

大学英语应用提高阶段专业英语系列教材
新世纪理工科英语教程

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Chemistry and Chemical Engineering
化学和化工

教师用书

主编：佟 方

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化学和化工

教师用书

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前言

大学英语教学大纲(修订本)规定大学英语教学分为基础阶段(一至二年级)和应用提高阶段(三至四年级)。应用提高阶段的教学包括专业英语(Subject-Based English, 简称SBE)和高级英语(Advanced English, 简称AE)两部分。大纲明确指出:“大学英语教学的目的是培养学生具有较强的阅读能力和一定的听、说、写、译能力使他们能用英语交流信息。……以适应社会发展和经济建设的需要。”新世纪对人才在外语方面提出了更高的要求。抓好大学英语应用提高阶段的教学已势在必行。编写本教材的目的是帮助理工科学生在应用提高阶段进一步发展、巩固和提高基础阶段已掌握的读、听、写、说、译五种技能,并使部分有一定口语基础的学生在听说能力方面也能有较大的提高,以适应21世纪对高级人才的需求。

本教材主要适用于已完成基础阶段学习的高等学校理工科本科生,为应用提高阶段的必修课和选修课教材。也可用作研究生教学或工程技术人员的外语培训教材。

全套教材由专业教师和英语教师合作编写而成。它以英国语言学家 H. G. Widdowson 的交际法理论为依据,着重解决语言运用能力的培养问题,使学生将基础阶段已掌握的英语语言知识和技能在自己的专业领域中得到进一步实践和应用,从而达到能以英语为工具获取和交流信息的教学目的。

全套教材由以下十个分册组成:

1. *Mechanical Engineering* (机械工程), 吉林工业大学编写。
2. *Electrical and Electronic Engineering* (电气与电子工程), 燕山大学编写。
3. *Computer Engineering* (计算机工程), 南开大学编写。
4. *Materials Science and Engineering* (材料科学与工程), 天津大学编写。
5. *Civil Engineering and Architecture* (土木工程与建筑), 大连理工大学编写。
6. *Chemistry and Chemical Engineering* (化学和化工), 华东理工大学编写。
7. *Power Engineering* (动力工程), 上海理工大学编写。
8. *Business Administration* (工商管理), 湖南大学编写。
9. *Engineering Talk* (工程师会话), 上海理工大学编写。
10. *Practical Writing and Translation Guidance* (写作与翻译指导), 燕山大学和华东理工大学编写。

其中1—8分册为专业英语(SBE)必修课教材,旨在使学生通过有关专业题材文章的阅读和训练,不仅能提高英语水平,而且还能学到一定的专业知识,了解一些该专业的信息动态,熟悉和了解专业题材文章的语言特点,掌握一定量的专业词汇。在教材的练习编写上力

求做到新颖多样且实用,并在信息转换和语言表达方式转换能力的训练上下功夫。学生可以通过各种练习在读、听、写、说、译诸方面得到锻炼。

第9分册《工程师会话》作应用提高阶段高级英语(AE)选修课教材,旨在使一些学有余力且在会话方面较有培养前途的学生在口头交际能力上得到训练和提高。选材力求实用,尽量提供一些工程技术人员在实际工作中会遇到的题材,以使他们参加工作后能较快地适应英语口头交际的需要。

第10分册《写作与翻译指导》为教学辅导材料,供教师和学生在学习和教学中作参考。

全套理工科教程由吉林工业大学、燕山大学、南开大学、天津大学、大连理工大学、华东理工大学、上海理工大学和湖南大学合作编写。上海理工大学程月芳教授担任总主编。英国利物浦大学英语语言文学系专家 Mr. Geoff Thompson 担任顾问并协助审校。Mr. Geoff Thompson 和上海交通大学杨惠中教授对教材编写提出了许多宝贵意见。在教材编写的全过程中上海外语教育出版社社长庄智象教授和编辑室陈鑫源主任给予了大力的支持和帮助。特此表示衷心的感谢。

