化学和化工

CHEMISTRY AND CHEMICAL ENGINEERING

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大学英语专业阅读精选系列教材

FOCUS READING SERIES

上海外语教育出版社

Focus Reading Series

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Chemistry and Chemical Engineering

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前　言

大学英语教学大纲规定大学本科(包括理工科和文理科)的英语教学分为基础阶段和专业阅读阶段。专业阅读阶段的任务是：指导学生阅读有关专业的英语书刊和文选，使其进一步提高阅读英语科技资料的能力，并能以英语为工具，获取专业所需要的信息。从实践中我们感到基础阶段学生所接触的语言材料在文体和词汇方面与专业阅读阶段有着较大的差别，而且一般说来学生第五学期刚开始接触专业基础课，他们还缺乏专业知识，直接进行专业阅读尚有一定困难。另外学生在基础阶段学习中所掌握的读、听、写、说四种技能在专业阅读阶段还需得到进一步巩固和提高。

Focus Reading Series 是为解决大学英语从基础阶段过渡到专业阅读阶段的衔接问题而编写的一套系列教材。本系列教材按专业大类分成六个分册：*Mechanical Engineering*, *Electrical and Electronic Engineering*, *Chemistry and Chemical Engineering*, *Computer Engineering*, *Materials Science* 和 *Power Engineering*。教师可按学生所学专业选用对口的分册。在编写过程中编者力求打破同类教材的老框框，使学生通过大量专业基础方面有关材料的阅读不仅能学到英语，而且还能学到一定的专业基础知识，熟悉和了解专业题材文章的特色并掌握一定量的专业词汇，从而为他们顺利进入专业阅读阶段学习打下良好的基础。本系列教材练习形式力求新颖多样，学生可以通过各种练习在语言运用上得到锻炼，使他们在大学英语基础阶段所掌握的读、听、写、说技能得到进一步的巩固和提高，并进而提高交际能力。本系列教材在编写过程中还着重强调了专业文章的特色及与之有关的功能意念和语言技能训练。

全套教材由机械工业部大学英语协作组责成华东工业大学、湖南大学、吉林工业大学和沈阳工业大学，并特邀上海工业大学合作编写。华东工业大学程月芳副教授担任总主编，卢思源教授担任总主审。教材编写的全过程得到了机械工业部教育司的领导和上海外语教育出版社编辑同志的大力支持和帮助。

编　者

1992年3月

本书使用说明

本书为 *Chemisty and Chemical Engineering* 分册，供化学化工、医疗卫生和环境保护等有关专业的大学本科学生用作专业阅读阶段之前的过渡性教材。一般在第五学期使用，约需 34 学时。

本书由15个单元组成，各单元均按专业内容划分，既考虑到专业知识的连贯性，又照顾到英语学习的循序渐进。每个单元由 Reading and Comprehension, Reading and Practice 和 Reading and Translation 三个部分组成。Reading and Comprehension 部分有一篇阅读文章，其后是检查学生对文章理解的练习，旨在训练提高学生对科技体裁文章的阅读技能。文章后面附有生词表，将大学英语 1～4 级中未出现过的词汇或虽已出现过但在专业方面有特殊词义的词汇列入表内，生词后注有汉语释义或英语解释并注有国际音标。生词表中出现的词汇在文中用斜体标出，以便于学生预习时查找。Reading and Practice 部分也有一篇文章，其内容基本与 Reading and Comprehension 部分一致，并附有生词表，但文字较浅近易懂。要求学生在理解文章内容的基础上做好练习。该部分练习由 Use of English 和 Guided Writing 两个部分组成，是为训练学生运用语言的能力而设计的。Use of English 可以是 Use of Language 也可以是 Information Transfer，旨在为学生提供运用语言的实践机会。教师在引导学生做这一练习时应注意语言的流畅和准确性并重，并要尽力鼓励学生将已有的语言知识较流利地运用到实践中去。Guided Writing 旨在指导并训练学生的书面表达能力，练习的设计从连句成段开始，最后到指导学生写出简单的实验报告以及某一零部件或图表的定义、分类和描述。Reading and Translation部分有单句、段落或短文，要求学生进行英译汉练习。在做这部分练习时教师可作一些翻译指导，并要求学生不仅注意单句的译法，还要注意前后文意思对译文的影响。该部分选材以有利于指导翻译教学为主，但在内容上力求不脱离本分册的专业范围。

