

GEOGRAPHY

Higher

Model Answers Booklet



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Section 1: Physical Environments

BIOSPHERE

a) Explain the main conditions and processes involved in the formation of a Brown Earth soil. (8)

Vegetation is deciduous forest that provides deep leaf litter (1), this decomposes rapidly in mild climate (1) resulting in a dark mildly acidic mull humus (1). Trees have long roots which penetrate deep into the soil and absorb nutrients from lower layers (1).

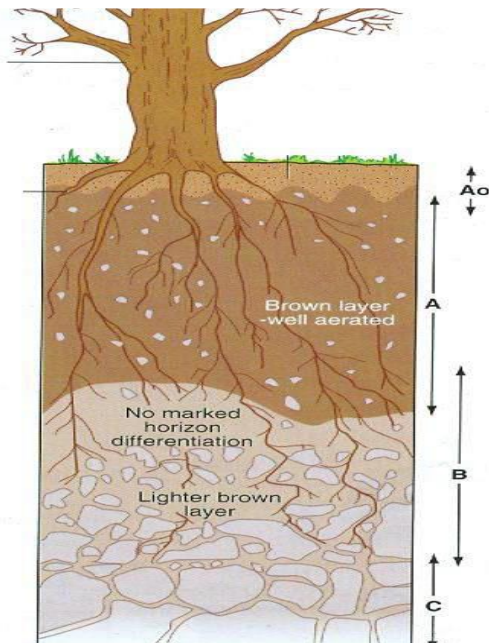
Biota are active and mix the soil so horizons are poorly defined (1).

Precipitation slightly exceeds evaporation, giving downward leaching of minerals (1). This means an iron pan may form, which may impeding drainage (1)

Brown earth soils tend to be found on gentler slopes which allows for good drainage (1).

Parent material in C horizon is weathered rock (1).

b) Draw a fully annotated soil profile of a Brown Earth soil to show its main characteristics (including horizons, colour, texture and drainage), and associated vegetation. (8)



Associated vegetation is deciduous trees (1)

Trees have deep roots (1) that can reach the C Horizon to recycle nutrients (1), this also allows for better drainage (1).

Mild climate encourages rapid decomposition of leaf litter (1) so humus is thick, dark (1) and mildly acidic 'mull' humus (1)

Light brown A Horizon (1) with crumbly texture (1)

Soil biota mix the soil (1) so horizons not well defined (1)

An iron pan may form as there is *slightly* more precipitation than evaporation (1)

Parent material is very weathered by roots. (1)

c) Explain the main conditions and processes involved in the formation of a Podzol. (8)

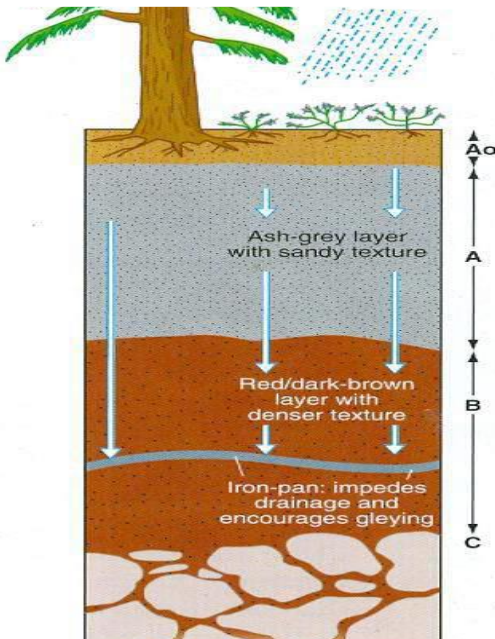
Vegetation is coniferous forests, that produces acidic mor humus (1). Low temperatures lead to slow decomposition (1). Limited soil biota leads to well defined horizons (1).

High precipitation causes leaching (1) which is the downward movement minerals (e.g. iron oxides) (1), this leads to formation of an iron pan in the B horizon (1). This iron pan may impede drainage causing water logging (1).

Eluviation leaves an ash grey A horizon (1) because the minerals have been leached out - this is podzolisation (1).

C horizon is parent material, generally weathered rock (1).

d) Draw a fully annotated soil profile of a Podzol to show its main characteristics (including horizons, colour, texture and drainage), and associated vegetation. (8)



Associated vegetation is coniferous forest or heather moorland. (1)

Plants have shallow, spreading roots. (1)

Thin black humus layer. (1) Mor/acidic humus. (1)

Ash-grey lower A horizon (1) with sandy texture. (1)

Well-defined horizons (1) because there's few soil biota to mix soil (1)

Iron pan develops in upper B horizon (1) impeding drainage and causing waterlogging. (1)

B horizon is reddish-brown (1) with denser texture due to downward leaching. (1)

C horizon is parent material, generally weathered rock. (1)

e) Explain the main conditions and processes involved in the formation of a Gley soil. (8)

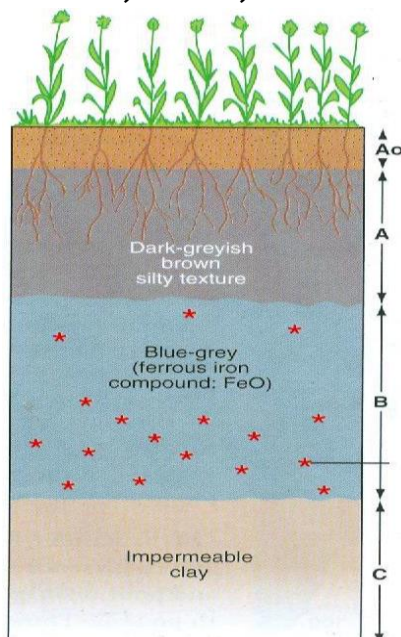
Little vegetation (small shrubs, moss) - mor acidic humus *eventually* forms. (1) Low temperatures lead to a slow rate of decomposition of organic matter (1) creating a thin dark humus. (1) Plant roots do not penetrate deeply so limited recycling of minerals back to the vegetation. (1)

Gleys tend to be waterlogged as drainage is prevented by the permafrost in the B Horizon (1).

Anaerobic conditions cause the soil to turn a blue grey colour (1), this also means few organisms can live in the soil (1) but horizons may become mixed by freeze-thaw weathering (1).

Impermeable clay in the C horizon also impedes drainage and causes waterlogging. (1)

f) Draw a fully annotated soil profile of a Gley soil to show its main characteristics (including horizons, colour, texture and drainage), and associated vegetation. (8)



There is little vegetation (small shrubs, moss) (1), a thin dark (1) mor acidic humus *eventually* forms (1). Low temperatures lead to a slow rate of decomposition of organic matter (1)

Plant roots do not penetrate deeply (1) so limited recycling of minerals back to the vegetation. (1)

Gleys tend to be waterlogged (1) as drainage is prevented by the permafrost in the B Horizon (1).

B horizon is a blue grey colour (1), due to the lack of oxygen (anaerobic conditions) (1) this also means few organisms can live in the soil (1) but horizons may become mixed by freeze-thaw weathering (1) Where gleying is intermittent the soil may have orange/red mottling (1).

Impermeable clay in the C horizon. (1)

HYDROSPHERE

a) Explain how water continuously moves through the hydrological cycle. (8)

Water moves continuously through the hydrological cycle because it is a closed system (1). Moisture is lost from sea or lakes into the atmosphere via evaporation (liquid changing into a gas) (1). The water vapour cools as it rises, changing from gas back to liquid (1) the water droplets gather in the atmosphere as clouds (condensation) (1). Eventually enough water droplets gather and fall back to the surface as precipitation, e.g. snow, rain, etc. (1). Raindrops may either flow over the land as surface run off (1) or within a stream or river as channel flow (1). However, some water is intercepted by vegetation before reaching the ground (1). Eventually the water makes its way back into the sea or lake and the cycle begins again (1).

b) 'A drainage basin is an open system with four elements - inputs, storage, transfers and outputs.' Discuss the movement of water within a drainage basin. (8)

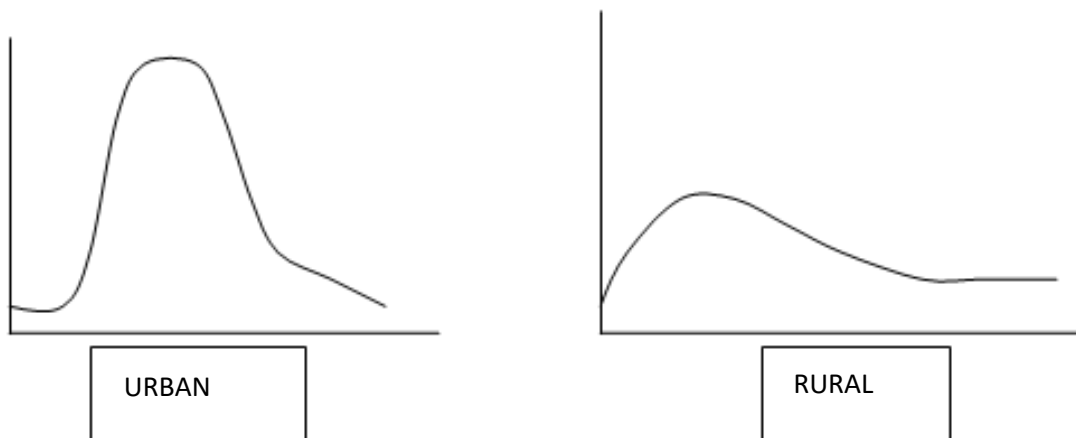
Precipitation is an input, mainly in the form of rainfall and snow (1). Water may then be stored on the surface in lakes and rivers (1) and interception by leaves and roots of vegetation (1). Transfers include surface run-off over land (1) and channel flow through rivers and streams (1). Infiltration is when the water moves downward into the soil (1). Throughflow is the movement of water through the upper soil layers towards the river (1). Output are water being lost via evaporation (liquid into gas) (1), and surface run-off from rivers into seas and oceans (1).

c) Explain how human activities can impact the hydrological cycle. (8)

Human activities such as mining has an impact on the hydrological cycle because it causes lakes and rivers 'silt up' leading to reduced storage capacity (1). There is also less vegetation cover which leads to increased run-off (1). Irrigating land involves taking water from a river or underground store (1), this can reduce river flow and lower water tables (1), it also increases evaporation by placing more water in surface stores (ditches/canals) (1). Deforestation increases surface run-off as trees can no longer intercept and store water (1). This will also cause more extreme river flows as water is not intercepted by vegetation (1). As urbanisation increases so does the amount of impermeable surfaces (e.g. concrete and tarmac) and can speed up surface runoff (1), leading to higher river levels (1).

d) Study Diagram Q2D below. Explain the differences in discharge between the hydrographs for the urban and rural areas following a heavy rainstorm. (8)

Diagram Q2D: Hydrographs for an Urban & Rural Area



The URBAN area has a steeper rising limb as there is less vegetation here so less interception causing the water to get to the river more quickly (2). Due to the tarmac/paved roads here there is a higher peak discharge as less water is absorbed by the soil via infiltration (1). Drains and sewers in the urban areas will also funnel the rainwater to the river more quickly (1). This causes a short lag time (1). The Urban hydrograph returns to base flow more quickly as less water has been transported as throughflow/groundwater flow (1). There is a steeper recessional limb due to increased surface run off by the roads/streets (1).

The RURAL area has a much gentler rising limb and lower peak discharge (1) as some of the water is intercepted by vegetation lost via transpiration (1).

