C11: The Atmosphere

Evolution of the Atmosphere 1

Volcanoes give off carbon dioxide, nitrogen, water vapour, methane and ammonia.

Most of the atmosphere is CO_2. There is no oxygen.

Evolution of the Atmosphere 2

Water vapour **condensed** to form oceans as the Earth cooled.

Lots of CO_2 **dissolved** into the **oceans**, forming carbonate precipitates. These formed sediments on the sea floor.

Green plants and algae evolved and absorbed some CO_2 for **photosynthesis**.

When marine animals evolved their shells and skeletons contained **carbonates**. These become a store of carbon when the animal is fossilised, or turned into fossil fuels.

Evolution of the Atmosphere 3

Green plants and algae photosynthesise to produce O_2:

carbon dioxide + water → glucose + oxygen

CO_2 + H_2O → $C_6H_{12}O_6$ + O_2

As oxygen levels increase more complex life can form.

The atmosphere is now **20% oxygen, 80% nitrogen** and less than **1% other** gases (inc. CO_2 and nobel gases).

Dates

Algae first evolved **2.7 billion** years ago.

Plants evolved over the next **billion** years.

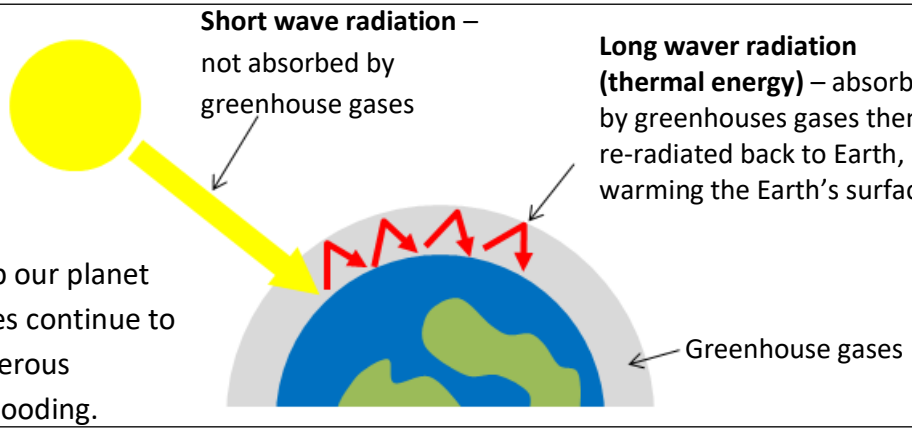
Todays levels were reached **200 million years ago**.

Climate Change

Greenhouse gases are:

- Carbon dioxide
- Methane
- Water vapour

These gases help to keep our planet warm but if temperatures continue to rise there could be dangerous consequences, such as flooding.



Carbon Footprints

A measure of how much greenhouse gasses are released over the **entire life cycle** of something.

It is very **difficult** to calculate as there are so many factors involved. It can be reduced by:

- Using renewable or nuclear energy sources
- Using more efficient processes to reduce energy use and waste.
- Tax companies based on their carbon footprint
- Use technology to capture CO_2 before it is released into the atmosphere.

How we contribute to climate change

Deforestation – less trees to remove CO_2 from the atmosphere by photosynthesis.

Burning fossil fuels – releases CO_2 into the atmosphere.

Agriculture – farm animals (eg. cows) produce lots of methane through digestive processes.

Waste – decomposition of waste at landfill sites releases CO_2 and methane.

Air Pollution

Carbon monoxide – caused by incomplete combustion it prevents blood carrying oxygen by binding to haemoglobin. Can result in fainting, coma or death. It is colourless and odourless so is very hard to detect.

Sulphur dioxide – released by burning fossil fuels that contain sulphur impurities. Causes acid rain.

Nitrogen oxides – formed when N_2 and O_2 react in hot engines (eg. cars). Causes acid rain.

Acid Rain

SO_2 and NO_2 mix with clouds to form sulphuric acid and nitric acid.

Acid rain kills plants and damages buildings.