

GCSE

Edexcel GCSE

Geography B (1313 3H)

Summer 2006

Mark Scheme (Results)

Question 1

- a) Natural increase - Birth rate minus death rate(1)
Number of births minus number of deaths (1)
Difference between birth and death rates (1)
Difference between number of births and number of deaths (1)
NB accept BR and DR for Birth rate and Death rate
- Net migration - Number of immigrants minus number of emigrants (1)
Difference between the numbers of immigrants and emigrants (1)
- 2 x 1 (2)
- b) Net migration (1)
- c) 210,000 (1)
- Total for question: 4 marks

Question 2

- a) E.g. Coal consumption (nearly) halved (1)
OR fell from 73 m to 40 m tonnes oil equivalent (1)
Gas doubled (1)
OR grew from 45 m to 95 m tonnes oil equivalent (1)
Nuclear and HEP doubled (1)
OR grew from 10 to 21 m tonnes oil equivalent (1)
Oil dropped from 1st to 2nd biggest (1)
Renewables and waste now used (1)
Must say million tonnes of oil equivalent where appropriate
Maximum 2 marks if data not used in answer, ie 2 changes may be unquantified
- 3 x 1 (3)
- b) i) Inexhaustible / infinite / replaceable / never run out (1)
- ii) 2. Other biofuels
3. Waste combustion
4. Wood
5. Hydro-electric power/HEP
6. Sewage gas
7. Wind
8. Geothermal and solar
- Six or seven correct - 2 marks
Four or five correct - 1 mark
- 2 x 1 (2)

- c) To combat/reduce global warming (1), because greenhouse gases absorb heat, up to 1, (1) and allow up to 1 extra mark for details of process (1)
 OR just “greenhouse gases cause global warming” (1)
 Up to 3 marks for problems caused by global warming:
 e.g. melting of ice sheets (1), coastal floods (1), storms (1), droughts (1), crop failures (1), deforestation (1), decline of fishing grounds (1),
 Allow 2 marks for one problem + explanation of it
 Freak weather (1) is an alternative to storms and droughts
 rising sea level(1) desertification (1)
 signed up to Kyoto agreement/target (1)

4 x 1 (4)

- d) i) From 309 to 379 TWh (1)
 By 70 TWh (1)
 By over 20 % (1)
 NB must give TWh where appropriate

(1)

- ii) Reduction in use of coal/oil (1), which release high level of carbon dioxide/ greenhouse gases when burnt (1) Increased use of gas (1), which releases lower level of carbon dioxide/ greenhouse gases when burnt (1) Increased use of nuclear power/HEP (1), which does not produce carbon dioxide/ greenhouse gases (1)

Max. 2 marks for changes in energy
 must link to greenhouse gases for 3 marks
 ie one change must be linked to greenhouse gases

3 x 1 (3)

Total for question: 14 marks

Question 3

a) The described changes must be linked to years:

- E.g. Rose to a peak/145 m tonnes in mid-1980s (1)
- Fell slightly/to 100 m tonnes in late 1980s (1)
- Rose to another peak/150m tonnes in mid/late 1990s (1)
- Reached highest output in 1999 (1)
- Fell slightly/to 130m tonnes in early 2000s (1)

3 x 1 (3)

b) i) A country that sells more oil to other countries than it imports (1)
A country that exports more oil than it imports (1)

(1)

- ii) Trade deficit in energy (1)
- Less tax revenue for government (1)
- Take money out of the economy (1)
- Reduced security of supplies (1),
- Producing countries such as Iraq are politically less stable (1)

Not accept - It will be expensive

2 x 1 (2)

Total for question: 6 marks

Question 4

- a) i) Onshore (1)
- ii) The electricity supply (or Power generated) from wind power is intermittent/irregular/unreliable (1)
To supplement it there needs to be stand-by capacity (1)
from another source e.g. gas-fired power station (1) 2 x 1 (2)
- iii) 40% (1)
- b) i) Plan and build - 12 years (1)
Decommission - 135 years (1) 2 x 1 (2)
- ii) £4 billion
Not just 4 billion (1)