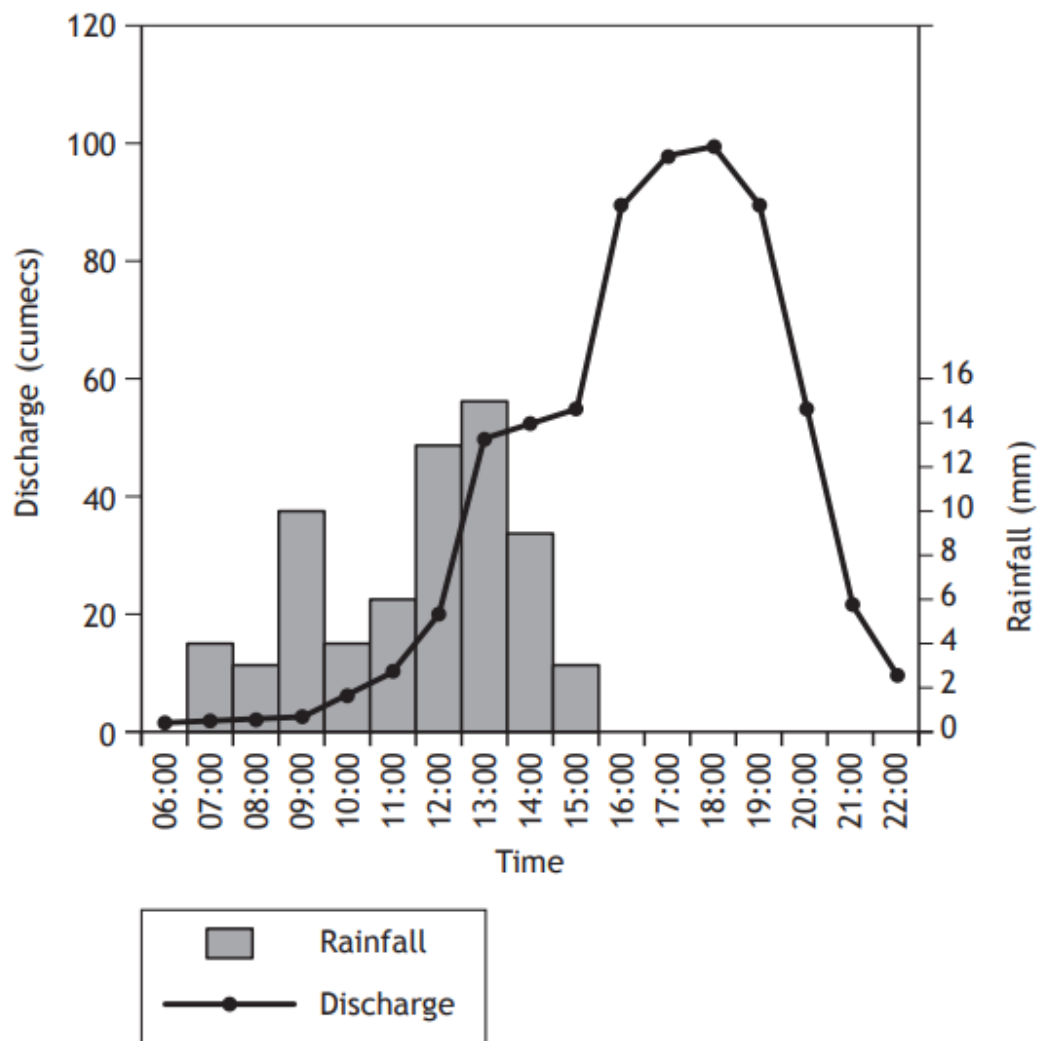
e) Study the Storm Hydrograph below.

For the River Valency on the 16th of August:

(i) Describe the changes in discharge level and

(ii) Suggest reasons why these changes may have occurred. (10)

Diagram Q2E: Storm Hydrograph for the River Valency, Boscastle, 16th August 2019



Descriptions may include:

- There is a lag time of five hours. (1)
- There is a slow rise in discharge until 09:00. (1)
- There is a steep rising limb (1) leading to a peak discharge of 100 cumecs at 18:00. (1)

Explanations may include:

- The river discharge rises slowly at first due to the initial rainfall which began at 07:00 (1); this earlier rain may have been intercepted by vegetation (1).
- The rising limb then becomes much steeper because soil storage has been exceeded (1).
- The steep rising limb may also be due to impermeable surfaces (like tarmac or concrete) causing rapid surface run-off so water gets to the river much quicker. (2)
- The catchment area may be steep leading to rapid overland flow to the channel. (1)
- The steep recession limb is due to there being no further rain after 15:00. (1)

f) Explain the formation of a waterfall. (8)

Waterfalls are found where hard rock overlies soft rock (1). The water is powerful and more easily erodes the softer rock (1) by hydraulic action. This is the sheer force of the river hitting the banks and compressing the air in the cracks and breaking off particles (2). Abrasion further erodes the soft rock, this is where sediment in the water hits off the rock, scraping it away (2). Through time a plunge pool forms (1). The softer rock is worn away and the hard rock is undercut leaving an overhang of hard rock above the plunge pool (1) which eventually collapses into the plunge pool due to gravity (1). This process is repeated over time and the waterfall retreats upstream (1).

g) Explain the formation of a meander. (8)

Meanders are winding curves or bends in a river; they are formed in the middle and lower course (1). The outer bends of the river are eroded first by hydraulic action which is the sheer force of the river hitting the banks and compressing the air in the cracks and breaking off particles (2), then by abrasion which is when sediment in the water hits off the rock, scraping it away (2). The river flows fastest on the outside bend increasing the erosive power (1); river flows slowest on the inside bend leading to deposition (1). This leads to river cliffs and beaches developing (1). Meanders migrate downstream as erosion continues. (1)

f) Explain the formation of an oxbow lake. (8)

Through the processes of abrasion, when sediment in the water hits off the rock, scraping it away (2), and hydraulic action, the sheer force of the river hitting the banks and compressing the air in the cracks and breaking off particles (2), the river continues to erode the outer banks of the meanders and deposit on the inside bend (1). Eventually the neck of land between them becomes very narrow (1). During a flood when the river has more energy, it cuts through the neck and makes a new straighter channel (1). Sediment is deposited along the sides of the new channel. The meander becomes cut off from the new channel (1) and a horseshoe shaped oxbow lake forms (1). The water in it becomes stagnant. The lake will remain sealed off until either the river floods into it or it dries out (1).

h) Study the OS Map extract of Dufftown (you will need this from your teacher). Describe the physical features of the river and its valley between 294454 - 283480. (8)

The river is flowing in a North West direction (1). The river is in its middle course due to the large meanders - 294463 (1). There appears to be the remains of an ox bow lake at 284477 (1). The valley floor is becoming wider (almost 1 square kilometer) (1). The river has a gentle profile (1) & it is also quite wide (1). There appears to be the remains of an ox bow lake at 284477 (1). Many tributaries join the river at confluence points like 294466 (1). The valley sides are still relatively steep, climbing to over 200m (1).

LITHOSPHERE

a) Explain the formation of a corrie. (8)

Snow accumulates in north facing hollows (1) because these slopes are more shaded so snow lies longer (1), the snow eventually turns to ice and moves downhill, as a glacier, due to gravity (1). The glacier erodes the hollow by the process of plucking when ice freezes on to bedrock, pulling loose rocks away from the back wall, making it steeper (2). Abrasion also occurs; this is when the angular rock embedded in the ice grinds the hollow making it deeper (2). Friction causes the ice to slow down at the front edge of the corrie, (1) allowing a rock lip to form which traps rain water (1). When the ice melts an armchair shaped hollow is left in the mountainside, this is a corrie (1).

b) Explain the formation of a u-shaped valley. (8)

Snow accumulates in north facing hollows (1) because these slopes are more shaded so snow lies longer (1), the snow eventually turns to ice and moves downhill, as a glacier, due to gravity (1). The glacier erodes the valley during its journey through abrasion; this is when the angular rocks embedded in the ice grinds the valley down, deepening the valley floor (2). Freeze-thaw action steepens the sides of the valley. This happens when melt water enters cracks in the rock, freezes and expands. This forces the crack wider. When this has happened many times the rock will break apart (2). As the ice melts, a wide u-shaped valley is left behind with steep sides and a flat valley floor (1).

c) Explain the formation of a Drumlin. (8)

Drumlins are elongated hills made up of glacial deposits. They are made up of unsorted till because the ice deposited all the material at the same time underneath the glacier as it moved downhill (1). The steep slope (stoss end) faces up-valley, whilst the gentler sloping 'lee' slope faces down-valley (1). They form when the sediment becomes too heavy for the glacier to carry (1). The glacier deposits the material, shaping it into streamlined mounds as it flows over the top (1). If there is a small obstacle on the ground, this may act as a trigger point and material can build up around it (1). Drumlins may also form when the ice flows over a layer of sediment that is deeper than normal. The huge overlying weight of ice causes increased pressure on the sediment beneath it, moulding it into the drumlin shapes (1). Drumlins may be reshaped by further ice movements after being originally deposited (1). Drumlins are found in 'swarms' or in a 'basket of eggs' (1).

d) Explain the formation of:

(i) Terminal Moraine and

(ii) an Esker. (12)

Terminal moraine is a ridge across the valley and made up of glacial deposits/till/boulder clay; which is unsorted (1). As the glacier moves downhill it acts like a bulldozer, pushing sediment in front of its snout as it goes (1). On reaching warmer lower altitudes, or when temperatures rise, the glacier melts, losing power and depositing the moraine (2). Terminal moraine marks the furthest point that the glacier reaches (1). Once the ice has retreated, the terminal (or end) moraine can often form a natural dam, creating a ribbon lake (1).

Eskers are formed by meltwater streams in or underneath a glacier. They form within ice-walled tunnels at the base of the glacier (1). As they move through and out of the glacier, the streams lose power and energy and, as a result, deposit the material along their river bed (1). Larger particles are heavier and deposited first. Smaller particles are lighter and can be carried for

longer. Therefore the deposits that make up an esker are sorted (2). The stones also tend to be more rounded than glacial deposits, because of the process of attrition (material carried along by the meltwater smashes against each other repeatedly, creating smaller and rounder pieces) (2). When the glacier retreats, the sub-glacial streams deposit their load on the channel bed and an esker is left as a long winding ridge of moraine across the valley floor (1).

e) Explain the formation of Headlands and Bays. (8)

Headlands and bays are found along coastlines where there are alternating bands of hard and soft rock (1). Waves erode the areas of softer rock more rapidly to form bays (1). Erosion occurs via hydraulic action (1), this is the sheer force of the waves hitting the rocks and compressing the air in the cracks and breaking off particles (1). Abrasion (1) also happens when sediment in the waves hits off the rock, scraping it away. (1) However, the waves cannot wear away the hard rock as easily and as quickly so headlands are left protruding out into the sea (1). Repetitive and long-term abrasion at the foot of a cliff can erode a wave-cut notch causing rock above to collapse into the sea (1). Headlands are left exposed and protect the sheltered bays that form between them (1).

f) Explain the formation of a Stack. (8)

A Headland with weaknesses such as joints, faults or cracks are eroded by the sea to form caves (1). Erosion takes place due to hydraulic action (1) this is the sheer force of the waves hitting the rocks and compressing the air in the cracks and breaking off particles (1). Abrasion (1) also happens when sediment in the waves hits off the headland, scraping it away. (1). Over time, erosion on both sides of the headland cuts through the back wall and enlarges the cave to create an arch (1). Continued erosion of the headland eventually results in the collapse of the arch roof (1) due to gravity (1), leaving a stack isolated from the headland (1).

g) Explain the formation of a Wave Cut Platform. (8)

Cliffs are formed in places where high, steep land meets the sea. (1) The sea constantly crashes against cliffs and erodes their base due to hydraulic action, the sheer force of the waves hitting the rocks and compressing the air in the cracks and breaking off particles (2) & abrasion, when sediment in the waves hits off the headland, scraping it away (2). Here, a wave cut notch forms (1). Over time, this notch enlarges due to solution, until the cliff becomes unsupported and collapses due to gravity (1). As a result the cliff appears to retreat backwards over a period of time (1). Where the material falls into the sea, a wave cut platform is created and marks out the old coastline (1). Wave-cut platforms are exposed at low tide but covered at high tide (1).

h) Explain the formation of a Sand Spit. (8)

Sand spits are formed by the process of longshore drift (1). Swash is where waves, driven by prevailing wind push material up the beach at an angle (2) the returning backwash is dragged back by gravity down the beach at right angles (2). Spit spits form when there is a change in direction on a coastline (1), allowing a sheltered area for deposition (1). Material slowly builds up to appear above the water (1), the spit develops as long as the supply of deposits is greater than the amount of erosion (1). The shape can become hooked or curved at the end in response to changes in wind direction/currents. (1)

ATMOSPHERE

a) Study Diagrams Q4A1 and Q4A2. Describe and explain why the Earth's surface absorbs only approximately 50% of the solar energy received at the edge of the atmosphere. You should refer to both conditions in the atmosphere and at the Earth's surface. (8)