本书阅读总量约为 70,000 词，每一阅读文章(不包括翻译部分)篇幅一般为 1,200 词左右。总生词量为 500 个左右，并按字母顺序列于书后。在讲课中教师应着重阅读理解、翻译和语言实践的指导及交际能力的培养。学生宜在课前做好预习工作。本书的阅读和练习量较大，教师可根据学生的实际情况安排教学内容，对教材进行有选择的使用。

本书由湖南大学伍爱成副教授担任主编。俞汝勤教授和林汝昌教授担任本书编委会顾问。王柯敏教授和张正举教授审校了全书。

在全书的编写过程中，成晓阳、王星尧、王益民、方瑞荪、陆魁秋、章晋新、庞建元、陈意

舍、陈声宗、林辉祥、徐伟建、黄玉琪等湖南大学教务处、外语系、化工系的负责人和教授们对本书的编写给予大力支持，谨向他们表示由衷的谢意。

由于编者水平有限，教材中不妥之处望广大读者提出宝贵意见。

编　者

1992年3月

CONTENTS

Unit One

I. Reading and Comprehension

CHEMISTRY AS A NATURAL SCIENCE

If we view a science as a body of *systematized* knowledge, then chemistry is usually called a natural science because it is concerned with knowledge of the natural world. At times we may wonder why there is no complete system into which all of chemistry fits perfectly. Gaps in the present system, however, show that chemistry is still a growing subject and that we haven't yet discovered all of its facts, laws, and theories. In other words, chemistry as a science is very much with us today, and its future holds the bright promise of much more to come.

Man's knowledge about himself and nature has grown into a variety of sciences. The growth of the separate sciences has been more developmental than intentional. The separation of the natural sciences into physical and biological sciences, and physical sciences into physics and chemistry, happily breaks up a larger body of knowledge into more *manageable* parts. At the same time we should remember that the concepts, techniques, and applications of the various sciences are *interdependent* and not *exclusively* a part of one science or another. In this respect, chemistry is a key science among the natural sciences because everyone, regardless of the area of natural science he wishes to *pursue*, needs at least an introduction to the principles and simpler applications of chemistry as a foundation for his *specialty*.

Chemistry deals with the properties of matter, changes in matter, the laws and principles describing these changes, and the concepts and theories that interpret them. Traditionally, chemistry has *evolved* into four *provinces*: organic, inorganic, physical, and analytical chemistry.

The traditional area of *organic* chemistry is concerned primarily with compounds of carbon, and *inorganic* chemistry deals with noncarbon compounds. Physical chemistry, a productive *marriage* of physics with chemistry, includes the problems of chemical reactions, the energy associated with them, the structure of molecules, and the nature of various states of matter. Analytical chemistry emphasizes the development of precise methods of analyzing the chemical *composition* of substances. Analysis may be qualitative (what is in it?) or quantitative (how much of each component is it?). In recent years, the development of a wide variety of electronic tools has greatly speeded up the chemist's work and has made possible more accurate measurements as well as measurements of new factors.

Chemistry has grown up as a *discipline* during the past 200 years. It is younger than astronomy but older than psychology. Today, when a student begins to study a discipline, such as chemistry, it may appear to him that the subject is completely "worked out", that all the answers have been found, and that there is nothing new to discover. Because there is a huge body of knowledge——facts, theories, and applications, already worked out——this impression is understandable. However, more new chemistry than ever is now being discovered in these three areas. There are over two million *entries* in the current *index* to the chemical literature each year, at least 300,000 new compounds are made annually.

