

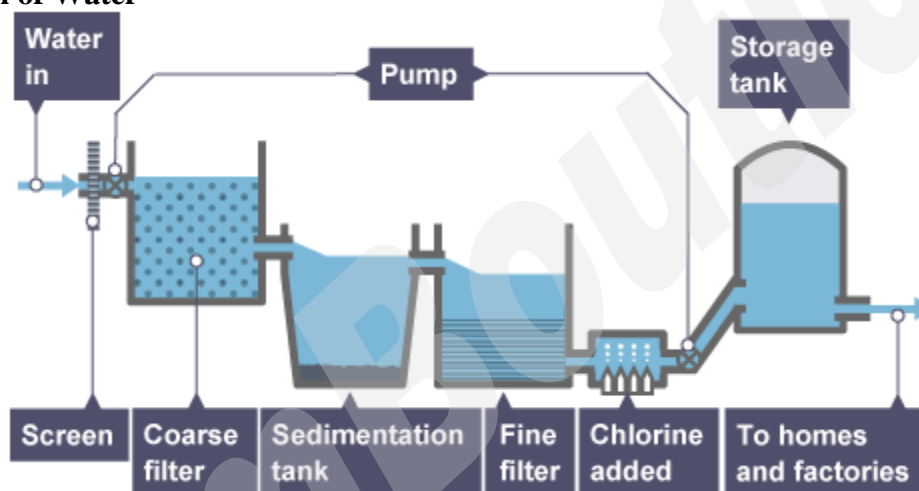
Air and Water

(IGCSE Chemistry Syllabus 2016-2018)

Water

Test	Type of Test	Positive Result
Blue Cobalt (II) Chloride Paper	Chemical	Blue to Pink
Anhydrous Copper (II) Sulphate powder	Chemical	White to Blue
Test Melting and Boiling Point	Physical	MP: 0 °C BP: 100 °C

Purification of Water

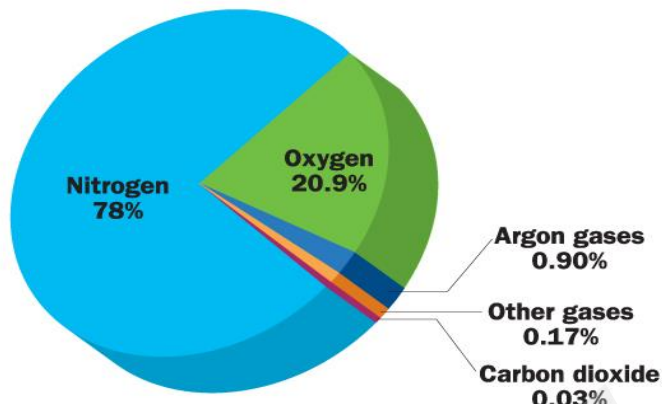


- Chlorine: to kill bacteria

Use of Water

- At home: drinking, cooking, washing
- In industry: dissolve, wash and cool engines, form steam turns turbines

