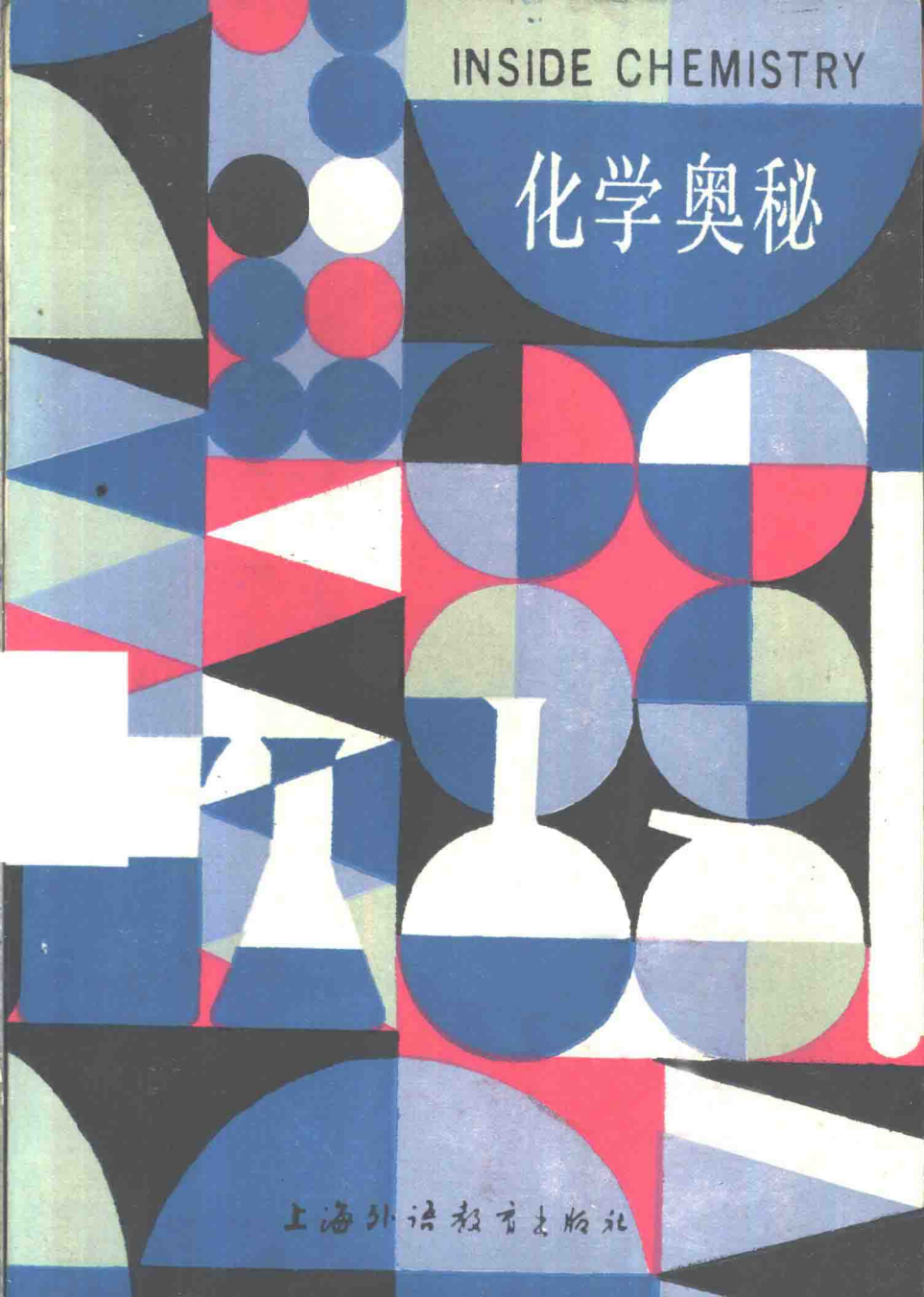




INSIDE CHEMISTRY

化学奥秘

上海外语教育出版社

科普注释读物

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〔美〕 查尔斯·康普顿 著
祝祖耀 姜鸿年 选注

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[美]查尔斯·康普顿著

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上海外语教育出版社出版

(上海外国语学院内)

