



**Cambridge Assessment
International Education**

Example Responses – Paper 1

**Cambridge International AS Level
Environmental Management 8291**

For examination from 2022



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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge AS Level Environmental Management 8291.

This booklet contains responses to all questions from June 2022 Paper 11, which have been written by a Cambridge examiner. Responses are accompanied by a brief commentary highlighting common errors and misconceptions where they are relevant.

The question papers and mark schemes are available to download from the [School Support Hub](#).

8291 June 2022 Question Paper 11

8291 June 2022 Mark Scheme 11

Past exam resources and other teaching and learning resources are available from the [School Support Hub](#).

Question 1

Answer **all** questions in this section.

- 1 (a) Fig. 1.1 shows the migration routes of three aquatic animals and the position of two mid-ocean gyres. A gyre is a very large system of circulating water which traps plastic waste brought by ocean currents to form polluted areas.

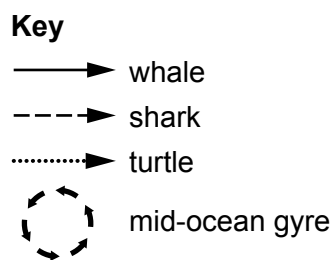
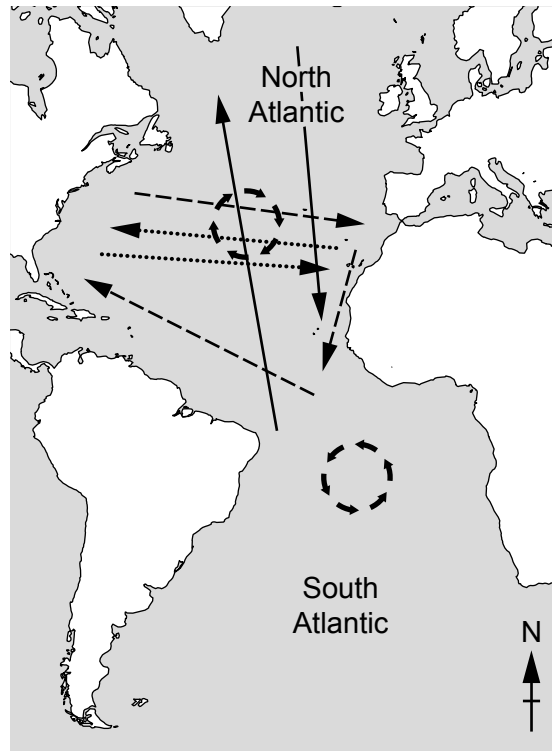


Fig. 1.1

- (i) Suggest **two** possible sources of the plastic pollution found in the mid-ocean gyres.

1 *From littering on beaches*

2 *Thrown from boats or cruises*

[2]

Examiner comment

- Common errors were to describe different types of plastics or discuss animals carrying the plastics into the gyres. Some just gave the name of adjacent land areas in Fig. 1.1.
- ‘Ocean dumping’ was an often-used phrase which needed more specific description.

- (ii) Suggest **one** way that plastic pollution in the mid-ocean gyres might affect migrating aquatic animal species.

The migrating aquatic animal might become trapped in the plastic causing it to be injured or die.

[2]

- (iii) Describe **two** strategies to manage the reduction in plastic waste entering the oceans.

strategy *Beach clean-ups*

description *Organise groups of volunteers to clean up the plastic waste on the beach which reduces the amount of waste entering the ocean.*

strategy *Recycling or re-use e.g. plastic bags or plastic bottles*

description *Reduces the amount of plastic waste being thrown away and entering landfill.*

[4]

(b) Fig. 1.2 shows a food web for the North Atlantic Ocean.

