



Chemistry Topic 13

The Earth's atmosphere

KNOWLEDGE

ORGANISER

Section 1: Key terms

Acid rain	Rain made so acidic that it causes harm to the environment .
Atmosphere	The thin layer of gases that surround planet Earth .
Biofuels	A source of renewable energy made from plant material that absorbs carbon dioxide during photosynthesis . When it burns it returns the same amount of carbon dioxide into the atmosphere.
Carbon footprint	The carbon footprint of a product, service or event is the total amount of carbon dioxide and other greenhouse gases released over its complete life cycle .
Climate change	The change in global weather patterns that could be caused by excess amounts of greenhouse gases in the atmosphere.
Ecosystems	A large community of living organisms in a particular area.
Fossil fuels	Fuels such as coal, oil or natural gas formed from the remains of decaying plants and animals .
Global dimming	A decrease in the amounts of sunlight reaching the surface of the Earth.
Global warming	Gradual heating of the Earth due to increased levels of greenhouse gases .
Haemoglobin	A red pigment located in red blood cells responsible for transporting oxygen around the body.
Longwave radiation	The radiation emitted from the Earth's surface . Some is absorbed by greenhouse gases and doesn't escape the atmosphere (e.g. IR).
Non-renewable	Something which cannot be replaced once it is used up .
Particulates	Very small particles in the atmosphere given off by incomplete combustion of fuels.
Pollutant	A substance that causes harm to the environment .
Photosynthesis	The process by which plants make food using carbon dioxide, water and sunlight. Releases oxygen as a waste product.
Sedimentary rock	When plants, plankton and marine animals die and fall to the seabed, they get laid down in layers. Over time, these layers are squashed under more layers of sediment (sand, mud and pebbles) forming sedimentary rock. Limestone & coal are example of sedimentary rocks.
Shortwave radiation	The radiation from the Sun . Is able to pass through the Earth's atmosphere and warm the surface of the Earth without being absorbed by greenhouse gases (e.g. Ultraviolet radiation)

Section 2: History of our atmosphere

Early atmosphere is mainly **carbon dioxide** and little or no oxygen gas.



Volcanoes release **nitrogen , water vapour** and small amounts of methane and ammonia.



The Earth begins to cool, **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**.



Green **plants & algae evolve** and **release oxygen** through **photosynthesis**.



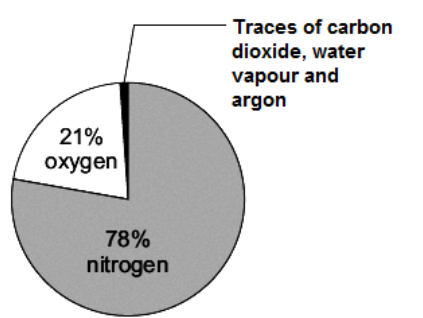
This process takes in more **carbon dioxide**.

Earth's early atmosphere

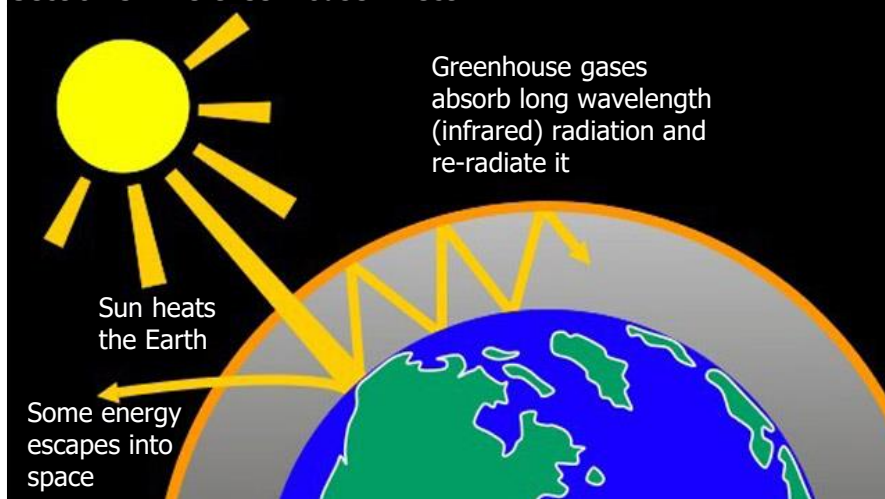
Section 3: Formation of coal, oil, gas and limestone

Coal	Plants absorbed CO₂ . They died and decayed . This layer of decaying plants was compressed to form coal .
Oil and natural gas	Plankton absorbed CO₂ . Plankton died and were deposited in muds on the sea floor . They were covered over by sediments and compressed over millions of years .
Limestone	Skeletons & shells (containing calcium carbonate) of dead marine animals build up on seabed. They were covered over by sediments and compressed over millions of years .

Section 4: The atmosphere today

Nitrogen 78%	
Oxygen 21%	
Argon 0.9%	
Carbon dioxide 0.04%	
Trace amounts of other gases	

Section 5: The Greenhouse Effect



- Greenhouse gases (like carbon dioxide, methane and water vapour act like an **insulating layer** in the Earth's atmosphere.
- They keep the Earth **warm enough to support life**.
- Greenhouse gases **don't absorb short wavelength** radiation from the Sun but they **do absorb long wavelength** radiation (infrared or thermal radiation) reflected from the Earth.
- They **re-radiate** it back towards the Earth warming the Earth's surface.

Section 6: Global climate change

How humans increase carbon dioxide in the atmosphere	How humans increase methane in the atmosphere
Combustion of fossil fuels	Increased animal farming
Deforestation	Rice fields
	Decomposition of rubbish in landfill
How humans can decrease carbon dioxide concentration	How humans can decrease methane concentration
Use alternative forms of energy e.g. wind turbines, solar panels	Alternative foods – non-animal based
Energy efficiency e.g. more efficient cars e.g. electric cars	Increased recycling
Carbon capture – capturing CO ₂ from power stations and trapping it underground in porous rocks.	
Carbon off-setting – planting more trees	
Effects of global warming	
Some regions will not be able to produce enough food due to drought .	
Changes to distribution of species and migration patterns put ecosystems under stress.	
Rising sea levels because of melting of polar ice caps.	
Increasing common extreme weather events such as severe storms.	

Section 7: Common Pollutants

Pollutant	Cause	Effect
Carbon monoxide	CO	Incomplete combustion of a hydrocarbon fuel. Toxic gas. Colourless and odourless so hard to detect.
Sulfur dioxide	SO ₂	Burning coal or petrol. Both contain sulfur which reacts with oxygen in air. Cause respiratory problems (e.g. for those with asthma).
Nitrogen oxides	NO _x	In car engines . N₂ and O₂ from air react at high temperatures . Combine with water vapour to cause acid rain .
Particulates	C	Incomplete combustion of a hydrocarbon fuel. Global dimming (reduction in sunlight reaching Earth). Can damage cells in lungs.