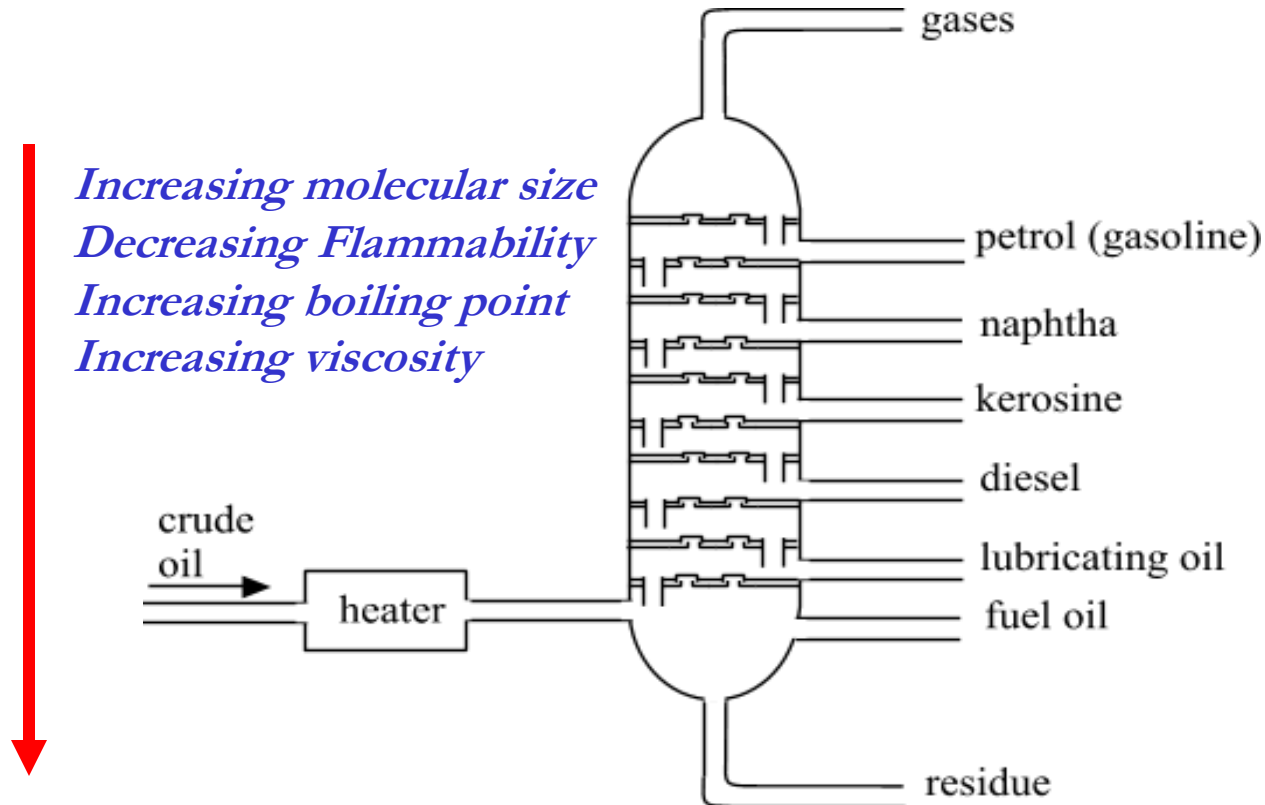


Hydrocarbons

Hydrocarbons

Molecules which contain the elements **HYDROGEN** and **CARBON ONLY**

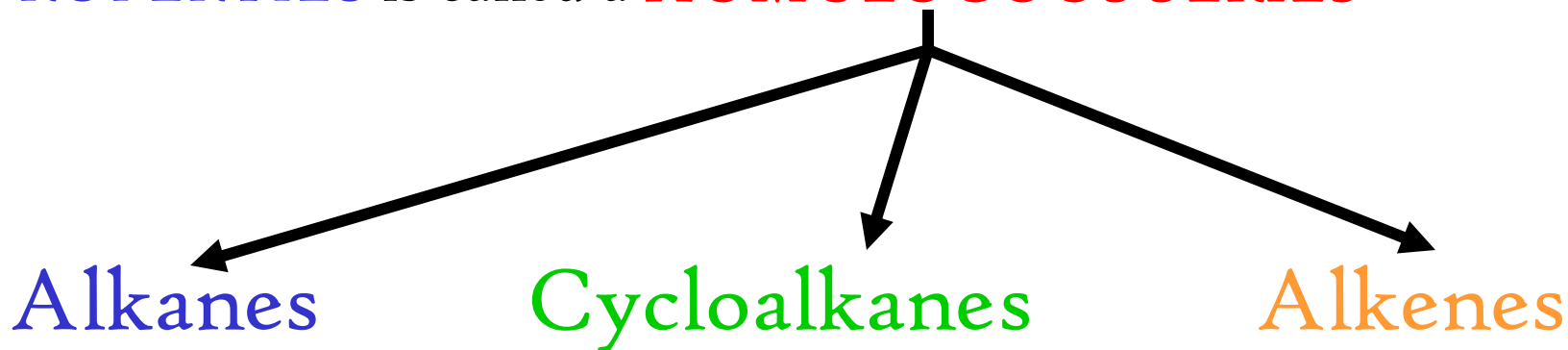
Obtained from crude oil by **FRACTIONAL DISTILLATION**:



Hydrocarbon Families

Hydrocarbons are divided up into families

A family of hydrocarbons which all fit the **SAME GENERAL FORMULA** and which all have **SIMILAR CHEMICAL PROPERTIES** is called a **HOMOLOGOUS SERIES**



Alkanes

All members are in **STRAIGHT CHAINS** and have only **SINGLE** carbon-to-carbon bonds

All members of the family have an individual name

1st part of name tells you how many carbon atoms are in the hydrocarbon:

Meth = 1

But = 4

Hept = 7

Eth = 2

Pent = 5

Oct = 8

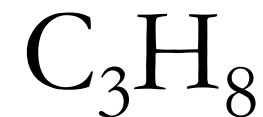
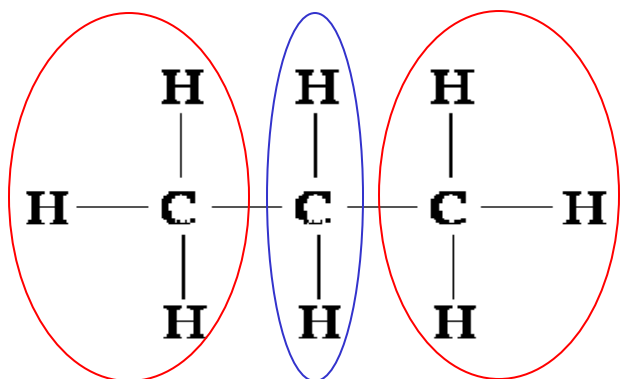
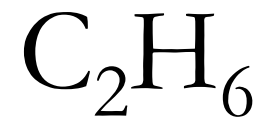
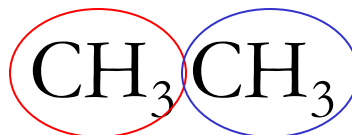
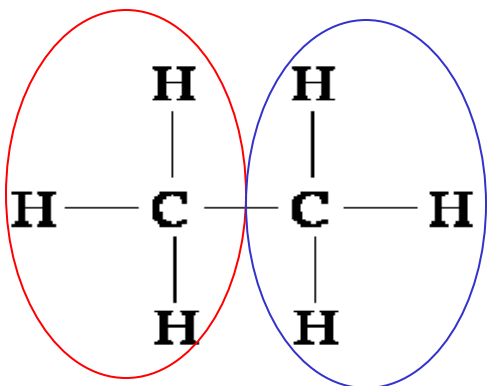
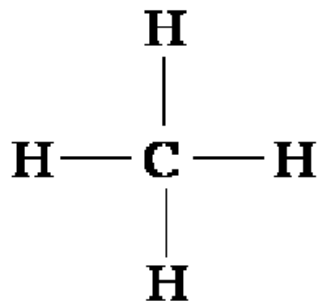
Prop = 3

Hex = 6

2nd part of name tells you which family the hydrocarbon belongs to:

