



**General Certificate of Secondary Education
June 2013**

Geography A

40301H

(Specification 4030)

Unit 1: Physical Geography (Higher)

Final Mark Scheme

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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GENERAL GUIDANCE FOR GCSE GEOGRAPHY ASSISTANT EXAMINERS

Quality of Written Communication

Where candidates are required to produce extended written material in English, they will be assessed on the quality of written communication.

Candidates will be required to:

present relevant information in a form and style that suits its purpose;
ensure that text is legible and that spelling, punctuation and grammar are accurate;
use specialist vocabulary where appropriate.

Levels Marking - General Criteria

Where answers are assessed using a level of response marking system the following general criteria should be used.

Level 1: Basic

Knowledge of basic information
Simple understanding
Little organisation; few links; little or no detail; uses a limited range of specialist terms
Reasonable accuracy in the use of spelling, punctuation and grammar
Text is legible.

Level 2: Clear

Knowledge of accurate information
Clear understanding
Organised answers, with some linkages; occasional detail/exemplar; uses a good range of specialist terms where appropriate
Considerable accuracy in spelling, punctuation and grammar
Text is legible.

Level 3: Detailed

Knowledge of accurate information appropriately contextualised and/or at correct scale
Detailed understanding, supported by relevant evidence and exemplars
Well organized, demonstrating detailed linkages and the inter-relationships between factors
Clear and fluent expression of ideas in a logical form; uses a wide range of specialist terms where appropriate
Accurate use of spelling, punctuation and grammar
Text is legible
Level 3 does not always equate to full marks, a perfect answer is not usually expected, even for full marks.

Annotation of Scripts

One tick equals one mark, except where answers are levels marked (where no ticks should be used). Each tick should be positioned in the part of the answer which is thought to be credit worthy.

Where an answer is levels marked the examiner should provide evidence of the level achieved by means of annotating 'L1', 'L2' or 'L3' in the left hand margin.

Ticks must not be used where an answer is levels marked.

Examiners should add their own brief justification for the mark awarded e.g. *Just L3, detail and balance here.*

Where an answer fails to achieve Level 1, zero marks should be given.

General Advice

Marks for each sub-section should be added in the right-hand margin next to the maximum mark available which is shown in brackets. All marks should then be totaled in the 'egg' at the end of each question in the right-hand margin. The totals should then be transferred to the boxes on the front cover of the question paper. These should be totaled. The grand total should be added to the top right-hand corner of the front cover. No half marks should be used.

It is important to recognize that many of the answers shown within this mark scheme are only exemplars. Where possible, the range of accepted responses is indicated, but because many questions are open-ended in their nature, alternative answers may be equally creditworthy. The degree of acceptability is clarified through the Standardization Meeting and subsequently by telephone with the Team Leader as necessary.

Diagrams are legitimate responses to many questions and should be credited as appropriate. However, contents which duplicate written material or vice versa should not be credited.

Quality of Written Communication (QWC) is part of the award of marks in levels marked answers only. In levels marked answers the quality of the geography is assessed and a level and mark awarded according to the geography. As is sometimes the case, the geography may be sound at a particular level but the examiner may not be sure as to whether there is quite enough to raise the mark within that level. In this case the examiner should consider the QWC of the answer. QWC that fulfils the criteria for the level should lead to the rise in the mark but where the QWC does not fulfil the criteria, the answer should remain at the mark first thought appropriate. In cases where QWC has been used in the award of marks, the examiner should indicate this with QWC and arrows that indicate either an upward or downward trend according to its impact on the final award of the mark.

SECTION A

Question 1: The Restless Earth

1(a)(i) Any 3 points relating to difference that can be derived from Figure 1, e.g. constructive plate margins occur where plates move away from each other – as with the North American plate and Eurasian plate in the Atlantic Ocean, whereas destructive plate margins are found where plates move towards each other – as is the case with the Nazca plate and the South American plate. New crust formed versus destroyed. Landforms at different plate margins. 3x1. Must have 1 mark at least on each plate margin. **(3 marks)**
AO2 – 1
AO3 - 2

1(a)(ii) North American plate and Pacific plate or can be indicated via location. **(1 mark)**
AO3 – 1

1(b) Flat/rounded top, low lying, broad base, gently sloping sides, made of runny lava / basaltic lava, little ash, non-explosive eruption, frequent eruptions. 2x1 **(2 marks)**
AO1 – 2

1(c) Composite volcanoes occur at destructive plate margins. Here, plates move towards each other due to convection currents. Pressure builds up over a long period of time as the denser oceanic plate sinks beneath the continental plate. Melting of this occurs in the subduction zone due to friction and heat and the crust becomes magma. This process causes a build-up of pressure which is released in an explosive eruption – giving volcanoes that are formed of sticky slow flowing lava and ash often in alternate layers along a line of weakness/fault. **(4 marks)**
AO1 – 3
AO2 – 1

Level 1 (Basic) (1-2 marks)

A partial explanation – may have start, end or random parts of sequence.

Sequence incomplete.

Plates move towards each other. One plate sinks beneath the other. Pressure builds up and a volcano is formed.

Level 2 (Clear) (3-4 marks)

Stages are clear and explanation is coherent and complete.

Sequence complete.

Develops and links points.

Plates move towards each other due to convection currents. The denser oceanic plate sinks beneath the continental plate. Melting of this occurs in the subduction zone due to friction and heat and a pool of magma forms. This rises and the pressure is released in an explosive eruption often along a fault – giving a steep sided volcano of lava and ash.

