Geography Short and Extended Response Questions

**Identify and describe three types of evidence for climate change through geological time.**

**(3 marks)**

**Describe three major changes in anthropogenic carbon emissions over time.**

**(3 marks)**

* Immense increase in population in 1950s (after the war)
* Industrial Revolution since the 1800s increase in factory production

**Describe key elements of the Earth’s atmospheric circulation system.**

**(4 marks)**

**What is a natural biome?**

**(2 marks)**

A biome is large area made of many similar ecosystems. A natural biome is a community of life forms adapted to a large natural area. Climate is the most significant factor influencing the location of biomes. For example the Tropical rainforest and Tropical coral reef biomes. It is a major ecological community with distinct climate, animals and plants. Biomes are most commonly identified by their dominant vegetation types.

**Define the term anthropogenic biomes.**

**(2 marks)**

An anthropogenic biome is a global ecosystem unit defined by global patterns of sustained direct human interactions with ecosystems, creating a description of the terrestrial in its contemporary, human altered form. Also known as anthromes or human biomes. Examples of anthropogenic biomes are urban areas, villages, and croplands.

**Outline the difference between the terms weather and climate.**

**(3 marks)**

Weather is the short-term conditions of the atmosphere around us. Climate is the longer-term average conditions of a place. An example of climate is the Mediterranean climate in Perth as they have long, hot, dry summers and mild, wet winters.

**Explain the concept of sustainability.**

**(3 marks)**

Sustainability is the development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. It is about providing incentives for businesses and other organisations to adhere to sustainability guidelines beyond their normal legislative requirements and also, to encourage incentives for the average person to do their bit where and when they can. Economic development is about giving people what they want without compromising quality of life, especially in the developing world. Environmental protection is the primary concern of the future of humanity and defines how we should study and protect ecosystems, air quality, integrity and sustainability of our resources and focusing on the elements that place stress on the environment. With social development, the most important facet is awareness of and legislation protection of the health of people from pollution and other harmful activities of business and other organisations and also about maintaining access to basic resources without compromising the quality of life.

**Discuss one approach to land cover restoration and rehabilitation and explain how it mitigates future land cover changes. (20 dot-points)**

**(8 marks)**

* *Alcoa’s restoration and rehabilitation programme*
* *Pre-mining surveys*
* *Flora and Fauna*
  + - * *Mitigates LCC if there’s a threatened or endangered species there as no mining will occur*
      * *Also mitigates LCC as all flora and fauna is recorded so it can be replaced*
* *Heritage Survey*
* *Mitigates LCC in places of archaeological or indigenous importance as these sites are not mined on*
* *7 post-mining steps*

1. *Landscaping – land is smoothed and flattened*
2. *Pre-ripping – land is broken roots can penetrate it*
3. *Soil return – Soil that was stockpiled during mining is returned*
4. *Final contour ripping – top soil is ripped to increase the soils water storage capacity*
5. *Recalcitrant planting – some plants are grown at the nursery then planted at the rehabilitation site by hands these plants account for 20% of the returned vegetation*
6. *Fertilising – one application is applied by helicopter to promote growth of new seedlings*
7. *Ongoing monitoring and management – ensures Alcoa are meeting government targets*

**Explain how one human land use activity contributes to Greenhouse Gas emissions in Australia.**

**(8 marks)**

**With the aid of a diagram, describe the concept of the greenhouse effect and the enhanced greenhouse effect.**

**(8 marks)**

**Describe how the heat budget influences climate.**

**(4 marks)**

*The heat budget can influence climate change. This would be because the heat budget is a balance between absorption and reflection.*

**Outline the key elements of the heat budget.**

**(2 marks)**

*The key elements of the heat budget are the input and output of energy in relation to the Earth. The sun sends out shortwave radiation and some of this energy is absorbed directly by land and water, some is interrupted by clouds and dust in the atmosphere and some is reflected back into space before even reaching the Earth’s surface. Earth re-directs the energy as longwave radiation. The greenhouse effect is the process by which the Earth’s atmosphere absorbs some of the Sun’s energy, helping to keep the Earth warm. This effect has been gradually intensifying due to the release of more carbon dioxide and methane into the atmosphere.*