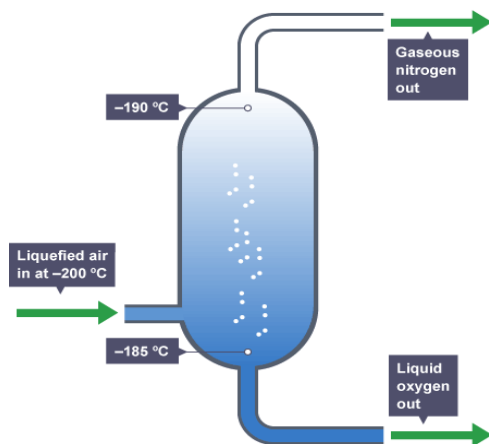
Air



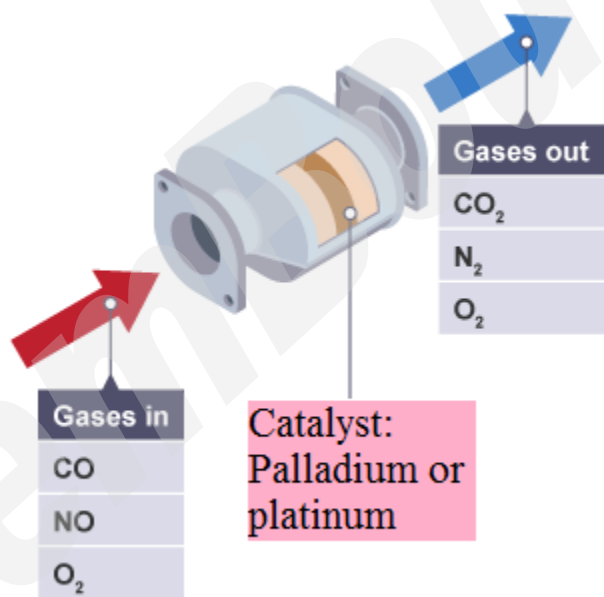
○ Pollutants in air

Pollutant	Source	Problems caused
Carbon Monoxide CO	Incomplete combustion of carbon-containing substances	Reacts with haemoglobin, preventing it from carrying oxygen, death due to oxygen starvation
Sulphur Dioxide SO ₂	Combustion of fossil fuels which contain sulfur	Irritates eyes and throat, causes respiratory problems and causes acid rain
Oxides of Nitrogen NO _x	From car exhausts	Causes respiratory problems and forms acid rain
Lead compounds	Combustion of fossil fuels which contain lead	Causes damage to brain and nerve cells in young children

- Fractional Distillation of Air – provide source of nitrogen

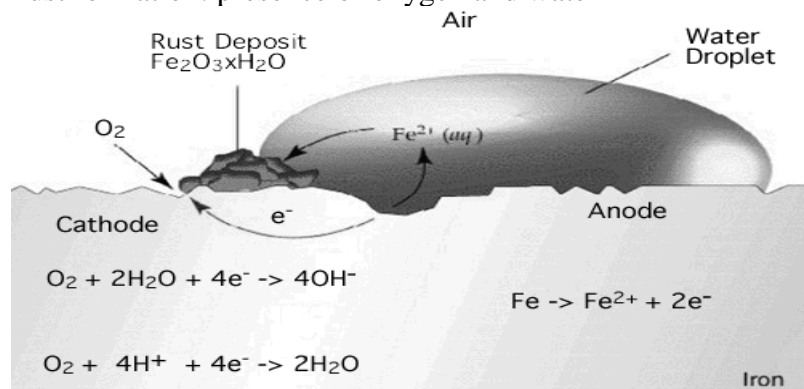


Catalytic Converter



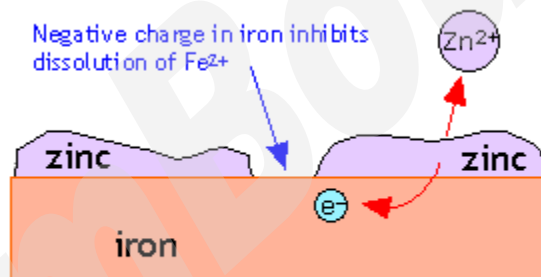
Rust Prevention

- Rust formation: presence of oxygen and water



- Rust prevention:
 - Coating with plastic, paint and grease
 - Electroplate with tin or chromium
 - Galvanizing: dipping in molten zinc
 - Sacrificial protection: attaching a piece of metal that is more reactive than iron, commonly magnesium and zinc, they will corrode in the place of iron

To prevent contact with air and water



Sacrificial coating

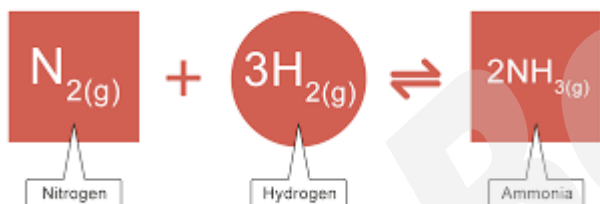
Nitrogen and Fertilizer

Fertilizer

- NPK used in fertilizers because:
 - Nitrogen: to make proteins
 - Phosphorus: roots grow and crops ripen
 - Potassium: make proteins and resist diseases
- e.g. ammonium chloride, ammonium sulphate
- All alkali (except ammonia) will react with ammonium compounds, removing ammonia
 $\text{NaOH} + \text{NH}_4\text{Cl} \rightarrow \text{NaCl} + \text{NH}_3 + \text{H}_2\text{O}$

Manufacture of Ammonia

- Haber process



- Raw material:
 - Nitrogen – fractional distillation of air
 - Hydrogen – electrolysis of water, cracking of alkane
- Essential conditions:
 - Temperature: 450 °C
 - Pressure: 200 atm
 - Catalyst: iron

Carbon Dioxide and Methane

- **Source of carbon dioxide:** product of complete combustion of carbon containing substances, product of respiration, product of reaction between acid and a carbonate and thermal decomposition of carbonate
- **Sources of methane:** oil and natural gas, decomposition of vegetation and waste gases from digestion in animals

Greenhouse Gases

- Methane and carbon dioxide
- Stop the heat from escaping into space
- Leading to climate change
- Cause ice poles to melt, rising sea levels, more droughts, storms, floods and global warming

Carbon cycle

