

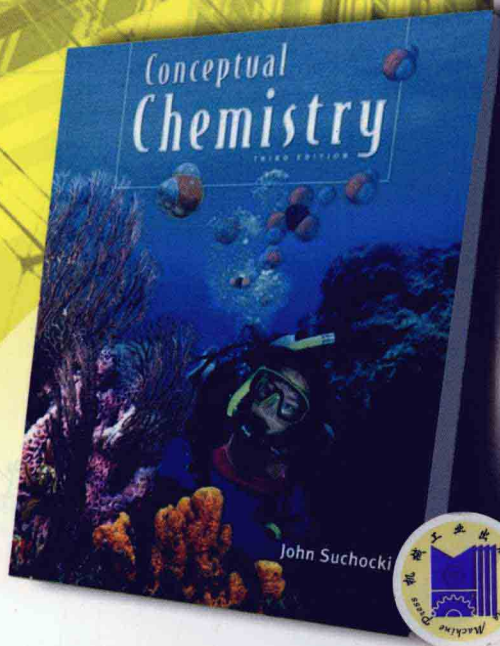
化学原理

了解原子和分子的世界

(英文版 · 原书第3版)

Conceptual Chemistry, 3e

(美) John Suchocki 著



机械工业出版社
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时代教育·国外高校优秀教材精选

化 学 原 理

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这是一本新版的普通化学教科书, 全书共 19 章, 前 12 章以化学基本原理为主, 通过学科发展的简介和与现实生活的联系, 使学生更容易了解和接受化学基本原理和概念。后 7 章为了使学生在探索与化学相关的其他课题前获得有关材料的经验, 而介绍了一些相对独立的应用领域, 如生活中的化学物质、药物化学、粮食生产的优化、淡水资源、空气资源、材料资源、能源。该书语言生动活泼, 内容涉及面较广, 比喻生动有趣, 可读性强, 图文并茂, 版面设计和栏目安排都很有特色。每章都附有概念自查、身边的化学、计算角等栏目, 并列出了关键术语和有关定义、建议的阅读材料和网址, 练习题也很丰富。总之这是一本值得向国内普通化学界推荐的教科书和参考书。

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Periodic Table of the Elements

Group																							
1	2											13	14	15	16	17	18						
1 H 1.0079																		2 He 4.003					
2 Li 6.941	3 Be 9.012											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180						
3 Na 22.990	4 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948						
4 K 39.098	5 Ca 40.078	6 Sc 44.956	7 Ti 47.88	8 V 50.942	9 Cr 51.996	10 Mn 54.938	11 Fe 55.845	12 Co 58.933	13 Ni 58.69	14 Cu 63.546	15 Zn 65.39	16 Ga 69.723	17 Ge 72.61	18 As 74.922	19 Se 78.96	20 Br 79.904	21 Kr 83.8						
5 Rb 85.468	6 Sr 87.62	7 Y 88.906	8 Zr 91.224	9 Nb 92.906	10 Mo 95.94	11 Tc 98	12 Ru 101.07	13 Rh 102.906	14 Pd 106.42	15 Ag 107.868	16 Cd 112.411	17 In 114.82	18 Sn 118.71	19 Sb 121.76	20 Te 127.60	21 I 126.905	22 Xe 131.29						
6 Cs 132.905	7 Ba 137.327	8 La 138.906	9 Hf 178.49	10 Ta 180.948	11 W 183.84	12 Re 186.207	13 Os 190.23	14 Ir 192.22	15 Pt 195.08	16 Au 196.967	17 Hg 200.59	18 Tl 204.383	19 Pb 207.2	20 Bi 208.980	21 Po 209	22 At 210	23 Rn 222						
7 Fr 223	8 Ra 226.025	9 Ac 227.028	10 Rf 261	11 Db 262	12 Sg 263	13 Bh 262	14 Hs 265	15 Mt 266	16 Uun 269	17 Uuu 272	18 Uub 277												

Lanthanides

Actinides

58 Ce 140.115	59 Pr 140.908	60 Nd 144.24	61 Pm 145	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.925	66 Dy 162.5	67 Ho 164.93	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.967
90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259	103 Lr 262

-  Metal
-  Metalloid
-  Nonmetal

Atomic-masses are averaged by isotopic abundance on the Earth's surface, expressed in atomic mass units. Atomic masses for radioactive elements are the whole number nearest the most stable isotope of that element.