New Words

systematize /'sistimətaiz/ ***vt.*** 使系统化,使成体系
manageable /'mænidʒəbl/ ***a.*** 易处理的;易驾驶的
interdependent /ˌintə(:)di'pendənt/ ***a.*** 互相依赖的,互相依存的
exclusively /iks'klu:sivli/ ***ad.*** 仅仅,只;独有地
pursue /pə'sju:/ ***vt.*** 追求;从事
specialty /'speʃəlti/ ***n.*** 专业
evolve /i'vɔlv/ ***vi.*** 演化;发展;逐渐形成
province /'prɔvins/ ***n.*** 领域
organic /ɔ:'gænik/ ***a.*** 有机的,有机物的
inorganic /ˌinɔ:'gænik/ ***a.*** 无机的,无生物的
marriage /'mæridʒ/ ***n*** 结合,配合
composition /ˌkɔmpə'ziʃən/ ***n.*** 构成;成分
discipline /'disiplin/ ***n.*** 学科
entry /'entri/ ***n.*** 登记;条目
index /'indeks/ ***n.*** 索引;指数

Reading Comprehension

Choose the best answer for each of the following.

1. Gaps in the present system of chemistry show that it is still ______.
   a. premature
   b. defective
   c. backward
   d. developing
2. In the history of science development, ______ has/have been divided into physics and chemistry after the separation of the natural sciences into physical and biological sciences.

a . physical chemistry
b . physical sciences
c . chemical sciences
d . chemical physics

3. Whatever area of the natural science he wishes to pursue, a person needs at least an introduction to the principles and simpler applications of chemistry as a foundation for his specialty, so chemistry is a(n)_______science.

a . complex
b . advance
c . essential
d . general

4. Chemistry is a science involving the properties of matter, and_______ changes of matter.

a . integral
b . external
c . partial
d . internal

5. The traditional area of inorganic chemistry is concerned primarily with___ compounds.

a . carbon
b . noncarbon
c . organic
d . inorganic

6. Analytical chemistry may deal with chemical composition of substances with a_______analysis.

a . precise
b . quantitative
c . qualitative
d . qualitative or quantitative

7. During the past 200 years, chemistry has developed as a discipline which is older than_______.

a . psychology but younger than astronomy
b . astronomy but younger than psychology
c . both psychology and astronomy
d . neither psychology nor astronomy

8. No less than 300,000_______are made each year.

a . compounds
b . substances
c . new compounds

d. new substances

II. Reading and Practice

THE HISTORICAL DEVELOPMENT OF INORGANIC REACTIONS AND THEORY

Inorganic chemical reactions are among the oldest characteristic evidences of human culture. After the discovery and mastery of fire and cooking, the next step in the earliest technology was certainly the firing of mud pots to harden them by *dehydrating* the *silicate* clay particles. A more obviously chemical process the smelting of copper ore to yield copper metal, may have occurred as early as 6000 B. C. in what is now Turkey.

The making of glass is nearly as old as copper smelting, although the earliest examples (approximately 4000 B. C.) are not separate glass objects, but rather glazed *soapstone beads* found in Egypt. Solid glass objects, mostly in the form of imitation *gemstones*, appear later, perhaps 2500—3000 B. C. It might be noted that these imitations require coloring, which indicates a more *sophisticated* process than simply melting sand, *lime*, and *soda ash*.

Another important ancient process is the preparation and use of cement. Modern *Portland cement* is made by partially fusing limestone and clay to a composition approximating *calcium* silicate. The Egyptians used a primitive form of cement in constructing the *pyramids* around 3000 B. C., but the Romans used their own form on a very large scale throughout the empire. Roman cement was made from lime and a *volcanic* silicate ash called *pozzolana*. Because the hardening process for pozzolan cement (or any other kind) involves the progressive *hydration* and *polymerization* of the finely divided silicate crystals, Roman cement would harden under water, a property useful for constructing *aqueducts* and harbor structures.

Both the Chinese (in about the eighth century A. D.) and the *Bavarians* (in the late thirteenth century) discovered the first primitive explosive: black powder, a mixture of powdered sulfur, powdered *charcoal*, and finely divided *potassium nitrate*. The first primitive cannon was built in about 1320, but its use was limited (perhaps fortunately) by the fact that KNO_3 is so readily water soluble that no mineral deposits of it occur in Europe. Black powder remained the standard military explosive until the late nineteenth century, but it was manufactured in widely varying qualities.