**Provide one example of a human modification to the hydrological cycle.**

**(8 marks)**

The water cycle is the continuous movement of water on, above and below the surface of the earth. Maintaining a constant balance in the water cycle, or hydrologic cycle, is vital for the wellness of the earth and every living thing on earth. When the water cycle is disrupted it can lead to global changes, such as climate change, that disrupt the state of living things. Deforestation is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use. Vast forests are cleared out so that the trees can be used or sold as fuel, or to make room for urban use or farms. Forests play a major part in the hydrological cycle. Forests transport large quantities of water into the atmosphere via plant transpiration. This replenishes the clouds and instigates rain that maintains the forests. When deforestation occurs, precious rain is lost from the area, flowing away as river water and causing permanent drying. When those trees are cut down the water they store is lost. Trees and plants play a huge part in the water cycle because they are responsible for extracting groundwater from the soil and returning it the atmosphere, so when trees are cut down the water isn't released into the atmosphere and the balance of the water cycle is lost. When parts of forests are removed due to deforestation, this leads to a much drier climate and drier soil, because there are no longer plants and trees to transpire the groundwater. Mass deforestation can quickly turn rainforests into barren deserts. Tropical rainforests produce about 30% of our planets' fresh water, and industrial companies are quickly destroying them. An example of this is the massive deforestation risks turning Somalia into desert. Northern Somalia was once a land of lush forest but today, the place is much more bare. Hundreds of thousands of Somalia’s herders and farmers cut down trees for resources, putting their impoverished country on a path of heavy deforestation that risks turning large parts of it into desert.  A likely solution would be to make sure that forests still remain intact after deforestation. Getting companies to plant more trees in place of the ones that they cut down would help restore forests and maintain the balance of the water cycle. Another solution could be eliminating the need for charcoal, lumber, export, and paper.

**Using Perth as a spatial location, describe how the hydrological cycle helps to drive our local climate. (5 marks)**

**Briefly explain the key elements of the carbon cycle. (4-6 marks)**

**Describe how any two of the following natural systems interact to influence the Earth’s climate: Hydrological cycle, atmospheric circulation, carbon cycle, and heat budget. (6 marks)**

**Explain how Earth’s heat budget and atmospheric circulation are linked and describe how they jointly influence temperatures across the planet.**

**(6 marks)**

**Describe three major causes of global carbon dioxide emissions over time.**

**(6 marks)**

Anthropogenic carbon emissions are the emissions of various forms of carbon - the most concerning being carbon dioxide - associated with human activities. These activities include the burning of fossil fuels, deforestation, land use changes, etc., that result in a net increase in emissions. 87% of all human-produced carbon dioxide emissions come from the burning of fossil fuels like coal, natural gas and oil. The remainder results from the clearing of forests and other land use changes (9%), as well as some industrial processes such as cement manufacturing (4%). Burning fuels releases energy, which is most commonly turned into heat, electricity or power for transportation. Some examples of where they are used are in power plants, cars, planes and industrial facilities. In 2011, fossil fuel use created 33.2 billion tonnes of carbon dioxide emissions worldwide. Land use changes are a substantial source of carbon dioxide emissions globally, accounting for 9% of human carbon dioxide emissions and contributed 3.3 billion tonnes of carbon dioxide emissions in 2011. Land use changes are when the natural environment is converted into areas for human use like agricultural land or settlements. From 1850 to 2000, land use and land use change released an estimated 396-690 billion tonnes of carbon dioxide to the atmosphere, or about 28-40% of total anthropogenic carbon dioxide emissions. Deforestation has been responsible for the great majority of these emissions. Deforestation is the permanent removal of standing forests and is the most important type of land use change because its impact on greenhouse gas emissions. Forests in many areas have been cleared for timber or burned for conversion to farms and pastures. When forested land is cleared, large quantities of greenhouse gases are released and this ends up increasing carbon dioxide levels in three different ways. Trees act as a carbon sink. They remove carbon dioxide from the atmosphere via photosynthesis. When forests are cleared to create farms or pastures, trees are cut down and either burnt or left to rot, which adds carbon dioxide to the atmosphere. Since deforestation reduces the amount of trees, this also reduces how much carbon dioxide can be removed by the Earth's forests. When deforestation is done to create new agricultural land, the crops that replace the trees also act as a carbon sink, but they are not as effective as forests. When trees are cut for lumber the wood is kept which locks the carbon in it but the carbon sink provided by forests is reduced because of the loss of trees. Deforestation also causes serious changes in how carbon is stored in the soil. When forested land is cleared, soil disturbance and increased rates of decomposition in converted soils both create carbon dioxide emissions. This also increases soil erosion and nutrient leaching which further reduces the area's ability to act as a carbon sink. Increases in carbon dioxide and nitrous oxide will become increasingly important in determining the future of the ozone layer.

**Briefly account for the climate cycle or variations that result from any of the following natural processes:**

**(6 marks)**

* + **Solar output**
  + **Orbit variations**
  + **Volcanoes**
  + **Atmospheric gases + chemistry**
  + **El Nina and La Nina**
  + **Indian Ocean Dipole**
  + **Pacific decadal cycle**
  + **Polar ice variations**

What is a ‘stakeholder’?