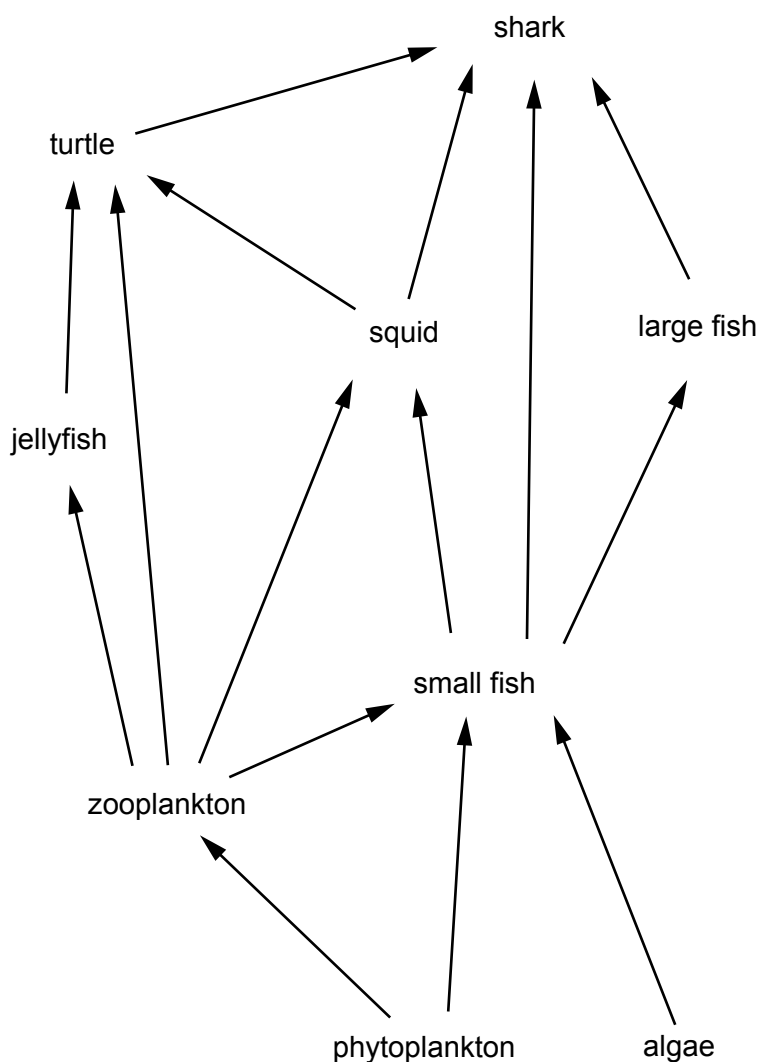


Fig. 1.2

(i) Identify an organism feeding at more than one trophic level shown in Fig. 1.2.

Small fish [1]

(ii) State the trophic level with the least energy shown in Fig. 1.2.

Shark or apex predator [1]

(iii) Suggest **one** effect the plastic pollution in the North Atlantic Ocean could have on the population of squid in the food web shown in Fig. 1.2.

Give a reason for your answer.

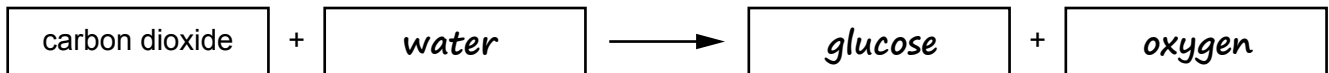
The plastic pollution can be mistaken for food and ingested by turtles and sharks. This causes the turtle and shark populations to decrease so there is less predation on the squid. The squid population, therefore, increases. [2]

[Total: 12]

Question 2

- 2 (a) Large areas of the tropical rainforest in Brazil and the forests and brushlands in Australia were destroyed by wild fires in 2019. The destruction had serious effects on the plants and animals in these ecosystems.

(i) Complete the word equation for photosynthesis.



[2]

(ii) Carbon dioxide is a limiting factor in the rate of photosynthesis.

Describe what is meant by the term limiting factor.

A substance such as carbon dioxide which affects a process e.g. controls the rate of photosynthesis.

..... [2]

(iii) The combustion of trees by wild fires releases a large amount of carbon dioxide into the atmosphere.

Describe the impact of this increased release of carbon dioxide.

The increased levels of carbon dioxide collect in upper atmosphere causing global warming as the heat is trapped and cannot be reflected back to space. The increased temperatures lead to drought, the melting of glaciers, rising sea levels and extreme weather such as floods, storms and hurricanes.

..... [4]

Examiner comment

A common misconception was that carbon dioxide, a greenhouse gas, destroys the ozone layer in the atmosphere leading to global warming.

(b) Suggest the impact of wild fires on the growth of plants.

Give reasons for your answers.

The smoke from wildfires contains increased levels of carbon dioxide which increases the rate of photosynthesis and, therefore, more plant growth. Initially, organic matter in the soil is burnt and water in the soil evaporates causing a decrease in soil fertility and less plant growth. The ash, which then collects on the soil, adds nutrients and improves soil fertility causing increased plant growth. The ash also covers the surface of the leaves which reduces the amount of sunlight being absorbed by the leaves, reducing the rate of photosynthesis and reducing plant growth.

