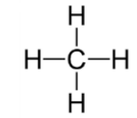
AQA C7a Crude Oil
TRIPLE CHEMISTRY

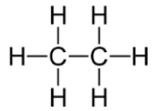
Crude oil, hydrocarbons and alkanes

Crude oil	A finite resource	Consisting mainly of plankton that was buried in the mud, crude oil is the remains of ancient biomass.
Hydrocarbons	They are made of hydrogen and carbon only. These make up the majority of the compounds in crude oil	Most of these hydrocarbons are called alkanes.
General formula for alkanes	C_nH_{2n+2}	For example: C_2H_6 C_6H_{14}

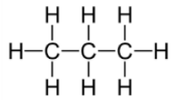
Displayed formula for the first four alkanes



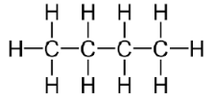
Methane (CH_4)



Ethane (C_2H_6)



Propane (C_3H_8)



Butane (C_4H_{10})

Cracking and Alkenes

Decane → pentane + propene + ethane

$C_{10}H_{22}$ → C_5H_{12} + C_3H_6 + C_2H_4

Alkanes to alkenes	Long chain alkanes are cracked into short chain alkenes.
Alkenes	Alkenes are hydrocarbons with a double bond (some are formed during the cracking process).
Properties of alkenes	Alkenes are more reactive that alkanes and react with bromine water. Bromine water changes from orange to colourless in the presence of alkenes.

Cracking	***The breaking down of long chain hydrocarbons into smaller chains***	The smaller chains are more useful and in demand. Cracking can be done by various methods including catalytic cracking and steam cracking.
Catalytic cracking	***The heavy fraction is heated until vaporised***	After vaporisation, the vapour is passed over a hot catalyst forming smaller, more useful hydrocarbons.
Steam cracking	***The heavy fraction is heated until vaporised***	After vaporisation, the vapour is mixed with steam and heated to a very high temperature forming smaller, more useful hydrocarbons.

Alkenes and uses as Polymers	Used to produce polymers. They are also used as the starting materials of many other chemicals, such as alcohol, plastics and detergents.
Why do we crack long chains?	Without cracking, many of the long hydrocarbons would be wasted as there is not much demand for these as for the shorter chains.

Properties of hydrocarbons

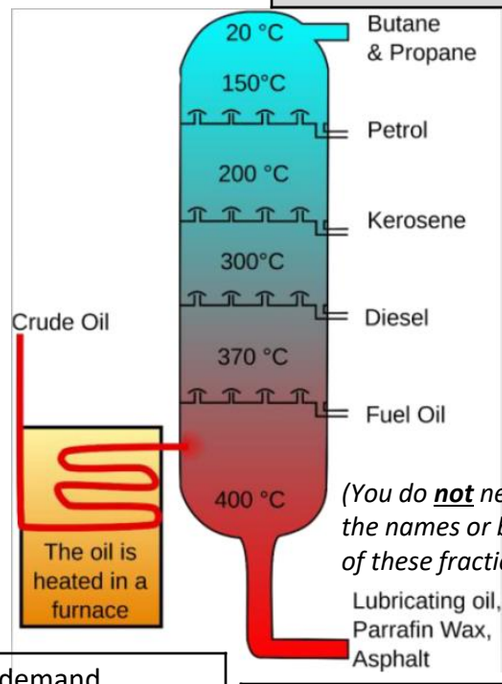
Combustion	During the complete combustion of hydrocarbons, the carbon and hydrogen in the fuels are oxidised, releasing carbon dioxide, water and energy.

Complete combustion of methane:

Methane + oxygen → carbon dioxide + water + energy

CH_4 (g) + $2O_2$ (g) → CO_2 (g) + 2 H_2O (l)

Boiling point (temperature at which liquid boils)	As the hydrocarbon chain length increases, boiling point increases.
Viscosity (how easily it flows)	As the hydrocarbon chain length increases, viscosity increases.
Flammability (how easily it burns)	As the hydrocarbon chain length increases, flammability decreases.



*(You do **not** need to remember the names or boiling points of any of these fractions)*

Fractional distillation and petrochemicals

Hydrocarbon chains

Boiling points	***In oil***
The boiling point of the chain depends on its length. During fractional distillation, they boil and separate at different temperatures due to this.	Hydrocarbon chains in crude oil come in lots of different lengths.

Fractions	***The hydrocarbons in crude oil can be split into fractions***	Each fraction contains molecules with a similar number of carbon atoms in them. The process used to do this is called fractional distillation.
Using fractions	***Fractions can be processed to produce fuels and feedstock for petrochemical Industry***	We depend on many of these fuels; petrol, diesel and kerosene. Many useful materials are made by the petrochemical industry; solvents, lubricants and polymers.