外教社——麦克米伦中学双语教材系列

化学

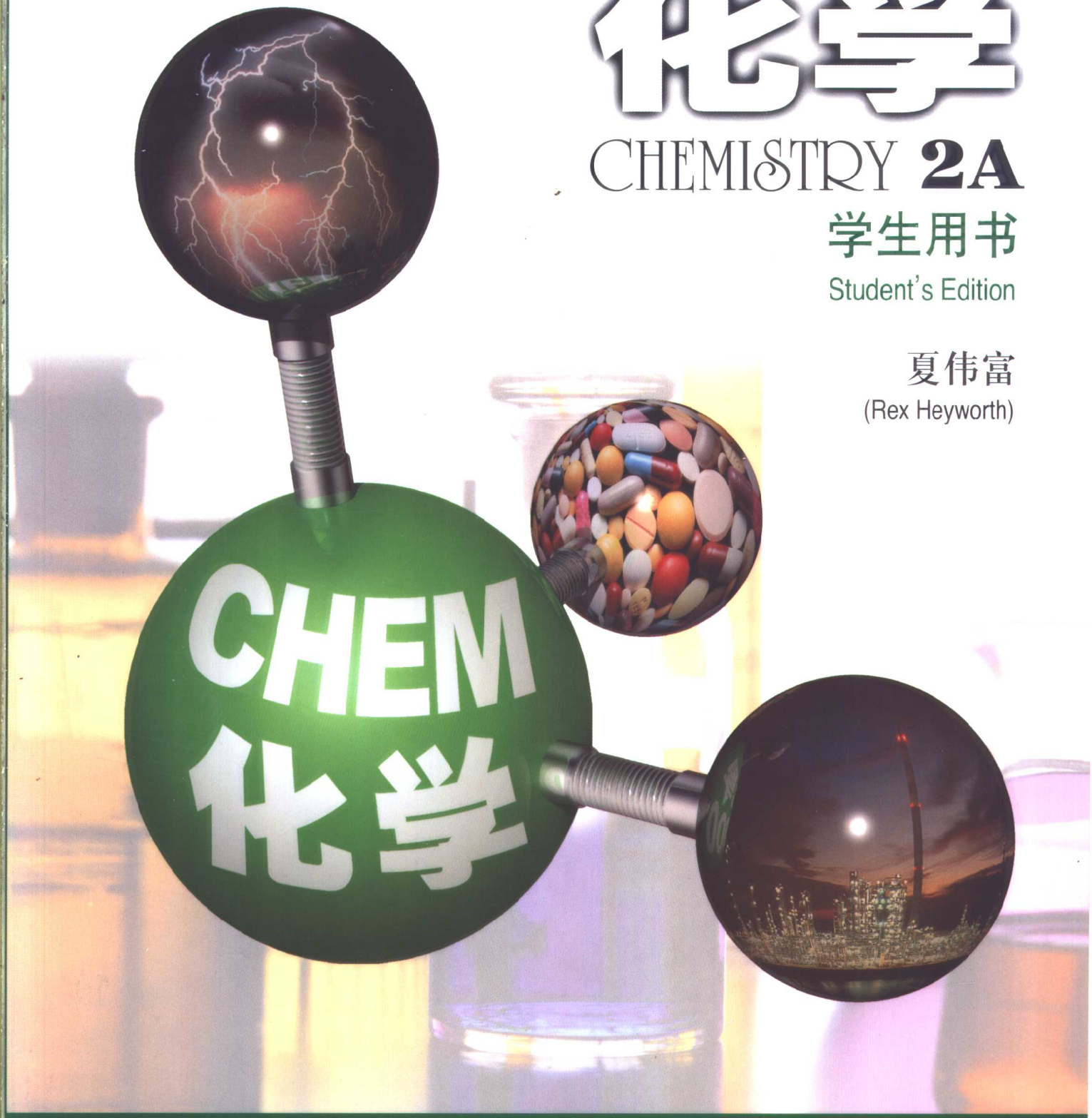
CHEMISTRY 2A

学生用书

Student's Edition

夏伟富

(Rex Heyworth)