江苏如皋印刷厂印刷

新华书店上海发行所发行

787×1092 毫米 1/32 4.875 印张 130 千字

1988 年 4 月第 1 版 1988 年 4 月第 1 次印刷

印数: 1—4,500 册

ISBN 7-81009-315-0

0·003

定价: 1.30 元

前 言

《化学奥秘》(*Inside Chemistry*)一书系美国威廉斯大学(Williams College)的查尔斯·康普顿(Charles Compton)所著,由 McGraw-Hill Book Co. 于1979年出版。该书用生动的语言阐述了化学学科的一些基本概念和基础理论,深入浅出地解释了人们在日常生活中颇感兴趣的一些化学现象。内容包括对化学理论的通俗叙述,同时还涉及与化学密切相关的其它许多学科,如化学在气象、生物、医学等领域中的应用。这是一本既能普及化学知识,又能帮助读者提高英语水平,扩大视野的英语注释读物。

本书共选注了二十四篇文章。选文具有科学性、实用性和趣味性,内容新颖,文简理明。每篇文章除正文外,还配有生词、词组及注释。注释包括难句译文、语法分析和例句说明,以期提高读者的阅读和理解能力。书末附有英语化学分子式和方程式的读法,以及词汇表,以备查阅。

本书除可用作大专院校理工科学生阅读材料或课外辅助材料外,还可作为广大科技人员自学英语的辅助读物。

本书在编选过程中,承蒙聂光序同志审阅,徐建国同志也为本书做了一些具体工作,特此致谢。

编 者

1987年6月

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1. THE COMPOSITION OF THE HUMAN BODY

The chemical composition of the human body varies, of course, from person to person, and depends, among other factors, on the sex of the person and what they eat⁽¹⁾. Table One lists the approximate composition of the average adult. About 50 percent of the protein material is in the form of muscle, about 20 percent is in the skeleton, about 9 percent is skin, and about 5 percent is blood. Most of the fats are found as deposits of adipose (fatty) tissue. The carbohydrate material is mainly glycogen. Most of the mineral content is found in the bone structure.

Table Two lists the composition, as percent by weight, of the average adult human body in terms of the atoms present in the various substances.⁽²⁾ In view of the high concentrations of proteins, fats, and water, it is not surprising that more than 95 percent of the body is composed of oxygen, carbon, hydrogen, and nitrogen atoms. Substantial concentrations of calcium and phosphorus are required by the bone structure. The fluid in cells contains an appreciable concentration of potassium ions, K^+ . The fluid outside cells contains a significant concentration of sodium ions, Na^+ .

Table Three compares, on an atom percent basis, the composition of the human body with the composition of the universe, the earth's crust, and seawater.⁽³⁾ The preponderance of hydrogen atoms in the body is made clearer on this basis than on a weight percent basis since they have such a small weight.⁽⁴⁾ This comparison reveals that carbon and phosphorus atoms, which are very important in the human body, are rather scarce elsewhere.

Table One
Chemical Composition
of the Average Adult
Human Body

Class of substance	Approximate percent by weight
Proteins	16
Fats	18
Carbohydrates	<1
Minerals	5
Water	60

Table Two
Composition* of the
Average Adult Human
Body in Percent by Weight
of Atoms

Atom	Percent by weight
Oxygen	65
Carbon	18
Hydrogen	10

Nitrogen	3.0
Calcium	2.0
Phosphorus	1.2
Potassium	0.35
Sulfur	0.25
Sodium	0.15
Chlorine	0.15
Magnesium	0.05
Iron	0.004

* Plus traces of iodine, fluorine, silicon, manganese, cobalt, copper, zinc, boron, aluminum, vanadium, and molybdenum.

Table Three

Comparison of the Atom Composition of the Universe, the Earth's Crust, Seawater, and the Average Adult Human Body
Percent of total number of atoms present*

Universe		Earth's crust	
Hydrogen	91	Oxygen	47
Helium	9.1	Silicon	28
Oxygen	0.057	Aluminum	7.9
Nitrogen	0.042	Iron	4.5
Carbon	0.021	Calcium	3.5
Silicon	0.003	Sodium	2.5
Neon	0.003	Potassium	2.5
Magnesium	0.002	Magnesium	2.2
Iron	0.002	Titanium	0.46
Sulfur	0.001	Hydrogen	0.22
		Carbon	0.19
All others	<0.01	All others	<0.1

Seawater		Human body	
Hydrogen	66	Hydrogen	63
Oxygen	33	Oxygen	25.5
Chlorine	0.33	Carbon	9.5

Sodium	0.28	Nitrogen	1.4
Magnesium	0.033	Calcium	0.31
Sulfur	0.017	Phosphorus	0.22
Calcium	0.006	Potassium	0.06
Potassium	0.006	Sulfur	0.05
Carbon	0.0014	Chlorine	0.03
Bromine	0.0005	Sodium	0.03
		Magnesium	0.01
All others	<0.1	All others	<0.01

