

The atmosphere

- ❖ State the composition of clean, dry air
- ❖ Explain the changes in the Earth that led to oceans forming.
- ❖ Relate the Earth's early atmosphere with that of Mars or Venus today.
- ❖ Explain the changes in the Earth's atmosphere today.

The Atmosphere

The Earth's atmosphere has been roughly as it is now for the last 200 million years or so.

The main gases in the atmosphere are nitrogen and oxygen.

Nitrogen is by far the most abundant gas — about four-fifths (80%) of the atmosphere is nitrogen.

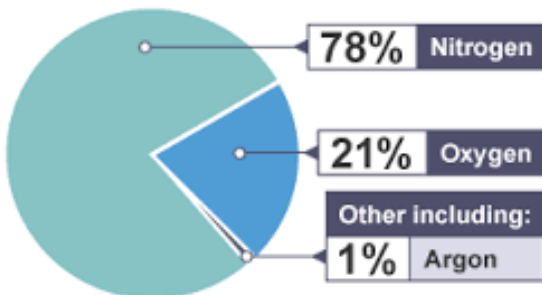
About one-fifth (20%) of the atmosphere is oxygen.

There are small amounts of other gases in the atmosphere too. These include carbon dioxide, water vapour and noble gases.

The permanent gases whose percentages do not change from day to day are nitrogen, oxygen and argon.

Nitrogen accounts for **78%** of the atmosphere, oxygen **21%** and argon **0.9%**.

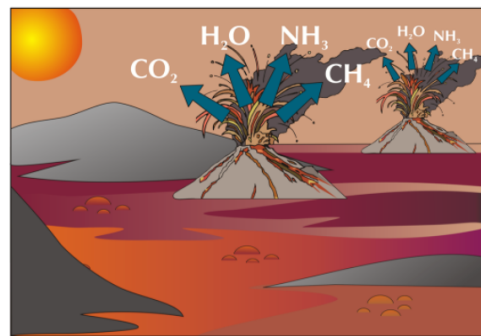
Gases like carbon dioxide, nitrous oxides, methane, and ozone are trace gases that account for about a tenth of **one percent** of the atmosphere.



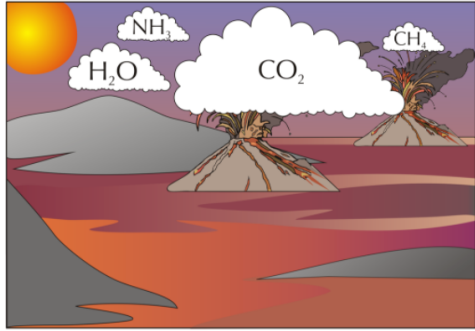
Gas	Symbol	Volume (%)
Nitrogen	N ₂	78.0840
Oxygen	O ₂	20.9480
Argon	A	0.9340
Carbon Dioxide	CO ₂	0.0314
Neon	Ne	0.0018
Helium	He	0.0005
Hydrogen	H ₂	<0.0001



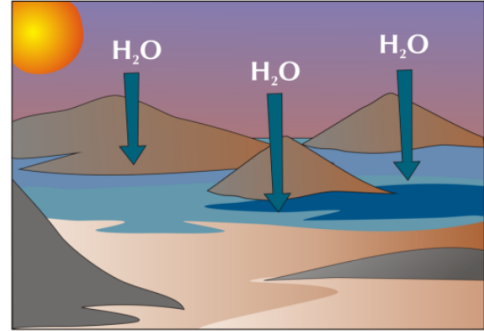
The surface of the Earth was molten for millions of years. There wasn't an atmosphere — it was too hot.



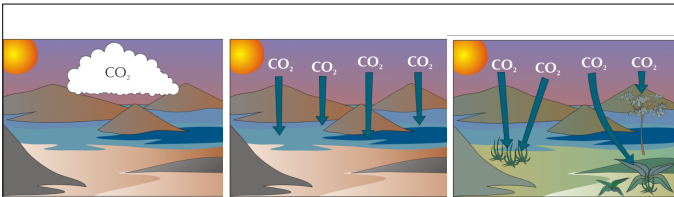
Later, the temperature cooled and a crust formed. Volcanoes erupted, giving out gases. It's thought that this is how the early atmosphere was formed.



It's thought the Earth's early atmosphere was mostly carbon dioxide (CO₂), with some water vapour (H₂O), ammonia (NH₃) and methane (CH₄) too.



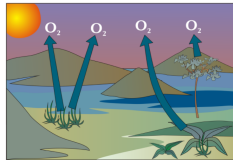
As the Earth cooled down, the water vapour released by the volcanoes condensed. The liquid water that formed created the oceans.



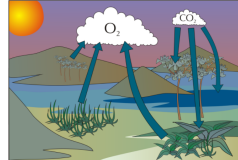
The Earth's early atmosphere was mostly carbon dioxide (CO₂).

Some of this carbon dioxide dissolved into the oceans...

...and some of it was taken in by plants and algae as they evolved.



Plants use carbon dioxide for photosynthesis. They release oxygen.



Over time, the amount of carbon dioxide in the atmosphere decreased, and the amount of oxygen increased.

Modern Atmosphere

In the Anthropocene the atmosphere has changed.

We have been clearing forests, and burning fossil fuels for thousands of years.

This really sped up in the industrial revolution and has been accelerating ever since. Industrialisation of South America and Asia along with incredible rates of deforestation.

These mostly affect carbon dioxide levels in the atmosphere. Along with other pollutants including methane (CH₄), Sulfur dioxide (SO₂) and CFCs.

CO₂ is a greenhouse gas, trapping heat in the atmosphere, causing global warming.

CH₄ is an even stronger greenhouse gas.

SO₂ dissolves in water in the atmosphere to cause acid rain.

CFCs were responsible for damaging the Ozone layer and so let in more harmful radiation.

Smoke particles (carbon) block out sunlight and this is called global dimming, it reduces the amount of photosynthesis that plants can do because they receive less light.

How is the atmosphere of Mars like the Earth's early atmosphere?