Diagram Q4A1: Global Heat Budget

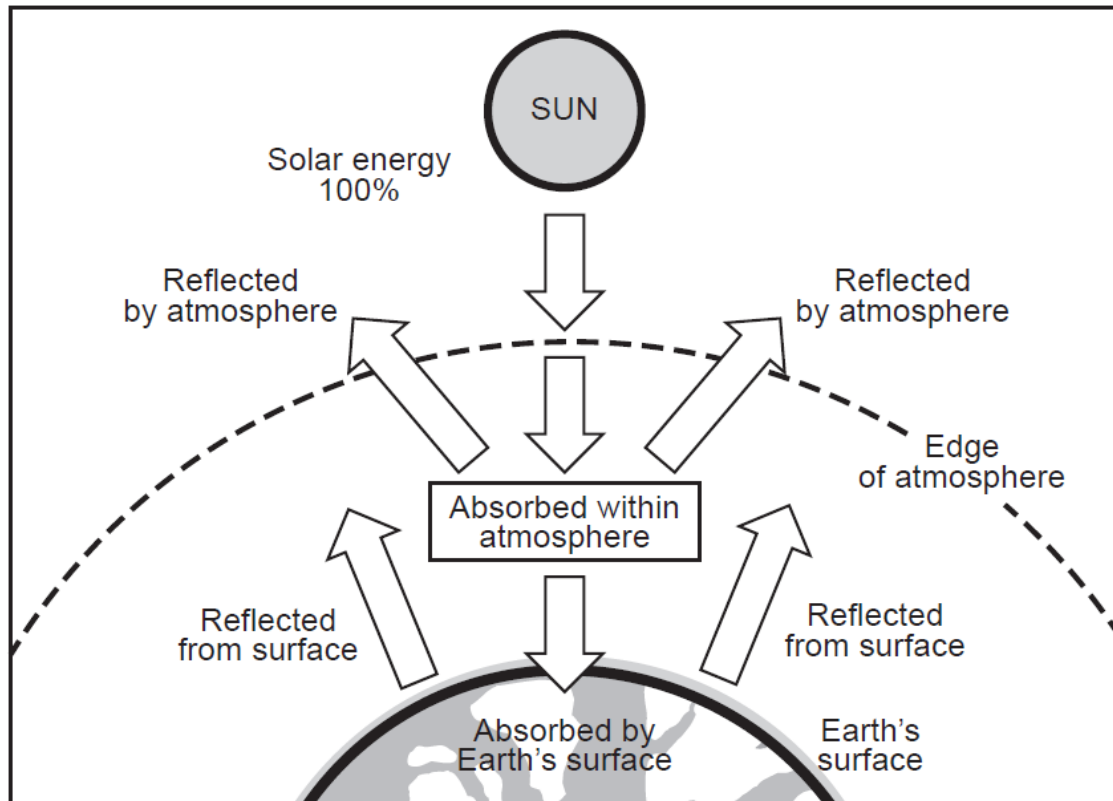
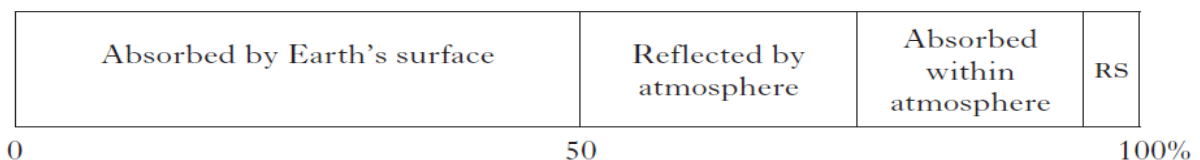


Diagram Q4A2: Proportion of Solar Energy Absorbed/Reflected



The earth's surface only absorbs about 50% of solar energy (1) because reflection and scattering reduces the amount of energy by about 31% (1). This energy is sent back into the atmosphere as long wave radiation (1).

Reflection therefore varies depending on cloud cover and the covering of the Earth's surface. This is known as the albedo effect (1). For example, snow at the poles reflects more radiation compared to darker forest areas which absorb more incoming radiation (1). About 17% is reflected by clouds and 8% is scattered by gas and dust particles, whilst 6% is reflected from the Earth's surface (1).

Absorption by the atmosphere reduces the solar energy by approximately 19% (1). This is because 17% is absorbed by dust and gases, whilst 3% is absorbed by clouds (1).

b) Explain why there is a surplus of solar energy in the tropical latitudes and a deficit of solar energy towards the poles. (8)

There is a surplus of solar energy in the tropical latitudes as this is where the sun's rays are more concentrated (1). The sun's rays strike these areas at right angles; therefore the intensity of insolation is at its greatest (1). Sun's angle in the sky decreases towards the poles due to the curvature of the Earth, which spreads heat energy over a larger surface area. (1) Therefore, the sun's rays have less atmosphere to pass through at the tropics, so less energy is lost through absorption and reflection by clouds, gas and dust (1).

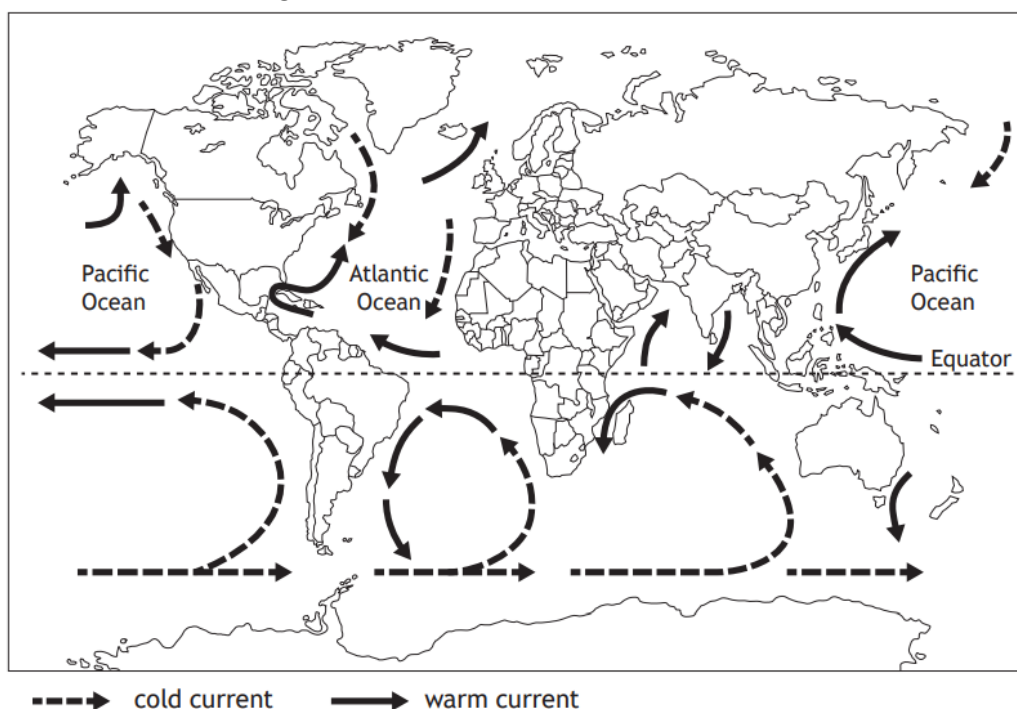
Tilt of the axis results in the Sun being higher in the sky between the tropics throughout the year, focusing energy. (1) No solar insolation at the poles for 6 months of the year, producing 24-hour darkness (1) so the tropics receive much more insolation throughout the year. (1) The albedo effect also makes a difference. More radiation is absorbed at the tropics due to the vast amount of dark forestry, e.g. the Amazon Rainforest (1).

c) Explain how circulation cells in the atmosphere assist in the transfer of energy between areas of surplus and deficit. (8)

The Coriolis Force causes Northern Hemisphere winds to deflect to the right, and Southern Hemisphere winds to deflect to the left (1). The equator has a surplus of energy as it is the hottest part of the Earth, so the air is warmer there and less dense (1). The warm air rises into the atmosphere, causing low pressure, and then travels to 30° N&S, where the temperatures are lower, so the air cools and sinks (1). Air returns to the equator, completing the Hadley cell (1). The Polar cell also redistributes energy. Air at the poles is very cold and dense and therefore sinks, causing high pressure (1). When it sinks to the surface it spreads out as wind (Polar Easterlies) to where it is then warmed by the Earth's surface and rises at 60° N&S (1). It then spreads out in the upper atmosphere and move pole wards, completing the Polar cell (1). Finally, some of the air that sinks at 30° spreads towards the poles as wind (South Westerlies) and meets cold air from the poles at 60° (1). The warm air rises over the cold air and cools in the upper atmosphere where it spreads North and South (1). This completes the Ferrel Cell (1).

d) Study Diagram Q4D. Describe the pattern of ocean currents for either the Pacific or Atlantic Ocean and explain how ocean currents redistribute energy around the globe. (8)

Diagram Q4D: Selected Ocean Currents



Description for Atlantic may include:

Currents follow loops or gyres (1), and move clockwise in the Northern Atlantic (1). Warm currents travel from the equator towards the Poles (1), for example The North Atlantic Drift (1). Cold currents return cool water from the poles (1).

Explanations may include:

The Coriolis Force deflects currents to the right in the Northern Hemisphere, and to the left in the Southern Hemisphere (1). Ocean currents are greatly influenced by the prevailing winds (1). Due to differing salinity levels density differences occur in water (1), resulting in chilled polar water sinking (1) spreading towards the Equator and displacing warm water pole wards (1).

e) Study Diagrams Q4E1 and Q4E2. Describe the origin and characteristics of the tropical maritime and tropical continental air masses. (6)

Diagram Q4E1: The Intertropical Convergence Zone (ITCZ)

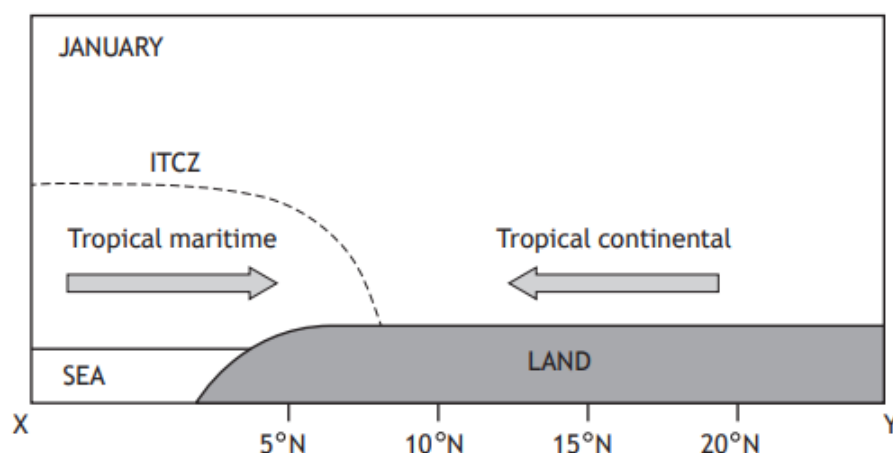
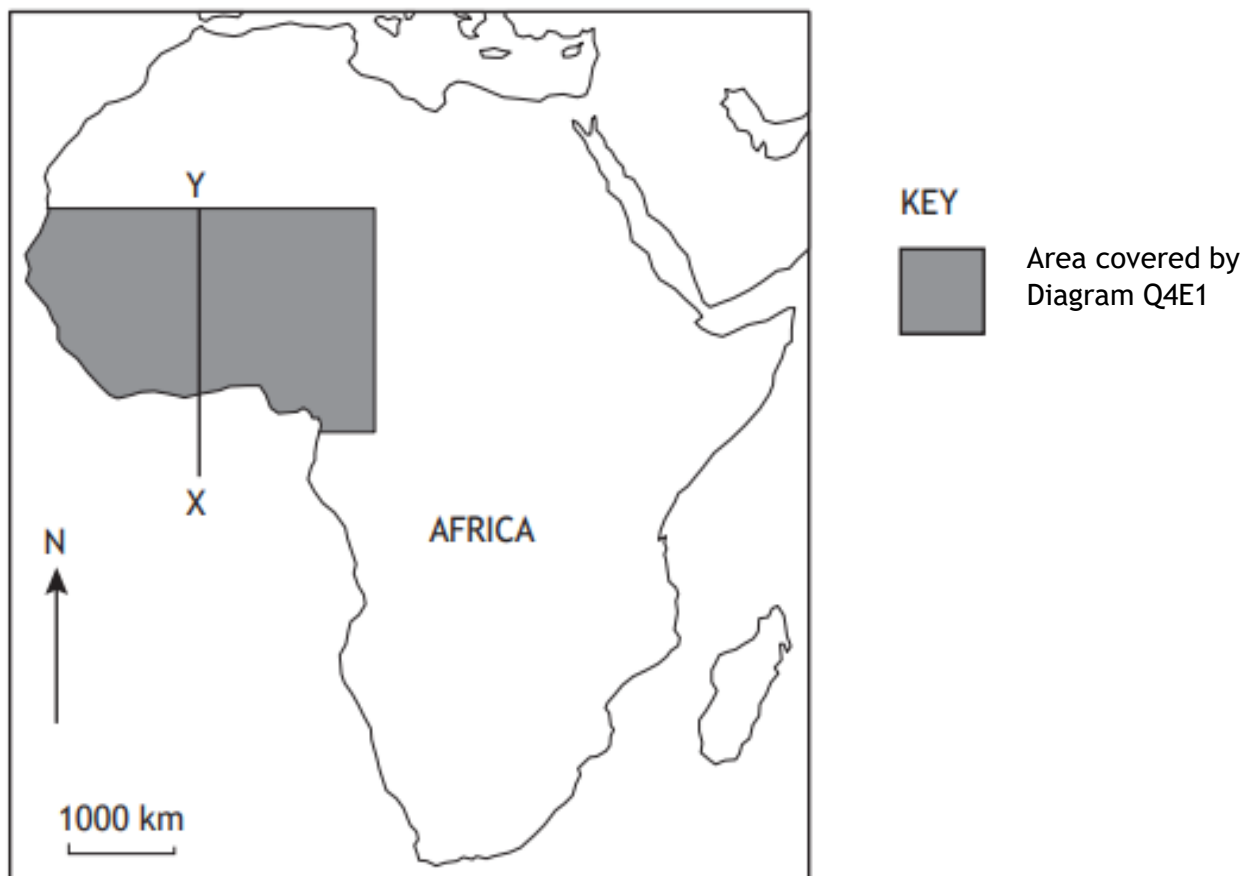


Diagram Q4E2: Location of section X -Y



Tropical Maritime (mT):

Origin is the Atlantic Ocean (1). The weather characteristics are hot, (1) unstable air (1) with high humidity (1), and high precipitation (1).

