stone from falling back.

1 mark for each valid point made. **(0-4 marks)**

(ii) Nivation: Usually occurs on shady/north-facing hillsides. Snow accumulates in hollows. Frost action occurs at the base of the snow which weakens and breaks up the rock below. During a period of melting, the meltwater flushes out the weathered material. Chemical weathering is also valid at the base of the hollow.

1 mark for each valid point made Flushing effect for the max mark.. **(0-4 marks)**

(iii) Nivation hollow: 5m to 1km diameter, 2 – 20m depth. .Not over deepened or lake filled, but still have a steep backwall. Rock stream and talus cone.

Level 1 Simple description of chosen landform using very general terms. Name and/or located examples. **(0-3 marks)**

Level 2 Detailed description including scale, appearance and field relationships. Quantitative max 2 level 2 credits **(4-6 marks)**

OPTION Q: COASTAL ENVIRONMENTS

Question 2

(a) (i) Coral reefs can be found almost all the way around the island, with some small gaps. The most extensive reef is to the SW of Kingston, extending out from the coast to form a barrier reef. The reefs along the N coast tend to be fringing reefs while on the south coast there are several that are detached from the mainland. There are 3 areas of protected reefs, the largest being SW of Kingston, extending out to the barrier islands. There are 2 areas on the N coast. Note gaps linked to river mouths (located) and reef growth on headlands. The protected area south of Kingston is 60Km N/S and 65km E/W max (tolerance +/- 5km). On the N coast they are 10km and 30km.

Level 1: Simple description of the location of either the coral reefs and/or the protected areas. **(0-3 marks)**

Level 2: Detailed description of the locations with reference to the size/extent or location of either/or the coral reefs and protected areas. **(4-6 marks)**

(ii) Reasons could include:
Sewage, fertilizer and chemical pollution
Sedimentation
Coastal construction and development
Seagrass and mangrove habitat loss
Ocean warming and rising carbon dioxide that leads to coral bleaching
Over-fishing/crown of thorns
Destructive fishing practices including the use of cyanide and dynamite
Coral mining for building materials and the souvenir trade
Careless recreation.
NB not rising sea level

Level 1 Simple naming of a threat to coral reefs. **(0-3 marks)**

Level 2 Links between the threat and the effect that it may have on the coral. Must have 2 threats at L2 to gain max marks **(4-6 marks)**
Detailed example of reef under threat.

(b) (i) Wave action can lead to the processes of abrasion: when the waves pick up stones and hurl them at the cliff face. This leads to undercutting of the cliff. Waves can also erode by the sheer weight of water crashing against cliff (8000kg/m^2). Finally, there is the effect of air compression in cavities in the cliffs. As the wave recedes the compressed air expands explosively sending shock waves through the cliff. LSD and scouring can lead to vulnerability of coasts to erosion.

(0-3 marks)

Level 1 Naming of a process or simple outline of that process.

Level 2 Explanation of the process or linking the name of the process to an effect on the coast. **(4-6 marks)**

(ii) 1. The chalk overlying the soft clay has led to blocks of chalk falling, probably breaking up along joint planes.

2. The coal seam has been picked out to form a notch.
3. The massive limestone has led to the production of steep cliffs and features such as arches and stacks.
4. Where the rocks dip seawards the face of the cliff is angled at the angle of dip.

Level 1: Simple link between the geology and the shape of the cliff face. **(0-3 marks)**

Level 2: Statements that show that each of the geologies have a different effect upon the nature of the cliffs. **(4-8 marks)**

(c) Sub-aerial processes include mass movements (slumping/slipping/sliding) and weathering (salt crystal growth) wetting/drying and spray.The effect of animals and vegetation. Freeze/thaw (though if source of water wrong max 3),and heating and cooling The nature of their effects depends upon the processes chosen e.g. rotational slumping can cause blocks of the cliff to fall seawards to create a stepped appearance, with the top of the step held by vegetation. The toe of the slump may well extend over the tidal zone and so be washed away. Wind only accepted in relation to sand dunes.

