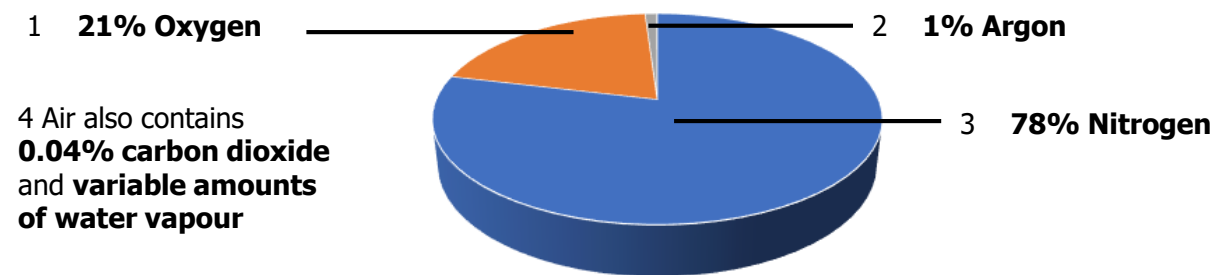


# Chemistry 9: Chemistry of the Atmosphere

## Section 1: The Atmosphere



## Section 2: Formation of the Atmosphere

**5. Early Atmosphere**  
Atmosphere is **mainly carbon dioxide** with **no oxygen**.

**6. 4.6 – 3.6 Billion Years Ago**  
**Volcanoes erupt releasing nitrogen and water vapour. Water vapour condenses** and forms the oceans. Some **carbon dioxide dissolves in the oceans. Carbon dioxide is also locked in fossil fuels and sedimentary rocks.**

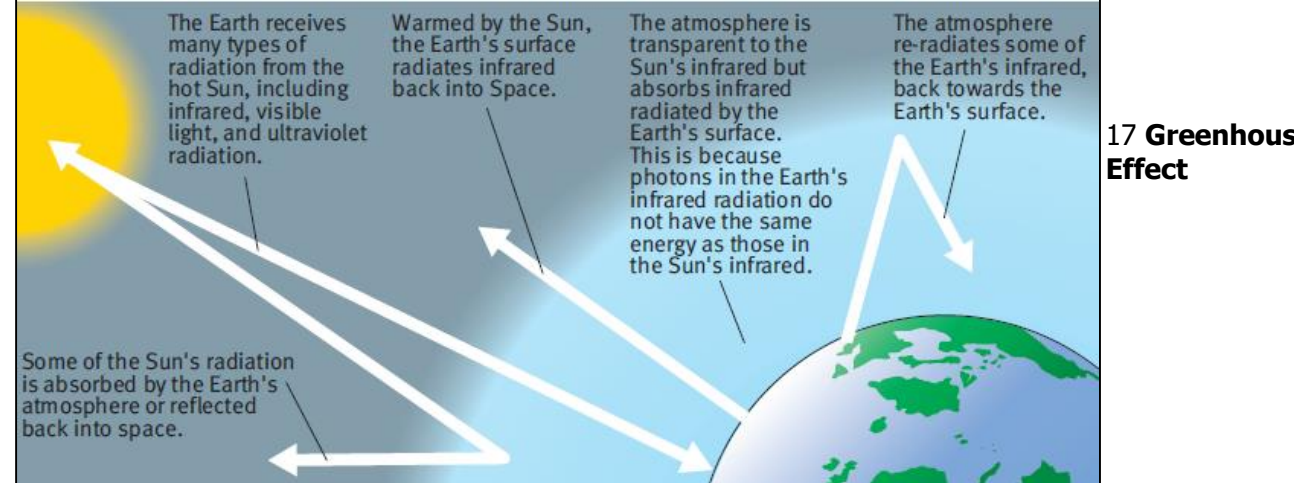
**7. 2.7-1.7 Billion Years Ago**  
**Plants evolve and release oxygen through photosynthesis.** They take in more carbon dioxide.

## Section 2a: Reduction of CO<sub>2</sub> by formation of deposits

8 Coal	<b>Plants absorbed CO<sub>2</sub>. They died and decayed.</b> This layer of decaying plants was <b>compressed to form coal.</b>
9 Oil and natural gas	<b>Plankton absorbed CO<sub>2</sub>. Plankton died and were deposited in muds on the sea floor.</b> They were covered over and <b>compressed over millions of years.</b>
10 Limestone	<b>Shelled animals absorbed CO<sub>2</sub> to make their calcium carbonate shells.</b> The remains of these animals were <b>compressed to form limestone.</b>

## Section 3: Greenhouse Effect and Global Warming

11 Greenhouse effect	The process by which the <b>temperature on Earth</b> is kept <b>high enough to support life</b> by greenhouse gases absorbing radiation radiated by the Earth.
12 Greenhouse gas	Greenhouse gases keep temperatures on Earth high enough to support life. <b>Water vapour, methane and carbon dioxide</b> are greenhouse gases.
13 Short wavelength radiation	The <b>radiation from the Sun.</b> Is able to <b>pass through the Earth's atmosphere</b> and <b>warm the surface</b> of the Earth <b>without being absorbed</b> by greenhouse gases.
14 Long wavelength radiation	The <b>radiation from the Earth's surface.</b> Some is <b>absorbed</b> by greenhouse gases and <b>doesn't escape the atmosphere.</b>
15 Carbon footprint	The <b>total amount of carbon dioxide</b> and other <b>greenhouse gases</b> emitted over the <b>full life cycle</b> of a product or event.
16 Global warming	The <b>increase of the average temperature</b> of the <b>Earth.</b>



<b>18 How humans increase carbon dioxide in the atmosphere</b>	<b>19 How humans increase methane in the atmosphere</b>
<b>Combustion of fossil fuels</b>	Increased <b>animal farming</b>
<b>Deforestation</b>	Decomposition of <b>rubbish in landfill</b>
<b>20 How humans can decrease carbon dioxide concentration</b>	<b>21 How humans can decrease methane concentration</b>
Use <b>alternative forms of energy</b> e.g. wind turbines	<b>Alternative foods – non-animal based</b>
<b>Energy efficiency</b> e.g. more efficient cars	Increased <b>recycling</b>
<b>Carbon capture</b> – capturing CO <sub>2</sub> from power stations and trapping it	
<b>Carbon off-setting</b> – planting <b>more trees</b>	
<b>Effects of global warming</b>	
22 Some regions will <b>not</b> be able to produce <b>enough food</b> because of <b>drought.</b>	
23 <b>Changes to distribution of species</b> and migration patterns.	
24 <b>Increase in sea levels</b> because of melting of polar ice caps.	
25 <b>Reduction of water supplies</b> in some regions.	

## Section 4: Common Pollutants

Pollutant	Formula	Cause	Effect
26 Carbon monoxide	CO	<b>Incomplete combustion</b> of a <b>hydrocarbon fuel.</b>	<b>Toxic gas.</b> Colourless and odourless so hard to detect.
27 Sulfur dioxide	SO <sub>2</sub>	<b>Burning coal or petrol.</b> Both contain sulfur which reacts with oxygen in the air.	Cause <b>respiratory problems</b> (e.g. for those with asthma).
28 Nitrogen oxides	NO <sub>x</sub>	In <b>car engines. N<sub>2</sub> and O<sub>2</sub> from air</b> react at <b>high temperatures.</b>	Combine with water vapour to cause <b>acid rain.</b>
29 Particulates	CO <sub>2</sub>	<b>Incomplete combustion</b> of a <b>hydrocarbon fuel.</b>	<b>Global dimming</b> (reduction in sunlight reaching Earth).