Tropical Continental (cT):

Origin is the Sahara Desert (1). The weather characteristics are very hot (1), low precipitation (1), and stable air (1) with low humidity (1).

f) Study Diagrams Q4E1, Q4E1, Q4F1 and Q4F2. Referring to the position of the ITCZ:

- (i) Describe the changing rainfall pattern as you move inland from Abidjan to Nioro and
- (ii) Suggest reasons for these differences.

Diagram Q4F1: West Africa - mean annual rainfall

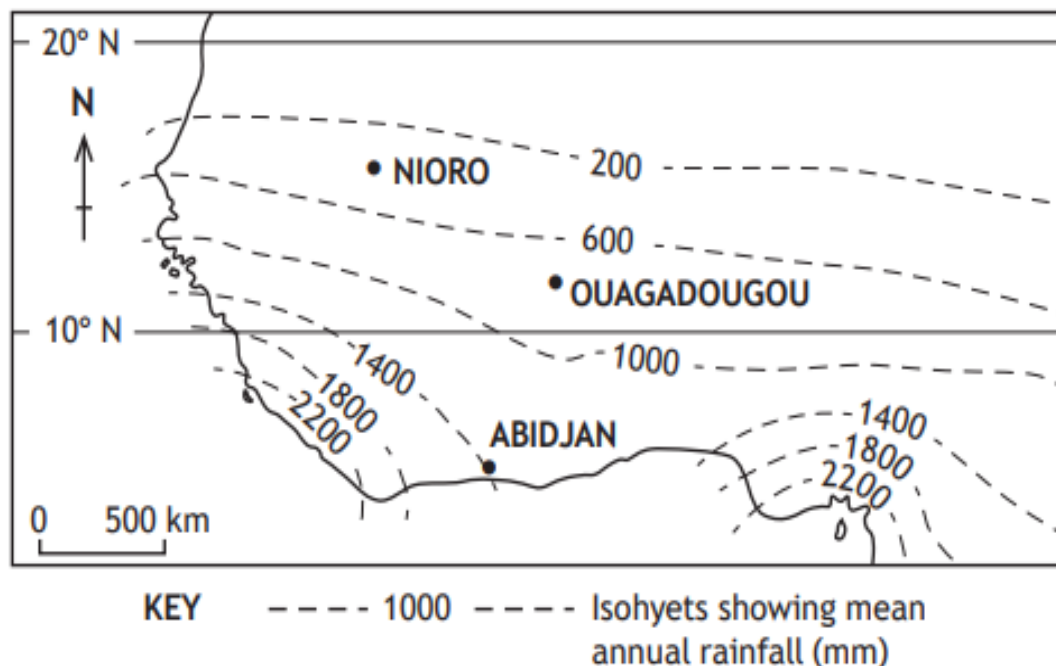
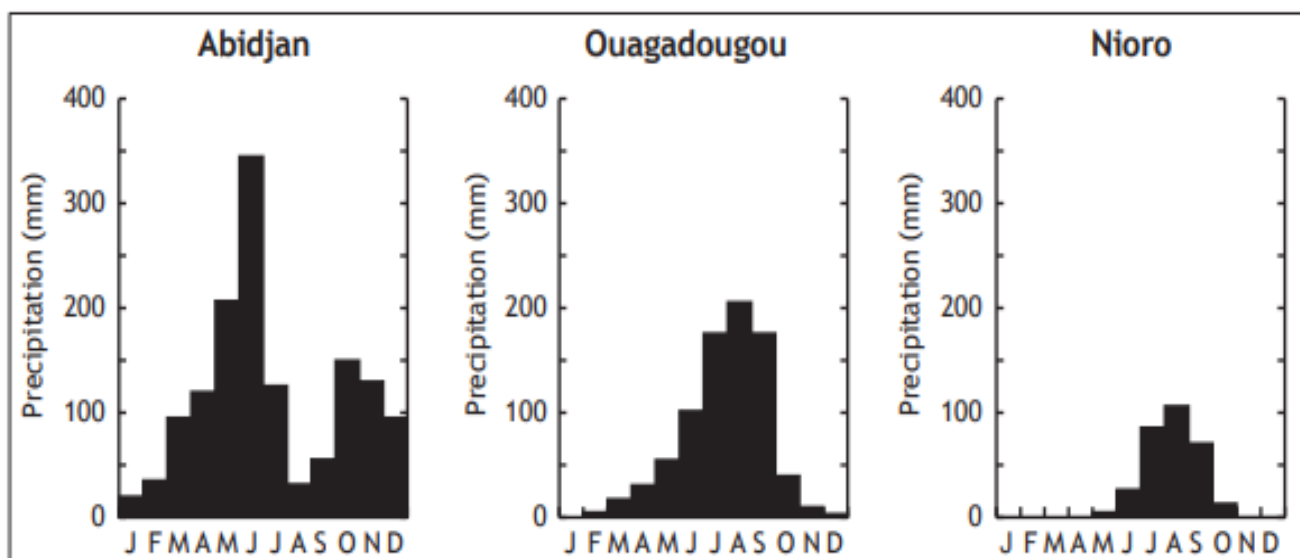


Diagram Q4F2: West Africa - selected rainfall graphs



Descriptions may include:

The north is very dry with a much wetter south (1) as Nioro has only 305mm of rainfall but Abidjan has 1390mm (1). Ouagadougou has a clear wet season/dry season, whereas Abidjan has year round rainfall (1). Abidjan has a twin-peak graph whereas the other areas have only one peak (1). Abidjan's peak rainfall is in June, whereas this is later as you move north - August in Nioro (1). Abidjan has a peak of 350mm whereas Nioro's is approximately 100mm (1).

Explanations may include:

The ITCZ is an area of low pressure where the trade winds meet (1). A band of rainfall is created where the two air masses meet pushing the maritime air up, cooling and condensing to form clouds (1). The twin precipitation peaks can be attributed to the ITCZ moving northwards in the early part of the year and then southwards later in the year (1) in line with the overhead sun (1). Abidjan on the coast is influenced by mT air for most of the year so is very wet (1). Nioro, on the other hand, is under the influence of cT air for most of the year so is very dry (1).

Section 2: Human Environments

POPULATION

Discuss different methods used by countries to collect population data. (6)

- census is a survey carried out every 10 years (1 mark)
- each householder is asked to complete a detailed questionnaire about the number of people living in their home (1 mark)
- householders answer other questions on their social, economic and cultural background (1 mark)
- civil registration of births, deaths (1 mark) provides an up-to-date count between censuses (1 mark)
- Scottish Household Survey is a continuous survey (1 mark) based on a random sample of the population (1 marks) which is cheaper than carrying out a full census (1 mark)
- governments also collect data on migration, for example visa applications (1 mark) and NHS records provide health data. (1 mark)

Referring to countries you have studied, explain why it is difficult to gather accurate population data in developing world countries. (12)

- countries with many official languages have to translate their census forms (1)
- countries have to employ enumerators who can speak multiple languages. (1) Nigeria has six major languages and hundreds of unofficial languages (1)
- low literacy levels - people are unable to complete the forms (1)
- size of the population - the sheer size of some populations makes it very difficult to conduct a census (1)
- inaccessibility makes some areas very difficult to reach within the time frame. (1) For example, Indonesia has many islands spread over a large area (1)
- conflict can make it too dangerous for enumerators to enter (1)
- data can quickly become out-of-date due to the high death rate (1)
- cost - in developing countries, there may be higher priorities for spending, such as health (1)
- many people in developing countries may be living in shanty towns so have no official address (1)
- ethnic tensions and internal political rivalries may lead to inaccuracies (1) for example, northern Nigeria was reported to have inflated its population figures to secure increased political representation (1)
- illegal immigrants wish to avoid detection, (1) for example Burmese migrants in Thailand (1)
- Nomadic people may be missed or counted twice as they cross international borders. (1)

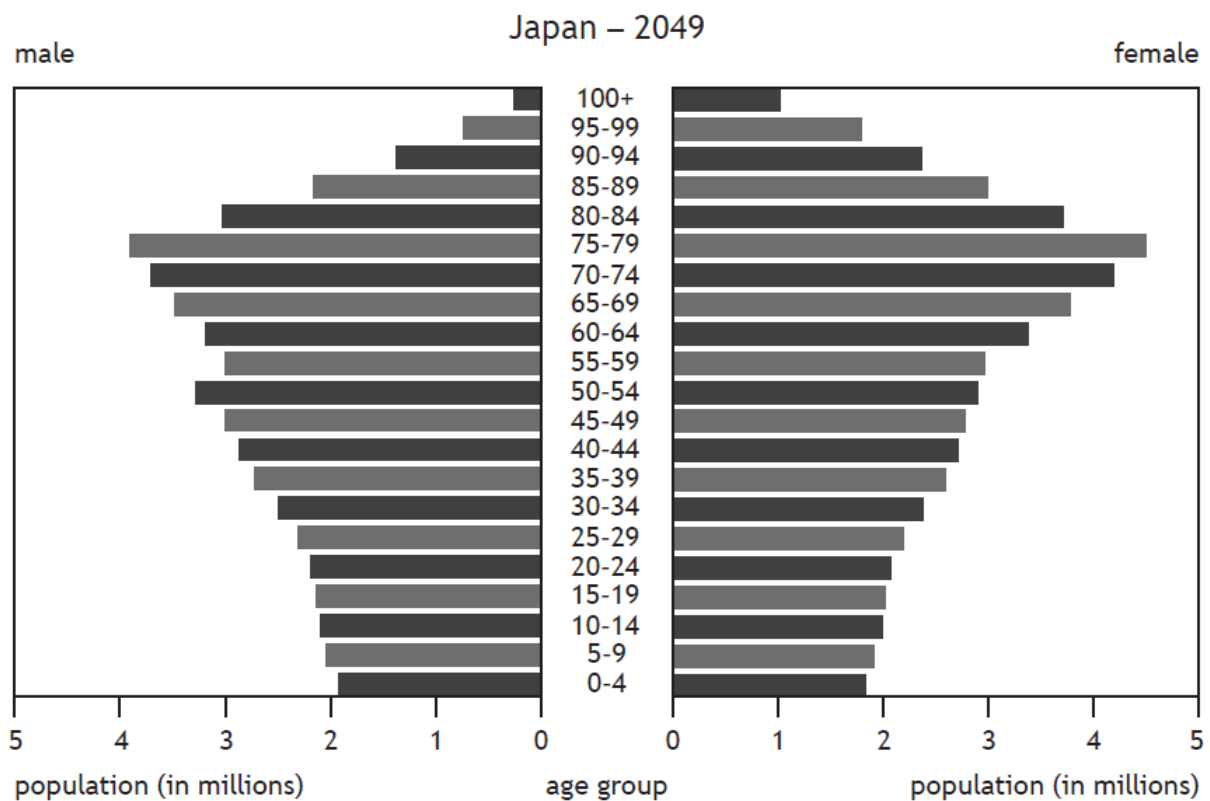
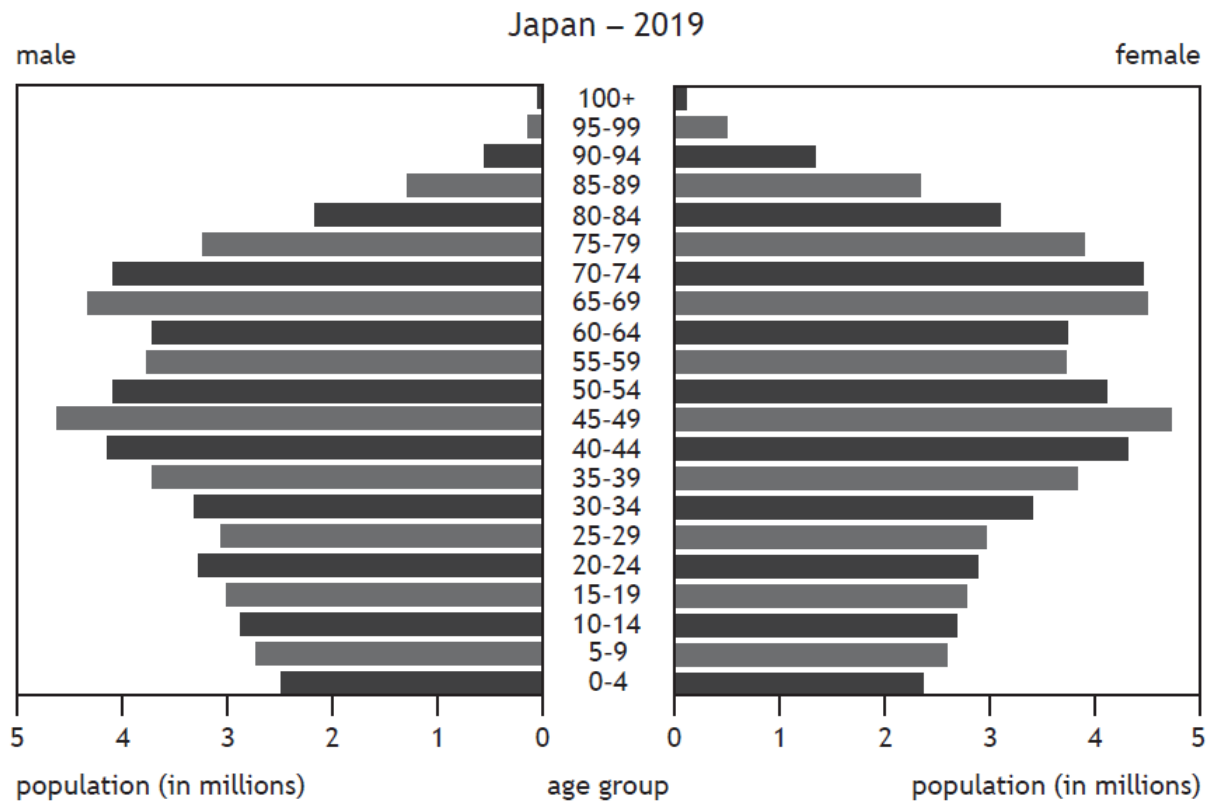
Study the diagrams below.

