

11 Hydrocarbons and fuels – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
Organic chemistry	有机化学	_____	_____	_____
hydrocarbon	碳氢化合物	_____	_____	_____
Petroleum	石油	_____	_____	_____
homologous series	同系物	_____	_____	_____
alkanes	烷烃	_____	_____	_____
saturated	饱和	_____	_____	_____
alkenes	烯烃	_____	_____	_____
unsaturated	不饱和	_____	_____	_____
fractions	馏分	_____	_____	_____
fractional distillation	分馏	_____	_____	_____
volatility	挥发性	_____	_____	_____
Cracking	裂化	_____	_____	_____
catalyst	催化剂	_____	_____	_____
Combustion	燃烧	_____	_____	_____
bromine water	溴水	_____	_____	_____

Recall

Organic chemistry 有机化学 is the chemistry of carbon compounds. A **hydrocarbon** 碳氢化合物 is a compound made of hydrogen and carbon only.

- **Petroleum** 石油 (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

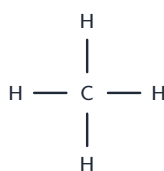
Read these first, then do the Practice.

■ 1 Two families of hydrocarbon

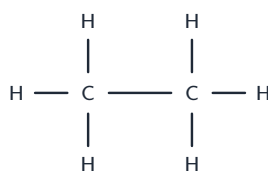
A **homologous series** 同系物 is a family of compounds with similar chemical properties and the same general formula. Two to know:

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

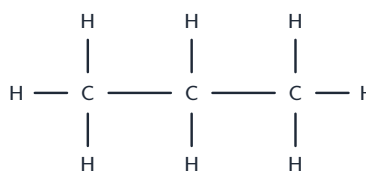
The start of the name gives the number of carbons (*meth-* = 1, *eth-* = 2, *prop-* = 3); the ending gives the family (*-ane* or *-ene*).



methane CH_4



ethane C_2H_6



propane C_3H_8

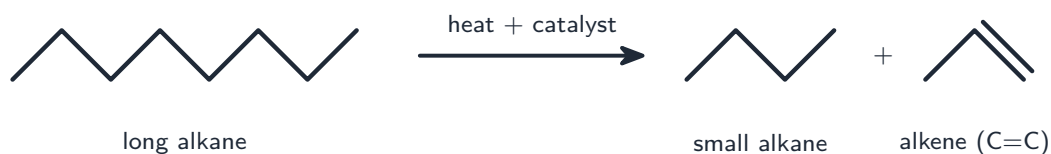
■ 2 Fractional distillation

Petroleum is separated into useful **fractions** 馏分 by **fractional distillation** 分馏. 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** 挥发性 (they turn to gas more easily).

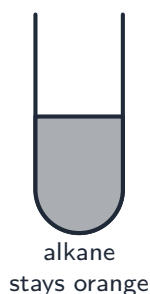
■ 3 Cracking

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



■ 4 Two reactions to know

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



bromine water:
the alkene
removes the
colour

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]