List of the Elements

Name	Symbol	Atomic Number	Atomic Weight	Name	Symbol	Atomic Number	Atomic Weight
Actinium	Ac	89	227.028	Mercury	Hg	80	200.59
Aluminum	Al	13	26.982	Molybdenum	Mo	42	95.94
Americium	Am	95	243	Neodymium	Nd	60	144.24
Antimony	Sb	51	121.76	Neon	Ne	10	20.180
Argon	Ar	18	39.948	Neptunium	Np	93	237.048
Arsenic	As	33	74.922	Nickel	Ni	28	58.69
Astatine	At	85	210	Niobium	Nb	41	92.906
Barium	Ba	56	137.327	Nitrogen	N	7	14.007
Berkelium	Bk	97	247	Nobelium	No	102	259
Beryllium	Be	4	9.012	Osmium	Os	76	190.23
Bismuth	Bi	83	208.980	Oxygen	O	8	15.999
Bohrium	Bh	107	262	Palladium	Pd	46	106.42
Boron	B	5	10.811	Phosphorus	P	15	30.974
Bromine	Br	35	79.904	Platinum	Pt	78	195.08
Cadmium	Cd	48	112.411	Plutonium	Pu	94	244
Calcium	Ca	20	40.078	Polonium	Po	84	209
Californium	Cf	98	251	Potassium	K	19	39.098
Carbon	C	6	12.011	Praseodymium	Pr	59	140.908
Cerium	Ce	58	140.115	Promethium	Pm	61	145
Cesium	Cs	55	132.905	Protactinium	Pa	91	231.036
Chlorine	Cl	17	35.453	Radium	Ra	88	226.025
Chromium	Cr	24	51.996	Radon	Rn	86	222
Cobalt	Co	27	58.933	Rhenium	Re	75	186.207
Copper	Cu	29	63.546	Rhodium	Rh	45	102.906
Curium	Cm	96	247	Rubidium	Rb	37	85.468
Dubnium	Db	105	262	Ruthenium	Ru	44	101.07
Dysprosium	Dy	66	162.5	Rutherfordium	Rf	104	261
Einsteinium	Es	99	252	Samarium	Sm	62	150.36
Erbium	Er	68	167.26	Scandium	Sc	21	44.956
Europium	Eu	63	151.964	Seaborgium	Sg	106	263
Fermium	Fm	100	257	Selenium	Se	34	78.96
Fluorine	F	9	18.998	Silicon	Si	14	28.086
Francium	Fr	87	223	Silver	Ag	47	107.868
Gadolinium	Gd	64	157.25	Sodium	Na	11	22.990
Gallium	Ga	31	69.723	Strontium	Sr	38	87.62
Germanium	Ge	32	72.61	Sulfur	S	16	32.066
Gold	Au	79	196.967	Tantalum	Ta	73	180.948
Hafnium	Hf	72	178.49	Technetium	Tc	43	98
Hassium	Hs	108	265	Tellurium	Te	52	127.60
Helium	He	2	4.003	Terbium	Tb	65	158.925
Holmium	Ho	67	164.93	Thallium	Tl	81	204.383
Hydrogen	H	1	1.0079	Thorium	Th	90	232.038
Indium	In	49	114.82	Thulium	Tm	69	168.934
Iodine	I	53	126.905	Tin	Sn	50	118.71
Iridium	Ir	77	192.22	Titanium	Ti	22	47.88
Iron	Fe	26	55.845	Tungsten	W	74	183.84
Krypton	Kr	36	83.8	Uranium	U	92	238.029
Lanthanum	La	57	138.906	Vanadium	V	23	50.942
Lawrencium	Lr	103	262	Xenon	Xe	54	131.29
Lead	Pb	82	207.2	Ytterbium	Yb	70	173.04
Lithium	Li	3	6.941	Yttrium	Y	39	88.906
Lutetium	Lu	71	174.967	Zinc	Zn	30	65.39
Magnesium	Mg	12	24.305	Zirconium	Zr	40	91.224
Manganese	Mn	25	54.938	—	Uun	110	269
Meitnerium	Mt	109	266	—	Uuu	111	272
Mendelevium	Md	101	258	—	Uub	112	277