Japan's population structure is projected to change in the next 30 years.

Discuss the possible consequences of these changes.

(9)

Population pyramids for Japan 2019 and 2049 (projected)



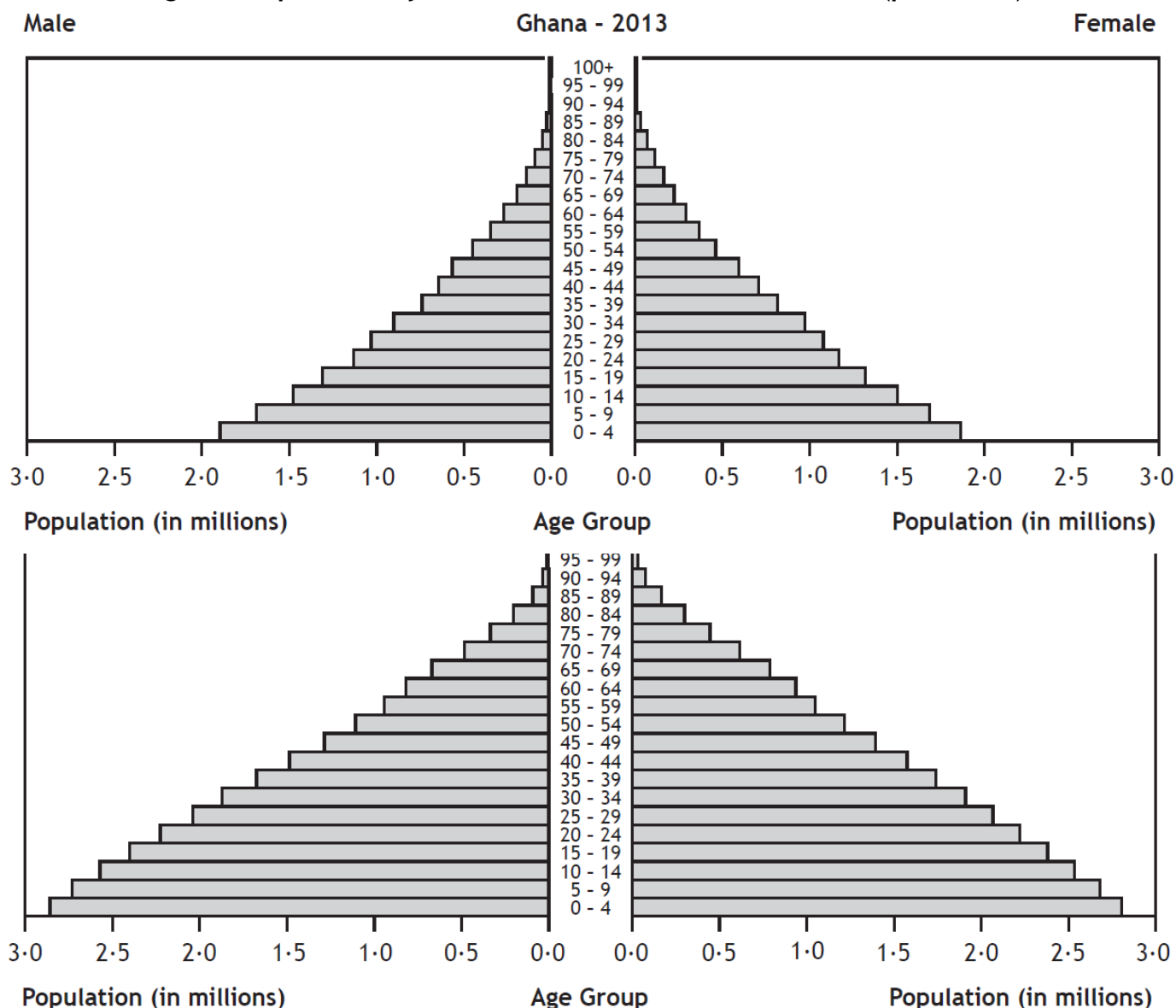
- the increase in elderly will lead to an increased cost of pensions to the government (1 mark) and increased tax contributions for the economically active population (1 mark)
- in-migration may need to be encouraged (1 mark) which may lead to tension between different cultures and or ethnic groups (1 mark)
- the retirement age may need to be increased (1 mark) and more services for older people provided, such as care homes (1 mark)
- there may be a lower unemployment rate in the future (1 mark) however a decrease in the economically active population may lead to a skills gap (1 mark)
- citizens may be encouraged to invest in private healthcare schemes and/or pensions (1 mark)
- the falling birth rate may lead to a decline in demand for services for children such as schools (1 mark)
- there will be an increased strain/costs on the Health Service to meet the needs of the ageing population (1 mark) for example more hip-replacements or heart medication (1 mark)
- there may also be more demands placed on adult children to care for elderly parents (1 mark)
- there may be an increase in robots doing the jobs of people. (1 mark)

Study the diagrams below before answering this question.

Discuss the possible consequences for Ghana of the 2050 population structure.

(9)

Diagram: Population Pyramids for Ghana in 2013 and 2050 (predicted)



Possible answers may include:

- The total population will increase significantly putting additional pressure on services like housing (1) which will add to the problems of overcrowding in many developing world cities (1) This may result in people being forced to live in shanty town / slum housing (1) with poor levels of sanitation leading to rapid spread of disease. (1).
- There will be a much larger potential workforce which may attract investment from multinational companies (1) which may create jobs and improve infrastructure (1). An increase in the active age group, however, could also result in higher levels of unemployment (1) which could lead to poverty (1).
- There will be twice as many children, so significant investment in maternity hospitals, immunisation programmes and education will be needed (1) otherwise many children may not receive an education - which lowers literacy rates (1) and would also hinder the future development of the country (1).
- It will be necessary to build more schools and train more teachers to support the growing number of young people (1). Ghana might struggle to finance this growing demand for childcare services such as midwives and education (1) and it will remove finance from other priority areas of development. (1)
- Government policies may need to promote smaller families similar to China's drastic One Child Policy (1). Or they could encourage emigration to reduce the problems of over-population (1).
- With life expectancy increasing, it will also be necessary to invest in healthcare to meet the needs of an ageing population in the future (1).
- A bigger population could put a strain on food and water resources (1) meaning that land is farmed more intensively leading to degradation (1). This may result in famine and death (1).

With reference to a migration flow you have studied:

- (a) explain the push and pull factors for this migration; and (8)
- (b) discuss the impacts of this migration on either the donor or the receiving country. (8)

(a) For Poland to Scotland (Voluntary Migration):

Push factors

- Not enough jobs with very few opportunities for example in 2014 the unemployment rate in Poland was around 14%. (1)
- Low paying jobs resulting in a low standard of living for example poor quality housing. (1)
- State benefits are very low compared to Scotland and the UK and also the healthcare in Scotland is free at the point of delivery. (1)
- Due to increased mechanisation/privatisation of farms rural unemployment has risen. (1)

Pull Factors

- Due to Poland joining the European Union, this allowed people to move freely with unlimited migration. (1)
- The exchange rate meant that the sterling conversion into zloty was favourable and meant that people could send money back to family members in Poland. (1)
- There were plenty of available jobs in parts of the economy such as in construction and trades such as plumbers and electricians. (1)

(b) For Poland to Scotland (Voluntary Migration):

Impacts on donor country:

- Fewer people means less pressure on limited resources like good quality housing and healthcare allowing living standards to improve. (1)

- This will also help reduce the unemployment rates for the country and migrants return with new skills. (1)
- Birth rate is lowered as male migrants are away so there will be a decline in the population further reducing strain on resources. (1)
- Migrants often send money home to their families meaning people have more money in Poland helping to improve standard of living. (1)
- The most educated and healthy leave which could hinder development and it tend to be older population that stay behind. (1)
- Active and educated population left ('brain drain') resulted in skills shortage in donor countries. (1)
- Families were divided and the death rates may increase due to the ageing population. (1)
- Family members remaining in the country of origin may become dependent on remittances being sent home by migrant workers. (1)

Impacts on receiving country:

- The government receives tax from migrant workers who are doing jobs that British people will not do due to low wages and unsociable hours, including fish processing, farm work and cleaning. (1)
- Generally, migrants are perceived as hard workers and many are highly skilled (e.g. engineers) and /or graduates so brought sought after skills during the UK construction boom. (1)
- The language barrier and cultural differences can lead to racial tension with ethnic groups tending not to integrate which can add to the tension. (1)
- May lead to the development of over-crowded, multi occupancy accommodation (in other instances, ghettos) due to the pressures on housing in certain areas. (1)
- The education system may become strained due to the number of children for whom English is not their first language. (1)
- Due to the number of migrants entering Scotland this can lead to increased unemployment rates as a knock-on of the economic downturn which can add to resentment of migrants (1)
- Positives for a multicultural society (e.g. language, food, music) would include Polish shops or aisles in supermarkets as well (1)
- Because migrants will often work for lower wages this reduces labour costs for companies and the tax paid by migrants can also be used by government to invest in local services (1).

(a) For Syria (Forced Migration):

CAUSES

- I have studied the forced migration of Syrians. The main cause of the migration is because of a civil war that broke out in March 2011 between demonstrators and President Assad's regime (1).
- As a result of this, neighbourhoods and cities are being bombed on a daily basis which is causing Syrians to escape the bombs for their own safety (1). As a result of all this conflict, Syria's economy is crippled with chronic high unemployment (~40%) so Syrians want to get away from the lack of jobs (1).
- A further reason Syrians have been forced to migrate is the lack of food and medical care available in Syria - this means people are moving in search of a stable food supply and better medical care (1).
- Countries such as Lebanon are attractive to Syrians because Lebanon has a strong economy thereby making the chance of a job much likelier (1).
- Also, many Syrians have already migrated to Lebanon and Jordan and therefore this is another reason for Syrians to join their families and escape the war (1).

