

## 5.7 - Organic Chemistry

### Section 1 - Definitions

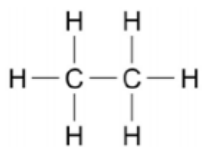
1. **Cracking** – the reaction used in the oil industry to break down large hydrocarbons into smaller, more useful ones.
2. **Fraction** – hydrocarbons with similar boiling points separated from crude oil.
3. **Hydrocarbon** – a compound containing only hydrogen and carbon.
4. **Alkane** – saturated hydrocarbon with the general formula  $C_nH_{2n+2}$ .
5. **Alkene** – unsaturated hydrocarbon which contains a carbon-carbon double bond. Its general formula is  $C_nH_{2n}$ .
6. **Viscosity** – the resistance of a liquid to flowing or pouring; a liquid's 'thickness'.
7. **Flammability** – how easy a substance is ignited.
8. **Fractional Distillation** – a way to separate liquids from a mixture of liquids by boiling off the substances at different temperatures, then condensing and collecting the liquids.

### Section 2 – Crude Oil

1. Crude oil is a finite resource found in **rocks**.
2. Crude oil is the **remains of an ancient biomass** consisting mainly of plankton that was buried in mud.
3. Crude oil is a mixture of a very **large number of compounds, mostly hydrocarbons**.
4. Most of the hydrocarbons in crude oil are hydrocarbons called alkanes.

### Section 3 - Alkanes

1. The general formula for the homologous series of **alkanes is  $C_nH_{2n+2}$** .
2. The first four members of the alkanes are **methane, ethane, propane and butane**.
3. Alkane molecules can be represented by chemical formula, such as  $C_2H_6$  or by displayed formula, as shown in the diagram.



### Section 4 – Fractional Distillation

1. The hydrocarbons in crude oil may be **separated into fractions**, each of which contains molecules with a similar number of carbon atoms, by fractional distillation.
2. The fractions can be processed to produce fuels and feedstock for the petrochemical industry.
3. Petrol, diesel oil, kerosene, heavy fuel oil and liquefied petroleum gases are produced from crude oil.
4. Solvents, lubricants, polymers and detergents are made by the petrochemical industry.

### Section 7 - Alkenes

1. Alkenes are **more reactive** than alkanes.
2. The test for alkenes is to react with bromine water. The bromine water will change from brown to colourless.
3. Alkenes are used to produce polymers and as starting materials for the production of many other chemicals.

### Section 6 - Cracking

1. Hydrocarbons can be broken down (cracked) to produce smaller, more useful molecules.
2. There are 2 methods for cracking.
  - **Catalytic cracking** – vaporised and passed over a hot catalyst.
  - **Steam cracking** – vaporised, mixed with steam and heated to a very high temperature.
3. The **products** of cracking include **alkanes and alkenes**.
4. There is a high demand for fuels with small molecules and so some of the products of cracking are useful as fuels.

### Section 5 - Alkanes

1. The **smaller** the hydrocarbon the **lower the boiling and melting point**.
2. The **smaller** the hydrocarbon the **lower the viscosity**.
3. The **smaller** the hydrocarbon the **higher the flammability**.
4. The **smaller** the hydrocarbon the **higher the volatility**.
5. The **combustion** of hydrocarbon fuels releases **energy**.
6. During complete combustion, the carbon and hydrogen in the fuels are oxidised to carbon dioxide and water.
7. **Propane + Oxygen → Carbon dioxide + Water**
8.  $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$