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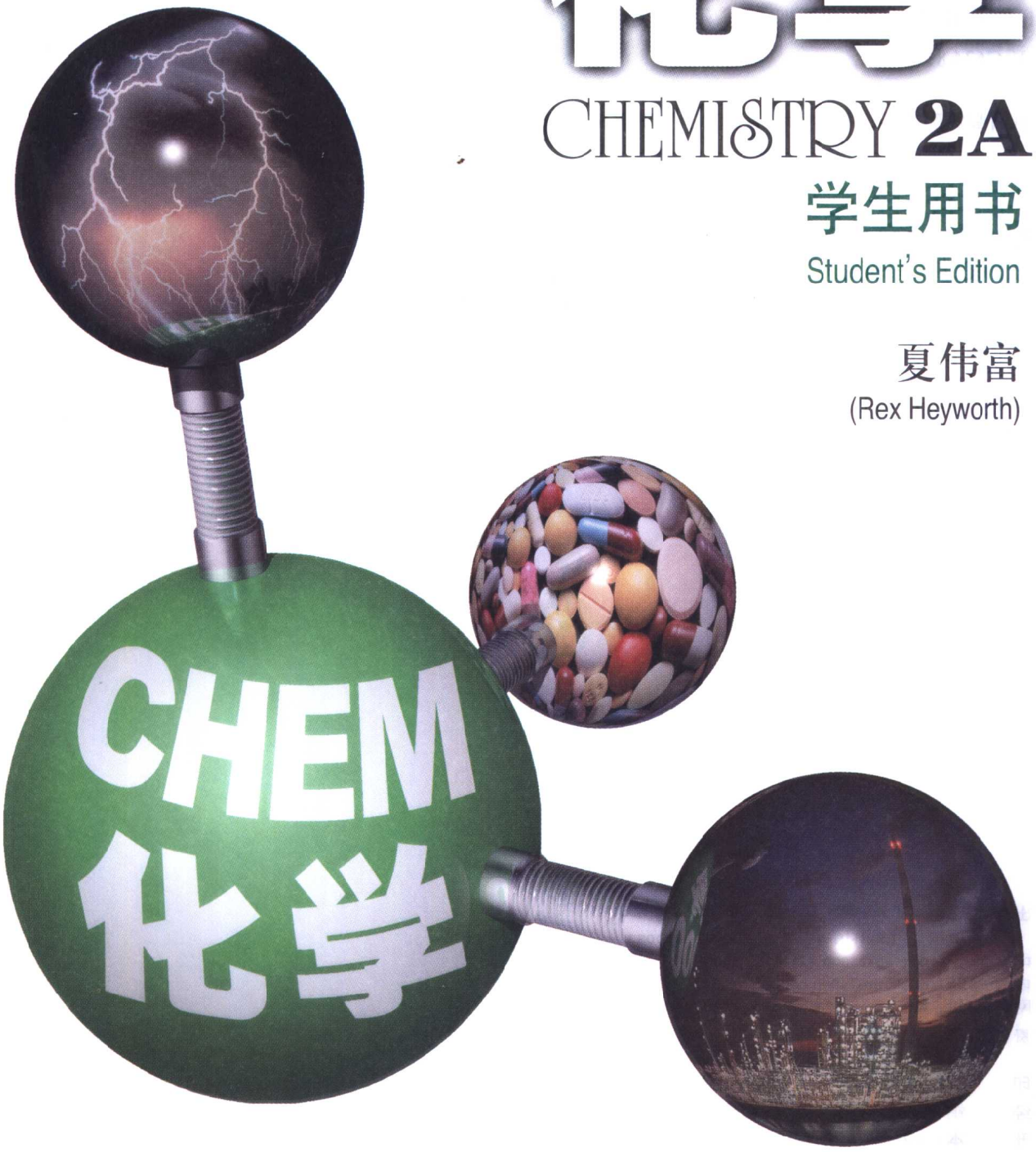

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出版前言

双语教育以外语作为学科的教学语言，直接进行学科知识的教学。这种新的教学尝试引起了教育主管部门、教育工作者、外语专家以及成千上万学子和家长的关注。随着对外开放的不断深入以及成功加入WTO，我国在经济、科技、教育等领域全面步入国际舞台，在更大范围内和更深层次上参与国际竞争，这对我们人才培养的规模和规格提出了崭新的要求。为了培养能够熟练运用外语吸收先进科技知识、参与国际交流的人才，基础教育的改革势在必行。双语教育对教师、学生、教育研究人员以及教育服务机构都是一种新的挑战。这种新的教学方法要取得成功，需要大胆而又科学的摸索与实践，也需要教师、学生、教育研究人员和教育服务机构各方的协同努力。

作为外语教育出版领域的专业出版社，外教社秉承一贯“全心致力中国外语教育事业的发展”的宗旨，为更好地推动双语教育，抓住时机，经过精心策划，从众多的双语教材中选择了原由麦克米伦出版社出版、在我国香港地区广泛使用的教材，供大陆地区进行双语教育试验的学校使用。本套《外教社—麦克米伦中学双语教材系列》主要有以下特点：

