高等学校教材
专业英语系列教程

A Course of Chemistry English

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主审 王尧宇 江元汝

化学专业英语教程

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【内容简介】 本书主要介绍化学、化工专业基本原理和基础知识的现代英文表述，内容涉及无机化学、有机化学、物理化学、现代仪器分析、基础专业知识等，不仅包括化学科技文献、专业前沿报告，还包括专利报告、会议通知、科技研究项目介绍等实用体裁，文章内容丰富，语言难度适中，练习设计精当。

本教材可用作高等院校理工类应用化学、化工专业的本科生及研究生的专业外语教材，也可用作化学研究作者的专业参考资料。

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前言

按照教育部最新颁布的《大学英语课程教学要求》中的规定，学生在完成基础阶段的英语课程学习任务后，必须修读专业英语。《化学专业英语教程》就是根据大纲要求，为高等院校化学专业而编写的英语教材。

全书由10个单元组成。每个单元由三部分组成：课文A安排阐述化学或化工专业的某一主题的文章，旨在引导学生精读，充分理解文章内容，掌握疑难表达和句型、专业词汇等；课文B为有关化学或化工专业的科普文章，旨在培养学生阅读兴趣，开拓视野。教材文章体裁多样，内容广泛，不仅有知名化学家传记、科技小品文及专业话题的前沿报告，还有化学科学史上的佚闻趣事等；课文C精选日常应用短文，包括通知、海报、简历、备忘录、最新消息及专利报告、会议论文及录用通知等。通过本教材的学习，不仅可以提高学生的化学专业词汇量和阅读专业文献的能力，还可以提高学生对化学专业的学习兴趣和英语综合素质。

“不积跬步，无以至千里；不积小流，无以成江海”。广泛阅读是积累知识的必经之路，因此本书在编写过程中，着重突出以下特点：

一、课文选材多样，新颖前沿。文章全都选自近几年国外期刊或专业书籍中的篇章，体裁多样，具有时代感。学生可以读到时尚的文字，了解本专业的新发展和新理念。

二、练习设计精当，实用易学。针对学生学习专业英语时遇到的难点和要求，设计了内容精当而类型不同的练习。学生可以学以致用，举一反三，真正掌握专业英语的基本知识。

三、编排深入浅出，循序渐进。各篇章的内容介绍了化学专业的基本原理和相关基础知识，内容涉及无机化学、有机化学、物理化学、基础专业等。各篇章的语言难度适中，由浅入深。

本书由长期从事化学教学和研究工作的专业英语教师以及大学英语教师共同编写。第1～5、8单元由石春成（西安建筑科技大学）编写，第6单元由王欣（西北工业大学）编写，第7单元由杨鹏辉（西安石油大学）编写，第9、10单元由石春让（西安外国语大学）编写。全书由石春成统稿，王尧宇教授（西北大学）和江元汝教授（西安建筑科技大学）主审。

在本书编写过程中，得到了许多前辈和同仁的大力支持和帮助，同时也参考了大量的专业文献，特此表示真挚的谢意。王尧宇教授和江元汝教授严谨的学

风，渊博的学识给编者留下了深刻的印象，另外，本书的编写和出版得到了西北工业大学出版社的大力支持，在此表示衷心的感谢。

由于作者水平有限，本书难免存在缺点和错误，肯请读者和同仁批评指正。

编　者

2007 年 1 月

目录

Unit 1

Text A

Chemistry: A Science for All Reasons

Chemists find toxic chemicals in our drinking water. Lethal chemicals are released in industrial accidents. Death-dealing chemicals are stockpiled as weapons. Cancer-causing chemicals are detected in the air of our cities. Lives are diminished and destroyed through chemical abuse.

Chemicals relieve pain. Chemicals kill bacteria and viruses that cause disease and death. Chemicals increase our food supply and improve our nutrition. Chemicals clothe us and provide us with cheaper and better housing. Chemicals fuel the machines that relieve us of back-breaking labor and that transport us rapidly to the far reaches of the world — and even to other worlds. Chemicals increase our wealth and improve our leisure time. Chemicals provide us with luxuries unavailable even to the mightiest kings of ages past.