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出版说明

随着我国加入 WTO, 国际间的竞争越来越激烈, 而国际间的竞争实际上也就是人才的竞争、教育的竞争。为了加快培养具有国际竞争力的高水平技术人才, 加快我国教育改革的步伐, 国家教育部近来出台了一系列倡导高校开展双语教学、引进原版教材的政策。以此为契机, 机械工业出版社陆续推出了一系列国外影印版教材, 其内容涉及高等学校公共基础课, 以及机、电、信息领域的专业基础课和专业课。

引进国外优秀原版教材, 在有条件的学校推动开展英语授课或双语教学, 自然也引进了先进的教学思想和教学方法, 这对提高我国自编教材的水平, 加强学生的英语实际应用能力, 使我国的高等教育尽快与国际接轨, 必将起到积极的推动作用。

为了做好教材的引进工作, 机械工业出版社特别成立了由著名专家组成的国外高校优秀教材审定委员会。这些专家对实施双语教学做了深入细致的调查研究, 对引进原版教材提出了许多建设性意见, 并慎重地对每一本将要引进的原版教材一审再审, 精选再精选, 确认教材本身的质量水平, 以及权威性和先进性, 以期所引进的原版教材能适应我国学生的外语水平和学习特点。在引进工作中, 审定委员会还结合我国高校教学课程体系的设置和要求, 对原版教材的教学思想和方法的先进性、科学性严格把关, 同时尽量考虑原版教材的系统性和经济性。

这套教材出版后, 我们将根据各高校的双语教学计划, 举办原版教材的教师培训, 及时地将其推荐给各高校选用。希望高校师生在使用教材后及时反馈意见和建议, 使我们更好地为教学改革服务。

机械工业出版社

BRIEF CONTENTS 序

这是一本新版的普通化学教科书, 全书共 19 章, 前 12 章以化学基本原理为主, 通过学科发展的简介和与现实生活的联系, 使学生更容易了解和接受化学基本原理和概念。后 7 章为了使学生在探索与化学相关的其他课题前获得有关材料的经验, 而介绍了一些相对独立的应用领域, 如生活中的化学物质、药物化学、粮食生产的优化、淡水资源、空气资源、材料资源、能源。

该书在文字叙述上一改原有教材的传统风格, 以贴近学生为主, 语言生动活泼, 内容涉及面较广, 比喻生动有趣, 可读性强, 图文并茂, 版面设计和栏目安排都很有特色。它与现有普通化学教材的最大差别在于理论的深度和系统性的不同。

书中几乎没有关于初等量子力学和热力学的内容, 这在国内外普通化学教材中几乎是唯一的。这不失为解决普通化学教学问题的一种有价值的尝试。例如内容繁杂而又极其重要的有机化学, 在普通化学教材编写时由于篇幅和学时的限制, 一直是一个很难处理的问题, 作者在该书中仅用了 36 页的篇幅就完成了有机化学基础的介绍。

各章所设栏目如下: 概念自查(附有问题, 随之给出解答, 有助于学生在学习新概念之前加深对已学概念的理解), 身边的化学(使学生不再化学实验室时利用家里的器具和物品也能进行化学探究, 以提高学生远程学习和课堂学习的积极性), 计算角。各章均附有关键术语和有关定义、复习问题、身边的化学现象的讨论、练习题、问题、讨论题、建议的阅读材料和网址。

