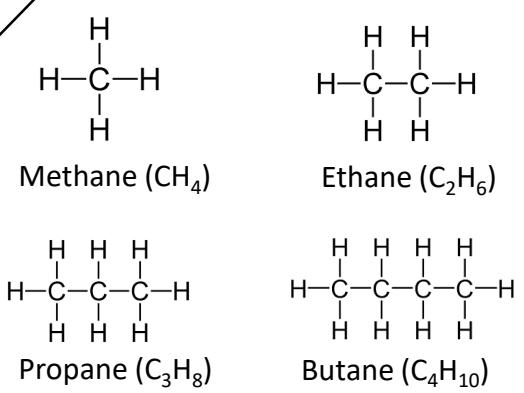


**Crude oil, hydrocarbons and alkanes**

Display formula for first four alkanes



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

<b>Crude oil</b>	<i>A finite resource</i>	Consisting mainly of plankton that was buried in the mud, crude oil is the remains of ancient biomass.
<b>Hydrocarbons</b>	<i>These make up the majority of the compounds in crude oil</i>	Most of these hydrocarbons are called alkanes.
<b>General formula for alkanes</b>	<i>C<sub>n</sub>H<sub>2n+2</sub></i>	For example:  C <sub>2</sub> H <sub>6</sub>  C <sub>6</sub> H <sub>14</sub>

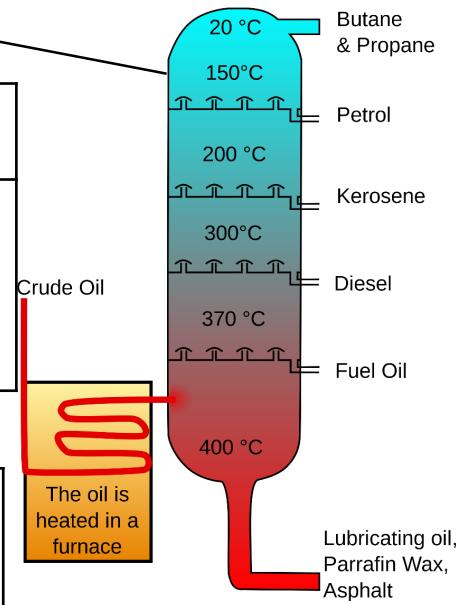
**Carbon compounds as fuels and feedstock**

**AQA GCSE Organic chemistry 1**

**Carbon compounds as fuels and feedstock**

**Fractional distillation and petrochemicals**

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



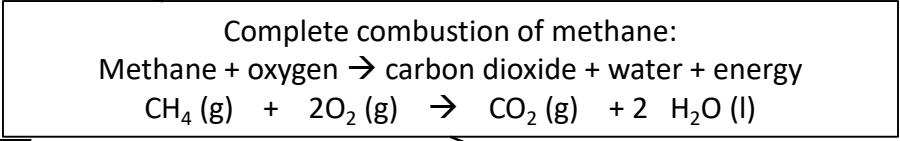
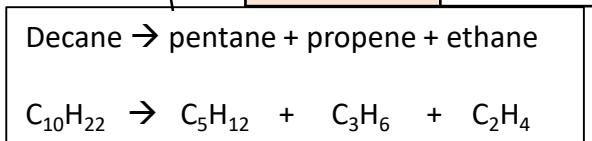
<b>Alkanes to alkenes</b>	<i>Long chain alkanes are cracked into short chain alkenes.</i>
<b>Alkenes</b>	<i>Alkenes are hydrocarbons with a double bond (some are formed during the cracking process).</i>
<b>Properties of alkenes</b>	<i>Alkenes are more reactive than alkanes and react with bromine water.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