Chemicals are toxic. Some are lethal. Some cause cancer. Chemicals are also beneficial. Some save lives. Many are useful. Often a particular chemical is both useful and dangerous. Chemicals may be and often are both good and bad.

Perhaps a better understanding of chemistry would enable us to control the uses of chemicals so that we could maximize their benefits and minimize the risk involved in their use.

Just what is chemistry anyway? Consider the usual definition: chemistry is a study of matter and the changes it undergoes. What is matter? It is anything that has mass and occupies space. Matter is the stuff of which all material things are made. We change matter to make it more useful. Most changes in matter are accompanied by changes in energy. Some matter we change to extract a part of its energy: for example, we burn gasoline to get energy to propel our automobiles.

More about matter and energy later Indeed, matter and energy are what this book — and all of chemistry — is about. But chemistry isn't just something you hear or read about. You practice chemistry every day.

You practice chemistry in the kitchen when you cook. You practice chemistry when you clean your house, wash your car or paint a fence. You practice chemistry in the bathroom when you bathe and apply cosmetics. You practice chemistry when you take medicine or treat an injury. Indeed, some remarkable chemistry occurs while you eat or breathe and even while you sleep. Your body is the most miraculous of all the chemical factories on Earth. It takes the food you eat and turns it into muscle and blood and skin and bones and brains and a myriad of other marvelous things. Your body takes oxygen from the air and combines it with part of the food you eat to provide you with energy for every activity you undertake.

What is chemistry? It is a science that touches your life every moment. It deals with matter from the tiniest parts of atoms to the minutest materials of the complex human body. It goes beyond the individual to affect society as a whole, and it shapes our civilization.

Science and Technology: the Roots of Knowledge

Chemistry is a *science*, but what is a science? Let's examine the roots of science. Our study of the material universe has two facets: the *technological, or factual*, and the *philosophical*, or *theoretical.*

Technology arose long before science, having its origins in antiquity. The ancients used fire to bring about chemical changes. For example, they cooked food, baked pottery, and smelted ores to produce metals such as copper. They made beer and wine by fermentation, and obtained dyes and drugs from plant materials. These things — and many others — were accomplished without an understanding of the scientific principles involved.

The Greek philosophers, about 2,500 years ago, were perhaps the first to formulate theories explaining the behavior of matter. They generally did not test their theories by experimentation, however. Nevertheless, their view of nature — attributed mainly to Aristotle — was consistent, internally, and it dominated natural philosophy for 2,000 years.

The experimental roots of chemistry are planted in alchemy, a mystical chemistry that flourished in Europe during the Middle Ages (about A. D. 500 to 1500). Modern chemists inherited from the alchemists an abiding interest in human health and the quality of life. Consider, for example, that alchemists not only searched for a philosophers stone that would turn cheaper metals into gold but also sought an elixir that would confer immortality on those exposed to it. Alchemists never achieved these goals, but they discovered many new chemical substances and perfected techniques such as distillation and extraction that are still used today. ①

Technology also developed rapidly during the Middle Ages in Europe, in spite of the generally nonproductive Aristotelian philosophy that prevailed. The beginnings of modern science were more recent, however, coming with the emergence of the experimental method. What we now call science grew out of natural philosophy, that is, out of philosophical speculation about nature. Science had its true beginnings in the seventeenth century, when the work of astronomers, physicists, and physiologists was characterized by a reliance on experimentation.

The Baconian Dream

It was a philosopher, Sir Francis Bacon (1561 - 1626), who first dreamed about how science could enrich human life with new inventions and increased prosperity. By the middle of the twentieth century, science and its application in technology appeared to have made the Baconian dream come true. Many dread diseases — smallpox, polio, plague — had been virtually eliminated. Fertilizers, pesticides, and scientific animal breeding and increased and enriched our food supply. Transportation was swift, communication nearly instantaneous. New power sources had been discovered. Nuclear energy seemed to promise an unlimited quantity of power for our every need. New materials — plastics, fibers, metals, ceramics — were developed to improve our clothing and shelter.

Much of twentieth-century technology has grown out of scientific discoveries, and technological developments are used by scientists as tools for even more discoveries. These developments in science and technology are, to a considerable extent, the base of what we mean by the "modern" world.