1. 英语语言纯正流畅，适合中学生水平，学生可以比较轻松地掌握学科知识，并在学习的过程中不知不觉地提高英语应用能力。
2. 教学内容丰富，编写体系完整，例证贴近生活，注重跨学科教育。
3. 版式活泼，插图精美，表格详细，各种知识的表现更加直观易懂，从而提高学生兴趣，增强教学效果。
4. 注意现代化教学手段的运用。页边空白处列出与授课内容相关的网址，为学生了解更多相关知识提供了有益的参考。

尽管可能在编写体系、知识结构、学科内容等方面与大陆地区传统学科教学稍有不同之处，我们相信本套教材纯正地道的英语、丰富的课程资源以及全新的教学理念会对大陆地区的双语教育产生良好的推动作用。

本套教材可供有较好英语基础的双语学校、国际学校、外国语学校以及重点中学进行双语教学使用。

本教材承蒙上海外国语大学双语学校的李秀萍、朱卫、周丽华、余枭然老师仔细审读，在此表示衷心的感谢。同时也欢迎使用本套教材的师生向我们提出宝贵意见。

上海外语教育出版社

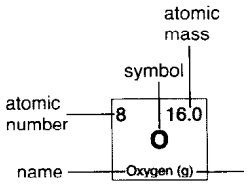
2003年5月

Periodic table of elements

Period	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group 0
1								2 4.0 **He** Helium (g)
2	3 6.9 **Li** Lithium	4 9.0 **Be** Beryllium	5 10.8 **B** Boron	6 12 **C** Carbon	7 14.0 **N** Nitrogen (g)	8 16 **O** Oxygen (g)	9 19.0 **F** Fluorine (g)	10 20.2 **Ne** Neon (g)
3	11 23.0 **Na** Sodium	12 24.3 **Mg** Magnesium	13 27.0 **Al** Aluminium	14 28.1 **Si** Silicon	15 31.0 **P** Phosphorus	16 32.1 **S** Sulphur	17 35.5 **Cl** Chlorine (g)	18 39.9 **Ar** Argon (g)
4	19 39.1 **K** Potassium	20 40.1 **Ca** Calcium	21 45.0 **Sc** Scandium	22 47.9 **Ti** Titanium	23 50.9 **V** Vanadium	24 52.0 **Cr** Chromium	25 54.7 **Mn** Manganese	26 55.8 **Fe** Iron	27 58.9 **Co** Cobalt	28 58.7 **Ni** Nickel	29 63.5 **Cu** Copper	30 65.4 **Zn** Zinc	31 69.7 **Ga** Gallium	32 72.6 **Ge** Germanium	33 74.9 **As** Arsenic	34 79 **Se** Selenium	35 80.0 **Br** Bromine (l)	36 83.8 **Kr** Krypton (g)
5	37 85.5 **Rb** Rubidium	38 87.6 **Sr** Strontium	39 88.9 **Y** Yttrium	40 91.2 **Zr** Zirconium	41 92.9 **Nb** Niobium	42 95.5 **Mo** Molybdenum	43 (98)a **Tc** Technetium	44 101.1 **Ru** Ruthenium	45 102.9 **Rh** Rhodium	46 106.4 **Pd** Palladium	47 107.9 **Ag** Silver	48 112.4 **Cd** Cadmium	49 114.8 **In** Indium	50 118.7 **Sn** Tin	51 121.8 **Sb** Antimony	52 127.6 **Te** Tellurium	53 127.0 **I** Iodine	54 131.3 **Xe** Xenon (g)
6	55 132.9 **Cs** Caesium	56 137.3 **Ba** Barium	[57 – 71] Lanthanides	72 178.5 **Hf** Hafnium	73 180.9 **Ta** Tantalum	74 183.0 **W** Tungsten	75 186.2 **Re** Rhenium	76 190.2 **Os** Osmium	77 192.2 **Ir** Iridium	78 195.1 **Pt** Platinum	79 197.0 **Au** Gold	80 200.6 **Hg** Mercury (l)	81 204.4 **Tl** Thallium	82 207.2 **Pb** Lead	83 209.0 **Bi** Bismuth	84 (209) **Po** Polonium	85* (210) **At** Astatine	86 (222) **Rn** Radon (g)
7	87 (223) **Fr** Francium	88 226.0 **Ra** Radium	[89 – 103] Actinides	104*(261) **Rf** Rutherfordium	105*(262) **Db** Dubnium	106*(263) **Sg** Seaborgium	107*(264) **Bh** Bohrium	108*(265) **Hs** Hassium	109*(266) **Mt** Meitnerium	110* **Uun**	111* **Uuu**	112* **Uub**	113* **Uut**					

