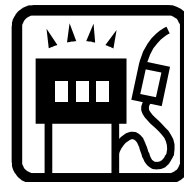


## Science Revision Notes

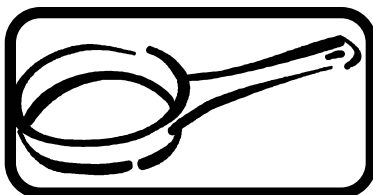
### Oils, Earth & Atmosphere - Products from oil



**Alkanes** are **saturated hydrocarbons** with **single bonds** between their carbon atoms. Many alkanes like Butane and Propane are used as **fuels**. Short chain alkanes like  $C_2H_6$  (ethane) are gases. Longer ones are liquids that pour easily e.g. petrol. The largest are hard to pour and are said to be **viscous**.

**Cracking** is a way of splitting large hydrocarbons into smaller ones by **thermal decomposition**. Cracking involves passing vaporised hydrocarbons over a hot **catalyst**. When an alkane is cracked a shorter alkane is formed together with **double bonded** molecules called **alkenes**, e.g.  $C_2H_4$  (ethene). The double bonded molecules are said to be **unsaturated**. Mixing an alkene with the brown coloured bromine solution makes it go clear. Bromine is a halogen and very reactive. To make **ethanol**, ethane is reacted with steam using a catalyst. Ethanol can also be made by fermentation using yeast (as in wines and beers). If ethanol is polymerised it can be made into **slime** with different viscosities. Slime can also be made by adding borax to PVA glue.

Alkenes (**monomers**) can be made to join together to form **polymers**. Polymers can be made by polymerisation or occur naturally, and have very long molecules. **Plastics** are made of monomers joined into long chains. Poly(ethene) is used to make plastic bags and poly(propene) is often used to make ropes and milk crates.



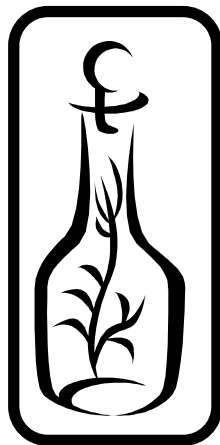
**Thermo softening** plastics can be remoulded when heated. They are good for making food wrapping. Transparency is another useful property of some plastics. **Thermo setting** plastics can not be remoulded once they have cooled. The handle of a pan is best made of a thermo setting polymer.



**New plastics** are still being invented, like hydro gel for making nappies more water absorbent and light sensitive polymers to make new types of sticking plaster.

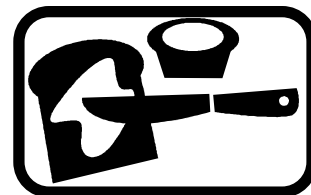
When cardboard and paper are buried they are broken down by micro-organisms. Burying waste polythene is a bad way to get rid of it because, like most plastics, it is not **biodegradable**.

### Oils, Earth & Atmosphere - Plant oils



Fruit, seeds and nuts are rich sources of **vegetable oils**. Vegetable oils are useful foods because they contain a **lot of energy**. Oils can be extracted by crushing or **distillation**. Distillation is when a substance is evaporated and then the vapour is changed back into a liquid. Oils can cook food at a higher temperature than in water. Vegetable oils can be mixed with liquids to make **emulsions**. Mayonnaise is a mixture of oil and vinegar. Egg yolk is the emulsifier which stops the oil and vinegar separating again.

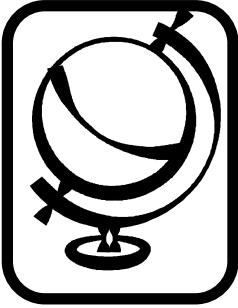
Heating oils to smoking point damages them. Solid fats like margarine can be made from oils by hydrogenation. **Hydrogenated** oil is made by heating unsaturated oil with hydrogen in the presence of a catalyst. Hydrogenated oil is saturated.