The Carsonian Nightmare

The Baconian dream has lost much of its lustre in recent decades. People have learned that the products of science are not an unmitigated good. Some people have predicted that science might bring not wealth and happiness but death and destruction.

Perhaps most noteworthy among these critics of modern technology was Rachel Carson, a biologist. Her poetic and polemic book *Silent Spring* was published in 1962. The book's main theme is that, through our use of chemicals to control insects, we are threatening the destruction of all life, including ourselves. People in the pesticide industry (and their allies) roundly denounced Carson as a "propagandist," while other scientists rallied to her support. By the late 1960s, though, we had experienced massive fish kills, the threatened extinction of several species of birds, and the disappearance of fish from rivers, lakes, and areas of the ocean that had long been productive. The majority of scientists had moved into Carson's camp popular support for Carson's views was overwhelming.

Carson was not the first prophet of doom. As early an 1798, Thomas Malthus, in his "Essay upon the Principles of Population," had predicted that an increase in population more rapid than the increase in food supply would lead to great famine. During the nineteenth century and for more than half of the twentieth, science and technology seemed to make a fool of Malthus. Food was abundant, at least in developed countries, and scientific discoveries and technological developments enabled us to increase food production as rapidly as the population grew.

The last few decades have brought changes, however. Population growth does threaten to outpace even the most optimistic projections of food production. Some scientists project a dismal future; others confidently predict that science and technology, properly applied, will save us from disaster.

Science: Testable, Explanatory, and Tentative

What *is* science if scientists dispute what is and what will be? Is science merely a guessing game in which one guess is as good as another? We cannot define science precisely. Rather, we must resort to *describing* in.

One essential characteristic of science is that its tenets are *testable*. Scientists make hypotheses (guesses) that can be tested by experiment. This is the main characteristic that distinguishes science from the arts and humanities. We can learn from individual experience, and we can learn about historical events, but the knowledge gained through science is different: it depends upon phenomena that can be verified through repeated testing. Even educated guesses are of little value to scientists unless they can devise experiments to test their guesses. You may be elated over a good grade in chemistry. But that experience is uniquely yours: others might not be at all pleased with the same grade. Scientific facts — such as the boiling point of water and the speed of light — remain the same, however, no matter who does the measuring. These facts are verified by repeated testing.

Scientists must make careful observations and accurate measurements. They record facts based upon their observations, but nothing really counts as science until those observations have been verified by others. If something is false, a scientist can't get away for long with saying that it is true.

Experimental observations are only a bare (but necessary) beginning to the intellectual processes of science. Science is not a straightforward and logical process for cranking out discoveries. It is a way of *explaining* nature, but the explanations must be tested against a sometimes less-than-agreeable reality. The most beautiful hypothesis can be destroyed by one ugly fact. Our ideas about the universe must correspond to our observations. Scientists test ideas by predicting what they should observe if the ideas are true. Their understanding of nature is refined constantly by the interplay of ideas and observations.

Science is a body of knowledge, but that knowledge is always *tentative*. Detailed explanations, called theories, are quite useful as a framework for the organization of scientific knowledge. Sometimes, though, a theory has to be modified or discarded in the light of new observations. The body of knowledge we call science is alive, ever changing, and rapidly growing.

Science is a way to cope with the environment. It involves the experimental establishment of cause and effect. For example, scientists have learned that water vapor condenses on small dust particles, called nuclei, to form raindrops. Therefore, scientists try to induce rainfall by seeding clouds with artificial nuclei. That such seeding is only somewhat successful in producing rain and that it raises innumerable economic, political, and ethical questions also serve to point out some of the limitations of science.

Scientists often use models to help explain complicated phenomena. The word *model* has a somewhat different meaning in science than in everyday life. A scientific model can be used to visualize the invisible.

