

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
GCE Advanced Subsidiary Level and GCE Advanced Level

**MARK SCHEME for the October/November 2009 question paper  
for the guidance of teachers**

**9696 GEOGRAPHY**

**9696/11**

Paper 11 (Core Geography), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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|        |  |          |       |
|--------|--|----------|-------|
| Page 2 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

### Section A

Answer all the questions in this section. All questions carry 10 marks.

#### Hydrology and fluvial geomorphology

1 Table 1 gives some data for two river catchments located in similar temperate climates.

(a) What percentage of average annual rainfall occurs as runoff in:

(i) River A; [1]

(ii) River B? [1]

River A is 80%

River B is 70%

(b) What is the difference between the maximum and minimum recorded flows in:

(i) River A; [1]

(ii) River B? [1]

River A is 150.1 cumecs

River B is 36.8 cumecs

(c) Using the evidence in Table 1, explain which of the rivers you think is more likely to produce floods in response to a storm event. [6]

The flashier regime is that of River A as the range of flows is so much higher than that of River B. Also the basin area is slightly smaller which could produce a quicker passage of water to the main channel although the average rainfall is given as the same. The main reason, however, is due to the different geologies. Sandstone and shale are less permeable than limestone, hence giving rise to more overland flow, particularly during intense rainfall (i.e. 80% of all ppt). Limestone allows a greater amount of percolation, thus more water reaches the river via baseflow (only 70 % as runoff) giving a more regular flow throughout the year, and a lower difference between minimum and maximum flows.

[Total: 10]

|        |  |          |       |
|--------|--|----------|-------|
| Page 3 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

## Atmosphere and weather

2 Fig.1 shows some possible effects of continued global warming.

(a) Give three examples from Fig. 1 that suggest there will be changes to precipitation. [3]

Movements of wheat belts in US, water shortages in Middle East and drought in Amazon, movement of Sahara, lack of Alpine snow – any three suggest onset of drought.

(b) Suggest one reason why the consequences of sea level rise may be more severe in some areas than others. [2]

Low lying areas with large populations (e.g. Bangladesh) are clearly more vulnerable than others (also Maldives). Cf the loss of beaches in the Mediterranean. Level of economic development (MEDC/LEDC) in providing coastal defences.

(c) Explain how increases in the greenhouse effect may cause changes to both temperature and precipitation. [5]

Through the agency of the greenhouse effect there will be an increase in carbon dioxide and other greenhouse gases in the atmosphere from human activities. This traps heat through absorption of outgoing longwave radiation and gives rise to global warming. The greater amount of heat means that more water vapour can be held in the atmosphere thus producing less rainfall. It could be argued that greater heat does produce more dynamic systems which coupled with sea level rise could lead to more evaporation and more storms and rainfall.

[Total: 10]

## Rocks and weathering

3 Photograph A shows a close-up of the effects of weathering on an area of limestone rocks.

(a) Draw a labelled sketch diagram of Photograph A, showing how the structure (joints and bedding planes) of the limestone has affected its weathering. [4]

The diagram should clearly identify the rectilinear jointing structure, particularly prominent in the top of the diagram. Most will no doubt identify the clints and grykes, although we would not require them to name them as such. Award 2 for reasonably accurate representation of photo and 2 for identifying features.

(b) Explain how weathering processes and the properties of limestone can result in the features shown in Photograph A. [6]

This requires an explanation of the process of carbonation, that is the action of acidulated water on calcium rocks. For full marks we would expect that the chemistry was correct and that there was some recognition of the role of rock structure. Some may also add freeze thaw, chelation, organic weathering which can be accepted for limited credit.

[Total: 10]

|        |  |          |       |
|--------|--|----------|-------|
| Page 4 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

### Population change

4 Fig. 2 shows birth rates, death rates and total population for England and Wales, 1701–2001. England and Wales are part of the United Kingdom, (UK), an MEDC.

