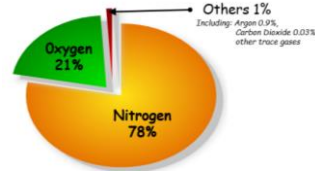


## Composition of the Atmosphere

1 The current composition has been stable for the past 200 million years.

The atmosphere is made up of: oxygen 21%, nitrogen 78% and 1% (CO<sub>2</sub>, water vapour, argon)




## Evolution of the Atmosphere

1	4.5 billion years ago	<p>Lots of volcanic activity. Atmosphere mostly CO<sub>2</sub>, water vapour condenses to form oceans.</p> <p>Volcanoes produce nitrogen which formed ammonia. CO<sub>2</sub> dissolves in sea water, reducing amount in atmosphere</p>
2	2.7 billion years ago	<p>Cyanobacteria (algae) evolves. This was the first organism that could <b>photosynthesise</b>.</p> $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ <p>This meant that oxygen levels in the atmosphere increased and carbon dioxide decreased.</p>
3	Between 2.7 billion and 200 million years ago	<p>Due to the increased oxygen, more complex life evolved (plants and animals). Carbon becomes locked in these organisms. The organisms die and become buried deep underground. Heat and pressure turn this into <b>fossil fuels</b> (coal, oil and gas)</p>
4	200 million years ago	The atmosphere has the same stable composition we see today.
5	Present day	Humans burn fossil fuels for energy. This releases stored carbon back into the atmosphere.

## Greenhouse Gases (GHG's)

1	The 3 main GHG's are...	Water vapour, carbon dioxide and methane
2	Greenhouse gases in the atmosphere	Absorb and re-emit longwave radiation, causing the greenhouse effect
3	Some human activities release GHG's into the atmosphere.	E.g. burning fossil fuels, agriculture, deforestation

## Greenhouse Effect

1	<p>The greenhouse effect is <b>essential for life</b> on Earth, because it keeps the Earth at a warmer temperature. However, too many GHG's in the atmosphere could mean that the Earth's temperature becomes too high.</p>		
2	<b>Shortwave solar radiation</b>	Goes from the <b>sun to the Earth</b> (through the atmosphere).	
3	<b>Longwave radiation</b>	Is the <b>reflected</b> back from the Earth. Some of this radiation is <b>absorbed by GHG's</b> and re-emitted back to Earth. This causes Earth's surface	

## Climate Change

1	Effects	<b>Ice melting</b>	Increases sea levels, can cause flooding and loss of beaches
		<b>Loss of habitats</b>	Extinction of some species and reduced biodiversity
		<b>Extreme weather</b>	Causes droughts leading to forest fires and extreme rainfall leading to flooding
2	Evidence	<b>Global temperatures are rising</b>	This correlates (follows the same pattern) as GHG emissions from human activity.
		<b>Sea ice and glaciers melting</b>	The sea levels are rising and photos and measurements show ice melting over the past several hundred years
		<b>More extreme weather</b>	More extreme weather is being recorded, such as record rainfalls and the hottest months on record. This leads to floods and droughts.

## Carbon Footprint

1	A carbon footprint...	Measures the amount of GHG's released by something during its life (can be a person, business or object).
2	Can be difficult to measure because...	There's lots of factors to consider which can mean that being precise is difficult.
3	Carbon footprints can be reduced by...	Not using processes that release GHG's (e.g. burning fossil fuels) or offsetting GHG emissions (e.g. planting trees).

## Life Cycle Analysis (LCA)

1	LCA's look at the <b>whole environmental impact</b> of an object during its life (not just GHG's) This is split into 4 stages...	<ul style="list-style-type: none"> <li>- Extracting and processing raw materials</li> <li>- Manufacturing and packaging</li> <li>- Use and reuse</li> <li>- Disposal of the product.</li> </ul>
2	LCA's use value judgements	Although it is possible to quantify (put a numerical value to) aspects of an items lifecycle (e.g. use of resources, how much waste is produced). It is <b>not easy to quantify the effect</b> of the pollutants, value judgements are used.
3	Value judgements are subjective...	This means that manufacturers may use a selective LCA that only shows <b>some</b> of the impacts of the product on the environment. For value judgements to be reliable, they should be <b>peer-reviewed</b>

## Complete and Incomplete Combustion

1	Complete combustion	<p>Occurs when there is enough available oxygen. Produces just carbon dioxide and water.</p> <p>Hydrocarbons (fuel) + Oxygen → carbon dioxide + water</p>
2	Incomplete combustion	<p>Occurs when there is not enough oxygen available Produce: Carbon monoxide (a toxic gas), soot (particulates of carbon), and water. May also produce sulphur dioxide and oxides of nitrogen (linked to acid rain).</p> <p>Hydrocarbon (fuel) + oxygen → carbon + carbon monoxide + water</p>

## Effects of Pollution

1	<b>Carbon monoxide</b>	Colourless, tasteless toxic gas that is difficult to detect.
2	<b>Acid rain</b>	Caused by sulphur dioxide and oxides of nitrogen. Damages plants and buildings.
3	<b>Soot and Global dimming</b>	Soot in the atmosphere can cause respiratory problems. Large amounts also reduce the amount of light reaching the surface of the Earth.

## Key Vocabulary

1	Greenhouse gases (GHG's)	Gases which absorb and re-emit longwave radiation in the atmosphere, leading to the greenhouse effect.
2	Greenhouse effect	The process in which GHG's absorb and re-emit longwave radiation, leading to an increase in the temperature at the Earth's surface.
3	Global warming	The increase in overall global temperature caused by excess levels of GHG's in the atmosphere.
4	Climate change	The change in global weather patterns caused by excess levels of GHG's in the atmosphere.
5	Shortwave solar radiation	Radiation from the sun that is seen as visible light (or near visible light). Contains lots of energy.
6	Longwave radiation	Radiation with a longer wavelength, that is seen as infrared light. Contains less energy than shortwave radiation.
7	Carbon footprint	A process of measuring the amount of GHG's something releases during its lifecycle.
8	Life cycle analysis (LCA)	A process of measuring the overall environmental impact of something during its lifecycle.
9	Value judgements	The scores assigned to the effects of a pollutant. Used in LCA.
10	Pollution	The introduction of contaminants (such as chemical substances) to an environment.
11	Particulates	Solid groups of particles suspended in liquid or gas