TRANSITION METALS

57 138.9 **La** Lanthanum	58 140.1 **Ce** Cerium	59 140.9 **Pr** Praseodymium	60 144.2 **Nd** Neodymium	61* (145) **Pm** Promethium	62 150.4 **Sm** Samarium	63 152.0 **Eu** Europium	64 157.3 **Gd** Gadolinium	65 158.9 **Tb** Terbium	66 162.5 **Dy** Dysprosium	67 164.9 **Ho** Holmium	68 167.3 **Er** Erbium	69 168.9 **Tm** Thulium	70 173.0 **Yb** Ytterbium	71 175.0 **Lu** Lutetium
89 227.0 **Ac** Actinium	90 232.0 **Th** Thorium	91 231.0 **Pa** Protactinium	92 238.0 **U** Uranium	93* 237.0 **Np** Neptunium	94* (244) **Pu** Plutonium	95* 243 **Am** Americium	96* (247) **Cm** Curium	97* (247) **Bk** Berkelium	98* (251) **Cf** Californium	99* (252) **Es** Einsteinium	100* (258) **Fm** Fermium	101* (258) **Md** Mendelevium	102* (259) **No** Nobelium	103* (260) **Lr** Lawrencium



state of element at room temperature and pressure
(g) gas
(l) liquid
no entry – solid

metal | metalloid | non-metal

* – element does not occur naturally (man-made element)

Note: element 110 and above are given a temporary IUPAC nomenclature; element 113 has not yet been discovered but is included in the table at its expected position.

Preface

The course

The course consists of the following:

- two textbooks for students. They are both divided into two sections, book A and book B.
- two activity books for students

The textbooks

Great attention has been paid to the presentation of the textbooks. Special features include:

- Careful choice of vocabulary, with use of Chinese terms to facilitate student comprehension.
- Full-colour diagrams and illustrations to maximize students' attention and interest.
- Study tips for students to aid learning.
- Cross reference to material in other parts of the book and to related material in other subjects, e.g. Biology and Physics.
- Carefully constructed examination-type questions to reflect the new emphasis of the syllabus.
- Full solutions to end-of-chapter questions.
- Material of social relevance.
- Techniques from educational psychology shown to be effective in facilitating learning and understanding. These techniques are found in a special students' introduction, in innovative chapter summaries, in section reviews and in margin references.
- 'Chemistry and Us' sections which stimulate interest and develop an appreciation of chemistry and its application in daily life.
- I.T. on the net sections provide web-sites for further information on selected topics.

The activity books

The basis of the course is the work in the activity books. They are designed mainly for small-group work and to help students think for themselves as much as possible. Special features include the following:

- The use of hazard warning symbols and safety warnings for experimental work.
- A variety of innovative activities to develop process skills including: decision-making exercises, problem-solving investigations, experimental design tasks, discussions or debates, data/information collection and communication tasks such as short talks.

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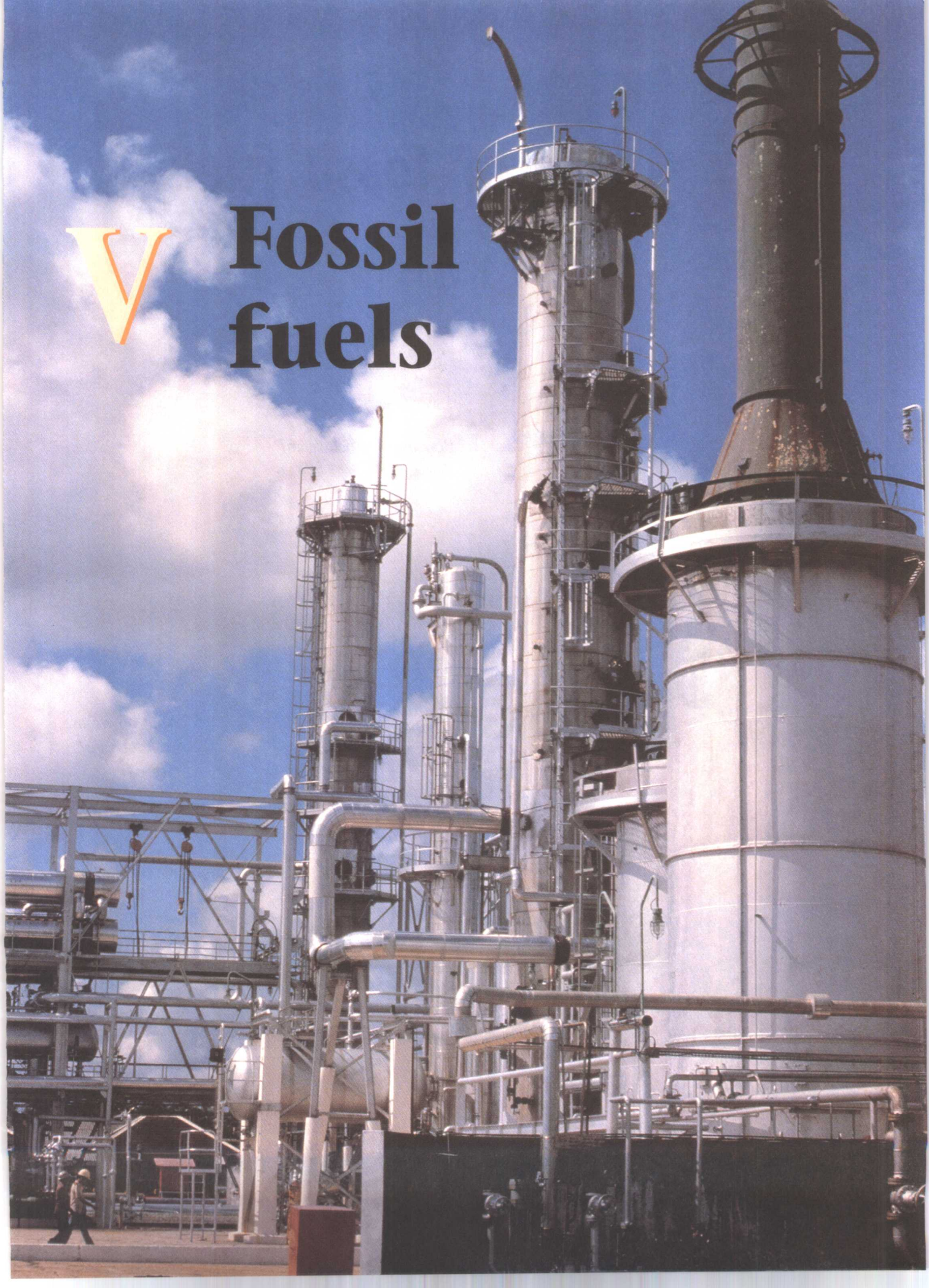
Contents

