

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

9696/12

Paper 12 (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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Section A

Answer five questions from this section. All questions carry 10 marks.

Hydrology and fluvial geomorphology

1 Fig. 1 shows a plan view and cross section of a river channel.

(a) (i) Identify the type of river channel shown . [1]

A braided channel

(ii) Name the landform marked X. [1]

A vegetated, permanent bar (island or cyot)

(iii) Name the landform marked Y. [1]

A temporary (unvegetated) bar (sand bar)

(iv) Identify the feature marked Z. [1]

Stream bank erosion (river cliff or embankment)

(b) Describe the channel landforms shown in Fig. 1 and explain how such a channel developed. [6]

Braided channels are shallow channels developed in unconsolidated and easily eroded materials. The channel is dominated by broad low elongated bars of sand and gravel as well as more permanent vegetated islands. The key to their formation are changes in discharge. In periods of high discharge large amounts of sediment is entrained which is deposited as discharge drops. Due to the unconsolidated material even the more permanent vegetated islands (which help trap sediment) can be removed in time.

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Atmosphere and weather

2 Fig. 2A shows incoming solar radiation and Fig 2B shows outgoing terrestrial (earth) radiation.

- (a) (i) In Fig. 2A, how many units of short wave radiation are absorbed by the earth's surface? [1]

$$100 - (27 + 24 + 4) = 45 \text{ units}$$

- (ii) In Fig. 2B, how many units of terrestrial (earth) radiation are lost from the atmosphere? [1]

$$113 - 97 = 16 \text{ units}$$

- (iii) In Fig. 2A, name two components of the atmosphere that help absorb 24 units of solar radiation. [2]

Water vapour, carbon dioxide, ozone, dust, greenhouse gases or its constituent gases – any two.

- (b) Describe what is meant by albedo. Explain how the earth's atmosphere is warmed. [6]

Albedo is the amount of reflected short wave radiation (swr). This is often seen as surface reflection although total albedo includes atmospheric reflection and scattering. The earth's atmosphere is heated through the agency of terrestrial long wave radiation (lwr). Incoming solar radiation passes through the atmosphere and heats the earth's surface. Reradiated long wave radiation (lwr) is absorbed by greenhouse gases and particulate matter to heat the atmosphere – the so called greenhouse effect.

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Population change

3 Table 1 gives estimates of maternal mortality for the world and selected world regions in 2000. Maternal mortality means deaths associated with pregnancy and childbearing.

(a) Describe the regional variation in the maternal mortality rate, supporting your response with data from Table 1. [4]

Main point is the disparity between MEDCs, with an MMR of 20, and LEDCs' 440. However, although no information breakdown is given for MEDCs (where it can be assumed small variations exist), LEDCs are highly variable, both overall, from a low in East Asia of 55 to extremely high Sub-Saharan Africa 920, almost 1 in 1000, and also within the continents named.

Max. 2 for a candidate who operates at the MEDCs/LEDCs scale only.

(b) Suggest how the very high lifetime risk of maternal death in Sub-Saharan Africa may be explained. [6]

An estimate of 1 in 16 is given, which eclipses that for any other world region. Sub-Saharan Africa is the least developed region of the least developed continent.

In LEDCs pregnancies are more frequent and health care systems less adequate.

Three factors, in particular, increase a woman's risk of death when she becomes pregnant:

- lack of prenatal care that might ensure her wellbeing and identify problems early on
- delivering the child without specialist help and not in a hospital
- seeking an unsafe abortion (candidates unlikely to recognise this).

Candidates may build up an explanation in different dimensions: social, e.g. tradition, role of women, lack of education; economic, e.g. poverty, lack of access to healthcare; environmental, e.g. remoteness, lack of cleanliness; political, e.g. corruption, other priorities, lack of will, etc.

Credit accounts which show an appreciation both of the distinctives of maternal mortality and the Sub-Saharan context, although specific locational information is not required. Weaker candidates may simply write about "bad" everything.

