外教社——麦克米伦中学双语教材系列

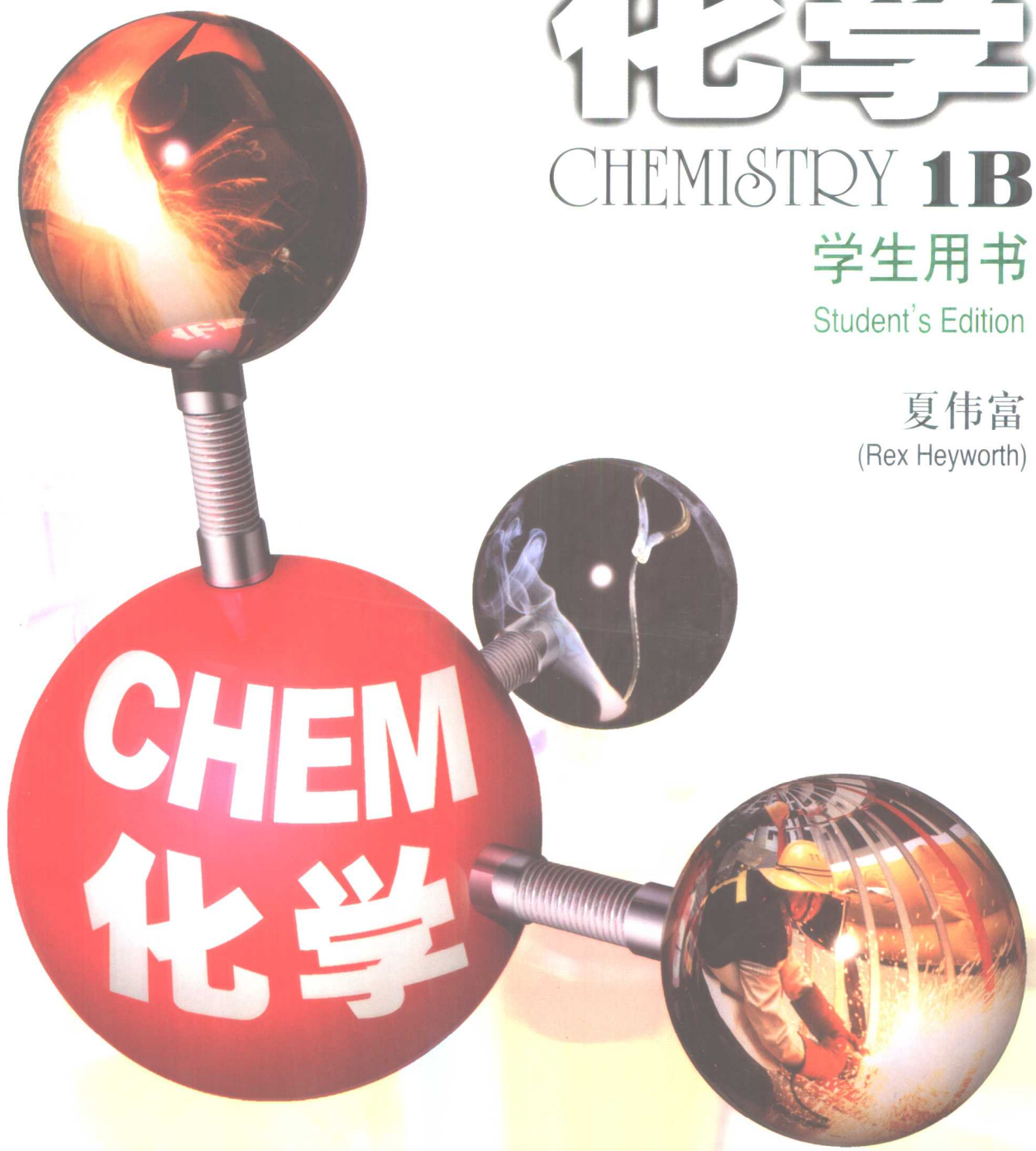
化学

CHEMISTRY 1B

学生用书

Student's Edition

夏伟富
(Rex Heyworth)