Total for question: 7 marks

Question 5

- a) Near the sea/coast/river (1) for (cooling) water (1)
 and for discharging warmed/waste water (1)
 Not accept waste or nuclear waste
 Hard rock (1) is good foundation for building (1)
 Flat land (1) is easy/cheap to build on (1)
 Plenty of space (1) for large buildings and car park (1)
 Sparsely populated area / no nearby houses (1)
 so hazardous for fewer people (1)
 Not noise/visual link to sparse population

3 x 1 (3)

- b) On top of a hill (1), so exposed to strong winds from all directions (1)
 Gentle slope (1) will give smooth wind flow/little turbulence (1)
 Built on rough pasture (1) which is of low agricultural value (1)

2 x 1 (2)

c)

Hinkley Point B N.P. station	Rheidol Wind Farm
Large buildings will be seen for miles around in flat area - most people consider them eyesores. Rural landscape around it is flat and not of great scenic value.	8 turbines on hilltop so will be seen for miles around - some people (but not all) consider them eyesores. Rural landscape around it is wild upland of great scenic value.
Coastal rocks scarred by construction of outlet channel	Hill scarred by building of service road
Very large area of land covered in tarmac and concrete - big loss of plantlife.	Majority of the large site remains as rough pasture - little loss of plant life.
Fish and shellfish may be harmed in the water intake equipment, or by the warmed outflow water.	Birds may be killed by moving turbine blades.
Long-term impact (about 175 years) as the site will not be reusable for 135 years after closure.	Short-term impact (about 30 years) as the site is quickly restorable to its original state after closure.
Capacity 1220 MW - so a relatively small overall environmental impact for the amount of energy generated.	Capacity 2.4 MW - so a relatively large overall environmental impact for the amount of energy generated
Some noise pollution possible.	Some noise pollution possible.
Risk of radioactive leaks into air or sea.	No risk of radioactive leaks.
No carbon dioxide emissions.	No carbon dioxide emissions.

<p>Level 1 1 - 2 marks</p>	<p>Describes some environmental impacts of nuclear and wind power in general and in separate accounts. OR Points out one difference between them in terms of their environmental impact.</p>
<p>Level 2 3 - 4 marks</p>	<p>Describes environmental impact of Hinkley and Rheidol schemes using photographic evidence but in separate accounts. OR Points out a few differences (and maybe some similarities) between nuclear and wind power in general in terms of their environmental impact.</p>
<p>Level 3 5 - 6 marks</p>	<p>Compares the environmental impacts of Hinkley and Rheidol in detail clearly using photographic evidence. Eg Comments on the size/colour of the buildings and turbines; the coastal rocks/mudflats and grassland; or the clear skies in both photos A and C. Refers to the difference in scenic value of the two areas; or to the environmental significance of the different MW of the two schemes (e.g. over 500 Rheidol wind farms would be needed to match the capacity of Hinkley Point)</p>

Focus of question is environmental impact so references to eg energy costs or reliability are not relevant.

(6)

Total for question: 11 marks

Question 6

a) i) 60% (1)

iii) Poorer (1)

b) Wood-fuel boiler
Environmentally friendly (1)
Uses energy from trees (1)
So is renewable/replaceable energy (1)
Is carbon-neutral (1)
Which means the CO₂ released is balanced
By the CO₂ absorbed by the recently growing tree (1)
So does not contribute to global warming (1)
Reduces need to burn fossil fuels (1)
Such as coal/oil/natural gas (1)
Reduces waste hazard of nuclear power(1)

Reduces the transmission of electricity (through national grid) (1)
Which causes energy loss (1)

Bio-fuel car
Environmentally friendly (1)
Uses energy from agricultural waste (1)
Uses energy from a crop (1)
Such as sugar beet/sugar cane/soybean/rape/flax/wheat (1 each to max of 2)
So is renewable/replaceable energy (1)
It is carbon-neutral (1) Which means the CO₂ released is balanced
By the CO₂ absorbed by the recently growing crop(1)
So does not contribute to global warming/greenhouse effect (1)
Reduces need to burn fossil fuels (1)
Such as oil/petroleum (1)

NB Liguified petroleum gas (LPG) car ≠ biofuel car

4 x 1 (4)

Total for question: 8 marks

Question 7

a) No mark for choices of policies.

Credit valid reasons for their choices of two policies and rejections of the other two.

Criteria include the impact on global environment (climate change); impact on local environment (e.g. noise, scenery, plant and animal life); effects on different groups in society; impact on other land uses (e.g. housing, transport, tourism); impact on trade and employment; health and safety issues; cost and cost-effectiveness.