[5]

Examiner comment

- There was an equal split amongst candidates as to whether the wildfire would have a positive or negative effect on the soil, but many were unable to provide a satisfactory reason to support their answer.
- Some candidates discussed succession, which was not relevant to this question, so were only able to access one or two marks.
- Very few candidates discussed the issue of smoke reducing light intensity or ash covering leaves, blocking the stomata and reducing gaseous exchange.
- Successful answers were characterised by a good understanding of the effect of the wildfire, increased carbon dioxide, smoke and ash on photosynthesis and soil fertility.

Question 3

3 Fig. 3.1 shows the contribution of different sources of energy to the total amount of electricity generated in three countries.

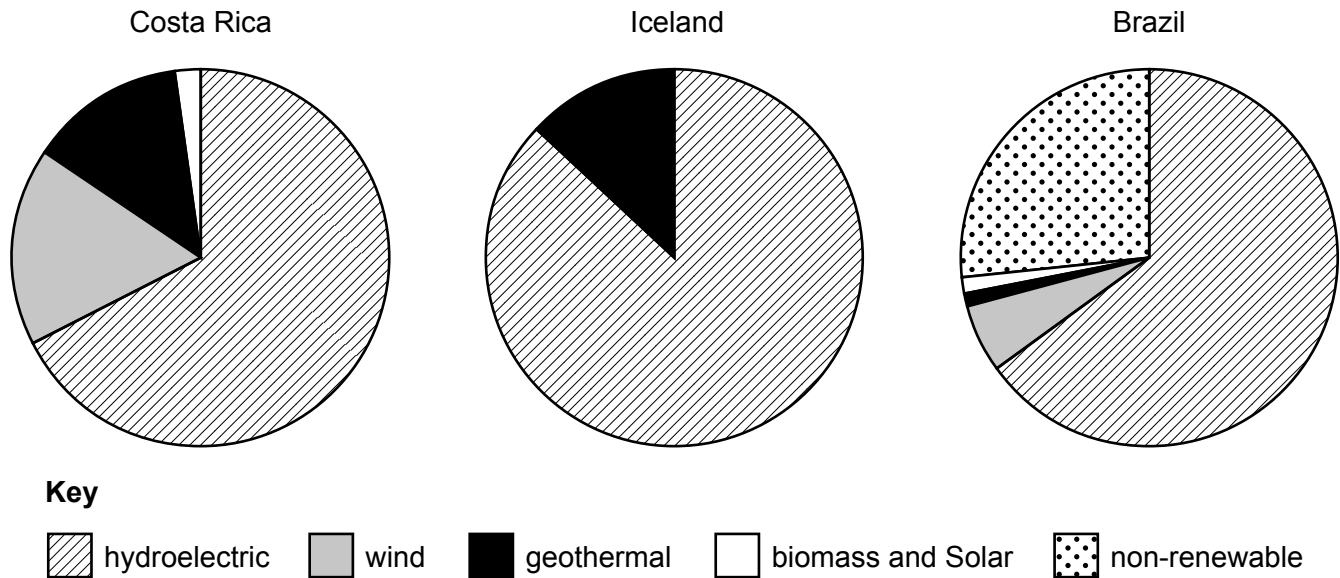


Fig. 3.1

(a) State the largest source of renewable energy used by the three countries shown in Fig. 3.1.
Hydroelectric..... [1]

(b) State **one** other source of renewable energy other than those shown in Fig. 3.1.
Tidal energy..... [1]

(c) Climate change can result in drought.
 Explain how droughts can lead to energy insecurity in Brazil.
Brazil is largely dependent on HEP with approx. 65% of its total electricity generated coming from HEP. Drought reduces the flow of rivers and therefore the amount of power that is generated...... [2]

(d) Suggest why Costa Rica might be described as being more energy secure than Iceland.
Costa Rica has four different sources of energy whereas Iceland only has two. If one source such as HEP fails, Costa Rica has more back-up sources compared to Iceland so is more energy secure...... [2]

Question 4

4 (a) Photochemical smog is linked to the combustion of fossil fuels.

(i) Describe **one** example of the combustion of fossil fuels.

Burning coal

.....
..... [1]

(ii) Define photochemical smog.