本书为 *Chemistry and Chemical Engineering* 分册教师用书,由华东理工大学佟方主编,庄思永、吴达俊、黄淑芳、华静参加编写。本书教学要求和教学设想由程月芳教授撰写,参考译文由庄思永教授提供,练习答案由佟方、黄淑芳、华静、吴达俊教授提供。

由于编者水平有限,教材中不妥之处望广大使用者提出宝贵意见。

新世纪理工科英语教程编委暨
编者
2001年12月

使用说明

本书由教学要求、教学设想、练习答案和参考译文三部分组成。

I. 教学要求

该部分为教师在教学中的注意点。

II. 教学设想

以一个单元为样板,列出了教学计划和每部分的具体教法,供教师安排教学时参考。教师应根据学生的具体情况安排教学。本教学模式仅供参考。

III. 练习答案和参考译文

学生用书中出现的每篇文章均有相应的参考译文。学生用书中所有练习都有参考答案。翻译练习答案可参考译文。

Reading and Practice 部分的 Exercise D 除参考答案外,某些单元还增加了“教学参考”,供教师在讲解功能意念和学习技能时作参考。

学生用书中的实用文写作练习答案和补充范例及翻译练习中的翻译法请参阅第十分册《写作和翻译指导》。

本书提供的所有内容仅供教师在具体教学实践中参考。

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教学要求

Chemistry and Chemical Engineering 是为化学和化工及相关专业学生编写的专业英语(SBE)教材。一般用于第 5、6 学期,约需 68 学时。

本教材由专业教师和英语教师合作编写而成,力求打破同类教材的老框框,使学生通过有关专业内容的读、听、写、说、译综合技能训练,熟悉了解科技文章的特点及与之有关的功能意念和学习技能,从而提高专业领域的英语交际能力,为顺利进入专业英语第 7 学期(专业文献资料阅读)打下良好的基础。

本书编写中力图将英国语言学家 H. G. Widdowson 的交际法理论与中国的传统教学实际相结合,博采众长。练习设计以“融学习于使用之中”为原则。选材讲究科学性、可读性、知识性、趣味性和实用性。在课堂教学中应以学生为中心,通过将英语学习与专业知识相结合的训练培养交际能力,充分调动学生的学习积极性和参与愿望,提高读、听、写、说、译五种技能在专业领域中的综合运用能力,达到以英语为工具获取和交流信息的教学目的。

本教材按专业内容分成 20 个单元。在编排上既考虑到专业知识的连贯性又照顾到英语语言循序渐进的原则。每一单元由 Reading and Comprehension, Reading and Practice, Reading and Translation 三部分组成。学生用书中的 Practical Writing 集中编于书后以便自成体系。

教师在进行 Reading and Comprehension 训练时应在通篇理解文章内容上多下功夫,帮助学生抓住要点和中心思想。并可要求学生口头叙述文章内容、中心思想、进行口头简答训练或要求他们用书面形式写出摘要等。提问过程中应注意扩大学生在该领域的知识面。

Reading and Practice 是本教材将英语与专业相结合的重点,旨在进行与专业内容相关的功能意念、语言技能和学习技能训练。Exercise A 和 Exercise B 着重语言能力训练。教师应注意语言的相关性,也可进行用法上的比较或错误分析,尽量避免单纯对答案现象。Exercise C 为听力练习。听完录音后教师不能光满足于完成教材中的练习,要把注意力放在综合能力的训练上。可让学生复述大意或说出要点,或回答问题,也可对所听到的内容开展讨论或对某一问题进行辩论,以提高学生的听说能力。还可让学生用书面形式写出内容提要等。Exercise D 与专业文体特色关系最密切。做这一练习时要让学生将英语知识用于专业知识的获取和交流上。教师应注重科技文章中常见的语言现象和功能意念的训练。信息转换(Information Transfer)和语言表达方式转换(Rhetorical Transformation)可以用书面方式也可用口头方式进行。教师应帮助学生掌握一些专业文章中的定义、分类、描述等典型表达方式,以便他们举一反三。“练习答案和参考译文”中的教学参考可供教师在讲解