-ANE = Alkanes

Formulae

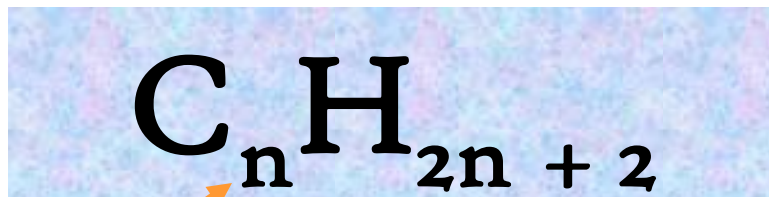


Full structural

Shortened structural

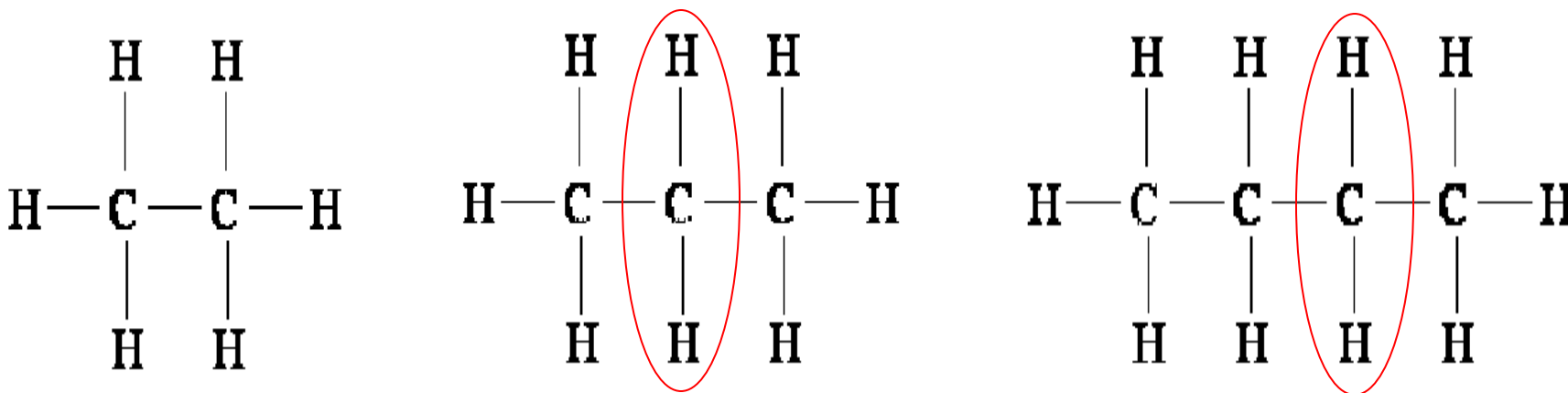
Molecular

General Formula



E.g. If there are 5 carbon atoms, the number of hydrogen atoms is $2 \times 5 + 2 = 12$

Each family member differs by a CH_2 unit:



Properties

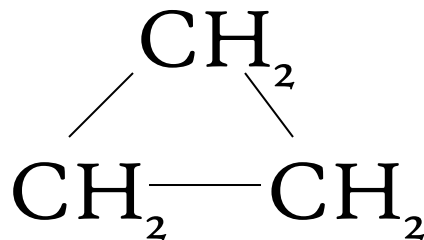
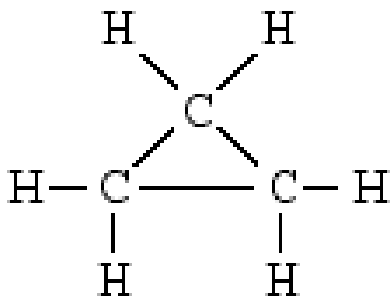
This **REGULAR INCREASE** in a CH_2 unit means that as you move through the family, there is a gradual change in **PHYSICAL PROPERTIES** *e.g. boiling point*

The **CHEMICAL PROPERTIES** in each member of the family are all very **SIMILAR** *e.g. flammability, solubility*

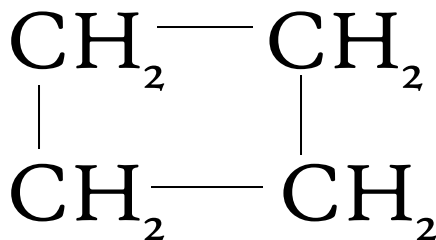
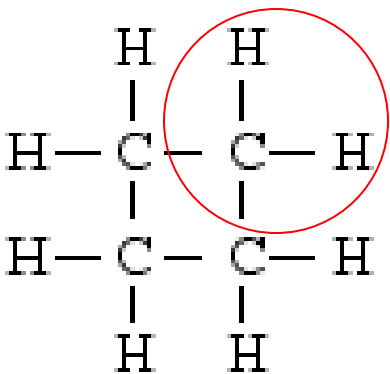
Cycloalkanes