Diagrams may be drawn to support text.

1(d) Earthquake activity is monitored as this can be a sign or a trigger of a volcanic eruption. Observation of changes in the shape of the land and more accurately the use of tiltmeters to identify and record such changes. GPS use satellites to detect the smallest movement – of a mm and robots known as spiders are introduced into craters to monitor changes in gases – especially sulphur dioxide – which can signify an eruption. All of these allow people to prepare and to evacuate if necessary. **(4 marks)**
AO1 – 3
AO2 – 1

Level 1 (Basic) (1-2 marks)

Simple, listed points.

Points are separate and link to preparation / eruption not present or unclear.

Earthquakes are recorded. Changes in the shape of the surface are identified.

Gases released change.

Level 2 (Clear) (3-4 marks)

Points are developed and linked.

Links monitoring to preparation with regard to advance warning / time given and / or imminent eruption.

Earthquakes occurring more frequently or strongly are a sign that an eruption is likely to occur and this gives warning and time to prepare. Tiltmeters record even a slight change in the shape of the land and spiders monitor gases – the concentration of sulphur dioxide increases before an eruption. Changes identified in advance allow time for evacuation if necessary or stocking up of essential supplies.

- 1(e)** Recognition of destructive plate margin with epicentre / earthquake originating under the ocean. This resulted in the land being thrown / flexed upwards leading to displacement of the column of water above. This separates and heads toward the coast. As it approaches, the wave length reduces and the height increases as the water piles onto the coast. **(3 marks)**
- AO2 – 1
AO3 – 2
- 3x1, reserving 1 mark for displacement of water which is critical for tsunami.

- 1(f)** Actual content will depend on the case study being used – Boxing Day tsunami of 2004 is textbook example but Japan tsunami also likely to be used – as below. **(8 marks)**
- AO1 – 4
AO2 – 4
- The area along the coast to the north of Tokyo was worst affected – stretching for over 200 miles. Closest to the epicentre was Minamisanriku where it is thought that half of its 17 000 population died. The wave was in excess of 10 metres and engulfed entire settlements transporting cars and boats like toys. In Sendai, these were shifted to the harbour wall, people were stranded in the airport and 5 million did not have power and 1 million had no mains water supply. Water flooded the reactors of the Fukushima nuclear plant causing the loss of power, but more worryingly the risk of meltdown as more people had to move from their homes.

Level 1 (Basic) (1-4 marks)

Describes effects of a tsunami.

Statements are general in a random order.

Lots of people died, a lot were drowned or killed by the sheer power of the water.

Buildings were destroyed. A huge wave hit the coast. People tried to run out of the way. In some parts whole places were destroyed.

Level 2 (Clear) (5-6 marks)

Effects are clearly described, in an organised way.

Statements are linked.

There is a clear reference to the case study named – rings true for example.

Cars, ships and planes were tossed like toys. Huge areas of the coast north of Tokyo were affected by waves over 10m. Thousands died due to the waves covering the coast and the nuclear plant was flooded. Many did not have power and were rationed. Whole towns were wiped out and hundreds of thousands were living in shelters. Industry was shut down, causing economic problems for the country.

Level 3 (Detailed) (7-8 marks)

Will have a clear structure.

Statements are logically ordered and linked.

Detailed reference to specific case study.

The area along the coast to the north of Tokyo was worst affected – stretching for over 200 miles. Waves of over 10 metres approached the coast and engulfed entire settlements transporting cars and boats like toys. Closest to the epicentre was Minamisanriku where it is thought that half of its 17 000 population had died. In Sendai there were boats stranded on the harbour wall, people were stranded in the airport. 5 million did not have power and 1 million had no mains water supply. Water flooded the reactors of the Fukushima nuclear plant causing loss of power, but more the threat of meltdown loomed, causing even more people to leave their homes.

Total: 25 marks

Question 2: Rocks, Resources and Scenery

- 2(a)** Granite is an older rock than chalk. Chalk formed during the Cretaceous period – some 65 to 145 mya (any idea of time within is acceptable) whilst granite formed 280 mya during Permian (according to NT book) or during Devonian, Silurian, Ordovician and Cambrian – all 359 mya or older. Thus granite is at least twice as old as chalk. There must be reference to both rock types for 3 marks.
3x1 **(3 marks)**
AO1 – 3
- 2(b)** Limestone is comprised of calcium carbonate; remains of dead sea creatures/contains fossils; it is a pervious/permeable rock; it has joints and bedding planes; it is formed in layers; it is light grey in colour and is resistant to erosion, but is chemically weak.
2x1 **(2 marks)**
AO1 – 2
- 2(c)(i)** The command is to describe, so 1 mark for a list of features – 2 or more of cave, stalactite, stalagmite, pillar and curtain. There should be specific reference to the features – that the stalactites hang from the ceiling and are thinner and longer than the corresponding stalagmites which appear opposite; the pillars that appear quite chunky where the two have joined and the curtains lining the walls of the cave.
3x1 **(3 marks)**
AO2 – 1
AO3 – 2
- 2(c)(ii)** Features identified are (A) stalactites and (B) stalagmites. Rainwater is a weak carbonic acid and limestone is soluble in this (carbonation). Therefore water present in the cave has flowed through limestone and so has dissolved calcium carbonate in it. As the water drips from the roof, some evaporates leaving behind small amounts of re-deposited calcium carbonate; this process continues for many years to build up the stalactite which is suspended from the ceiling. Drops of water drip from the stalactite to the floor below; calcium carbonate is deposited when evaporation occurs, leading to the build-up of material opposite as a stalagmite that grows from the ground.
(4 marks)
AO1 – 3
AO2 – 1

Level 1 (Basic) (1-2 marks)

A partial explanation – may have start, end or random parts of sequence.
Sequence incomplete – may be some confusion between stalactites and stalagmites.