1 mark for each valid point made. **(4 marks) for each process**

(d) Depends on the feature chosen.

(i) Likely to be a spit. Relevant description can be either of a named example or a generic feature. Descriptions of scale, field relationships, deposits and appearance are all relevant. Can also be beach, salt marsh, sand dunes, tombolo, bar (bay mouth and offshore).

(ii) 1 mark for each description point made including 1 for named/located example. **(0-4 marks)**

Spit formation by combination of marine transgression and then subsequent re-working by longshore drift etc.

(0-4 marks)

1 mark for each relevant process, either named and/or described.

(e) Sand dunes: embryo 1m max height with 80-90% sand exposed, sea twitch and Lyme Grass (NB no marram); fore dunes (yellow) 5m max 20% exposed sand, creeping fescue, marram sea purge, cotton grass, heather; wasting dune 8m max, 40% exposed sand, acidic, heather and gorse. Other features would include steepness of dunes, slacks and blowouts. Field relationships are part of the description as is the pH etc.
Onshore winds / large intertidal area / low angled beach that dries out. Some object creates an eddy behind which enables the sand to build up behind and in front of the object.
Colonisation by salt tolerant plant species with extensive root systems fixes the sand. As the dunes build they become drier and less alkaline enabling the colonisation by other plants. Their litter stains the sand grey and shallow soil develops fixing the dune still further. NB. Description of plant physiology / adaptation to the environment 2 max.

Saltmarshes: located within an estuary or on landward side of a spit. Most seaward part is covered by tide most of the time and only has algae and Salicornia. The slob zone with Spartina, then cliff and sward zone. There are also salt pans and creeks.
Saltmarshes are created in quiet environments where flocculated mud is caught by the roots of salt loving plants. This builds up and dries out. Salt pans are created when sea water becomes trapped in the marsh as the water drains away. Water evaporates and leaves behind a salt deposit.

Level 1 Simple description of the chosen feature, naming of processes that lead to their formation. **(0-3 marks)**

Level 2 Detailed description of the chosen feature, including detail of the scale (2Q max) and the vegetation (2 Sp max). Link between a formation factor and the feature. There must be at least one explanation to gain max marks (annotate E) . **(4-8 marks)**

OPTION R: URBAN PHYSICAL ENVIRONMENTS

Question 3

(a) (i) NB. The scale is semilog. Both continents have a positive relationship between population of settlements and the HIE. Both have a straight line relationship which shows a geometrical relationship. The rate of change shown by the N. Am cities is greater than that of Europe. This means that as the N Am cities grow they have a greater effect upon the Tu-Tr max.

Level 1 Simple statements showing that there is a positive relationship for both continents. **(0-3 marks)**

Level 2 Details of the relationships given, either by the realisation of the semi-log scale or by direct reading from the scales to illustrate differences One explicit comparison for max mark. **(4-6 marks)**

(ii) The urban heat island phenomenon that is characterised by urban areas having higher temperatures than the surrounding rural area. As one approaches the urban centre from the outskirts there is a series of 'cliffs' and 'plateaux' caused by sudden changes in land use and then a uniformity of land use. Generally, the greater the building density, the greater the temperature. There are anomalies, 'sinks' over parks and water bodies and 'peaks' over industrial areas and the CBD.
The causes include: the production of heat by human activity (home heating / air conditioning; factory, car, office heat emissions; human body emissions); lack of surface water producing less heat loss by evapotranspiration; absorption of insolation by multiple urban surfaces which is then re-emitted as long wave radiation that heats the air. The pollution in the urban atmosphere helps to increase cloud amount and also creates a pollution dome that allows in the short wave radiation but absorbs a lot of the outgoing radiation as well as reflecting it back to the surface.