**Cracking and alkenes**

**Properties of hydrocarbons**

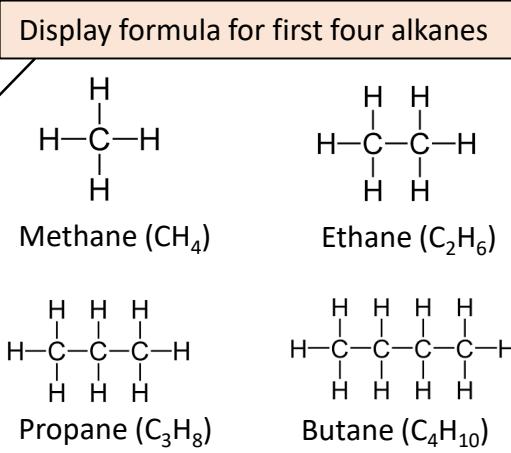
<b>Combustion</b>	During the complete combustion of hydrocarbons, the carbon and hydrogen in the fuels are oxidised, releasing carbon dioxide, water and energy.
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<b>Cracking</b>	<i>The breaking down of long chain hydrocarbons into smaller chains</i>	The smaller chains are more useful. Cracking can be done by various methods including catalytic cracking and steam cracking.
<b>Catalytic cracking</b>	<i>The heavy fraction is heated until vaporised</i>	After vaporisation, the vapour is passed over a hot catalyst forming smaller, more useful hydrocarbons.
<b>Steam cracking</b>	<i>The heavy fraction is heated until vaporised</i>	After vaporisation, the vapour is mixed with steam and heated to a very high temperature forming smaller, more useful hydrocarbons.



<b>Alkenes and uses as polymers</b>	<i>Used to produce polymers. They are also used as the starting materials of many other chemicals, such as alcohol, plastics and detergents.</i>	<b>Boiling point (temperature at which liquid boils)</b>	<i>As the hydrocarbon chain length increases, boiling point increases.</i>
<b>Why do we crack long chains?</b>	<i>Without cracking, many of the long hydrocarbons would be wasted as there is not much demand for these as for the shorter chains.</i>	<b>Viscosity (how easily it flows)</b>	<i>As the hydrocarbon chain length increases, viscosity increases.</i>
		<b>Flammability (how easily it burns)</b>	<i>As the hydrocarbon chain length increases, flammability decreases.</i>

**Crude oil, hydrocarbons and alkanes**



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

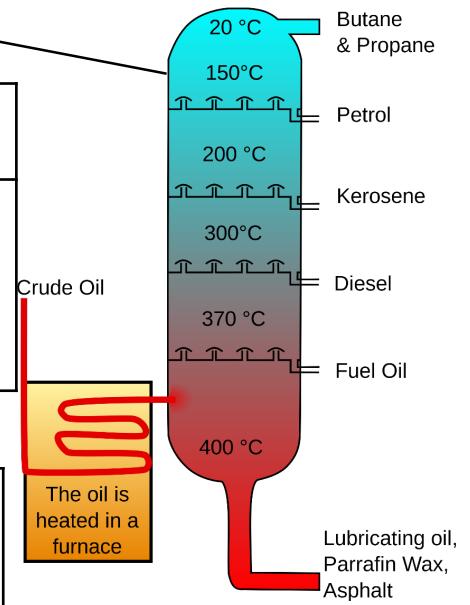
**Carbon compounds as fuels and feedstock**

**AQA GCSE Organic chemistry 1**

**Carbon compounds as fuels and feedstock**

**Fractional distillation and petrochemicals**

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	The boiling point of the chain depends on its length. During fractional distillation, they boil and separate at different temperatures due to this.



