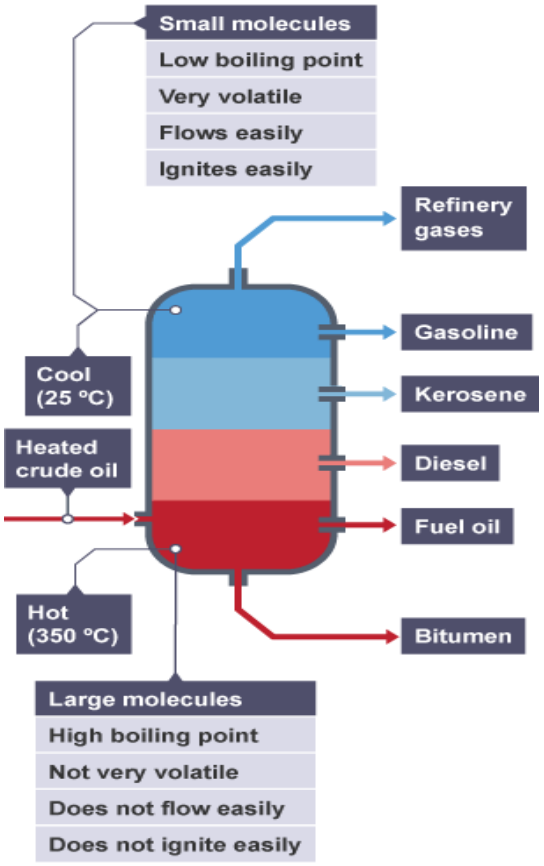
C7 Knowledge Organiser – Organic chemistry (COMBINED)

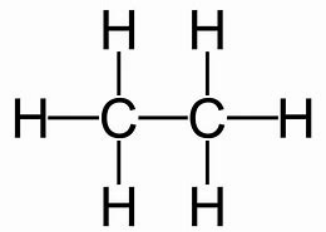
Fractional distillation of crude oil 1



- Crude oil is heated
- **Evaporates/ vaporises**
- Vapours travel up the fractionating column
- Until they reach a temperature matching their boiling point
- **Vapours condense**
- Collected as a liquid
- **Separated according to boiling point**

Hydrocarbons 2

Hydrocarbons are made up of hydrogen and carbon only

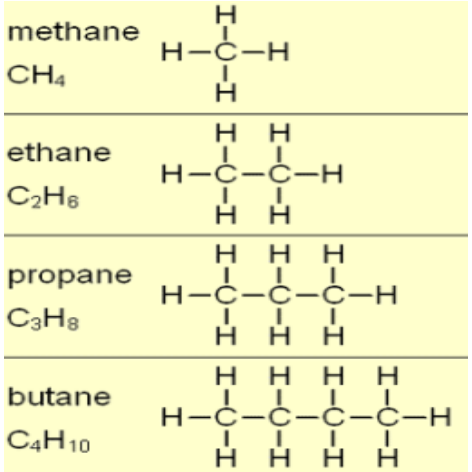


Properties of hydrocarbons 3

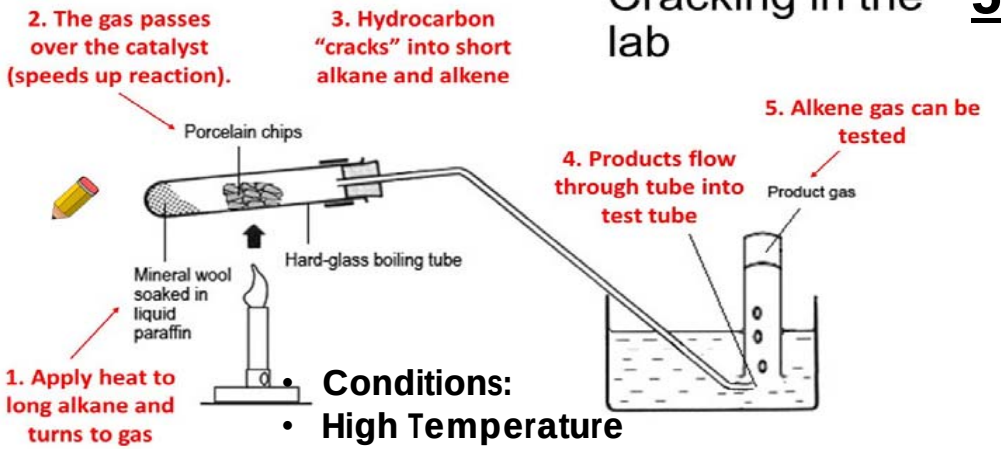
- **Boiling point increases with chain length –** more intermolecular bonds which require more energy to break
- **Short chains are more flammable**
- **Long chains are more viscous**

Alkanes 4

- Saturated
- **Single bonds**
- **General formula: C_nH_{2n+2}**
- Used as fuels
- **React with oxygen to form carbon dioxide + water**

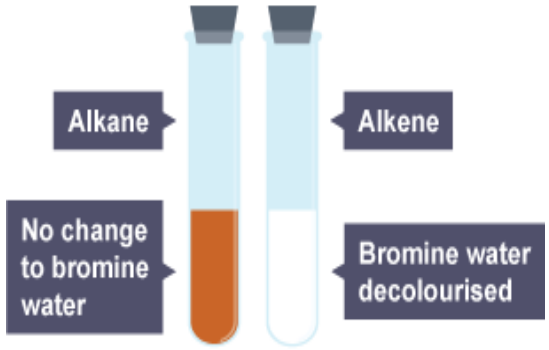


Cracking in the lab 5



- **Conditions:**
- **High Temperature**
- **Catalyst**

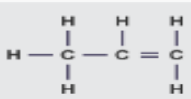
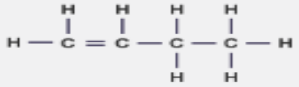
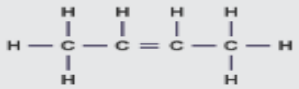
Cracking and alkenes 6