New Words and Expressions

composition [ˌkɒmpəˈzɪʃən] *n.*

组成, 成分

sex [seks] *n.* 性别, 男女

approximate [əˈprɒksɪmɪt] *a.*

近似的, 大约的

average [ˈævərɪdʒ] *n.* 平均;

a. 平均的

adult [ˈædʌlt] *a.* 成年人的;

n. 成年人

muscle [ˈmʌsl] *n.* 肌肉

skeleton [ˈskelɪtn] *n.* 骨骼

deposit [dɪˈpɒzɪt] *n.* 沉淀, 淤

积, 存积 *vt.* 使沉淀, 使存积

adipose [ˈædɪpəʊs] *a.* 脂肪

(质)多的

tissue [ˈtɪʃu:] *n.* 组织

carbohydrate [ˈkɑːbəʊˈhaɪdreɪt]

n. 碳水化合物

glycogen [gˈlɪkəʊdʒən] *n.* 糖

原, 动物淀粉

bone [bəʊn] *n.* 骨

in terms of 依据, 按照, 用……

词句来表示

in view of 由于, 鉴于, 考虑到

concentration [ˌkɒnsənˈtreɪʃən]

n. 浓度, 集中

protein [ˈprəʊtiːn] *n.* 阮, 蛋

白质

substantial [səbˈstænʃəl] *a.* 物

质的, 实质的, 大量的

calcium [ˈkælsiəm] *n.* 钙

phosphorus [ˈfɒsfərəs] *n.* 磷

aluminum [əˈljumɪnəm] *n.* 铝

fluid [ˈfluːɪd] *n.* 流体

titanium [taɪˈteɪnjəm] *n.* 钛

cell [sel] *n.* 细胞

appreciable [əˈpriːʃiəbl] *a.* (大

得)可以看到的, 明显的

potassium [pəˈtæsjəm] *n.* 钾

ion [aɪən] *n.* 离子

sodium [ˈsəʊdɪəm] *n.* 钠

universe [ˈjuːnɪvəs] *n.* 宇宙

on ... basis 根据,在……基础上

crust [krʌst] *n.* 外壳,地壳

preponderance [pri'pɒndərəns]

n. (数量,重量或重要性上的)

优势

reveal [ri'veɪl] *vt.* 展现,(显)

露出,揭露

scarce [skeəs] *a.* 缺乏的,不

足的

sulfur ['sʌlfə] *n.* 硫

magnesium [mæg'ni:zjəm] *n.*

镁

helium ['hi:ljəm] *n.* 氦

silicon ['silikən] *n.* 硅

neon ['ni:ən] *n.* 氛

Notes

1. The chemical composition ... what they eat.

当然,人体的化学组分是因人而异的,它取决于各种因素,其中包括人的性别和人们摄取的食物。

本句中 *vary from ... to ...* 作“……与……之间各不相同”或“变动于……和……之间”解。例如:

The weather varies from hour to hour in this area.

这个地区的天气时刻在变化。

又句中 *among other factors* 是“除了其它许多因素之外”的意思,为介词短语,作状语。

2. in terms of the atoms present in the various substances

根据不同物质中具有的原子数

本句中的 *in terms of* 可解释为“依据,按照”。例如:

We must plan our work in terms of the new situation.

我们必须按照新形势来计划我们的工作。

又本句中的 *present in the various substances* 是形容词短语,作后置定语,修饰 *atoms*。例如:

1) All comrades present here must have seen the film.

所有在座的同志们一定看过这部电影。

2) Carbon occupies a position unique in the science of chemistry.

碳在化学中占据独一无二的地位。

句中 **unique ...** 是后置定语，修饰 **position**。

3. **Table Three compares, ... the earth's crust, and seawater.**

表三以原子数百分比作为比较的基础，把人体的组分同宅宙、地壳和海水的组分作了比较。

本句中 **compare ... with ...** 作“把……和……比较”解释。例如：

Compare A with B, and you will see which is better.

