

## AQA C7a Crude Oil Combined Foundation Chemistry

### Crude oil, hydrocarbons and alkanes

|                            |                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------|
| <b>crude oil</b>           | mixture of hydrocarbons - a finite resource                                          |
| <b>hydrocarbon</b>         | molecule made of only hydrogen and carbon                                            |
| <b>crude oil formed...</b> | from ancient biomass, mainly plankton, which was buried in mud millions of years ago |
| <b>alkane</b>              | saturated hydrocarbon                                                                |
| <b>saturated</b>           | only single bonds                                                                    |
| <b>general formula</b>     | $C_nH_{2n+2}$ for example $:C_2H_6$ $C_6H_{14}$                                      |

### Fractional distillation

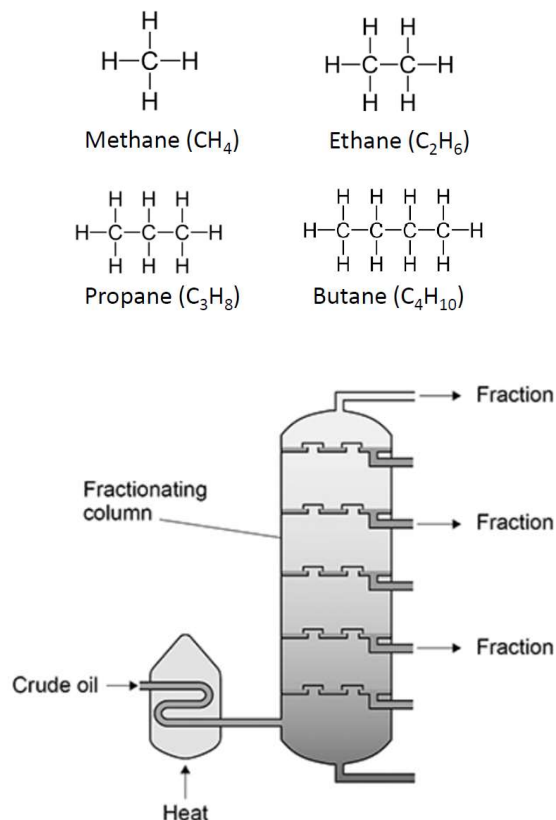
Crude oil must be separated into fractions, which contain a similar number of carbon atoms.

Different fractions can be used to form fuels such as petrol, diesel, kerosene. They can also be used as “feedstocks” (raw materials) to make solvents, lubricants, polymers, detergents.

Fractional distillation:

- At the bottom of the column, crude oil is heated and hydrocarbons evaporate.
- The column is hot at the bottom and cooler at the top.
- Fractions have different boiling points.
- They condense at different heights.
- Small molecules have lower boiling point.
- Large molecules have higher boiling points.

(do not learn specific fractions or boiling points)



### Properties of hydrocarbons

Hydrocarbons with bigger molecules have higher boiling points, are more viscous, and less flammable. This means shorter hydrocarbons are usually better fuels.

|                      |                                                                      |
|----------------------|----------------------------------------------------------------------|
| <b>boiling point</b> | temperature substance turns from liquid into gas, or gas into liquid |
| <b>viscous</b>       | thick and sticky                                                     |
| <b>flammable</b>     | can burn easily                                                      |

Combustion means burning. Combustion of hydrocarbons releases energy. Carbon and hydrogen are oxidised, and carbon dioxide and water are produced during “complete” combustion.

Make sure you can balance combustion equations. Start by balancing C atoms, then H, and finally O.  
Complete combustion of methane (example)  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

### Cracking

|                                |                                                                                                                                                                                                                                     |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>cracking</b>                | breaking down hydrocarbons into smaller, more useful molecules                                                                                                                                                                      |
| <b>conditions for cracking</b> | cracking requires <u>high temperatures</u> and either <u>steam</u> or a <u>catalyst</u> .                                                                                                                                           |
| <b>products of cracking</b>    | <ul style="list-style-type: none"> <li>smaller alkanes, which are useful as fuels so in high demand</li> <li>another type of hydrocarbon: <u>alkenes</u></li> </ul>                                                                 |
| <b>alkenes</b>                 | more reactive than alkanes<br>used to produce polymers (plastics)                                                                                                                                                                   |
| <b>tests for alkenes</b>       | <p>bromine water means a small amount of bromine dissolved in water. It is orange.</p> <p>alkanes do not react with bromine water.</p> <p>alkenes react with bromine water, and turn it from <u>orange</u> to <u>colourless</u></p> |