Water drips from the roof. Limestone is left behind to form stalactites. Some drops to the floor below.

Level 2 (Clear) (3-4 marks)

Stages are clear and explanation is coherent and complete.
Sequence complete.
Develops and links points.

Water in the cave contains dissolved calcium carbonate. As this drips from the roof, some evaporates leaving behind tiny particles of re-deposited limestone. Over hundreds of years these form icicle shaped stalactites. Some water drips to the cave floor opposite and a stalagmite grows from the floor in the same way.

2(d)(i) 706741 or 706742. **(1 mark)**

AO3 – 1

2(d)(ii) Impacts may be positive or negative. The map shows the proximity of Ingleton and therefore the possibility of jobs for people living there; conversely the B road from the quarry goes through Ingleton which could lead to traffic problems – heavy lorries going through the settlement. The photograph illustrates the negative impact of the environment with the large white scar clearly visible in contrast to the surrounding area, the presence of heavy machinery and the resultant dust. **(4 marks)**

AO2 – 2
AO3 – 2

Level 1 (Basic) (1-2 marks)

Describes impacts.

Points are quite general – no specific reference to resource.

Simple, separate points.

The quarry will be unsightly. There will be a lot of noise and heavy lorries.

People may get a job in the quarry.

Level 2 (Clear) (3-4 marks)

Develops statements – refers to features shown in Figure 4a and/or 4b.

Statements are linked and developed.

The quarry will provide jobs for people living in Ingleton – there does not seem to be a lot of other jobs in the area. The quarry is large and a deep hole in the landscape which spoils the environment as it is hilly and attractive with waterfalls present. Heavy lorries will spoil the peace and quiet in Ingleton.

2(e) Candidates may refer to management during extraction and after – but there is no requirement to do so. Actual information will depend on case study selected. **(8 marks)**

Likely to refer to points such as – planting of hedgerows/lines of trees to shield area from view to reduce visual intrusion; limiting blast times / heavy goods vehicle movement to reduce noise; cleaning roads to reduce dust; having a programme of landscaping, replacement of topsoil once an area is worked out and restoring area to specific use such as farming – or a new use – such as a golf course so that area blends in.

AO1 – 4
AO2 – 4

After extraction restoration is more complete – large numbers of plants are often planted to recreate a habitat for wildlife; wetlands may be created – with conservation a focus or lakes for recreation, or there may be a complete return to farming as the area is improved and enhanced – so that it may be even better than before quarrying took place.

Response should demonstrate specific knowledge of case study and places, facts therefore should be noted.

Level 1 (Basic) (1-4 marks)

Simple statements, perhaps list like at lower end.

Separate ideas.

Generalised statements.

Trees planted on edges of quarry. Roads cleaned at night.

Used for other things like lakes.

Level 2 (Clear) (5-6 marks)

Develops statements and begins to make links between strategy and reduction of impact.

There is clear reference to the case study – rings true.

At Hope in Derbyshire, a lot of trees have been planted to make the quarry and cement works less obvious. Much is transported by train, so traffic on narrow roads in the countryside is reduced. Road clearing is arranged to get rid of dust in immediate area. After an area is finished it is restored to farming or a different use, such as fishing lakes.

Level 3 (Detailed) (7-8 marks)

Detailed development of statements, response is organised and focused.

Case study is specifically referred to and points made relate to this – detailed factual information.

At Lafarge Cement in Hope in Derbyshire, over 75000 trees have been planted to make the quarry and cement works less obvious and make it blend in with the environment. Two and a half million tonnes of limestone that could not be used for making cement have been used to help to conceal the entrance by altering the landscape. Much is transported by train, so traffic on narrow roads in the countryside is reduced. After an area is finished it is restored to farming or a different use, such as fishing lakes and a 9-hole golf course has been opened – this is much more attractive and the lakes encourage a natural habitat.

Total: 25 marks

Question 3: Challenge of Weather and Climate

- 3(a)** The graph shows that temperatures have overall increased by about 2 degrees from 1950 to 2010. The increase has not been a steady one, but there have been fluctuations. The highest temperatures were in 1990s – in excess of 16 degrees. Recent trend has shown fluctuation and decline. **(4 marks)**

AO1 – 1
AO2 – 1
AO3 – 2

Level 1 (Basic) (1-2 marks)

Describes information on graph – partial.

Notes overall increase, but may be step by step or stage by stage.

Temperatures have increased from 1950 to 2010. They started off at their lowest and then increased, then dropped and increased again in 1990s.

Level 2 (Clear) (3-4 marks)

Complete description of trends.

Sees fluctuating change and supports with evidence.

Temperatures show an overall increase of approximately 2 degrees. However, this has fluctuated being lowest at the start with about 12.5 degrees and then fluctuating until 1990s. This decade had the highest temperatures – over 16 degrees and there has been a slight decrease in this century.