把A和B比较一下，你就可以看出哪个比较好了。

又句中 **on an atom percent basis** 意思是“以原子百分数为基础”，是介词短语作状语，修饰谓语动词 **compares**。

4. **The preponderance of hydrogen atoms ... a small weight.**

由于氢原子的重量很轻，采用原子数的百分比，要比原子重量的百分比更能显示其在人体中的重要性。

本句中 **on this basis** 指 **on an atom percent basis**。

2. HYDROGEN

Hydrogen atoms are the most abundant of all of the different kinds of atoms, constituting as they do at least 90 percent of all the atoms in the universe.⁽¹⁾ They are incorporated into some of the most interesting substances, as well as some of the most important. Water molecules contain hydrogen atoms, as do the molecules of sugar, proteins, and the components of crude petroleum.⁽²⁾

Elemental hydrogen is made up of molecules containing two hydrogen atoms. It is a colorless, odorless gas with the lowest density of all forms of matter; that is, 1 liter weighs only about 0.08 gram under ordinary conditions, whereas the same volume of air weighs about 15 times as much, or 1.2 grams.⁽³⁾ Its low density is responsible for its ability to lift balloons and other lighter-than-air aircraft. Only traces of molecular hydrogen gas occur in the earth's atmosphere since the earth's gravitational field is not strong enough to hold onto the hydrogen released into it from volcanoes, the decomposing action of light on water, and other sources.⁽⁴⁾

What is all this hydrogen used for? About two thirds of it is converted into ammonia as a first step toward the synthesis of important fertilizers, among other things.⁽⁵⁾

Consequently hydrogen production is a significant factor in the supply of food.

Elemental hydrogen is ordinarily a gas. It tends so strongly to be a gas that a special effort is required to persuade it to condense to a liquid: cooling it at least to -253°C .⁽⁶⁾ Keeping large quantities at this low temperature presents a special challenge, and its handling is further complicated by hydrogen's famous explosive nature when mixed with oxygen, which is abundant in the atmosphere.⁽⁷⁾ Yet liquid hydrogen has been required for the space program. It is used as one of the fuels to propel rockets into outer space.

New Words and Expressions

hydrogen ['haɪdrədʒən] *n.* 氢

abundant [ə'bʌndənt] *a.* 丰富的

constitute ['kɒnstɪtʃʊt] *vt.* 构成

incorporate [ɪn'kɒrpəreɪt] *v.* 结合, 使混合, 组成

component [kəm'pəʊnənt] *a.* 组成的, 合成的; *n.* 成分, 组成部分

odorless ['əʊdələs] *a.* 没有气味的

density ['densɪti] *n.* 密度

liter ['lɪtə] *n.* (公)升(容量单位)

volume ['vɒljʊm] *n.* 体积

be responsible for [rɪ'spɒnsəbl] 对……负责; 是……的原因

lift [lɪft] *vt.* 使……升起, 举起

balloon [bə'lʊn] *n.* 气球

aircraft ['eəkrɑ:ft] *n.* (单复数同)飞船, 航空器

trace [treɪs] *n.* 痕迹

molecular [məʊ'lekjʊlə] *a.* 分子的

atmosphere ['ætməsfiə] *n.* 大气, 空气

gravitational [grævi'teɪʃənəl] *a.* 万有引力的, 地心吸力的

hold [hould] vt. 握住, 容纳;

vi 适用, 有效;

hold onto 拉住

release [ri'li:s] vi. 释放

volcano [vɒl'keɪnəʊ] n. 大山

decompose [di'kɒm'pəʊz] vt.

分解

source [sɔ:s] n. 来源, 起源

be converted into [~ kən'veɪ

tɪd ~] 被转变成

ammonia [ə'məʊnjə] n. 氨

synthesis ['sɪnθɪsɪs] n. 合成

fertilizer ['fɜ:tɪlaɪzə] n. 肥料

consequently ['kɒnsɪkwəntli]

ad. 因此, 所以

significant [sɪg'nɪfɪkənt] a. 有
意义的, 重要的

factor ['fæktə] n. 因素

tend [tend] v. 倾向

persuade [pə'sweɪd] vt. 促使

condense [kən'dens] v. 冷凝,

使冷凝, 浓缩

challenge [tʃælɪndʒ] n. 挑

战, 任务, 课题

handle ['hændl] vt. 处理

explosive [ɪks'plɔ:sɪv] a. 爆炸

性的

propel [prə'pel] vt. 推进, 推

动

Notes

1. Hydrogen atoms are ... in the universe.

在宇宙间各种不同种类的原子中, 氢原子含量最丰富, 它至少占有宇宙间原子总数的百分之九十。

本句中 *constituting as they do ...* 是分词短语作状语, 它的逻辑主语是句子的主语 *hydrogen atoms*。其中 *as they do* 是方式状语从句, *do* 代替动词 *constitute*。例如:

Solids expand and contract as liquids and gases do,

固体象液体和气体一样能膨胀与收缩。

2. as do the molecules of sugar ... crude petroleum

如同糖分子、蛋白质分子以及原油组分中都含有氢原子一样

本句中 *as* 是从属连词, 引导方式状语从句, *do* 代替动词 *contain*。从句取倒装形式, 代动词 *do* 放在主语的前面是因为主语较长。例如: