

## **MARK SCHEME for the May/June 2007 question paper**

### **9696 GEOGRAPHY**

**9696/01**

Paper 1 (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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

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## Section A

### *Hydrology and fluvial geomorphology*

**1 Fig. 1 shows the flows and stores of water associated with a river channel and its adjoining slopes.**

**(a) Identify the flows marked A and B on Fig. 1. [2]**

A is surface (overland) flow  
B is base (groundwater) flow

**(b) Briefly describe interception storage. [3]**

Interception storage is the precipitation that is retained by the vegetation on leaves, trunks, branches stems etc. Some will be evaporated back whilst the progress of moisture to the surface will be slowed.

**(c) Using Fig. 1, explain how water from surface storage reaches groundwater storage. [5]**

Water from surface storage (puddles etc.) will proceed as overland (surface) flow in circumstances where precipitation intensity exceeds infiltration capacity. Otherwise water will be infiltrated that is taken into the surface level of the soil to form soil moisture storage where water is held within the interstices of the soil. Under gravity water will flow both downslope to the channel via throughflow whilst the rest will percolate downwards through the soil and cracks and joints within the bedrock to form a level of saturated rock which is groundwater storage (or the water table).

Good answers will be those distinguishing between the processes of infiltration and percolation.

**[Total: 10]**

### *Atmosphere and weather*

**2 Fig. 2 shows energy exchanges at the earth's surface during the day and night.**

**(a) Give two differences in the effects of radiation energy between day and night. [4]**

During the day air is warmed whilst at night it is cooled.  
The opposite is true for soil.

**(b) Explain how the differences in energy exchanges between day and night occur. [6]**

Solar radiation enters the atmosphere as short wave radiation and is absorbed by the surface before being re radiated as long wave radiation which heats the air. The energy exchange is thus downwards into the soil, whilst heating occurs from the surface upwards. At night time there is an absence of incoming solar radiation, the only energy source being counter radiation that is retained within the atmosphere. The principal energy flow is therefore a net loss of heat, cooling the air from the surface upwards.

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*Rocks and weathering*

**3 Fig. 3 shows some factors affecting processes on a slope.**

**(a) Name and briefly describe the two slope profiles marked A and B on Fig. 3. [4]**

A is free face or cliff slope where angles are steep and bare rock faces are likely to be found.  
B is debris or concave slope. Sometimes straight or concave in shape where weathered material accumulates.

**(b) Explain how the factors shown in the diagram can affect the shape of the slope. [6]**

Climate acts as an overall influence in that it affects the type and rate of weathering and transportational processes. Vegetation can affect slopes as the root systems stabilise slopes and to some degree protect from weathering. Weathering of material will be most pronounced on bare surfaces under suitable weather conditions and will lead to the transport of material down slope. River action can remove weathered material and at times undercut the slope.

**[Total: 10]**

*Population change*

**4 Fig. 4 shows the density of population by region for Chile, an LEDC in Latin America, in 2002.**

**(a) Name one region where a density of over 79.9 persons per square kilometre was recorded. [1]**

Valparaiso or Santiago

**(b) Describe the overall pattern of population density within Chile shown in Fig. 4. [4]**

Likely to be presented either as a gradient from the N rising towards Valparaiso/Santiago and falling to S, or as a core-periphery pattern from the central high density regions out to N and S.

Reserve 1 for use of names/data/anomalies from Fig. 4.

A full response observes some anomalies or element of complexity  
e.g. mixed densities 20-39.9 and 40-79.9 S of Santiago, or the leap from Coquimbo's 10-19.9 to Valparaiso's over 79.9.

**(c) Using examples, explain why population density is a poor indicator of overpopulation. [5]**

Candidates are not expected to have knowledge of Chile but could use it for the **examples**, if, for instance, they recognise the implications of Atacama or know that 70% of Chile's land area is mountain and desert.