Photochemical smog is a mixture of pollutants and particulates

including ground-level ozone. It is formed from oxides of nitrogen

and VOCs in the presence of sunlight.

.....
..... [2]

Examiner comment

- Many candidates simply provided descriptions of photochemical smog as a dense cloud of pollution caused by burning fossil fuels.
- Very few candidates accessed any marks and there were a significant number who did not write a response.
- Successful responses gave a precise, correct definition of photochemical smog including reference to NO_x, VOCs and ground-level ozone.

(iii) State **one** impact of photochemical smog on humans.

Breathing problems such as asthma

.....
..... [1]

(b) Fig. 4.1 is a map showing the Ultra-Low Emission Zone for London, UK. An Ultra-Low Emission Zone is an area which restricts vehicle access in order to improve air quality.

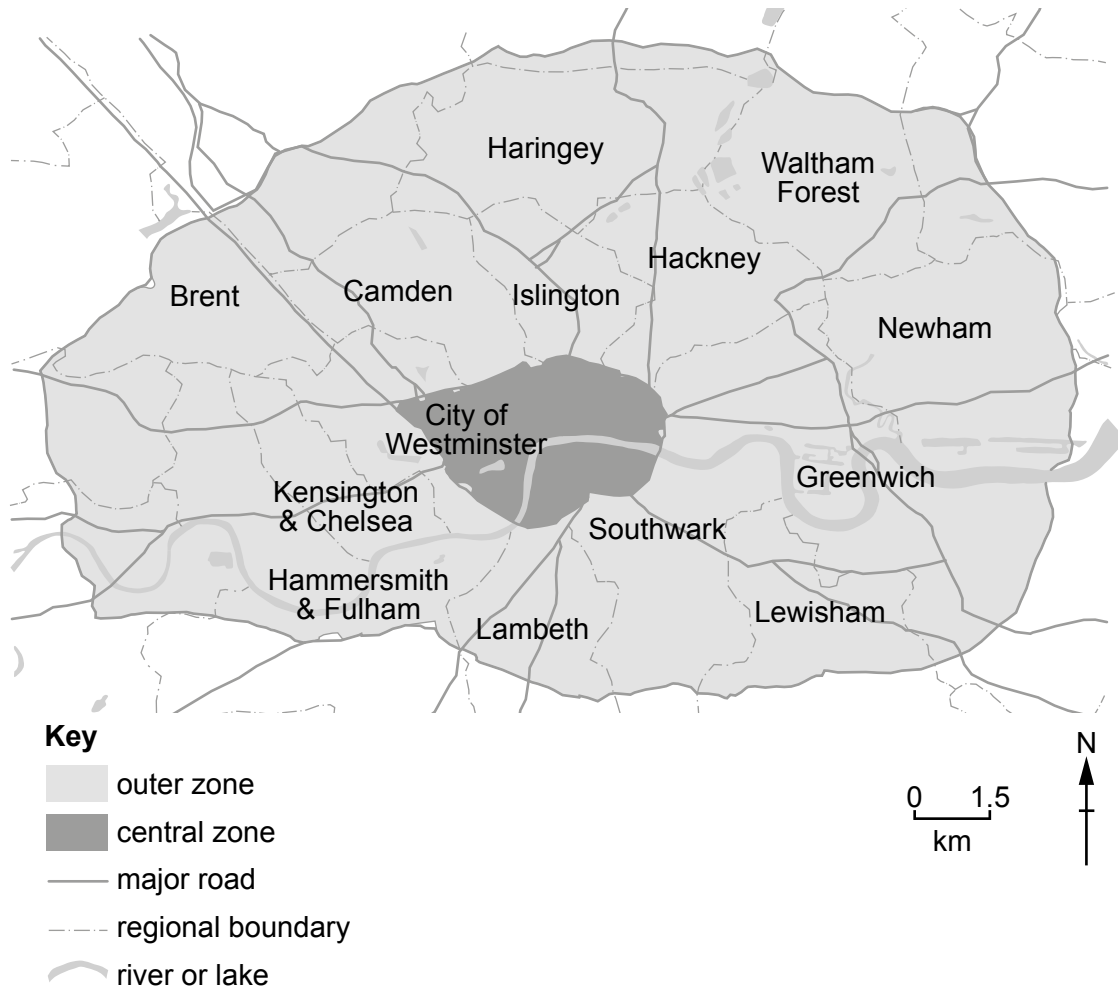


Fig. 4.1

Suggest how an Ultra-Low Emission Zone works as a strategy to manage air pollution.