Are another **HOMOLOGOUS SERIES** of hydrocarbons

This time, each member forms a **RING** shape



Cyclopropane



Cyclobutane

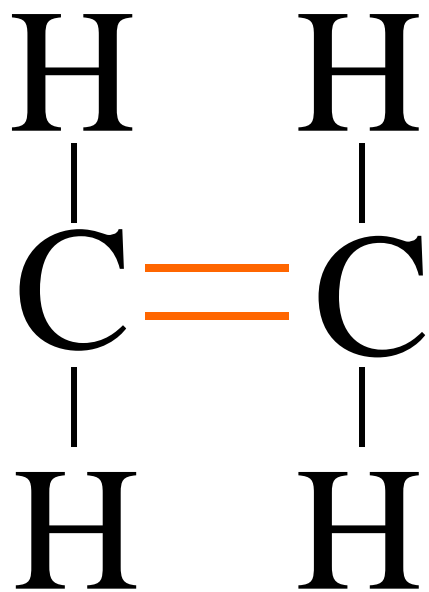


Alkenes

Are another **HOMOLOGOUS SERIES** of hydrocarbons

Each member is in a **straight chain**

Each member contains a carbon-to-carbon **DOUBLE BOND**

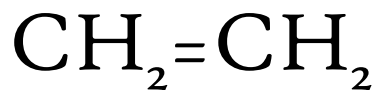
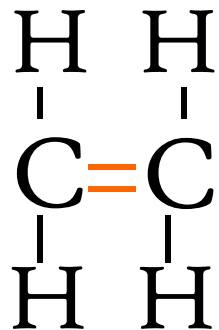


Ethene

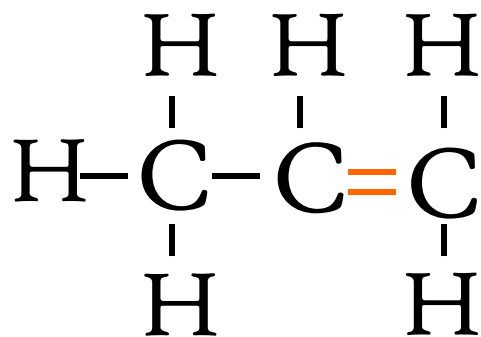
- The first member of this family



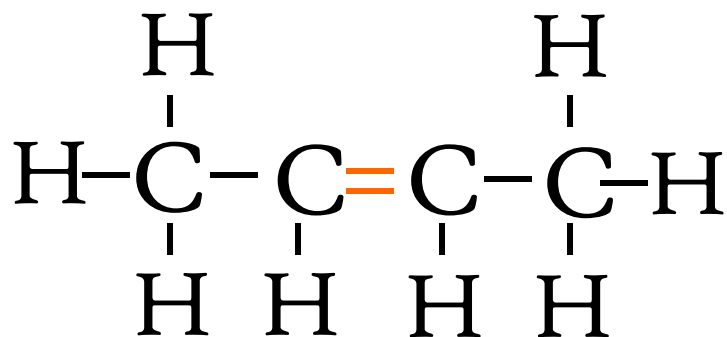
Members of the Alkene Family



Ethene C_2H_4



Propene C_3H_6

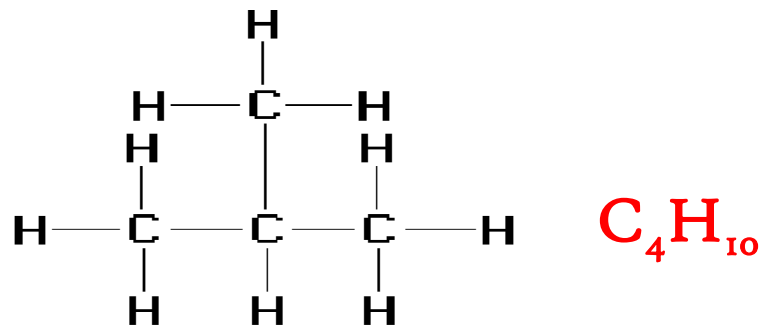
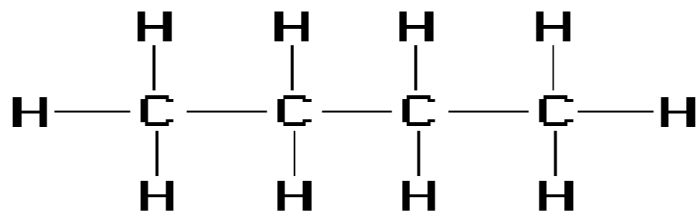