The key to a successful response is that **overpopulation** is the number of people on an area judged relative to resources (and at a given level of technology). By contrast, **population density** is an absolute figure.

It is therefore possible for two places, such as a CBD in an MEDC city and a squatter settlement in an LEDC urban fringe to have the same population density but for one to be overpopulated and the other not. Classically this was seen by standard of living (level and trend), but to this today it is helpful to add depletion of resource base and environmental degradation.

Suggest credit the concepts **3/2** and their application/examples **2/3**.

**[Total: 10]**

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*Settlement dynamics*

5 Fig. 5 shows two processes occurring within a large urban area in an MEDC. [4]

(a) Name the process shown by the dotted arrow on Fig. 5.

gentrification 1 (no credit for centripetal force)

(b) Explain why the filtering (lower income groups moving into better housing) shown in Fig. 5 may occur.

A response usefully involves two aspects of urban dynamics:

- relating to the housing stock  
It is assumed that housing deteriorates with age and becomes less desirable and more affordable as prices to buy/rent drop relatively. Housing thus filters downwards socio-economically (linked to invasion and succession).
- relating to the residential population  
The higher the socio-economic group the more it is able to demand adequate housing standards and pay for them. Aspiration, lifestyle choices and ability to travel (especially by car ownership) contribute. Lower socio-economic groups filter upwards as, by invasion, they occupy property a higher group vacated.

Burgess himself wrote of Chicago in the 1920s that newcomers went into, “areas of deterioration which ...within the memories of thousands of Chicagoans, contained the residence of the best families.”

Whilst it may be too rigid to maintain a 2/2 division, a full answer should include both aspects, so reserve 1 either way.

(c) Under what circumstances may newly-built housing be located within the existing urban area rather than on its outer edge? Support your answer from a city or cities you have studied. [5]

A number of **circumstances** may be envisaged,

- urban renewal and redevelopment (hinted at in Fig. 5)
- infilling of various sorts e.g. marginal land, open space, sub-dividing larger plots
- clearance and rebuilding e.g. replacing low-rise with high-rise, removal of squatter areas and provision of municipal housing
- other

It is also possible to answer by reasoned **circumstances**, for example,

- where the city cannot expand further e.g. mountain barrier
- where negative externalities e.g. time/cost of commuting make living near the centre attractive (cf re-urbanisation).
- because of planning decisions, both “stick” and “carrot”
- other

Suggest that a full response deals with at least two **circumstances** if well-developed and illustrated from the chosen city or cities.

[Total: 10]

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## Section B: Physical Options

### *Hydrology and fluvial geomorphology*

- 6 (a) (i) Define the terms velocity and discharge as they apply to river channels. [4]

Velocity is the mean speed of flow over time (metres per second) measured either at a point in a river channel or over a set distance.

Discharge is the volume of water passing a particular point. It is calculated as  $Q$  (discharge) =  $A$  (cross sectional area of river)  $\times$   $V$  (mean velocity)

- (ii) Briefly describe helicoidal flow. [3]

A corkscrew type of flow found in meander bends. The flow moves across the water surface from the inside bank towards the outside bank where it descends and returns as a reverse flow. Best shown by a diagram.

- (b) With the use of diagrams, describe and explain the formation of: [8]

(i) waterfalls;

(ii) gorges.

(i) Diagram should show a resistant rock over which water falls into a plunge pool. The less resistant rock may be being eroded backwards (cavitation) as the waterfall retreats upstream.

(ii) Diagrams should show a gorge as a deep narrow river chasm with precipitous rocky walls occupied (usually) by a river channel. It is found where rivers have cut down through hard rocks and may be fault-aligned.

- (c) To what extent can human activities affect river channels? [10]

Human activities can affect both the flows within and the shape (plan and profile) of river channels. Discharge can be affected by changes of land use within the catchment area (i.e. deforestation, urbanisation etc.), which can reduce lag time and bring about flooding. Abstraction, damming etc can reduce channel flow producing the deposition of sediment. Human activities can dredge, straighten or canalise the channel itself. The building of embankments, levees etc also will alter shape, usually for promotion of flood control. These, in turn, will have an impact upon velocity and types of flow. Whilst these changes can have profound local effects they rarely extend throughout a rivers course or catchment although projects such as the Three Gorges Dam will have significant and widespread impacts.