(a) Using Fig. 2 and your knowledge of the demographic transition model, identify a likely date for the following and give a reason for your choice:

(i) the end of Stage 1; [2]

1741 ( $\pm 5$  years) 1 (a date, not the decade 1741–1751)  
when the death rate starts to drop, or when the death rate declines and moves away from fluctuating with the birth rate 1

(ii) the start of Stage 3. [2]

1871 ( $\pm 5$  years) 1  
when the birth rate starts to drop in a sustained manner 1

In each case it is possible to achieve the second mark without the first.

(b) Describe the natural increase rate in England and Wales during the period 1951–2001. [3]

Natural increase rate is the difference between birth rate and death rate.  
 $NIR = BR - DR$ . NIR is low, but fluctuating, not stable. In 1951 it is moderate, (approx. 2.5/1000), rises in 1961 (approx. 6/1000) and then falls to be negligible (1/1000, accept zero) in 2001. For a response without data support, max. 2.

(c) From the trends shown in Fig. 2, outline two possibilities for the demographic transition for England and Wales beyond 2001. [3]

Remains in Stage 4 (both BR and DR low and fluctuating). 1/2  
Enters Stage 5 (DR slightly higher than BR, giving negative NIR leading to population decline over time). 2/1  
[Less likely, but creditable, is the 'populationist' response to declining NIR and an ageing population which seeks to increase BR and/or immigration and thus NIR].

[Total: 10]

|        |  |          |       |
|--------|--|----------|-------|
| Page 5 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

### Settlement dynamics

5 Fig. 3 shows, by world region, the percentage of urban population in 2003 and the predicted percentage of urban population in 2030.

(a) Describe the relative changes in percentage of urban population between 2003 and 2030 predicted in Fig. 3. [5]

A full answer addresses both **relative changes** and the levels at which these occur. One possible approach to marking is as follows.

All world regions show a predicted increase in urban population by 2030 1

but this increase is highly variable, from Oceania's 2% to a massive 17% for Africa and Asia (or other data support) 2/3

For some comment on levels, such as that four world regions had urban population of 73% or higher in 2003 or that only Africa and Asia had a much lower level in 2003, 38%, so the majority of the population still lived in rural areas 2/1

(b) How does an understanding of urbanisation help to explain the data for Africa and Asia in Fig. 3? [5]

Although candidates may launch into rural-urban migration, push factors and pull factors, etc., the key to an effective explanation is the early stage of the urbanisation cycle or the relatively short history of urbanisation in these continents.

Despite Africa and Asia both having ancient civilisations and urban centres, urbanisation (the progressive concentration of population into urban areas) began relatively recently. This means both that they start from a lower base (38%) in 2003 and show great predicted urban population growth, (+17%), far greater than any other world region. 3/2

Candidates are likely to link this to the stage of development (LEDCs), the nature of the economy and, of course, to rural-urban migration. 2/3

For a full answer, no reference is needed to any other continent but some may show fuller understanding of urbanisation by so doing.

[Total: 10]

|        |  |          |       |
|--------|--|----------|-------|
| Page 6 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

### Section B: The Physical Core

#### Hydrology and fluvial geomorphology

- 6 (a) (i) Define the terms *riffle* and *pool*. [4]

Pool is a deeper area within a channel over which water flows sluggishly.  
Riffle is a bar of gravel over which water flows rapidly with a riffled surface.

- (ii) Briefly explain how riffle and pool sequences may affect channel shape. [3]

Basically by causing the current to swing and hence encouraging the development of a meandering channel. Pools tend to be concentrated where erosion is greatest on the outside of the developing meander bends, whilst riffles are regularly spaced along the straighter parts of the channel. Could be shown as a diagram.

