**Population Change**

**(1) (a) (i) State one disadvantage of presenting population data in this way [1]**

Accept any reasonable criticism of the map. Examples include:

* Choropleth presents generalized data patterns based on a range of data that can hide specific regional spatial patterns within countries **(1)**
* Specific regional variation is provided for South Asia and China but not other countries for example African nations **(1)**

**(ii) State one disadvantage of presenting population data in this way [1]**

Accept any possible mapping technique. Examples include:

* Population distribution maps with dots **(1)**
* Resized territories based on population ratio to land area **(1)**

**(b) (i) Briefly describe the pattern of population density in South America  [2]**

* Population density is low in the central spine of South America from Amazonian down to Argentina with 0-10 people per square km **(1)**
* Population density is highest along the eastern coast, particularly in Brazil with population density higher than 1000 per square km **(1)**
* Population density is of medium density in northern nations of South America between 25-75 people per square km **(1)**

**(ii) Suggest two reasons for this distribution in population in South America  [2]**

Accept any reasonable response that is linked to the question. Examples include:

* Remoteness of continental interior make access difficult **(1)**
* Extreme Environment, steep relief and forest cover make it challenging to access and live there **(1)**
* Climatic challenges such as extreme heat of cold due to altitude restricts population size **(1)**
* Proximity to ports and trading routes including shipping encourage core growth **(1)**

(**c) Explain two possible problems caused by the population distribution in South America  [2+2]**

Award**(1)** mark for correct problem e.g. Underdeveloped interior **(1)** Over populated cities  **(1)**Award an additional **(1)** mark for development. e.g. the interior lacks resource development which influences slower slower economic growth **(1)** City space and land area becomes over populated, cities struggle to keep pace with housing, services and resource demand hindering economic growth and political stability **(1)**

**Global Climate Vulnerability and Resilience**

**(2) (a) (i) State the one element of the atmosphere that reflects 17% of incoming radiation [1]**

Clouds

**(ii) State one other atmospheric element that reflects incoming solar radiation [1]**

Accept atmospheric gas, also nitrogen, oxygen, ozone, water vapor , dust particles, pollen

**(iii) State the atmospheric element responsible for absorbing 19% of the total 23% of incoming solar radiation [1]**

Water vapor

**(b) State one carbon storage and explain how it is impacted by climate change [1+2]**

Award **(1)** mark for correct carbon storage e.g. oceans, permafrost, vegetation cover. Award a further **(2)** marks for full development of the explanation, e.g. As temperatures warm ocean temperatures increase, this may lead to a slowing down in its ability to sink and store carbon from the atmosphere **(1)**. In addition current levels of sinked carbon has led to acidification of the ocean causing loss of marine life such as coral health **(1)** . This in turn reduce the the ability of oceans to absorb more carbon **(1)**

**(c) Explain two possible impacts of climate change on health of people [2+2]**

Award**(1)** mark for correct impact e.g. northern migration of malaria **(1)** increased heat stress due to heat waves  **(1)**Award an additional **(1)** mark for development. e.g. as northern latitudes experiencing warming  malaria carrying vectors are migrating further north and south away from their familiar tropical humid territories **(1)** With increased frequency of droughts and heat waves for example in temperate latitudes such as Europe the elderly will be particularly vulnerable to heat stress and dehydration due to heat waves **(1)**

**Global Resource Consumption**

**(3) (a) (i) State the irrigation source that has grown the most  [1]**

Wells

**(ii)     Compare the growth in use of wells and canals  [2]**

The use of wells as irrigation has more than quadrupled from under 700 000 hectares to just less than 4 million hectares **(1)** compared to the growth in canals that has increased from 800 000 hectares to 1.6 million hectares **(1)**

Well irrigation has shown a constant rise in the time period**(1)**whilst canals increased until 1985 before leveling off **(1)**

**(b) Explain one consequence of India increase in irrigation [2]**

Award **(1)** mark for correct consequence e.g. lowering of water table **(1)**, increased crop yields **(1)**Award a further **(1)** marks for full development of the explanation, e.g. with such high withdrawal rates groundwater aquifers can't replenish and so water levels drop increasing salt concentrations**(1)**. technology advances allow for more efficient and reliable water supply that increase crop yields and food security  **(1)**

**(c) State one factor other than food and water that may affect India's future security and explain its link with food and water [1+ 2+2]**