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	<b>These make up the majority of the compounds in crude oil</b>	Most of these hydrocarbons are called alkanes.
	<b>C<sub>n</sub>H<sub>2n+2</sub></b>	For example:  C <sub>2</sub> H <sub>6</sub>  C <sub>6</sub> H <sub>14</sub>

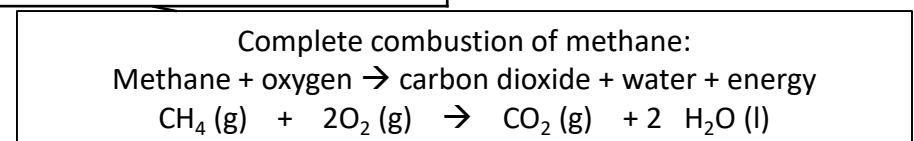
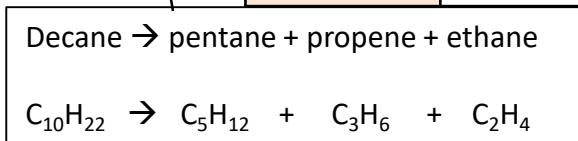
	<b>Long chain alkanes are cracked into short chain alkenes.</b>
	<b>Alkenes are hydrocarbons with a double bond (some are formed during the cracking process).</b>
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**Cracking and alkenes**

**Properties of hydrocarbons**

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

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	<b>The heavy fraction is heated until vaporised</b>	After vaporisation, the vapour is passed over a hot catalyst forming smaller, more useful hydrocarbons.
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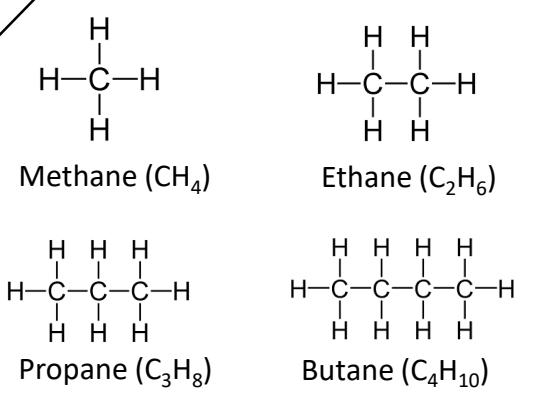


	<b>Used to produce polymers. They are also used as the starting materials of many other chemicals, such as alcohol, plastics and detergents.</b>
	<b>Without cracking, many of the long hydrocarbons would be wasted as there is not much demand for these as for the shorter chains.</b>

	<b>As the hydrocarbon chain length increases, boiling point increases.</b>
	<b>As the hydrocarbon chain length increases, viscosity increases.</b>
	<b>As the hydrocarbon chain length increases, flammability decreases.</b>

**Crude oil, hydrocarbons and alkanes**

Display formula for first four alkanes



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<b>Using fractions</b>	We depend on many of these fuels; petrol, diesel and kerosene.  Many useful materials are made by the petrochemical industry; solvents, lubricants and polymers.

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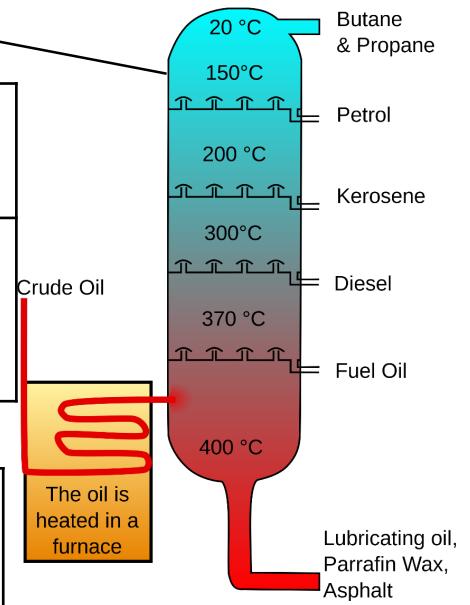
**Carbon compounds as fuels and feedstock**

