

MARK SCHEME for the October/November 2007 question paper

9696 GEOGRAPHY

9696/01

Paper 1 (Core Geography), maximum raw mark 100

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Hydrology and fluvial geomorphology

1 Study the map of Port Antonio area, Jamaica (1:50,000)

- (a) (i) Draw a sketch map of the course of the main river channels of the Rio Grande and the Back Rio Grande north of northing 60.
- (ii) Name and show the location of two physical features of the river channels on your sketch map.

The sketch map should give a reasonable representation of the channel of the Rio Grande and the tributary Back Rio Grande with its pronounced meanders. Allow up to three marks for the sketch; the further two marks are for the identification of the two landforms. These could be the sand bars that feature in the main channel (most are in locations that do not suggest point bars, but there are one or two north of Berridale that could be so interpreted), the meander bends that are most characteristic of the Back Rio Grande, but could be identified in the main channel (e.g. at Berridale). There are also significant sections of straight channel (e.g. between Newington and Fellowship). There are some structural controls e.g. in the diversion of the channel through the highlands south of Port Antonio and in the steeper narrow valley and channel in the highlands to the south. [5]

- (b) Explain the formation of one of the river channel features you have identified in (a).

Meanders will, no doubt, be the most popular. Better answers will explain the action of helicoidal flow and the likely influence of pool and riffle sequences. Weaker accounts will merely relate a swinging current to differential erosion on river banks. Sand/gravel bars are part of fluvial deposition and are related to changes in discharge and competence. Many may set this in the context of braiding, which is acceptable. Straight channel areas can be seen as structural control but, given the location with a bridge and plantation agriculture, could be argued as a product of human intervention. Other structural features that could be credited are the narrow and steeper upper channel in highland areas or the diversion through the highland area south of Port Antonio. Only one channel feature is required. [5]

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Atmosphere and weather

2 Fig. 1 shows measurements of the concentration of carbon dioxide (CO₂) in the atmosphere taken at Mauna Loa in Hawaii between the years 1750 and 2000.

(a) Describe the changes in the rates of increase in carbon dioxide concentrations from 1750 to 2000.

A gentle, steady increase between 1750 and 1900 (i.e. only an increase of 15 ppm – 280–295) but 1900 to 2000 an increasing and almost exponential rise (295 to 365 i.e. 70ppm). 1 mark for general description of trend and 2 marks for supporting use of figures. [3]

(b) Name one cause of the increases in carbon dioxide concentrations that have occurred since 1900.

Increase in use of fossil fuels (or an example of), increased deforestation.
General pollution is not acceptable.

[1]

(c) Explain how increases in carbon dioxide concentrations can lead to global warming.

CO₂ is the main greenhouse gas. Solar radiation entering the atmosphere as short wave radiation passes through the earth's atmosphere engendering little heating. This short wave radiation is converted at the earth's surface to long wave radiation which when reradiated can be absorbed by greenhouse gases, of which CO₂ is the main component. Heat is thus 'trapped within the atmosphere. The greater the concentrations of CO₂, the greater the heat retention, thus leading to global rises in temperature.

[6]

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Population change

3 Fig. 2A shows life expectancy, total fertility rate and natural increase rate for 25 large LEDCs during the period 1950–55. Fig. 2B shows the same variables and countries during the period 1995–2000.

(a) Using Fig. 2A, identify the country with the highest life expectancy and the country with the lowest life expectancy.

Argentina 1 Ethiopia 1 [2]

(b) Using both figures, compare the changes in total fertility rate and natural increase rate experienced by Nigeria with those experienced by China.

TFR declined in both: in Nigeria from 6 to just over 5 or 5.1 but in China from 6 (the same) to a low/the lowest of all 1.8. 2

NIR increased slightly for Nigeria, from 2% to 2.1 or 2.2% but decreased significantly for China from a higher initial value (2.2%) to a mere 1.5%. 2

% data is hard to read so allow a margin for error. Some data support and 'an element of comparison' is needed for each variable. [4]

(c) Suggest an explanation for the decrease in natural increase rate of a country, such as Mexico, over this 50 year period.

NIR is the difference between BR and DR, so rates must have converged.
The context is demographic transition (but note that the model is descriptive not explanatory).

The key factor is the decrease in birth rate to meet death rates that are low/lowered further. An annotated diagram showing Stages 2 and 3 and the drop in BR could be valuable (and save candidates time). Some recognition of the role of death rates *must* be made for a full answer. 3/2

For the underlying or background reasons such as economic development, government population programmes, access to birth control, rise in literacy and education etc. No specific knowledge of Mexico is expected. 1/2 [4]

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Population change/Settlement dynamics

4 Fig. 3 shows one model of South-east Asian cities.

(a) Describe the pattern of *residential* areas shown in Fig. 3.

Mixed, has elements of sectors and rings. Differentiated by density, income type and extent:

- middle density outside mixed zone and around two commercial zones
- beyond it a zone of two new suburbs (formal, boxed) two squatter areas (informal and loose in shape) interspersed
- narrow spine on eastern edge of high income with new high income area extending beyond it to market gardening
- possibility of other residence e.g. in mixed land-use zone or EMR

Mark on overall quality of descriptive language employed. [5]

(b) Suggest reasons for the development of the city's three *commercial* zones in the pattern shown in Fig. 3.

One is Western, one Chinese and one Indian so ethnicity differentiates the zones. The ethnic mix derives from the influx of foreign migrants to this port city over time, to international trade and to commercial opportunity. Many factors promote *ethnic segregation* over mixing, e.g. language, kinship, religion, culture, support, business opportunities and networks. This is as true commercially as it is residentially. At first traders may live in/over the business.

Later immigration and business expansion tend to reinforce existing patterns so the zones' *growth* is inland as wedges, because of available space at an acceptable cost, location of custom etc. They remain separated, however, for identity, cohesion, defence, exclusion etc.

In *location*, two of the zones connect physically to the port suggesting a clear link to the port trade and nearness saving time and money, responding to ships arriving and sailing etc. Only the Indian zone is not connected to the port which suggests it may occupy a somewhat different position functionally within the city e.g. manufacturing, marketing or financing. The Western commercial zone is alongside the Government zone (it was a colonial city).

There are several legitimate ways to approach **reasons**. It may be helpful to bear in mind that three main aspects of the **pattern** require explanation:

ethnic segregation
location
wedge-like growth

A full answer should recognise elements of **Population change**, notably migration (reserve 2), as well as **Settlement dynamics**. [5]

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Settlement dynamics

5 Study the map of the Port Antonio area, Jamaica (1:50 000).

- (a) Giving map evidence, identify two examples of the health services provided in the town of Port Antonio.

a health centre (HC), a hospital (Hosp), infirmary on eastern edge

credit 1 any two with GR, location description, compass point or symbol [2]

- (b) The built-up area in grid squares 1767 and 1768 is a new residential area. Give *one* possible objection to the development, supporting your suggestion with evidence from the map.

There are several, so mark on merit using your geographical judgement.

e.g. out-of-character (nothing like this outside Port Antonio)
 spoils the view (land slopes gently away to cliffs and King Point)
 displaces existing population (area of scattered houses)
 takes up agricultural land (mixed or scattered cultivation)
 makes for a dangerous junction with the A road (GR173678)

For **objection 1** and **evidence 1**, but if 'soft' or weakly made 1 [2]

- (c) Describe and explain how people living in the village of Williamsfield (12688) might use the town of Port Antonio for *shopping*.

Key syllabus concepts are orders of settlement, the settlement hierarchy, the range of a good, threshold and orders of goods.

Williamsfield is a small settlement a few miles east of the town along the A road. Car owners would have easy access to Port Antonio and there could be bus services, although many may cycle, walk or hitch a lift (LEDC context).

A market is shown (GR078696) in central San Antonio, this may be permanent/daily, weekly, general or for particular goods e.g. fish, vegetables.

Shops are not shown on the map but are likely to be found both centrally and throughout the urban area, selling low to high order goods and serving a wide area, having a wide sphere of influence.

Villagers are likely to obtain low order goods such as bread or soap in the village as these are cheap, needed daily and low range (unless other factors operate e.g. a person is already visiting/working in town). They are likely to travel to Port Antonio for medium to high order goods when these are needed e.g. clothing, household items. There may be the opportunity for comparison shopping within the town e.g. more than one electrical retail outlet and to have goods delivered, maybe.

Credit well accounts which combine conceptual background with the map context and who get into the situation creatively. [6]

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Section B: The Physical Core

Hydrology and fluvial geomorphology

6 (a) (i) Define the terms *precipitation intensity* and *antecedent moisture*.

Precipitation intensity is the rate at which ppt is received at the surface i.e. amount divided by time.

Antecedent moisture is the amount of soil moisture that is present prior to the onset of a rainfall (ppt) event. [4]

(ii) Briefly describe how precipitation intensity might affect surface flows in a river basin.

When precipitation intensity exceeds the infiltration capacity of the soil/surface then overland flow will result. It may be expressed in terms of the filling up of surface storage and soil moisture storage to bring about surface flows. [3]

(b) For each of:

(i) a river basin on clay (impermeable) geology

(ii) a river basin on limestone (permeable) geology

draw labelled storm hydrographs to show the effects of a rain storm.

(i) With an underlying clay geology, the high peak discharge should be shown with short lag time and pronounced rising and falling limbs. The impermeable surface thus encourages quick flow over throughflow and base flow due to lower infiltration.

(ii) Limestone – Lower peak discharge, longer lag time and more gentle rising and falling limbs. Permeability allows greater infiltration and percolation. Thus less surface flow and more throughflow and base flows which are slower. [8]

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(c) What are the main causes of river floods and to what extent can their effects be limited by human actions?

River floods are when river channels achieve overbankful discharge. That is when there is too much water for the channel to handle. The main cause is excessive inputs of precipitation into the catchment system resulting in the inundation of flood plains in the lower catchment areas. Lower catchment areas can also be affected by storm surges etc. The situation can be exacerbated by human activities, such as deforestation, land use changes and urbanisation. These tend to amplify rather than directly cause flooding. The effects of flooding can be mitigated to some extent by controlling flows in the upper catchment (dams etc. such as Nile and Colorado), straightening channels, building of artificial levées, dredging channels to increase capacity, flood water diversions from urban run off etc. Allowing flood plains to remain undeveloped also can reduce the impact upon humans. Extreme rainfall events, however, are still likely to result in flooding and indeed some measures taken may increase the risks (e.g. Mississippi). [10]

Candidates will probably:

Level 3 give answers which will be aware of the physical causes of flooding and will attempt to assess the extent to which human intervention can mitigate their effects through appropriate exemplification. [8–10]

Level 2 give answers which will concentrate more upon human causes of floods and will provide examples of various flood protection schemes. [5–7]

Level 1 give answers which will concentrate on the disastrous effects of flooding with a few examples of flood protection. [0–4]

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Atmosphere and weather

7 (a) (i) Define the terms *reflected solar radiation* and *latent heat transfer*.

Reflected solar radiation is that radiation that is reflected back to space from clouds or from features (e.g. snow) of the earth's surface (albedo)

Latent heat transfer is the heat emitted or absorbed in the change of state. Hence water to vapour etc. Can also be expressed in terms of the transfer of energy from the ground to the atmosphere. [4]

(ii) Briefly describe convectional heating.

The transfer of heat from the ground to the air causes the air to become less dense than surrounding air and hence to rise through thermal convection (adiabatic lapse rate). This could be illustrated by a simple diagram. [3]

(b) With the help of diagrams, describe and explain two methods by which the heat from the solar radiation received at the equator is transferred towards the poles.

The main mechanism is by atmospheric circulation whereby winds induced by the pressure gradients caused by differential heating. Thus the simple tri-cellular model can be invoked. Essentially air rises at the equator due to excess receipt of solar radiation and sinks at the poles where there is a deficit. The other method is via ocean currents with warm currents moving polewards and cold return flows. [8]

(c) Explain how clouds and fog are formed.

Clouds are formed due to the uplift of air through convectional heating, orographic or frontal uplift causing air to cool adiabatically. Dew point temperatures can then be reached at which point condensation occurs around hygroscopic nuclei to form various types of cloud. Fog is formed by the cooling of air at ground level by cooling from below (either radiation or advection). Condensation then takes place at ground level. [10]

Candidates will probably:

Level 3 give answers which will demonstrate a clear understanding of adiabatic cooling and resultant condensation. Effective use of T/H diagram. [8–10]

Level 2 show an understanding of cooling and condensation although adiabatic lapse rates and triggers may be less well explained. [5–7]

Level 1 have some concept of air cooling and condensation of water vapour but the processes by which these are achieved will be poorly developed. [0–4]

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Rocks and weathering.