IMPACTS

The forced migration of Syrians to neighbouring countries has had a number of impacts on Lebanon, Jordan and Turkey:

- The countries have established refugee camps, e.g. Zaatari in Jordan (1) which put financial pressure on the countries to provide water, clothes, food and shelter to Syrian refugees - \$500,000 per day for Zaatari! (1)
- Also, these host countries now house a lot of orphaned children who have either had parents killed or separated as a result of the Syrian conflict. (1) This poses a problem for social services in Lebanon for example as they try and look after these orphans. (1)
- A number of Syrian refugees are not at refugee camps at all and instead have headed to urban areas which has put huge pressure on local health and education services. (1)
- In fact, in Lebanon, some schools have now started sending Lebanese children home at lunch so that they can then teach Syrian children in the afternoon (1) - this has a detrimental effect on the education provided to Lebanese nationals and could see literacy rates drop. (1)
- Housing services in cities of these host countries have also been stretched and house prices trebling (1) as Syrian refugees increase the housing demand - there has even been reports of Lebanese citizens being evicted from their homes. (1)
- As such, there is a building of resentment between the nations and towards Syrians, especially as Syrians are seen to be costing natives their jobs as Syrians are willing to work for much lower wages. (1)
- There is the fear that the conflict is “spilling over” into Lebanon and this is becoming apparent as weapons are smuggled through Lebanon and also there was a suicide bombing in Beirut in 2015. (1)
- The only real benefits to the host countries of these refugees is that aid agencies (e.g. UNHCR) (1) are bringing money into the area which could then help improve the local economy. (1)

RURAL

Rural land degradation has many impacts on people and the environment.

Explain the impacts of rural land degradation on a semi-arid or rainforest area you have studied. (8)

Award a maximum of 1 mark for a specific named example of a tribe, city, region within a country or event.

For Africa, north of the Equator (Sahel region)

- Loss of fertile topsoil leading to the inability of the land to support vegetation. (1)
- RLD can lead to crop failures and the death of livestock (1) which can cause an increase in malnutrition and starvation (1) which in turn can detrimentally impact child development (1)
- there may be large-scale migration (1) into overcrowded urban areas, causing more pressure and the growth of shanty towns (1)
- migration can also lead to conflict between ethnic groups as people move (1) for example Darfur (1) leading to the growth of large refugee camps (1)
- countries are becoming increasingly reliant on international aid (1) or paying back high interest loans (1)
- the soil structure deteriorates as there are no roots to bind it so wind erosion blows it away (1) e.g. Harmattan wind of North Africa (1) causing the advance of the Sahara Desert – desertification. (1)
- Economically, farmers have lost their income as a result of poor crop yields (1) meaning they can no longer afford to pay for their basic needs, such as schooling. (1)
- The collapse of the nomadic way of life due to the lack of grazing and water forcing many nomads to settle in villages increasing pressure/tension in these areas (1) (e.g. Tuareg people moving into Libya) (1)
- Heavy infrequent rain storms can wash away soil, turning semi-arid areas into deserts. (1)
- Torrential rain can also lead to widespread gullying which is impossible to rectify - further loss of precious farmland. (1)
- As the land deteriorates it becomes harder for the soil to retain water from rainfall and thus the water table is lowered. (1) The impact of this is that it becomes even more difficult to access clean underground freshwater for drinking (1).

Explain (or evaluate) the strategies used to manage rural land degradation in a rainforest or semi-arid area that you have studied. (8)

For the Sahel:

- afforestation projects such as the Great Green Wall (1) reduce wind erosion and prevent soil erosion as the tree roots bind the soil and hold it in place (1) However, the current and anticipated cost of the Great Green Wall project has been heavily criticised; it is out of the reach of most developing nations (1).
- Larger trees are often planted in lines perpendicular to the prevailing wind. This prevents the wind from blowing away the nutrient rich top soil, protecting against desertification. (1)
- In places in the Sahel the kad tree has been planted to restore soil fertility and productivity. (1) This has been effective as its leaves help to shade the soil and provide an additional source of nutrients in the form of decaying leaf litter. (1)
- Drought-resistant shrubs and plants are planted. These succeed in areas with limited access to water/low rainfall. The roots of the plants bind the soil and prevent erosion by heavy rain. (1)

- Fanya juu terraces (popular in Makanya in north-eastern Tanzania) have been made by digging a drainage channel and throwing soil uphill to make a ridge to increase infiltration (1) In drier areas, trees can be planted in the ditch, and in wetter areas on the ridge to increase infiltration (1). This low technology approach has been particularly successful. However, maintaining the terraces is very labour intensive (1).
- Diguettes or 'Magic Stones' are lines of stones placed along the contours of gently sloping land to trap rain water as well as soil (1) This is very cost effective and communities in Mali and Burkina Faso have seen crop yields increase by as much as 50%. (1)
- Stone lines can be placed at the bottom of slopes and when overland/surface flow moves sediment it is trapped. Locals then rake this material back over the source area, minimising land degradation. (1) This is particularly useful following the seasonal rainfall in the Sahel caused by the ITCZ which causes surface run-off (1).
- Moveable fencing allows farmers to control grazing area allowing soil to recover at different times of the year (1)
- Controlling grazing by spreading around feeding and water stations prevents animals from trampling on the ground, which can compact the soil and lead to higher rates of erosion. (1)
- Grazing can also be controlled through the reduction in the size of a herd. A reduced herd will decrease grazing pressure and the impact of soil compaction. (1) This is very difficult to implement as traditionally the size of one's herd was a sign of masculinity and wealth and therefore herders may be resistant to change. (1)
- Zai (microbasins, or planting pits) are hollows dug to retain moisture and nutrients which is effective at increasing infiltration/reduces run-off (1).
- Educating farmers about the causes and consequences of rural land degradation can help change detrimental practices. (1) For example, farmers could be educated on crop rotation or appropriate irrigation techniques such as drip irrigation. (1) Crop rotation ensures that the same nutrients are not always taken from the soil. This allows the soil to recover and the cultivation of various crops that harvest at different times maintains vegetation cover. (1)
- Small-scale schemes to improve irrigation (e.g. build wells) bring greater water security to areas (1). This encourages natural vegetation to grow. Native species can also be reintroduced to increase the amount of vegetation. (1)
- Large-scale dams are also constructed in some areas to ensure regular water supply but these are extremely expensive and can have negative environmental consequences. (1)

Rural areas have a number of competing land uses which can create conflict.

Referring to a glaciated or coastal area you have studied, discuss the conflicts caused by the various land uses. (12)

Award a maximum of 2 marks for specific named examples within the chosen area.

A maximum of 11 marks should be awarded if the answer does not clearly relate to a specific case study.

For Loch Lomond and the Trossachs, points may include

- traffic congestion on narrow rural roads (1 mark) leads to high levels of air and noise pollution (1 mark)
- tourists park on grass verges leading to erosion (1 mark) for example Luss (1 mark)
- tourists wander off footpaths widening them (1 mark) and stone walls can be damaged by people climbing over them (1 mark)
- litter if eaten by wildlife or livestock can harm or kill (1 mark)
- tourists leave gates open causing farm animals to escape (1 mark)

- dogs off leash can worry sheep leading to miscarriages (1 mark) this will reduce the farmers income (1 mark)
- speedboats on Loch Lomond can erode beaches (1 mark) and oil from engines can harm aquatic life (1 mark)
- quarrying rock can produce large quantities of dust (1 mark) for example CEMEX Cambusmore Quarry (1 mark) which can settle on plants stunting their growth (1 mark)
- this can also lead to visual pollution in spectacular landscapes (1 mark)
- tourists buying second homes pushes prices up for locals (1 mark) and can lead to rural depopulation, (1 mark) which can reduce demand for local services which may close. (1 mark)

Many glaciated and coastal areas have competing land users which can create conflict.

Referring to a glaciated upland or coastal area you have studied:

- explain the strategies used to manage these conflicts and**
- comment on the effectiveness of these strategies. (10)**

For example: Loch Lomond & the Trossachs:

- litter bins in remote areas are removed because it is difficult to empty them regularly. (1) This has been found to encourage people to take their litter home (1)
- A full time litter prevention manager has recently been appointed to help reduce litter (1)
- The National Park Authority and farmers can put up signs such as “Keep Your Dog on a Lead” and “Remember to Close Gates Behind You” (1)
- Visitor Centres such as the one in Balmaha (1) can educate people on how to be responsible when in the great outdoors and leaflets such as the Scottish Outdoor Access Code (1) can be distributed to visitors so that they are aware of how to act responsibly and respect other users in the Loch Lomond area (1)
- traffic restrictions such as one-way streets and limited waiting times have been introduced to encourage the flow of traffic. (1) They have had limited success as people prefer the convenience of their own vehicles (1)
- farmers’ fields can be used as temporary car parks to reduce on-street parking (1) This is successful because farmers buy into the scheme due to increased income (1)
- Luss Estate have approved plans for a bigger car park with 240 spaces (1) This should therefore reduce the amount of on street / illegal parking (1). However, this could also encourage even more people to bring their car into the National Park area which is already congested at honeypot sites (1).
- planting trees around unsightly developments can shield them. (1) However, trees take a long time to grow therefore this is not a short-term solution (1)
- ‘Fix the Fells’ (1) pitching technique using local stone improves the aesthetic appeal and durability (1) - local stone blends in with the landscape (1)
- speed limits have been imposed on water users to reduce wake, (1) for example Loch Lomond, (1) however this has only served to move the users to other lakes in the area. (1)
- All boats using the loch must be registered with the National Park allowing them to monitor them (1).
- Camping byelaws have been introduced in 2017 to clamp down on the amount of irresponsible camping (1) This involves campers having to pay £3 for a permit to camp in popular camping areas around the loch from March to September (1) therefore allowing the National Park Authority to monitor camping activities and reduce litter and associated campfire damage in areas (1).

URBAN

Explain why there is a need to manage housing in a developed world city you have studied. (8)

- Many of Glasgow's old tenements were built in late 18th/early 19th century and require costly renovation (1)
- Scotland's ageing population has led to a lack of affordable family homes in the city (1)
- The average house prices in Glasgow are 4 or 5 times higher than average earnings (1)
- Many young people struggle to afford a first home due to the rising housing costs (1)
- The private rental market has increased and many young people and families now rent and struggle to save enough to buy a house (1) plus rents continue to increase making housing even more expensive (1).
- Some rented properties are not invested in properly by landlords who cut corners and therefore the housing quality is poor (1) e.g. in Govanhill (1)
- Homelessness has increased in the city partly due to a lack of affordable social housing (1)
- An increased capacity at Glasgow three universities has led to a demand in student accommodation in the city (1)
- Glasgow's population continues to increase due to rural to urban migration which puts more pressure on housing sector (1)

'Newcastle City Council has announced plans to invest millions of pounds to improve housing in Newcastle by 2021'.

Explain (or evaluate) the strategies used to manage housing problems in a developed world city you have studied. (8)

Award a maximum of 1 mark for a specific named strategy within the chosen area. A maximum of 6 marks should be awarded if the answer does not clearly relate to a specific case study.