这部分内容时作参考。

指导学生做 Reading and Translation 时教师不仅应注意英汉两种语言在表达方式上的差别和前后文内容对译文的影响,还应帮助学生掌握科技文章的特点和翻译技巧。有关英译汉和汉译英的翻译技巧有必要时教师可参考第 10 分册《写作与翻译指导》给学生开一些讲座。

教师在讲解 Practical Writing 时应重在实践,要让学生勤写多练。让他们掌握一些典型应用文的模式,以便进行模仿写作。教师还可根据学生的具体情况,参考《写作和翻译指导》给学生补充一些学生用书中没有的模式。

本教材的阅读量为 100,000 词,总生词量为 1,000。使用对象是完成大学英语基础阶段学习的高校理工科本科生或研究生。他们经过基础阶段学习已掌握 4,200 左右英语单词和 1,600 个词组,并在读、听、写、说、译等方面受过一定的训练,具备一定的语言交际能力。教师在讲课中既不要过多地进行语言方面的讲解分析,也不要过多地传授专业知识,要把重点放在指导学生如何将已有的英语语言知识运用到专业知识的获取和交流中去,在培养学生的语言交际能力上下功夫。教师在教学中应采用各种生动活泼的教学手段和先进的教学设备,努力提高教学效果。在教学过程中教师应不断指导学生做好课前预习工作,使学生养成独立思考和自学的好习惯。

使用本教材所需理想教学时数为 64~68 学时,建议每个单元用 2 学时,多余课时可安排写作和翻译法讲座等。

为适合不同学生的需求,本书阅读量和练习量都较大,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。

Teaching Suggestions

The following notes indicate how the second unit might be dealt with in the classroom. The other units can be handled in a similar way. These notes are intended as suggestions only. It is expected that the teacher will develop his/her own procedure according to the needs of his/her students. A particular teacher, for example, may find that he/she needs to place greater emphasis on one type of exercise than on another. He/She may wish to pay more attention to oral than to written work, or the reverse. It will also be up to the teacher to decide, according to his/her own circumstances, how the work is to be divided into class sessions, and which part of it can be done as homework.

Reading and Comprehension

1. Introduction (5 minutes)

The teacher may get the students to say something they know about CHEMISTRY according to their own knowledge. Then put the students' answers aside for further discussion.

2. Group work (10 minutes)

Get the students to do the exercises in groups.

3. Classroom discussion (10 minutes)

- Choose one student from one of the groups to give the answers to the True/False questions in Exercise A.
- Ask other groups whether they agree with him/her. If not, ask them to give the reasons.
- Ask the other groups to explain why the false answers are false. While one student is explaining the reasons the other students can add extra comments or give their own opinions.
- Get some students to answer the questions in Exercise B.

4. Summary (5 minutes)

Come back to the students' explanations of CHEMISTRY at the beginning and

get some better explanations. The teacher may help the students to summarize it.

Reading and Practice

1. Exercises A & B (10 minutes)

- Get the students to go over the passage quickly.
- Give the key to Exercise A to the students and see whether they have any questions. The teacher may help the students to solve some difficult problems or ask the students to help one another.
- Get one or two students to read out the passage of Exercise B with his/her answers. Ask other students to point out the mistakes and give the correct answers and the reasons.

2. Exercise C (15 minutes)

- Get the students to listen to the tape once and say what the passage is about.
- Listen to the tape twice again then check the answers. While doing so the teacher may give the students some guidance on locating main points and taking notes.
- Get some students to retell the main points of the passage if time allows.