该书作者在化学科学领域不大为人所知, 但是他所编写的这本教科书却颇有特色, 在体现化学教学新理念方面有比较大的进步, 是一本值得向国内普通化学界推荐的教科书和参考书。

清华大学 化学系

宋心琦

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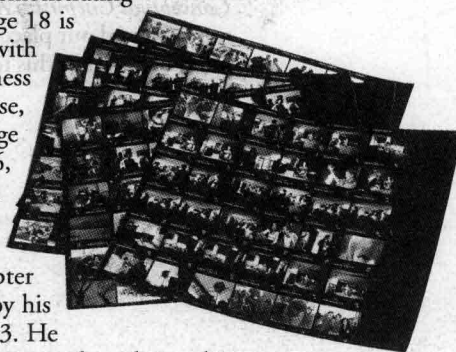
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CONCEPTUAL CHEMISTRY PHOTO ALBUM

Conceptual Chemistry is personalized with photographs of my family and friends. A photo of my uncle and mentor Paul Hewitt, author of *Conceptual Physics*, appears on page xxxi. On Uncle Paul's lap is my son Evan Suchocki (pronounced Su-HOCK-ee, with a silent *c*), who, as a toddler, sums up the book with his optimistic message.

Taking advantage of water's high heat of vaporization is my wife, Tracy, who is seen fearlessly walking over hot coals on page 280. Demonstrating the potential energy of a drawn bow and arrow on page 18 is our precious oldest son, Ian, who is also seen as a baby with his mom on page 92 letting us know that the closeness between us is in the heart. Our third child, Maitreya Rose, is proudly showcased both as a fetus and as a baby on page 473, as one of the models of Figure 13.18, on page 446, highlighting the value of proteins, and as a two-year-old holding the cellulose and color-rich Vermont autumn leaves on page 439. She appears yet again within the Chapter 12 opening photograph and within the Chapter 10 Spotlight essay on hair and skin care. About to enjoy his favorite beverage—by the liter—is son Evan on page 13. He appears again on page 585 using balloons to demonstrate the relationship between the volume of a gas and its temperature. The inverted image of Evan and his mom enjoying the balmy beaches of Hawaii can be seen on page 366 in the discussion on the chemistry of photography. Evan, his mom, and brother Ian are seen huddled together at Evan's ceramic art show in the middle figure on page 628. Those are Ian's hands holding the mineral fluorite on page 192 and my fingers on page 160 lightly touching the strings of Betsy, my guitar since childhood. I still use Betsy in producing music for my alter ego, John Andrew (see www.JohnAndrew.net). Also of our immediate family is Rusty Cat, whom you will find on page 646 helping provide perspective for the propane tank at the side of our home. Our dog Sam demonstrates his panting skills on page 269.

A few members of our extended family have also made their way into *Conceptual Chemistry*. My nephew Graham Orr, lead singer for the emo-rock group Burlington, is seen on page 53 drinking water both as a kid and as a grown-up college student. Exploring the microscopic realm with the uncanny resolution of electron waves is my cousin George Webster, who is seen on page 155 alongside his own scanning electron microscope. George's son, Christian, is the cute kid in the Chapter 3 opening photo. Friend and former housemate Rinchen Trashy is seen looking through the spectroscope on page 149. Cousin Gretchen Hewitt demonstrates her taste for chips on page 446. Tracy's brother, Peter Elias, is found on page 614 smelling the camphorous odor of a freshly cut Ping-Pong ball. Look carefully on page 630 and you will see my father-in-law,



David Hopwood, sailing with his wife Hedi on their boat Dogs of Sabbatt. On the same page appears my brother-in-law Peter Elias along with his mom (my mother-in-law), Sharon Hopwood, as they perch on the branch of a tree made strong by its composite nature. Both Peter and Sharon were key players in the development of Conceptual Chemistry Alive! Also key to *CCAlive!* are my dear former students Kai Dodge and Maile Ventura who appear on page 345. Watch for Kai and Maile's popular student-oriented video lessons with *CCAlive!* Key to my being accepted into the chemistry department family at St. Michael's College is Alayne Scholl, shown on page 316 tending to an entropy-driven exothermic reaction.

