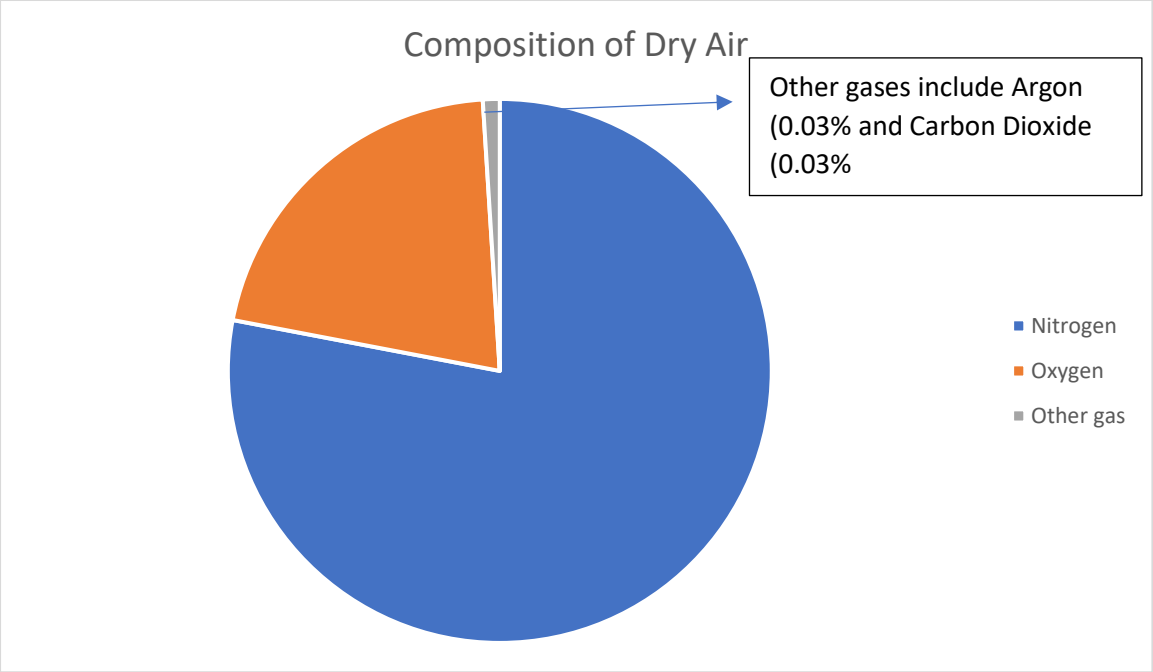
Air and the Atmosphere

Content

Composition of Air



Air Pollution

Pollutant	Sources	Effects
Carbon monoxide, CO	• Incomplete combustion of fuels	• Fatigue, headache, death • CO binds irreversibly with haemoglobin in blood, preventing it from carrying oxygen. • $2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$
Sulfur dioxide, SO_2	• Volcanic eruptions • Burning of fossil fuels containing sulfur	• Irritation to eyes of lungs • Acid rain (corrodes limestone buildings) • $2SO_2 + 2H_2O + O_2 \rightarrow 2H_2SO_4$ • $4NO_2 + 2H_2O + O_2 \rightarrow 4HNO_3$
Nitrous dioxide, NO_2 Nitrous oxide, NO	• Lightning activity • Internal combustion in engines • Strong N≡N bonds so combustion only occurs at high temps	
Unburnt hydrocarbons	• Incomplete combustion of fuels	• Reacts with NO_2 to form ozone
Methane, CH_4	• Decaying matter • Digestion of food	• Greenhouse gas effect
Ozone, O_3	• Reaction of unburnt hydrocarbons with NO_2	• Photochemical smog

Catalytic Converter

- Made up of Rhodium, Platinum, Palladium

List of reactions

1	$CO + NO \rightarrow N_2 + CO_2$
2	$CO + O_2 \rightarrow 2CO_2$
3	$2NO_2 \rightarrow N_2 + O_2$
4	$C_XH_{4X} + 2xO_2 \rightarrow CO_2 + 2xH_2O$

Flue Gas Desulfurization

- Waste gases from combustion of fossil fuels are called flue gases
- Desulfurization is the process of removing sulfur dioxide from flue gases
- $SO_2 + CaCO_3 \rightarrow CaSO_3 + CO_2$
- $2CaSO_3 + O_2 \rightarrow 2CaSO_4$
- $SO_2 + CaO \rightarrow CaSO_3$

Depletion of the ozone layer

- Caused by chlorofluorocarbons in aerosols and refrigeration coolants
- In UV rays, CFCS decompose to form chlorine atoms
- React with ozone to form chlorine monoxide and oxygen
- Ozone layer is destroyed and UV rays can reach earth

Carbon Cycle

Respiration → $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

Photosynthesis → $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

Greenhouse effect

- Increased concentrations of greenhouse gases due to anthropogenic activities
    - Enhanced greenhouse effect → rise in temperature
- Consequences?
    - More drought, flooding
    - Less snow + ice
    - More extreme weather incidents
    - RISING SEA LEVEL
        - Warmer oceans + partially melted glaciers + other ice → increase sea level. Ocean water expands when warm → further rise in sea level