Legislation is put in place to restrict vehicle access to the U-Low Emission Zone, with fines for not complying. This encourages low emission forms of transport e.g. electric cars or bicycles. Vehicle emissions are reduced and the air quality in that area is improved.

..... [4]

Question 5

- 5 Fig. 5.1 shows the reduction of water in the Puzhal reservoir in the Chennai area, India.

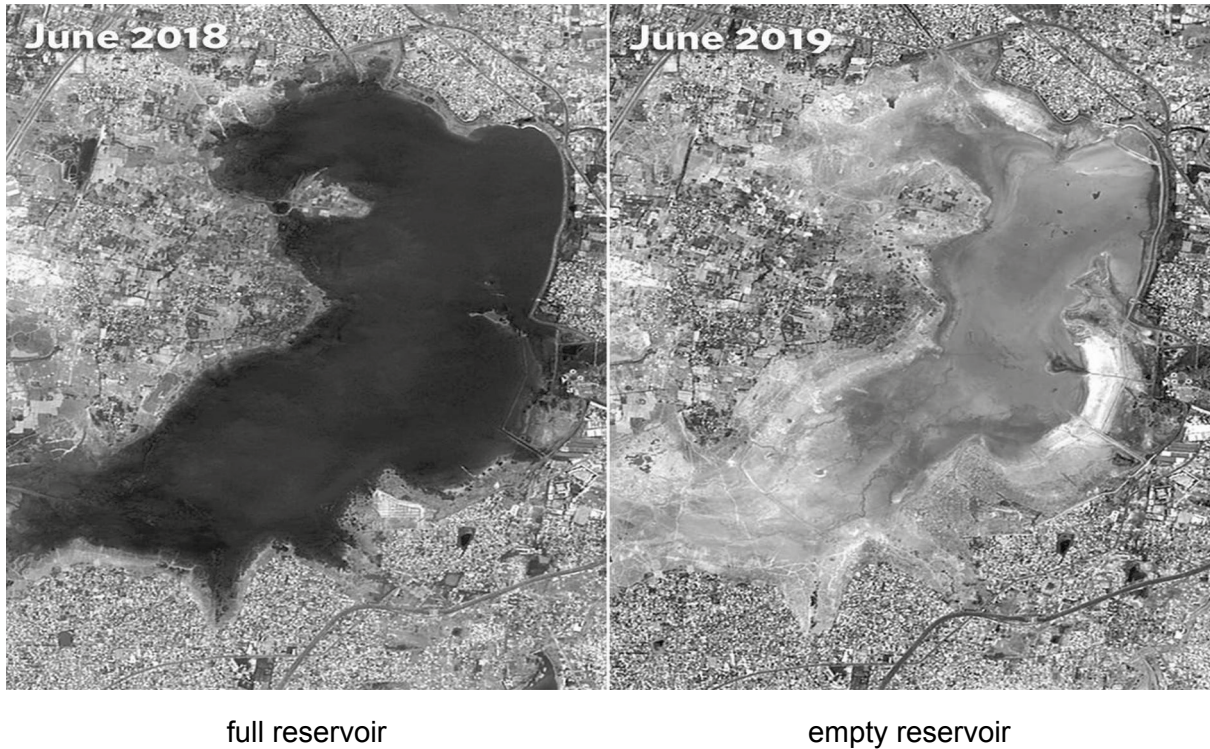


Fig. 5.1

- (a) Suggest reasons for the reduction of water in the Puzhal reservoir shown in Fig. 5.1.

As a result of climate change, there is less rainfall leading to drought conditions. The increased temperatures cause the water in the reservoir to evaporate at a faster rate and it dries up.

.....

.....

.....

.....

.....

.....

[4]

(b) Define the term water security.

Water security is the access to sufficient quantities of clean water to meet the daily needs of the population.

[2]

(c) Describe **two** impacts of the loss of water security in the Chennai area, India.

1 Reduced crop yield or crop failure leading to food shortages or food insecurity.

2 Dehydration due to lack of clean, accessible drinking water resulting in illness or even death.

[4]

(d) Describe **two** strategies to manage the water security in the Chennai area, India.

1 Reduction in water usage in agriculture by improving irrigation techniques such as drip irrigation or using grey water.