The theoretical basis of inorganic chemistry was much slower to develop than the practical uses just mentioned. Some genuine achievements were made (at least in the laboratory sense) by the Arabic and European *alchemists* of the eighth to seventeenth centuries A. D.: they prepared *sulfuric acid*, *nitric acid*, and *hydrochloric acid*, for example, and discovered the elemants *zinc*, *arsenic*, *bismuth*, and *phosphorus* (they had an entirely different concept of the word "element", of course). Quantitative experimental chemistry oriented toward developing a logical structure for understanding chemistry did not begin until the publication of *Lavoisier*'s *Traité élémentaire de chimie* in 1789. The atomic theory itself did not emerge until *Dalton*'s atomic model was described in 1807 by *Thomas Thomson* in a textbook entitled *System of Chemistry*.

In the nineteenth century, a great deal of *systematization* was brought to all of chemistry, including most inorganic areas. Perhaps the most important systematizing principle of the nineteenth century, however, was the periodic table, introduced by *Mendeleyev* in 1869. It was quickly adopted as the organizing principle for the textbook presentation of descriptive inorganic chemistry, and has remained in that role to the present day.

The twentieth century has, of course, seen enormous advances in the scientific basis of inorganic chemistry. Our current understanding of atomic and molecular structure, of ***lattice*** and ***solvent*** behavior, and of the driving forces and mechanisms of inorganic reactions was essentially reached in this century. For this reason, the discussion will be organized around these concepts, rather than around the traditional periodic-table order. However, it is important to remember the long historic development and cultural significance of inorganic chemistry even as we examine it in its present *maturity* of *perspective* and *vigor* of discovery.

New Words

dehydrate /diː'haidreit/ ***vt.***	使脱去水分
silicate /'silikit/ ***n.***	硅酸盐
soapstone /'səupstəum/ ***n.***	皂石，滑石
bead /biːd/ ***n.***	有孔小珠；玻璃球
gemstone /'dʒemstəun/ ***n.***	宝石，美玉
sophisticated /sə'fistikeitid/ ***a.***	复杂的，高级的，尖端的
lime /laim/ ***n.***	石灰
soda ash /'səudə æʃ/	纯碱，无水碳酸钠
Portland cement /'pɔːtlənd si'ment/	波特兰水泥，普通水泥，硅酸盐水泥
calcium /'kælsiəm/ ***n.***	钙
pyramid /'pirəmid/ ***n.***	金字塔
volcanic /vɔl'kænik/ ***a.***	火山的
pozzolana /ˌpɔtsə'lɑːnə/ ***n.***	白榴火山灰；一种混合水泥(波特兰水泥与

	火山灰的混合物)
hydration /hai'dreiʃən/ *n.*	水合(作用)
poiymerization /ˌpɔliməraiˈzeiʃən/ *n.*	聚合(作用)
aqueduct /'ækwidʌkt/ *n.*	沟渠,导水管,渠道
Bavarian /bə'vɛəriən/ *n.*	巴伐利亚人
charcoal /'tʃɑ:kəul/ *n.*	炭,木炭
potassium /pə'tæsjəm/ *n.*	钾
nitrate /'naitreit/ *n.*	硝酸根;硝酸盐
KNO_3=potassium nitrate	硝酸钾
alchemist /'ælkimist/ *n.*	炼金术,炼丹术士
sulfuric acid /sʌl'fjuərik 'æsid/ *n.*	硫酸
nitric acid /'naitrik 'æsid/ *n.*	硝酸
hydrochloric acid /ˌhaidrəu'klɔrik 'æsid/ *n.*	盐酸,氢氯酸
zinc /ziŋk/ *n.*	锌
arsenic /'ɑ:snik/ *n.*	砷
bismuth /'bizməθ/ *n.*	铋
phosphorus /'fɔsfərəs/ *n.*	磷
Lavoisier /Lɑ:vwɑ:'zjei/	拉瓦锡(法国化学家,现代化学奠基人,《一些化学元素》的作者)
Dalton /'dɔ:ltən/	道尔顿(英国化学家,物理学家)
Thomas Thomson /'tɔməs 'tɔmsn/	托马斯·汤姆森(英国科学家,《化学体系》的作者)
systematization /ˌsistimətai'zeiʃən/ *n.*	系统化;体系
Mendeleyev /ˌmendə'leief/	门捷列夫(俄国化学家)
lattice /'lætis/ *n.*	格子,晶格
solvent /'sɔlvənt/ *n.*	溶剂,溶媒
maturtiy /mə'tjuəriti/ *n.*	成熟
perspective /pə(:)'spektiv/ *a.*	观点,看法,洞察力
vigor /'vigə/ *n.*	活力,精力

1. Use of Language

Exercise A

Complete the following paragraph selected from the reading passage with right words.