SECTION V Fossil fuels



V Fossil fuels

14 Uses of fossil fuels

1 *How useful is petroleum?*
(See p10)

2 *What do we use fossil fuels for?*
(See p3)

3 *How is town gas made?*
(See p33)

In this chapter you will find out:

- how fossil fuels, such as coal and oil, were formed in the earth
- that most of the world's energy comes from fossil fuels
- that supplies of fossil fuels will soon run out
- how compounds in coal and oil can be separated into useful products
- about the properties of some families of compounds found in oil
- how compounds in fossil fuels are changed into other fuels needed by society, e.g. petrol from coal, town gas from oil

14.1 Fossil fuels

IT ON THE NET

More on fossil fuels.

http://www.shell.com/zone/directory/0,1387,1056,00.html

A fuel is any substance which burns to give heat energy.

Wood is a fuel. The petrol used in a car engine is also a fuel.

Most of the energy we use today comes from either coal, petroleum (crude oil), or natural gas. These fuels are often called **fossil fuels** because they were made in the earth many years ago from plant or animal material.

Coal

Coal is a hard, black, shiny solid. Coal is a very old fuel and was used in China thousands of years ago. Coal is found in many parts of the world. Large amounts come from Russia, the USA and China.

Formation of coal

The coal we use today was formed from plants that grew in swampy areas about 300 million years ago. The plants grew and died to form layers of decaying material. Heat, pressure, and the action of bacteria changed the decaying plants into coal (see Fig. 14.1). As coal comes from plants, plant fossils are sometimes found in coal.