- (b) Using a labelled diagram, describe how the Hjulstrom curve can be used to show transportation and deposition in a river channel. [8]

The Hjulstrom curve represents the flow velocities in a channel that are required for the initiation of movement of particles of different size. It thus shows the speeds required to entrain and transport different types of sediment. It is usually combined with a settling curve so that it is possible to see the speeds at which material will be deposited. It thus allows an estimate to be made of the balance between deposition and erosion and transportation. Many will express this in terms of the sediment size i.e. silt, sand, clay, pebbles, cobbles etc. The diagram should show the basic parameter/sediment size and velocity and give an outline indication of the areas of deposition and transportation.

- (c) How might human activities affect the amount and speed of water flowing in a river channel? [10]

Human activities can remove water through abstraction, irrigation, etc. which will reduce flow and discharge. Similarly the construction of dams will reduce discharge as well as affecting the velocity of water, depending on the amounts released into the channel below the dam. Changes made to the channel itself (straightening, embanking dredging, etc) are likely to affect velocity more than volume. Changes made in the catchment area, such as changes to land use such as urbanisation, afforestation, deforestation etc could affect the amount of water reaching the channel by increasing the amount of overland flow although it is generally the speed at which water arrives in the channel as the overall amount is controlled by climate. Climatic change through global warming could affect amounts of water in the long run.

Candidates will probably:

L3 concentrate on the channel with emphasis on amounts (Q) and velocity (V). [8–10]

L2 give more emphasis on catchment changes and the impact on flows into the river. [5–7]

L1 give an account that bases itself around flooding and its general causes and effects. [0–4]

[Total: 25]

|        |  |          |       |
|--------|--|----------|-------|
| Page 7 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

## Atmosphere and weather

- 7 (a) (i) Define the terms *sensible heat transfer* and *latent heat transfer*. [4]

Sensible heat transfer is heat that can be transferred within the atmosphere by either convection or conduction.

Latent heat transfer occurs when there is a change of state i.e. in condensation or evaporation.

- (ii) Explain one way in which solar radiation is reflected. [3]

Solar radiation entering the atmosphere is reflected by water droplets and ice in clouds or it can be reflected at the earth's surface through the albedo effect, e.g. ice sheets, etc.

- (b) With the help of a diagram, describe the global distribution of pressure belts and explain why this varies seasonally. [8]

Only broad semi-permanent pressure belts need to be identified in diagram or description. That is the equatorial low pressure belt (equatorial trough), sub-tropical highs, mid latitude troughs and polar highs. These might be seen in the context of the tri-cellular model, which is acceptable. The pressure belts migrate polewards, seasonally due to the passage of the overhead sun. This is complicated, particularly in the northern hemisphere, by the larger continental areas. As only 8 marks are available do not expect great detail on the land/sea or hemispheric differences.

- (c) Explain how stability and instability within the atmosphere produce different weather conditions. [10]

Stability is when the air remains cooler than surrounding air (DALR to left of ELR in diagrams) thus no uplift and cooling. This gives rise to clear (anticyclonic) conditions with no ppt and less cloud cover, etc. Cool nights can lead to frost, dew, etc. Instability is when air remains warmer than surrounding air meaning that air rises and cools adiabatically until dewpoint is reached and condensation takes place. Further rise at the SALR leads to cloud development and to rainfall. Diagrams could be used effectively.

Candidates will probably:

- L3** show a good understanding of lapse rates and explanation of the resultant weather phenomena. [8–10]
- L2** show an understanding of uplift as against stable air, although lapse rates may not be fully grasped. Distinction between rainy and clear weather. [5–7]
- L1** have a vague appreciation that there are weather differences but little clear indication as to why. [0–4]

[Total: 25]

|        |  |          |       |
|--------|--|----------|-------|
| Page 8 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

## Rocks and weathering

### 8 (a) (i) Define the terms *island arc* and *ocean trench*. [4]

Island arc is a curvilinear group of volcanic islands proximate to a convergent oceanic plate margin.

Ocean trench. Very deep trenches in the ocean associated with subduction zones of convergent plates.

