

11 Hydrocarbons and fuels – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English

Write it 3 times (English)

Organic chemistry

hydrocarbon

Petroleum

homologous series

alkanes

saturated

alkenes

unsaturated

fractions

fractional distilla-
tion

volatility

Cracking

catalyst

Combustion

bromine water

Recall

Organic chemistry is the chemistry of carbon compounds. A **hydrocarbon** is a compound made of hydrogen and carbon only.

- **Petroleum** (crude oil) is a mixture of many hydrocarbons.
- Carbon is special: it joins to other carbon atoms to make long chains.

Nothing here is hard – it just gives names to families of molecules.

New ideas

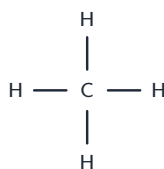
Read these first, then do the Practice.

■ 1 Two families of hydrocarbon

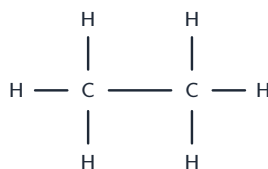
A **homologous series** is a family of compounds with similar chemical properties and the same general formula. Two to know:

Family	Bonds	General formula
alkanes	single C–C only (saturated)	C_nH_{2n+2}
alkenes	one C=C double bond (unsaturated)	C_nH_{2n}

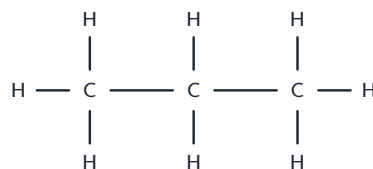
The start of the name gives the number of carbons (*meth-* = 1, *eth-* = 2, *prop-* = 3); the ending gives the family (*-ane* or *-ene*).



methane CH_4



ethane C_2H_6



propane C_3H_8

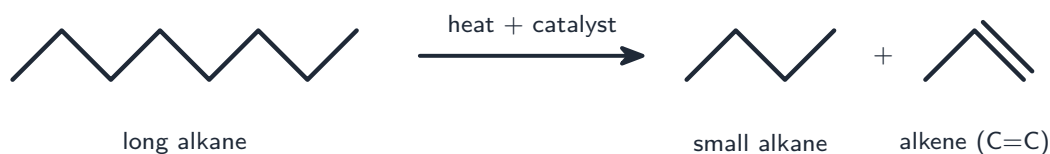
■ 2 Fractional distillation

Petroleum is separated into useful **fractions** by **fractional distillation**. The oil is heated; the gases rise up a tall column that is hot at the bottom and cool at the top, so each fraction turns back to liquid at a different height.

Going up the column the molecules get smaller, with lower boiling points and higher **volatility** (they turn to gas more easily).

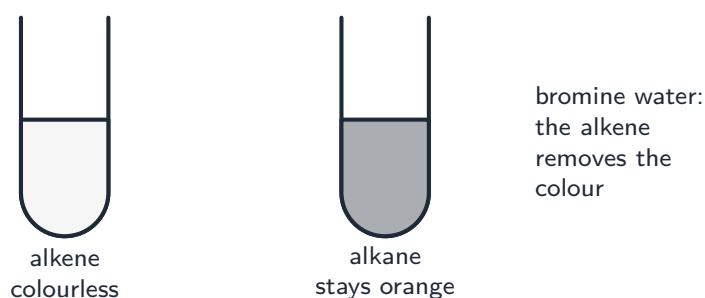
■ 3 Cracking

Long alkane molecules are not very useful. **Cracking** breaks them into smaller, more useful molecules – a smaller alkane plus an alkene – using a high temperature and a **catalyst**.



■ 4 Two reactions to know

- **Combustion** : hydrocarbons burn in plenty of oxygen to give carbon dioxide and water.
- **Test for a C=C**: shake the compound with orange **bromine water**. An alkene turns it colourless; an alkane leaves it orange.



Watch out: **alkanes** are *saturated* (single bonds only, C_nH_{2n+2}); **alkenes** are *unsaturated* (one $C=C$, C_nH_{2n}). Only an **alkene** decolourises bromine water – that is the test for the $C=C$ double bond.

Practice

Try these in order.

11.1 What is a *hydrocarbon*?

[1]

11.2 Give the general formula of (a) the alkanes and (b) the alkenes.

[2]

11.3 Name the process used to separate petroleum into fractions. [1]

11.4 What does *cracking* do, and why is it useful? [2]

11.5 Describe the test that tells an alkene from an alkane, and the result for each. [2]

11.6 Challenge. Propene is an alkene with 3 carbon atoms. Write its molecular formula, and state what you would see when it is shaken with bromine water. [3]