Reasons for supporting the policies

A - Reducing the population

- UK is already one of Europe's most densely populated countries
- Reducing the population will reduce demand for energy and therefore carbon emissions. This will help to reduce global warming.
- Will reduce local/regional environmental damage e.g. less demand for land for housing, so less urban sprawl, less damage to Green Belt and reduced commuting to, and congestion in cities; less demand for land for shops, schools and roads; less pressure on other resources e.g. water supplies.
- Removing child allowances from third and later children will help reduce birth rate.
- Greater use of contraception will reduce BR and spread of Aids.
- Reducing immigration to the same level as emigration will mean net migration (the main cause of recent UK population growth) is zero.
- Relatively cheap solution – certainly cheaper for the government than Policies B and C

B - Developing more wind farms

- Wind energy has no carbon emissions. Expanding it at the expense of fossil fuels will help to reduce global warming
- Wind farms are quickly built (2 years) - so could start dealing with global warming problem promptly.
- Wind is a renewable, sustainable energy resource and safe too - no toxic waste, unlike nuclear power.
- Huge indigenous resource - UK has 40% Europe's offshore potential. Country would not be dependent on possibly unstable oil-exporting countries (Iraq, Azerbaijan) - so security of supply.
- Onshore wind power is cheaper to produce than nuclear power. Offshore wind power is also cheaper than NP when nuclear decommissioning costs are included.
- Wind power costs have fallen and are likely to continue to do so as the technology improves.
- Any adverse environmental impact is limited to the lifetime (20 years) of the turbines, which are easily dismantled. Much shorter environmental impact than nuclear power.
- Land between the turbines can still be farmed. Landowner earns extra income from diversification.
- Offshore wind farms have less environmental impact than onshore ones, so they face less opposition. Winds over the sea are less intermittent, so electricity supply is more regular.

- General problem of wind intermittency will be reduced if wind farms are widely distributed geographically (all parts of the UK are never windless at the same time).
- There is less opposition from the general public to wind farms than to NP

C - Build more nuclear power stations

- No carbon emissions so do not contribute to global warming
- Existing stations will all soon be closed - need replacing just to maintain capacity
- As North Sea oil and gas reserves decline (oil run out by 2015?), there is a need to expand nuclear capacity to avoid growing UK dependence on politically unstable countries (Iraq, Azerbaijan) for oil and gas imports.
- Uranium for NP must be imported, but is available from politically reliable source (Canada). In any case, reprocessed fuel can also be used.
- NP stations use little land for the amount of electricity they produce (compare wind power).
- Electricity production costs likely to drop in future with improved technology, and with economies of scale if multiple reactors built. Will be competitive with oil/gas if they keep rising in price.
- New NP stations could be built on the existing sites - so environmental impact confined to those localities, and jobs also maintained there. Less opposition there than at new sites.
- Giving companies tax breaks or other subsidies will make it profitable for them to build NP stations.

D - Encourage more energy-efficient homes and transport

- 16% UK carbon emissions from housing and 60% of household energy is wasted, so there is scope for saving energy and emissions, and so reducing global climate change.
- Council tax discounts for installing roof/wall insulation, etc will encourage energy saving.
- Building regulations requiring the use of green technologies (e.g. solar panels) in all new homes will reduce carbon emissions.
- Increasing domestic micro-generation (e.g. solar panels, wind turbines) will mean less reliance on fossil fuels and so reduced carbon emissions. It will also mean less electricity needed from the National Grid - so reducing wastage from transmission.
- 22% UK carbon emissions from transport, so scope for saving energy and reducing global warming.
- Higher taxes on petrol would cut general road vehicle usage, and lower taxes on LPG and biofuels would encourage the use of greener fuels.
- Higher vehicle taxes on larger, less energy-efficient vehicles would discourage their use
- Grants for energy-conservation cost less (1.3p per KWh saved) than the subsidies for renewables (2.5p per KWh) and the electricity production costs from all sources (fossil fuels, nuclear and wind). So Policy D is more cost-effective than B or C.
- There is a case for increasing spending on promoting energy efficiency. More effective advertising on TV and other media could increase public awareness of the advantages for themselves and the environment.