[Total: 10]

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Population change

4 Study Fig. 3, which shows net migration for Canada, an MEDC in North America, 1851–2001. Net migration is the balance between immigration and emigration. [3]

(a) Using data from Fig. 3, describe net migration for Canada between 1851 and 1911.

In the 60 year period, two decades (the first and the last) recorded positive net migration, the middle four negative. Started with a modest gain 1851 to 1861, then modest net losses, –54 to –150, ending with a very large net gain of 810 000 people between 1901 and 1911. Whilst not needed for a full answer, the overall net migration for the 60 year period was a gain of 512 000 people.

(b) Using Fig. 3, identify the 5 year period for which the census recorded: [2]

(i) the greatest migration gain;

1986–1991 (value not needed) (1)

(ii) net migration of 463 000 people.

1966–71 (1)

(c) Between 1991 and 2001, the majority of immigrants to Canada were from Asia. Explain what other information would be useful for a fuller understanding of immigration to Canada during this period. [5]

Candidates may approach this creditably in a variety of ways, for example,

- other source continents
- source by country
- actual numbers of immigrants (Fig. 3 is only net)
- age/gender
- marital status
- pioneer migrant or joining family member(s)
- occupation/skills/education
- destination within Canada (province, urban/rural, etc.)
- means of arrival: air, land, sea and/or point of entry
- illegals?
- national policy on immigration
- world events and trends in the world economy
- other

Comprehensive responses are not needed for the modest mark allocation, but lists are inadequate in terms of explanation. Please reward responses which show conceptual appreciation of both international migration and the nature of information about it.

[Total: 10]

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Settlement dynamics

5 Fig. 4 shows a theoretical bid-rent diagram for an urban area.

(a) Identify the land-use shown as L on Fig. 4. [1]

industry, industrial (or manufacturing)

(b) Give two reasons why there is intense competition among potential users to obtain a location in the CBD. [3]

Classically there are two main reasons,

- CBD land is the most accessible and so attracts the most people/ customers
- there is relatively little CBD land/space available (assuming concentric rings)

Acceptable reasons include,

- CBD land offers the highest potential profits for businesses
- prestige
- other.

Credit simple reasons (1) or a developed reason (2) to the maximum.

(c) With the help of an example or examples, explain why Fig. 4 is limited in helping to understand the actual costs and uses of land in urban areas. [6]

A number of different approaches are possible. Some of the main limitations are that, in idealising the dominant land-use, it is,

- general, there are only three broad zones, e.g. no CBD core and frame, residential undifferentiated by income, etc.
- impressionistic, e.g. straight lines for cost curves, no scale on the y axis
- graphical, compared to a map or plan.

And, being theoretical, Fig. 4 does not allow for the significance of,

- transport, e.g. subsidiary peak land values at peripheral nodes, or out-of-town developments for the secondary and tertiary sectors
- urban planning decisions
- other features: physical, e.g. harbours, open space; historical, e.g. an historic core, the zone in transition in cities in MEDCs, etc.

Better accounts may develop the chosen context(s) throughout, whilst some may offer exemplification in name only, "e.g. London", to **max. 4**. Suggest that a full response consists of two or more limitations.

[Total: 10]

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Section B: The Physical Core

Answer one question from this section. All questions carry 25 marks.

Hydrology and fluvial geomorphology

- 6 (a) (i) Define the terms *evapotranspiration* and *antecedent moisture*. [4]

Evapotranspiration includes both evaporation from the earth's surface and the transpiration of water vapour through the stomata of plants.

Antecedent moisture is the moisture retained in the soil immediately before a rainfall event.

- (ii) Why are the terms in (a) (i) important in a study of the hydrology of drainage basins [3]

They are important as they have crucial effects on soil moisture levels which can affect infiltration, surface storage and run off. Also accept evapotranspiration as representing water loss from the drainage basin.

- (b) How are the patterns of discharge in a drainage basin affected by: [8]

(i) Size and shape of the drainage basin;

(ii) drainage density.