### (ii) Briefly describe sea floor spreading. [3]

The movement of plates such that ocean floors are extended laterally as the plates move apart from the zone of separation along a mid oceanic ridge. Could be shown diagrammatically.

### (b) Using a diagram, show how plate tectonics can explain the development of mountains. [8]

Diagrams should show convergent plates either of oceanic and continental plates or two continental plates. The sediments on continental plates are crushed and folded to form fold mountain chains, whilst magma escaping along lines of weakness can produce volcanicity. Some may suggest volcanoes along hot spots which is acceptable but not a requirement.

### (c) To what extent can human activities affect the stability and shape of slopes? [10]

Human activities can affect stability and shape of slopes by affecting vegetation, slope transport and erosion, i.e. the factors that control slope development. Most will approach this through different types of human activities that can affect slopes, i.e. mining, quarrying, undercutting, deforestation, etc. The impact of dumping material (slag heaps) and resultant catastrophes may also appear. Enhancing slope stability through terracing.

Candidates will probably:

**L3** relate human activities to slope processes and thus to shape (mass movement) and to stability (water content leading to flows or undercutting leading to slides). [8–10]

**L2** give a range of relevant human activities with some relationship to both stability and shape, although not clearly explained in terms of process. [5–7]

**L1** mention relevant human activities but give little indication of impact on slopes. [0–4]

[Total: 25]



|        |  |          |       |
|--------|--|----------|-------|
| Page 9 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|        | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

### Section C: The Human Core

#### Population change

- 9 (a) Study Fig. 4, which shows a model of migration. With the help of examples, explain how positive factors and negative factors, as shown in Fig. 4, may affect whether or not people decide to migrate within a country. [7]

**positive factors** are advantages that attract migrants at the origin or destination

**negative factors** are disadvantages that repel them at the origin or destination

Candidates may express this in the more familiar push-pull terminology; **examples** should relate to **internal** migration but may be generic or located. For one type of factor, **max. 5.**

- (b) Describe some of the possible obstacles to international migration. [8]

Here **obstacles** (shown as intervening obstacles by Lee) may be both real and perceived. Classically they need to be overcome in order for migration to take place and thus work to deter some potential migrants, delay others and to restrict the scale of flows. These **obstacles** differ according to social context and development level. The most frequently recognised are,

- distance to destination (physical)
- cost of getting there (economic)
- existence of international borders (political)
- need for visa or permit (political)
- availability of imperfect information (social)

- (c) In what ways do the migration patterns of men and women differ?

Much depends on what type of migration is covered and what examples are known and used. Women may be more migratory than men over short distances, especially for marriage, domestic service and in societies where their status is low (Ravenstein). Men may be pioneers and then send for their wives (and children) later when they are established in employment and accommodation. Women may experience stronger family ties, e.g. where care of children or the elderly is involved, and may exhibit lower risk-taking traits. Forced migration is not gender specific. Some candidates may use the 'bites' and 'bulges' in population structures as evidence.

Candidates will probably:

- L3** develop a perceptive response, using the material that they have well to identify key gender differences. Show good conceptual understanding of migration and structure the response well. [8–10]
- L2** make a response of satisfactory but limited quality overall, which may include some good observations but which is restricted in detail and/or development. May make heavy use of one example or case study. [5–7]
- L1** offer a simple response, making a few basic points and may struggle to identify gender differences. Notes and fragments remain in L1. [0–4]

[Total: 25]

|         |  |          |       |
|---------|--|----------|-------|
| Page 10 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|         | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

## Population change

- 10 (a) Give the meaning of the term *carrying capacity* and outline how carrying capacity may be related to population increase. [7]

*carrying capacity* is an ecological concept, but it is important that candidates explain it in the context of human populations and not simply animal ones. It is defined as,

the largest or maximum number of people 1  
that can be supported or sustained by 1 (if just 'carried' 0)  
(the resources of) a given environment or place 1 Show /3