2 Education on how to use water sustainably i.e. no car washing or use of hosepipes, taking shorter showers and not leaving the tap running while cleaning teeth.

[4]

[Total: 14]

Question 6

6 Fig. 6.1 shows the structure of the atmosphere.

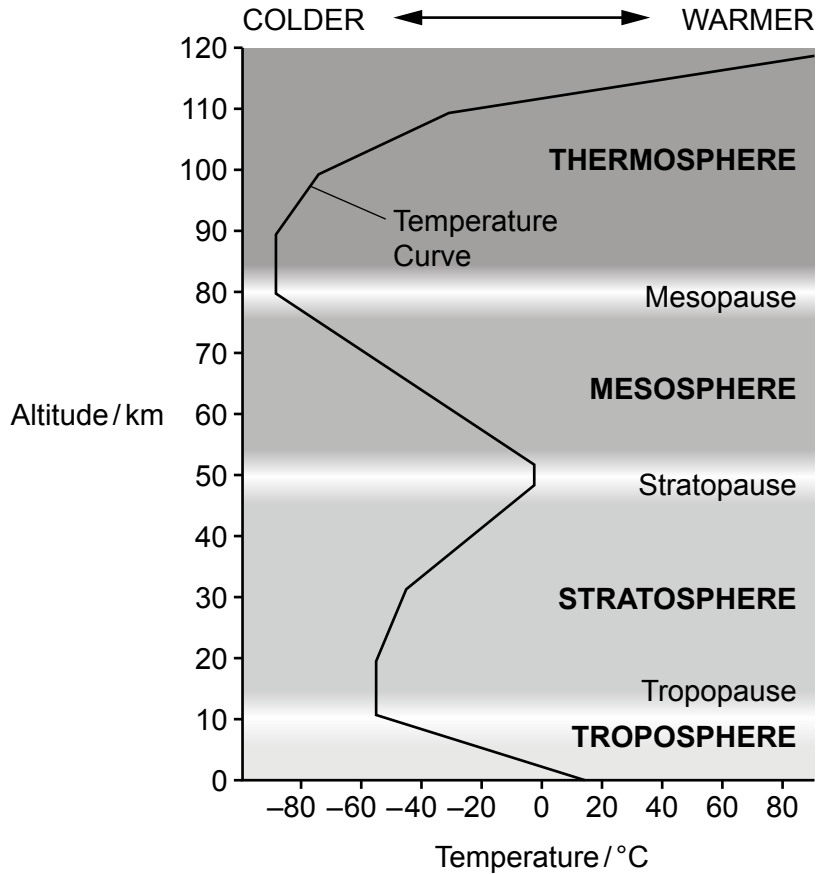


Fig. 6.1

(a) Using Fig. 6.1, state the range of altitudes that contain the ozone layer.

15-35km

[1]

(b) Outline the role of the ozone layer.

The ozone layer absorbs ultra-violet radiation from the Sun.

[2]

(c) Define the term ozone hole.

An area of the ozone layer where the average concentration of ozone is below 100 Dobson Units.

.....

..... [2]

Examiner comment

- Most candidates were able to access one mark by stating ‘an area where the ozone layer is depleted’.
- A few candidates were able to define the ozone hole as an area where the concentration of ozone is below 100 Dobson Units.
- Some candidates referred to the use of CFCs as the cause, which did not answer the question.

(d) State **two** effects of ozone depletion on humans.

1 *Skin cancer*

.....

.....

2 *Cataracts*

.....

..... [2]

[Total: 7]

Question 7

- 7 'Think globally and act locally' is an effective strategy for people to take responsibility for the environment.'

To what extent do you agree with this statement?

Give reasons and include information from relevant examples to support your answer.

[20]

The statement 'think globally and act locally' is an effective strategy for people to take responsibility for the environment' is true to some extent.

Local and global initiatives to manage environmental issues can both be effective when agreed at local or international level and action is taken.

[AO3,
Level 3]

For example, to manage conservation of habitats, local conservation zones can protect endangered species. A conservation zone in North California, USA has been able to conserve the Bald Eagle species by enforcing local laws banning the hunting and trapping of these birds. This local effort has been successful as, over time, the Bald Eagle has been able to reproduce and population numbers have increased.

[AO2,
Level 3 /
AO3,
Level 3]

Creation of areas as national parks, manage widespread conservation of both habitats and the biodiversity of plants and animals. For example, Yellowstone National Park, USA has focussed on the preservation of the bison population which had been hunted to near extinction. With legislation on hunting bison, breeding programmes and the management of migration routes, the bison population has increased steadily.