The larger the size of the drainage basin the greater the amount of discharge is likely to be produced although this might take longer to reach the main channel and hence give longer lag times. If it is very large a rainfall event may affect only one part of the basin. The shape of the basin can affect discharge such that elongated basins, following the main channel may have short lag times, but peak discharges which although fairly low may be sustained for some time. Roughly circular basins have longer lag times but high peak discharges.

Drainage density (Dd) is total stream length divided by total area. High Dd implies rapid and efficient run off giving high peak discharges. Low Dd may give lower peak discharge but more rapid response.

- (c) How are floods caused and their effects limited? [10]

Floods are caused by an excess of input into the system that the drainage network is unable to cope with in time. This is due to such features as intense periods of rainfall and nival melting of snow and ice. These can occur regularly and the fluvial system copes with over bankful conditions by the development of flood plains. Human interference (e.g. changes in land use, urbanization, channel alteration) can also contribute but the prime cause remains excess of rainfall.

Flood control measures can include embankments/levées, diversion channels, river channelisation and flood plain retreat.

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Candidates will probably:

- L3** Show a good understanding of the causes of floods with emphasis upon the physical elements rather than human interference. A reasonable selection of ameliorating means. [8–10]
- L2** Be aware of flood causes but will concentrate more upon human agency. Some control methods described. [5–7]
- L1** A few human activities contributing to flooding with little appreciation (if any) of the natural causes. Control limited to sand bags and levees. [0–4]

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Atmosphere and weather

- 7 (a) (i) Define the terms *condensation* and *water vapour*. [4]

Condensation is the conversion from gaseous state to that of a liquid i.e. water vapour to moisture, usually through the assistance of hygroscopic nuclei and cooling.

Water vapour is the gaseous state of moisture in the atmosphere that has been evaporated from the earth's surface

- (ii) Briefly explain the conditions necessary for the formation of snow. [3]

Snow is solid precipitation produced when conditions are below freezing. In clouds this can be the result of sublimation or vertical updrafts carrying rain drops to high and cold altitudes. To fall to earth temperatures at the ground level must be below freezing.

- (b) Using diagrams, explain how convective uplift and orographic uplift of air occur. Outline the effects of such uplift on weather. [8]

Convective uplift is produced through the surface heating (conduction) of a parcel of air which will rise at the DALR. It will rise as long as it remains warmer than the ELR. Adiabatic cooling can lead to condensation and the development of clouds. Whether these develop ppt will depend upon the ELR and SALR. It is possible that only fair-weather Cumulus will be produced. Orographic uplift is the forced ascent of air over hills and mountains. Initially the parcel of air is cooler than its surrounding air, but the forced ascent can reduce the temperature to the point of condensation, particularly in moisture laden maritime air. The result is clouds and precipitation on the windward side of the mountains.

- (c) To what extent does an urban area experience a climate different from that of a surrounding rural area? [10]

An opportunity to compare the urban heat island and its effects with that of the rural areas. There should be some comparative element i.e. how much warmer, wetter, cloudier urban areas are. Good answers may be able to address features such as relative humidity in urban and rural areas. Most will however, deal with the differences in thermal capacity and heat retention of urban areas, their increased levels of pollutants and propensity for higher rainfall and cloudier days. Mists and fogs are likely to be more common in rural areas as are frosts.

Candidates will probably:

L3 Give an indication of the difference between urban and rural, even if only in terms of percentages of temperature or rainfall. Good understanding of the urban heat island and its impact on a range of climatic phenomena. [8–10]

L2 More of a straightforward account of urban climates with little or no reference to rural areas. [5–7]

L1 Some urban climatic features, such as pollution, winds and a very limited understanding of heat islands. [0–4]

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Rocks and weathering

8 (a) (i) Define the terms *hydration* and *oxidation*. [4]

Hydration is where rocks take up water, therefore undergoing an increase in volume which causes surface flaking.