3. Exercise D (10 minutes)

- Get the students to go over the text as fast as they can and do Exercise 1.
- Put an enlarged figure in 1) of this exercise on the blackboard and ask the students to give the Chinese versions, then explain it in English. The similar way might be applied in dealing with 2) of this exercise.
- The teacher may help to give guides to scanning in order to locate specific information and using the headings or subheadings to find specific information.
- Get the students to do Exercise 2. The teacher may get the students to pay attention to how meaning is conveyed in the passage and draw their attention to features of cohesion and coherence by actively engaging them in the rational reformulation of meanings.

Reading and Translation

1. Exercise A (15 minutes)

- Get some students to go to the blackboard and write down their answers.
- Get the students to discuss the translation. The teacher may help the students to get the right versions and to point out the reasons why such mistakes are made. And the teacher should also give some guidance to the differences in theme and rhythm between the two languages which is helpful for the recognition of the differences between the two languages and is useful for improving their skill in

translation.

2. Exercise B

For homework assignment. Exercise B is mainly about the translation of attributive clauses. The teacher may help the students to find the differences between English and Chinese attributes and ask the students to pay attention to the ways of translating attributive clauses.

Guided Writing

Application Letter (10 minutes)

1. Get the students to read the Model Text, and ask them to pay attention to the writing of the heading, the inside address, the salutation, the body, the complimentary close and the signature. The teacher may write the outside address on the blackboard for the students' reference while the students are reading.
2. Get the students to rewrite a letter according to the directions in the Practice. One or two students may be asked to do the rewriting on the blackboard for classroom discussion.
3. Get the students to help point out the errors in the written work that is on the blackboard. Also they should be asked to correct their own errors after class.
4. The teacher may ask the students to find the important points of an Application Letter, which will be discussed later in class.

练习答案和参考译文

UNIT ONE

练习答案

Reading and Comprehension

Exercise A

1. a 2. c 3. d 4. d 5. b 6. c 7. d 8. a 9. b 10. b

Exercise B

1. The tentative explanation we formulate is called a hypothesis. We use hypothesis to make predictions of new behavior and then design experiments to test our predictions. If our explanation survives repeated testing, it is gradually accepted and may ultimately achieve the status of a theory.
2. The general approach that these scientists bring to their work is called the scientific method. It is, quite simply, a common sense approach to developing an understanding of natural phenomena.
3. In 1828 Frederick Wöhler, a German chemist, was heating a substance called ammonium cyanate in an attempt to add support to one of his hypotheses. His experiment, however, produced an unexpected substance, which out of curiosity he analyzed and found to be urea (a constituent of urine). This was an exciting discovery, because it was the first time anyone has ever knowingly made a substance produced only by living creatures from a chemical not having a life origin. The fact that this could be done led to the beginning of a whole new branch of chemistry called *organic chemistry*.

Reading and Practice

Exercise A

1. 1) radically 2) unravel 3) entail 4) synthesize 5) replenish

- 6) revitalize 7) factual 8) salable 9) deduced 10) commonplace
 2. 1) devising 2) deficit 3) Occupational 4) surplus 5) rip-off
 6) formulate 7) monumental 8) legumes 9) Nystatin 10) have deduced

Exercise B

1. in 2. educated 3. among 4. applies 5. properties
 6. bottom 7. numerous 8. intimate 9. structure 10. determines

Exercise C

Energy makes its presence known in a variety of ways. It can appear entirely as (1)mechanical energy, which is simply (2)energy of motion or kinetic energy. We can observe this energy when (3)it is transferred in a collision (4)between one object and another. However, perhaps the most common way we observe (5)the transfer of energy is as heat.

Mention of heat immediately brings to mind (6)the notion of temperature. Heat (also called thermal energy) is actually a form of (7)kinetic energy. Specifically, it is the total kinetic energy of all the tiny particles (atoms) that (8)make up an object. These tiny particles have kinetic energy because they are constantly (9)moving and jiggling around. The temperature of an object (10)is related to the average kinetic energy of the jiggling and moving atoms. Stated another way, the temperature of an object is related to the kinetic energy of an “average” atom within it, whereas the heat an object contains equals the total kinetic energy of all of its atoms.