- 3(b)** Economic effects – likely to include loss of earnings, loss of businesses/livelihoods, e.g. as ice melts and skiing cannot occur; impact on farming – different crops grown as climates change, e.g. parts of southern England growing more crops linked to Mediterranean areas such as vines, olives. Health could be affected as a social impact of diseases such as malaria may become common; people may be affected by the heat. **(4 marks)**

AO1 – 3
AO2 – 1

Environmental effects – likely to refer to impact on climate – such as southern Britain getting warmer; the UK experiencing more gales, floods, drought. Impact on things that will grow – deciduous trees may struggle in drier conditions, crops grown may change – oranges and vines in southern areas will become more common. Coastal flooding is likely to feature with vulnerable areas being along The Wash, and the Humber and the Thames estuaries.

Level 1 (Basic) (1-2 marks)

Simple statements, perhaps list-like at lower end.

Separate ideas – may be only one effect.

General points.

It will get warmer. There will be more rain. Some plants may die and others, like oranges and grapes, will be able to grow. The coast will flood.

Level 2 (Clear) (3-4 marks)

Develops statements and makes links.

Will refer to more than one effect.

Response is targeted to question – reference to the UK is clear.

Low lying coastal areas will flood. Some areas will be really likely to flood such as areas around The Wash and the Thames estuary. Weather may be more extreme. There will be more gales and rain and flooding of rivers will be more likely to occur.

- 3(c)** Extreme weather is that which is not the norm / exceptional / breaks (Met Office) records. It occurs relatively rarely and may last for longer than expected. Examples include drought, heat waves, heavy rain and deep snow and thick fog. 1 mark for example. 3x1 **(3 marks)**
AO1 – 3
- 3(d)(i)** 1 mark for recognising that the vast majority of the British Isles is covered in snow +1 if qualified. 1 mark for identifying areas not covered – such as some western coastal areas, parts of the Republic of Ireland. 2x1 **(2 marks)**
AO2 – 1
AO3 – 1
- 3(d)(ii)** **Coldest temperature:** –21.2°C **(3 marks)**
Snowfall at Gatwick Airport: 45cm
Summary of weather outlook. Any valid summary – staying very cold but mainly dry; sunny, but cold, a little snow. 3x1
AO2 – 1
AO3 – 2
- 3(d)(iii)** Depression. **(1 mark)**
AO1 – 1
- 3(e)** Issues should refer to the extent to which preparations are put in place and there is a readiness to deal with the effects. There may be reference to any type of extreme weather – with reference to the snow, there may be comment on the impact of the readiness of air, rail and road transport to cope with people being left stranded and the need to cancel flights and put people up. There may be debate about the amount of equipment needed and things such as salt and what scale of event we are ready for. Reference may be made to forecasting and warnings given and the extent to which these are accurate and heeded. Equally, there may be reference to how we deal with the impacts – how successful we are in rescuing trapped motorists, accommodate stranded travellers at airports and get things moving again. Positive aspects may be considered – such as snow for ski industry in Scotland and need for clothing / equipment. **(8 marks)**
AO1 – 4
AO2 – 4

Level 1 (Basic) (1-4 marks)

Simple statements, perhaps list-like at lower end.

Separate ideas – descriptive points (impacts) are included in a random order.

People were trapped in cars as snow closed roads. Airports shut and people had to stay there. Lots of schools closed, so children had lots of snow days.

People could not get to the shops as roads had not been gritted.

Level 2 (Clear) (5-6 marks)

Develops statements and make links.

Relates negative impacts to preparation/how impacts dealt with to some extent - begins to identify / discuss issues.

Some illustration present.

Thousands of schools closed in Nov/Dec 2010 for many days and children enjoyed snow days, instead of being at school. Transport and safety issues led to closures that were part of a plan, but could roads have been gritted more.

Airports in London were closed, but other countries get far more snow than we do and their airports do not close. We need more snow ploughs to keep runways open and de-icers to keep planes flying to reduce disruption caused.

Level 3 (Detailed) (7-8 marks)

Fully developed statements that are linked.

Clearly relates negative impacts to preparation/how impacts dealt with – discusses issues.

Details in exemplars used.

In Nov/Dec 2010 large amounts of snow caused problems for many people.

Over 7000 schools closed, people were trapped in cars on M25, many trains were stuck between stations and major airports – London Heathrow and Gatwick were closed as there was too much snow on runways. Yet, we are supposed to prepare for such events. There was not enough equipment to keep the runways clear despite the efforts of 100 people and 45 snowploughs. Many roads were impassable as gritters struggled despite having ordered 350 000 extra tonnes of rock salt. Train operators failed to get information to passengers about delays and cancellations. So, should things have been better – the issue really is how much money we spend to be ready for an event that may occur very rarely – so that all the equipment is left idle and wasted.

Total: 25 marks

Question 4: Living World

4(a) Tropical rainforests are found along the Equator and either side of it. There are three large areas – the largest is Amazonia in South America, the central part of Africa – the west (especially in the central area) but not the east has another large area, and the area of south east Asia and Indonesia is important. The north and eastern coastal areas of Australia contain smaller areas of tropical rainforest.
3x1 **(3 marks)**
AO1 – 3

4(b) Any valid point from photograph – a variety of species is present as shown by the different coloured and shaped leaves; the vegetation is dense – the leaves and branches giving complete cover in what is the canopy; some trees are taller – these are emergents such as the palm like tree in the foreground; different layers of vegetation.
3x1 **(3 marks)**
AO2 – 1
AO3 – 2

4(c) Likely to explain the presence of the canopy and emergents as the trees fight to get to the sunlight to allow photosynthesis to take place. There may be reference to specific features such as lianas that climb the trees to reach the light, epiphytes that live on the trees to access the light; buttress roots which seek to stabilise the trees as their roots are shallow and they grow so tall. Drip tip leaves that are designed to shed the large amount of rain as is the smooth bark. **(4 marks)**
AO1 – 3
AO2 – 1

Level 1 (Basic) (1-2 marks)

Simple statements.