**AQA GCSE Organic chemistry 1**

**Carbon compounds as fuels and feedstock**

**Fractional distillation and petrochemicals**

<b>Hydrocarbon chains</b>	<b>In oil</b>	
	<b>Boiling points</b>	



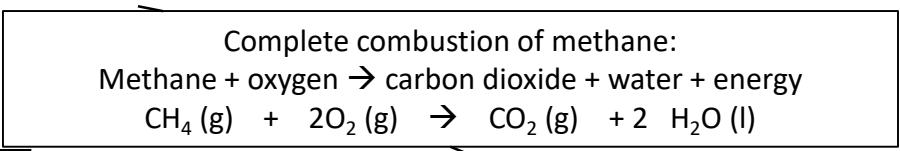
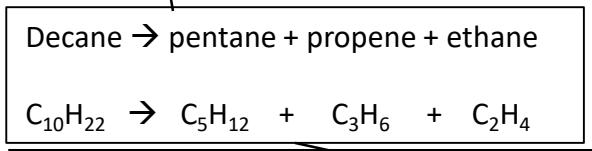
<b>Alkanes to alkenes</b>	
<b>Alkenes</b>	
<b>Properties of alkenes</b>	

**Cracking and alkenes**

**Properties of hydrocarbons**

<b>Combustion</b>	
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<b>Alkenes and uses as polymers</b>	
<b>Why do we crack long chains?</b>	

<b>Boiling point (temperature at which liquid boils)</b>	
<b>Viscosity (how easily it flows)</b>	
<b>Flammability (how easily it burns)</b>	

**Crude oil, hydrocarbons and alkanes**

Display formula for first four alkanes

$$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \end{array}$$

Methane (CH<sub>4</sub>)

$$\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$

Ethane (C<sub>2</sub>H<sub>6</sub>)

$$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ | \quad | \quad | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ | \quad | \quad | \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$$

Propane (C<sub>3</sub>H<sub>8</sub>)

$$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ | \quad | \quad | \quad | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ | \quad | \quad | \quad | \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$$

Butane (C<sub>4</sub>H<sub>10</sub>)

<b>Fractions</b>			
<b>Using fractions</b>			

<b>Crude oil</b>		
<b>Hydrocarbons</b>		
<b>General formula for alkanes</b>		For example:

**Carbon compounds as fuels and feedstock**

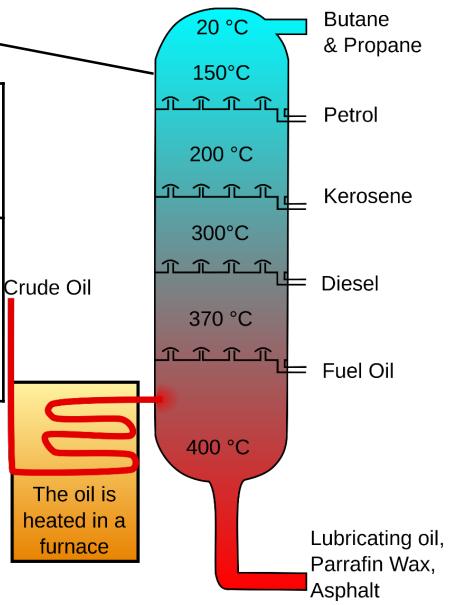
**AQA GCSE Organic chemistry 1**

**Carbon compounds as fuels and feedstock**

**Fractional distillation and petrochemicals**

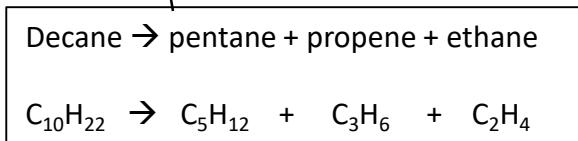
<b>Alkanes to alkenes</b>		
<b>Alkenes</b>		
<b>Properties of alkenes</b>		

<b>Hydrocarbon chains</b>	<i>In oil</i>	
<b>Boiling points</b>		



**Cracking and alkenes**

<b>Properties of hydrocarbons</b>	
<b>Combustion</b>	



**Complete combustion of methane:**

Word equation:  
Symbol equation:

<b>Cracking</b>		
<b>Catalytic cracking</b>		
<b>Steam cracking</b>		

<b>Alkenes and uses as polymers</b>	
<b>Why do we crack long chains?</b>	

<b>Boiling point (temperature at which liquid boils)</b>	
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