Butene C_4H_8

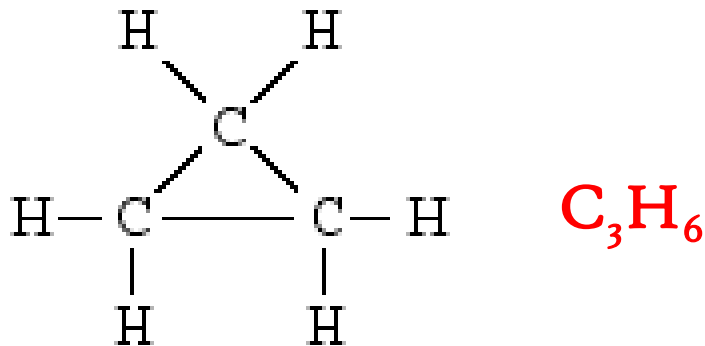
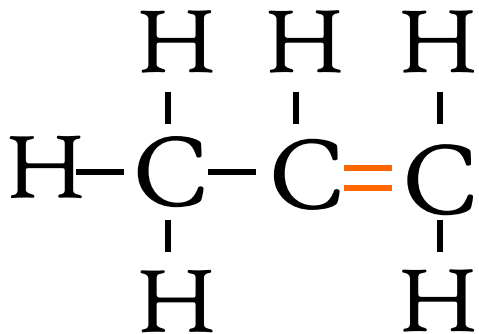
Isomers

Hydrocarbons with the **SAME NUMBER** of atoms but **DIFFERENT** structures are called **ISOMERS**

Isomers can be of hydrocarbons in the **SAME FAMILY**:



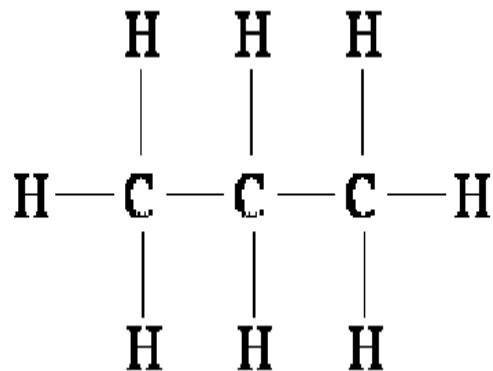
Or in **DIFFERENT FAMILIES**:



Saturated vs Unsaturated

Saturated:

Alkanes, cycloalkanes

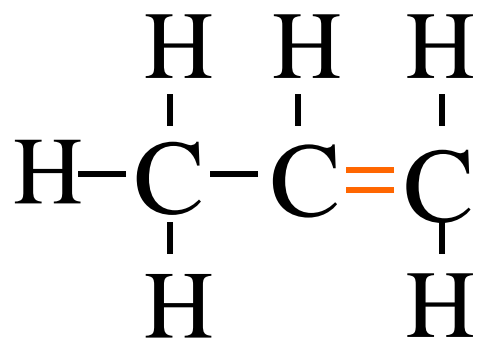


Only carbon-to-carbon SINGLE bonds

No other atoms will join on to the molecule

Unsaturated:

Alkenes



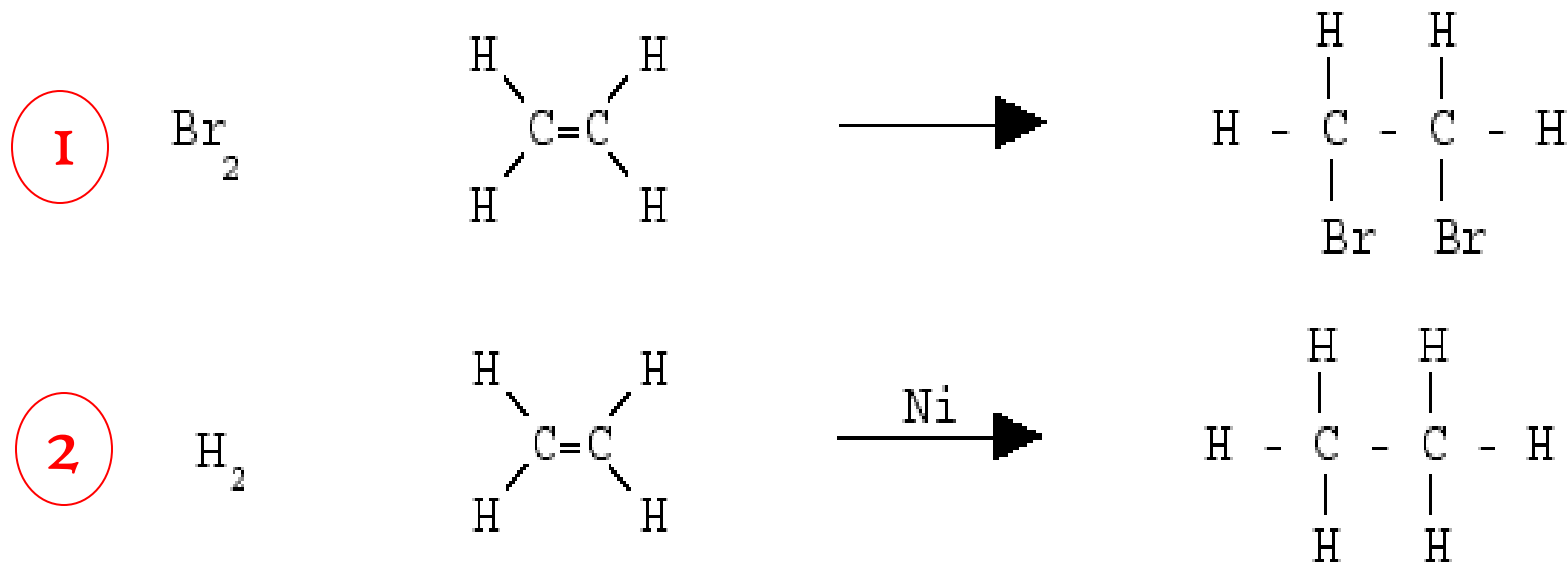
Contains at least one carbon-to-carbon **DOUBLE** bond