Reasons for rejecting the policies

A - Reducing the population

- Long term solution only - will have little immediate impact on gas emissions/global warming.
- A high population density does not automatically mean overpopulation. UK has high and rising living standards and high employment, despite its recent population growth.
- Removing child allowances will increase child poverty and undermine family life.
- Some religious objections to making contraceptives more easily available, especially to teenagers.
- Birth rate is already low and reducing it further may in practice prove difficult.
- Reducing immigration is politically sensitive and considered racist by some. Children may be prevented from living with their migrated parent(s). Job vacancies in some industries might remain unfilled, stunting economic growth and/or reducing quality of public services.
- Matching immigration to same level as emigration may in practice be difficult/costly to administer. Possible conflict between accommodating asylum seekers and economic migrants within a quota.
- Young adult immigrants are needed to compensate for the ageing UK population (23% over 65 by 2031): they pay more in taxes than they use in services, and will support the dependent population.

B - Developing more wind farms

- Considered eyesores by some. Will spoil scenery in upland areas where wind potential is highest.
- Offshore farms have less environmental impact than onshore ones, but electricity production costs are higher.
- Building offshore wind farms closer to the coast will reduce the costs but will threaten inshore fishing and may spoil some coastal views.
- Scenery of National Parks/AONBs will possibly be threatened if the government relaxes planning restrictions on location of wind farms.
- Wind power needs a much greater area of land than nuclear power to generate the same amount of electricity (500 Rheidol Wind farms equivalent in capacity to one Hinkley Point NP Station).
- Turbines may disturb local residents with noise, interference to TV, and reduced house prices.
- Turbines may kill birds, and their siting can disturb plant life and soil drainage.
- The intermittency of winds means some standby capacity from other energy resources (nuclear and/or fossil fuels) will still be needed to supply electricity when wind speeds are unsuitable.

C - Build more nuclear power stations

- Problem of safe disposal of high-level radioactive waste is still not resolved: will impact on future generations, so not a sustainable development.
- Risk of serious radioactive leaks (e.g. Sellafield) and explosions (e.g. Chernobyl) - health hazard.
- Risk of sabotage by terrorists in post 9/11 era - could cause release of radioactive material.
- Take long time to build (12 years) - not a quick fix for reducing global warming.
- High electricity production costs - more expensive than onshore wind farms, and than offshore ones if nuclear decommissioning costs included.
- Government will have to pay for/subsidise the high building costs (£4 billion for 4 NP stations). This could divert funds from promoting renewables, so Policies B and C are not a good combination.
- NP stations considered eyesores by most people. Other negative environmental effects: e.g. noise, loss of land, loss of habitats, thermal pollution.
- Take a long time to decommission (135 years) - so NP has a more prolonged negative environmental impact than wind power.
- There is more opposition from general public to NP than to windfarms. Will be especially strong if the planning restrictions on the siting of NP stations are relaxed.

D - Encourage more energy-efficient homes and transport

- Discounts on council taxes for installing roof/wall insulation could be difficult/costly to administer. Householders who have already installed would not benefit.
- Building regulations requiring the use of green technologies in new houses have been ignored by some building firms, and not enforced.
- Higher petrol taxes would increase transport costs for businesses and make them raise their prices. This would make it more difficult to compete with foreign firms.
- Higher petrol taxes would be unpopular with the public and hit poorer people disproportionately.
- Motorist organisations and the road haulage industry are powerful lobbyists and often succeed in preventing governments introducing “anti-motorist” measures.
- Publicity promoting energy efficiency in UK has not so far proved very effective.
- Some types of domestic micro-generation (e.g. solar panels) are very expensive to run.
- Policy D on its own will do nothing to reduce the UK’s future over-dependence on imported fossil fuels.

N.B. Candidates may validly argue for a particular policy but against some of the methods that are suggested for it in the Resource Book. Similarly, credit candidates who suggest and argue for better ways of achieving the ends of a particular policy (e.g. taxing aviation fuel in Policy D).

