## **AQA Science**: Organic Chemistry

hydrogen and carbon atoms only, joined together by single chemical bonds called covalent bonds. Structural formula

**Hydrocarbons:** Are fuels that are made of just

Alkanes: Are

their carbon

ioined to each

other by single

C-C bonds and

that they can

have as many

as possible.

Alkanes have

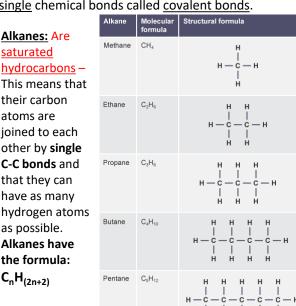
the formula:

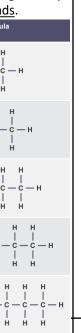
 $C_{n}H_{(2n+2)}$ 

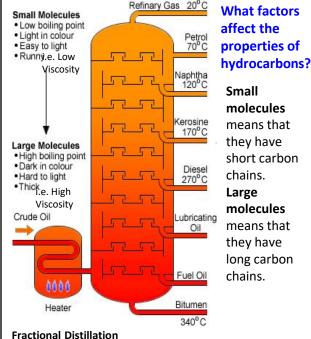
**Crude Oil** 

atoms are

saturated







When a hydrocarbon is burned with sufficient oxygen

Combustion (burning)

supply, the products are always carbon dioxide and water vapour.

Hydrocarbon + oxygen → carbon dioxide + water (+ energy) E.g. Butane + Oxygen → Carbon Dioxide + water

 $2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(g)$ During combustion both carbon and hydrogen from the

fuels due to the amount of energy released when they combust completely. condenses here



hydrocarbon are **oxidised**. Hydrocarbons are used as

Crude Oil uses are important in the modern world Oil provides the fuel for most modern transport – cars,

trains, planes etc. E.g. diesel, kerosene, heavy fuel oil

etc. come from crude oil.. The **petrochemicals industry** uses some of the hydrocarbons from crude oil as feedstock (raw material

to supply or fuel a machine or industrial process) to make new compounds for use in things such as solvents, lubricants, polymers, detergents etc.

## Cracking (is a thermal decomposition reaction)

heat. Short-chain hydrocarbons are flammable so make good fuels and are high in demand. Long-chain hydrocarbons are thick, gooey liquids = not that useful. Cracking is the breakdown of large, long-chain hydrocarbon alkanes into smaller, more useful alkanes and alkenes. This process requires high

This mean splitting up long-chain hydrocarbons using

Heat long-chain hydrocarbons to vaporise them (turn them into gas) Vapour is passed over hot powdered aluminum

Methods for Cracking: Catalytic and steam cracking.

- oxide catalyst
- Long-chain molecules split apart on the surface of the speck of the catalyst = catalytic cracking Vaporise hydrocarbons and mix them with steam
- Heat to very high temperature = steam cracking 500°C + catalyst

decane

This cracking reaction is an example of thermal decomposition.

Alkenes: Are unsaturated hydrocarbons. This means

they have 2 fewer H atoms and are joined by double C=C bonds.

Testing to see if it's an alkane or an alkene Add orange bromine water and shake

Alkane = stays orange

Alkene = colourless

temperatures and high pressure. 5) Some hydrocarbons have **very low** boiling points Alkenes are used as a starting material when making and so they are gases. They don't condense but are lots f other compounds and be used to make polymers.

collected as 'fuel gases'.

chains) condense first, low down in the tower

Formed from the buried remains of plants and animals

temperature and pressure, the remains turn into crude oil. Fossil fuels such as coal, oil and gas are non-

(mainly plankton). Over millions of years with high

renewable. Crude oil Is a mixture of lots of different

hydrocarbons (mostly alkanes). Crude oil can be split up into separate fractions by fractional distillation.

Fractional Distillation (see diagram in the middle box above)

distillation column and is heated to about 350°C

3) Most of the substances in the crude oil evaporate.

The mixture of vapours then passes up the tower

1) Crude oil enters the **bottom** of a fractional

4) Hydrocarbons with high boiling points (long

until most of it has turned to gas 2) The temperature is controlled

and condense