English For Applied Chemistry

应用化学英语

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内容简介

本书根据较新的英文化学化工书籍、期刊、专利等选编而成。与其它化学化工专业英语教材相比，具有实用性更强、内容更贴近现代生活的特点。更主要的是，本书采用表格的形式对常见无机及有机化合物的英文命名作了集中及归纳性介绍，使读者在短时间内就可理解并掌握常见化合物的命名。本书内容既有无机化学、有机化学、分析化学、物理化学及生物化学等基础学科知识的介绍，也有不少涉及电化学、环保、食品、药物、日用化学、香料、天然物利用、粘结剂、催化剂、分析仪器操作、计算机应用及如何从 Internet 上获取化学情报等实用性很强的课文。本书文体多样，课文难易皆有，包括专著文章、论文、专利、综述、文摘、会议通知、单位简介、外贸合同、各种广告等。书末附有常见玻璃仪器名称、常用化学化工缩略语、化学元素名称、常见化合物的词头和词尾、常用化学分子式和方程式及数学式的读法，以及生词表和课文注释等，适合于高等院校化学、应用化学及相关专业高年级学生及研究生学习使用，也可供从事轻化工专业的科技人员阅读。

前　言

应用化学英语是国内各高等院校化学、应用化学及相关专业的一门必修课。当前随着中国改革开放的不断扩大与深入，同国外的科技交流与合作日趋增多，对从事应用化学及化学化工人员的专业英语水平提出了更高的要求。选编本教材的宗旨，就是帮助有关人员尽快熟悉和掌握应用化学英语。

本书经云南大学化学系化学及应用化学专业的学生试用多年，现修改后正式出版。

本书词汇丰富，选材面广，文体各异，内容新颖。可供化学及应用化学专业的学生、研究生及从事轻化工及相关专业的科技人员学习使用。

本书在编写与修改过程中得到了许多同志的帮助，特此致谢！

由于我们水平有限，书中难免有不足和错误之处，敬请读者提出宝贵意见。

编　者

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1 CHEMISTRY AND CHEMIST

Without chemistry our lives would be unrecognisable , for chemistry is at work all around us . Think what life would be like without chemistry – there would be no plastics, no electricity and no protective paints for our homes. There would be no synthetic fibres to clothe us and no fertilisers to help us produce enough food. We wouldn' t be able to travel because there would be no metal, rubber or fuel for cars, ships and aeroplane. Our lives would be changed considerably without telephones, radio, television or computers, all of which depend on chemistry for the manufacture of their parts. Life expectancy would be much lower, too, as there would be no drugs to fight disease.

Chemistry is at the forefront of scientific adventure, and you could make your own contribution to the rapidly expanding technology we are enjoying. Take some of the recent academic research: computer graphics allow us to predict whether small molecules will fit into or react with larger ones – this could lead to a whole new generation of drugs to control disease; chemists are also studying the use of chemicals to trap the sun' s energy and to purify sea water; they are also investigating the possibility of using new ceramic materials to replace metals which can corrode.

Biotechnology is helping us to develop new sources of food and new ways of producing fuel, as well as producing new remedies for the sick. As the computer helps us to predict and interpret results from the test tube, the speed, accuracy and quality of results is rapidly increasing – all to the benefit of product development.

It is the job of chemists to provide us with new materials to take us into the next century, and by pursuing the subject, you could make your positive contribution to society.

Here are some good reasons for choosing chemistry as a career.

Firstly, if you have an interest in the chemical sciences, you can probably imagine taking some responsibility for the development of new technology. New ideas and materials are constantly being used in technology to improve the society in which we live. You could work in a field where research and innovation are of primary importance to standards of living, so you could see the practical results of your work in every day use.

Secondly, chemistry offers many career opportunities, whether working in a public service such as a water treatment plant, or high level research and development in industry. *Your chemistry – based skills and experience can be used, not only in many different areas within the chemical industry, but also as the basis for a more general career in business.*[1] As a qualification, chemistry is highly regarded as a sound basis for employment.

You should remember that, as the society we live in becomes more technically advanced, the need for suitably qualified chemists will increase. Although chemistry stands as a subject in its own right, it acts as the bond between physics and biology. Thus, by entering the world of chemistry you will be equipping yourself to play a leading role in the complex world of tomorrow.

Chemistry gives you an excellent training for many jobs, both scientific and non - scientific. To be successful in the subject you need to be able to think logically, and be creative, numerate, and analytical. These skills are much sought after in many walks of life, and would enable you to pursue a career in, say, computing and finance, as well as careers which use your chemistry directly.