Oxidation is the combining of rock minerals with oxygen, usually dissolved in water. Example iron (FeO) to oxidized iron (FeO₃).

(ii) Briefly explain what is meant by *pressure release*. [3]

Pressure release or dilatation occurs where rocks such as granite and gneiss, which were formed at depth, are exposed at the earth's surface. This unloading brings about sheet jointing as the rocks expand upwards and outwards.

(b) Using diagrams, explain how the processes of flow and heave affect mass movements on slopes. [8]

Flows tend to occur in thicker, well weathered regoliths that contain a lot of water causing pore pressure and the movement of the regolith under gravity down the slope. Such movements can be swift as in debris flows, but mud flows and earth flows can be more catastrophic when hurricanes or volcanic eruptions produce sudden saturation on steep slopes. The movement of the regolith to the foot of the slope gives rise to a more gentle and hence more stable gradient. Heave is the rising of particles at right angles to the slope and their subsequent movement downslope. This is essentially a slow movement usually found in types of creep such as rock creep and soil creep. It generally leads to a more rounded slope although much will probably be made of its indicators such as angled trees and lampposts or accumulations behind walls.

(c) How does the chemical composition and physical nature of granite and limestone affect their weathering and erosion? [10]

Granite is a hard igneous rock of closely bonded crystals such as quartz and feldspar. Granite is well jointed with vertical joints intersected by horizontal curving joints that are the result of dilatation. This can lead to block disintegration when the rocks are penetrated by weathering processes such as hydrolysis (particularly under humid tropical conditions) or freeze thaw. Erosive processes will take some advantage of the structure but will be inhibited by general hardness and texture.

Limestone is a sedimentary rock containing calcium carbonate. Limestone formed under pressure at depth can be hard, but will possess bedding planes and jointing. This allows the penetration of acidulated rainwater which will lead to carbonation and the extensive chemical weathering of the rock. Acidulated water can also lead to erosion by streams through solution. Landforms are not required in the answer although can be used to illustrate composition/nature etc.

Candidates will probably:

L3 Some balance between the two rock types with a good awareness of their properties and effect upon weathering and erosion. [8–10]

L2 Concentration upon the effects of carbonation and hydrolysis with only passing reference to composition and physical nature. [5–7]

L1 Hard and soft will be the type of description of composition and vague reference made to weathering processes such as carbonation/and or hydrolysis. [0–4]

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Section C: The Human Core

Population change

- 9 (a) (i) Give the meaning of the term *natural increase rate* and show how it is calculated. [3]

natural increase rate is the rate at which the population is growing naturally i.e. excluding gains and losses from migration (1).

NIR = birth rate (BR) – death rate (DR) (1) per thousand per year (1)

- (ii) With the help of one or more examples, describe the circumstances under which natural decrease (a negative rate of natural increase) occurs. [4]

Simply, this occurs where death rate > birth rate, so, theoretically, in some of the fluctuations in Stage 1 and 4 of the demographic transition model or in Stage 5. Stage 5 examples include Japan, Germany, Russia and many countries in Eastern Europe. Clearly shifts in both BR and DR and relevant.

- (b) Explain why, although the size of the average family size is getting smaller, world population is still growing. [8]

The key elements are age structure (particularly women of childbearing age, say 15–49), better rates of child survival, and longer life expectancy for both men and women in almost all countries. Some candidates may refer to the effects of population momentum (with 6 billion+ people, tiny % changes make large absolute differences) and the variation in situations across the world, both between countries and within them (rich/poor, urban/rural, more educated/less educated, etc). Weaker candidates may explain world population growth, but not be able to integrate the element of family size.

- (c) Explain the reasons for the success or failure of attempts to alter a country's birth rate. [10]

Candidates may take anti-natalist attempts to decrease BR, such as China, or pro-natalist attempts to increase BR e.g. Singapore. Credit is for explanation of why the attempts did or did not work, not simply describing what was done.