For Glasgow answers may include

- new tenement style housing has been built to create a community spirit (1 mark)
- high rise flats demolished due to damp antisocial conditions (1 mark)
- all the houses were architecturally designed with some of the houses representing the area's heritage (1 mark) which attracted people with a higher income to move to the area increasing the social and economic mix (1 mark)
- public art has been used on the housing to help improve the attractiveness of the area (1 mark)
- a new leisure centre was built to improve life expectancy in the area (1 mark)
- the Legacy Hub (1 mark) is a new and improved community centre to meet the demands of the community (1 mark) it includes everyday services such as dentist and a café (1 mark)
- housing associations receive government grants to build more affordable housing (1 mark)
- new energy efficient homes built (or refurbished) to lower energy bills (1 mark) for example Athletes village in Dalmarnock. (1 mark)

Explain why there is a need to manage transport in a developed world city you have studied. (8)

- Air quality in Glasgow's CBD is poor which can lead to increased respiratory diseases (1) e.g. Hope Street most polluted street in Scotland (1)

- Growing population of Glasgow due to rural-urban migration leads to a greater pressure on road network (1) public transport therefore needs to be prioritised for mass transit of people (1)
- Glasgow's CBD was developed in the pre-car era with medieval/Victorian sections unsuited for modern traffic (1) The CBD streets are narrow, cobbled, grid-iron pattern with many junctions. (1)
- Increased commuting from dormitory towns and villages due to more people living in the suburbs (1) leads to converging on a few main roads (e.g. Great Western Road)
- Major roads have to converge to cross the river Clyde, leading to bottlenecks at bridges over the rivers (1) e.g. Kingston Bridge, Clyde Arc (1)
- Glasgow is a growing tourist/shopping centre attracting coach tours and shoppers which contribute to CBD congestion (1)
- Glasgow has major industrial areas at Hillington Industrial estate (1) leading to large amounts of commuters outwith the city centre (1)
- Thousands of car journeys per day in Glasgow are generated by through traffic, clogging up city streets unnecessarily (1) such as at Charing Cross section of the M8 (1)
- More strict traffic regulations in and around the CBD and a shortage of car parking facilities leads to unnecessary traffic flow as people search for parking (1)
- Growing car ownership, related to high disposable income (1) and increased number of 2 (or more) car families results in >50% of employed people in Glasgow travelling to work by car (1)
- Increased road haulage/deliveries in larger vehicles creates a need for road maintenance due to increased traffic flow and weight of modern lorries (1)
- Increased use of private transport to do 'school run' extending and expanding rush hours (1)
- Increase in number and size of lorries and buses which often find it difficult to manoeuvre in outdated road network, delaying other traffic (1)

Explain (or evaluate the effectiveness of) the strategies used to manage traffic in a developed world city you have studied. (7)

- Pedestrianisation of CBD roads e.g. Buchanan Street (1 E.G.) increases the safety of pedestrians in shopping areas (1) and also improves the air quality of the environment as there is less pollution (1).
- One-way streets are successful in reducing waiting times at junctions (grid-iron street pattern) (1) and also allow more lanes of traffic which improves the traffic flow. (1)
- Bus lanes help speed up public transport journey times (1) which make it more efficient and so discourage the use of private transport (cars). (1)
- Installing free Wi-Fi on buses/trains may encourage more people to travel by public transport as they can work on their commute (1) however many people prefer the convenience of using their own car especially in poor weather (1).
- Parking restrictions (e.g. double yellow lines) and fines have reduced the amount of on street parking (1) which allows the streets to be wider allowing more space for cars. (1)
- Bus lane cameras have been introduced such as on Glassford Street (1 E.G.) meaning that buses are more reliable and faster (1) whilst also putting people off bringing their car into the city as they may be fined £60 (1).
- New links to motorway extensions e.g. the M74 (1 E.G.) help bypass already heavily congested areas (1) and has removed unnecessary through traffic from bottlenecks such as the Kingston Bridge. (1)
- Queen Street station (1 E.G) is currently being upgraded with longer platforms so more people can use trains (1) and electrified lines mean the trains are much quicker and more reliable (1).

Rapid urbanisation in developing world cities has resulted in many housing problems.

Referring to a developing world city you have studied:

- (a) discuss the socio-economic and environmental problems associated with housing in shanty towns. (6)**
- (b) explain (or evaluate) strategies used to manage these problems. (8)**

(a)

For Rio:

- Overcrowded dwellings lead to lack of privacy (1)
- Lack of public utilities such as sewage systems or power (1)
- lack of basic facilities such as schools, water (1)
- High incidence of disease (1), e.g. cholera from ingesting dirty water and contaminated food (1).
- Inadequate drinking water supply and contamination of water pipes (1) – next to the open sewers are water pipes, which can crack and take in sewage (1).
- Located on hillsides prone to landslides / collapsing (1).
- High crime rates with drug lords / criminal gangs running favelas (1)
- high rates of unemployment (1)
- unsightly dwellings made from scrap materials (1)
- often built without legal permission (1)

(b)

For Rio

- Site and service schemes has planned and managed improvements such as upgrading mains sewerage (1) to help reduce diseases such as cholera (1). E.g. Favela-Bairro project (ex1)
- Self-help schemes support the efforts of local people to improve their housing (1) for example by adding an additional floor to buildings thus reducing overcrowding (1).
- Residents have been given legal rights to land (1). This encourages further self-improvement and longer-term planning by residents and has been successful in Rocinha. (1)
- Residents have been supplied with building materials to strengthen/make safe the housing (1). This reduces the risk of weather-related property damage or fires in wooden properties. (1)
- Houses in the Rocinha shanty town have been connected to water and electrical supplies along with sewage pipes, improving the quality of life for residents. (1) This means that the risk of disease spreading in an overcrowded area is reduced. (1)
- Some shanty towns have been cleared and replaced with high-rise apartments (1) but this has not been entirely successful as many of the poorest residents are unable to afford the rent and end up living in more peripheral areas. (1)
- Roads have been improved and tarred in areas such as Rocinha to allow rubbish collections. (1)
- Pacification is when Pacifying Police Units (ex1) enter favelas an remove drug lords to make them safer and reduce crime (1).

Explain why there is a need to manage transport in a developing world city you have studied. (8)

- Rio has experienced an increase in car ownership of 40% in the last 10 years (1) this means that there are far more cars making journeys on the same road networks leading to pressure building on the network. (1)
- Rio has a lack of main roads accessing the city centre (1) this means that most cars wanting to get into Rio are all travelling on the same roads leading to traffic jams / bottlenecks. (1)

- Rio is situated with mountains around the North and to the West and the coast to the South/South East (1) this means that the transport network is hemmed in by these physical features leading to a lack of room to expand roads. (1)
- Rio also suffers from having few bridging points across Guanabara Bay (1) (Rio-Niteroi Bridge) which means that traffic travelling to and from Niteroi causes severe traffic congestion / bottleneck along the bridge. (1)
- Rio also has the National Park of Tijuca (1) situated to its West which means that if Rio was wishing to expand its road network, it would face great difficulty in building new roads in this area due to needing to conserve the National Park area (1)
- Rio suffers from air pollution in the CBD which can lead to respiratory illnesses (1)
- The amount of cars, motorbikes, buses, vans etc. increase the likelihood of road accidents (1)

For a developing world city you have studied, discuss (or evaluate) the management strategies used to reduce traffic issues.

(7)

Award a maximum of 1 mark for a specific named example within the chosen city. A maximum of 5 marks should be awarded if the answer does not clearly relate to a specific case study.

For Rio:

- Engie camera and traffic light system (1 EG) relays live images from traffic junctions to a central headquarters (1) allowing for real time adjustments of traffic signals (1) which are synchronised to help commuters catch green lights to increase traffic flow (1)
- Building the Rio-Niteroi Bridge (1 E.G.) across Guanabara Bay has shortened journey times and directed traffic away from the city centre (1) however at peak times the bridge can still get very congested due to the rise in car ownership. (1)
- New roads such as the Yellowline Expressway (1 E.G.) has connected the airport to Barra de Tijuca and this has reduced congestion by 40% (1) however during the FIFA World Cup in 2014 the Yellowline Expressway still suffered congestion due to the volume of traffic (1).
- The Rio Metro has recently seen a reduction in fares (equivalent to 60p for a single) to attract more people to use public transport and this has reduced the number of cars on Rio's roads (1). The Metro system has also had extensions and new stations added (1) such as Line 1 being extended to Copacabana (1) which has increased accessibility to areas and reduced the demand for buses along these routes (1).
- A new VLT tram system has been built to improve public transport (1) and this allows more people to travel without a car around the city centre (1).
- New BRT bus corridors such as the Transolimpica (1 E.G.) have been built which allow buses only to travel in them (1). This means that journey times by bus have been reduced and more people may take public transport (1).
- The Bike Rio Scheme (1 E.G.) introduced in 2011 has tried to bring sustainable transport to Rio meaning less pollution (1) and it has been extended as it has successfully increased bike usage and decreased car usage (1).

Section 3: Global Issues

DEVELOPMENT AND HEALTH

Referring to the HDI, or any other composite indicator you have studied, explain why it is a useful indicator of level of development. You should refer to named examples in your answer. (6)

OR

Explain why using only one development indicator, such as Gross National Income* (GNI) per capita, may fail to reflect accurately the true quality of life within a country. (6)

- The HDI is a composite indicator measuring aspects of health, education and economic activity (1). This wider approach to measuring development overcomes problems with narrow or single indicators by giving a more accurate picture on development. (1)
- Essentially single indicators are too broad/generalised and are averages (1) which disguise or distort wide internal variations e.g. urban v rural; male v female; north v south (1)
- Single indicators often hide wide variations within countries (1). For example, Saudi Arabia performs well in economic development measures (GNP) because of the oil industry/revenues, however wide inequalities exist between the rich and poor. (1) For example, in Brazil rural and urban areas differ greatly (1).
- Development is not only about money, other aspects of development like literacy and healthcare as well as freedom of speech, happiness and environmental quality etc. are also important (1).
- Single economic indicators do not take into account the fact that the value of money is different in different countries, and that it changes over time (1). Therefore countries may appear less developed and/or have a lower quality of life as \$1 will go a lot further and buy more necessities in some parts of the world. (1)
- Single indicators are too narrow and do not consider the role of the informal economy (1). E.g. in China subsistence agriculture remains common and is not yet monetized. This appears to devalue the economic output of China. (1)
- Only focusing on one development indicator does not give a rounded view of the level of development (1). A country may have focused on this one area and neglected other areas of development. (1)
- It is not possible to tell where a rise in GDP is being spent within a country - not always spent on improving standard of living (1).
- GDP per capita does not include any profits made by the country's multi-national companies operating in other parts of the world (unlike GNP) (1).
- Certain indicators are perhaps irrelevant to the real quality of life in many poorer ELDCs (1) e.g. TVs per household when there is no electricity supply. (1)

Diagram: Development indicators for selected developing countries

Country	Indicators of Development					
	GDP (US \$ per capita)	Employment agriculture (%)	Adult literacy (%)	Birth rate (births per 1000)	Life expectancy at birth (in years)	Hospital beds (per 1000)
Mexico	15,400	14	93	18	76	1.7
Brazil	11,700	16	90	15	73	2.3
Cuba	10,200	20	99	10	78	5.1
Kenya	1,800	75	87	30	63	1.4
Malawi	800	90	75	40	53	1.3

Study the table above before answering this question.

- (a) In what ways does the information in the table suggest that the five countries are at different levels of development? (4)
- (b) Suggest reasons for the wide variations in development which exist between developing countries. You may wish to refer to countries that you have studied. (6)

(a)

- GDP per person shows that Brazil, Mexico and Cuba are emergent developing countries with an intermediate level of income, while Kenya and Malawi are still classed as low income developing countries (1).
- Employment in agriculture is far higher in Malawi (90%) than Brazil at 16% so it is less industrialised (1).
- Adult literacy is far higher in Brazil, Mexico and Cuba than in Malawi suggesting they have more schools (1).
- Birth rate shows a vast difference in development with both African countries having high birth rates (Kenya - 30%); compared with Mexico at 18%, suggesting lack of contraception/education (1).
- There is also a large difference between the country with the poorest life - Malawi has a life expectancy of 53 whereas Cuba is 78, suggesting better health care. (1).

(b)

- some countries such as Saudi Arabia (1 EG) have natural resources such as oil, which can be sold to generate foreign currency (1)
- some countries are landlocked (e.g. and find it more expensive to export and import goods (1)
- a very hot and dry climate, which can cause desertification, makes it very difficult to grow crops to feed the population (1) e.g. sub-Saharan Africa (1 EG)
- some countries have beautiful beaches and scenery (e.g. Thailand) (1 EG), which attracts tourists creating job opportunities (1)
- countries with a poor education system have many low skilled workers and are unable to attract foreign investment (1)
- corruption in government such as in Zimbabwe (1 EG) can lead to money being used inappropriately for military purposes (1)
- the lack of strict pollution laws in parts of SE Asia has also made some countries more attractive for manufacturing industries (1)

- where countries suffer from conflict or civil war (e.g. Syria) (1 EG) they are unable to keep the economy working and spend extra finance on weapons (1)
- many countries suffer natural disasters which destroy infrastructure and wipe out efforts for development (1) for example hurricanes in the Caribbean (1 EG), flooding in Bangladesh (1 EG) or earthquakes in Haiti (1 EG).
- countries which have accumulated large debts have to repay loans and interest causing less money for services (1)
- famine can lead to malnutrition, and a reduced capacity to work and create income (1) such as in Burkina Faso (1 EG)
- countries around the tropics with hot and humid climates may suffer from malaria (e.g. sub-Saharan Africa) (1 EG) which leads to a sick population unable to work and generate money (1). They also have to spend extra money on investing in healthcare taking money away from other areas like education (1).