Here is a brief outline of some of the fields chemists work in:

Many are employed in the wealth - creating manufacturing industries - not just oil, chemical and mining companies, but also in ceramics, electronics and fibres. Many others are in consumer based industries such as food, paper and brewing; or in service industries such as transport, health and water treatment.

In manufacturing and service industries, chemists work in Research and Development to improve and develop new products, or in Quality Control, where they make sure that the public receives products of a consistently high standard.

Chemists in the public sector deal with matters of public concern such as food preservation, pollution control, defence, and nuclear energy. The National Health Service also needs chemists, as do the teaching profession and the Government's research and advisory establishments.

Nowadays, chemists are also found in such diverse areas as finance, law and politics, retailing, computing and purchasing. Chemists make good managers, and they can put their specialist knowledge to work as consultants or technical authors. Agricultural scientist, conservationist, doctor, geologist, meteorologist, pharmacist, vet ... the list of jobs where a qualification in chemistry is considered essential is endless. So even if you are unsure about what career you want to follow eventually, you can still study chemistry and know that you are keeping your options open.

What Do Chemistry Graduates Do?

Demand for chemists is high, and over the last decade opportunities for chemistry graduates have been increasing. This is a trend that is likely to continue. Chemistry graduates are increasingly sought after to work in pharmaceutical, oil, chemical, engineering, textile and metal companies, but the range of opportunities also spans the food industry, nuclear fuels, glass and ceramics, optical and photographic industries, hospitals and the automotive industry. Many graduates begin in scientific research, development and design, but over the years, about half change, into fields such as sales, quality control, management, or consultancy. Within the commercial world it is recognised that, because of the general training implicit in a chemistry course, chemistry graduates are particularly adaptable and analytical – making them attractive to a very broad spectrum of employers. There has been a growth of opportunity for good chemistry graduates to move into the financial world, particularly in accountancy, retail stores, and computer software houses.

2 NOMENCLATURE OF INORGANIC COMPOUNDS

The term element refers to a pure substance with atoms all of a single kind. At present 107 chemical elements are known. For most elements the symbol is simply the abbreviated form of the English name consisting of one or two letters, for example:

oxygen = O   nitrogen = N   magnesium = Mg

Some elements, which have been known for a long time, have symbols based on their Latin names, for example:

iron = Fe (ferrum)   copper = Cu (cuprum)   lead = Pb (plumbum)

A few elements have symbols based on the Latin name of one of their compounds, the elements themselves having been discovered only in relatively recent times [1], for example:

sodium = Na (natrium = sodium carbonate)

potassium = K (kalium = potassium carbonate)

A listing of some common elements may be found in Table 1.

Naming Metal Oxides, Bases and Salts

A compound is a combination of positive and negative ions in the proper ratio to give a balanced charge and the name of the compound follows from names of the ions, for example, NaCl, is sodium chloride; $Al(OH)_3$ is aluminum hydroxide; $FeBr_2$ is iron (II) bromide or ferrous bromide; $Ca(OAc)_2$ is calcium acetate; $Cr_2(SO_4)_3$ is chromium (III) sulphate or chromic sulphate, and so on. Table 3 gives some examples of the naming of metal compounds. The name of the negative ion will need to be obtained from Table 2.

Table 1 Names of Some Common Elements

Symbol	Name	Symbol	Name	symbol	Name
Ag	silver	Co	cobalt	Ni	nickel
Al	aluminium	Cr	chromium	O	oxygen
As	arsenic	Cu	copper	P	phosphorus
Au	gold	F	fluorine	Pb	lead
B	boron	Fe	iron	Pd	palladium
Ba	barium	H	hydrogen	Pt	platinum
Bi	bismuth	Hg	mercury	S	sulfur
Br	bromine	I	iodine	Se	selenium
C	carbon	K	potassium	Si	silicon
Ca	calcium	Mg	magnesium	Sn	tin
Cd	cadmium	Mn	manganese	Ti	titanium
Ce	cerium	N	nitrogen	U	uranium
Cl	chlorine	Na	sodium	Zn	zinc

Negative ions, anions, may be monatomic or polyatomic. All monatomic anions have names ending with – ide. Two polyatomic anions which also have names ending with – ide are the hydroxide ion, OH^-, and the cyanide ion, CN^-.