decaying 腐朽　fossils 化石　swampy areas 沼泽

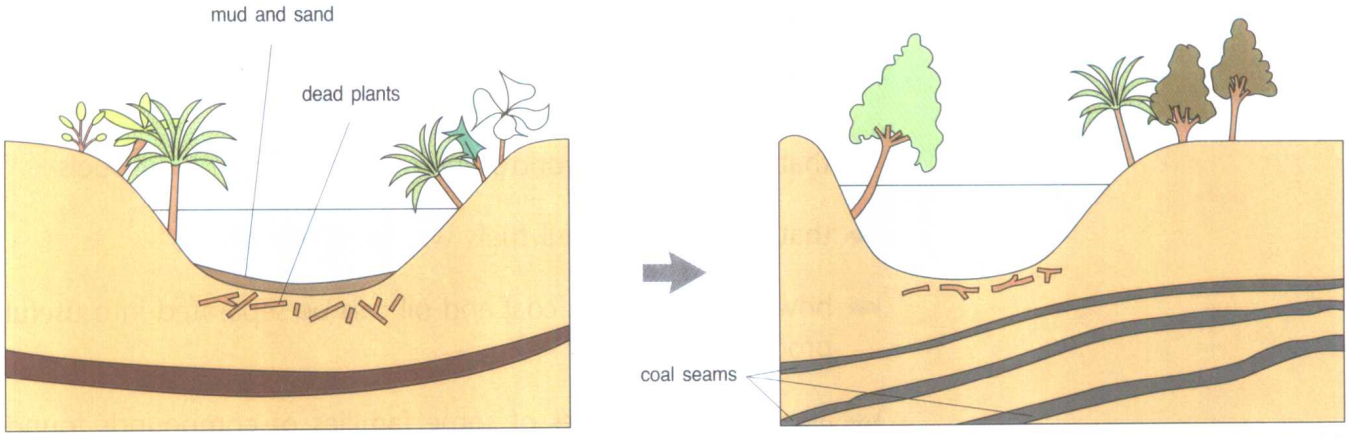


Fig. 14.1 *The formation of coal.*

Extraction of coal

Some coal is close to the surface and is easy to extract. Other coal is deep under the earth. This coal is more difficult to extract (Fig. 14.2).

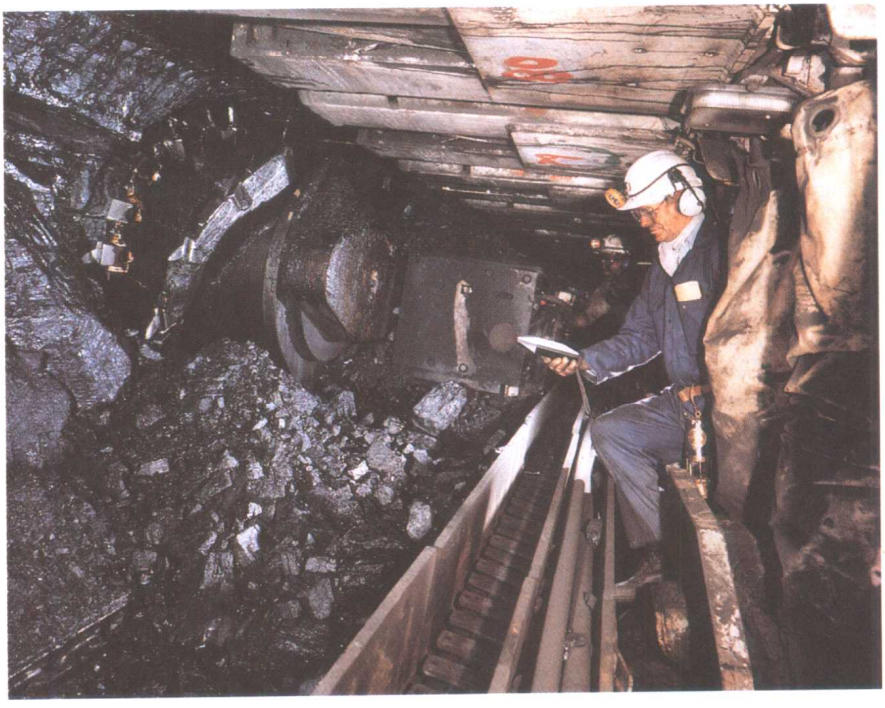


Fig. 14.2 *Extracting coal.*

Uses of coal

Today, about 70 per cent of the total coal mined is burned in power stations to generate electricity. Power stations in the Hong Kong SAR use coal (see Fig. 14.3).

Fig. 14.3 *The power station at Castle Peak in Hong Kong burns coal.*

Fig. 14.4 *A coal ship at the Castle Peak power station. This ship has enough coal for 5 days. About 10 000 000 tonnes are burned in a year.*

CLASS PRACTICE

1 **(a)** What is a fossil?

(b) Why is coal called a fossil fuel?

2 The following form an energy chain:

trees, power station, sun, electric lamp, coal

(a) Put them in the correct order.

(b) Why is it called an energy chain?

(c) What is the ultimate source of all the energy in the chain?

ACTIVITY 14.1 A

Where are the earth's sources of petroleum?

STUDY TIP

The word 'petroleum' means 'rock oil'.

Petroleum

Petroleum (also called crude oil or oil) is a thick, black liquid. Oil was used as a fuel in China about 900 years ago. The oil came from wells about 1 km under the ground.