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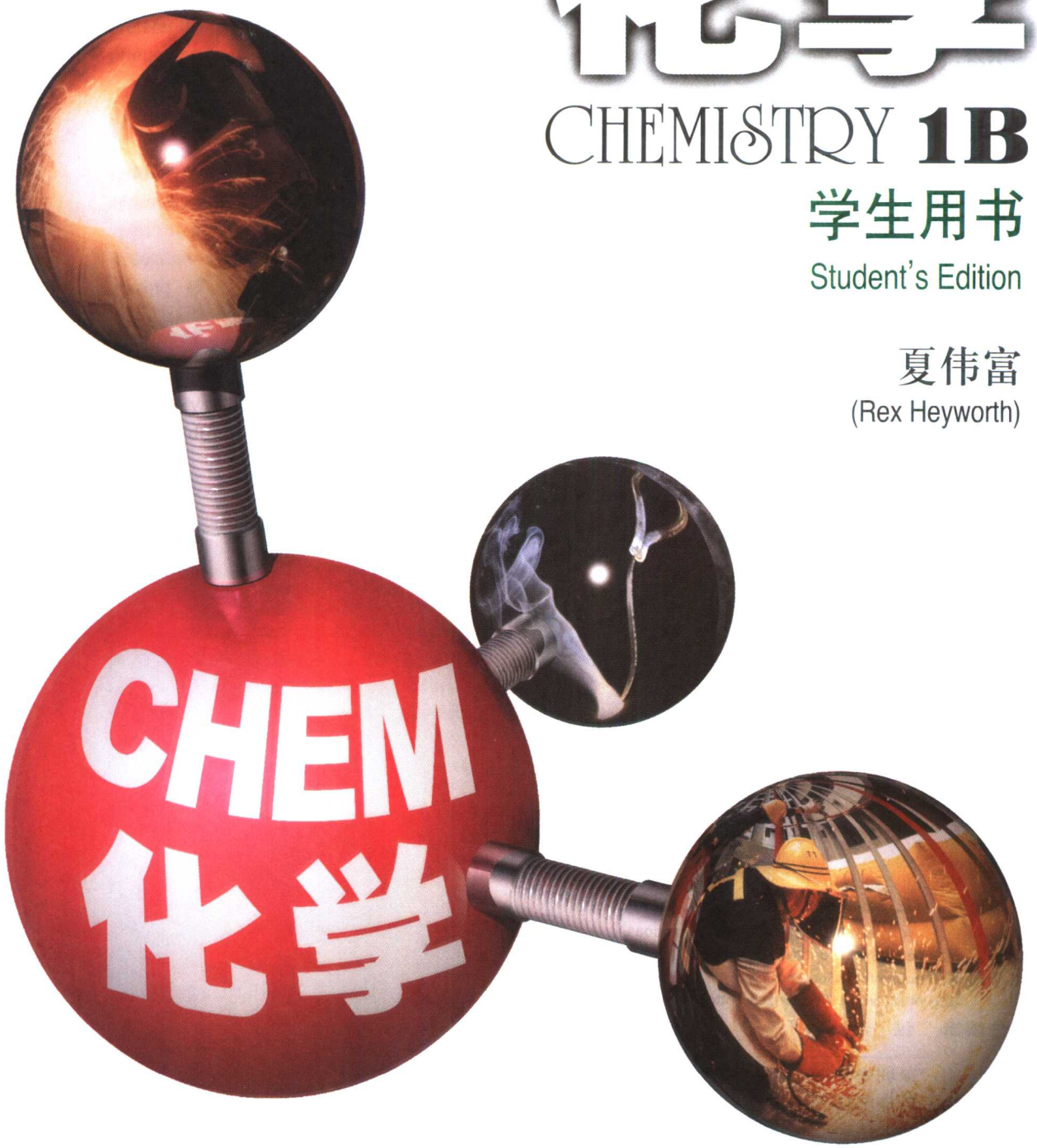