Statements are generalised and separate.

May describe climate and/or adaptations.

Explanation is tentative, partial understanding.

Climate is very hot and wet. Trees grow very tall. Water drips off pointed leaves.

Level 2 (Clear) 3-4 marks

Develops points.

Linked statements – may have specific species.

Climate linked to adaptations.

Explanation is clear.

The trees grow very tall as they are trying to reach sunlight and compete with each other. Epiphytes live on the higher branches so that they can get sunlight. The leaves on the trees come to a point – known as drip tip, so that the large amount of rainfall can flow off them easily, without them breaking.

4(d)(i) 60km **(1 mark)**
AO3 – 1

4(d)(ii) The main tourist and new developments are strung out along the coast as this offers beaches and the sea for visitors. New islands off shore provide the site for many new developments as technology allows this to happen. Golf and race courses are found more centrally as less land will be needed here for these uses at lower cost. **(4 marks)**
AO1 – 2
AO2 – 1
AO3 – 1
There may be reference to access via road or air.

Level 1 (Basic) (1-2 marks)

Simple statements.

Location of tourist areas is described.

The hotels and new developments are along the coast. Tourist islands are being developed in The Gulf.

Level 2 (Clear) (3-4 marks)

Begins to develop points and to link ideas.

Location of tourist areas is explained.

The hotels and new developments are along the coast as this is where the main attractions will be for tourists – beaches and the sea. The main city seems to be in one area and new developments to the south – as if these are zoned and planned. The race and golf courses are more central as they will need less land and maybe cheaper land here. Access by road is important with Emirates Road going next to Sports City.

- 4(d)(iii)** Evidence should relate to the sheer number of tourists – large scale – 6 million versus its population of under 2 million; a significant part of wealth - just under a fifth is from tourism; it is unique in having world's only 7-star hotel; the sheer scale of the venues and the numbers going to events. 1 mark for selectively quoting / lifting information. There must be some use of figure for second mark. 2x1 **(2 marks)**
- AO2 – 1**
AO3 – 1
- 4(e)** Case studies likely to be dependent on those appearing in related texts – South West US likely to be used, perhaps western Australia. Opportunities mentioned in specification are commercial farming, irrigation, mineral extraction, retirement, migration and tourism. There may be a focus on one or two of these or a broader coverage. For SWUSA, reference is likely to be made to Hoover and Glen Canyon dams along the Colorado; provision for commercial farming – supplying water to California for fruit and vegetables to be grown; also possible provision of a power source to facilitate development, such as tourism; development of tourism on a large scale, such as Las Vegas; building areas for retirement such as Sun City in Phoenix and mineral extraction, especially in Utah – with copper at Bingham and iron ore at Cedar City. There must be reference to the idea of sustainability and this may accept that in a rich country they are sustainable or question such vast amounts of water being used in an area that is a hot desert and receives 250mm rain or less each year. **(8 marks)**
- AO1 – 4**
AO2 – 4

Level 1 (Basic) (1-4 marks)

Simple statements, perhaps list-like at lower end.

Describes opportunities for economic development.

Information is general.

Inappropriate example.

There are dams built. This gives a water supply. Farming is better and fruit is grown. People have a lot of water. There is tourism in some areas.

Level 2 (Clear) (5-6 marks)

Develops statements.

Tentative links/hints are made between opportunities and sustainability – begins to discuss.

Some reference is made to the case study.

Dams hold back rivers, like the Colorado. The Hoover Dam means there is water for big resorts like Las Vegas. This allows lots of tourists to go there and lots of jobs have been developed in hotels and services. These jobs should be

long term if the area is looked after carefully.

Level 3 (Detailed) 7-8 marks)

Fully developed statements.

Links are clearly made between opportunities and sustainability – purposeful discussion.

May question the extent to which it can be sustainable.

Specific, detailed reference is made to the case study.

Dams hold back rivers, like the Colorado. The Hoover Dam and Lake Mead mean there is water for big resorts like Las Vegas. This allows lots of tourists to go there and lots of jobs have been developed. These jobs should be long term if the area is looked after carefully – and it should be sustainable. However, there have been problems – there are other dams such as Glen Canyon at Lake Power and little water reaches the lower reaches of the river. In Phoenix, there are larger retirement areas and an increasing demand for water. Lots of homes have pools in an area that is very dry and it is uncertain whether this can continue forever.

Total: 25 marks

Question 5: Water on the Land

5(a)(i) Any 3 valid characteristics – arrow must make contact with feature for mark and refer to river valley or channel only. **(3 marks)**
3×1. Maximum 2 on either valley or channel. **AO2 – 1**
AO3 – 2

5(a)(ii) There is likely to be reference to horizontal layers of hard and soft rock, with the hard rock forming the cap rock. Erosion of the underlying softer rock at a faster rate causes an overhang to develop; abrasion and hydraulic action are particularly important erosion processes; material from overhang collapses causing waterfall to retreat. The process begins again and repeats, subsequent collapses lead to the formation of a gorge – the narrow steep-sided valley in front of the waterfall. **(4 marks)**
Any valid explanation of a gorge is permissible. **AO1 – 3**
AO2 – 1

Level 1 (Basic) (1-2 marks)

Simple points.

Order not correct – jumps about.

Sequence may be incomplete.

Erosion occurs at the bottom of a waterfall. An overhang develops. Over time this cannot be supported and it collapses. The same thing happens again.

Level 2 (Clear) (3-4 marks)

Complete, clear statements.

Statements are developed and linked.

Sequence and formation of a gorge is complete and clear.

Hard rock is underlain by soft rock. This erodes faster as a result of abrasion and hydraulic action. An overhang forms. This eventually collapses and the waterfall retreats upstream. This is how a gorge is formed, as the sequence repeats, a narrow, steep-sided valley is left where the waterfall used to be.

5(b)(i) Hydrograph should have a higher peak and a shorter time lag. **(2 marks)**
2×1

AO1 – 1
AO3 – 1

5(b)(ii) The amount of water fluctuates due to a variety of factors. The specification refers to amount and type of rainfall, temperature, previous weather conditions, relief, rock type (impermeable, permeable, porous and pervious) and land use. There should be reference to some of these. There is a need to explain so answer should focus on this, e.g. the recognition that rivers in areas of impermeable rock will have more water in them than those with permeable as they do not allow water to soak in, so water flows quickly over the surface to the channel. In contrast, rocks like limestone have joints and bedding planes that provide pathways for water to enter and go through, so water is removed from the surface and takes a slower route to the river, so there is less water present in the channel. **(6 marks)**

AO1 – 3
AO2 – 3

Level 1 (Basic) (1-4 marks)

Simple, separate statements, perhaps list-like identification at lower end.

Will begin to explain at top end.

Some rivers are in areas where there are lots of trees. Some have steep slopes.

Water gets to the river fast where slopes are steep.

Level 2 (Clear) (5-6 marks)

Develops and links statements.

Will refer to more than one reason.

Clear, purposeful explanation.

The amount of water will be high if the river is in an area with steep slopes. This will cause the water to run quickly over the surface due to gravity, before it has time to soak in. It will reach the river quickly and the amount of water will increase. The previous weather can also cause changes. If it has been dry, rain will soak into the ground and will be slow to reach the river. However, if it has been wet, the water will flow over the surface reaching the river quickly.

- 5(c)(i)** Any valid point – area is mountainous, with lower lying areas that have rivers – so could be dammed; likely to receive more rain due to being higher up; population density likely to be low so less disruption. **(2 marks)**
2x1 or 1x(1+1) **AO3 – 2**

- 5(c)(ii)** There is no requirement to use a case study, but it is permissible to use one to support the answer. **(8 marks)**
Specification refers to economic, social and environmental issues, so reference should be expected to these. Economic issues may refer to cost of building dam and pipelines; loss of farmland and livelihood versus opportunities for development of tourism. Social issues may refer to the loss of people's homes and displacement of people as villages are drowned; ill-feeling regarding the origin of water and its destination such as reservoirs in Wales and Welsh water supplying England. Environmental issues likely to refer to loss of land and habitat, impact on the flow of the river and impact of new uses such as recreation and tourism; reduction of flood risk. **AO1 – 4**
AO2 – 4

Level 1 (Basic) (1-4 marks)

Describes problems and/or advantages that result from building dam and reservoir.

Statements are simple and separate.

Dams lead to large lakes behind them which flood farmland. Villages can be covered in water. People may visit the new lakes and use them for sailing and other water sports.

Level 2 (Clear) (5-6 marks)

Begins to discuss issues – and recognises that building dams and reservoirs creates debate.

Will offer some support – perhaps via case study.

Statements are developed and linked.

The building of a dam is very expensive as well as all the pipelines needed to transport the water. Perhaps money could be spent on educating people to conserve water rather than provide more. People lose their homes and livelihoods as a result of dams being built. Whole villages have been flooded as at Llanwddyn in north Wales. This is a lot of disruption for some people.

Level 3 (Detailed) (7-8 marks)

Clearly discusses issues – recognises that building dams and reservoirs creates debate.

Will offer support – perhaps via case study.

Statements are linked and detailed.

Building dams and creating large reservoirs is at a huge cost. At Carsington, the cost was £107million – all this to meet increased demand for water for increased use for things like washing machines and dishwashers. Perhaps, instead people could conserve water. People lost homes and livelihoods – when Lake Vrynwy was created, the village of Llanwyddyn was flooded. People were forced to move as 10 farmhouses as well as 2 chapels and 3 pubs were drowned – taking away the whole community. This Welsh water is then taken to English cities such as Liverpool – which the local people object to – seeing it as their water.

Total: 25 marks

Question 6: Ice on the Land

6(a)(i) Allow 1 for sketch where drumlin is recognisable from photo. **(3 marks)**
 Any 2 valid characteristics – arrow must make contact with feature for mark and refer to features of drumlin only – such as blunt end, tapered end, covered in vegetation, egg shaped. Gentle and steep is 1 mark. **AO2 – 1**
AO3 – 2
 3x1

6(a)(ii) The glacier is carrying a lot of material of all different sizes – moraine. As it is carrying so much, it is overloaded and struggles to carry it as it is nearer the end and it is melting. Small obstacles – like rocks – lead to the moraine being deposited around them as the ice cannot overcome them and carry material. **(4 marks)**
 The moraine moulds itself around the obstacle – the blunt end being the deposited material upstream of the ice and the long tapered ice where the ice has flowed over the obstacle and trailed the moraine with it. **AO1 – 3**
AO2 – 1
 Alternative explanations are permissible.

Level 1 (Basic) (1-2 marks)

Simple points.

Order not correct – jumps about.

Sequence may be incomplete.

Moraine is carried by ice. Some of it is deposited on the valley floor to form drumlins.

Level 2 (Clear) (3-4 marks)

Complete, clear statements.

Statements are developed and linked.

Sequence and formation of a drumlin is complete and clear.

In lower lying areas the glacier is overladen by moraine and it is beginning to melt. The glacier struggles to carry the moraine. Obstacles, such as small rocks, lead to the deposition of the moraine. This occurs especially on the upstream side to give the blunt end of the drumlin. Once the glacier has gone over the top, it trails the moraine over a longer area forming the tapered end of the drumlin.

6(b)(i) Glacier should end higher up the valley and be thinner, especially near snout, than 'normal'/average one. Must use key, otherwise 1 mark. **(2 marks)**
 2x1 **AO1 – 1**
AO3 – 1

6(b)(ii) Glaciers advance and retreat due to the glacial budget. There is likely to be reference to inputs and outputs and the balance between them. The glacier will advance when there is more accumulation than ablation and will retreat when there is more ablation than accumulation. This will happen seasonally in alpine glaciers due to summer being warmer than winter. However, there will also be longer term trends. Unusually snowy winters will lead to greater inputs and unusually mild ones to less accumulation – with advance and retreat being the result. Reasons for present retreat with reference to global warming and underlying reasons for this are also permissible. **(6 marks)**
AO1 – 3
AO2 – 3

Level 1 (Basic) (1-4 marks)

Simple, separate statements, perhaps list-like identification at lower end.

Accumulation and ablation are seen separately.

Will begin to explain at top end.

Snow is added to the glacier and over time this turns to ice. This is accumulation and occurs nearer the beginning especially. Some ice melts, this is ablation and occurs nearer the end.

Level 2 (Clear) (5-6 marks)

Develops and links statements.

May refer to more than one reason.

Clear purposeful explanation – aware of relationship between accumulation and ablation.

Whether glaciers advance or retreat depends on the glacial budget. If there is a high level of snowfall over a number of years, this will be compacted to form ice and this will add to the size of the glacier. Ablation or melting occurs mainly at the snout where it is warmer as it is lower down. If there is more ice being added than that which is melting, the glacier will advance. However, if more is melting than is being added, the length of the glacier will reduce and it will retreat.

- 6(c)** Any 2 valid points, e.g. there are ice caps (glaciers) shown in the Alps, suggesting skiing or glacier walking opportunities. There are many mountains such as the Jungfrau for skiing and snowboarding. There are 3 major airports which allow international tourists easy access and roads/railways which provide access to resorts within Switzerland. **(2 marks)**
2x1 **AO3 – 2**

- 6(d)** Fragile environments are those that are easily damaged and that take a long time to recover. These cold areas are susceptible to damage as vegetation grows very slowly. Less snow means the low lying ski resorts will lack their essential ingredient and its lack of a guarantee means steps are often taken to overcome this. The use of snow making machines increases noise levels and uses millions of litres of water. As the ground melts, the safety of bases for cable cars may become uncertain. Pressure will be put on higher altitude areas – many of which are very fragile – as these are the areas with snow and more people will lead to greater erosion and litter concentrated in fewer areas. Skiing on thin snow cover causes greater erosion and vegetation cover may be affected – low in height and with patches of bare earth – with no time to recover in the cold conditions. As other activities are sought to diversify – activities such as mountain biking which do not require snow, can lead to gullies forming and rapid erosion during snowmelt. **(8 marks)**
AO1 – 4
AO2 – 4

Level 1 (Basic) (1-4 marks)

Describes how tourism can damage fragile environments.

Will be general.

Statements may be in a random order.

Areas that are fragile are easily damaged. High up areas are cold so vegetation does not grow very quickly. Tourists damage paths. There is a lot of litter left.

Level 2 (Clear) (5-6 marks)

Begins to explain how tourism can damage fragile environments.

Offers evidence in support.

Statements are linked.

Seeks to explain.

Fragile environments are likely to be damaged easily and take a long time to recover. Less snow results in more people concentrating in the upper slopes and causing greater wear there. Litter becomes more of a problem as does

greater erosion of the slopes through thinner layers of snow. Some lower resorts like Wengen use snow making machines which are noisy.

Level 3 (Detailed) (7-8 marks)

Clearly explains how tourism can damage fragile environments.

Evidence is used to illustrate points.

Statements are linked and detailed.

Explanation is to the fore.

Fragile environments are damaged easily and take a long time to recover as cold conditions mean vegetation is slow growing. Less snow results in more people concentrating in the upper slopes and causing greater wear there.

Vegetation is damaged and in places there is bare earth where it has been eroded entirely. This is especially a problem where the snow layers are thin and skiing is allowed to take place. Some lower resorts like Wengen use snow making machines which are noisy and use millions of litres of water – can this be sustainable? The avalanche risk will also increase as warmer temperatures lead to instability and the different layers of snow separate.

Total: 25 marks

Question 7: Coastal Zone

7(a)(i) 3×1 for labelling any 3 valid landforms – arrow must make contact with feature for mark. Landforms such as headland, cliff, cave, arch, wave-cut notch. **(3 marks)**
3×1

AO2 – 1
AO3 – 2

7(a)(ii) Waves erode the base of the cliff via hydraulic action and abrasion. A cave forms as a crack/weakness is exploited by the waves. On a narrow headland, continued erosion extends the caves backwards and once it breaks through the headland, an arch forms. Further erosion at the base widens the arch. Eventually the roof of the arch will not be able to be supported by the rock below. This collapses to leave a sea stack – an isolated pillar of rock, now detached from the headland. **(4 marks)**

AO1 – 3
AO2 – 1

Level 1 (Basic) (1-2 marks)

Simple points.

Order not correct – jumps about.

Sequence may be incomplete.

The sea erodes the bottom of the cliff. An arch forms. Eventually, this collapses to leave a sea stack.

Level 2 (Clear) (3-4 marks)

Complete, clear statements.

Statements are developed and linked.

Sequence and formation of a stack is complete and clear.

Waves erode a crack in a headland. This leads to a cave forming due to hydraulic power and abrasion. Over time, the cave gets bigger and finally breaks through the headland to form an arch. Weathering of the roof and erosion at the base widen the arch. A point comes when the roof cannot be supported and this collapses. This results in the formation of a sea stack – an isolated pillar of rock – once attached to the headland.

7(b)(i) Sea level should be drawn as a solid line to match the key and be in line with 40cm scale line (i.e. add 35 to the 2010 figure). **(2 marks)**
2×1

AO1 – 1
AO3 – 1

7(b)(ii) Economic effects include risk of loss of farmland, settlements such as Kings Lynn, the threat to the coastal tourist industry and areas such as the Norfolk Broads with its lucrative sailing. The cost of protection is likely to rise as areas seek to prevent flooding – the Thames Barrier will need replacing ultimately. Environmental effects include the flooding of large areas of mudflats, salt marsh – which provide unique habitats. Rates of coastal erosion will increase and settlements will be further threatened – Happisburgh. **(6 marks)**

AO1 – 3
AO2 – 3

Level 1 (Basic) (1-4 marks)

Simple, separate statements, perhaps list-like identification at lower end.

Will describe effects at top end.

Lots of places will be flooded. People will lose jobs as tourist areas are lost. More sea walls will be needed and barriers.

Level 2 (Clear) (5-6 marks)

Develops and links statements.

Refers to both economic and environmental.

Clear, purposeful description.

There are many economic and environmental effects. Economically, settlements will be threatened, even London where 1.25 million people work in flood risk area. The cost of protection will be high with the Thames Barrier needing to be replaced. Environmentally, many coastal areas will be threatened – with salt marshes and mudflats that provide habitats for different plants and animals and birds under threat. Rates of coastal erosion will increase and further threaten vulnerable settlements, such as Happisburgh.

- 7(c)** Area X has a more indented coast with headlands and bays, whereas Area Y is much straighter / smoother with sand spits visible. **(2 marks)**
2x1 **AO3 – 2**

- 7(d)** Actual content will depend on strategies selected. Can refer to advantages of selected strategy or disadvantages of one that is rejected. For example if hard engineering (sea walls, groynes and rock armour) is selected, likely to note the effectiveness of sea walls at stopping the sea; the presence of cheaper alternatives such as rock armour and groynes which protect the base of cliffs and reduce erosion or keep a beach in place which is a natural protection. **(8 marks)**
AO1 – 4
AO2 – 4
There are other advantages of these – such as encouraging tourists by maintaining a beach or encouraging fishing off them. Overall, they offer secure protection against the waves. In contrast, soft engineering (beach nourishment, dune regeneration and marsh creation) are less secure means and beach nourishment no cheaper than rock armour. This needs greater maintenance than a sea wall. Dune regeneration can lead to the exclusion of people from protected areas – discouraging, rather than encouraging tourists and marsh creation involves the sacrificing of some land to the sea – so not really offering protection everywhere.

Level 1 (Basic) (1-4 marks)

Describes hard and/or soft engineering strategies.

Simple statements, may be in a random order.

Soft engineering involves dumping sand on the beach. This means that a beach is kept in place and this protects the coast behind.

Level 2 (Clear) (5-6 marks)

Begins to consider why the strategy selected is better option.

Advantages of option clear and/or disadvantages of alternative are included.

Statements are developed and linked.

Beach nourishment means adding sand to the beach material that is already present. This acts as a barrier to the waves and protects the land behind. It is an environmentally friendly method of protecting the coast as it does not look unsightly. It is cheaper than hard engineering options like sea walls.

Level 3 (Detailed) (7-8 marks)

Clearly focused on why the strategy selected is better option.

Advantages of chosen option clear and/or disadvantages of alternative in a purposeful discussion – makes a case for chosen option.

Statements are developed and linked.

Beach nourishment adds sand from offshore to the beach material that is already present. The beach is a natural protector and this keeps the beach in place and adds to the appearance. It will also ensure tourists keep coming. This is a lot cheaper than hard engineering strategies like building sea walls – a 2.1km sea wall at Scarborough cost £50million in 2005, in contrast to £3000 per metre for beach nourishment. Marsh creation is another way of protecting the coast with little impact. By allowing a limited amount of low value areas to flood, many other areas are protected without interfering with the movement of material in an area. This is a more sensible approach than trying to keep the sea out with sea walls that need replacing and are costly and can be unsightly.

Total: 25 marks