Exercise D

1. 1) K.E. — kinetic energy
 m — mass
 v — velocity
 2) J — joule
 kg — kilogram
 m — meter
 s — second
2. 1) Chemists who work in the area of applied research synthesize new chemical compounds for use as drugs or pesticides.
 2) Chemistry which is fundamental to other disciplines is a central science.
 3) The chemical industry which has sales of about \$200 billion per year is important to the economy of the United States.
 4) It is essential to know some chemistry, which helps to understand how a drug or a pesticide acts.
 5) George Washington Carver was a famous scientist of applied chemistry whose ac-

accomplishments in the realm of applied research were among the most monumental ones.

- 6) Industries which seek a competitive edge with a novel, better, or more salable product carry on applied research.
- 7) Some chemical research which is called basic research concerns the working out of fine points of atomic and molecular structure.
- 8) Hildebrand, who deduced that in any liquid helium would be found less soluble than any other gas, proposed that a mixture of helium and oxygen be used for deep-sea diving.
- 9) Bubbles of nitrogen which dissolves in the blood separate from the blood, causing the bends in deep-sea diving.
- 10) Carver who taught southern farmers to rotate crops and to use legumes to replenish the nitrogen removed from the soil by cotton crops was a botanist and agricultural chemist.

(Carver was a botanist and agricultural chemist who taught southern farmers to rotate crops and use legumes to replenish the nitrogen removed from the soil by cotton crops.)

Reading and Translation

Exercise A

1. In a gasoline engine, the combustion of gasoline produces hot gases from which heat is extracted to perform work.
2. What marks an idea as particularly outstanding is its influence on a wide range of problems.
3. Pauling's knowledge of another area of physics, that of X-ray diffraction, was brought to bear on fundamental problems in biochemistry, one being the structures of proteins.
4. The hemoglobin molecule is made in the body by piecing together portions of hundreds of small "building blocks" called amino acids, very roughly somewhat in the way that a poem might be made from "piecing" together letters of the alphabet.
5. Sickle cell anemia is a molecular disease of hemoglobin, the red substance in blood that transport oxygen.

参考译文

阅读与理解

化 学 科 学

化学反应

化学特别与探求和了解发生于化学物质间的变化有关,这种变化我们称之为化学反应。在一种化学反应中,化学物质之间发生相互作用生成性质完全不同的物质。有时这种变化可能相当剧烈,像钠与氯气反应所表明的那样。

钠是一种金属。和其他金属一样,它表面有光泽并导电良好。然而,它又不同于其他金属,它很软,容易用小刀切割。请注意钠块的外表覆盖着一层白薄膜,它是由钠与空气中的氧气和潮气反应形成。由于钠会与氧气和水迅速反应,所以使用时,它被当成危险化学品。钠在水中剧烈反应,生成大量的热并且释放可燃气体氢气。在同一反应中,钠也生成一种物质叫做氢氧化钠,俗名为火碱,它对肌肤有很强的腐蚀性。皮肤与钠接触会引起严重化学烧伤。

氯气在很多方面与钠不同,它是一种浅黄绿色的气体,如果你曾经闻过液体洗涤漂白剂如 Clorox,你就已闻过它了,氯气从漂白剂中微量释放出来。吸入高浓度氯气非常危险,会引起严重肺损伤从而导致死亡。事实上,氯气曾被用作战争武器。

当金属钠与氯气相遇,它们产生剧烈反应。反应生成的物质呈白粉末状,外表与钠或氯气大不相同。它的化学名称叫氯化钠,尽管大多数人都知道它的俗名——食盐。

如果你想一想这个反应,也许真的会令你很吃惊,甚至感觉有点像魔术。我们这里有两种化学物质,钠和氯气,摄入它们会引起严重的医学问题甚至死亡。而它们相互反应形成的物质却是我们身体必不可少的!这种令人惊讶的事例使得化学令人着迷。在你学习这门课程时,也许你会自己发现,正是这种魅力吸引着人们的想像力,产生了一代又一代的化学家。