For example, when a glass of water stands for a period of time, the water disappears. The process is called evaporation. Scientists explain this phenomenon by the kinetic-molecular theory. According to the kinetic-molecular model, the liquid (water, in this case) is made up of small, invisible particles called *molecules*. The molecules are in constant motion and in the bulk of the liquid, are held together by forces of attraction. Some molecules near the surface of the liquid gain sufficient energy (through collisions with other molecules) to break the attraction of their neighbors, escape from the liquid, and disperse among the widely spaced air molecules. Thus, the water in the glass disappears. For the scientist, understanding evaporation is much more satisfying than merely having a name for it.

What *is* science, then? We can only state some of its characteristics: it is *testable*, *explanatory*, and *tentative*. Contrary to a popular notion, scientific knowledge is not absolute. Science is cumulative, but the body of knowledge is growing, changing, and never final. New facts and new concepts are always being added. Old concepts, or even old "facts," are discarded when new tools, new questions, and new techniques reveal new data and generate new concepts. To understand what science is, we have to observe what the worldwide community of scientists has done over several years; we cannot just look over the shoulder of one scientist for a few days.

What Science Cannot Do

We sometimes hear scientists and nonscientists alike state that we could solve all our problems if we would only attack them using the scientific method. We have seen already that there is no single scientific method. But why can't the procedures of the scientist be applied to social, political, ethical, and economic problems? Why do scientists disagree when they try to predict the future?

The answer usually lies in the ability to control *variables*. If, for example, we wanted to study in the laboratory how the volume of gases varies with changes in pressure, we would hold constant such factors as temperature and the amount and kind of matter. If, on the other hand, an economist wished to determine the effect of increased interest rates on the rate of unemployment, he or she would find it difficult, if not impossible, to control such variables as the level of governmental expenditures, the rate of business expansion, the number of high-school and college graduates (and dropouts) entering the job market, and so on. Imagine, then, the difficulties encountered by a sociologist trying to predict the effect of a technological innovation, such as a communications satellite, upon whole populations.

We cannot control variables in social "experiments" (for example, public-school desegregation) as we can in laboratory experiments. [②] Therefore, a scientist would not be in any better position than any other citizen to decide whether desegregation is good or evil.

Figure 1. 1 is a rough graph showing how the number of variables increases as we go from an exact science such as physics to the complex social sciences. Notice that there is overlap between disciplines. The boundaries in the graph are crude approximations at best. A more accurate representation (but one much harder to draw) would show overlap between *all* the disciplines — even between physics and the social sciences.

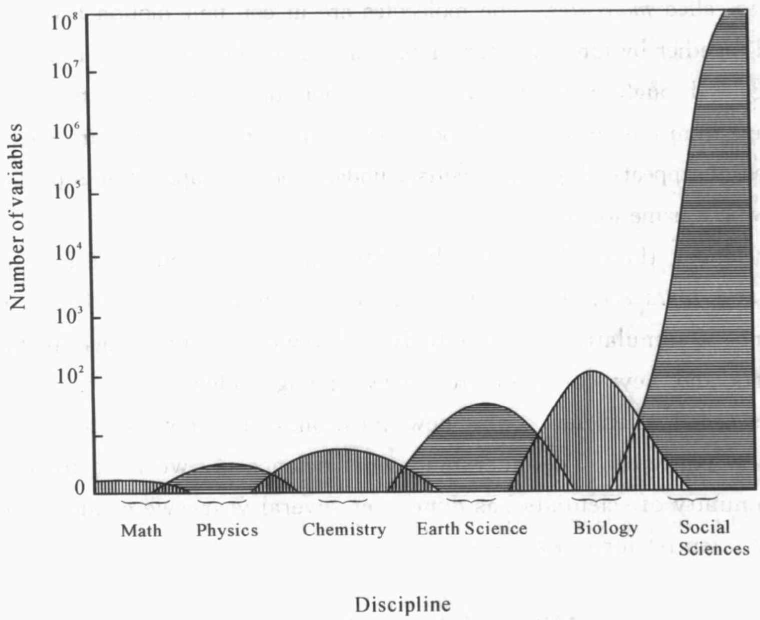

Figure 1. 1 A rough estimate of the number of variables involved in scientific disciplines.