In addition to family photographs, the photographs of many of our friends' children grace this book. Ayano Jeffers-Fabro is the adorable girl hugging the tree on page 11. Jill Rabinov and her daughter Michaela appear on page 47 demonstrating the chemical nature of biological growth. Cole Stevens, who is seen on page 256, helps us to be amazed by what happens to the volume of water as it freezes. Helping us to understand the nature of DNA in the Chapter 13 opener are Daniel and Jacob Glassman-Vinci. Makani Nelson, on page 432, provides us with a fine example of a human body full of cells and biomolecules. Look also for Makani's cameo appearance on the opening montage video of *Conceptual Chemistry Alive!* We are born with the desire to learn about our environment and our place in it. Let the sparkle of curiosity in the eyes of the many kids portrayed in this textbook serve as a reminder of this important fact.

TO THE STUDENT

Welcome to the world of chemistry—a world where everything around you can be traced to these incredibly tiny particles called atoms. Chemistry is the study of how atoms combine to form materials. By learning chemistry, you gain a unique perspective on what things are made of and why they behave as they do.

Chemistry is a science with a very practical outlook. By understanding and controlling the behavior of atoms, chemists have been able to produce a broad range of new and useful materials—alloys, fertilizers, pharmaceuticals, polymers, computer chips, recombinant DNA, and more. These materials have raised our standards of living to unprecedented levels. Learning chemistry, therefore, is worthwhile simply because of the impact this field has on society. More important, with a background in chemistry you can judge for yourself whether or not available technologies are in harmony with the environment and with what you believe to be right.

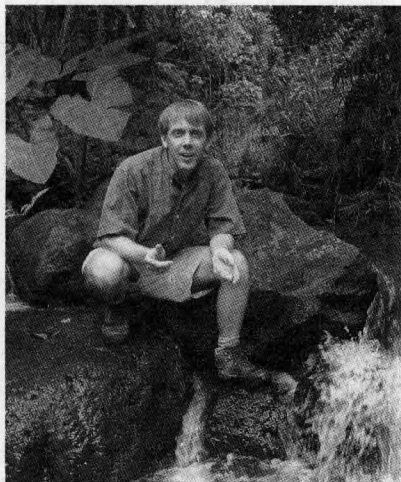
This book presents chemistry conceptually, focusing on the concepts of chemistry with little emphasis on calculations. Though sometimes wildly bizarre, the concepts of chemistry are straightforward and accessible—all it takes is the desire to learn. What you will gain from your efforts, however, may be

more than new knowledge about your environment and your personal relation to it—you may improve your learning skills and become a better thinker! But remember, just as with any other form of training, you'll get out of your study of chemistry only as much as you put in.

I enjoy chemistry, and I know you can, too. So put on your boots and let's go explore this world from the perspective of its fundamental building blocks.

Good chemistry to you!

John Surchocki



TO THE INSTRUCTOR

As instructors, we share a common desire for our teaching efforts to have a long-lasting positive impact on our students. We focus, therefore, on what we think is most important for the student to learn. For students taking liberal arts chemistry courses, certain learning goals are clear. They should become familiar with and, perhaps, even interested in the basic concepts of chemistry, especially the ones that apply to their daily lives. They should understand, for example, how soap works and why ice floats on water. They should be able to distinguish between stratospheric ozone depletion and global warming, and also know what it takes to ensure a safe drinking water supply. Along the way, they should learn how to think about matter from the perspective of atoms and molecules. Furthermore, by studying chemistry, students should come to understand the methods of scientific inquiry and become better equipped to pass this knowledge along to future generations. In short, these students should become citizens of above-average scientific literacy.

These are noble goals, and it is crucial that we do our best to achieve them. Judging from encounters with my former liberal arts students in the midst of their daily lives, however, I have come to conclude that this is not what they usually cherish most from having taken a course in chemistry. Rather, it is the personal development they experienced through the process.