Other atoms can join on to the molecule

Addition Reactions

Hydrocarbons with a C=C can react with other atoms to let them ADD ON.

This is called an **ADDITION REACTION**



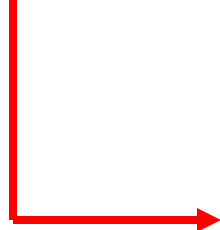
The new atoms join on to **EITHER SIDE** of the **DOUBLE BOND**

Test for Unsaturation

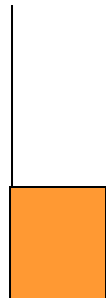
Bromine solution can be used to distinguish between alkanes and alkenes, or cycloalkanes and alkenes

Hydrocarbon	Saturated / unsaturated	Test with bromine solution
Alkane	Saturated	Stays brown / red
Cycloalkane	Saturated	Stays brown / red
Alkene	Unsaturated	Changes from brown / red to colourless

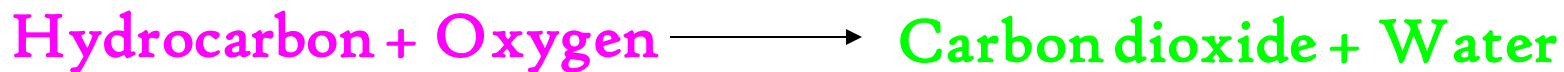
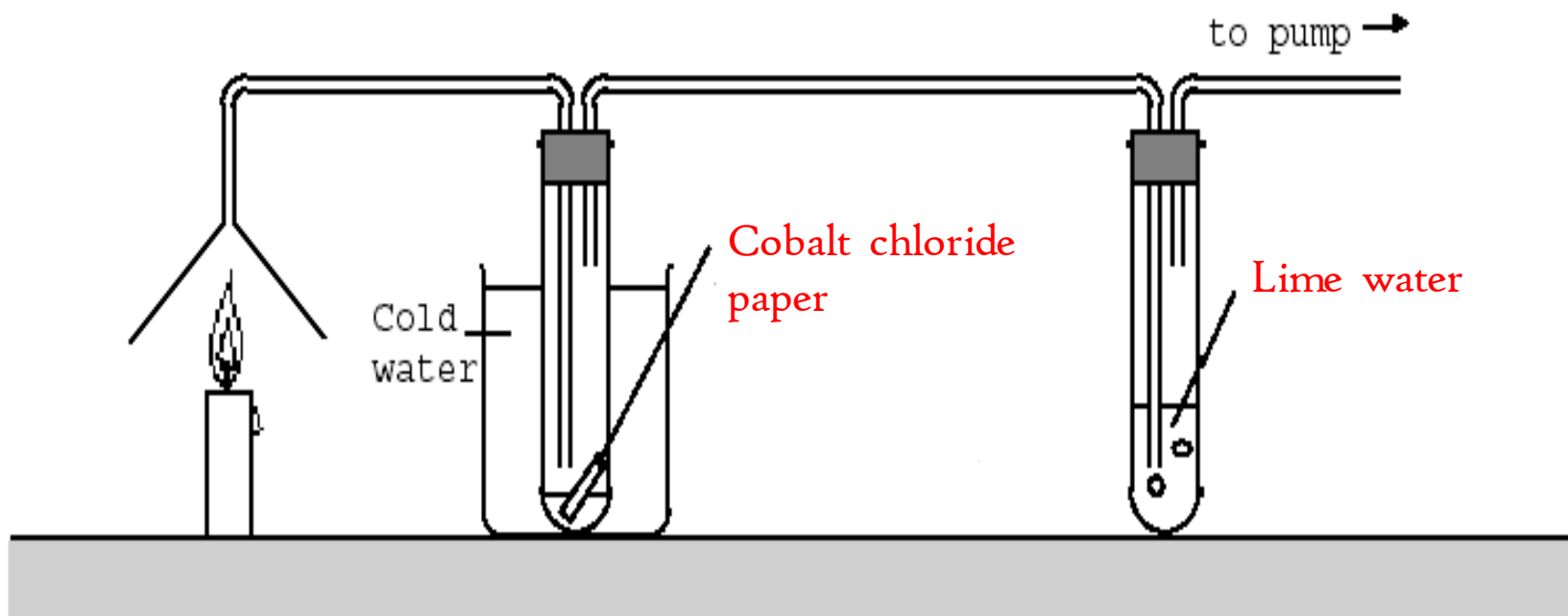
Alkene