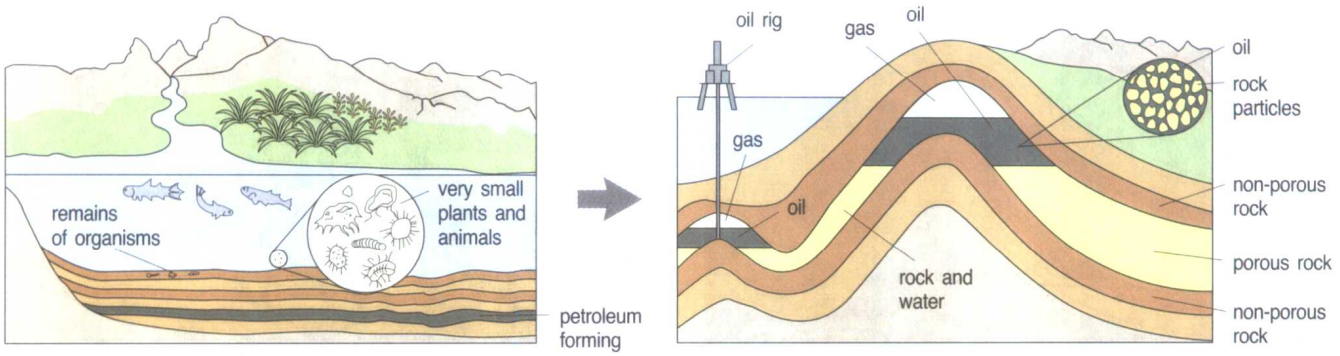
Today, oil is a very important fuel. About 40 per cent of the energy used in the world today comes from oil. Large amounts of oil are found in the Middle East, the USA and Russia.

Formation of petroleum

Scientists are not sure how petroleum was formed. They think it was formed from small sea animals and plants that lived millions of years ago. As the organisms died, they fell to the bottom and decayed.

Heat, pressure, and the action of bacteria changed the remains into oil. The oil formed was then trapped as small drops inside the pores (tiny holes) of rocks (like water in a sponge) (see Fig. 14.5).

cruel oil 原油	Middle East 中东	wells 油井



Sea plants and animals died and fell into the sand and mud at the bottom of the sea. Thick layers of sand and mud covered the decaying matter, which slowly changed into petroleum and natural gas.

Movement of the earth trapped the petroleum and natural gas in porous rock between layers of non-porous rock.

Fig. 14.5 *The formation of oil.*

Extraction of oil

To extract oil, a hole is drilled through the rock layers. If the oil is under pressure, it will be forced to the surface. If the pressure is low, a pump has to be used (see Fig. 14.6). The oil is then taken by tanker or pipeline to an oil refinery (see Figs. 14.7 and 14.8).

Fig. 14.6 *Extracting oil from under the sea.*

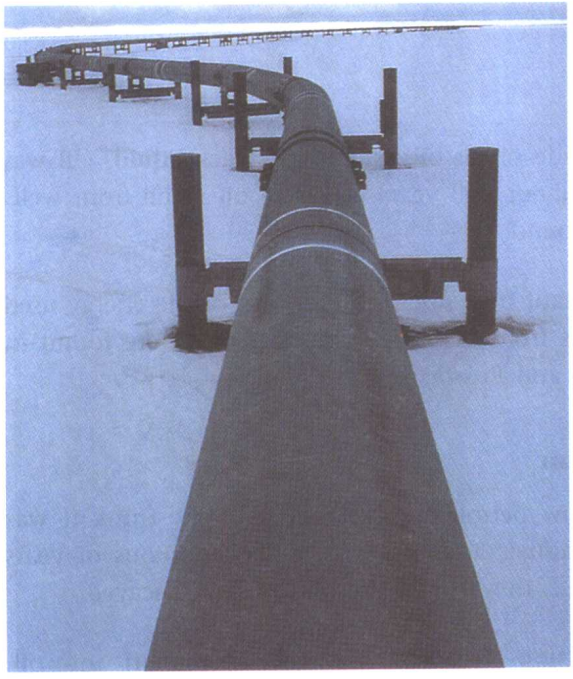


Fig. 14.7 *An oil pipeline in Alaska. It is 1300 km long.*

Fig. 14.8 *Carrying oil by tanker.*

trapped
受困

Uses of oil

The thick crude oil that comes from the ground is a complex mixture of compounds. In this form, it is of little use. It is necessary to separate the compounds. The separation is done in an oil refinery. The separated substances have two main uses.

1 A source of useful fuels, e.g. petrol.

2 A raw material to make other products, e.g. plastics, detergents.

CLASS PRACTICE

3 Look at Datatable 11.

(a) Draw a map of the world. On the map, show the main countries that produce petroleum.

(b) Draw a bar graph to show the amounts of petroleum produced by these countries.

4 Oil was formed under the sea. Today, a lot of oil is found under the land. Give a reason for this.

5 Crude oil is sometimes called 'black gold'. Why is this a suitable name?

Natural gas

Natural gas is found together with oil and sometimes with coal. The gas consists mainly of methane CH_4. Natural gas is often found in large amounts under the sea. In some countries, the gas is carried by pipes to homes and factories for heating and cooking.