E numbers are legal food **additives**. Preservatives give foods a longer shelf life. An internet search is the best way to find out which dyes are in children's drinks. **Chromatography** is the best way to separate dyes. Vegetable oils, like rape, burned as a fuel are called **Bio diesel**. Also, other vegetable oils can be mixed with ordinary oils like diesel, to make Bio diesel. Renewable fuels are sometimes called 'carbon neutral' because they only emit carbon dioxide at the same rate as they grow and remove carbon dioxide from the air.



## Oils, Earth & Atmosphere -The changing world

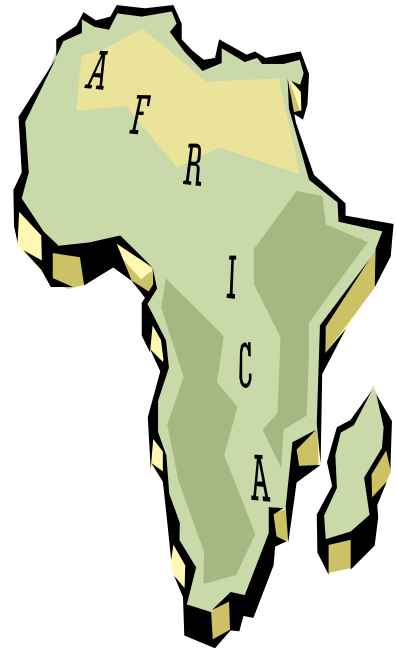


The outermost layer of the earth is the **crust** and beneath this layer is the **mantle**. The innermost layer is the **core** which has a radius of 3500 kilometres. The core contains the elements nickel and iron. The crust has a thickness of about 6 kilometres under oceans and 35 kilometres under continents. The interior of the earth remains hot because of natural **radioactive processes**.

The **shrinking earth theory** explained how mountains were the high points in wrinkles formed as the earth cooled.

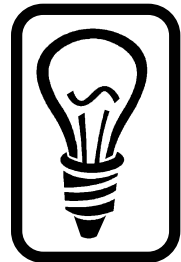


**Wegener** suggested that the African and American plates are moving apart (now measured to be a few centimetres per year). This theory of crustal movement is called Continental drift. Wegener's theory was not believed by other scientists because he could not explain how continents moved. Now scientists can explain how **tectonic plates** move on **convection currents** caused by the heating effect of radioactivity. Tectonic plates are made of crust and upper mantle. Scientists now believe that mountains were formed by large-scale movements of the earth's crust causing collisions between tectonic plates. At plate **boundaries** there are often **earthquakes** and **volcanic eruptions**. Old mountains are destroyed by weathering and erosion. Eroded rock collecting in the sea is cemented together to make sedimentary rocks. Wegener's theory of crustal movement explains how melting rock and volcanic eruptions recycle rock. The new theory which uses Wegener's idea is called Plate Tectonics.



Earth's early **atmosphere** contained large quantities of carbon dioxide, water vapour and small quantities of methane and ammonia. These gases were put into the air by eruption of volcanoes. Oceans were formed as the cooling water vapour condensed. Carbon dioxide was removed when plants began to grow. Green plants released oxygen into the air by **photosynthesis**.

The earth's present **atmosphere** has 78% nitrogen, 21% oxygen, 0.9% noble gases and 0.04% carbon dioxide. The earth's atmosphere has been stable for the last 200 million years. **Noble gases** (group 0 of the Periodic table) like Argon can be used in light bulbs because they are **unreactive** and the gas glows. Helium is used in airships because it has a low density (hydrogen is not used in airships because it is explosive).



The weather on earth seems to be changing as we put more carbon dioxide into the air. Carbon dioxide prevents heat escaping from the atmosphere. The Polar ice caps are melting and this is evidence for the **global warming theory**. Destruction of forests is also believed to be a factor. This reduces the amount of Carbon dioxide being removed from the air by the trees.