Many polyatomic anions contain oxygen in addition to another element. The number of oxygen atoms in such oxyanions is denoted by the use of the suffixes – ite and – ate, meaning fewer and more oxygen atoms, respectively. In cases where it is necessary to denote more than two oxyanions of the same element, the prefixes hypo – and per –, meaning still fewer and still more oxygen atoms, respectively, may be used, for example,

hypochlorite	ClO^-	chlorite	ClO_2^-
chlorate	ClO_3^-	perchlorate	ClO_4^-

Table 2 Some Common Negative Ions

Name	Symbol	Name	Symbol
nitrate	NO_3^-	nitrite	NO_2^-
carbonate	CO_3^{2-}	sulphite	SO_3^{2-}
sulphate	SO_4^{2-}	phosphite	PO_3^{3-}
phosphate	PO_4^{3-}	arsenite	AsO_3^{3-}
hydrogen sulphate	HSO_4^-	hydrogen sulphite	HSO_3^-
hydrogen carbonate	HCO_3^-	hypo – chlorite	ClO^-
arsenate	AsO_4^{3-}	cyanide	CN^-
iodate	IO_3^-	iodide	I^-
chlorate	ClO_3^-	fluoride	F^-
chromate	CrO_4^-	chloride	Cl^-
dichromate	$Cr_2O_7^{2-}$	bromide	Br^-
perchlorate	ClO_4^-	sulphide	S^{2-}
permanganate	MnO_4^-	oxide	O^{2-}
acetate	OAc^-	hydride	H^-
oxalate	$C_2O_4^{2-}$	hydroxide	OH^-

Naming Nonmetal Oxides

The older system of naming and one still widely used employs Greek prefixes for both the number of oxygen atoms and that of the other element in the compound[2]. The prefixes used are (1) mono –, some-times reduced to mon – , (2) di – , (3) tri – , (4) tetra – , (5) penta – , (6) hexa – , (7) hepta – , (8) octa – , (9) nona – and (10) deca – . Generally the letter a is omitted from the prefix (from tetra on) when naming a nonmetal oxide and often mono – is omitted from the name altogether.

Table 3 Names of Some Metal Oxides, Bases and Salts

Formula	Name	
FeO	iron (II) oxide	ferrous oxide
Fe_2O_3	iron (III) oxide	ferric oxide
$Sn(OH)_2$	tin (II) hydroxide	stannous hydroxide
$Sn(OH)_4$	tin (IV) hydroxide	stannic hydroxide
Hg_2SO_4	mercury (I) sulphate	mercurous sulphate
$HgSO_4$	mercury (II) sulphate	mercuric sulphate
$NaClO$	sodium hypochlorite	
$K_2Cr_2O_7$	potassium dichromate	
$Cu_3(AsO_4)_2$	copper (II) arsenate	cupric arsenate
$Cr(OAc)_3$	chromium (III) acetate	chromic acetate

The Stock system is also used with nonmetal oxides. Here the Roman numeral refers to the oxidation state of the element other than oxygen.

Table 4 Names of Some Nonmetal Oxides

Formula	Name	
CO	carbon (II) oxide	carbon monoxide
CO_2	carbon (IV) oxide	carbon dioxide
SO_3	sulphur (VI) oxide	sulphur trioxide
N_2O_3	nitrogen (III) oxide	dinitrogen trioxide
P_2O_5	phosphorus (V) oxide	diphosphorus pentoxide
Cl_2O_7	chlorine (VII) oxide	dichlorine heptoxide

In either system, the element other than oxygen is named first, *the full name being used, followed by oxide*[3]. *Table* 4 *shows some examples.*

Naming Acids

Acid names may be obtained directly from a knowledge of Table 2 by changing the name of the acid ion (negative ion) in the Table 2 as follows:

Ion in Table 2	Corresponding Acid
– ate	– ic
– ite	– ous
– ide	– ic

Examples are:

Acid Ion	Acid
acetate	acetic acid
perchlorate	perchloric acid
bromide	hydrobromic acid
cyanide	hydrocyanic acid

There are a few cases where name of the acid is changed slightly from that of the acid radical; for example, H_2SO_4 is sulphuric acid rather than sulphic. Similarly, H_3PO_4 is phosphoric acid rather than phosphic.

Naming Acid and Basic Salt and Mixed Salts.

A salt containing acidic hydrogen is termed an acid salt. A way of naming these salts is to call Na_2HPO_4 disodium hydrogen phosphate and