As all science educators know, chemistry—with its many abstract concepts—is fertile ground for the development of higher-thinking skills. Thus, it seems reasonable for us to share this valuable scientific offering—tempered to an appropriate level—with all students. Liberal arts students, like all other students, come to college not just to learn about scientific subjects but for personal growth as well. This growth should include improvements in their analytical and verbal-reasoning skills along with a boost in self-confidence from having successfully met well-placed challenges. The value of our teaching, therefore, rests not only on our ability to help students learn chemistry but also on our ability to help them learn about themselves.

These are the premises upon which *Conceptual Chemistry* was written. You will find the standard discussions of the applications of chemistry, as shown in the table of contents. True to its title, this textbook also builds a conceptual base from which nonscience students may view nature more perceptively by helping them visualize the behavior of atoms and molecules and showing them how this behavior gives rise to our macroscopic environment. Numerical problem-solving skills and memorization are not stressed. Instead, chemistry concepts are developed in a story-telling fashion with the frequent use of analogies and tightly integrated illustrations and photographs. Follow-up end-of-chapter questions are designed to challenge the students' understanding of concepts and their ability to synthesize and articulate conclusions. Concurrent with helping

students learn chemistry, *Conceptual Chemistry* aims to be a tool by which students can learn how to become better thinkers and reach their personal goals of self-discovery.

ORGANIZATION

The basic concepts of chemistry are developed in the first 12 chapters of *Conceptual Chemistry*. Threaded into the development, real-life applications facilitate the understanding and appreciation of chemistry concepts. In the remaining 7 chapters, students have the opportunity to exercise their understanding of earlier material as they explore numerous chemistry-related topics such as nutrition, genetic engineering, pharmaceuticals, agriculture, water treatment facilities, air pollution, modern materials, and energy sources.

FEATURES

Key features of *Conceptual Chemistry* include the following:

- A conversational and clear writing style aimed at engaging student interest.
- In-text **Concept Checks** that pose a question followed by an immediate answer. These questions reinforce ideas just presented before the student moves on to new concepts.
- **Hands-On Chemistry** activities that allow students to experience chemistry outside a formal laboratory setting. These activities can be performed using common household ingredients and equipment. Most chapters have two or three Hands-On features, which lend themselves well to distance learning or to in-class activities.
- **Calculation Corners** appear in selected chapters. They are included so that students can practice the quantitative-reasoning skills needed to perform chemical calculations. In each Calculation Corner, an example problem and answer show students how to perform a specific calculation; then their understanding is tested in a Your Turn section. None of the calculations involves skills beyond fractions, percentages, or basic algebra.
- Each chapter includes four to six **FYI** margin features that highlight interesting information relating to the adjacent chapter content. An accompanying web reference points the student in the direction of additional interesting tid-bits.
- **In the Spotlight** essays appear after each of the first 12 chapters. These essays focus on chemistry-related issues that lend themselves to controversy. A Spotlight essay can serve as a starting point for a student project or as a centerpiece for in-class student discussion groups.
- **Conceptual Chemistry Alive!** is a student tutorial presented by the author on a single DVD-ROM found in every textbook. This extensive tutorial features over 200 minilectures, demonstrations, animations, home chemistry projects, and explorations of chemistry in the community. Students browse through over 24 hours of Quicktime movies in an interactive environment that follows the *Conceptual Chemistry* table of contents. After viewing a segment, students answer Concept Checks that encourage them to test their understanding of key material before progressing further. A student's answer to these Concept Checks are recorded in an electronic notebook that can be submitted to an instructor for assessment. More than a study supplement, *Conceptual Chemistry Alive!* is a textbook companion suitable for distance-learning programs and for instructors seeking to free up class time for student-centered curricula.

