

- Makes ethanol and Carbon Dioxide.
- $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + CO_2$
- Anaerobic respiration (no oxygen) otherwise it makes vinegar (ethanoic acid.)
- Water and yeast needed.
- 37°C - optimum for zymase enzymes.
- Used as: drink, solvents and fuels.

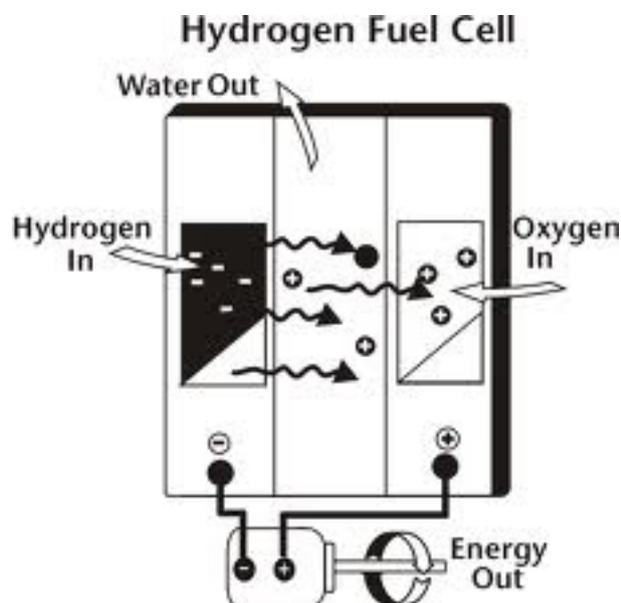
Alcohols and Fermentation

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Fuel Cells

- H^+ Electrons lost to anode $2H_2 \rightarrow 4H^+ + 4e^-$
- H^+ electrons Oxygen atoms combine $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$
- H^+ ions can pass across membranes in electrolysis- proton exchange membrane.



oxidation is loss reduction is gain

OIL RIG

Sacrificial protection:- Bolt block of a more reactive metals onto the hull of a ship e.g. Zinc and that displaces and stops the ship from rusting.

- Oxidation
- Is
- Loss (of electrons)
- Reduction
- Is
- Gain (of electrons)

Redox Reactions

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Hydration and Dehydration of Ethene

Salts and Ethanol's

- Hydration catalyst= Hot Phosphoric acid.
- Dehydration catalyst= Hot Aluminium oxide.
- Hydration= $C_2H_4 + H_2O \rightarrow C_2H_5OH$
- Dehydration= $C_2H_5OH \rightarrow C_2H_4 + H_2O$
- Alcohol Fermentation Pro's:- Carbon neutral, renewable, house hold waste used.
- Hydration of Ethene Pro's:- Cheaper, not enough land in UK so it's more economical not to grow crops.
- Alcohol Fermentation Con's:- Growing crops means large areas are deforested, not efficient with transport, difficult to make high concentrations of alcohol.
- Hydration of Ethene Con's:- Non-renewable we need to find an alternative fuel!



- Fat = Solid.
- Oil = Liquid.
- Saturated Hydrocarbons = Single Bonds.
- Unsaturated Hydrocarbons = Double Bonds.
- Testing for unsaturated fats = Bromine water test.
- Soaps = Saponification (Making soaps).
- Fat + alkali = soap + glycerol.
- $H_4C_2 + Br_2$ (orange) $\rightarrow H_4C_2Br$ (colourless).

Fats and Emulsions

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Ozone

Ozone is destroyed by CFC's, Ozone is O_3 :-

- 1. Initiation. $Cl_2 \rightarrow Cl \cdot + Cl \cdot$ (Radicals on right)
- 2. Propagation. $Cl \cdot + O_3 \rightarrow OCl \cdot + O_2$ then... (Radicals on both sides)
- $OCl \cdot + O_3 \rightarrow Cl \cdot + 2O_2$ overall...
- $O_3 + O_2 \rightarrow O_2 + 2O_2 + 2O_3$
- 3. Termination. $Cl \cdot + Cl \cdot \rightarrow Cl_2$ (Radicals on left)

CFC's are:- Non toxic, non-flammable, odourless, tasteless and chemically stable.





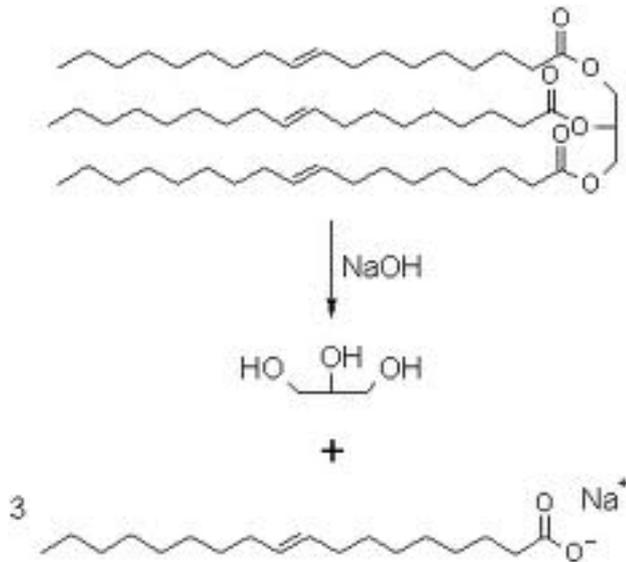
- Hard water reacts with soap but not detergent to make a scum instead of bubbles. It's 'hard' to make bubbles.
- Temporary Hardness = $\text{H}_2\text{CO}_3 + \text{CaCO}_3 \rightarrow \text{Ca}(\text{HCO}_3)_2$, When boiled it can be made soft.
- Permanent Hardness = $\text{H}_2\text{SO}_4 + \text{CaCO}_3 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$, Boiling doesn't remove Ca^{2+} ions, when heating CaSO_4 , no reaction is used. Sodium Carbonate is used.
- $\text{Ca}^{2+} (\text{aq}) + \text{CO}_3^{2-} (\text{aq}) \rightarrow \text{CaCO}_3 (\text{s})$ used in washing powders e.g. Calgon.
- Weak acids remove limestone.
- Ion exchange resins include:- Calcium and Magnesium.

Hard Water

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Saponification





- Manufacturing.
- Paying employees.
- Research and development.
- Drug testing and trials.
- Energy.
- Packaging.
- Machinery.
- Computer and hardware.
- Transporting drugs.
- Administration.
- Raw materials can be expensive.

Costs Involved in Making Medicines

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Medicines

Asprin = $C_9H_8O_4$ RFM= 180

Paracetamol = $C_8H_9O_2N$ RFM=151

Ibuprofen= $C_{13}H_{18}O_2$ RFM= 206





- Covalent compounds= Not soluble in water.
- Ionic compounds= Soluble in Water
- Salicylic acid+ acetic anhydride ---> acetylsalicylate + acetic acid.
- Made in lab but can be found in the bark of willow trees.
- Numbs pain, anticoagulant, pain-killer and anti-inflammatory.
- Has large risks, but you generally throw up after overdose unlike paracetamol which kills.
- React acid with Na+ to make Aspirin soluble.

Aspirin