For malaria, or any other water-related disease you have studied, explain the human and environmental* conditions that put people at risk of contracting this disease. (8)

- The female *Anopheles* mosquito carries the disease and must be present (1). It occurs between the tropics where the temperatures are between 15 and 40°C (1). This is because the mosquito has adapted to warm, wet climates and this is its natural habitat (1).
- Areas of vegetation (trees) are required because they provide shade for the mosquito to rest and digest their blood meals. (1)
- Anopheles mosquitoes breed close to stagnant water as they require this type of environment to lay their larvae (eggs) e.g. ponds. (1)
- Constructions by humans, e.g. reservoirs and other man-made stores, irrigation channels and basic sewage works increase stagnant water for breeding (1).
- Rice is a main source of food in high density areas of the world and padi fields provide a breeding ground for the mosquito (1). The spread of malaria is increased where people work outside with exposed skin at dusk and dawn when mosquitoes are more active. (1)
- Malaria spreads in high population density areas where lots of humans act as a blood reservoir. (1) This allows mosquitoes to feed and reproduce successfully in high density areas e.g. SE Asia (1)
- The increase of global trade and tourism to afflicted areas can lead to the disease moving into new territories, leading to further spreading of malaria. (1)
- If people who suffer from malaria don't complete their course of drugs then this also increases the chances of malaria spreading as the parasite will still be in their body. (1)
- Housing in favelas can provide shade for mosquitoes to digest blood meals (1).
- An altitude below 3000m is also where you would find mosquitoes because any higher than this would make it difficult for the mosquito to survive as it is too cold (1).
- Poor education on how the disease spreads could increase the opportunities for the disease to spread. (1)

Water-related diseases such as malaria have many impacts on the development of a country. Referring to malaria, or any other water-related disease you have studied,

- (a) discuss the impacts on people and the economy and (6)
- (b) explain (or evaluate the effectiveness of) the strategies used to manage the disease. (14)

(a)

- high percentage of a family's income may be spent on doctors' visits/drugs (1)
- this reduces the amount of money which can be spent on food/education (1)
- breeding season of mosquitoes coincides with harvesting time (1) if families can't harvest crops, this leads to malnutrition (1)
- high proportion of nation's GDP is spent on combatting disease leaving less to spend on improving infrastructure (1)
- high levels of absenteeism leads to lower literacy rates (1) and this can lead to a less skilled workforce in the future (1)
- tourists may avoid the area reducing revenue from visitors (1)
- foreign companies may not invest in the area due to an unreliable workforce (1)

(b)

Award up to 2 marks where candidates give appropriate named examples which develop the answer, with a maximum of 1 mark should be awarded for a named example of each strategy

- one method used was to spray pesticides/insecticides on walls in homes in an attempt to kill the Anopheles mosquitoes. (1 mark) For example, DDT (1 E mark)
- breeding genetically modified sterile mosquitoes. (1 mark), these cause the species to die out (1 mark) Other GM mosquitoes are unable to carry the parasite (1 mark) these are dominant mosquitoes and would outcompete the others (1 mark)
- specially designed mosquito traps use CO₂ to mimic animals and humans (1 mark)
- BTI bacteria artificially grown in coconuts. (1 mark) The fermented coconuts are broken open after a few days and thrown into the mosquito larvae-infested ponds. (1 mark) The larvae eat the bacteria and have their stomach lining destroyed (1 mark)
- putting larvae-eating fish into stagnant ponds or padi fields, (1 mark) such as the muddy loach (1 E mark)
- flushing reservoirs every seven days (1 mark) as it takes longer than this period of time for the larvae to develop into adult mosquitoes (1 mark)
- planting eucalyptus trees can help soak up excess moisture (1 mark) and reduce the amount of stagnant water/remove the breeding grounds (1 mark)
- covering standing water and water storage cans, (1 mark) for example the Oxfam bucket, (1 E mark) reduces the chances of mosquitoes breeding near to homes or villages (1 mark)
- medication to kill the parasite/prevent infection (1 mark) such as quinine/chloroquine/Lariam/Malarone/Artemisia (1 E mark)
- trials have produced a vaccine (1 mark) such as RTS,S/Mosquirix (1 mark) which has now been recommended as being safe for use, as prevention is better than cure (1 mark)
- educating people in the use of insect repellents (1 mark) or covering the skin at dawn/dusk (1 mark) when mosquitoes are most active, to reduce the chances of being bitten (1 mark) the increased use of insecticide-coated mosquito nets at night. (1 mark) For example the WHO's 'Roll Back Malaria' campaign. (1 mark)

Possible comments on the effectiveness might include:

- Insecticides to kill the mosquito were effective at first and helped to eradicate the disease in Southern Europe and Florida, however the mosquito became resistant to DDT and alternative insecticides are often too expensive for developing countries. (1)

- Mosquito traps have been effective at a small scale, but mosquitoes breed so quickly that it is impossible to trap them all. (1)
- The BTI bacteria in coconuts is a cheap and environmentally friendly solution, with 2/3 coconuts clearing a typical pond of mosquito larvae for 45 days. (1)
- Draining stagnant ponds is impossible to be effective on a large-scale, especially in tropical climates where it can rain heavily most days. (1)
- Using mosquito nets at night/covering up exposed skin is effective as mosquitoes are often most active during dusk and dawn. (1)
- Drugs to kill the parasite once inside humans have been effective for a spell, but the parasite often adapts and becomes resistant – this is true even of the Artemisia-based drugs in SE Asia. (1)
- Anti-malarial drugs like Larium and Malarone often have unpleasant side-effects such as nausea, headaches and in some cases hallucinations so may prevent people from completing the whole course. (1) (Larium linked to depression too)
- They are also expensive to research, develop and produce, making them often too expensive for people living in developing countries. (1)
- Scientists have trialled a vaccine on 6,000 children across Africa and the early results from this are encouraging (a 56% drop in malaria after a year with children who had the vaccine, compared with those who did not). (1)
- Putting larvae-eating fish such as the muddy loach into ponds. As the fish breed, this has the added advantage for farmers who can eat some of the fish and add extra protein to their diet. (1)
- The approaches aimed at killing the mosquito larvae have had only limited success (and only at a local scale) and have been criticised for causing pollution/changing the ecosystem of water courses. (1)

Referring to specific Primary Health Care strategies you have studied:

(i) explain how these strategies meet the health care needs of the people in a developing country; and

(ii) comment on the effectiveness of these strategies. (12)

- Barefoot doctors were chosen by each village to be trained to a basic level of health care and so were fully trusted by the community (1 Ex) In countries with large rural areas it is very difficult to ensure that every village has access to a fully trained doctor/hospital (1 Ex). They were effective at first as they treated up to 80% of all illnesses (1 Eff). They also reduced the strain on hospitals and doctors in the cities (1 Eff). However the rural population of China is vast (over half a billion people) and so there were not enough barefoot doctors for all rural areas (1 Eff).
- Oral Rehydration Therapy (ORT) is an easy, cheap and effective method of treating dehydration through diarrhoea – allowing even the poorest developing country to tackle this health problem (1 Ex). The World Health Organization (WHO) estimates that ORT saves about 1 million babies each year in developing countries (1 Eff). Child deaths from diarrhoea have fallen from 4.6 million in 1980 to 1.5 million today (1 Eff).
- Preventative healthcare such as vaccinations are easier and more cost-effective than trying to cure someone once they have a disease (1 Ex). Vaccination programmes aim to immunise against preventable diseases like polio, cholera, measles, tetanus (1 Ex). These are estimated by the WHO to save between 2 and 3 million lives every year (1 Eff). Cases of Polio have decreased by 99% since the 1980s (1 Eff). By 2014 polio was endemic in only 3 countries (Afghanistan, Pakistan and Nigeria) (1 Eff).
- Health Education Programmes educate people about how to prevent diseases spreading for example by the use of mosquito nets to prevent malaria (1 Ex). The use of village meetings, songs, plays and posters to pass on health education messages are particularly effective in places with an illiterate population where a written leaflet would be of limited use (1 Eff).

- Cleaner water can be obtained by initiatives like Play Pumps International which provide roundabouts that extract ground water which can be used for drinking (1 Ex).
- SODIS is also an initiative to get clean drinking water by using recycled bottles and the natural sunny weather to disinfect the water by leaving it out in the sun e.g. on roofs of houses (1 Ex). These clean water initiatives help reduce the spread of diseases like cholera caused by drinking dirty water (1 Eff).
- Charities such as Water Aid work with countries to improve the provision of clean water and sanitation by installing e.g. pit latrines/Blair toilets (1). Pit latrines are also a suitable strategy because in many developing countries people don't have access to a plumbed toilet (1 Ex). Pit latrines help by reducing contamination of water via human waste (1 Ex).
- Organisations like Medecins Sans Frontieres (MSF) opened clinics in Southern Malawi because 25% of the adult population are HIV positive (1 Ex) so the clinics provide a place for treatment as well as providing contraception and advice on safe sex (1 Ex).

GLOBAL CLIMATE CHANGE

a) Explain the physical causes of climate change. (8)

Increased sunspot activity increases global temperatures (1), this follows an 11-year pattern (1). After volcanic eruptions, large amounts of dust and droplets of sulphur are ejected into the atmosphere (1) and may reflect the sun's rays lowering temperature (1).

Retreating ice caps reduces the albedo effect (1) as more dark land is exposed and this will absorb more heat, rather than reflecting it. (1).

As permafrost melts the decaying organic matter held within will release methane (1).

A physical cause of climate change is Milankovitch's theory; changes in the earth's orbit/tilt (1) alter the amount of energy reaching the Earth (1). Every 41,000 years, there is a change in the tilt of the Earth's axis (1). A greater tilt means more sunlight in Polar regions (1).

b) Explain the human causes of climate change. (8)

Carbon Dioxide is released into the atmosphere by the burning fossil fuels, for example coal, oil and natural gas, this will trap heat (1). Coal has been used increasingly to power factories, generate electricity in power stations and to heat homes (1). Deforestation means there are less trees to absorb CO₂ (1).

Methane has been released from landfill sites as waste decomposes (1). The increase in padi fields to feed rapidly growing populations in Asian countries has increased the amount of methane in the atmosphere (1). The increasing demand for beef has resulted in more methane being created by belching cattle and from animal dung (1).

Increased car exhaust emissions have resulted in more Nitrous Oxide (1). Due to rising food demand the increased production of fertilisers also adds to the amount of Nitrous Oxide in the atmosphere (1).

Refrigerators which are not disposed of correctly release CFCs when the foam insulation inside them is shredded (1).

c) Explain the local and global impacts of climate change. (12)

Sea level rises caused by the melting of glaciers and ice caps (1) in Greenland. Low-lying coastal areas will suffer flooding, (1) for example, Bangladesh, leading to large-scale displacement of people (1) and loss of farmland and destruction of property (1). Climate change refugees will exert more pressure on resources such as housing and water supplies in the receiving area (1).

More extreme and more variable weather such as flooding and droughts will occur (1) and more frequent and intense hurricanes will be caused due to increased sea temperatures (1). Globally, there will be an increase in rainfall, particularly in winter in northern countries (1). There will be an increase in extent of tropical diseases, as warmer areas expand (1). Up to 40 million more people in Africa will be exposed to risk of contracting malaria (1). Predicted extinction of 10% of land species (1), and coral reefs will suffer 80% bleaching (1) from more CO₂ in oceans, turning them more acidic (1). The North-West Passage will be opened up to ships due to melting sea ice (1) meaning more efficient trading routes. (1)

Max 2 marks for named examples

d) Many strategies have been implemented to both reduce greenhouse gas emissions and to manage the effects of climate change.

(i) Describe, in detail, local, national and international strategies you have studied, and

(ii) Evaluate their effectiveness. (14)

Individuals can reduce, reuse and recycle products so that less refuse is sent to landfill sites (1). This will reduce the amount of methane entering the atmosphere (1 EV). However, Scotland still on recycles about 45% of its waste (1 EV). To reduce the amount of CO₂ generated by the burning of fossil fuels households could reduce energy consumption by insulating their homes or switching lights off, etc (1). People are also being encouraged to use public transport, walk or cycle (1), or use hybrid or electric cars to cut down on fossil fuel consumption (1).

On a national level the 5p plastic bag charge has meant also meant less waste is sent to landfill, and the policy has successfully resulted in 15 billion fewer plastic bags now in circulation (1 EV). The government is trying to cut back on CO₂ emissions by relying on more renewable energy, such as wind or solar power (1). However, some people complain that wind turbines are scars on the landscape and cause noise pollution (1 EV), as well as a hazard to birds who frequently fly into them (1 EV). The government are also preparing for extreme weather events, such as flooding, by building defences to hold back flood water (1), e.g. The Thames Flood Barrier. Countries can try to reduce deforestation by carrying out large scale afforestation in order to soak up more CO₂ through photosynthesis (1). However, forests take decades to mature so it will take years to reap the benefits (1 EV). Some governments (e.g. Australia) provide a scheme where companies pay according to the quantity of greenhouse gases they generate, thus encouraging them to be more energy efficient (1). However, wealthy companies are likely to purchase carbon credit offsets instead of actually reducing their emissions (1 EV).

On an international level the Paris Agreement outlined agreements between leaders of developed and developing countries to limit climate change to below a 2°C rise (1). However, the USA - one of the world's biggest greenhouse gas emitters - has now withdrawn (1 EV).

Max 3 marks for named examples