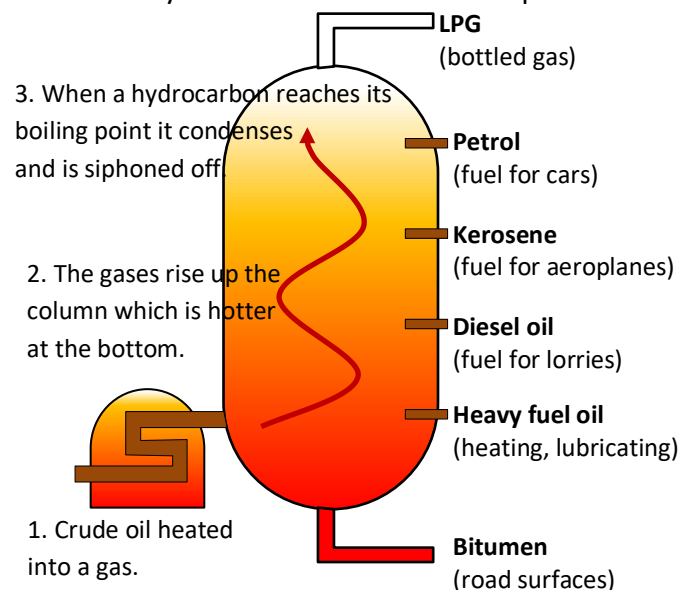


C9: Alkanes and Alkenes

Hydrocarbons contain **only hydrogen and carbon**.

Fractional Distillation

Crude oil is a fossil fuel made over millions of years from the remains of plants and animals. It is a mixture of hydrocarbons that we can separate out.

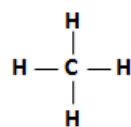


Hydrogenation

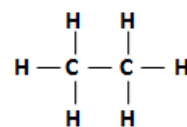
H_2 reacts with the double bond in the presence of a **catalyst**, opening it up. This forms the equivalent alkane – eg. propene would become propane.

'R' represents a hydrocarbon chain.

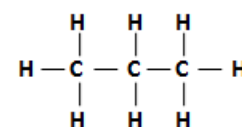
Alkanes (C_nH_{2n+2}) – saturated hydrocarbons. Are a homologous series (they react in similar ways) These are the displayed formula



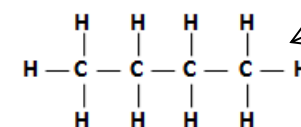
Methane
 CH_4



Ethane
 C_2H_6



Propane
 C_3H_8

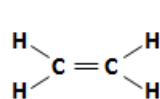


Butane
 C_4H_{10}

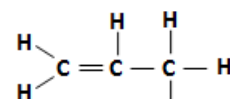
Shorter chains are:

- less viscous
- more volatile
- more flammable
- lower boiling points

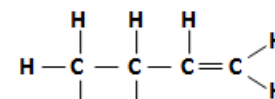
Alkenes (C_nH_{2n}) – unsaturated hydrocarbons. Have a $C=C$ double bond.



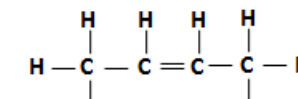
Ethene
 C_2H_4



Propene
 C_3H_6



Butene
 C_4H_8



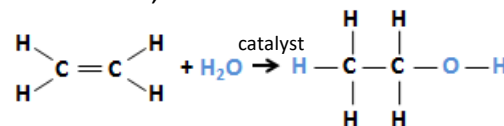
The double bond can be moved to give a different structure.

Complete combustion – plenty of oxygen is present: hydrocarbon + oxygen \rightarrow carbon dioxide + water
Alkanes combust completely in air so release lots of energy. This makes them good fuels.

Incomplete combustion – a lack of oxygen: hydrocarbon + oxygen \rightarrow carbon + carbon monoxide + water
Alkenes combust incompletely in air so produce a smoky flame. This means they produce less energy.

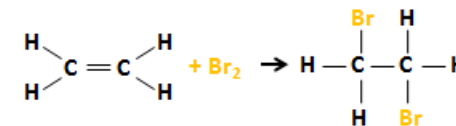
Forming Alcohols

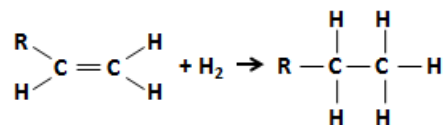
Steam is reacted, with the double bond.



Reacting with Halogens

Halogens react in addition reactions with alkenes.





This reaction has produced ethanol. It is then condensed – ethanol and water have higher boiling points than ethene so the ethene stays as a gas. The ethanol is purified by fractional distillation.

This reaction has produced dibromoethane. It is a test for an alkene. The orange bromine water turns colourless when it reacts with an alkene. It will not react with an alkane so stays orange.