Social scientists have become more productive by using some of the methods of science. We can make observations, formulate hypotheses, and conduct experiments even if most of the variables are not subject to control. Interpretation of the results however is much more difficult and much more subject to disagreement. Other nonscientists use some of the methods and language of scientists. Artists experiment with new techniques and new materials. Playwrights and novelists observe life as it is before trying to express its essence in their writings. It is easy to see some of the method of science as well as the influence of science, in nearly all of the endeavors of modern men and women. [③]

From *Chemistry International*, by Porter S. Genrge

Words and Expressions

toxic *adj*. 有毒的，中毒的

lethal *adj*. 致命的；*n*. 致死因子

beneficial *adj*. 有益的，受益的

stuff *n.* 原料，材料，素材资料；*vt.* 塞满，填满，填充
gasoline *n.* 汽油
propel *vt.* 推进，驱使
miraculous *adj.* 奇迹的，不可思议的
antiquity *n.* 古代，古老，古代的遗物
ore *n.* 矿石，含有金属的岩石
fermentation *n.* 发酵
alchemy *n.* 炼金术，魔力
flourish *vi.* 繁荣，茂盛，活跃，手舞足蹈，兴旺，处于旺盛时期；*vt.* 挥动，夸耀；*n.* 茂盛，兴旺，华饰，繁荣
inherit from *n.* 可遗传的特性
alchemist *n.* 炼金术士
elixir *n.* 炼金药，不老长寿药，万能药
prevail *vi.* 流行，盛行，获胜，成功
speculation *n.* 思索，做投机买卖
reliance *n.* 信任，信心，依靠，依靠的人或物
smallpox *n.* [医]天花
polio *n.* [医]脑灰质炎
plague *n.* 瘟疫，麻烦，苦恼，灾祸；*vt.* 折磨，使苦恼，使得灾祸
eliminate *vt.* 排除，消除；*v.* 除去
ceramic *adj.* 陶器的；*n.* 陶瓷制品
lussatite *n.* 正绿方，石英
unmitigated *adj.* 未缓和的
denounce *vt.* 公开指责，公然抨击，谴责
propagandist *n.* 宣传员；*adj.* 宣传的
rally *v.* 帮助某人
famine *n.* 饥荒
desegregation *n.* 废止种族歧视
kinetic-molecular *n.* 分子动力学
molecule *n.* [化]分子，些微
cumulative *adj.* 累积的

Notes

1. Alchemists never achieved these goals, but they discovered many new chemical substances and perfected techniques such as distillation and extraction that are still used today.
   参考译文 虽然炼丹术士们未曾达到目标，获得成功，但他们发现了许多新的化学物质，也发现了许多直到今天仍在使用的非常好的工艺，诸如蒸馏和提纯工艺。
2. We cannot control variables in social "experiments" (for example, public-school

desegregation) as we can in laboratory experiments.

参考译文 我们不能控制社会“实践”中的多种情况(例如公立学校的道德败坏现象),但是我们可以控制实验室里的各项实验。

3. It is easy to see some of the methods of science, as well as the influence of science, in nearly all of the endeavors of modern men and women.

参考译文 人们很容易了解到一些科学方法,科学影响,以及现代人所取得的成绩。

Exercises

1. Questions for consideration.

(1) Define chemistry.

(2) What is matter?

(3) Which of the following are examples of matter?

A. iron	B. air
C. love	D. the human body
E. gasoline	F. an idea

(4) List five chemical activities that you have engaged in today.

(5) State three distinguishing characteristics of science. Which characteristic best serves to distinguish science from other disciplines?

(6) Why were the ancient Greek philosophers, such as Aristotle, not successful as scientists?

(7) What is alchemy?

(8) What is natural philosophy?

(9) What did Francis Bacon envision for us as a result of science?

(10) What was the main theme of Rachel Carson's *Silent Spring*?

(11) Why have Thomas Malthus's predictions not been fulfilled in developed countries?

(12) What is a hypothesis? How are hypotheses tested?

(13) What is a theory?

(14) Why can't scientific methods always be used to solve social, political, ethical, and economic problems?

(15) How does technology differ from science?

(16) What is risk-benefit analysis?

(17) What sort of judgments go into the evaluation of benefits?

(18) What sort of judgments go into the evaluation of risks?

(19) What is a desirability quotient?