The first known use of natural gas as a fuel was in China. It was piped through bamboo tubes and was used for lighting. Today, natural gas provides about 20% of the world's energy needs. The gas is often cooled, to –162°C, to liquefy it. The liquid has a much smaller volume than the gas. The liquefied natural gas, LNG, can then be easily transported around the world. Again, power stations use natural gas to heat water and generate steam, to run turbines to produce electricity.

Fig. 14.9 *Black Point power station in Hong Kong burns natural gas to produce electricity.*

Fig. 14.10 *A LNG tanker.*

14.2 Limited resources of fossil fuels

Fossil fuels are the world's most important sources of energy. The demand for these fuels has increased greatly this century. This is shown in Figure 14.11.

Today, the world uses large amounts of fossil fuels. However, once used, the fossil fuels made millions of years ago cannot be replaced. Figure 14.12 shows estimates of when fossil fuels will run out.

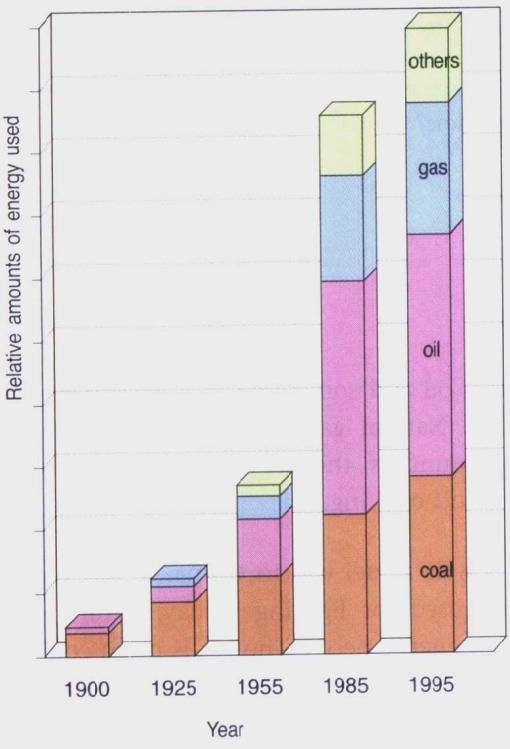


Fig. 14.11 *Increase in world energy use in the 20th century.*

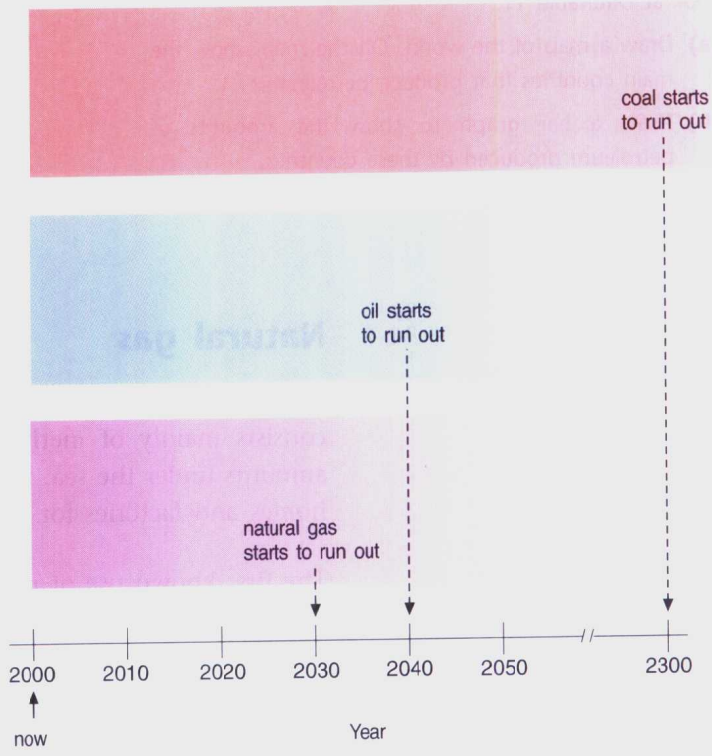


Fig. 14.12 *The years when our fossil fuels are estimated to run out.*

CLASS PRACTICE

6 Look at Figure 14.11.

(a) What was the largest source of energy in the world in 1925?

(b) What is the largest source of energy today?

(c) **(i)** What percentage of our energy is from non-fossil fuels?

(ii) Name one or more of these energy sources.

7 **(a)** Give examples of how we use more energy today than 100 years ago for: **(i)** heating and cooking; and **(ii)** transport.

(b) Which of the examples you gave in (a) use fossil fuels?

demand
需求