[AO2,
Level 3 /
AO3,
Level 3]

Global organisations e.g. World Wildlife Fund (WWF) supported by local fundraising initiatives also help to conserve endangered species around the world such as Orca whales, tigers and sea turtles.

[AO2,
Level 2 /
AO3,
Level 3]

Local strategies can be very effective in raising awareness and have a wider impact on environmental issues such as plastic pollution, waste disposal, conserving water and reducing air pollution. 'Beach clean-ups' have become

popular where local volunteers join a group to clear plastic waste from beaches and prevent it from entering the ocean. However, this only has a positive effect in the short-term. Recycling and re-use of plastic items e.g. plastic drinks bottles, can be encouraged through education and campaigns, local legislation and provision of recycling bins to reduce the amount of plastic waste.

[AO2,
Level 3 /
AO3,
Level 4]

Climate change is a global issue which can be tackled by both local and international strategies.

Local legislation such as 'Clean Air Act' in some states in USA and designated Ultra-Low Emission Zones restricting vehicle access in the UK to improve air quality by reducing air pollution in the local area has some success. Some local efforts, however, such as switching to renewable sources of energy are not always successful as there is lack of infrastructure and it is not an affordable option by many LICs or areas reliant on fossil fuels such as coal which is readily available. Another example of local actions is action by activist groups e.g. the 'Save Our Earth' protest in Washington DC, USA which successfully raised awareness on climate change and how individuals can modify their actions in everyday life to reduce their carbon footprint.

[AO2,
Level 3 /
AO3,
Level 4]

There have been a number of international agreements to address climate change and reduce greenhouse gas emissions such as The Kyoto Protocol and The Paris Agreement, as well as the Glasgow Climate Pact reached at the more recent COP26 Summit. These international agreements have been successful to some extent but both political and economic issues of individual countries can make agreement difficult. For example, the USA pulled out of the Paris Agreement under Donald Trump and at the COP26 Summit, countries such as China, Russia and India did not sign the commitment to cut methane, and both China and the US, two of the largest coal-dependent countries did not sign up to shift away from coal.

[AO2,
Level 3 /
AO3,
Level 4]

In conclusion, 'think globally and act locally' is an effective strategy and it is through many local efforts and initiatives that can collectively have a huge impact on the wide range of environmental issues that we face globally today. However, without international efforts some of the local strategies will not be as effective e.g. air pollution or greenhouse gas emissions do not respect local boundaries and needs to be addressed on a global scale and then actioned locally. In addition, some local strategies e.g. 'beach clean-ups' can help reduce plastic pollution from entering the ocean but unless the root cause is addressed more widely, it is only a short-term solution.

[AO3,
Level 4]

Examiner comment

- Most candidates made a good start by referring to local strategies with examples such as: 'beach clean-ups', litter picking, reduction in single use plastics, recycling, tree planting, growing own vegetables, conserving water or using environmentally friendly modes of transport to help reduce air pollution.
- Very few candidates discussed examples of global strategies. When International Protocols were mentioned, there was some confusion between the Kyoto Protocol, the Paris Agreement and the Montreal Protocol.
- Stronger responses gave a good range of directly relevant examples (both local and global) of their chosen environmental issues and made comparisons between the luxury of choice for people living in HICs compared to the difficulties facing people living in LICs. Some candidates understood that many environmental strategies are more expensive and out of reach of LIC countries and people on lower incomes.
- A few candidates discussed strategies to manage human population size which was not relevant to the question.

Question 8

- 8 Evaluate the success of strategies to manage the human impacts on a tundra location of your choice.

Give reasons and include information from relevant examples to support your answer.

[20]

Tundra is characterised by extremely low temperatures, high winds and permanently frozen subsoil known as permafrost. Sápmi or Lapland is a tundra region in Norway, Sweden, Finland and Russia near the Arctic Circle. Although the harsh conditions prevent most people living on the tundra, there is some human settlement and in Sápmi, land is leased to the indigenous Sámi people who are traditionally ecologically minded. They are traditionally migratory people who culturally herd reindeer practising sustainable animal husbandry. There is a wide range of plants adapted to resist the cold climate and diverse fauna in tundra.