<p>Level 1 1 - 4</p>	<p>Only considers a few relevant criteria. Probably only uses obvious points from Figures 13 and 14</p> <p>Makes simple points lifted from the Resource Booklet</p> <p>E.g. Reducing the population will improve the quality of life.</p> <p>Wind power is safe and clean.</p> <p>The UK must build more NP stations if it is to meet its target for reducing carbon dioxide emissions.</p> <p>Tax incentives on property encourage house owners to save energy.</p> <p>Countries with ageing populations need migrant workers.</p> <p>Wind turbines damage birds and property values.</p> <p>NP stations are dangerous because radioactive waste may leak out.</p> <p>Motorists want lower fuel taxes, not higher ones</p> <p>For the top mark, makes several simple points</p>
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<p>Level 2 5 - 8</p>	<p>Considers a number of relevant criteria. May use more sources than Figures 13 and 14.</p> <p>Makes a number of simple points, but also includes at least one developed (D) point (i.e. elaborates with more detail, or explanation, or makes comparisons).</p> <p>E.g. I favour building <u>offshore</u> wind farms. There is less opposition to them because they don't spoil the countryside. (D)</p> <p>NP stations and wind farms do not produce any carbon emissions, so policies C and B will both help to combat global warming (D)</p> <p>It costs the government less to save electricity than to produce it. So policy D is more cost-effective than policy B or C. (D)</p> <p>16% of greenhouse gases come from houses, and 60% of housing energy is wasted. So energy-efficient homes must be a priority. (D)</p> <p>More house owners would save energy if they could get discounts on their council tax for installing roof and wall insulation. (D)</p> <p>The UK needs lots of young migrant workers to help pay for the pensions of the increasing numbers of old people. (D)</p> <p>Removing benefits for the third and later children in large families would be unfair and lead to child poverty. (D)</p> <p>Offshore wind power is more expensive than new NP stations (5.7 pence per KWh compared with 4 pence). (D)</p> <p>Since 9/11 NP stations seem more vulnerable to sabotage by terrorists. We cannot risk building any more. (D)</p> <p>Raising fuel tax will hit poorer people disproportionately (D)</p> <p>To reach the top mark:</p> <ul style="list-style-type: none"> • Includes several developed (D) points • Writes in sentences with a clear and structured style. Spells, punctuates and uses the rules of grammar with reasonable accuracy
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<p>Level 3 9 - 12</p>	<p>Considers a range of criteria May explicitly prioritise between them.</p> <p>Includes many developed (D) points - see Level 2.</p> <p>May see some implications not mentioned in the Resource Booklet.</p> <p>E.g. Allowing offshore turbines nearer the coast will destroy the view in many coastal areas and cause conflict with inshore fishing. (D)</p> <p>Building more NP stations will divert investment away from renewables like wind. So C and B are not a good combination. (D)</p> <p>Energy conservation on its own will do nothing to reduce the UK's dependence on foreign countries for its future gas supplies. (D)</p> <p>Probably acknowledges some problems, as well as advantages, of the chosen option (and vice versa for the rejected ones)</p> <p>E.g. Although reducing the population would be cheap, it is only a long-term solution - it will not deal with the pressing need to combat climate change now. (D)</p> <p>Admittedly offshore wind power is currently dearer than NP, but I still prefer it because it is a much safer source of energy. (D)</p> <p>Although businesses will complain about their increased costs, raising fuel taxes is essential if the UK is to reduce greenhouse gas emissions from road transport. (D)</p> <p>May include some well developed (WD) points.</p> <p>E.g. Reducing the population will mean less demand for new housing. This will save many greenfield sites from vanishing under urban sprawl, and prevent the further growth of commuting and traffic congestion in cities. (WD)</p> <p>The biggest potential for onshore wind farms is in upland areas, which have the most scenic landscapes. These would be spoilt by ugly wind turbines. However, if offshore sites were used instead, the cost of the electricity produced there is dearer. (WD)</p> <p>New NP stations will produce cheap electricity, but it will be less competitive when the costs of decommissioning are included. The high costs will have to be paid by UK taxpayers, yet the risk of suffering terrorist attacks will be increased. (WD)</p> <p>Wind's intermittency means energy will still be needed from gas or NP as a stand-by. But new technology may solve this problem in the long term: hydrogen obtained from water with wind-powered electricity might fill the gaps when winds don't blow. (WD)</p> <p>To reach the top mark:</p> <ul style="list-style-type: none"> • Makes some well developed points in a thoroughly argued, balanced answer • Writes in sentences that are clear, structured and coherent. Spells, punctuates and uses the rules of grammar with considerable accuracy, using specialist terms appropriately.
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Total for question: 12 marks
Total for paper: 60 marks