

## Uses of Alkanes

- Used as domestic and industrial fuel
- Used to make important halogenated compounds.

## List the fossil fuels

- 1- Petroleum
- 2- Coal
- 3- Natural Gas

## What is the composition of petroleum

It is a complex mixture of hydrocarbons mostly from the alkane series in which natural gas is also dissolved.

## Name the main constituent of natural gas

Methane

Note: Methane is odorless however a substance of characteristic odour is added before natural gas is supplied to the consumers. This is to detect any leakage as methane is flammable and forms an explosive mixture with air.

## Fuel

### Petroleum

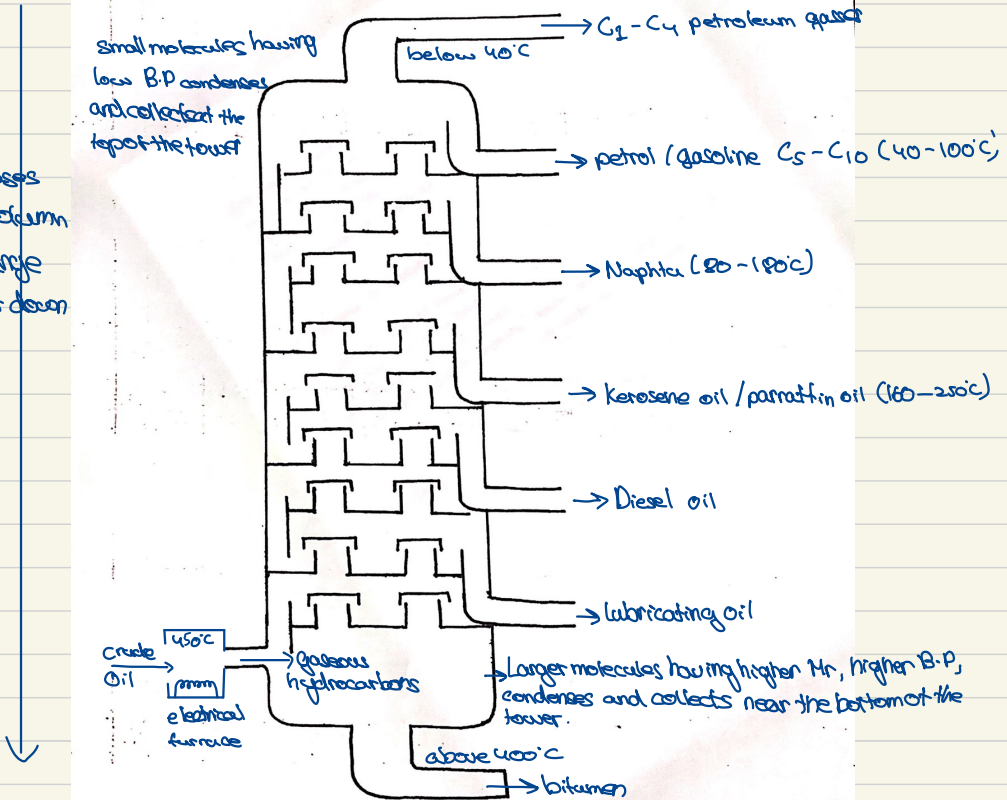
It is the source of hydrocarbons as it is a mixture of different hydrocarbons mostly from the alkane series. In this mixture of hydrocarbons some natural gas is also dissolved.

Petroleum refineries separate the hydrocarbon mixture by fractional distillation into smaller groups of hydrocarbons called fractions.

What is a fraction?

A group of molecules with a defined boiling point range which distill off at the same place during fractional distillation. The fractions are separated due to different boiling ranges.

Carbon  
range increases  
down the column  
and B.P range  
also increases down  
the column



Explain how crude oil is separated into valuable fraction?

- 1- They are separated by fractional distillation. The petroleum is heated in an electric furnace to <sup>boil</sup>
- 2- The fractionating column is hotter at the bottom than at the top.
- 3- The hydrocarbon vapours are introduced into the column.
- 4- They rise up the column until they reach the temperature at which they condense.
- 5- The distance they rise depends on their B.P
- 6- The larger hydrocarbons have higher B.P than the smaller ones so they will condense near the bottom of the tower. The smaller molecules having lower B.P will condense up the tower.

Uses of each fraction

Petroleum → fuel in cars

Naphtha → chemical feedstock (Makes plastic)

Kerosene oil → Jet fuel

Diesel oil → fuel for diesel engine

Fuel oil fraction → Fuel in ships and home heating systems

Lubricating Oil → As a lubricant and it is used to make wax and polish

Bitumen → Asphalt (used in making road surfaces)

Petroleum Gases → used in heating and cooking

<sup>same thing</sup> ↳ Refinery Gas

Explain how the above fractions differ in

- 1) volatility
- 2) flammability
- 3) viscosity
- 4) colour

(going from top - bottom)  
As the boiling range of the fraction increases volatility decreases, flammability decreases, viscosity increases, colour darkens

Note: Carbon chain length increases from top-bottom

Name two fuels suitable in motor cars but does not come from petroleum?

1- Hydrogen

2- Ethanol

## Alkene

Elements present: Carbon and Hydrogen only

Type of hydrocarbon: Unsaturated

Functional Group:  $>C=C<$

General Formula:  $C_nH_{2n}$

Sources: 1) Alkene  $\rightarrow$  Catalytic Cracking (Industrial Method)

2) Alcohol  $\rightarrow$  dehydration (lab method)

Name Formula & Physical State Of the following alkenes

$C_2H_4$  = Ethene = Gas

	but-1-ene	pent-2-ene
molecular formula	$C_4H_8$	$C_5H_{10}$
empirical formula	$CH_2$	$CH_2$
displayed formula	$  \begin{array}{ccccccc}  H & & H & H & & & \\  & \backslash & / & \backslash & / & & \\  C & = & C & - & C & - & C - H \\  & / & \backslash & / & \backslash & & \\  H & & H & H & & &   \end{array}  $	$  \begin{array}{ccccccc}  & H & & H & & H & \\  &   & &   & &   & \\  H - & C & = & C & - & C & - & C & - & C - H \\  &   & &   & &   & &   & \\  & H & & H & & H & & H &   \end{array}  $
condensed formula	$CH_2=CH-CH_2-CH_3$	$CH_3-CH=CH-CH_2-CH_3$
State	Gas	Liquid