Extensive end-of-chapter material includes:

- **Key Terms** A short summary of important terms that appear boldfaced in the text.
- **Chapter Highlights** A set of 30 easy-to-answer questions that highlight the essentials of the chapter. Designed as a quick review, these questions are grouped by chapter section to help the student in finding the answer.
- **Concept Building** An extensive set of questions designed to challenge student understanding of the chapter material and to emphasize critical thinking rather than mere recall. In many cases, a “concept builder” links chemistry concepts to familiar situations.
- **Supporting Calculations** A set of questions featuring concepts that are more clearly understood with numerical values and straightforward calculations. They are based on information presented in the Calculation Corners and therefore appear only in chapters containing this feature.
- **Difficulty Ratings** All Concept Builders and Supporting Calculations are rated by their level of difficulty to assist you and the student in selecting among the numerous questions. The solutions to all odd-numbered Concept Builders and Supporting Calculations appear in Appendix C. The solutions to all end-of-chapter questions appear within the Instructor Manual.
- **Discussion Questions** In the topical chapters (13–19), students are prompted to express their opinions on issues that have no definitive answers. This is similar to the discussion questions found within the interchapter Spotlight essays. These questions promote student debate about controversial ideas.
- **Hands-On Chemistry Insights** The “insights” are a follow-up to the Hands-On Chemistry activities. These insights are designed to ensure that the student is getting the most out of performing the Hands-On activities and also to clear up any misconceptions that may have developed.
- **Exploring Further** The references provided here serve as a bibliography allowing the student to research the ideas of the chapter for him or herself.

NEW TO THE THIRD EDITION

Conceptual Chemistry's Third Edition is a major revision of the textbook as well as its many supplements. In all of these revisions, the main focus has been on creating tools that support the instructor seeking to emphasize student-centered learning in the classroom and beyond.

For the textbook, this has meant the creation of new interchapter In the Spotlight essays and marginal FYIs as described above. The aim of such features is to help reveal how the concepts of chemistry are central to students' lives, especially in these modern times. Also, the end-of-chapter questions have been extensively reworked to provide ample opportunity for student assessment. Notably, select Concept Builders and Supporting Calculations appear within the Instructor Resource CD-ROM in a multiple-choice format amenable to “Think-Pair-Share” teaching techniques as described in the Instructor Manual. Most significant is the inclusion of the full version of *Conceptual Chemistry Alive!* now housed on a single DVD-ROM. This DVD-ROM, found in every textbook, contains minilecture presentations organized around the Third Edition's table of contents. Using this DVD-ROM, students can access chemistry lectures whenever and wherever they have access to a computer. Class sessions can then

become a time more dedicated to various student-centered learning techniques, such as Process Oriented Guided Inquiry Learning (POGIL). In other words, students can “go home for their lectures,” but they come to class to study under the expert supervision of their course instructor.

Accompanying the Third Edition are two new student supplements; this includes the *Study Guide*, consisting of detailed chapter summaries, numerous POGIL oriented worksheets, study group questions, and RATS, which are Readiness Assurance Tests designed to help the student gauge how prepared he or she may be for an exam. RATS are particularly popular with students, which is why I have my students perform their RATS in class during the period preceding an exam.

In contrast to the minds-on approach of the study guide is *Explorations in Conceptual Chemistry: A Student Activity Manual* written by Jeff Paradis of California State University–Sacramento. Unlike the laboratories of a traditional lab manual, these activities are short and relatively easy to set up. They can be scheduled directly into the course syllabus or alternatively pulled together “on the fly” based upon student need as the semester progresses. The majority of these activities can be performed by students during class, which is a surefire way to maintain student interest. Many can also be performed by students outside of class as prescribed by the instructor. The primary goal of this booklet is to allow the student to learn chemistry by doing chemistry.

As can be expected, the creation of the Third Edition allowed for further improvements in the readability of the text and for the correction of inaccuracies appearing in earlier editions. Content changes were also made. The most significant of these changes include a reworking of the presentation of the scientific method as found in Chapter 1. For Chapter 9, the section on entropy was greatly revised. For Chapter 10, Lewis acids and bases are now discussed, and for Chapter 17 a new section on gas laws was added. The topical chapters of this textbook, Chapters 13–19, were also updated to reflect current events.