大多数化学反应并不像钠和氯气反应那样引人入胜。然而,它们在我们身上和我们四周无时无刻不在发生。我们新陈代谢消耗食物,而光合作用补充它们。电池中的化学反应就像燃料的燃烧一样给我们提供能量。空气中的化学反应产生烟雾,与此同时,在外层大气中阳光与由喷雾罐和损坏的空调机中释放出来的气体相互作用,破坏了保护地球不受紫外线辐射伤害的天然臭氧层。理解这些反应并寻求控制对我们有害的反应的方法是化学在现代科学和社会中起的重要作用。

科学方法及其在化学中的应用

作为一门科学,化学是一门动态的学科,随着在大学里和在工业实验室里工作的科学家的新发现而不断地改变。科学家在工作中普遍采用的方法称为科学方法。它就是如何去加

深对自然现象理解的一种合乎常识的方法。

科学研究通常从某些观测开始,这些观测引发我们的好奇心,并对自然现象提出某些疑问。通常我们先从已发表在科学期刊上别人的工作中寻求解答。随着我们知识的增长,我们开始设计实验来进行我们自己的观测。一般来说,这些实验在实验室里一定的条件下完成,使得实验结果可重复。事实上,正是实验结果的可重复性使真科学区别于如占星术这类伪科学。

经验事实和科学定律

实验中我们作出的观测使我们获得经验事实——称之为经验事实,是因为我们通过观察某些物理、化学、生物体系才知道它们。经验事实是指我们的实验数据。举例来说,如果我们研究气体的特性,比如说我们呼吸的空气,我们很快会发现一种气体的体积取决于很多因素,包括气体的质量、温度和压力。我们记录下来的与这些因素相关的种种信息就是我们的数据。

科学的一个目的是通过整理事实建立数据间的关系或得出相关的概括性结论。例如,我们可以从观测中得出这样的一个总结,随着气体温度的上升,气体趋向于膨胀而占有更大的体积。如果我们用各种不同的气体反复做很多次实验,我们会发现上述结论一律成立。这样一个建立在许多次实验结果基础上的涵盖广泛的概括,称为定律或科学定律。

假说和理论

定律在总结实验结果时也许有用,但它们只能描述已经发生的事情。它们不能说明为什么物质会有此种特性。可是,人类是一种好奇心很强的动物,我们还要寻求解释。所以,当我们搜集和研究数据后,就会开始思考导致实验结果的原因。我们给出的试探性解释称为假说。我们用假说对新的特性进行预测,然后设计实验来验证我们的预测。如果这些新的实验结果证明我们的假说错了,我们必须抛弃它,再寻找一个新的。但是,如果我们的假说经受住反复实验的考验,它逐渐被接受并最终可能成为一种理论。理论是经过检验的对自然现象特性的解释。大多数有用的理论适用面广,有很多深远和微妙的含意。因为我们不可能做完所有可能证明该理论是错误的检验,所以我们不能绝对保证一个理论的正确。

刚才所说的一系列步骤——观测、解释、通过其他实验检验解释——构成了科学方法。不管这个名称如何,这种方法不仅只是被那些自称为科学家的人使用。汽车修理工修你的汽车时同样使用这些步骤。首先,进行各种检查(观测),这些检查使机修工能提出导致故障的可能原因(提出假说)。然后更换零件后再检查汽车看问题是否解决了(通过实验检验假说)。简言之,我们都在有意无意中使用科学方法。

从前面的讨论中你可能会得出这样一种印象:科学进步总是单调乏味地,有条不紊地,有步骤的进行。这是不正确的,科学是激动人心的,它给聪明才智和创造力提供有回报的发挥机会。运气,有时也起了重要作用。例如,1828年,德国化学家弗里德立克·武勒,对一