(20) Why is it often difficult to estimate desirability quotients?

(21) Synthetic food colors make food more attractive and increase sales. Some such dyes are suspected carcinogens (cancer inducers). Who derives most of the benefits from the use of food colors? Who assumes most of the risk associated with use of

these dyes?

(22) Penicillin kills bacteria, thus saving the lives of thousands of people who otherwise might die of infectious diseases. Penicillin causes allergic reactions in some people; in extreme cases it can cause death if the resulting condition is not treated. Do a risk-benefit analysis of the use of penicillin for society as a whole.

2. Explain the words and expressions as they are used in the text.

(1) relieve pain
(2) kill bacteria and viruses
(3) cause disease and death
(4) increase our food supply
(5) improve our nutrition
(6) provide us with cheaper and better housing
(7) improve our leisure time
(8) maximize their benefits
(9) minimize the risk involved in their use
(10) bathe and apply cosmetics
(11) attributed mainly to Aristotle
(12) Baconian dream come true

3. Choose ONE answer that best completes the sentence.

(1) The way other people behave towards us influences how we ________ ourselves.
A. conceive of B. consist of C. confront with D. conform to

(2) Based on the ________ that every business is now free to formulate its own strategy in light of the changing market, I would predict a marked improvement in the efficiency of China's economy.
A. guidance B. instruction C. premise D. eminence

(3) With the economy of the country going strong, the ________ mood is one of optimism.
A. presiding B. circulating C. floating D. prevailing

(4) She is quite capable, but the problem is that she is not ________.
A. consistent B. insistent C. beneficent D. resistant

(5) I reject absolutely the ________ that privatization is now inevitable in our industry.
A. perception B. notion C. impression D. concept

(6) I admire her courage, compassion and ________ to the cause of humanity, justice and peace.
A. dedication B. determination C. opposition D. realism

(7) The remedy proposed by Mr. Maxwell is simple, easy and ________.
A. appreciable B. amendable C. collapsible D. feasible

(8) We shall offer you advice, but you are under no ________ to follow it.
A. pursuit B. obligation C. command D. instruction

(9) These technological advances in communication have ________ the way people do business.
A. revolted B. represented C. adopted D. transformed

(10) The accused was ________ to have been the leader of a plot to overthrow the government.
A. reconciled B. blended C. alleged D. referred

4. Translate the following into Chinese.

The United States Congress has passed laws intended to drastically reduce water pollution. It can't be eliminated entirely, however. To use water is to pollute it. You can do your share by conserving water and by minimizing your use of products that require vast amounts of water for production. And you, the citizen, must be prepared to foot the bill for waste treatment. As our population grows, it will cost plenty just to maintain the present (and often inadequate) water quality. To clean our water up, and then keep it clean will cost even more. Remember that the cost of unclean water is even higher — discomfort. loss of recreation, illness, even death.

Text B
Welcome to Our Chemical World!

Chemistry is fun. Through this book, I would like to share with you some of the excitement of chemistry and some of the joy in learning about it. I hope to convince you that chemistry does not need to be excluded from your learning experiences. Learning chemistry will enrich your life — now and long after this course is over — through a better understanding of the natural world, the technological questions now confronting us, and the choices we must face as citizens within a scientific and technological society.

Chemistry Directly Affects Our Lives

How does the human body work? How does aspirin cure our headaches? Do steroids enhance athletic ability? Is table salt poisonous? Can scientists cure genetic diseases? Why do most weightloss diets seem to work in the short run but fail in the long run? Does tasting "cleanse" the body? Why do our moods swing from happy to sad? Can a chemical test on urine predict possible suicide attempts? How does penicillin kill bacteria without harming our healthy body cells? Chemists have found answers to questions like these and continue to seek the knowledge that will unlock still other secrets of our universe. As these mysteries are resolved, the direction of our lives often changes — sometimes dramatically.

We live in a chemical world — a world of drugs, biocides, food additives, fertilizers, detergents, cosmetics, and plastics. We live in a world with toxic wastes, polluted air and water, and dwindling petroleum reserves. Knowledge of chemistry will help you to better understand the benefits and hazards of this world and enable you to make intelligent decisions in the future.