Candidates will probably:

**Level 3** Concentrate on impacts upon channels with good exemplification and an appreciation of scale of impact. (8–10)

**Level 2** Give more concentration on human activities rather than effects upon channel. Some awareness of both flows and shape effects. (5–7)

**Level 1** Give a random selection of human activities which are poorly related to river channels. (0–4)

[Total: 25]

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*Atmosphere and weather*

**7 (a) (i) Define the terms *adiabatic lapse rate* and *environmental lapse rate*. [4]**

Adiabatic lapse rate is the changes in temperature of a parcel of air as it is expanded (cooled) or compressed (heated). Often expressed as rising or falling.

Environmental lapse rate is the change in temperature in the atmosphere with height (ave. 0.6 °C per 100m ascent)

**(ii) Briefly describe what is meant by the term *frost*. [3]**

Frost is the freezing of surface moisture often in the form of frozen dew. Gives a white frozen coverage to ground surfaces when temperatures drop below freezing point.

**(b) Using a labelled diagram, describe and explain the distribution of the world's main surface wind belts. [8]**

A simple diagram showing the trade winds, mid-latitude westerlies and the polar easterlies. Explanation need only be given in terms of broad pressure belts that are brought about by the differential heating of the earth's surface

**(c) Explain the extent to which the climate in urban areas differs from that in the surrounding countryside. [10]**

The main differences can be explained in terms of atmospheric composition, energy and surface roughness. Urban pollutants give rise to more aerosols and particulate matter producing hygroscopic nuclei, smogs and cloud cover. Human activities and the greater heat storage capacity of urban areas leads to higher night temperatures – heat island effects. Together with pollutants, this contributes to greater cloud cover and incidence of thunderstorms. Airflow can be channelled through urban areas, although overall wind speeds may be lower but more turbulent. Lack of water bodies and rapid removal of rainwater can lead to lower absolute humidity

Candidates will probably:

Level 3 Give good coverage of climatic differences with clear understanding of heat islands. Some indication of extent of differences with rural areas. (8–10)

Level 2 Give an account of urban climates with little reference to rural. A partial coverage of features. (5–7)

Level 1 Give a very outline appreciation of climatic differences, concentrating on pollution. (0–4)

**[Total: 25]**

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*Rocks and Weathering*

**8 (a) (i) Define the terms *rock slide* and *soil creep*. [4]**

Rock slide is the downslope movement under gravity of large blocks of rock moving along a slide plane.

Soil creep is the slow movement of particles down slope under gravity as a result of individual displacement (gravity creep and soil heave).

**(ii) Briefly describe the effects of soil creep on the shape of a slope. [3]**

As the movement is very slow, it has limited impact on overall shape. Its main impact is to smooth and round the slope. Sometimes pressure ridges can be seen, but more common features are the accumulation of soil behind walls, curved tree trunks and leaning fences.

**(b) Describe the characteristics of granite rocks. Explain the influence of one characteristic on the weathering of granite. [8]**

Granite is a hard, coarsely grained igneous rock. It is comprised of feldspar, mica and quartz. As a hard rock it is generally resistant to weathering but its jointed nature allows ingress of water for chemical weathering. Hence it breaks up into blocks and corestones. Its mineral composition can also make it vulnerable to hydrolysis, which attacks feldspar producing clay minerals. Accept rectilinear jointing as allowing freeze thaw weathering.

**(c) With the help of diagrams, explain the processes that lead to the formation of landforms at convergent plate margins. [10]**

Diagrams can be employed to show the landforms produced at convergent boundaries. Better candidates will distinguish between oceanic and continental plates and the resultant landforms. The subduction of a plate should be demonstrated as leading to the production of ocean trenches, fold mountains and island arcs. Some indication of the processes involved should be given.

Candidates will probably:

**Level 3** Associate landforms correctly with convergent plate margins and the compression of sediments to produce fold mountains will be explained. Similarly island arcs will be seen as resultant from magma ascending from melted plate margins. (8–10)

**Level 2** Give more generic diagrams often showing all landforms associated with these margins. Explanation will be limited to subduction. (5–7)

**Level 1** Give a rather confused association of convergent margins and landforms with little indication of process. (0–4)

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## Section C: The Human Core

### Population change

- 9 (a) With the help of an age/sex pyramid, explain the meaning of the terms *dependency* and *dependency ratio*. [7]

*dependency* is reliance for survival on the support provided by another or others [1/2]

*dependency ratio* is the relationship between the economically active and non-economically active population. The active (independent) population is usually taken as 15-65, young dependent under 15 and aged dependent over 65. Unemployment, disability etc. do not matter. Formula for calculation,

$$\frac{\text{youth (under 15) + aged (over 65)}}{\text{population 15-65}} \times 100 \quad [4/3]$$

For cohorts shown on a simple labelled age/sex pyramid, reserve 2.

- (b) Explain the implications of an ageing population for government spending. [8]

A full response recognises greater investment in older age groups, especially health care and pensions, but also transport, social services, recreation etc and reduction in budgets for the young/youth e.g. in education.

More perceptive candidates may be able to link ageing to government spending plans such as attracting migrants to fill the labour “gap” or pro-natalist policies seeking to reverse the fertility decline. Some may have concerns with national “weakness” in terms of defence and human resources.

An indicator of quality may be the examples used, whether located or generic, and if data support is offered.

- (c) Japan is an MEDC with an ageing population. Japan’s National Institute of Population has predicted that the population will be extinct (zero) by the year 3387.

To what extent do you agree that such predictions are of limited value?

Candidates may observe that population prediction is notoriously difficult and depends on extrapolating current trends. It is also heavily dependent on the reliability of data (likely to be good in Japan’s case).

It may be a shock tactic or a wake-up call to provoke pro-natalist policy and a change in attitude to having and raising children. 3387 is, of course, a long way off (1380 years) and much can change in the meantime: society, economy, environment, global politics?

Candidates will probably:

**Level 3** Integrate content and assessment throughout, showing good knowledge and understanding of both population prediction and demographic trends. Use examples effectively. [8–10]

**Level 2** Provide a sound answer which remains partial in understanding and/or Assessment. May make some good points but lack development. Offer limited exemplar support. [5–7]

**Level 1** Make one or two points in a thin or descriptive response, perhaps somewhat catastrophic or doom-laden in tone. Show little appreciation of what population prediction involves. [0-4]

[Total: 25]



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*Population change*

**10 Fig. 6 shows the possible demographic impacts of educating girls.**

**(a) Describe how infant mortality may be reduced as girls' education improves. [7]**

Whilst infant mortality is not shown on Fig. 6, the alert candidate will be able to use it as a stimulus to derive credit. A definition is creditable. The first year of life is a highly vulnerable period. A number of ways can be envisaged:

- seeking medical help at all/sooner
- better nutrition for herself, and, in consequence, a child
- fewer children to take care of allows more time, money, attention
- greater life skills and reduced risks e.g. hygiene
- community or friends with higher education levels (advice, norms)
- other

A full answer should cover the situation for both mother and child, recognise that the pregnancy is contributory and may give some examples.

**(b) Using examples, explain at least two different ways that a country's government may attempt to educate young people about birth control. [8]**

Whilst we could see a lot of China's "one child" policy, any ways are valid, so long as they are different. Some examples of attempts will be highly creative,

e.g. in school, in the community, by leaflets and posters, on the radio or TV by advertising or soap opera, through training female educators and respected elders, through giving incentives, through working with a NGO etc.

The term young people allows for material on boys as well as girls. It would be good if candidates pick up on the word educate, but, if not, critical comment on the relative futility of, say, simply handing out contraception, is creditable.

Suggest credit two ways 3/5 to 5/3, more with max. 3 for any one.

**(c) To what extent is Fig. 6 helpful in understanding population change in one country you have studied?**

A simple invitation to use the case study that a candidate has (syllabus 1.4). Astute candidates will observe that population change has two components: natural increase and migration and that Fig. 6 only covers a small part of a much bigger picture. Any assessment of its usefulness, if supported, is therefore valid. If more than one country is taken, credit only the better/best.

Candidates will probably:

**Level 3** Provide an effective assessment of Fig. 6's usefulness, based in detailed knowledge of the chosen country and demonstrate good understanding of both components of population change. [8–10]

**Level 2** Make an answer which is sound to good but limited in overall quality, by the knowledge base or conceptual understanding (maybe dealing only with natural increase). Assessment may be moderate or 'tacked on' after a descriptive account. [5–7]

**Level 1** Offer one or two observations about population change which may remain general or based in an example in name only. May simply reuse Fig. 6's labels. Make no assessment, or one which is superficial and unsupported. [0–4]

**[Total: 25]**

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*Settlement dynamics*

**11 (a) (i) Give the meaning of the term *sphere of influence* in settlement geography.**

The area around a settlement **1** which is affected by it/comes under its influence (better not reused), economically, socially or politically **1**

(may also be termed hinterland, *umland* or market area)

**(ii) Describe two ways to find the extent of a town's sphere of influence.**

- theoretically, using some form of break-point theory e.g. Reilly's law of retail gravitation
- by fieldwork, of two broad kinds:
  - questionnaire surveys: asking "Come from?" questions in town or "Go to?" questions in the surrounding area
  - functional surveys e.g. school catchment, political constituency, official boundary, local newspaper circulation, bus services etc.

The description need only be basic on what can be done with a little of how to go about it. Significant technical detail not expected for so modest a mark allocation.

Credit any **two ways**, using **3/2** or **2/3**. **[5]**

**(b) With reference to one or more settlements, show how an understanding of threshold may help to explain which shops and services are located there.** **[8]**

**threshold** is the minimum number of people/customers needed to support a good or service

It is the level at which a business becomes viable and is the minimum for profitability, as such business owners and entrepreneurs are keenly aware of potential custom. This will be drawn from the settlement itself and its sphere of influence. Threshold is greater for a high order, than for a low order, good.

An effective approach would be to compare what is found in two settlements of different sizes (although better candidates may be more subtle than, say, to take the capital city and a village). Better responses may be dynamic, allowing for openings and closures and refer to other factors e.g. planning decisions, business strategy, space.

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- (c) Should settlement hierarchy be regarded as fixed or as changing? Support your answer with examples.

The **area** may be it at any scale up to the national. The name of the topic **Settlement dynamics** is clearly a hint, but candidates may recognise that the settlement hierarchy has elements to it which are fixed e.g. the division into levels, the progression reduction in number of settlements, and elements which are changing. This is especially true as settlements grow and move up the hierarchy. Other changes are possible e.g. a settlement being chosen for investment and given special status, or, over time a new level may emerge, such as that of the regional capital.

Candidates will probably:

- Level 3** Appreciate that the settlement hierarchy has elements which are fixed and elements which are changing, whilst focusing on the dynamics most likely. Base their response in effective examples and structure the argument well. [8–10]
- Level 2** Demonstrate good understanding of the settlement hierarchy but perhaps some rigidity of thought and argument. Offer suitable to good content but limited examples. Only see one side of the issue? [5–7]
- Level 1** Struggle to deal with a familiar concept in an unfamiliar manner. Make one or two basic observations which may be descriptive or inconclusive. Lack the understanding, skills (or time?) to complete. [0–4]

**[Total: 25]**