[AO2,
Level 3]

Global warming and climate change is one of the biggest threats to tundra regions as the increased temperatures cause melting of the permafrost layer and can result in the collapse of tundra ecosystems. As permafrost melts, frozen plant material decomposes leading to release of its carbon dioxide and methane stores and accelerating global warming further. This in turn leads to the rapid melting of sea ice and snow cover which provides shelter for small rodents and camouflage for animals such as polar bears, Arctic foxes and Arctic hares. Polar bears also rely on sea ice formed in the winter months to hunt seals but warmer winters have significantly reduced the extent of ice floes causing starvation and unnatural behaviour in the animals. In addition, darker surfaces e.g. from increased shrub density and 'blackened' snow caused by atmospheric pollution, absorbs more solar energy due to decreased albedo increasing the rate at which snow and ice melt. Globally, efforts are being made with some success to reduce the use of

[AO2,
Level 3 /
AO3,
Level 3]

fossil fuels and replace with renewable energy sources. The Sápmi region has shifted energy resources from oil and lumber to clean, renewable sources such as hydroelectric power (HEP) and geothermal. These generate little to no carbon dioxide and do not require extreme resource extraction. However, HEP near the tundra region requires construction of large dams and turbines and high-volume reservoirs which results in habitat destruction and disruption to local waterways and impacts local animals and plants. Geothermal turbines result in thermal pollution where warm water is released into bodies of water, not of the same temperature. This harms aquatic species not adapted to these conditions.

[AO2,
Level 3 /
AO3,
Level 4]

Resource extraction e.g. oil and gas also has an impact on tundra regions. Slow vegetation growth, clearing for oil fields, pipelines, roads and other infrastructure leaves soil exposed and increases the rate of erosion. Extraction and transport of oil, use of toxic chemicals in mining operations can lead to release of these pollutants into the Arctic environment. Legislation and restrictions by Norway on local open-faced mining, industry and resource harvesting have lowered the impact of these practices in the Sápmi region, including a reduction in heavy metal pollution.

[AO2,
Level 3 /
AO3,
Level 4]

Although a fine system is in place as a disincentive, it is difficult to fully assess this impact on the tundra as illegal harvesting and waste disposal is hard to account for.

However, these restrictions have been highly controversial, as the closure of mines and oil wells has increased unemployment and harmed the local economy already limited due to the remote and climate-limited nature of Sápmi. Income from resource extraction is not available to be used to fund the costly clean energy projects needed to phase out non-renewables.

[AO3,
Level 4]

Scientific research and ecotourism can both have a positive impact on the economy and furthers our knowledge and understanding of how best

to protect the tundra region. To reduce the negative impact of tourism, visitors are restricted to certain times of the year and there are organised tours which use established trails. Restrictions of some activities and the banning of hunting of some species has reduced the threat of extinction of some animals, although not all. For example, the muskox was hunted by Arctic people for generations and almost wiped out in the tundra region. The banning of hunting and reintroduction efforts have helped recovery but population numbers are still significantly reduced. Polar bears, although not actively hunted, can be killed when they come into contact with humans. Although there are a wide range of strategies to manage the human impact on tundra regions, some are more successful than others and to some extent rely on global strategies particularly with regard to the impact of global warming and climate change to be fully effective. Tundra regions can be affected by air and water pollution, oil spills, and ocean warming or acidification that find its way to the Arctic. Therefore, international protocols will also have a part to play in the future in conserving the tundra.

[AO2,
Level 3 /
AO3,
Level 4]

[AO3,
Level 4]

Examiner comment

- This question was chosen by relatively few candidates.
- Candidates who opted for this question often did not appear to understand the definition of a tundra, and that tundra is most commonly found in the Arctic.
- In consequence, the most common 'tundra' chosen was Antarctica which caused a problem as only the peripheral islands of Antarctica are tundra. Most of Antarctica is too cold and dry to support vegetation and is covered by ice fields. Other incorrect examples of 'tundra' quoted included the tropical rainforest in Brazil and the Sahara Desert in North Africa.
- Despite this, some examples of human impacts such as climate change, tourism, oil extraction and oil spills, mining and scientific research could still be awarded marks.
- The most common management strategy given in responses was the Antarctic Treaty, which was not strictly relevant to tundra regions. However, candidates could still be awarded marks if they evaluated the success of strategies within the Antarctic Treaty such as protected areas, tourism control, banning or limiting mineral extraction and waste management, which are also relevant to tundra regions.

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