SUPPORT PACKAGE

The *Conceptual Chemistry* instructional package provides complete support materials for both students and faculty.

FOR THE STUDENT

- *Conceptual Chemistry Alive!* is a student tutorial presented by the author on a single DVD-ROM included with every Third Edition textbook. Students obtaining a used DVD-ROM can renew the *CCAlive!* registration on-line at www.ConceptChem.com, which is the technical support website for all *Conceptual Chemistry Alive!* users.
- *Study Guide for Conceptual Chemistry* features engaging minds-on, pencil-pushing, concept-review activities designed to help students working collaboratively to prepare for exams and learn chemistry through that process. Available for purchase (ISBN 0-8053-1789-9).
- *Explorations in Conceptual Chemistry: A Student Activity Manual* features hands-on activities that help students learn chemistry by doing chemistry in a discovery-based team environment. Available for purchase (ISBN 0-8053-8289-5).
- The *Chemistry Place* website (www.aw-bc.com/chemplace) is a unique study tool that offers detailed learning objectives, practice quizzes, flash cards, and web links for each chapter of the text. *The Chemistry Place* also includes inter-

active tutorials featuring simulations, animations, and 3-D visualization tools.

- *Student Laboratory Manual for Conceptual Chemistry*, coauthored with Donna Gibson, Chabot College, features laboratory activities tightly correlated to the chapter content. Available for purchase (ISBN 0-8053-8232-1).

FOR THE INSTRUCTOR

- Written by the author, the *Instructor Manual* is an important resource for the instructor seeking to implement student-centered learning techniques, such as “think-pair-share,” “student-centered circles,” “minute quizzes,” “student mini-presentations with activity intervals,” “muddiest points,” “readiness-assurance tests,” “collaborative exams,” and more. In addition to discussions on student-centered learning, the *Instructor Manual* contains sample syllabi, teaching tips, suggested demonstrations, and answers to all end-of-chapter questions. Also included are answers to all questions and worksheets appearing in the *Study Guide*, *Explorations in Conceptual Chemistry: A Student Activity Manual*, and the *Lab Manual*. Discussions on how to prep for guided inquiry activities and laboratories are also included (ISBN 0-8053-8228-3).
- The *Instructor Resource CD-ROM* contains the extensive PowerPoint presentations developed by the author in making *Conceptual Chemistry Alive!* Instructors using *Conceptual Chemistry* may adapt these PowerPoints for their own electronic presentations. To further support such electronic presentations, these CDs also contain all of the figures and tables from the textbook in JPG format. Also included are the author’s favorite Test Bank and end-of-chapter Concept Builder questions in multiple-choice format. These are the same questions that appear in the student *Study Guide* as short-answer “study group exercises” and as RATS. Presented as “clicker” PowerPoints, these multiple-choice questions serve as useful in-class concept checks tightly integrated with the *Study Guide*. The CD also contains the Test Bank and *Instructor Manual* in Word and PDF format (ISBN 0-8053-8223-X).
- *The Chemistry Place* website (www.aw-bc.com/chemplace) provides learning objectives, quizzes, interactive tutorials, and a link to downloadable supplements.
- A set of 250 four-color acetates of figures and tables from the text is available (ISBN 0-8053-8227-5).
- An extensive test bank comes in both printed format (ISBN 0-8053-8225-9) and on a cross-platform CD-ROM (ISBN 0-8053-8226-7). A special section of this test bank contains multiple-choice versions of odd Concept Builders and Supporting Calculations. These multiple-choice questions are provided as a reward to students who have studied these questions at the end of each chapter where they appear in a short-answer format.
- Course management technologies available to qualified college adopters:
Blackboard: <http://cms.aw.com/blackboard>
CourseCompassTM: www.coursecompass.com

In addition to offering Blackboard, we also offer CourseCompass—a nationally hosted on-line course management system. All CourseCompass and Blackboard courses offer preloaded content, including testing and assessment, interactive web-based activities, animations, web links, illustrations, and photos. To view a demonstration of any course, go to www.coursecompass.com.