8 (a) (i) Define the weathering terms *organic action* and *wetting and drying*.

Organic action is the breakdown of rocks by flora and faunal action e.g. tree roots and burrowing animals for mechanical weathering and humic acids etc. for chemical.

Wetting and drying is the expansion and contraction of materials (some clays) produced by alternative wet and dry periods leading to its mechanical disintegration. [4]

(ii) Describe one effect that organic action can have upon rocks.

Trees and burrowing animals can prise apart joints and cracks in rocks whilst humic acids can lead to the chemical breakdown of suitable rocks (chelation) either for the marks. [3]

(b) Explain the conditions under which chemical weathering is most active.

Chemical weathering is most active where there are plentiful supplies of water (ppt) and temperatures are high (e.g. Equatorial and humid tropics). Thus via Van Hoff's rule, the speed of chemical weathering increases each rise in temperature. The development of large amounts of soil moisture and humic acids from vegetation will lead to the production of a deep regolith which allows deeper penetration of chemical weathering below the surface of the rock. Rock type and structure will also affect the rate of weathering. Some are more susceptible to particular types of chemical weathering (e.g. limestone – carbonation) and the existence of joints and bedding planes allows the penetration of water and hence the chemical weathering processes. [8]

(c) How and to what extent can human activities affect the shape and form of slopes?

The most obvious ways in which human activities affect slopes is by mining, quarrying or undercutting through road construction. They also add to the surface by dumping material and the development of spoil heaps. In most cases this can lead to a destabilisation of the slope and subsequent slips and slides (e.g. Aberfan) which re-establish stability to the slope profile. There are more subtle effects such as the removal of vegetation or drainage diversion and damming which can affect the movement of both water and materials down slopes. Attempts are made to stabilise slopes through various changes to drainage and the propping up of the slope. The extent to which these affect the overall development of slope forms is probably minor on a global scale but can have considerable and often catastrophic local effects. [10]

Candidates will probably:

Level 3 show an awareness of the impact of human activities (exemplified) on slope processes and hence the impact upon form and shape. Some attempt to assess the level of impact. [8–10]

Level 2 give an emphasis on appropriate human activities with some account of the impact upon slopes, although processes are unlikely to be developed. [5–7]

Level 1 limit themselves to the catastrophic impact of human activities on mass wasting. Stray examples with little reference to slopes. [0–4]

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Population change

9 (a) (i) Give the meaning of the term *population structure*.

the make-up/dimensions/attributes/composition of the people or population in a country or area usually age and sex/gender [also marital status, family or hh size] [2]

(ii) Draw a simple labelled age/sex pyramid to show a youthful population structure.

a 'bottom-heavy' shape needed, probably tapering. Credit labelled axes **2** and shape **3**. An indicator of quality may be a clear line at age 15 to show the youth or the shading of the cohort, for example. [5]

(b) Describe and explain the impacts of migration on the population structure of *either* a source area or a receiving area you have studied.

Straight from the syllabus, clearly a pyramid or two with extended or shortened bars, bulges or gaps would assist a response. Beyond simple losses or gains, candidates should be able to consider consequent demographic **impacts** such as raising or lowering vital rates, gender imbalance which may disrupt marriage patterns etc.

For a general response **max. 4**, if more than **area** credit the better/best. [8]

(c) To what extent do you agree that in MEDCs an ageing population is a market to be exploited rather than a cause for concern?

Much comment about ageing is highly negative although the economic/market potential for everything from private health care to holidays is now clear.

In MEDCs many of the aged group (over 65) are comparatively affluent, have state and private pensions, houses paid off, few family commitments etc.

There may be elements of truth in both statements, the **cause for concern** usually being seen as including national budgets, a reduced tax base bearing a higher burden, labour supply issues, a declining population etc. [10]

Candidates will probably:

Level 3 make an effective assessment of the validity and limitations of both phrases, supporting their argument with detailed exemplar material. Whilst not comprehensive, impress by the perspective. [8–10]

Level 2 develop a suitable, but ultimately limited response, which may contain some good points. Recognise aspects of validity and/or limitations, perhaps focusing on just one phrase. Offer some example(s). [5–7]

Level 1 have little understanding of the implications of ageing. Make one or two simple descriptive points: "zimmer frames and wheelchairs" or doom? Offer little or no assessment and few, if any, examples. [0–4]

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Population change/Settlement dynamics

10 (a) Describe the character of *one* squatter settlement or shanty town you have studied.