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出版前言

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

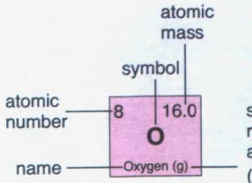
2003年5月

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 (book 1 and 2) 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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We are also grateful to the Hong Kong Examinations Authority for kind permission to reproduce past HKCEE Chemistry papers.

Student's notes – learning with the textbook

When we read a textbook, we want to understand and remember ideas. What is the best way to do this? Many students use repetition. This is not a good way. Repeating sentences sometimes helps us to remember. But it does not help us to understand.

The best way to remember is to understand. And the best way to understand is to think deeply about what we read. Some ways of doing this are described below.

How can we learn terms and their meanings?

Here are some ways to understand and remember terms. They work because they make us think deeply.

To remember chemical terms

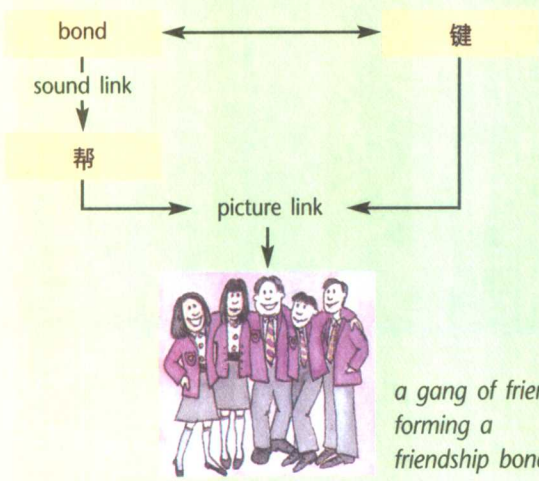
Here is a useful method if you also know the Chinese word for a term. Do this:

1 Think of a Chinese word with a similar sound to the English chemical term.

2 Think of a picture to link this sound word with the Chinese word. Use any picture. Silly or weird pictures are often the best because these tend to stick in the mind.

EXAMPLE 1

To remember the chemical term 'bond'.



a gang of friends forming a friendship bond

To remember the picture is easy. From the picture, you can recall the chemical term.

To remember meanings of chemical terms

This is similar to the previous method. First, understand the meaning. Then do this:

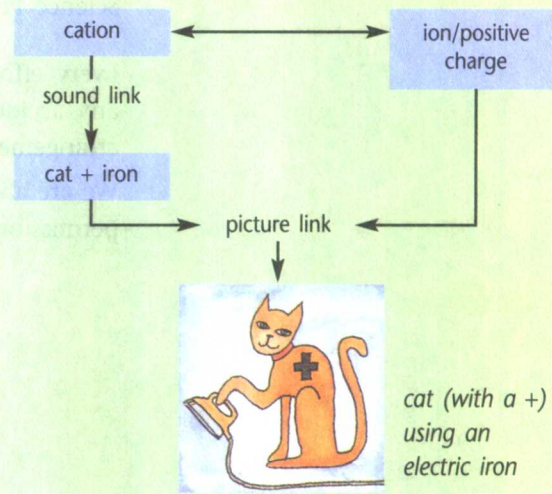
1 Think of a familiar Chinese or English word with a similar sound.

2 Make a picture link using some or all of the meaning.

EXAMPLE 2

To remember the meaning of the term 'cation'.

A cation is an ion with a positive charge.



cat (with a +) using an electric iron

Word analysis

Many terms in chemistry are made of smaller parts joined together. Each part has a meating. The parts can help us to work out the meaning of the term. 'Word analysis' gives a list of many common word parts. Also, 'STUDY TIPS' throughout the book gives you help.

EXAMPLE 3

What is the meaning of the term 'dehydrate'?
Dehydrate consists of the parts 'de-' and '- hydrate'.
From Word analysis, 'de-' = reverse, opposite to
'-hydr' = water
So, hydrate = adding water
dehydrate = removing water

deeply 深入地 recall 记起 repetition 重复学习 silly 傻里傻气的 word analysis 词语分析

Sets of related words

Many words are related to other words. When possible, learn sets of related words. The study tips will help you. For example in Chapter 11:

electrolysis (noun)
electrolyte (noun)
electrode (noun)
electrolytic (adjective)
to electrolyse (verb)

To remember lists of words

Sometimes we need to remember a list of words. One way is to make a sentence with the words, or with the first letters of the words.

EXAMPLE 4

To remember the names and symbols of the first nine elements. Consider this sentence:

Harry **He**ung **Li**kes **Be**ef **B**ut **C**andy **N**g **O**rders **F**ish.

As this sentence is easy to remember, we can recall the symbols and the names for the elements. For example, Harry gives H (hydrogen), Fish gives F (fluorine).

EXAMPLE 5

Suppose you read the words in the box below. The ideas around the box are examples of elaboration.

Related words – e.g. electrolysis

Electrolytes Substances that conduct electricity when molten or in aqueous solution (i.e. dissolved in water). During conduction, they decompose. Compounds made of metals and non-metals are electrolytes.

Meaning of this word

Example – lead(II) bromide → lead + bromine

Examples – sodium chloride, lead(II) bromide, copper(II) sulphate

Previous work – metals conduct electricity but they are not electrolytes

Elements cannot be electrolytes

How can we understand ideas?

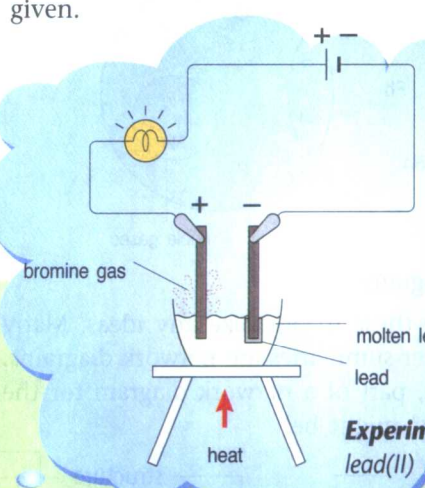
Understanding involves joining ideas together. Here are three ways to do this joining.

Elaboration

When you read something, think of other ideas related to the ideas in the text. You can:

- think of *examples*
- think of *diagrams* or *pictures*; you can even make your own mental pictures
- recall *experiments*
- join the ideas to work in *other subjects*, e.g. Biology, EPA
- recall *previous work*

The book helps you to elaborate by reminding you to 'THINK ABOUT' information from other subjects. References to 'MORE ABOUT' the subject are also given.



Experiment *– with molten lead(II) bromide*

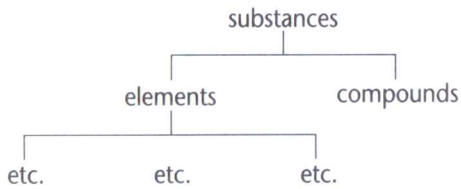
elaboration
扩大法

Organization

Organizing ideas also helps understanding. Some ways used in this book are shown below. Use these examples to help when you make your own organization.

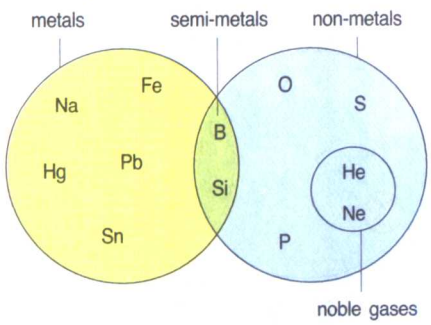
(a) Tree diagrams

For example, for a classification of substances (see the summary for Chapter 1).