$C_{10}H_{22} \rightarrow C_7H_{16} + C_3H_6$

- **Long chained alkanes cracked to produce shorter chain alkanes and alkenes**
- **High demand for short chain alkanes - fuels**
- **Alkenes contain a double bond**
- **Alkenes used to make polymers**
- **Cracking equations must balance**

C7 Knowledge Organiser – Functional groups (CHEM ONLY)

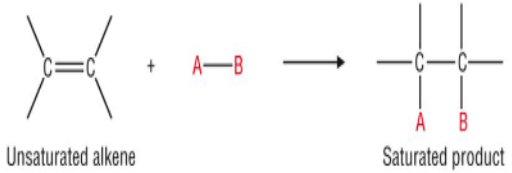
Alkene	Molecular formula	Structural formula
Ethene	C_2H_4	
Propene	C_3H_6	
But-1-ene	C_4H_8	
But-2-ene	C_4H_8	

Alkene structure 1

- Unsaturated
- Contains a **double carbon-carbon bond**
- **Very reactive**
- Used to make polymers
- **General formula: C_nH_{2n}**

Alkene reactions 2

Addition reactions – With hydrogen, water and halogens by the addition of atoms across the carbon-carbon double bond, which becomes a single bond.



Combustion reactions – Alkenes usually react with oxygen in an incomplete combustion reaction
– Forms CO and H_2O
– Burns with smoky flame

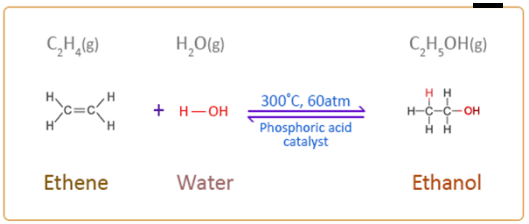
$$C_2H_4 + 2O_2 \rightarrow 2CO + 2H_2O$$
$$C_2H_4 + O_2 \rightarrow 2C + 2H_2O$$

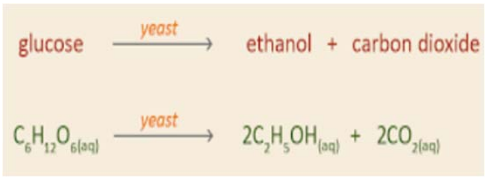
Alcohols 3

- Functional group – OH
- Methanol, Ethanol, Propanol, Butanol
- **Main reactions**

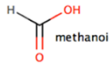
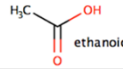
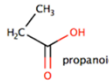
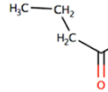
Ethanol + Sodium → Sodium ethoxide + Hydrogen
Ethanol + Oxygen → Carbon dioxide + water
Ethanol + oxidising agent → Ethanoic acid + Water

- **Formation of Ethanol**
- Ethanol + Water
- Fermentation of glucose





Carboxylic acids 4

Name of carboxylic acid	Molecular formula	Structural formula	Displayed formula
Methanoic acid	H_2CO_2	HCOOH	 methanoic acid
Ethanoic acid	$C_2H_4O_2$	CH_3COOH	 ethanoic acid
Propanoic acid	$C_3H_6O_2$	CH_3CH_2COOH	 propanoic acid
Butanoic acid	$C_4H_8O_2$	$CH_3CH_2CH_2COOH$	 butanoic acid

- Functional group – COOH
- **Main reactions**

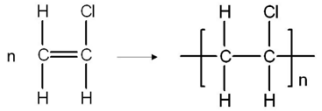
Carboxylic acid + Carbonate → Salt + Water + Carbon dioxide
Ethanoic acid + Ethanol → Ethyl ethanoate + water (Sulphuric acid catalyst)

Properties of carboxylic acids

- Increasing the chain length decreases the solubility of a carboxylic acid
- Weak acid – partially ionise in water

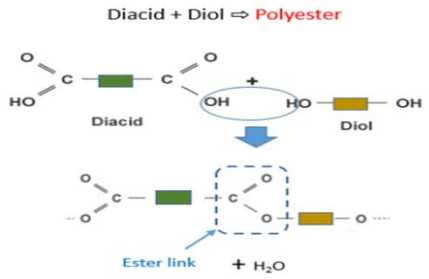
Addition Polymerisation 5

- Alkenes can be used to make polymers
- **Small monomers (alkenes) join together to form large molecules (polymers)**
- **A repeating unit has the same atoms as the monomer**
- The double bond breaks to form a single bond



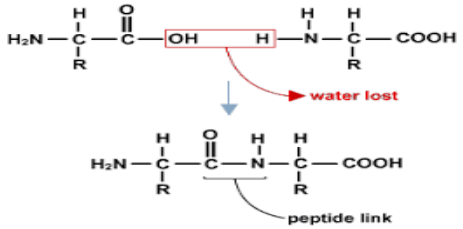
Condensation Polymerisation 6

- Monomers have two functional groups, e.g. diol – 2 alcohol (OH) groups, or dioic acids – 2 carboxylic acid groups (COOH)
- **When the monomers join a molecule of water is lost**



Amino acids 7

- Amino acids have two functional groups
- **Condensation polymerisation to form a polypeptide**
- The order of amino acids will change the protein made



Naturally occurring polymers 8

- **DNA** consists of two polymer chains made from 4 monomers called nucleotides, and forms a double helix
- **Proteins** - polymers of amino acid monomers
- **Starch** – polymer of alpha glucose
- **Cellulose** – polymer of beta glucose