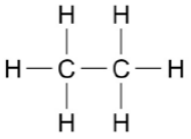
# AQA Trilogy-Chemistry key terms – Organic Chemistry

<table>
<tr><th colspan="2">Crude Oil</th></tr>
<tr><td>Crude oil is a mixture of a very large number of compounds.<br>Any mixtures have arrange of boiling points, single substances have a fixed boiling point.</td><td>Most compounds in crude oil are made up of H and C atoms only (hydrocarbons).<br><br>Most of these are saturated hydrocarbons called alkanes, which have the general formula $C_nH_{2n+2}$.</td></tr>
<tr><td>Crude oil is a finite resource found in rocks.<br><br>Crude oil is the remains of an ancient biomass consisting mainly of plankton that was buried in mud.</td><td>Methane ($CH_4$), Ethane ($C_2H_6$), Propane ($C_3H_8$) and Butane ($C_4H_{10}$) are the first 4 alkanes.<br><br>They can be represented by diagrams like this for Ethane.<br>  </td></tr>
<tr><th colspan="2">Fractional Distillation and petrochemicals</th></tr>
<tr><td>The hydrocarbons in crude oil can be separated into fractions by fractional distillation.<br><br>A fraction contains molecules with a similar number of carbon atoms, by fractional distillation.</td><td>To do fractional distillation:<br>1) evaporate the oil<br>2) allow the vapor to rise up a fractionating column which is cooler towards the top.<br>3) As the vapor rises it cools and condense at a number of different temperatures because fractions have different boiling points.<br>4) the condensed fractions are tapped off.</td></tr>
<tr><td>The properties of hydrocarbons depend on the size of their molecules eg boiling points, viscosity and flammability. These properties influence how hydrocarbons are used as fuels (e.g. petrol, butane etc)</td><td>As the length of a hydrocarbon increases the boiling point increases and they become more viscous. This is because the longer the chain the more intermolecular forces there are between hydrocarbons so the more energy is needed to break them.<br><br>Shorter hydrocarbons are more flammable because there are less intermolecular forces.</td></tr>
<tr><td>Combustion of fuels (burning) produces energy, carbon dioxide and water. The carbon and hydrogen are completely oxidised.<br><br>Complete combustion (burning in excess Oxygen):<br>Fuel + oxygen → Water + Carbon Dioxide<br><br>Incomplete combustion (burning in insufficient oxygen):<br>Fuel + oxygen → Water + Carbon + Carbon Monoxide</td><td>The fractions can be processed to produce fuels and feedstock for the petrochemical industry.<br>E.g. fuels (petrol, diesel oil, kerosene, heavy fuel oil and liquefied petroleum gases)<br><br>other useful materials such as solvents, lubricants, polymers, detergents.</td></tr>
<tr><th colspan="2">Impact of burning fuels</th></tr>
<tr><td>Most fuels contain carbon, hydrogen and sometimes sulphur.<br><br>When a fuel burns (combustion) it can release water, carbon dioxide, carbon monoxide, nitrogen oxide, sulphur dioxide or particulates (solid particles) into atmosphere</td><td>Sulphur dioxide forms when sulphur in ‘dirty’ fuel reacts with oxygen from the air. Sulfur can be removed from fuels before they are burnt (e.g. in cars) or $SO_2$ can be taken out of the waste products after combustion (e.g. power stations)</td></tr>
<tr><td>Carbon dioxide is linked to global warming.<br>Particulates (tiny particles of unburned fuel) cause global dimming</td><td>Carbon monoxide is formed if there is incomplete combustion, due to not enough oxygen supplied. It is toxic.</td></tr>
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| **Sulphur dioxide & nitrogen oxides** cause **acid rain**. Nitrogen dioxide forms because the nitrogen and oxygen in the air can react in the very high temperatures in an engine. | |
| **Cracking and Alkenes** | |
| Hydrocarbons can be **cracked** to make **smaller**, more **useful** molecules.<br><br>Hydrocarbons are heated to **vaporise** them. The vapours then passed over a **hot catalyst** so that a **thermal decomposition** reactions happen. | **Cracking** makes alkanes (e.g. methane), but also unsaturated hydrocarbons (double bond between C atoms =) called **alkenes**. Have the general formula $C_nH_{2n}$<br><br>Alkenes are more reactive than alkanes because they contain a double bond. |
| Some of the products of cracking are useful as fuels | Alkenes are more reactive than alkanes because they contain a double bond.<br><br>**Alkenes** react with **bromine water**, turning it from **orange to colourless** (test for alkenes) |
| **Alkenes can be used to make polymers** such as polyethene and polypropene. In these reactions, many small molecules (**monomers**) join together to form very large molecules (**polymers**). (poly=many) | Polymers have **many uses** e.g. packaging materials, waterproof coatings for fabrics, dental polymers, wound dressings, hydrogels, smart materials (including shape memory polymers). |
| Most polymers are not **biodegradable** (not broken down by microbes). Build up waste – landfill. | Plastic bags are being made from polymers and **cornstarch** so that they break down more easily. |