



| Gas            | Percentage |
|----------------|------------|
| Nitrogen       | ~80%       |
| Oxygen         | ~20%       |
| Argon          | 0.93%      |
| Carbon dioxide | 0.04%      |

Proportions of gases in the atmosphere

|                          |                                                                                         |                                                                                                                                                           |
|--------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Algae and plants         | <i>These produced the oxygen that is now in the atmosphere, through photosynthesis.</i> | carbon dioxide + water $\rightarrow$ glucose + oxygen<br>$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ |
| Oxygen in the atmosphere | <i>First produced by algae 2.7 billion years ago.</i>                                   | Over the next billion years plants evolved to gradually produce more oxygen. This gradually increased to a level that enabled animals to evolve.          |

How oxygen increased

How carbon dioxide decreased

Reducing carbon dioxide in the atmosphere

*Algae and plants*

These gradually reduced the carbon dioxide levels in the atmosphere by absorbing it for photosynthesis.

Formation of sedimentary rocks and fossil fuels

*These are made out of the remains of biological matter, formed over millions of years*

Remains of biological matter falls to the bottom of oceans. Over millions of years layers of sediment settled on top of them and the huge pressures turned them into coal, oil, natural gas and sedimentary rocks. The sedimentary rocks contain carbon dioxide from the biological matter.

Composition and evolution of the atmosphere

AQA GCSE Chemistry of the atmosphere

Common atmospheric pollutants

CO<sub>2</sub> and methane as greenhouse gases

Greenhouse gases

Carbon dioxide, water vapour and methane

*Examples of greenhouse gases that maintain temperatures on Earth in order to support life*

The greenhouse effect

*Radiation from the Sun enters the Earth's atmosphere and reflects off of the Earth. Some of this radiation is re-radiated back by the atmosphere to the Earth, warming up the global temperature.*

Carbon footprints

The total amount of greenhouse gases emitted over the full life cycle of a product/event. This can be reduced by reducing emissions of carbon dioxide and methane.

Global climate change

Human activities and greenhouse gases

Effects of climate change

Rising sea levels

Extreme weather events such as severe storms

Change in amount and distribution of rainfall

Changes to distribution of wildlife species with some becoming extinct

Carbon dioxide

*Human activities that increase carbon dioxide levels include burning fossil fuels and deforestation.*

Methane

*Human activities that increase methane levels include raising livestock (for food) and using landfills (the decay of organic matter released methane).*

Climate change

*There is evidence to suggest that human activities will cause the Earth's atmospheric temperature to increase and cause climate change.*

Properties and effects of atmospheric pollutants

|                                       |                                                                                          |
|---------------------------------------|------------------------------------------------------------------------------------------|
| Carbon monoxide                       | <i>Toxic, colourless and odourless gas. Not easily detected, can kill.</i>               |
| Sulfur dioxide and oxides of nitrogen | <i>Cause respiratory problems in humans and acid rain which affects the environment.</i> |
| Particulates                          | <i>Cause global dimming and health problems in humans.</i>                               |

Atmospheric pollutants from fuels

|                          |                                                                                              |
|--------------------------|----------------------------------------------------------------------------------------------|
| Combustion of fuels      | <i>Source of atmospheric pollutants. Most fuels may also contain some sulfur.</i>            |
| Gases from burning fuels | <i>Carbon dioxide, water vapour, carbon monoxide, sulfur dioxide and oxides of nitrogen.</i> |
| Particulates             | <i>Solid particles and unburned hydrocarbons released when burning fuels.</i>                |