For how it relates to population increase, reserve 1 for the concept of a population ceiling or saturation level, which population may increase towards, reach, adjust to (J curves and S curves) or exceed (Malthusian crisis). Diagrams are creditable and an example or examples, whilst not necessary, may assist the response. /4

- (b) Using examples, suggest reasons why some areas of the world are considered underpopulated. [8]

Underpopulation is said to occur where there are too few people to exploit the resource base fully and therefore to attain the highest standard of living for all, at any given level of technology. It is usually calculated and expressed at national or sometimes a regional, scale.

Most areas **considered underpopulated** today are of great physical extent and high resource endowment, such as Australia or Canada, but accept any appropriate **examples** offered as candidates may have local cases.

- (c) To what extent do you agree that 'necessity is the mother of invention' in the relationship between population and resources? [10]

The saying usually used to summarise Ester Boserup's 1965 counter to Malthus. Especially in terms of food production (Green Revolution, etc.) it may be seen to be the case, but food shortages and famines still occur and "other factors", such as political ones, may restrict environmental potential. Water and energy may be included but many will focus on food production.

Candidates will probably:

**L3** develop an effective assessment of the validity of the saying, with elements of agreement and disagreement, well-supported by evidence. [8–10]

**L2** provide a sound response, which may have good points and limitations, and be characterised by a 'satis. so far' quality. May describe and 'top and tail' with comments which assess. [5–7]

**L1** make a basic quality response, which offers a few simple observations and little or no effective assessment. Show simplistic or faulty understanding and only general knowledge of the topic. Notes and fragments remain in this level. [0–4]

[Total: 25]

|         |  |          |       |
|---------|--|----------|-------|
| Page 11 | Mark Scheme: Teachers' version         | Syllabus | Paper |
|         | GCE A/AS LEVEL – October/November 2009 | 9696     | 11    |

## Settlement dynamics

- 11 (a) Describe the main changes which have occurred recently to the Central Business District (CBD) of one town or city you have studied. [7]

The example taken determines the nature of the response, but we may see issues such as horizontal expansion (zones of assimilation and discard), vertical expansion, renewal, changes to transport systems, security measures, new buildings e.g. malls and local issues such as the impacts of a major fire or terrorist attack, etc.

Credit well candidates who can identify **main** and structure the response accordingly.

- (b) Give the meaning of the term *functional zonation* and explain why it may occur within the CBD of towns and cities. [8]

The term *functional zonation* means the development of clusters of establishments of the same particular land-use (function) together into an identifiable areas or locations (zone) within the CBD. 2

It occurs for a combination of reasons which include,

- spatial competition
- bid-rent, similar uses bid similarly and can afford the same area
- convenience e.g. for business dealing between solicitors
- comparison shopping behaviour e.g. shoe shops close together,
- work to increase rather than reduce custom
- historical factors and old quarters in cities
- planning decisions and land-use specification
- other

- (c) Assess the success of attempts to improve one inner city area in an MEDC. [10]

In the past candidates have offered London Docklands, Birmingham, Manchester and Glasgow. Good accounts will cover what the attempts' aims and character were, as well as what they achieved. Some indication of difficulties encountered, unforeseen events and ongoing needs may be given. It is highly creditable to identify outcomes which differ by location or favour groups of people differentially.

Candidates will probably:

- L3** make effective use of the chosen case study and produce a response which impresses by the detail it offers, conceptual understanding shown and depth of the assessment made. [8–10]
- L2** develop a satisfactory response, which at the upper end may be quite good, but which remains partial and limited in knowledge of the chosen inner city and/or detail given and/or assessment made. [5–7]
- L1** offer a response of basic quality which may not be based on an inner city area or which remains general. Make one or more simple points in a piece which is descriptive, rather than evaluative, in character. [0–4]

[Total: 25]