__(1)__ the Chinese (in about the eighth century A.D.) and the Bavarians (in the late thirteenth century) discovered the first __(2)__ explosive: black powder, a __(3)__ of powdered sulfur, powdered charcoal, and finely divided potassium nitrate. The first primitive cannon was built in (4) 1320, but its use was limited (perhaps fortunately) by the fact that KNO_3 is so (5) water soluble that no mineral deposits of it (6) in Europe. Black powder remained the standard military explosive until the late nineteenth century, but it was manufactured in widely varying (7) . To remedy this, the French appointed a Gunpowder Commission in 1775 (8) by Lavoisier, who not only brought French powder to the highest standard in (9) , but also trained a young associate, Eleuthère Irénée du Pont de Nemours, (10) turned black powder into the United States' first chemical industry.

Exercise B

Fill in the following blanks with proper prepositions.

1) _______ the discovery and mastery of fire and cooking, the next step _______ the earliest technology was certainly the firing of mud pots to harden them by dehydrating the silicate clay particles.
2) Solid glass objects, mostly in the form _______ imitation gemstones, appear later, perhaps 2500—3000 B.C.
3) The Egyptians used a primitive form of cement in constructing the pyramids _______ 3000 B.C., but the Romans used their own form _______ a very large scale throughout the empire.
4) Because the hardening process _______ pozzolan cement involves the progressive hydration and polymerization of the finely divided silicate crystals, Roman cement would harden _______ water, a property useful for constructing acqueducts and harbor structures.
5) Roman cement was made _______ lime and a volcanic silicate ash called pozzolana.
6) Quantitative experimental chemistry oriented _______ developing a logical struoture _______ understanding chemistry did not begin until the publication of Lavoisier's Traite elementaire de chimie in 1789.
7) It was quickly adopted _______ the organizing principle for the textbook presentation of descriptive inorganic chemistry.
8) For this reason, the discussion will be organized _______ these concepts, rather than _______ the traditional periodic-table order.

Exercise C

Fill in the blanks with the words or expressions given below. Change the forms where necessary.

deal with	a great deal of	see of course	for example
rather than	the publication of	on very large scale	

1) The traditional area of organic chemistry is concerned primarily with compounds of carbon, and inorganic chemistry_______ noncarbon compounds.
2) As there are over two million entries in the current index to the chemical literature annually, the twentieth century has_______ enormous advances in chemistry.
3) Each year new compounds are made_______, at least 300,000.
4) Chemistry is concerned with knowledge of the natural world, _______ it is called a natural science.
5) Some genuine achievements were made by the Arabic and European alchemists of the eighth to seventeenth centuries A.D.: they discovered zinc, arsenic, bismuth, and phosphorus, _______.
6) In the nineteenth century, _______ systematization was brought to all of chemistry, including most inorganic area.
7) Chemistry is an intellectual discipline that its future holds the bright promise of much more to come, _______ that there is nothing new to discover.
8) The atomic theory itself did not emerge until_______ Thomas Thomson's System of Chemistry in 1807.

2. Guided Writing

Definition (1)

Definitions occur frequently in scientific English because it is so often necessary to define ideas, concepts, laws, natures, certain operation substances, objects or machines. There are two types of definitions: simple and expanded. A simple definition is often called a "definition formula". In terms of language this means that the thing to be defined is usually a single noun unaccompanied by any other nouns or adjectives modifying it.

Example:

An alloy is a metallic substance which is composed of two or more elements.

Stage 1

In the following sentences the ten definitions have been mixed up. Write them out correctly.

1) A thermometer	is water	which is made up of one or more atoms.
2) A pyrometer	is a substance	which measures temperature.
3) A molecule	is an instrument	for measuring high temperature.
4) Steam	is an instrument	that has become a gas.
5) A biologist	is a machine	made by mixing cement, sand, small stones and water.