Level 1 Simple definition / description of the UHI effect. Use of unexplained terms for the explanation. **(0-3 marks)**

Level 2 Detailed description of the UHI effect. To gain max marks there must be at least a level 1 example and a level 2 explanation. **(4-8 marks)**

(b) (i) <u>Differences</u> Generally there is a spring / summer maximum of differences. from March to July, with the max in July with almost 1. There are 2 months that are almost zero (Jan & Sept). Spring months are almost constant at 0.6. Winter is the minimum. Etc.
<u>Similarities</u> Both are highest in June/July (R6 U6.7)Both have Dec Minima (R0.85 U1.2)

Level 1 Simple description of the graph, with no reference to patterns **(0-3 marks)**

Level 2 Detailed description of the graphs giving max/min and patterns. **(4-6 marks)**

(ii) Thunderstorms are more common in urban areas for 2 main reasons. The main one is that the UHI creates a localised area of low pressure which draws in air from the surrounding area. As the air approaches the urban area it warms up. This warm air is then subject to convectional uplift. This uplift accelerates as the rate of cooling of the rising air is less than that of the surrounding air, making the temperature difference even greater. Large cumulonimbus clouds develop and storms occur. The whole thing is aided also by the presence of a greater number of hygroscopic nuclei in the form of particulate pollution. NB. Reasons for the UHI are not credited. Industrial sources of atm water.

Level 1 Simple statement regarding the fact that urban areas are warmer than surrounding or the presence of particulates. **0-3 marks**

Level 2 Links between the warmth of the urban area and the uplift of air resulting in convectional rain. **4-6 marks**

(c) (i) Particulate pollution specifically relates to solids suspended in the atmosphere, sometimes called Pm10's. These include smoke from both internal and external combustion and other anthropogenic particles e.g. cement dust. Vehicle exhaust particulates are much finer with a range from just over 0.0001mm to just under 0.001mm (.01μm – 1.0μm) whereas cement dust all falls in the 'large' category and ranges from 0.01mm to 0.1mm (10μm - 100μm). The range of vehicle exhaust is actually much smaller (0.00099mm or 0.99μm) as opposed to 0.09mm (90μm) though the exhaust particulates increase by a factor of 100 as opposed to 10. They are not gaseous.

Statements identifying the nature of particulate pollution with a max of 3 for examples. **0-4 marks**

(ii) 'Policy' can be interpreted in its widest sense. Thus policies can include the 'clean air act', pedestrianisation, public transport improvements, 'park and ride' schemes, MOV lanes, cycle lanes etc. all attempt to reduce traffic flow in urban areas; downwind placement of industrial complexes, planting of vegetation to capture particulates on leaves etc. etc. Urban diesel. Congestion charges etc etc

Level 1 Simple identification of a policy with no indication of how it operates or what the effect is supposed to be. **0-3 marks**

Level 2 Identification of a policy, with either some indication of how the policy operates or what effect it has. There must be two policies at level 2 to gain the max mark. **4-6 marks**

(d) (i) A plant succession is a series of changes that take place to a plant community. In the case of urban areas, this often takes place on areas of abandoned land, either cleared building land or small plots that have been isolated for various reasons. The succession would start with pioneers that are able to withstand the harsh conditions. They would then disappear as more dominant plants come to the area as conditions ameliorate. It is unlikely that the succession would gain climax status.

Distinctive ecology: ecology is the interrelationships between plants, animals and their environment. For an ecology to be distinctive, it must have a balance of the three that is common for particular environments, but is different from other environments. Thus routeways have common factors which do not appear in gardens or parks.

For each definition, 1 mark for each correct statement made. A specific urban aspect must be covered to gain max. **Two times 0-4 marks**

(ii) Introduction could have been from escapes from gardens, from plants brought in by collectors or amateur gardeners. Escapes could occur from wind blown seed, animal or plant vectors etc. Examples likely to be used are the Oxford Ragwort, whose windblown seeds have been dispersed along routeways in the vortices of vehicles. Animals that have been introduced include escaped pets, or animals from collections (Muntjac deer) that have made use of 'corridors' to get into the urban areas.

Level 1 Simple statements regarding the movement into the urban area of certain species e.g. 'seeds have been blown in'. **0-3 marks**

Level 2 Link between specific examples and the method by which they have become introduced into urban areas. **4-6 marks**