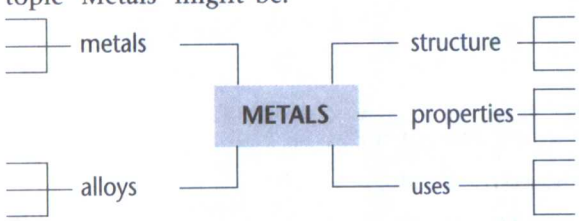
(b) Set diagrams

For example, for groups of elements (see Book 1A, page 6).



(c) Network diagrams

You can use these to organize any ideas. Many of the chapter summaries are network diagrams. For example, part of a network diagram for the topic 'Metals' might be:

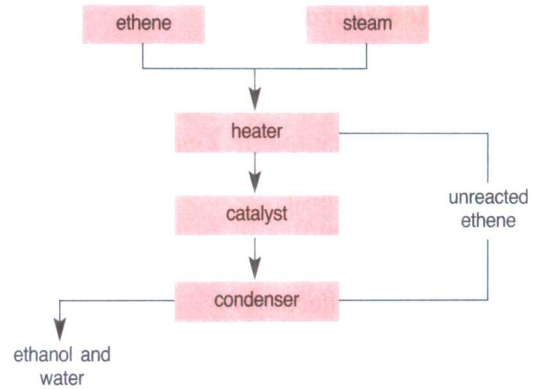


(d) Tables

A lot of information in Science is organized into tables. This book contains many tables. For example, look at the table in Chapter 5 for the structures of substances (see Book 1A, page 114).

(e) Flow charts

Flow charts are useful when one idea follows another. For example, in Chapter 18 we use a flow chart to explain the manufacture of ethanol (see Book 2A, page 139).



Reorganization

When something is organized one way, try to organize it another way. This will make your understanding even better. For example:

- If you have a table, reorganize it as a network diagram.
- Use the ideas in a network diagram to write sentences.

How can we study a chapter?

Here are three steps to follow when you study a chapter in the book.

Preview

To get an idea of what you will learn:

- Look at the headings in the chapter.
- Look at the summary.

Study each section

- Look at each heading. Many are in the form of questions. Think of other questions.
- Read the section. Underline important parts.
- Think deeply about the section. For example, use word analysis, elaboration.
- Answer the questions given. Also try to answer your own questions. This is important. If you cannot answer a question, study the section again.

Review

After you finish the chapter:

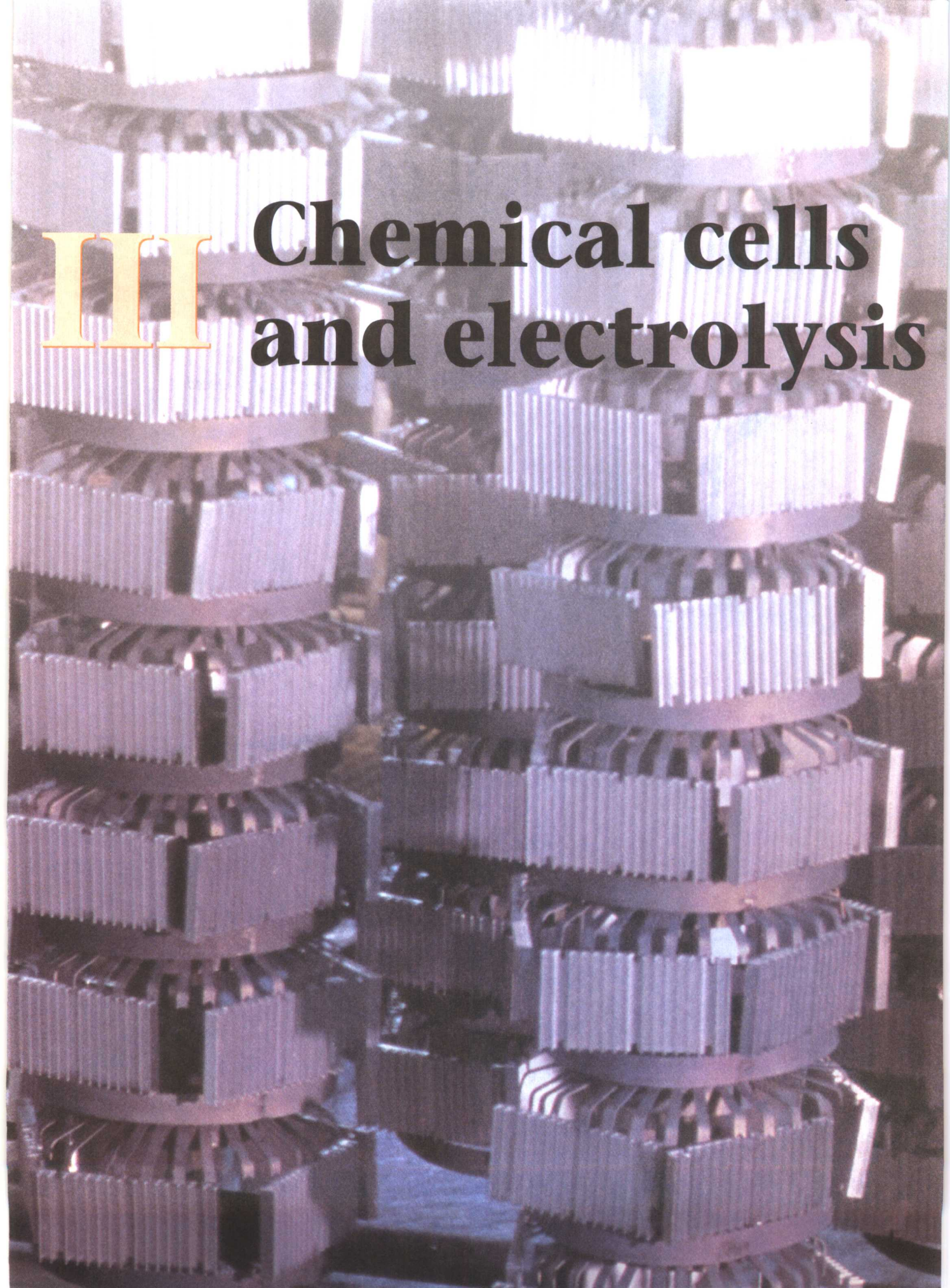
- Study the summary. Try to recall the ideas without looking at the summary.
- Try some of the examination-type problems at the end of the chapter.

flow charts 流程图 | network diagrams 网络图解 | preview 预习 | review 复习 | underline 划底线于

Contents

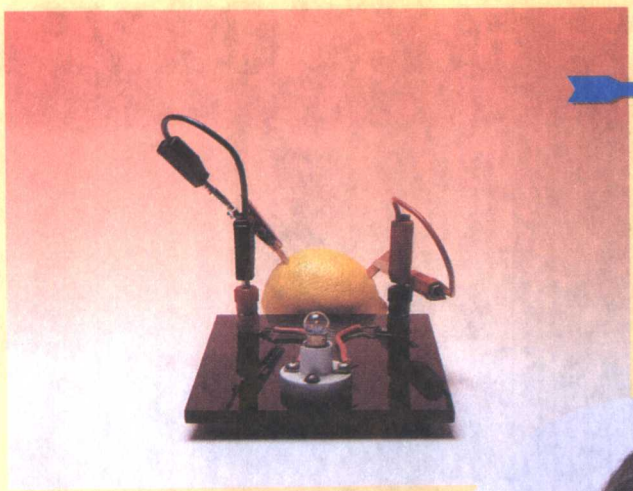
SECTION III Chemical cells and electrolysis