Candidates will probably:

- L3** Provide an effective, well-structured, explanation of the outcomes of the chosen attempt(s), based in a detailed exemplar context. [8–10]
- L2** Offer a reasonable explanation which may contain good points, but which remains limited. Reasons may be given the end of an otherwise descriptive or narrative piece. [5–7]
- L1** Offer a few basic ideas, struggle to deal with the issue, make little or no meaningful explanation. Fragmentary responses and notes remain in this level. [0–4]

[Total: 25]

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Population change

10 (a) (i) Give the meaning of the term *internal migration*. [3]

population movement (1) inside a country/within national borders (1)
of one year's duration or more (1).

(ii) Describe briefly one example of internal migration. [4]

Much depends on the example chosen. Anticipate where to and where from, who, why, when, how, with what consequences, etc. Actual examples may perform better than generic ones, which can be vague.

(b) With the help of examples, explain why much internal migration occurs in stages. [8]

Staged (stepped or step-wise) migration breaks up a long, challenging and potentially costly movement into smaller sections. It offers a number of potential benefits, mainly social, e.g. a trial or taster in terms of risk-taking, maintaining contact with the familiar; and economic, e.g. reduces costs, allows skills and savings to be acquired along the way. It keeps options open (of return migration as well as onward moves), etc. Examples may be actual and located or generic.

(c) Assess the impacts of one or more migratory movement within a named urban settlement. [10]

Candidates need to consider *intra-urban* movement (excluding circulation).

The impacts depend on the movement chosen. For example, centripetal flows, such as re-urbanisation; centrifugal flows, e.g. to the suburbs, invasion and succession; or other movements, e.g. from a shanty town into new housing, etc. Credit impacts in more than one dimension (social, economic, environmental and political) and reward well the recognition of different groups of people experiencing different impacts. Exemplar detail assists overall quality, compared to the "e.g. Cairo" approach after a general piece.

Candidates will probably:

L3 Make a good quality assessment of the chosen intra-urban movement(s). Recognise the reality and complexity of the associated impacts. [8–10]

L2 Provide a sound response which may be good in parts, but which is limited in detailed knowledge and/or the assessment offered. [5–7]

L1 Make an answer which is essentially descriptive rather than evaluative and which remains basic. May struggle to identify an appropriate example. Notes and fragments remain in this level. [0–4]

[Total: 25]

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Settlement dynamics

- 11 (a) Describe the location and character of one named rural settlement or rural area which you have studied in detail. [7]

The syllabus requires a case study. Whilst a rural settlement is a village or a hamlet, a rural area may have, for example, a market town included.

For **location** observations by name, distance, compass points, environment, physical features, etc. are all acceptable. Accept a broad interpretation of **character** to allow candidates to use the example they have.

Suggest mark flexibly, with a reserve of 2 either way.

- (b) Explain one or more of the issues in the development of the rural settlement or rural area you chose in (a) and describe the effects. [8]

The **issues** may be of any type; for example, urban encroachment and expansion into the rural/urban fringe, HIV infection and AIDS deaths in an LEDC, or tourism development. The **effects** on the rural settlement or rural area will also be diverse and may not all be negative.

Indicators of quality may include the clear identification of the pressure(s) and the reality - and complexity(?) – of its effects.

- (c) How far do you agree that the differences between rural settlements and urban settlements are becoming less clear? [10]

This could be approached in a number of ways, such as by considering urban accretion and the incorporation of former villages into urban areas, or by considering changing services and lifestyles in rural settlements, maybe commuting, etc. Some countries maintain strict governmental definitions of what is rural and what is urban.

Candidates will probably:

- L3** Develop a good assessment of the definition and character of rural and urban areas, using exemplar content effectively. [8–10]
- L2** Make a satisfactory but limited response, which may be quite general but which contains one or more good points. Give a suitable, but partial, assessment. [5–7]
- L1** Make one or two basic or general points and struggle to deal with the key idea. Respond descriptively or with an unsupported opinion. Offer notes or a fragmentary piece. [0–4]

[Total: 25]