Energy**(1)**

Award**(1)**for each developed point linked to food and water security, e.g. Energy is required in India to secure agricultural and industrial development **(1)**Water is critical to India in terms of hydroelectric energy and dam construction**(1)**Intensive agriculture and irrigation requires energy to drive pumps and water feedsto improve crop yields**(1)**

**Infographic**

**(4) (a) (i) State the country/region with the highest emissions of greenhouse gases [1]**

China **(1)**

**(ii)** **Suggest one way that the data on emissions may be seen as misleading  [1]**

* It doesn't show per capita data **(1)**
* It doesn't show historical contribtuion of CO2 **(1)**

**(b) Suggest two reasons why gas as an energy source is going to increase in its use, whilst other greenhouse gas emitting energies will fall [2+2]**

Award **(1)** mark for correct reason e.g. There are large quantities of gas in shale **(1)**, it's a cleaner energy **(1)**Award a further **(1)** mark for full development of the explanation, e.g. energy security is an important issue for countries such as the US who have developed shale gas as an important element of its energy mix **(1)**. gas emits lower amounts of greenhouse gases compared to oil and coal **(1)**

**(c) Suggest two ways the infographic could have been improved to show greater representation of developing nations [2+2]**

Award **(1)** mark for correct idea e.g. Providing historical causes of emissions of both developed and developing countries/regions **(1)**, Clearer regional representation to show views of global citizens **(1)**Award a further **(1)** mark for full development of the explanation, e.g. historical emission would show the root causes and show remove fault from developing nations  **(1)**. The global views all relate to mitigation whilst developing nations would have a greter focus on adpatation **(1)**

Other answers may include:

* More information on the $100 billion climate finance
* Information on emissions from Africa - non included and only Brazil in South America

**(5) “Adaptation at a range of scales is more important than mitigation in the management of climate change” To what extent do you agree with this statement? [10]**

Marks must be allocated according to the mark bands for the 10 mark essay

Responses may explain that the “importance” of adaptation may depend on the nation in question due to differing levels of for example: exposure to risk and vulnerability to climate change. In addition countries may not require greater focus on mitigation due to their lack of development and level of current emissions.

Responses may explain the importance of adaptation through place examples of climate change sensitive environments at a range of scales. Equally, place examples of industrialized nations may be developed to argue the importance of mitigation. This may vary in scale from international to the local/household. The moral responsibility of developed nations to mitigate as countries with the main responsibility for the cause of climate change may be developed.

**Good answers may be well-structured (AO4)** and may additionally offer **a Critical evaluation (AO3)** which focuses on the importance of adaptation or mitigation. Clear assessment and evaluation will be developed. Another approach might be to evaluate the different time scales over which the importance of adaptation and mitigation

**For 5–6 marks**

Expect weakly-evidenced outlining of adaptation and mitigation

**For 7–8 marks**

Expect a well-structured account, which includes:

Either a well evidenced synthesis, which links together several well-evidenced adaptations and mitigation approaches based on  themes from the Guide. Or a critical conclusion (or on-going evaluation) informed by geographical concepts and/or perspectives

**For 9–10 marks**

Expect both traits

**(6) “The circular economy offers us the greatest opportunity to achieve sustainable resource consumption”. To what extent do you agree with this statement?  [10]**

Marks must be allocated according to the mark bands for the 10 mark essay

Responses may explain the “importance” of circular economy in the context of sustainable resource consumption and the problems of the current linear model. The extent to which a circular economy can be adopted will vary between countries and will depend on many factors, including government priorities, regulation and economic integration. Place examples should be developed to support the effective use of circular economy at a range of scales. There are challenges to its adoption in terms of the cost effective nature of the current linear model and consumer model and the profit interests of corporations.

The response is likely to develop the advantages of circular economy in terms of sustainable resource use, protection of environment and consumer relationships. It is likely a broad interpretation of sustainable to include, social, economic and environmental aspects will be developed

**Good answers may be well-structured (AO4)** and may additionally offer **a Critical evaluation (AO3)** which focuses on the importance of the circular economy over the linear economy. Clear assessment and evaluation will be developed .  Another approach might be to evaluate the different time scales over which the circular economy can be adopted without causing too much economic disruption

**For 5–6 marks**

Expect weakly-evidenced outlining of circular economy and linear economy

**For 7–8 marks**

Expect a well-structured account, which includes:

Either a well evidenced synthesis, which links together several well-evidenced circular economy themes

Or a critical conclusion (or on-going evaluation) informed by geographical concepts and/or perspectives

**For 9–10 marks**

Expect both traits