SECTION IV Common acids and alkalis



III Chemical cells and electrolysis

9 Chemical cells



1 *How is electricity produced from a fruit?*
(See p5)

2 *What is a dry cell?*
(See p12)

3 *What are cells used for?*
(See p3)

In this chapter you will find out

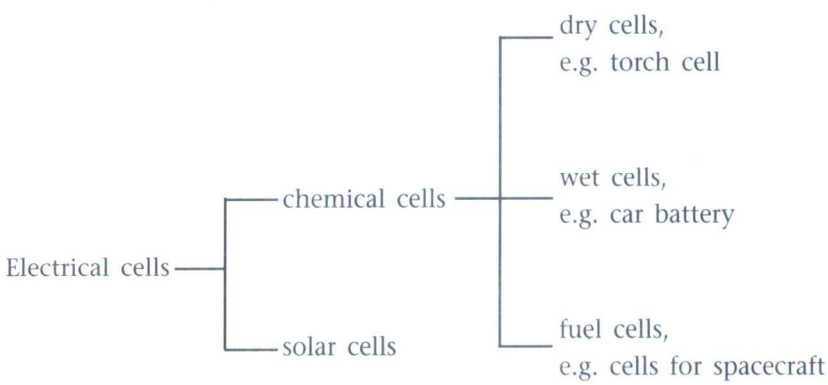
- how electricity is made from chemicals in chemical cells
- what is needed to make a cell
- what reactions happen inside cells
- about the variety and importance of chemical cells in everyday life

9.1 Electrical cells

We are all familiar with electrical cells. We use electrical cells in torches, radios, clocks and toys (see Fig. 9.1). Cars use large electrical cells to start the engine and to light the lamps. Electrical cells are also used to provide electricity needed in spacecraft.

There are two main types of electrical cells: chemical cells and solar cells.

Fig. 9.1 *Toys and electrical apparatus that use electrical cells.*



In chemical cells, the energy change is:

chemical energy → electrical energy
(from the chemicals)

In solar cells, the energy change is:

solar energy → electrical energy
(from the sun)

In this chapter, we will look at chemical cells and batteries. A battery is just several cells joined together. However, in daily conversation, we often use the word 'battery' for a 'cell'.

solar
太阳能

CLASS PRACTICE

1 **(a)** One advantage of a solar cell is that it may last forever. Why?

(b) Give one disadvantage of a solar cell.

2 Ask some questions about chemical cells.

For example:

- What are chemical cells made of?
- How does a cell produce electricity?

As you study the chapter, try to answer the questions.

9.2 Simple chemical cells

ACTIVITY 9.1

How can we make chemical cells?

Figure 9.2 shows a simple chemical cell. A piece of zinc and a piece of copper are in a solution of sodium chloride. The two metals are joined to a light bulb. The light bulb shines which shows that the cell has made electricity.

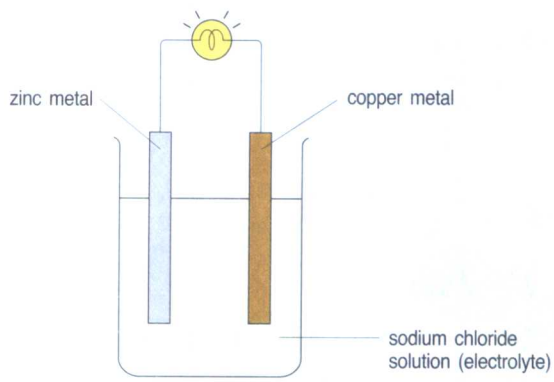


Fig. 9.2 *A simple chemical cell.*

A simple chemical cell consists of two parts: any two different metals; and any electrolyte solution.

A strip of magnesium and a strip of lead in dilute sulphuric acid also gives a simple chemical cell.

Other simple chemical cells

Two other simple cells are shown in Figures 9.3 and 9.4.