(2 marks)

A stakeholder in geographical terms is someone who has real interests in a social issue or in the maintenance/formation/removal or of a public policy. This interest could be defined materially i.e. loss of property or opportunity for profit etc. They can be internal or external of both junior and senior levels.

Make a list of relevant climate change stakeholders at local, national and international levels.

(3 marks)

Stakeholders

Explain the concept of climate change.

(3 marks)

Climate change is a change of climate that is attributed directly or indirectly to human activity, altering the composition of the global atmosphere. Human activity includes the pollution that arises from industrial activity and other sources that produce greenhouse gases. These gases, such as carbon dioxide, have the ability to absorb the spectrum of infrared light and contribute to the warming of our atmosphere. Once produced, these gases can remain trapped in the atmosphere for tens or hundreds of years.

Describe two major types of evidence for climate change, including one through geological time and one in recent human history.

(8 marks)

Two major

With reference to specific examples, explain the interrelationship between Land Cover Change and Climate Change.

(4 marks)

Describe how changes in surface reflectivity (albedo) from land cover can lead to changes in climate.

(4 marks)

Discuss the effects of climate change on land cover in two anthropogenic biomes.

(10 marks)

Name one site and one situation factor for Perth.

(2 marks)

One situation factor of Perth is that it is at 31.9505° S, 115.8605° E and one site factor is that it extends from Yanchep (North) to Mandurah (South) over a distance of 120km

Name one site and one situation factor for Fremantle.

(2 marks)

Fremantle is situated 19km SW of Perth CBD and Fremantle is at an elevation of 8.31m above sea level.

Discuss the strategies implemented and/or proposed to adapt to and/or mitigate the adverse effects of atmospheric greenhouse gas emissions at local, national, international levels.

(10 marks)

Discuss one current or recent strategy to mitigate the adverse effects of climate change.

(10 marks)

Outline the viewpoints of three different stakeholders toward one strategy that aims to minimise the effects of climate change.

(10 marks)

Discuss one way in which human activity has adapted or may be required to adapt to climate change

(10 marks)

Explain the concept of sustainability, using two examples from agriculture.

(10 marks)

* + Genetically modified crops
  + The amount of arable land available for food production per person is limited and constantly decreasing. This is due to population growth, but also factors such as urbanization, erosion and desertification. So only 0.5 percent of the Earth’s surface can be used for growing crops.
  + Sustainability; Understanding how to meet the needs of the present without compromising the needs of future generations to meet their own needs.
  + Growers may use methods to promote soil health, minimize water use, and lower pollution levels on the farm.
  + Consumers and retailers concerned with sustainability can look for “values-based” foods that are grown using methods promoting farmworker well beings, that are environmentally friendly, or that strengthen the local economy.
  + The likelihood of a food crisis directly affecting Australia is remote given that we have enjoyed cheap, safe and high quality food for many decades and we produce enough food today to feed 60 million people – three times our current population.
  + Given the limits to natural resources the world simply cannot afford to sustain the loss of food that is caused by diseases of plants and animals. Currently, diseases (bacterial, viral, fungal) cause general losses of 20-40% of horticultural crops, 10-15% of grains, up to 50% of aquaculture and more than 20% of livestock worldwide.
  + While the population is growing, the amount of available farmland per capita is shrinking. The situation is made even more difficult by the fact that valuable farmland is lost every year due to factors such as heat, drought, flooding, salinization, erosion and urbanization.
  + In 2016, a new rice seed will be launched that can even survive being underwater for 14 days. And in 2017, a seed variety capable of tolerating twice the level of salinity that currently available seeds can cope with will be introduced.

**1. a) Identify one natural and one anthropogenic cause of global climate change or biodiversity loss.**

**(2 marks)**

**b) Describe the rate of global climate change or biodiversity loss, with reference to a specific example.**

**(2 marks)**

**2. Explain the interrelationship between land cover change and climate or biodiversity.**

**(4 marks)**

**3. Describe the spatial distribution of the world’s rainfall and temperature patterns or natural biomes.**

**(10 marks)**

**4. For global climate change or loss of biodiversity, discuss one major type of evidence through geological time and one major type of evidence in recent human history.**

**(10 marks)**

**5. Describe five key elements of one of the following**

**(10 marks)**

**- hydrological cycle - ecosystem structure**

**- atmospheric circulation - ecosystem dynamics**

**- heat budget - carbon cycle**

**6. Discuss the effects of climate change or biodiversity loss in one natural and one anthropogenic biome.**

**(10 marks)**

**7. Describe one current and one proposed strategy implemented to mitigate the adverse effects of global climate.**

**(10 marks)**

**8. Evaluate two ways that human activity had adapted to global climate change.**

**(10 marks)**