C1 3.3 ALUMINIUM & TITANIUM

	Aluminium	Titanium
Property	• Shiny • Light • Low density • Conducts electricity and energy • Malleable – easily shaped • Ductile – drawn into cables and wires	• Strong • Resistant to corrosion • High melting point – so can be used at high temperatures • Less dense than most metals
Use	• Drinks cans • Cooking foil • Saucepans • High-voltage electricity cables • Bicycles • Aeroplanes and space vehicles	• High-performance aircraft • Racing bikes • Jet engines • Parts of nuclear reactors • Replacement hip joints
Extraction	<u>Electrolysis</u> • Aluminium ore is mined and extracted. • Alumminium oxide (the ore) is melted • Electric current passed through at high temperature → Expensive process – need lots of heat and electricity	<u>Displacement & Electrolysis</u> • Use sodium or potassium to displace titanium from its ore • Get sodium and magnesium from electrolysis → Expensive – lots of steps involved, & needs lots of heat and electricity

C1 3.6 METALLIC ISSUES

EXPLOITING ORES

Mining has many environmental consequences:

- Scar the landscape
- Noisy & Dusty
- Destroy animal habitats
- Large heaps of waste rock
- Make groundwater acidic
- Release gases that cause acid rain

RECYCLING METALS

- Recycling aluminium saves 95% of the energy normally used to extract it!
- This saves money!
- Iron and steel are easily recycled. As they are magnetic they are easily separated
- Copper can be recycled too – but it's trickier as it's often alloyed with other elements

BUILDING WITH METALS

Benefits

- Steel is strong for girders
- Aluminium is corrosion resistant
- Many are malleable
- Copper is a good conductor and not reactive

Drawbacks

- Iron & steel can rust
- Extraction causes pollution
- Metals are more expensive than other materials like concrete

C1 5.1 CRACKING HYDROCARBONS

CRACKING → Breaking down large hydrocarbon chains into smaller, more useful ones

CRACKING PROCESS

1. Heat hydrocarbons to a high temp; then either:
2. Mix them with steam; OR
3. Pass the over a hot catalyst

EXAMPLE OF CRACKING

Cracking is a thermal decomposition reaction:

$$C_{10}H_{22} \xrightarrow{800^oC} C_5H_{12} + C_3H_6 + C_2H_4$$

Decane → Pentane + Propene + Ethene

ALKENES

- These are unsaturated hydrocarbons
- They contain a double bond
- Have the general formula → C_nH_{2n}

SATURATED OR UNSATURATED?

We can react products with bromine water to test for saturation:

Positive Test:

Unsaturated hydrocarbon + Bromine Water → **COLOURLESS**

= **ALKENES**

Negative Test:

Saturated Hydrocarbon + Bromine Water → **NO RECTION** (orange)

= **ALKANES**

C1 6.1 EXTRACTING VEGETABLE OIL

There are 2 ways to extract vegetable oils from plants:

1) PRESSING

1. Farmers collect seeds from plants
2. Seeds are crushed and pressed
3. This extracts oil from them
4. Impurities are removed
5. Oil is processed to make it into a useful product

2) DISTILLATION

1. Plants are put into water and boiled
2. Oil and water evaporate together
3. Oil is collected by condensing (cooling the gas vapours)

Lavender oil is one oil extracted this way

FOOD AND FUEL

Vegetable oils are important foods:

- Provide important nutrients (e.g. vitamin E)
- Contain lots of energy → so can also be used as fuels
- Unsaturated oils contain double bonds (C=C) → they decolourise Bromine water

Food	Energy (kJ)
Veg Oil	3900
Sugar	1700
Meat	1100

Table for info only – don't memorise it!

C1 7.4 LIFE ON EARTH

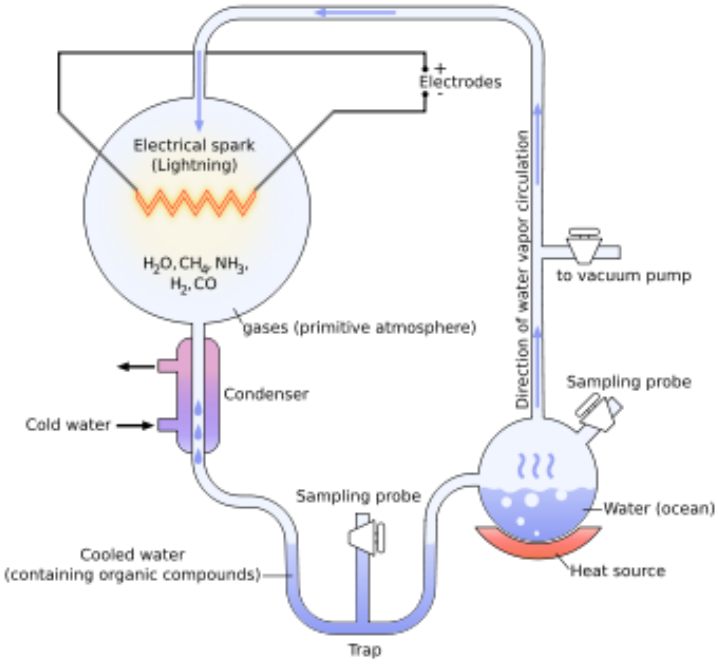
No one can be sure how life on Earth first started. There are many different theories:

MILLER-UREY EXPERIMENT

- Compounds for life on Earth came from reactions involving hydrocarbons (e.g. methane) and ammonia
- The energy for this could have been provided by lightning

OTHER THEORIES

1. Molecules for life (amino acids) came on meteorites from out of space
2. Actual living organisms themselves arrived on meteorites
3. Biological molecules were released from deep ocean vents



The experiment completed by Miller and Urey