Br_2 (aq)



Combustion of Hydrocarbons

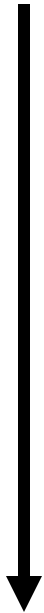


REACTANTS

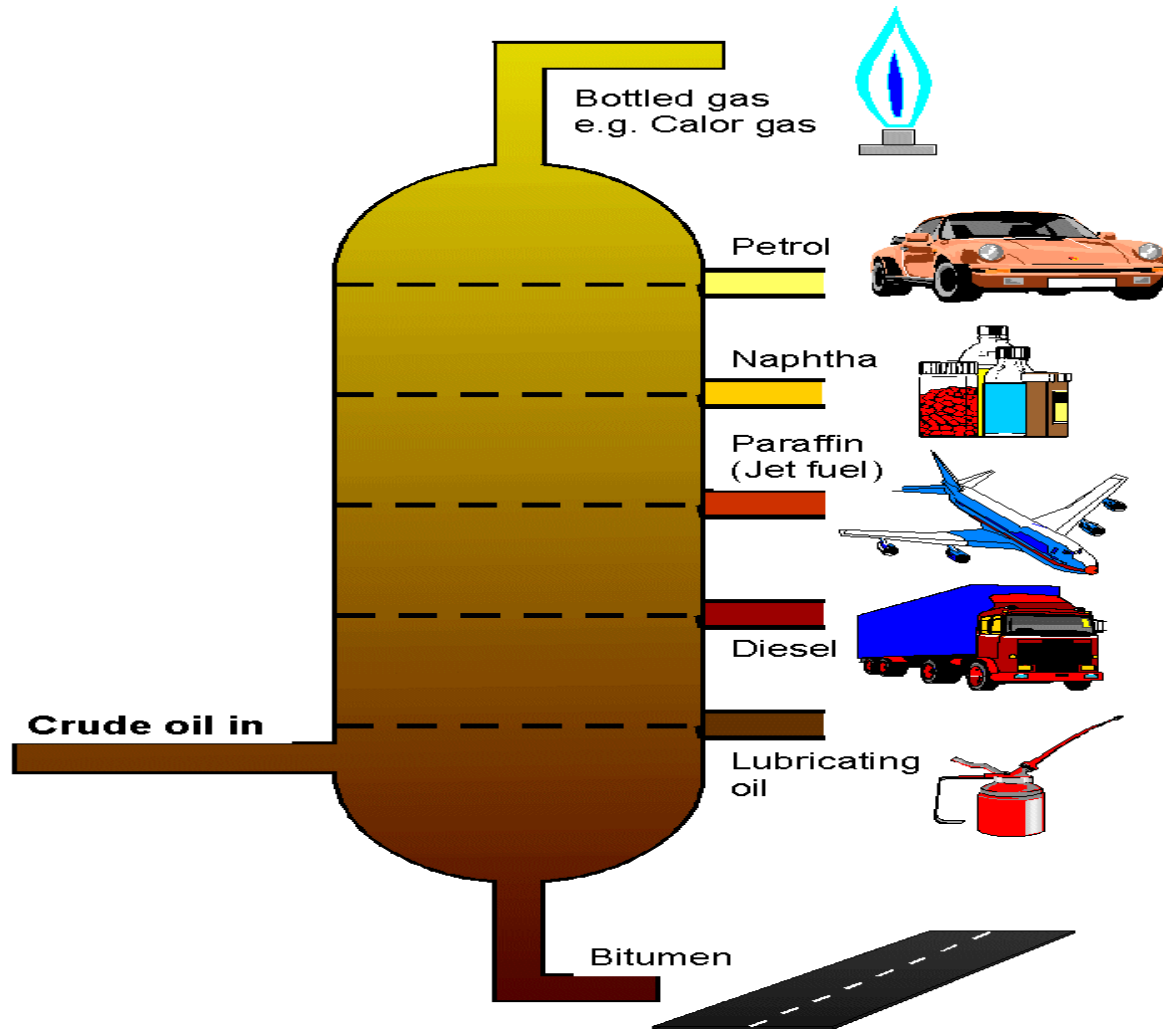
PRODUCTS

Supply vs Demand

High demand



Low demand