Straightforward invitation to profile a case study. A full response has name and some locational detail and may give extent, population size or years of existence. The description of **character** may helpfully involve all four dimensions: physical or environmental, social, economic, political.

Quality may be seen in detail, data support or perhaps a sense of the positive. [7]

(b) Fig. 4 shows the distribution of favelas (squatter settlements) in Rio de Janeiro, Brazil in 1997.

Why is it so difficult for the authorities in cities like Rio to improve the quality of life in squatter settlements?

For a variety of reasons, which include:

- scale and extent
- continued growth, immigration and arrivals
- other metropolitan priorities
- financial issues e.g. indebtedness, mismanagement, loss of funding
- authority issues and power structures e.g. gangs, drugs lords
- land issues, land occupancy, land rights and illegality
- need for a multifaceted approach e.g. clean water & education & roads
- other

Suggest that a full response covers at least three areas of difficulty well. [8]

(c) Using a case study of a squatter settlement or a shanty town, assess the extent to which intervention has made the situation there worse rather than better.

May or may not use the example used in (a) but avoid double credit. Although the classic case is bulldozing or clearance (e.g. Zimbabwe 2005) there are other situations in which **intervention** has not helped much, such as where funding ran out, allocations were corrupt, divisive and increased socio-economic disparities or residents found schemes unaffordable e.g. electricity. [10]

Candidates will probably:

Level 3 provide an answer in which content and assessment are integrated throughout. Show detailed knowledge of place(s), intervention and outcomes, and strong skills in organisation and argument. [8–10]

Level 2 make a sound but partial response, with some good elements. Be limited by a combination of knowledge, understanding and the assessment offered. May struggle to use a suitable case in the manner required. [5–7]

Level 1 find the direction of the question challenging. Make one or more simple descriptive points. Offer a basic or superficial assessment. Superficial. Treat squatter settlement/shanty towns generically.

Fragments, notes and points remain in this level. [0–4]

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Settlement dynamics

11 (a) Why may there be intense competition for space (spatial competition) within the Central Business District (CBD)?

Essentially for two reasons: there is a limited amount of space and it is in heavy demand from many possible users, because of its economic potential.

According to bid-rent theory in a free market the highest bidder obtains the use of the land. Other factors may contribute, including

a context of urbanisation, urban growth (or re-urbanisation)
 planning decisions restricting CBD expansion, protecting open spaces etc
 the operation/manipulation of the property market

Suggest credit the two essential points **2** or **3** each allowing some credit for other factors or exemplar support [7]

(b) With reference to *one* city, describe one or more recent attempts to improve the city's infrastructure.

Infrastructure is the physical 'skeleton' of the city, its transport systems, utilities (gas, electricity etc.) and water/sewerage systems. Do not credit education or health.

Straightforward invitation to describe after more challenging (a). Candidates would do well to answer the basic questions: what, when, where, why, how, and to cover issues such as funding, responsible body or bodies, experience during the work etc. The ability to differentiate groups and opinions or to identify conflicts of interest is highly creditable. A map or diagram is creditable in assisting the text. [8]

(c) How true is it that the attempt(s) you described in (b) benefited the city's rich but failed the city's poor?

Clearly much will depend on the chosen **city** and **attempts** but much work on infrastructure may widen rich/poor disparities through issues of costs and access. Some aspects may be great levellers and do not differentiate by income e.g. pipes or subway systems. [10]

Candidates will probably:

Level 3 treat their case study perceptively in an unfamiliar way, providing a strong assessment of outcome(s) for both rich and poor. Give good and varied city detail in support of their argument. [8-10]

Level 2 provide a sound and, in part, good, treatment of the attempt(s)' outcome, but one which remains limited in detail or development.

May not differentiate rich and poor much or well. Offer a partial assessment, perhaps separately at the end. [5-7]

Level 1 have a limited or faulty idea of infrastructure and/or lack a city study. Make descriptive points rather than assess. Lack the knowledge, understanding (or time?) to offer more than a basic response. [0-4]

[Total: 25]