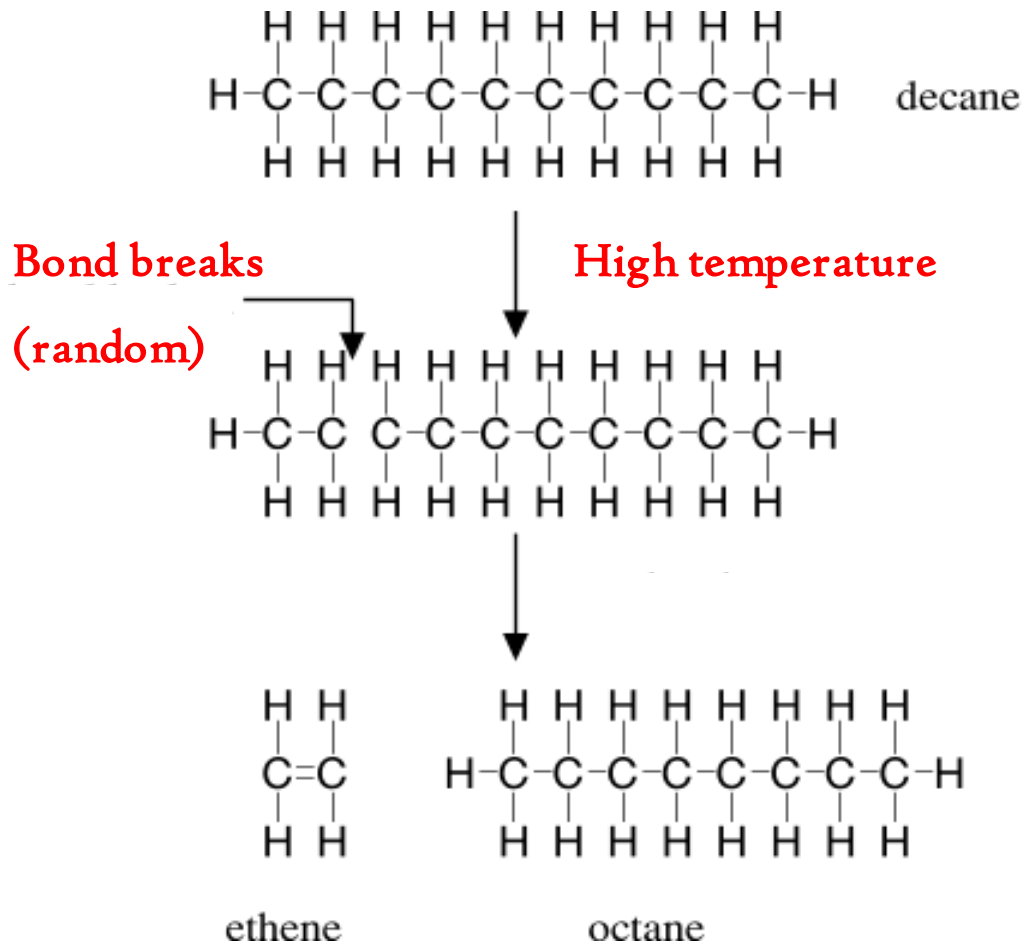
Less produced



Lots produced

Cracking

- Is used to make smaller, more useful molecules from larger molecules



Cracking in the Lab

- Can be done in the laboratory:

